

MapServer

open source web mapping

MapServer Documentation

Release 6.2.0

The MapServer Team

March 15, 2013

Contents

1	About	3
2	An Introduction to MapServer	5
2.1	MapServer Overview	5
2.2	Anatomy of a MapServer Application	6
2.3	Installation and Requirements	8
2.3.1	Windows Installation	8
2.3.2	Hardware Requirements	13
2.3.3	Software Requirements	13
2.3.4	Skills	14
2.4	Introduction to the <i>Mapfile</i>	14
2.4.1	<i>MAP</i> Object	15
2.4.2	<i>LAYER</i> Object	16
	Raster Layers	16
	Vector Layers	16
2.4.3	<i>CLASS</i> and <i>STYLE</i> Objects	16
2.4.4	<i>SYMBOLs</i>	17
2.4.5	<i>LABEL</i>	19
2.4.6	<i>CLASS Expressions</i>	20
2.4.7	<i>INCLUDE</i>	21
2.4.8	Get MapServer Running	22
2.4.9	Get Demo Running	22
2.5	Making the Site Your Own	22
2.5.1	Adding Data to Your Site	22
2.5.2	Vector Data	23
2.5.3	Raster Data	23
2.5.4	Projections	23
2.6	Enhancing your site	23
2.6.1	Adding Query Capability	23
2.6.2	Attribute queries	23
2.6.3	Spatial queries	24
2.6.4	Interfaces	24
2.6.5	Data Optimization	24

2.7	How do I get Help?	24
2.7.1	Documentation	24
2.7.2	Users Mailing List	25
2.7.3	IRC	25
2.7.4	Reporting bugs	25
2.7.5	Gallery	25
2.7.6	Tutorial	25
2.7.7	Test Suite	25
2.7.8	Books	25
3	MapServer Tutorial	27
3.1	Tutorial background	27
3.1.1	Tutorial Timeframe	27
3.1.2	Tutorial Data	27
3.1.3	Before Using the Tutorial	28
3.1.4	Windows, UNIX/Linux Issues	28
	Paths	28
	Executable	29
3.1.5	Other Resources	29
3.2	Section 1: Static Maps and the MapFile	29
3.3	Section 2: CGI variables and the User Interface	30
3.3.1	HTML Templates	30
	Variables	30
	Examples	30
3.4	Section 3: Query and more about HTML Templates	30
3.5	Section 4: Advanced User Interfaces	31
4	Installation	33
4.1	Compiling on Unix	33
4.1.1	Introduction	33
4.1.2	Obtaining the necessary software	34
	Required External Libraries	34
	Highly Recommended Libraries	34
	Optional External Libraries	34
	Optional Features	35
4.1.3	libgd	35
	Minimum libgd versions	36
	libiconv	36
	Pre-packaged/system libraries	36
	MacOSX	36
	FreeType support	36
	1px Anti-Aliasing and segfaults	37
	Curved label support	37
4.1.4	Anti-Grain Geometry Support	37
4.1.5	OGC Support	37
	WMS support	37
	WFS support	38
4.1.6	Spatial Warehousing	39
	PostGIS	39
	ArcSDE	39
	Oracle Spatial	39
4.1.7	Compiling	40
4.1.8	Installation	41
	MapServer binary	41

Common problems	42
Where to go once you've got it compiled	42
4.2 Compiling on Win32	43
4.2.1 Introduction	43
4.2.2 Compiling	43
4.2.3 Set up a Project Directory	44
4.2.4 Download MapServer Source Code and Supporting Libraries	44
4.2.5 The MapServer source code	44
Required Libraries	44
Optional Libraries	45
4.2.6 Set Compilation Options	45
Comments	46
4.2.7 Compile the Libraries	47
Compiling libcurl	47
4.2.8 Compile MapServer	47
4.2.9 Compiling MapServer with PostGIS support	47
4.2.10 Common Compiling Errors	48
4.2.11 Installation	48
4.2.12 Other Helpful Information	49
4.2.13 Acknowledgements	49
4.3 PHP MapScript Installation	49
4.3.1 Introduction	50
Which version of PHP is supported?	50
How to Get More Information on the PHP/MapScript Module for MapServer	50
4.3.2 Obtaining, Compiling, and Installing PHP and the PHP/MapScript Module	50
Download PHP and PHP/MapScript	50
Setting Up PHP on Your Server	50
Build/Install the PHP/MapScript Module	51
Installing PHP/MapScript	51
Example Steps of a Full Windows Installation	52
4.3.3 FAQ / Common Problems	53
Questions Regarding Documentation	53
Questions About Installation	54
4.4 .NET MapScript Compilation	55
4.4.1 Compilation	56
Win32 compilation targeting the MS.NET framework 1.1	56
Win32 compilation targeting the MS.NET framework 2.0	56
Win32 compilation targeting the MONO framework	56
Alternative compilation methods on Windows	57
Testing the compilation	57
Linux compilation targeting the MONO framework	57
OSX compilation targeting the MONO framework	57
4.4.2 Installation	58
4.4.3 Known issues	58
Visual Studio 2005 requires a manifest file to load the CRT native assembly wrapper	58
Manifests for the dll-s must be embedded as a resource	59
Issue with regex and Visual Studio 2005	59
C# MapScript library name mapping with MONO	59
Localization issues with MONO/Linux	60
4.4.4 Most frequent errors	60
Unable to load dll (MapScript)	60
4.4.5 Bug reports	61
4.5 IIS Setup for MapServer	61
4.5.1 Base configuration	61

4.5.2	Php.ini file	61
4.5.3	Internet Services Manager	62
4.5.4	Under the tree for your new website - add virtual directories for	62
4.5.5	Test PHP	63
4.5.6	Mapfiles for IIS	63
4.5.7	Configuration files:	63
4.6	Oracle Installation	63
4.6.1	Preface	63
4.6.2	System Assumptions	64
4.6.3	Compile MapServer	64
4.6.4	Set Environment Variables	65
	System Variables	65
	Setting the Apache Environment	65
	Create mapfile	66
	Testing & Error handling	66
5	Mapfile	69
5.1	Cartographical Symbol Construction with MapServer	69
5.1.1	Abstract	70
5.1.2	Introduction	71
	Multiple Rendering and Overlay	71
	Symbol Scaling	72
	MapServer and symbol specification	72
5.1.3	Using Cartographical Symbols in MapServer	73
	Output formats	74
	Symbol units	74
	Scaling of Symbols	74
5.1.4	Construction of Point Symbols	74
	Symbols of <i>TYPE vector</i> and <i>ellipse</i>	74
	Symbols of <i>TYPE truetype</i>	76
	Symbols of <i>TYPE pixmap</i>	76
	Symbol definitions for the figure that demonstrates point symbols	76
	Combining symbols	80
5.1.5	Construction of Line Symbols	81
	Overlaying lines	81
	Use of the <i>PATTERN</i> and <i>GAP</i> parameters	82
	Use of the <i>OFFSET</i> parameter	91
	Asymmetrical line styling with point symbols	92
5.1.6	Area Symbols	92
	Hatch fill	93
	Polygon fills with symbols of <i>TYPE pixmap</i>	95
	Polygon fills with symbols of <i>TYPE vector</i>	97
	Polygon outlines	108
5.1.7	Examples (MapServer 4)	108
	Basic Symbols	109
	Complex Symbols	111
5.1.8	Tricks	113
	Changing the center of a point symbol	113
5.1.9	Mapfile changes related to symbols	117
	Version 6.2	117
	Version 6.0	117
5.1.10	Current Problems / Open Issues	117
	<i>GAP - PATTERN</i> incompatibility	117
5.1.11	The End	118

5.2	CLASS	118
5.3	CLUSTER	120
5.3.1	Description	120
5.3.2	Supported Layer Types	121
5.3.3	Mapfile Parameters	121
5.3.4	Supported Processing Options	121
5.3.5	Mapfile Snippet	121
5.3.6	Feature attributes	122
5.3.7	PHP MapScript Usage	122
5.3.8	Example: Clustering Railway Stations Mapfile Layer	122
	Map Image	124
5.4	Display of International Characters in MapServer	124
5.4.1	Credit	125
5.4.2	Related Links	125
5.4.3	Requirements	125
5.4.4	How to Enable in Your Mapfile	125
	Step 1: Verify ICONV Support and MapServer Version	125
	Step 2: Verify That Your Files' Encoding is Supported by ICONV	125
	Step 3: Add ENCODING Parameter to your LABEL Object	126
	Step 4: Test with the shp2img utility	127
5.4.5	Example Using PHP MapScript	127
5.4.6	Notes	127
5.5	Expressions	128
5.5.1	Introduction	128
	String quotation	129
	Quotes escaping in strings	129
	Using attributes	129
	Character encoding	130
5.5.2	Expression Types	130
	String comparison (equality)	130
	Regular expression comparison	130
5.5.3	“MapServer expressions”	132
	Logical expressions	132
	String expressions that return a logical value	132
	Arithmetic expressions that return a logical value	133
	Spatial expressions that return a logical value (GEOS)	134
	String operations that return a string	135
	Functions that return a string	135
	String functions that return a number	135
	Arithmetic operations and functions that return a number	135
	Spatial functions that return a number (GEOS)	136
	Spatial functions that return a shape (GEOS)	136
	Temporal expressions	136
5.6	FEATURE	137
5.7	FONTSET	138
5.7.1	Format of the fontset file	138
5.8	GRID	139
5.8.1	Description	139
5.8.2	Mapfile Parameters:	139
5.8.3	Example1: Grid Displaying Degrees	139
5.8.4	Example2: Grid Displaying Degrees with Symbol	141
5.8.5	Example2: Grid Displayed in Other Projection (Google Mercator)	142
5.9	INCLUDE	143

5.9.1	Notes	143
5.9.2	Example	144
5.10	JOIN	145
5.10.1	Description	145
5.10.2	Supported Formats	145
5.10.3	Mapfile Parameters:	145
5.10.4	Example 1: Join from Shape dataset to DBF file Mapfile Layer	146
	Ogrinfo	146
	Template	147
5.10.5	Example 2: Join from Shape dataset to PostgreSQL table Mapfile Layer	147
	Ogrinfo	147
	Template	148
5.10.6	Example 3: Join from Shape dataset to CSV file Mapfile Layer	148
	CSV File Structure	148
	Ogrinfo	149
	Template (prov.html)	149
5.10.7	Example 4: Join from Shape dataset to MySQL Mapfile Layer	149
5.11	LABEL	150
5.12	LAYER	155
5.13	LEADER	162
5.13.1	Description	163
5.13.2	Supported Layer Types	163
5.13.3	Mapfile Parameters	163
5.13.4	Mapfile Snippet	163
5.13.5	Example: World Countries Labels Mapfile Example #1	164
	Map Image	165
	Mapfile Example #2	165
	Map Image	167
5.14	LEGEND	167
5.15	MAP	168
5.16	OUTPUTFORMAT	171
5.17	PROJECTION	175
5.17.1	Important Notes	176
5.17.2	For More Information	176
5.18	QUERYMAP	176
5.19	REFERENCE	177
5.20	SCALEBAR	177
5.21	STYLE	178
5.22	SYMBOL	185
5.23	Symbology Examples	186
5.23.1	Example 1. Dashed Line	187
5.23.2	Example 2. TrueType font marker symbol	187
5.23.3	Example 3. Vector triangle marker symbol	187
5.23.4	Example 4. Non-contiguous vector marker symbol (Cross)	188
5.23.5	Example 5. Circle vector symbol	188
5.23.6	Example 6. Downward diagonal fill	188
5.23.7	Example 7. Using the Symbol Type HATCH (new in 4.6)	189
5.23.8	Example 8. Styled lines using GAP	189
5.24	Templating	190

5.24.1	Introduction	190
Notes		190
5.24.2	Format	191
General		191
File Reference		192
Image Geometry		192
Map Geometry		193
Layer		195
Zoom		195
Query		196
5.24.3	Example Template	199
5.25	Union Layer	200
5.25.1	Description	200
5.25.2	Requirements	200
5.25.3	Mapfile Configuration	201
5.25.4	Feature attributes	201
5.25.5	Classes and Styles	202
5.25.6	Projections	202
5.25.7	Supported Processing Options	202
5.25.8	Examples	202
Mapfile Example		202
PHP MapScript Example		204
5.26	WEB	205
5.27	XML Mapfile support	207
5.27.1	Enabling the support	207
5.27.2	Usage:	207
5.28	Notes	207
6	MapScript	209
6.1	Introduction	209
6.1.1	Appendices	209
6.1.2	Documentation Elements	209
6.1.3	fooObj	209
fooObj Attributes		209
fooObj Methods		210
6.1.4	Additional Documentation	210
6.2	SWIG MapScript API Reference	210
6.2.1	Introduction	211
Appendices		211
Documentation Elements		212
fooObj		212
Additional Documentation		212
6.2.2	MapScript Functions	212
6.2.3	MapScript Classes	213
classObj		213
colorObj		215
errorObj		216
fontSetObj		216
hashTableObj		216
imageObj		217
intarray		218
labelCacheMemberObj		218
labelCacheObj		219
labelObj		219

layerObj	221
legendObj	227
lineObj	228
mapObj	228
markerCacheMemberObj	234
outputFormatObj	234
OWSRequest	236
pointObj	237
projectionObj	238
rectObj	238
referenceMapObj	239
resultCacheMemberObj	240
resultCacheObj	240
scalebarObj	240
shapefileObj	241
shapeObj	241
styleObj	243
symbolObj	245
symbolSetObj	246
webObj	247
6.3 PHP MapScript	247
6.3.1 Introduction	249
6.3.2 Versions Supported	249
6.3.3 How to Get More Information on PHP MapScript	250
6.3.4 Important Note	250
6.3.5 Constants	250
6.3.6 Functions	251
6.3.7 Classes	251
classObj	252
clusterObj	253
colorObj	254
errorObj	254
gridObj	255
hashTableObj	255
imageObj	256
labelcacheMemberObj	257
labelcacheObj	257
labelObj	257
layerObj	259
legendObj	263
lineObj	264
mapObj	265
outputformatObj	271
OwsrequestObj	272
pointObj	272
projectionObj	273
querymapObj	274
rectObj	274
referenceMapObj	275
resultObj	276
scalebarObj	276
shapefileObj	277
shapeObj	278
styleObj	280

symbolObj	281
webObj	283
6.3.8 Memory Management	284
6.4 Python MapScript Appendix	284
6.4.1 Introduction	285
6.4.2 Classes	285
imageObj	285
pointObj	286
rectObj	286
6.4.3 Exception Handling	286
6.5 Python MapScript Image Generation	287
6.5.1 Introduction	287
Pseudocode	287
6.5.2 Imagery Overview	287
6.5.3 The imageObj Class	288
Creating imageObj from a mapObj	288
Creating a new imageObj	288
6.5.4 Image Output	288
Creating files on disk	288
Direct Output	288
6.5.5 Images and Symbols	289
6.6 Mapfile Manipulation	289
6.6.1 Introduction	289
Pseudocode	289
6.6.2 Mapfile Overview	289
6.6.3 The mapObj Class	290
New instances	290
Cloning	290
Saving	290
6.6.4 Children of mapObj	290
Referencing a Child	290
Cloning a Child	291
New Children	291
Backwards Compatibility	291
Removing Children	291
6.6.5 Metadata	291
New API	292
Backwards Compatibility for Metadata	292
6.7 Querying	292
6.7.1 Introduction	292
Pseudocode	292
6.7.2 Querying Overview	293
The Query Result Set	293
Result Set Members	293
Resulting Features	293
Backwards Compatibility	293
6.7.3 Attribute Queries	294
By Attributes	294
6.7.4 Spatial Queries	294
By Rectangle	294
By Point	294
By Shape	294
By Selection	294
6.8 MapScript Variables	294

6.8.1	Version	295
6.8.2	Logical Control - Boolean Values	295
6.8.3	Logical Control - Status Values	295
6.8.4	Map Units	296
6.8.5	Layer Types	296
6.8.6	Font Types	296
6.8.7	Label Positions	296
6.8.8	Label Size (Bitmap only)	297
6.8.9	Shape Types	297
6.8.10	Measured Shape Types	297
6.8.11	Shapefile Types	297
6.8.12	Query Types	297
6.8.13	File Types	297
6.8.14	Qerymap Styles	298
6.8.15	Connection Types	298
6.8.16	DB Connection Types	298
6.8.17	Join Types	298
6.8.18	Line Join Types (for rendering)	298
6.8.19	Image Types	299
6.8.20	Image Modes	299
6.8.21	Symbol Types	299
6.8.22	Return Codes	299
6.8.23	Limiters	299
6.8.24	Error Return Codes	300
7	MapCache	301
7.1	Compilation & Installation	301
7.1.1	Getting the Source	302
7.1.2	Linux Instructions	302
Apache Module Specific Instructions	303	
Nginx Specific Instructions	303	
CGI/FastCGI Specific Instructions	305	
Customizing the build, or if something went wrong	306	
Experimental options, use at your own risk	308	
7.1.3	Windows Instructions	309
Dependencies	309	
Configure Your Makefile	310	
Compilation	310	
Move the Module into Apache Directory	310	
Configure Your Installed Apache	310	
Test Your MapCache Module	311	
7.2	Configuration File	312
7.2.1	Source	312
7.2.2	Cache	314
7.2.3	Format	315
7.2.4	Grid	316
Mandatory Configuration Options	316	
Optional Configuration Options	317	
Preconfigured Grids	317	
7.2.5	Tileset	318
7.2.6	Services	320
7.2.7	Miscellaneous	321
7.3	Supported Tile Services	322
7.3.1	TMS service	323

7.3.2	KML Service	324
7.3.3	OGC WMTS Service	324
7.3.4	OGC WMS Service	325
7.3.5	GoogleMaps XYZ Service	325
V2 API	326	
V3 API	326	
7.3.6	Virtual Earth Tile service	326
7.4	Seeder	327
7.4.1	Usage	328
Commandline options	328	
Optional Commandline options when using OGR/GEOS	328	
Important Note	328	
Examples	329	
7.5	Cache Types	329
7.5.1	Disk Caches	329
Default Structure	330	
Template Structure	330	
7.5.2	BerkeleyDB Caches	330
7.5.3	Sqlite Caches	331
Default Schema	331	
Custom Schema	332	
MBTiles Schema	332	
7.5.4	Memcache Caches	333
7.5.5	(Geo)TIFF Caches	333
Defining the TIFF file sizes	333	
Setting up the file naming convention	334	
Customizing the template keys	334	
Setting JPEG compression options	334	
GeoTIFF Support	335	
7.6	Image Formats	335
7.6.1	JPEG Format	335
7.6.2	PNG Format	336
7.6.3	Mixed Format	336
7.7	Tileset Dimensions	336
7.8	FeatureInfo Requests	336
7.9	Proxying Unsupported Requests	337
7.9.1	Parameter Filtering	337
7.9.2	Proxy Destination	338
7.10	Data Sources	338
7.10.1	HTTP Service Definition	338
7.10.2	WMS Sources	338
7.10.3	MapFile Sources	338
7.11	Tile Assembling	338
7.12	Features	339
8	Data Input	341
8.1	Vector Data	341
8.1.1	Data Format Types	342
File-based Data	342	
Directory-based Data	342	
Database Connections	342	
8.1.2	ArcInfo	343
File listing	343	
Data Access / Connection Method	343	

8.1.3	ArcSDE	344
	Supported ArcSDE Operations	344
	Unsupported ArcSDE Operations	345
	How to make a connection to SDE:	345
8.1.4	DGN	347
	File listing	347
	Data Access / Connection Method	347
	OGRINFO Examples	348
8.1.5	ESRI File Geodatabase	349
	File listing	349
	Data Access / Connection Method	349
	OGRINFO Examples	349
	Mapfile Example	350
8.1.6	ESRI Personal Geodatabase (MDB)	350
	File listing	351
	Data Access / Connection Method	351
	OGRINFO Examples	351
	Mapfile Example	352
8.1.7	ESRI Shapefiles (SHP)	353
	File listing	353
	Data Access / Connection Method	353
	OGRINFO Examples	353
8.1.8	GML	354
	File listing	354
	Data Access / Connection Method	355
	OGRINFO Examples	355
8.1.9	GPS Exchange Format (GPX)	356
	File listing	356
	Data Access / Connection Method	356
	OGRINFO Examples	356
	Mapfile Example	357
8.1.10	Inline	357
	Data Access / Connection Method	357
	Map File Example	358
8.1.11	KML - Keyhole Markup Language	359
	Links to KML-Related Information	359
	Data Access / Connection Method	359
	Example 1: Displaying a .KML file	360
	Example 2: Displaying a .KMZ file	361
8.1.12	MapInfo	362
	File listing	362
	Data Access / Connection Method	362
	OGRINFO Examples	363
	Map File Example	363
8.1.13	MSSQL	364
	Introduction	364
	Creating Spatial Data Tables in MSSQL 2008	364
	Connecting to Spatial Data in MSSQL 2008	365
	More Information	367
8.1.14	MySQL	367
	Introduction	368
	Connecting to Spatial Data in MySQL	368
	Connecting to non-Spatial Data in MySQL	370
	More Information	371

8.1.15	NTF	371
	File listing	371
	Data Access / Connection Method	372
	OGRINFO Examples	372
8.1.16	OGR	373
	Introduction	373
	What is OGR?	374
	Obtaining and Compiling MapServer with OGR Support	375
	Integrating OGR Support with MapServer Applications	376
	STYLEITEM “AUTO” - Rendering Layers Using Style Information from the OGR File	381
	Sample Sites Using OGR/MapServer	385
	FAQ / Common Problems	385
8.1.17	Oracle Spatial	386
	What MapServer 5.2 with Oracle Spatial	386
	Binaries	387
	Installation	387
	Two options for using Oracle Spatial with MapServer	387
	Mapfile syntax for native Oracle Spatial support	387
	Using subselects in the DATA statement	388
	Additional keywords - [FUNCTION]	389
	Additional keywords - [VERSION]	389
	More information	390
	Example of a <i>LAYER</i>	390
	Mapfile syntax for OGR Oracle Spatial support	391
8.1.18	PostGIS/PostgreSQL	391
	PostGIS/PostgreSQL	391
	Data Access /Connection Method	392
	OGRINFO Examples	393
	Mapfile Example	393
	Support for SQL/MM Curves	394
8.1.19	SDTS	399
	File listing	399
	Data Access / Connection Method	399
	OGRINFO Examples	399
8.1.20	S57	401
	File listing	401
	Data Access / Connection Method	401
	OGRINFO Examples	401
8.1.21	SpatiaLite	403
	File listing	403
	Data Access / Connection Method	403
	OGRINFO Examples	403
	Mapfile Example	405
8.1.22	USGS TIGER	406
	File listing	406
	Data Access / Connection Method	406
8.1.23	Vector field rendering - UVraster	408
8.1.24	Virtual Spatial Data	410
	Types of Databases	410
	Types of Flat Files	410
	Steps for Display	411
8.1.25	WFS	414
	Capabilities	414
	Data Access / Connection Method	415

Map File Example	415
8.2 Raster Data	416
8.2.1 Introduction	416
8.2.2 How are rasters added to a Map file?	416
Classifying Rasters	417
8.2.3 Supported Formats	419
8.2.4 Rasters and Tile Indexing	420
Tile Index Notes	420
8.2.5 Raster Warping	421
8.2.6 24bit RGB Rendering	421
8.2.7 Special Processing Directives	421
8.2.8 Raster Query	424
8.2.9 Raster Display Performance Tips	425
8.2.10 Preprocessing Rasters	426
Producing Tiled Datasets	426
Reducing RGB to 8bit	426
Building Internal Overviews	426
Building External Overviews	427
8.2.11 Georeference with World Files	427
9 Output Generation	429
9.1 AGG Rendering Specifics	429
9.1.1 Introduction	429
9.1.2 Setting the OutputFormat	429
9.1.3 New Features	430
9.1.4 Modified Behavior	431
9.2 AntiAliasing with MapServer	431
9.2.1 What needs to be done	432
9.3 Dynamic Charting	435
9.3.1 Setup	435
Supported Renderers	435
Output from AGG and GD Renderers	435
9.3.2 Adding a Chart Layer to a Mapfile	436
Layer Type	436
Specifying the Size of each Chart	436
Specifying the Values to be Plotted	437
Specifying Style	437
9.3.3 Pie Charts	438
9.3.4 Bar Graphs	439
Stacked bar Graphs	439
9.4 Flash Output	439
9.4.1 Introduction	440
Links to Flash-Related Information	440
9.4.2 Installing MapServer with Flash Support	440
Using Pre-compiled Binaries	440
Compiling MapServer with Flash Support	440
9.4.3 How to Output SWF Files from MapServer	441
Other OutputFormat Options	442
Composition of the Resulting SWF Files	442
Exporting Attributes	443
Events and Highlights	443
Fonts	444
Outputting Raster SWF for Vector Layers	444
9.4.4 What is Currently Supported and Not Supported	444

9.5	HTML Legends with MapServer	445
9.5.1	Introduction	445
Implementation	446	
Legend Object of Mapfile	446	
CGI [legend] tag	446	
HTML Legend Template File	447	
9.5.2	Sample Site Using the HTML Legend	453
9.6	HTML Imagemaps	454
9.6.1	Introduction	454
9.6.2	Mapfile Layer Definition	454
9.6.3	Templates	455
Point Layers	455	
Polygon Layers	456	
9.6.4	Request URL	456
9.6.5	Additional Notes	456
9.6.6	More Information	456
9.7	OGR Output	456
9.7.1	Introduction	457
9.7.2	OUTPUTFORMAT Declarations	457
9.7.3	LAYER Metadata	458
9.7.4	MAP / WEB Metadata	459
9.7.5	Geometry Types Supported	459
9.7.6	Attribute Field Definitions	459
9.7.7	Return Packaging	460
9.7.8	Test Suite Example	460
9.8	PDF Output	460
9.8.1	Introduction	461
9.8.2	What is currently supported and not supported	461
9.8.3	Implementing PDF Output	462
Build the PDF Library	462	
Build MapServer with PDF support	462	
Mapfile definition	462	
Testing	463	
Possible Errors	463	
9.8.4	PHP/MapScript and PDF Output	463
How does it work?	464	
Create the PDF document	464	
Render PNG views at a suitable resolution	464	
Insert the PNG elements into your PDF document	465	
Buffer the PDF and send it to the user	465	
Additional stuff to try	465	
9.9	SVG	465
9.9.1	Introduction	466
Links to SVG-Related Information	466	
9.9.2	Feature Types and SVG Support Status	466
Circle Layers	466	
Line Layers	466	
Point Layers	467	
Polygon Layers	467	
Raster Layers	467	
Text Features	467	
WMS Layers	467	
9.9.3	Testing your SVG Output	468
9.9.4	goSVG	469

Definition	469
Support for Specific goSVG Elements	469
Setting up a Mapfile for goSVG Output	470
Testing your goSVG Output	471
Sample goSVG File Produced by MapServer	471
9.10 Tile Mode	472
9.10.1 Introduction	472
9.10.2 Configuration	472
9.10.3 Utilization	473
About Spherical Mercator	473
Using Google Maps	474
Using Virtual Earth	475
9.11 Template-Driven Output	476
9.11.1 Introduction	476
9.11.2 OUTPUTFORMAT Declarations	477
9.11.3 Template Substitution Tags	477
9.11.4 Examples	478
9.12 Kml Output	481
9.12.1 Introduction	481
9.12.2 General Functionnality	481
9.12.3 Output format	482
9.12.4 Build	482
9.12.5 Limiting the number of features	482
9.12.6 Map	482
9.12.7 Layers	483
General notes on layers	485
Point Layers	486
Line Layers	486
Polygon Layers	486
Raster Layers	486
9.12.8 Styling	486
Point Layers	487
Line Layers	487
Polygon Layers	487
9.12.9 Attributes	487
9.12.10 Coordinate system	487
9.12.11 Warning and Error Messages	487
10 OGC Support and Configuration	489
10.1 MapServer OGC Specification support	489
10.2 WMS Server	489
10.2.1 Introduction	490
Links to WMS-Related Information	490
How does a WMS Work	490
10.2.2 Setting Up a WMS Server Using MapServer	491
Install the Required Software	491
Setup a Mapfile For Your WMS	492
Test Your WMS Server	494
GetLegendGraphic Request	496
10.2.3 Changing the Online Resource URL	497
Apache ReWrite rules (using Apache mod_rewrite)	497
Apache environment variables - MS_MAPFILE	498
Apache SetEnvIf	498
ASP script (IIS - Microsoft Windows)	498

Mapscript wrapper	499
Wrapper script (Unix)	499
10.2.4 WMS 1.3.0 Support	499
Major features related to the WMS 1.3.0 support	499
Coordinate Systems and Axis Orientation	499
Example of requests	500
Other notable changes	500
Some Missing features	500
OCG compliance tests	501
10.2.5 Reference Section	501
Web Object Metadata	501
Layer Object Metadata	505
Vendor specific WMS parameters	511
Cascading WMS Requests	511
Sample WMS Server Mapfile	512
10.2.6 FAQ / Common Problems	513
10.3 INSPIRE View Service	514
10.3.1 Introduction	514
10.3.2 Activation of INSPIRE support	515
10.3.3 Multi-language support for certain capabilities fields	515
10.3.4 Provision of INSPIRE specific metadata	516
10.3.5 Named group layers	517
10.3.6 Style section for root layer and possibly existing group layers	518
10.4 WMS Client	519
10.4.1 Introduction	520
WMS-Related Information	520
10.4.2 Compilation / Installation	520
Check your MapServer executable	521
Install Optional PROJ4 EPSG Codes	521
10.4.3 MapFile Configuration	521
Storing Temporary Files	522
Adding a WMS Layer	522
10.4.4 Limitations/TODO	526
10.5 WMS Time	527
10.5.1 Introduction	527
Links to WMS-Related Information	527
10.5.2 Enabling Time Support in MapServer	527
Time Patterns	527
Setting Up a WMS Layer with Time Support	528
GetCapabilities Output	529
Supported Time Requests	529
Interpreting Time Values	529
Limiting the Time Formats to Use	530
Example of WMS-T with PostGIS Tile Index for Raster Imagery	530
10.5.3 Future Additions	531
10.5.4 Limitations and Known Bugs	531
10.6 WMS Dimension	531
10.6.1 Introduction	532
Links to WMS-Related Information	532
10.6.2 Enabling Dimension Support in MapServer	532
Setting Up a WMS Layer with dimension support	532
10.6.3 GetCapabilities Output	533
10.6.4 Supported Dimension Requests	533
10.6.5 Processing Dimension Requests	534

10.7	Map Context	534
10.7.1	Introduction	534
	Links to WMS / Map Context Related Information	534
10.7.2	Implementing a Web Map Context	535
	Special Build Considerations	535
	Map Context Mapfile	535
	Testing Map Context Support	538
	Sample Map Context Document	538
	Map Context Support Through CGI	539
	Map Context Support Through WMS	541
10.8	WFS Server	541
10.8.1	Introduction	541
	WFS-Related Information	541
	Software Requirements	542
	Versions of GML Supported	542
10.8.2	Configuring your MapFile to Serve WFS layers	542
	Example WFS Server Mapfile	543
	Rules for Handling SRS in MapServer WFS	544
	Axis Orientation in WFS 1.1	544
	Test Your WFS Server	545
10.8.3	Reference Section	546
	Web Object Metadata	546
	Layer Object	547
10.8.4	To-do Items and Known Limitations	550
10.9	WFS Client	550
10.9.1	Introduction	550
	WFS-Related Information	550
	Software Requirements	551
10.9.2	Setting up a WFS-client Mapfile	551
	Storing Temporary Files	551
	WFS Layer	551
	Example WFS Layer	552
	Connection - deprecated	553
10.9.3	TODO / Known Limitations	553
10.10	WFS-T Server	553
10.10.1	WFS-T	553
10.11	WFS Filter Encoding	553
10.11.1	Introduction	554
	Links to SLD-related Information	554
10.11.2	Currently Supported Features	554
	Units of measure	555
10.11.3	Get and Post Requests	555
10.11.4	Use of Filter Encoding in MapServer	556
	Server Side	556
	Client Side	557
10.11.5	Limitations	558
10.11.6	Tests	558
10.12	SLD	561
10.12.1	Introduction	562
	Links to SLD-related Information	562
10.12.2	Server Side Support	562
	General Information	562
	Specific SLD Elements Supported	564
10.12.3	Client Side Support	570

PHP/MapScript Example that Generates an SLD from a Mapfile	570
10.12.4 Named Styles support	571
10.12.5 Other Items Implemented	571
10.12.6 Issues Found During Implementation	572
10.13 WCS Server	572
10.13.1 Introduction	572
Links to WCS-Related Information	572
Software Requirements	573
10.13.2 Configuring Your Mapfile to Serve WCS Layers	573
Example WCS Server Mapfile	573
Output Formats	575
10.13.3 Test Your WCS 1.0 Server	575
Validate the Capabilities Metadata	575
Test With a DescribeCoverage Request	576
Test With a GetCoverage Request	576
10.13.4 WCS 1.1.0+ Issues	577
GetCapabilities	577
DescribeCoverage	577
GetCoverage	577
URNs	578
10.13.5 WCS 2.0	578
Overview	578
Changes to previous versions	580
Specifying coverage specific metadata	581
New band related metadata entries	581
10.13.6 HTTP-POST support	583
10.13.7 Reference Section	584
Web Object Metadata	584
Layer Object Metadata	586
10.13.8 Rules for handling SRS in a MapServer WCS	588
10.13.9 Spatio/Temporal Indexes	588
Building Spatio-Temporal Tile Indexes	588
10.13.10WCS 2.0 Application Profile - Earth Observation (EO-WCS)	589
10.13.11To-do Items and Known Limitations	589
10.14 WCS Use Cases	589
10.14.1 Landsat	590
10.14.2 SPOT	590
10.14.3 DEM	591
10.14.4 NetCDF	592
10.15 SOS Server	594
10.15.1 Introduction	595
Links to SOS-Related Information	595
Relevant Definitions	595
10.15.2 Setting Up an SOS Server Using MapServer	595
Install the Required Software	595
Configure a Mapfile For SOS	596
Example SOS Server Mapfile	597
Test Your SOS Server	598
10.15.3 Limitations / TODO	600
10.15.4 Reference Section	600
Web Object Metadata	600
Layer Object Metadata	602
10.15.5 Use of sos_procedure and sos_procedure_item	605
GetCapabilities	605

DescribeSensor	605
GetObservation	605
10.16 How to set up MapServer as a client to access a service over https	606
10.16.1 Introduction	606
10.16.2 Requirements	606
10.16.3 Default Installation (with apt-get install, rpm, manual, etc)	606
10.16.4 Non-Standard Installation (common with ms4w and fgs)	606
10.16.5 Remote Server with a Self-Signed SSL Certificate	607
10.17 MapScript Wrappers for WxS Services	608
10.17.1 Introduction	608
10.17.2 Python Examples	608
10.17.3 Perl Example	609
More Perl example code	610
10.17.4 Java Example	612
10.17.5 PHP Example	613
10.17.6 Use in Non-CGI Environments (mod_php, etc)	615
10.17.7 Post Processing Capabilities	615
11 TinyOWS	617
11.1 TinyOWS Installation	617
11.1.1 Requires	617
Installing from a stable source release	618
Installing the Current Trunk from GIT	618
Installing from source on Windows (oldies so dunno if still up to date)	618
11.2 Configuring TinyOWS with an XML File	618
11.2.1 Configuration file simple Example	618
11.2.2 Testing your config.xml file	619
11.2.3 Structure of the config.xml file	619
TinyOWS Element	619
Limits Element	620
PostgreSQL Connection	620
Metadata and Contact Elements	621
Layer Element	622
11.3 Configuring TinyOWS with a standard Mapfile	624
11.3.1 Mapfile Config File support for TinyOWS	624
11.3.2 Mapfile path of each TinyOWS config element	625
11.4 Sample: WFS-T with TinyOWS and OpenLayers	626
11.5 Server Tuning: How to speed up your TinyOWS server	631
11.5.1 Tips and Tricks for PostgreSQL / PostGIS databases	631
11.5.2 Tips and Tricks for Apache	631
11.5.3 Using Fast-CGI	631
Fast-CGI in Apache	631
Fast-CGI in MS4W	632
11.5.4 HTTP GZip compression	632
11.6 Working Around the LibXML2 XSD Schema GML Bug	632
11.6.1 Issue	632
11.6.2 Workaround and options	632
12 Optimization	635
12.1 Debugging MapServer	635
12.1.1 Introduction	635
Links to Related Information	635
12.1.2 Steps to Enable MapServer Debugging	636
Step 1: Set the MS_ERRORFILE Variable	636

Step 2: Set the DEBUG Level	637
Step 3: Turn on CPL_DEBUG (optional)	638
Step 4: Turn on PROJ_DEBUG (optional)	638
Step 5: Test your Mapfile	638
Step 6: Check your Web Server Logs	641
Step 7: Verify your Application Settings	643
12.1.3 Debugging MapServer using Compiler Debugging Tools	643
Running MapServer in GDB (Linux/Unix)	643
12.1.4 Debugging Older Versions of MapServer (before 5.0)	645
12.2 FastCGI	646
12.2.1 Introduction	646
12.2.2 Obtaining the necessary software	646
12.2.3 mod_fcgid Configuration	647
12.2.4 Deprecated mod_fcgid Configuration	647
12.2.5 Common mod_fcgid/mod_fcgid Configuration	648
12.2.6 Common Problems	648
File permissions	648
12.2.7 FastCGI on Win32	648
MS4W Users	648
Building fcgi-2.4.0	648
Binary IO Patch	648
Building libfcgi	649
Other Issues	649
12.3 Mapfile	649
12.3.1 Introduction	650
1. Projections	650
2. Layers	650
3. Symbols	651
4. Fonts	652
12.4 Raster	652
12.4.1 Overviews	652
12.4.2 Tileindexes and Internal Tiling	652
12.4.3 Image formats	653
12.4.4 Remote WMS	653
12.5 Tile Indexes	653
12.5.1 Introduction	653
12.5.2 What is a tileindex and how do I make one?	653
12.5.3 Using the tileindex in your mapfile	654
12.5.4 Tileindexes may make your map faster	654
12.6 Vector	655
12.6.1 Splitting your data	655
12.6.2 Shapefiles	655
12.6.3 PostGIS	655
12.6.4 Databases in General (PostGIS, Oracle, MySQL)	656
13 Utilities	657
13.1 legend	657
13.1.1 Purpose	657
13.1.2 Syntax	657
13.2 msencrypt	657
13.2.1 Purpose	657
13.2.2 Syntax	657
13.2.3 Use in Mapfile	658
Example	658

13.3	scalebar	659
13.3.1	Purpose	659
13.3.2	Syntax	659
13.4	shp2img	659
13.4.1	Purpose	659
13.4.2	Syntax	659
	Example #1	660
	Example #2	660
	Example #3	660
13.5	shptree	661
13.5.1	Purpose	661
13.5.2	Description	661
13.5.3	Syntax	661
13.5.4	Mapfile Notes	661
13.6	shptreetst	662
13.6.1	Purpose	662
13.6.2	Syntax	662
13.7	shptreevis	663
13.7.1	Purpose	663
13.7.2	Syntax	663
	Example	663
13.8	sortshp	664
13.9	sym2img	666
13.9.1	Purpose	666
13.9.2	Syntax	666
13.10	tile4ms	667
13.10.1	Purpose	667
13.10.2	Description	667
13.10.3	Syntax	667
13.10.4	Short Example	667
13.10.5	Long Example	668
13.11	Batch Scripting	671
13.11.1	Windows	671
13.11.2	Linux	671
13.12	File Management	671
13.12.1	File Placement	671
13.12.2	Temporary Files	671
	Windows	672
14	CGI	673
14.1	MapServer CGI Introduction	673
14.1.1	Notes	673
14.1.2	Changes	673
	From MapServer version 4.x to version 5.x	673
	From MapServer version 3.x to version 4.x	674
14.2	mapserv	674
14.3	Map Context Files	674
14.3.1	Support for Local Map Context Files	674
14.3.2	Support for Context Files Accessed Through a URL	674
14.3.3	Default Map File	675
14.4	MapServer CGI Controls	675
14.4.1	Variables	675
14.4.2	Changing map file parameters via a form or a URL	678
	Using MapServer version >= 5	679

Using MapServer version < 5	679
14.4.3 Specifying the location of mapfiles using an Apache variable	679
14.4.4 ROSA-Applet Controls	680
14.5 Run-time Substitution	680
14.5.1 Introduction	680
14.5.2 Basic Example	681
14.5.3 Parameters Supported	681
FILTERS	681
14.5.4 Default values if not provided in the URL	682
14.5.5 VALIDATION	682
14.5.6 Magic values	683
14.6 A Simple CGI Wrapper Script	683
14.6.1 Introduction	683
14.6.2 Script Information	683
Alternative 1	683
Alternative 2	684
14.7 MapServer OpenLayers Viewer	684
14.7.1 Using the OpenLayers viewer	684
Opening the OpenLayers viewer in your browser	684
Opening the OpenLayers viewer in the form of a WMS request	685
15 Community Activities	687
15.1 IRC	687
15.1.1 Server and Channel Information	687
15.1.2 Why IRC?	687
15.1.3 How do I join?	687
15.2 Mailing Lists	688
15.2.1 mapserver-announce	688
15.2.2 mapserver-users	688
15.2.3 mapserver-dev	688
15.2.4 MapServer mailing lists in languages other than English	689
15.2.5 Downloading list archives	689
15.3 MapServer Wiki Pages	689
15.4 MapServer Service Providers	689
16 Development	691
16.1 Sponsors	691
16.2 MapServer Release Plans	692
16.2.1 6.0 Release Plan	692
Background	692
New Features and Major Bug Fixes	692
6.2 Wishlist	694
Planned Dates	694
Release Manager	694
SVN Tags / Branches	694
Trac Conventions	695
Q/A	695
16.2.3 Release Announcements	695
16.3.1 6.2 Announcement	695
Major New Features in MapServer 6.2	696
Minor New Features in MapServer 6.2	701
Noteworthy Changes Which Could Affect Existing Applications	702
Migration Guide	703
Source Code Download	703

Binary Distributions	704
Thanks	704
16.3.2 6.0 Announcement	704
Core Changes in MapServer 6.0 Which Could Affect Existing Applications	704
New Features and Notable Enhancements in MapServer 6.0	705
Migration Guide	705
Source Code Download	705
Binary Distributions	705
Documentation	706
16.4 MapServer Changelogs	706
16.4.1 MapServer 6.2.0 Changelog since RC1	706
16.4.2 MapServer 6.2.0 RC1 Changelog	707
16.4.3 MapServer 6.2.0 beta4 Changelog	707
16.4.4 MapServer 6.2.0 beta3 Changelog	708
16.4.5 MapServer 6.2.0 beta2 Changelog	711
16.5 Bug Submission	712
16.6 GitHub	713
16.6.1 Background	713
16.6.2 GitHub Sub-Projects	713
16.6.3 Code Developer's GitHub Access	713
16.6.4 Support Libraries	714
16.6.5 How to Obtain Commit/Push Access	714
16.6.6 Issue Trackers	714
16.7 Documentation Development Guide	714
16.7.1 Background	715
16.7.2 GitHub Notes	715
16.7.3 General Writing Guidelines	715
16.7.4 reStructuredText Reference Guides	715
16.7.5 reStructuredText Formatting	715
16.7.6 Installing and Using Sphinx for rst-html Generation	716
16.7.7 How translations are handled	717
16.7.8 Reference Labels	718
Regenerating the reference labels	723
16.8 Testing	723
16.8.1 Regression Testing	723
Getting msautotest	724
Running msautotest	724
Checking Failures	725
Background	725
Result Comparisons	726
REQUIRES - Handling Build Options	726
RUN_PARMS: Tests not using shp2img	727
Result File Preprocessing	727
What If A Test Fails?	727
TODO	728
Adding New Tests	728
16.8.2 MapScript Unit Testing	728
Test Driven Development	728
About the tests	729
Status	729
16.9 Request for Comments	730
16.9.1 MS RFC 1: Technical Steering Committee Guidelines	730
Summary	730
Detailed Process	730

When is Vote Required?	731
Boundaries of “Technical”	731
Observations	731
Bootstrapping	731
16.9.2 MS RFC 2: Creating line features and/or shapes using WKT	731
Files affected	732
Backwards compatabilty issues	732
Implementation Details	732
Bug ID	733
Voting history	734
16.9.3 MS RFC 3: Feature Layer Plug-in Architecture	734
Abstract Solution	734
Technical Solution	734
Files and objects affected	738
Backwards compatibility issues	738
Implementation Issues	738
Bug ID	738
Voting history	739
Open questions	739
16.9.4 MS RFC 4: MapServer Raster Resampling	739
Overview	739
Technical Details	739
Mapfile Implications	740
MapScript Implications	740
Documentation Implications	740
Test Plan	740
Staffing / Timeline	740
16.9.5 MS RFC 5: MapServer Horizon Reprojection Improvements	740
Purpose	740
Approach	741
Point Features	741
Line Features	741
Area Features	741
Tolerances	741
Caveats	742
Mapfile Implications	742
MapScript Implications	742
Backward Compatibility Issues	742
Staffing and Timeline	742
16.9.6 MS RFC 6: Color Range Mapping of Continuous Feature Values	742
Background	743
Current Syntax Problems	743
Proposed New Syntax	743
Proposed Legend Format	744
MapScript Issues	744
Files affected	744
Backwards compatabilty issues	745
Multiple Mapping Methods	745
Bug ID	745
Voting history	745
16.9.7 MS RFC 7: MapServer CVS Commit Management	745
Purpose	746
Election to CVS Commit Access	746
Committer Tracking	746

CVS Administrator	746
CVS Commit Practices	747
16.9.8 MS RFC 7.1: MapServer SVN Commit Management	747
Purpose	747
Election to SVN Commit Access	748
Committer Tracking	748
SVN Administrator	748
SVN Commit Practices	748
Legal	749
Voting History	750
16.9.9 MS RFC 7.2: MapServer Git Push Management	750
Purpose	750
Election to Git Push Access	750
Committer Tracking	750
Git Administrator	751
Git Commit Practices	751
Legal	752
Voting History	752
16.9.10 MS RFC 8: Pluggable External Feature Layer Providers	752
Purpose	753
Abstract Solution	753
Technical Solution	753
Files and objects affected	754
Backwards compatibility issues	754
Implementation Issues	754
Bug ID	754
Voting history	754
Open questions	754
Working Notes	754
16.9.11 MS RFC 9: Item tag for query templates	755
Files affected	755
Backwards compatibility issues	755
Implementation Details	755
Examples	756
Notes	756
Bug ID	756
Voting history	756
16.9.12 MS RFC 10: Joining the Open Source Geospatial Foundation	756
Abstract	756
MapServer's Participation in the Foundation	757
Expected Benefits of OSGeo to the MapServer Project	757
Deciding to Join	757
Considerations	757
Voting history	758
16.9.13 MS RFC 11: Support for Curved Labels	758
Overview	758
Technical Details	758
Mapfile Implications	759
Support for Non-GD Renderers	759
Bug Tracking	759
Voting History	759
16.9.14 MS RFC 12: C code Unit tests	759
Overview	759
Example	760

Unit testing software	760
Usage recommendations	760
Testing specific functionalities	761
Running unit tests and functional tests (Continuos integration)	761
16.9.15 MS RFC 13: Support of Sensor Observation Service in MapServer	762
Overview	762
User Interface	762
Changes in MapServer	762
Mapscript implications	763
Additional libraries	763
Testing	763
Bug Tracking	763
Voting History	763
Annexe A : Sensor Observation System (SOS) support in MapServer	763
16.9.16 MS RFC 14: Relative Coordinates for INLINE features	767
C Structural Changes	767
Mapfile Changes	767
Files affected	768
Testing	768
Backwards compatabilty issues	768
Bug ID	768
Voting history	768
16.9.17 MS RFC 15: Support for thread neutral operation of MapServer/MapScript	768
1. Overview	769
2. Purpose	769
2. General principles of the solution	769
2.1 Not changing the code (Considering as safe without locks)	769
2.2 Retaining the variable, but reconsidering the initialization code	769
2.3 Rewriting the code to eliminate the need of the global variable	770
2.4 Using thread local variable instead of the global one	770
2.5 Not changing the code (Marking as safe with locks, will be reconsidered later)	770
2.6 Not changing the code (Marking as unsafe, will be deprecated and unsupported)	770
3. Issues of the MapServer /Mapscript code	770
3. Issues of the related libraries	776
4. Considerations for the future development	776
5. Backwards compatibility issues	776
Bug ID	776
Voting history	776
16.9.18 MS RFC 16: MapScript WxS Services	776
Purpose	776
Technical Solution	777
WxS Functions	777
OWSRequest	777
IO Hooking	778
gdBuffer	779
Files and objects affected	779
Backwards compatibility issues	779
Implementation Issues	779
Test suite	780
Example	780
Bug ID	780
Voting history	780
Open questions	780
16.9.19 MS RFC 17: Dynamic Allocation of layers, styles, classes and symbols	781

Purpose	781
MS_MAXSYMBOLS	781
MS_MAXLAYERS	781
MS_MAXCLASSES	782
MS_MAXSTYLES	782
Files and objects affected	782
Backwards compatibility issues	783
Test suite	783
Bug ID	783
Voting history	783
Comments/Questions from the review period	783
16.9.20 MS RFC 18: Encryption of passwords in mapfiles	784
Overview	784
Technical Solution	784
Encryption key	784
New “msencrypt” command-line utility	785
Encoding of encrypted strings	785
Modifications to the source code	785
Files affected	786
Backwards compatibility issues	786
Bug ID	786
Voting history	786
Comments from the review period	786
16.9.21 MS RFC 19: Style & Label attribute binding	787
C Structural Changes	787
Mapfile/MapScript Changes	787
Files Affected	788
Testing	788
Backwards compatabilty issues	788
Bug ID	788
Voting history	789
16.9.22 MS RFC 21: MapServer Raster Color Correction	789
Overview	789
Technical Details	789
Other Curve Formats	790
Mapfile Implications	790
MapScript Implications	790
Documentation Implications	790
Test Plan	790
Staffing / Timeline	790
Tracking Bug	790
16.9.23 MS RFC 22a: Feature cache for long running processes and query processing	790
1. Overview	791
2. Purpose	791
3. General principles of the solution	791
3.1 Feature caching provider	792
3.1.1 Shape retrieval options	792
3.1.2 Items selection	793
3.1.3 Support for the STYLEITEM “AUTO” option	793
3.1.4 Support for the attribute filter	793
3.2 Geometry transformation provider	793
3.2.1 Items selection	793
3.2.2 Applying the transformations	794
3.3 Layer filter provider	794

4. Putting the things together (example)	794
4.1 Adding the feature cache for the layers	796
4.2 Applying transformations on the counties	797
4.3 Using the transformed shape as the selection shape	798
5. Modifying the mapserver core	800
5.1 Hashtable implementation	800
5.2 Extending the layerObj structure to support nesting the layers (map.h)	800
5.3 Adding a new built in data connection types (map.h)	801
5.4 Support for destroying the persistent data of the providers (map.h, maplayer.c)	801
5.5 Vtable initialization for the new data providers (maplayer.c)	801
6. Files affected	802
7. Backwards compatibility issues	802
8. Bug ID	802
9. Voting history	802
16.9.24 MS RFC 23: Technical Steering Committee Guidelines	802
Summary	803
Detailed Process	803
When is Vote Required?	804
Observations	804
Committee Membership	804
Membership Responsibilities	804
Bootstrapping	805
Updates	805
16.9.25 MS RFC 25: Align MapServer pixel and extent models with OGC models	806
Overview	806
Technical Details	806
Mapfile Implications	807
MapScript Implications	807
Documentation Implications	807
Test Plan	807
Staffing / Timeline	808
16.9.26 MS RFC 26: Version 5 Terminology Cleanup	808
TRANSPARENCY	808
SCALE	809
PATTERN	810
16.9.27 MS RFC 27: Label Priority	810
Overview	810
Technical Solution	811
Support for attribute binding	811
Modifications to the source code	811
MapScript Implications	811
Files affected	812
Backwards compatibility issues	812
Bug ID	812
Voting history	812
Questions/Comments from the review period	812
16.9.28 MS RFC 28: Redesign of LOG/DEBUG output mechanisms	812
Overview	813
Inventory of existing mechanisms	813
Questions	813
Technical Solution	813
Setting MS_ERRORFILE	814
DEBUG levels	814
The MS_DEBUGLEVEL environment variable	815

MapScript Implications	815
Files affected	815
Backwards compatibility issues	815
Bug ID	815
Voting history	815
Questions/Comments from the review period	816
16.9.29 MS RFC 29: Dynamic Charting Capability	816
Overview	816
Technical Solution	816
Issues and limitations	817
MapScript Implications	817
Files affected	817
Backwards compatibility issues	818
Bug ID	818
Documentation	818
Voting history	818
Questions/Comments from the review period	818
16.9.30 MS RFC 30: Support for WMS 1.3.0	818
Overview	819
Coordinate Systems and Axis Orientation	819
WMS and SLD	820
HTTP Post support	820
OCG compliance tests	820
Other Notes	820
MapScript Implications	820
Files affected	820
Backwards compatibility issues	821
Bug ID	821
Voting history	821
Questions/Comments from the review period	821
16.9.31 MS RFC 31: Loading MapServer Objects from Strings	821
Current State	821
C API Changes	822
MapScript	822
URL	822
Backwards Compatibility	823
Post Implementation Notes	823
Bug IDs	824
Voting history	824
16.9.32 MS RFC 32: Support for Anti-Grain Geometry (AGG) Rendering Engine	824
Overview	824
Technical Solution	825
C API Changes	825
MapScript	825
Mapfiles	825
Issues and Caveats	826
Bug ID	826
Voting history	826
16.9.33 MS RFC 33: Removing msLayerWhichItems() from maplayer.c	826
Overview	826
Technical Solution	827
General C API Changes	827
Input Driver Changes	827
MapScript	827

Mapfiles	828
Backwards Compatibility Issues	828
Bug ID	828
Voting History	828
16.9.34 MS RFC 34: MapServer Release Manager and Release Process	828
Overview	828
The MapServer Release Manager Role	828
The MapServer Release Process	829
MapServer Version Numbering	830
Voting history	830
16.9.35 MS RFC 35: Standards Compliance Enforcement	830
Overview	830
OWS_COMPLIANCE_METADATA	831
msOWSLookupMetadata()	831
MapServer 5.0.1	831
MapServer 5.1	831
Documentation	832
Implementation	832
MapScript	832
Backwards Compatibility Issues	832
Bug ID	832
Voting History	832
16.9.36 MS RFC 36: Simplified template support for query output	832
Overview	833
Additional Mapfile Changes	835
Documentation	835
Implementation	835
MapScript	836
Backwards Compatibility Issues	836
Bug ID	836
Voting History	836
16.9.37 MS RFC 37: MapServer Spatial Reference Improvements and Additions	836
Purpose	837
The History of Spatial References in MapServer	837
Specification Features	838
Implementation Details	838
Files Affected	839
Backward Compatibility Issues	839
Documentation	839
16.9.38 MS RFC 38: Native Microsoft SQL Server 2008 Driver for MapServer	840
Purpose	840
Background	840
Usage Details	840
Files Affected	841
Backward Compatibility Issues	841
Documentation	841
Intellectual Property	841
16.9.39 MS RFC 39: Support of WMS/SLD Named Styles	841
Overview	841
Proposed Changes	842
Affected/Added functionalities in MapServer	842
Other Considerations	843
Files Affected	843
MapScript	844

Backwards Compatibility	844
Documentation	844
Testing	844
Bug ID	844
Voting History	844
Discussions on mailing list	844
16.9.40 MS RFC 40: Support Label Text Transformations	844
Overview	845
Line Wrapping	845
Line Centering	845
Modifications to the source code	845
MapScript Implications	846
Files affected	846
Backwards compatibility issues	846
Bug ID	846
Voting history	846
Questions/Comments from the review period	846
16.9.41 MS RFC 41: Support of WCS 1.1.x Protocol	846
Overview	847
Implementation Methodology	847
WCS 1.1 Protocol Limitations	847
Metadata Mapping	847
URNs / Coordinate Systems and Axis Orientation	847
MapScript	848
Backwards Compatibility	848
Documentation	848
Implementation Resources	848
Testing	848
Bug ID	848
Voting History	848
16.9.42 MS RFC 42: Support of Cookies Forwarding	849
Overview	849
Implementation Methodology	849
Implementation Issues	850
Modifications to the Source Code	850
MapScript	850
File Affected	850
Backwards Compatibility	851
Bug ID	851
Voting History	851
16.9.43 MS RFC 43: Direct tile generation for Google Maps and Virtual Earth API	851
Overview	851
Technical Solution	851
MapScript Implications	853
Files Affected	853
Backwards Compatibility Issues	853
Bug ID	853
Voting History	853
References	853
16.9.44 MS RFC 44: Restore URL modification of mapfiles to pre-5.0 levels	854
Proposed Changes	854
Files Affected	854
Mapfile Changes	855
MapScript Changes	855

Backwards Compatibility Issues	855
Post-Implementation Notes	855
Bug ID	855
Voting History	855
16.9.45 MS RFC 45: Symbology, Labeling, and Cartography Improvements	855
Scale Dependent Rendering	856
Precise Symbol Placement	856
Keywords moved from SYMBOL to STYLE	857
add MINSCALEDENOM/MAXSCALEDENOM parameters to styleObj	858
add LABELMETHOD to layerObj	858
add LABEL to layersObj	858
add OUTLINEWIDTH to styleObj	858
add TYPE to styleObj for line and polygon types	859
Files Affected	859
Bug IDs	859
16.9.46 MS RFC 46: Migrate Website to OSGeo	859
Purpose	860
Failures of the Current Website	860
Administrative Failures	860
Survey	860
Goals	860
Make it easy for folks to find the docs	860
Stay the out of developers' way	861
Allow documenters to get their job done	861
Allow limited user-contributed information in the form of wiki pages	861
Have a gallery that works better	861
Move off of UMN computing and integrate within OSGeo's infrastructure	861
Implementation	861
16.9.47 MS RFC 47: Move IGNORE_MISSING_DATA to run-time configuration	862
Overview	862
Technical Solution	862
Mapscript Implications	863
Files Affected	863
Backwards Compatibility Issues	863
Bug ID	863
Voting History	863
References	863
16.9.48 MS RFC 48: GEOTRANSFORM Geometry operations	863
Summary	864
Detailed functionality	864
Implementation Details	864
Affected Files	865
Limitations	865
MapScript implications	865
Documentation	865
Backwards Incompatibility Issues	865
Bug ID	865
Voting History	866
16.9.49 MS RFC 49: Symbology, Labeling, and Cartography Improvements	866
Purpose	866
Fractional values for SIZE and WIDTH	866
MINSCALEDENOM / MAXSCALEDENOM for STYLES and LABELS	866
OUTLINEWIDTH on line layers	866
add LABEL to layersObj	867

Affected Files	867
Documentation	867
Mapscript	867
Backwards Incompatibility	867
Comments from Review period	868
Voting History	868
16.9.50 MS RFC 50: OpenGL Rendering Support	868
Overview	868
Technical Solution	869
C API Changes	869
Mapfiles	869
Issues	870
Documentation	870
Backwards Incompatibility	870
Bug ID	870
16.9.51 MS RFC 51: XML Mapfile Format	870
Overview	870
Technical Solution	871
Mapfiles	871
Future Enhancement	872
Documentation	872
Backwards Incompatibility	872
Bug ID	872
16.9.52 MS RFC 52: One-pass query processing	872
Overview	872
Technical Solution	873
Backwards Compatability Issues	873
Query File Support	874
Files Impacted	874
Unknowns	875
Voting History	875
16.9.53 MS RFC 53: Guidelines for MapScript method return values	875
Overview	875
Technical Solution	875
Backwards Compatability Issues	876
Ticket Id	876
Voting History	876
16.9.54 MS RFC 54: Rendering Interface API	876
Purpose	876
Low Level Rendering API	877
High Level Usage of the rendering API	880
Image I/O	882
Miscelaneous	883
Affected Files	884
Documentation	884
Mapscript	884
Backwards Incompatibility	884
Comments from Review period	884
Voting History	884
16.9.55 MS RFC 55: Improve control of output resolution	884
Overview	885
Technical Solution	885
Usage example	886
Backwards Compatibility Issues	886

Documentation notes	886
Files Impacted	886
Ticket Id	887
Voting History	887
16.9.56 MS RFC 56: Tighten control of access to mapfiles and templates	887
Overview	887
Technical Solution	887
Enforce the requirement for the MAP and SYMBOLSET keywords	888
Require a Magic String at the beginning of all MapServer templates	888
MS_MAP_PATTERN Environment Variable	889
MS_MAP_NO_PATH Environment Variable	889
Backwards Compatibility Issues	889
Files Impacted	889
Ticket Id	890
Voting History	890
16.9.57 MS RFC 57: Labeling enhancements: ability to repeat labels along a line/multiline	890
Overview	890
Enhancement 1: Label all the lines in MultiLine shape	890
Enhancement 2: Ability to repeat labels along a line	890
Technical Solution	891
Usage example	891
Backwards Compatibility Issues	891
Files Impacted	891
Ticket Id	892
Images	892
Voting History	892
16.9.58 MS RFC 58: Kml Output	892
Purpose	892
General Functionnality	892
Output format	893
Build	893
Map	893
Layers	894
Styling	897
Attributes	897
Coordinate system	898
Warning and Error Messages	898
Testing	898
Documentation	898
Comments from Review period	898
Voting History	898
16.9.59 MS RFC 59: Add Variable Binding to Database Connection Types	898
Purpose	899
Implementation Details	899
Backward Compatibility Issues	899
Documentation	899
Files Impacted	900
Comments from Review period	900
Voting History	900
16.9.60 MS RFC 60: Labeling enhancement: ability to skip ANGLE FOLLOW labels with too much character overlap	900
Overview	900
Background	900
Experiments	901

Technical Solution	901
Usage example	901
Backwards Compatibility Issues	902
Files Impacted	902
Ticket Id	902
Voting History	902
16.9.61 MS RFC 61: Enhance MapServer Feature Style Support	903
Background	903
Proposed New Syntax	903
Supported Style Representations	903
Implementation Details	904
MapScript Issues	904
Files affected	904
Backwards Compatiblity Issues	904
Further Considerations	904
Bug ID	905
Voting history	905
16.9.62 MS RFC 62: Support Additional WFS GetFeature Output Formats	905
WFS GetFeature Changes	905
WFS GetCapabilities Changes	905
outputFormatObj	906
OGR OUTPUTFORMAT Declarations	906
OGR Renderer Implementation	907
Geometry Types Supported	907
Attribute Field Definitions	907
gml_types auto	908
Use of CPL Services	908
Backwards Compatiblity Issues	908
Security Implications	908
Further Considerations	908
Outstanding Issues	909
Testing	909
Documentation	909
Ticket Id	909
Voting history	909
16.9.63 MS RFC 63: Built-in OpenLayers map viewer	909
Overview	910
Implementation Details	910
OpenLayers Dependency	911
Files affected	911
Further Considerations	911
Bug ID	911
Voting history	911
16.9.64 MS RFC 64 - MapServer Expression Parser Overhaul	911
Overview	912
Existing Expression Parsing	912
Proposed Technical Changes	912
Expression Use Elsewhere	914
Query Impact	915
Backwards Compatibility Issues	915
Security Issues	915
Todo's	915
Bug ID	916
Voting history	916

16.9.65 MS RFC 65 - Single-pass Query Changes for 6.0	916
Overview	916
Drivers that Implement msLayerResultsGetShape()	917
Proposed Techincal Changes	917
Bug ID	918
Voting history	918
16.9.66 MS RFC 66: Better handling of temporary files	918
Overview	918
Proposed Solution	918
Purposes of temporary files	918
Files affected	919
Future enhancement	919
Bug ID	919
References	919
Voting history	919
16.9.67 MS RFC 67: Enable/Disable Layers in OGC Web Services	920
Overview	920
Use Cases	920
Proposed Solution	920
Inheritance	921
Implementation notes	921
Improved handling of wms_layer_group as real layers	922
Backwards Compatibilty Issues	922
Tickets	922
Voting history	922
16.9.68 MS RFC 68: Support for combining features from multiple layers	922
1. Overview	923
2. The proposed solution	923
2.1 Handling the layer attributes (items)	924
2.2 Projections	924
2.3 Handling classes and styles	924
2.4 Query processing	924
3. Implementation Details	924
3.1 Files affected	924
3.2 MapScript Issues	924
3.3 Backwards Compatibilty Issues	925
4. Bug ID	925
5. Voting history	925
16.9.69 MS RFC 69: Support for clustering of features in point layers	925
1. Overview	925
3. The proposed soution	925
3.1 The concept of the implementation	927
3.2 Handling the feature attributes (items)	927
3.3 Handling classes and styles	928
3.4 Query processing	928
4. Implementation Details	928
4.1 Files affected	928
4.2 MapScript Issues	928
4.3 Backwards Compatibilty Issues	928
5. Bug ID	929
6. Voting history	929
16.9.70 MS RFC 70: Integration of TinyOWS in MapServer project	929
1. Overview	929
2. The proposed solution	929

2.1 Keeping the cycle release independant	929
2.2 SVN	929
2.3 A common MapFile as config file	930
2.4 Perspective: Packaged build system	930
3. Solution Details	930
3.0 Naming	930
3.1 Documentation	930
3.2 Licence	930
3.3 Tickets	930
3.4 Developpers & PSC	931
3.5 SVN Import	931
3.6 Code Convention	931
3.7 Redirections	931
3.8 Project Maturity	931
4. TinyOWS Code Review	931
4.1 Code Origin	931
4.2 Code Quality	932
4.3 Security Audit	932
4.4 OGC WFS-T compliancy	932
4.5 External Dependancies	932
4.6 MapFile notions not yet addressed	932
4.7 Build system	933
4.8 Roadmap and vision	933
5. Voting history	933
16.9.71 MS RFC 71: Integration of Mod-Geocache in the MapServer project	933
1. Overview	933
1.1 The need for a tile caching solution	934
1.2 The mod-geocache project	934
1.3 Integration Overview	935
2. Governance	935
2.1 Finding a Name	935
2.2 Release Cycles	935
2.3 Source Code Location	935
2.4 RFCs and Decision Process	935
2.5 Licence	935
2.6 Tickets	935
2.7 SVN Import	936
3 A common MapFile as config file	936
3.1 LibMapfile API	936
3.2 Configuration Directives	936
3.3 Documentation	936
4. Code Review	936
4.1 Code Origin	936
4.2 Code Quality	936
4.3 Security Audit	936
4.4 External Dependancies	937
4.5 Build system	937
4.6 IP and Patent overview	937
5. Voting history	937
16.9.72 MS RFC 72: Layer and Label-Level Geomtransforms	937
1. Overview	937
2. The proposed solution	938
3. Implementation Details	938
3.1 Files affected	938

3.2 MapScript Issues	938
3.3 Security Issues	939
3.4 Backwards Compatibilty Issues	939
4. Bug ID	939
5. Voting history	939
16.9.73 MS RFC 73: Improved SVG symbols support	939
Overview	939
Technical Solution	939
Existing Partial Implementation	940
Usage example	940
Backwards Compatibility Issues	940
Affected Files	940
Ticket Id	940
Voting History	940
16.9.74 MS RFC 74: Includes from non-file connections (eg Databases)	941
1. Overview	941
2. The proposed solution	941
2.5 Use Cases	942
3. Implementation Details	942
3.1 Files affected	942
3.2 MapScript Issues	942
3.3 Security Issues	942
3.4 Backwards Compatibility Issues	942
4. Bug ID	942
5. Voting history	942
16.9.75 MS RFC 75: INSPIRE view service support	943
1. Overview	943
2. Activation of INSPIRE support	943
3. Multi-language support for certain capabilities fields	944
4. Provision of INSPIRE specific metadata	945
5. Named group layers	946
6. Style section for root layer and possibly existing group layers	946
7. Implementation details	948
7.1 Files affected	948
7.2 MapScript issues	949
7.3 Backwards compatibility issues	949
8. Solution	949
9. Tests	950
10. Voting history	950
16.9.76 MS RFC 76: Adding License Metadata to Output Images	950
1. Overview	950
2. Proposed Technical Change	951
2.1. Driver Support	951
2.2. Map File Configuration	951
2.3. Build Configuration	953
3. Implementation Details	953
3.1. Files Affected	953
3.2. Bug ID	953
3.3. Documentation	953
4. Enhancements	953
5. Voting history	953
16.9.77 MS RFC 77: Support for Multiple Label Objects Within a Class	954
1. Overview	954
2. Proposed Technical Change	954

2.1 Core Object Changes	954
2.2 Label Rendering Changes	955
2.2.1 Point and Polygon Labels	955
2.2.2 Line Labels	955
2.3 MapScript	955
3. Implementation Details	955
3.1. Files Affected	955
3.2 Documentation Changes	956
3.3 Bug ID	956
4 Configuration Examples	956
5. Backwards Compatibility	956
5.1 Relationship to Other Outstanding Label Bugs	956
6. Enhancements	957
7. Voting history	957
16.9.78 MS RFC 78: Vector Field Rendering (CONNECTIONTYPE UVRASTER)	957
1. Overview	957
2. The proposed solution	958
3. Implementation Details	959
3.1 Files affected	959
3.2 MapScript	959
3.4 Backwards Compatibilty Issues	959
4. Bug ID	960
5. Voting history	960
16.9.79 MS RFC 79: Layer Masking	960
1. Overview	960
2. Proposed solution	960
3. Implementation Details	961
3.1 Files affected	961
3.2 MapScript	962
3.4 Backwards Compatibilty Issues	962
4. Limitations	962
5. Error Handling	962
6. Bug ID	962
7. Voting history	962
16.9.80 MS RFC 80: Font Fallback Support	963
1. Overview	963
2. Proposed Technical Change	963
2.1 Core Object Changes	963
2.2 Label Rendering Changes	963
2.3 MapScript	963
3. Implementation Details	964
3.1. Files Affected	964
3.2 Bug ID	964
4. Backwards compatibility issues	964
5. Error reporting	965
6. Example Usage	965
7. Voting history	965
16.9.81 MS RFC 81: Offset Labels with Leader Lines	965
1. Overview	965
2. Proposed Technical Change	966
2.1 Expected issues	968
3. Implementation Details	968
3.1. Files Affected	968
3.2 Bug ID	968

4. Backwards compatibility issues	969
5. Error reporting	969
6. Example Usage	969
7. Voting history	969
16.9.82 MS RFC 82: Support for Enhanced Layer Metadata Management	969
Overview	969
Technical Solution	970
Testing	971
Documentation	971
Backwards Compatibility Issues	971
Affected Files	971
Ticket Id	972
Voting History	972
16.9.83 MS RFC 83: Source tree reorganization	972
1. Overview	972
2. Current directory structure	972
3. New proposed directory structure	973
4. Backwards Compatibilty Issues	974
5. Bug ID	974
6. Voting history	974
16.9.84 MS RFC 84: Migrate project repository from svn to git	974
1. Overview	975
2. Github hosting	975
3. Git Worflows	976
4. Upgrade path for SVN users	976
5. Tasks	977
6. Bug ID	977
6. Voting history	977
16.9.85 MS RFC 85: Vector Contour Rendering (CONNECTIONTYPE CONTOUR)	977
1. Overview	978
2. The proposed solution	978
3. Implementation Details	979
3.1 OGR Input driver	979
3.2 Resample and Reprojection	980
3.3 Labeling	980
3.4 Tile boundaries	980
3.5 Files affected	980
3.6 MapScript	980
3.7 Backwards Compatibilty Issues	980
4. Tests	980
5. Bug ID	980
6. Voting history	980
16.9.86 MS RFC 86: Scale-dependant String Substitutions	981
1. Overview	981
2. Proposed solution	981
2.1. Example 1	982
2.2 Example 2	982
2.3 Example 3	983
2.4 Discussion	983
3. Implementation Details	984
3.1 Overview	984
3.2 Files affected	985
3.3 MapScript	985
3.4 Backwards Compatibilty Issues	985

4. Security implications	985
4. Performance implications	985
5. Bug ID	985
6. Voting history	985
16.9.87 MS RFC 87: Bitmap pattern support	985
1. Overview	986
2. Proposed Solution	986
3. Implementation Details	986
4. Files Affected	987
5. Bug ID	987
6. Backwards compatibility issues	987
7. MapScript changes	987
8. Voting history	987
16.9.88 MS RFC 88: Saving MapServer Objects to Strings	987
1. Overview	987
2. Proposed Solution	988
3. Implementation Details	988
4. Files Affected	989
5. Bug ID	990
6. Backwards compatibility issues	990
7. MapScript changes	990
8. Voting history	990
16.9.89 MS RFC 89: Layer Geomtransforms	990
1. Overview	991
2. The proposed solution	991
3. New Geomtransform Parameters	991
4. MapScript	992
6. Backwards Compatibilty Issues	992
7. Tests	992
8. Bug ID	992
9. Voting history	992
16.9.90 MS RFC 90: Enable/Disable Layers in OGC Web Services by IP Lists	993
1. Overview	993
2. Proposed Solution	993
3. Disable the stock CGI operations	994
4. Implementation Details	994
5. Files Affected	995
6. Bug ID	995
7. Backwards compatibility issues	995
8. Documentation	995
9. Sponsorship	995
10. Voting history	996
16.9.91 MS RFC 91: Layer Filter Normalization	996
1. Overview	996
2. Proposed solution	996
2.1 Driver Filter Translation	996
2.2 Filter Merging	997
2.3 Discussion	997
3. Implementation Details	997
3.1 Overview	997
3.2 Files affected	997
3.3 MapScript	997
3.4 Backwards Compatibilty Issues	997
4. Security implications	997

5. Performance implications	997
6. Bug ID	997
7. Voting history	998
16.10 Mapfile Editing	998
16.10.1 VIM Syntax	998
General remarks	998
Installation	998
Folding	999
Closing Remarks	999
16.11 External Links	999
17 Download	1001
17.1 Source	1001
17.1.1 Current Release(s)	1001
17.1.2 Development Releases	1001
17.1.3 Past Releases	1001
17.1.4 Development Source	1002
17.2 Documentation	1002
17.2.1 Current Release	1002
17.2.2 Previous Releases	1002
17.3 Binaries	1002
17.3.1 Windows	1002
17.3.2 Linux	1003
17.3.3 Mac OS X	1003
17.4 Demo Application	1003
18 Environment Variables	1005
19 Glossary	1009
20 Errors	1013
20.1 drawEPP(): EPPL7 support is not available	1013
20.1.1 Explanation	1013
20.2 loadLayer(): Unknown identifier. Maximum number of classes reached	1013
20.3 loadMapInternal(): Given map extent is invalid	1014
20.3.1 How to get a file's EXTENT values?	1014
20.4 msGetLabelSize(): Requested font not found	1015
20.5 msLoadFontset(): Error opening fontset	1015
20.6 msLoadMap(): Failed to open map file	1015
20.7 msProcessProjection(): no options found in 'init' file	1015
20.8 msProcessProjection(): No such file or directory	1016
20.8.1 Setting the location of the epsg file	1016
20.9 msProcessProjection(): Projection library error.major axis or radius = 0 not given	1016
20.9.1 Valid Examples	1016
20.10 msQueryByPoint: search returned no results	1017
20.11 msReturnPage(): Web application error. Malformed template name	1017
20.12 msSaveImageGD(): Unable to access file	1018
20.13 msWMSLoadGetMapParams(): WMS server error. Image Size out of range, WIDTH and HEIGHT must be between 1 and 2048 pixels	1018
20.14 Unable to load dll (<i>MapScript</i>)	1018
20.14.1 C#-specific information	1018
21 FAQ	1019
21.1 Where is the MapServer log file?	1019
21.2 What books are available about MapServer?	1019

21.3	How do I compile MapServer for Windows?	1019
21.4	What do MapServer version numbers mean?	1019
21.5	Is MapServer Thread-safe?	1020
21.6	What does STATUS mean in a LAYER?	1021
21.7	How can I make my maps run faster?	1021
21.8	What does Polyline mean in MapServer?	1021
21.9	What is MapScript?	1022
21.10	Does MapServer support reverse geocoding?	1022
21.11	Does MapServer support geocoding?	1022
21.12	How do I set line width in my maps?	1022
21.13	Why do my JPEG input images look crappy via MapServer?	1023
21.14	Which image format should I use?	1023
21.15	Why doesn't PIL (Python Imaging Library) open my PNGs?	1023
21.16	Why do my symbols look poor in JPEG output?	1024
21.17	How do I add a copyright notice on the corner of my map?	1024
21.17.1	Example Layer	1024
21.17.2	Result	1025
21.18	How do I have a polygon that has both a fill and an outline with a width?	1025
21.19	How can I create simple antialiased line features?	1026
21.20	Which OGC Specifications does MapServer support?	1027
21.21	Why does my requested WMS layer not align correctly?	1027
21.22	When I do a GetCapabilities, why does my browser want to download mapserv.exe/mapserv?	1028
21.23	Why do my WMS GetMap requests return exception using MapServer 5.0?	1028
21.24	Using MapServer 6.0, why don't my layers show up in GetCapabilities responses or are not found anymore?	1029
21.25	Where do I find my <i>EPSG</i> code?	1029
21.26	How can I reproject my data using ogr2ogr?	1030
21.27	How can I help improve the documentation on this site?	1030
21.28	What's with MapServer's logo?	1030
22	License	1031
23	Credits	1033
Bibliography		1035
Index		1037

Note: The entire documentation is also available as a single PDF document  and ePub document 

If you are upgrading from an earlier version of MapServer, be sure to review the *MapServer Migration Guide*.
previousversions

Table 1: Quick Links

<i>An Introduction to MapServer</i>	<i>Installation</i>	<i>Mapfile</i>
<i>MapScript</i>	<i>Data Input</i>	<i>Output Generation</i>
<i>OGC Support and Configuration</i>	<i>Optimization</i>	<i>Utilities</i>
<i>Development</i>	<i>MapCache</i>	<i>Errors</i>
<i>About</i>	<i>Community Activities</i>	<i>Glossary</i>
<i>genindex</i>		

About

MapServer is an [Open Source](#) geographic data rendering engine written in C. Beyond browsing GIS data, MapServer allows you create “geographic image maps”, that is, maps that can direct users to content. For example, the Minnesota DNR [Recreation Compass](#) provides users with more than 10,000 web pages, reports and maps via a single application. The same application serves as a “map engine” for other portions of the site, providing spatial context where needed.

MapServer was originally developed by the University of Minnesota (UMN) ForNet project in cooperation with NASA, and the Minnesota Department of Natural Resources (MNDNR). Later it was hosted by the TerraSIP project, a NASA sponsored project between the UMN and a consortium of land management interests.

MapServer is now a project of [OSGeo](#), and is maintained by a growing number of developers (nearing 20) from around the world. It is supported by a diverse group of organizations that fund enhancements and maintenance, and administered within OSGeo by the MapServer [Project Steering Committee](#) made up of developers and other contributors.

- Advanced cartographic output
 - Scale dependent feature drawing and application execution
 - Feature labeling including label collision mediation
 - Fully customizable, template driven output
 - TrueType fonts
 - Map element automation (scalebar, reference map, and legend)
 - Thematic mapping using logical- or regular expression-based classes
- Support for popular scripting and development environments
 - PHP, Python, Perl, Ruby, Java, and .NET
- Cross-platform support
 - Linux, Windows, Mac OS X, Solaris, and more
- Support of numerous [Open Geospatial Consortium](#) (OGC) standards
 - WMS (client/server), non-transactional WFS (client/server), WMC, WCS, Filter Encoding, SLD, GML, SOS, OM
- A multitude of raster and vector data formats
 - TIFF/GeoTIFF, EPPL7, and many others via [GDAL](#)

- *ESRI shapefiles, PostGIS, ESRI ArcSDE, Oracle Spatial, MySQL* and many others via *OGR*
- Map projection support
 - On-the-fly map projection with 1000s of projections through the *Proj.4* library

An Introduction to MapServer

Revision \$Revision\$

Date \$Date\$

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Author David Fawcett

Contact david.fawcett at moea.state.mn.us

Author Howard Butler

Contact hobu.inc at gmail.com

Contents

- An Introduction to MapServer
 - MapServer Overview
 - Anatomy of a MapServer Application
 - Installation and Requirements
 - Introduction to the *Mapfile*
 - Making the Site Your Own
 - Enhancing your site
 - How do I get Help?

2.1 MapServer Overview

MapServer is a popular Open Source project whose purpose is to display dynamic spatial maps over the Internet. Some of its major features include:

- support for display and querying of hundreds of raster, vector, and database formats
- ability to run on various operating systems (Windows, Linux, Mac OS X, etc.)
- support for popular scripting languages and development environments (PHP, Python, Perl, Ruby, Java, .NET)
- on-the-fly projections

- high quality rendering
- fully customizable application output
- many ready-to-use Open Source application environments

In its most basic form, MapServer is a [CGI](#) program that sits inactive on your Web server. When a request is sent to MapServer, it uses information passed in the request URL and the [Mapfile](#) to create an image of the requested map. The request may also return images for legends, scale bars, reference maps, and values passed as CGI variables.

See Also:

The [Glossary](#) contains an overview of many of the jargon terms in this document.

MapServer can be extended and customized through [MapScript](#) or [templating](#). It can be built to support many different [vector](#) and [raster](#) input data formats, and it can generate a multitude of [output](#) formats. Most pre-compiled MapServer distributions contain most all of its features.

See Also:

[Compiling on Unix](#) and [Compiling on Win32](#)

Note: [MapScript](#) provides a scripting interface for MapServer for the construction of Web and stand-alone applications. MapScript can be used independently of CGI MapServer, and it is a loadable module that adds MapServer capability to your favorite scripting language. MapScript currently exists in [PHP](#), Perl, [Python](#), Ruby, Tcl, Java, and .NET flavors.

This guide will not explicitly discuss MapScript, check out the [MapScript Reference](#) for more information.

2.2 Anatomy of a MapServer Application

A simple MapServer application consists of:

- **Map File** - a structured text configuration file for your MapServer application. It defines the area of your map, tells the MapServer program where your data is and where to output images. It also defines your map layers, including their data source, projections, and symbology. It must have a .map extension or MapServer will not recognize it.

See Also:

[MapServer Mapfile Reference](#)

- **Geographic Data** - MapServer can utilize many geographic data source types. The default format is the ESRI Shape format. Many other data formats can be supported, this is discussed further below in [Adding data to your site](#).

See Also:

[Vector Input Reference](#) and [Raster Input Reference](#)

- **HTML Pages** - the interface between the user and MapServer . They normally sit in Web root. In it's simplest form, MapServer can be called to place a static map image on a HTML page. To make the map interactive, the image is placed in an HTML form on a page.

[CGI](#) programs are ‘stateless’, every request they get is new and they don’t remember anything about the last time that they were hit by your application. For this reason, every time your application sends a request to MapServer, it needs to pass context information (what layers are on, where you are on the map, application mode, etc.) in hidden form variables or URL variables.

A simple MapServer [CGI](#) application may include two HTML pages:

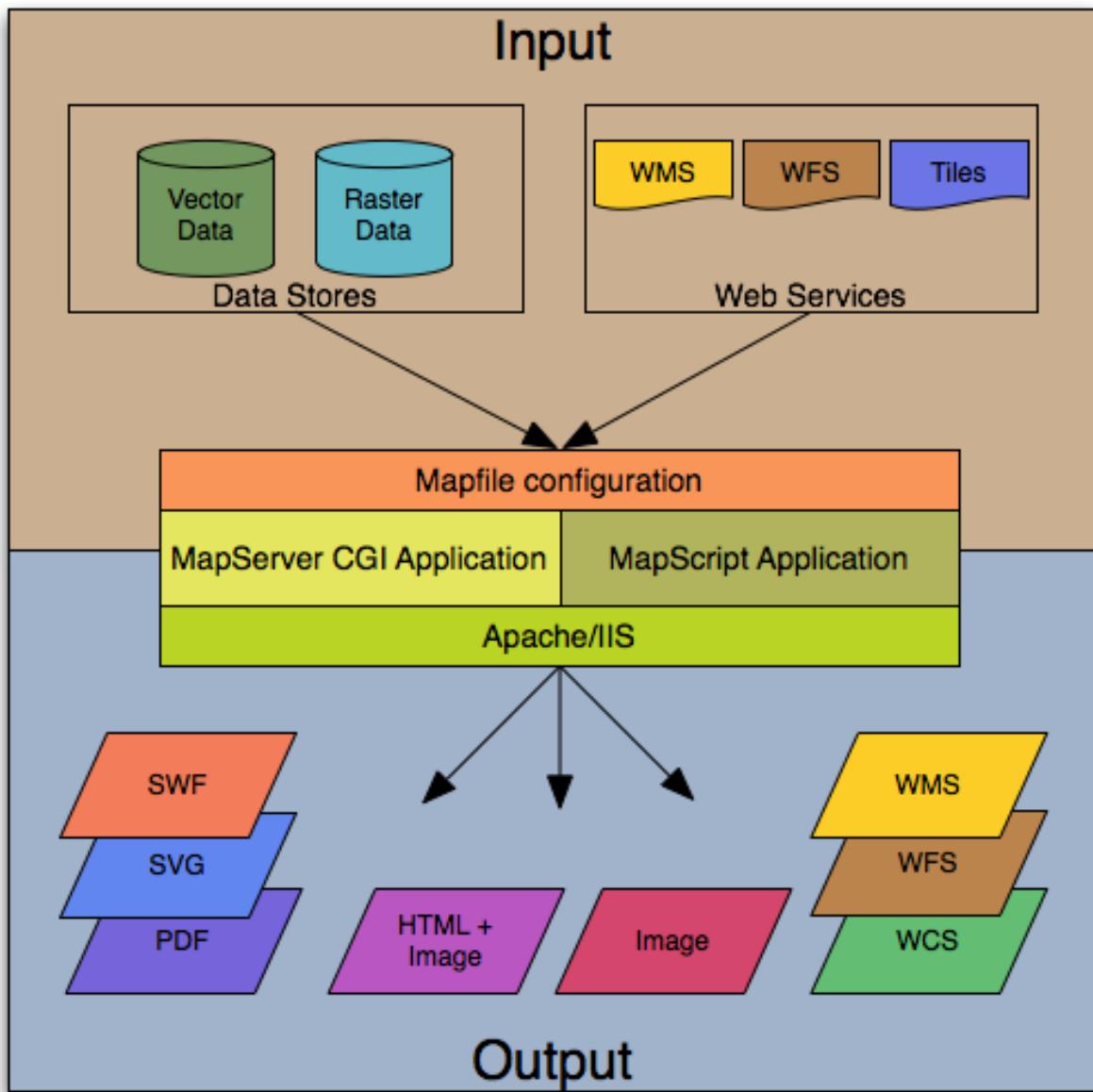


Figure 2.1: The basic architecture of MapServer applications.

- **Initialization File** - uses a form with hidden variables to send an initial query to the web server and MapServer. This form could be placed on another page or be replaced by passing the initialization information as variables in a URL.
- **Template File** - controls how the maps and legends output by MapServer will appear in the browser. By referencing MapServer CGI variables in the template HTML, you allow MapServer to populate them with values related to the current state of your application (e.g. map image name, reference image name, map extent, etc.) as it creates the HTML page for the browser to read. The template also determines how the user can interact with the MapServer application (browse, zoom, pan, query).

See Also:

Templating

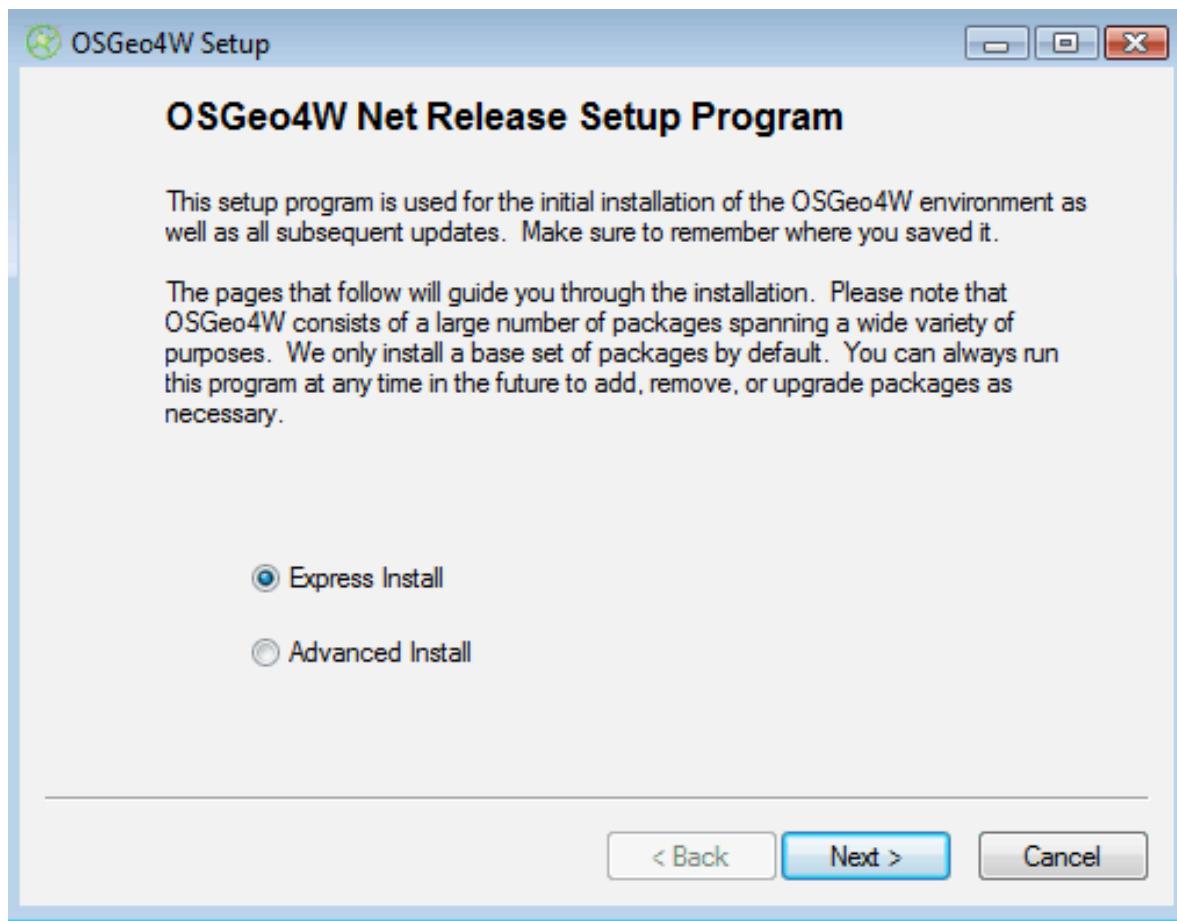
- **MapServer CGI** - The binary or executable file that receives requests and returns images, data, etc. It sits in the cgi-bin or scripts directory of the web server. The Web server user must have execute rights for the directory that it sits in, and for security reasons, it should not be in the web root. By default, this program is called *mapserv*
- **Web/HTTP Server** - serves up the HTML pages when hit by the user's browser. You need a working Web (HTTP) server, such as *Apache* or Microsoft Internet Information Server, on the machine on which you are installing MapServer.

2.3 Installation and Requirements

2.3.1 Windows Installation

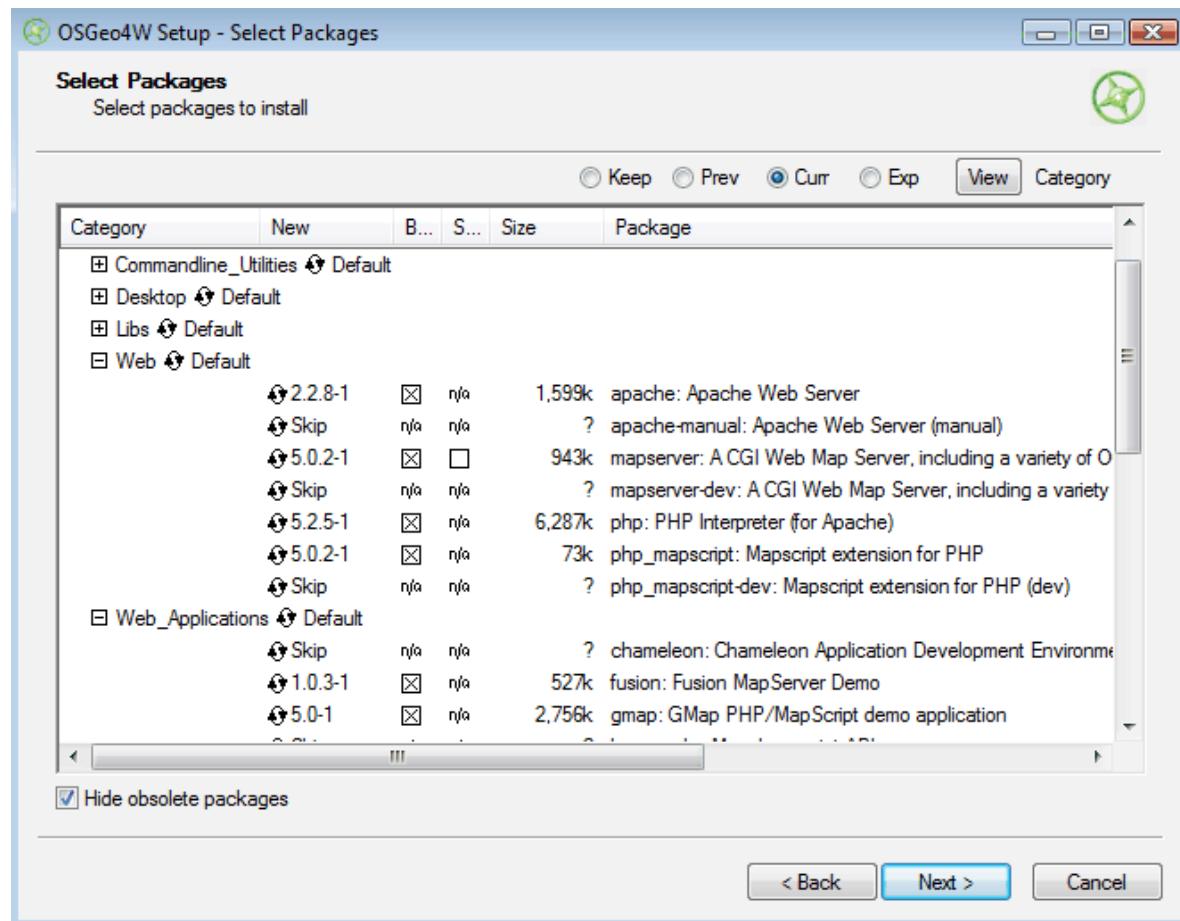
OSGeo4W is a new Windows installer that downloads and/or updates MapServer, add-on applications, and also other Open Source geospatial software. The following steps illustrate how to use OSGeo4W:

1. Download OSGeo4W <http://download.osgeo.org/osgeo4w/osgeo4w-setup.exe>
2. Execute (double-click) the .exe
3. Choose “Advanced” install type



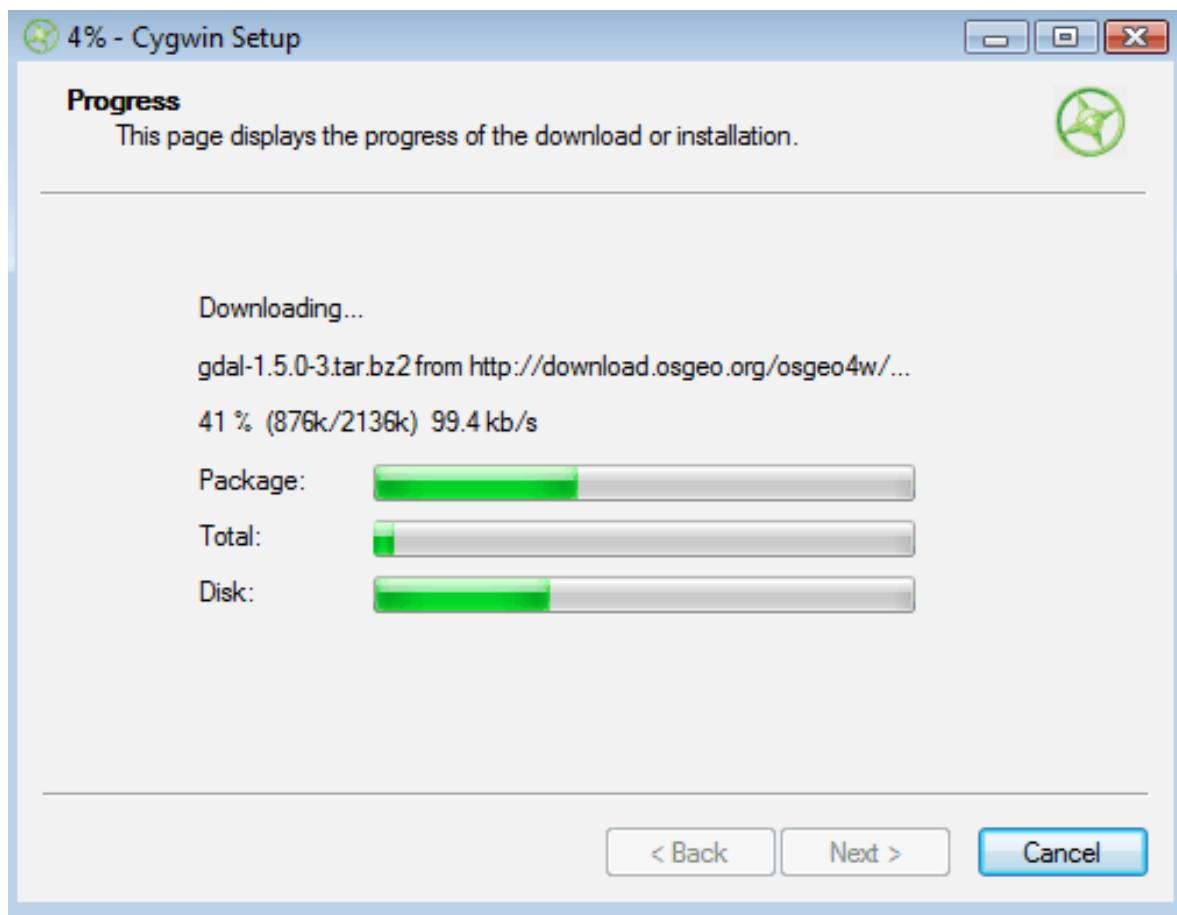
Note: Express contains options for higher-level packages such as MapServer, GRASS, and uDig. Advanced gives you full access to choosing commandline tools and applications for MapServer that are not included in the Express install

-
4. Select packages to install



Note: Click on the “Default” text beside the higher-level packages (such as Web) to install all of Web’s sub-packages, or click on the “Skip” text beside the sub-package (such as MapServer) to install that package and all of its dependencies.

- Let the installer fetch the packages.



- Run the apache-install.bat script to install the Apache Service.

Note: You must run this script under the “OSGeo4W Shell”. This is usually available as a shortcut on your desktop

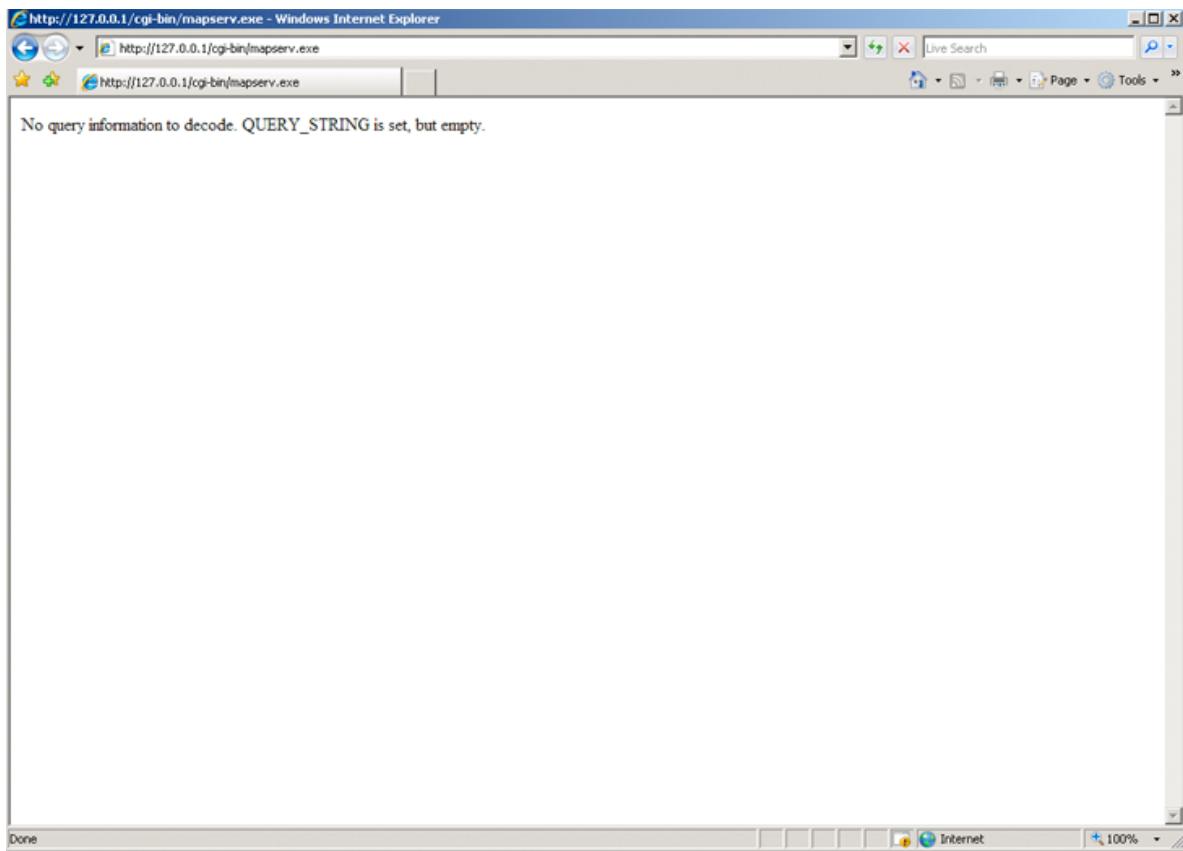
Note: An apache-uninstall.bat script is also available to remove the Apache service installation.

- Start Apache from the OSGeo4W shell and navigate to <http://127.0.0.1>

apache-restart.bat



8. Verify that MapServer is working



2.3.2 Hardware Requirements

MapServer runs on Linux, Windows, Mac OS X, Solaris, and more. To compile or install some of the required programs, you may need administrative rights to the machine. People commonly ask questions about minimum hardware specifications for MapServer applications, but the answers are really specific to the individual application. For development and learning purposes, a very minimal machine will work fine. For deployment, you will want to investigate *Optimization* of everything from your data to server configuration.

2.3.3 Software Requirements

You need a working and properly configured Web (HTTP) server, such as [Apache](#) or Microsoft Internet Information Server, on the machine on which you are installing MapServer. OSGeo4W contains Apache already, but you can reconfigure things to use IIS if you need to. Alternatively, [MS4W](#) can be used to install MapServer on Windows.

If you are on a Windows machine, and you don't have a web server installed, you may want to check out [MS4W](#), which will install a pre-configured web server, MapServer, and more. The [FGS Linux Installer](#) provides similar functionality for several Linux distributions.

This introduction will assume you are using pre-compiled OSGeo4W Windows binaries to follow along. Obtaining MapServer or [Linux](#) or [Mac OS X](#) should be straightforward. Visit [Download](#) for installing pre-compiled MapServer builds on Mac OS X and Linux.

You will also need a Web browser, and a text editor (vi, emacs, notepad, homesite) to modify your HTML and *mapfiles*.

2.3.4 Skills

In addition to learning how the different components of a MapServer application work together and learning Map File syntax, building a basic application requires some conceptual understanding and proficiency in several skill areas.

You need to be able to create or at least modify [HTML](#) pages and understand how HTML forms work. Since the primary purpose of a MapServer application is to create maps, you will also need to understand the basics of geographic data and likely, map projections. As your applications get more complex, skills in SQL, DHTML/Javascript, Java, databases, expressions, compiling, and scripting may be very useful.

2.4 Introduction to the *Mapfile*

The .map file is the basic configuration file for data access and styling for MapServer. The file is an ASCII text file, and is made up of different objects. Each object has a variety of parameters available for it. All .map file (or mapfile) parameters are documented in the *mapfile reference*. A simple mapfile example displaying only one layer follows, as well as the map image output:

```
MAP
  NAME "sample"
  STATUS ON
  SIZE 600 400
  SYMBOLSET "../etc/symbols.txt"
  EXTENT -180 -90 180 90
  UNITS DD
  SHAPEPATH "../data"
  IMAGECOLOR 255 255 255
  FONTSET "../etc/fonts.txt"

  #
  # Start of web interface definition
  #

WEB
  IMAGEPATH "/ms4w/tmp/ms_tmp/"
  IMAGEURL "/ms_tmp/"
END # WEB

  #
  # Start of layer definitions
  #

LAYER
  NAME 'global-raster'
  TYPE RASTER
  STATUS DEFAULT
  DATA b l u e m a r b le.gif
END # LAYER
END # MAP
```

Note:

- Comments in a mapfile are specified with a '#' character
- MapServer parses mapfiles from top to bottom, therefore layers at the end of the mapfile will be drawn last (meaning they will be displayed on top of other layers)
- Using relative paths is always recommended
- Paths should be quoted (single or double quotes are accepted)

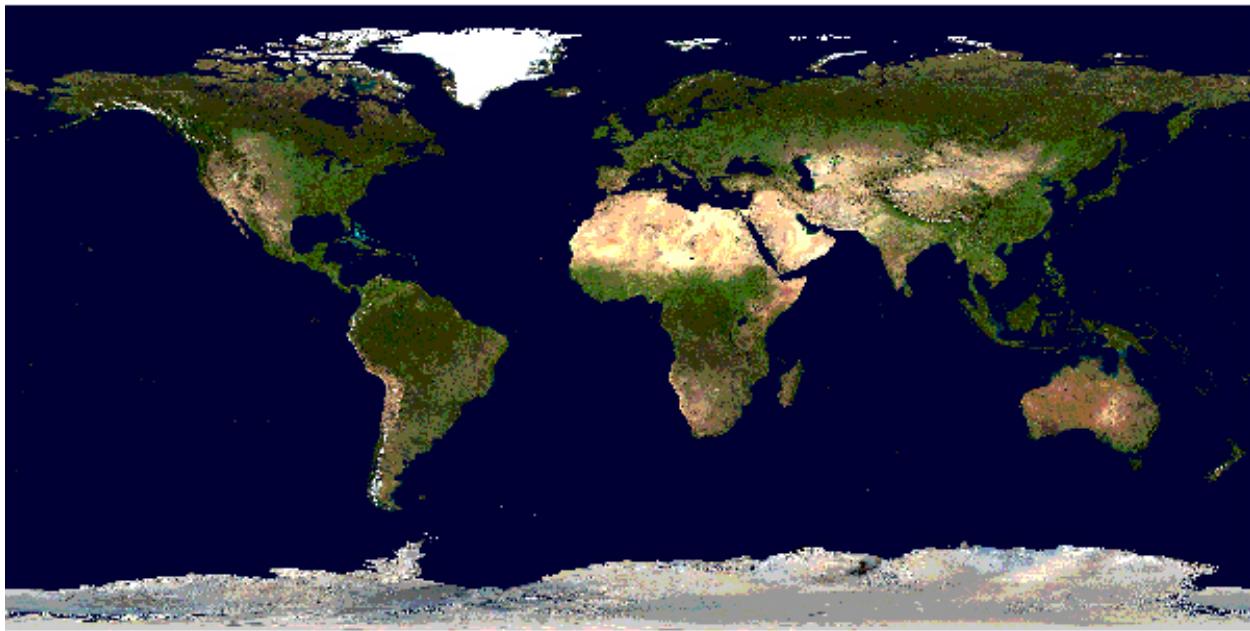


Figure 2.2: Rendered Bluemarble Image

- The above example is built on the following directory structure:
 - The mapfile could be placed anywhere, as long as it is accessible to the web server. Normally, one would try to avoid placing it at a location that makes it accessible on the web. Let us say it is placed in `/home/msuser/mapfiles/`
 - The location of the font file is given relative to the map file, in this case: `/home/msuser/etc/fonts.txt`
 - The location of the datasets (`bluemarble.gif`) is given relative to the map file, in this case: `/home/msuser/data/`
 - The location of the symbol file is given relative to the map file, in this case: `/home/msuser/etc/symbols.txt`
 - The files generated by MapServer will be placed in the directory `/ms4w/tmp/ms_tmp/`. The web server must be able to place files in this directory. The web server must make this directory available as `/ms_tmp` (if the web server is on `www.ms.org`, the web address to the directory must be: `http://www.ms.org/ms_tmp/`).

2.4.1 MAP Object

```
MAP
  NAME "sample"
  EXTENT -180 -90 180 90 # Geographic
  SIZE 800 400
  IMAGECOLOR 128 128 255
END # MAP
```

- EXTENT is the output extent in the units of the output map
- SIZE is the width and height of the map image in pixels
- IMAGECOLOR is the default image background color

Note: MapServer currently uses a pixel-center based extent model which is a bit different from what GDAL or WMS use.

2.4.2 *LAYER* Object

- starting with MapServer 5.0, there is no limit to the number of layers in a mapfile
- the *DATA* parameter is relative to the *SHAPEPATH* parameter of the *MAP* object
- if no *DATA* extension is provided in the filename, MapServer will assume it is ESRI Shape format (.shp)

Raster Layers

```
LAYER
  NAME "bathymetry"
  TYPE RASTER
  STATUS DEFAULT
  DATA "bath_mapserver.tif"
END # LAYER
```

See Also:

Raster Data

Vector Layers

Vector layers of *TYPE point*, *line*, or *polygon* can be displayed. The following example shows how to display only lines from a *TYPE polygon* layer, using the *OUTLINECOLOR* parameter:

```
LAYER
  NAME "world_poly"
  DATA 'shapefile/countries_area.shp'
  STATUS ON
  TYPE POLYGON
  CLASS
    NAME 'The World'
    STYLE
      OUTLINECOLOR 0 0 0
    END # STYLE
  END # CLASS
END # LAYER
```

See Also:

Vector Data

2.4.3 *CLASS* and *STYLE* Objects

- typical styling information is stored within the *CLASS* and *STYLE* objects of a *LAYER*
- starting with MapServer 5.0, there is no limit to the number of classes or styles in a mapfile
- the following example shows how to display a road line with two colors by using overlayed *STYLE* objects

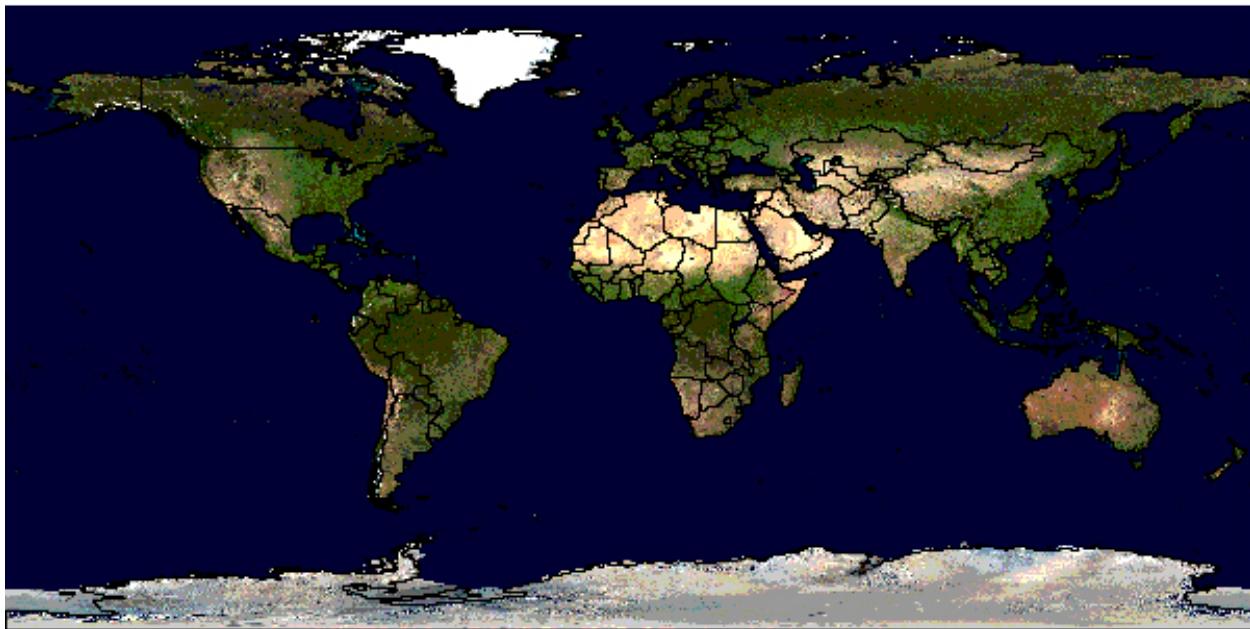


Figure 2.3: Rendered Bluemarble image with vector boundaries

```

CLASS
  NAME "Primary Roads"
  STYLE
    SYMBOL "circle"
    COLOR 178 114 1
    SIZE 15
  END # STYLE
  STYLE
    SYMBOL "circle"
    COLOR 254 161 0
    SIZE 7
  END # STYLE
END # CLASS

```

2.4.4 ***SYMBOLs***

- can be defined directly in the mapfile, or in a separate file
- the separate file method must use the **SYMBOLSET** parameter in the **MAP** object:

```

MAP
  NAME "sample"
  EXTENT -180 -90 180 90 # Geographic
  SIZE 800 400
  IMAGECOLOR 128 128 255
  SYMBOLSET ".../etc/symbols.txt"
END # MAP

```

where symbols.txt might contain:

```

SYMBOL
  NAME "ski"

```

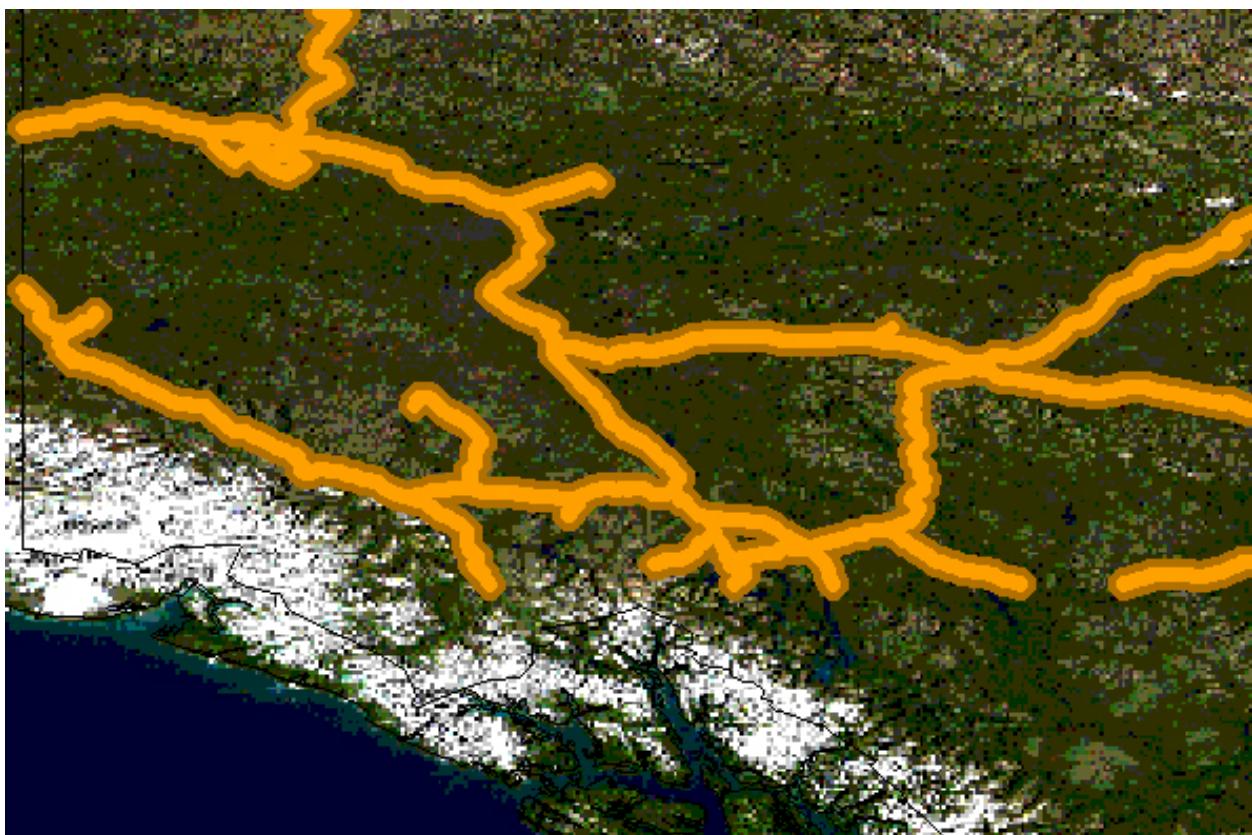


Figure 2.4: Rendered Bluemarble image with styled roads

```

TYPE PIXMAP
IMAGE "ski.png"
END # SYMBOL

```

and the mapfile would contain:

```

LAYER
...
CLASS
  NAME "Ski Area"
  STYLE
    SYMBOL "ski"
  END # STYLE
END # CLASS
END # LAYER

```

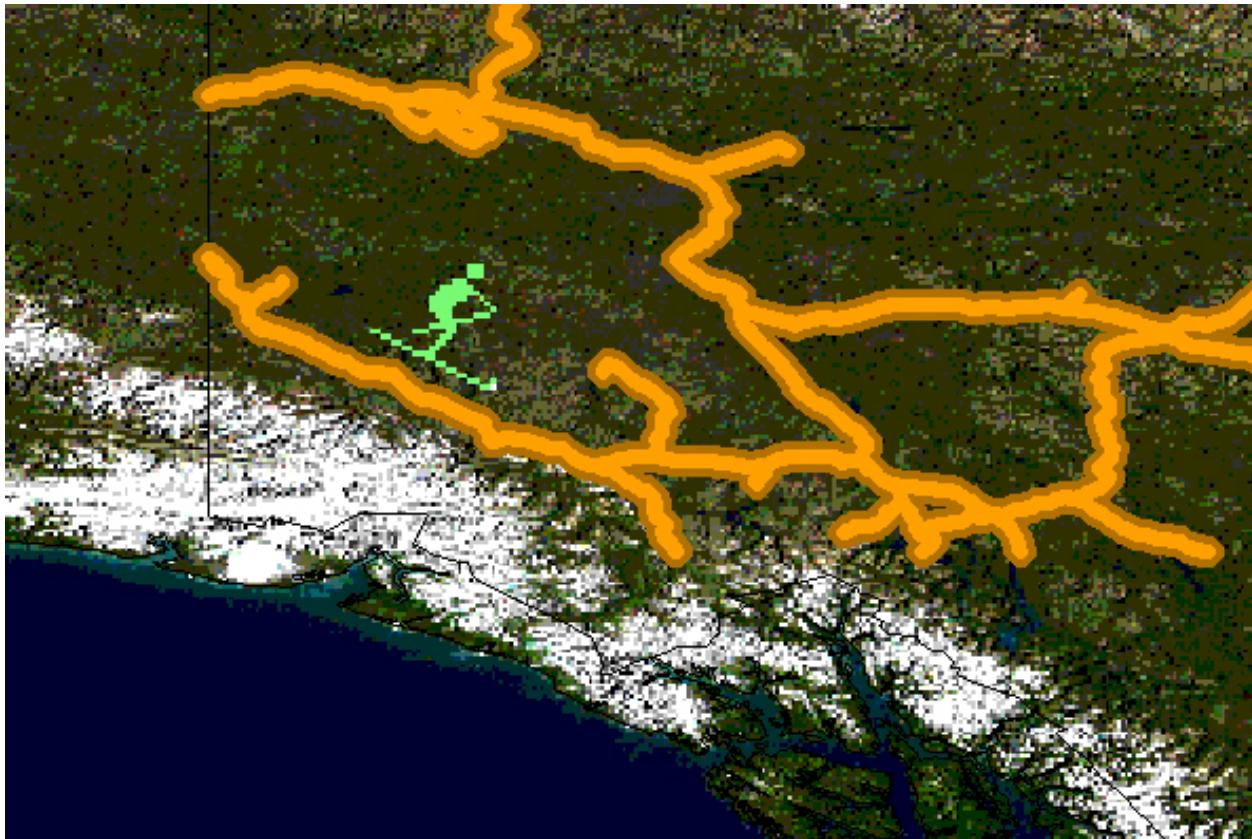


Figure 2.5: Rendered Bluemarble image with skier symbol

See Also:

Cartographical Symbol Construction with MapServer, *Symbology Examples*, and *SYMBOL*

2.4.5 *LABEL*

- defined within a *CLASS* object
- the *LABELITEM* parameters in the *LAYER* object can be used to specify an attribute in the data to be used for labeling. The label is displayed by the *FONT*, declared in the *FONTSSET* file (set in the *MAP* object). The

FONTS file contains references to the available font names. *ENCODING* describes which encoding is used in the file (see *Display of International Characters in MapServer*).

An example *LABEL* object that references one of the above fonts might look like:

```
LABEL
  FONT "sans-bold"
  TYPE truetype
  ENCODING "UTF-8"
  SIZE 10
  POSITION LC
  PARTIALS FALSE
  COLOR 100 100 100
  OUTLINECOLOR 242 236 230
END # LABEL
```

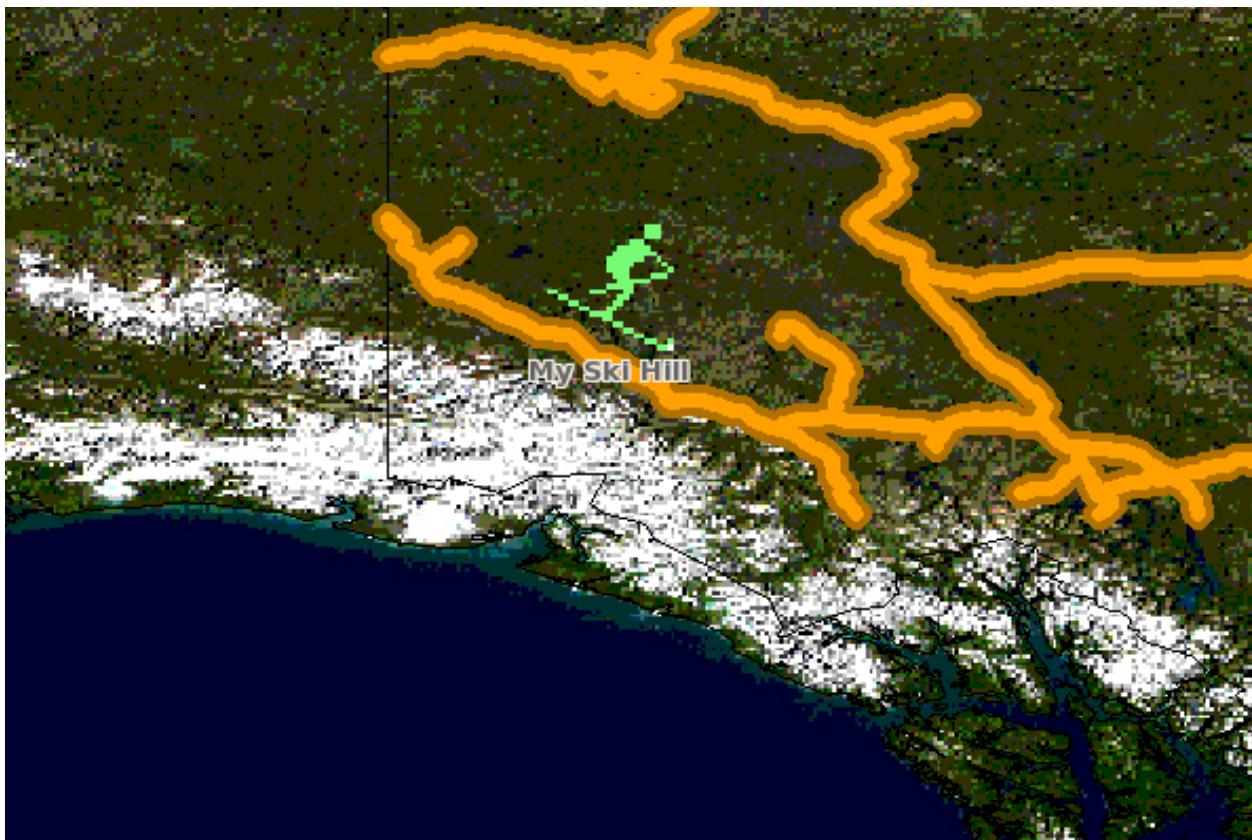


Figure 2.6: Rendered Bluemarble image with skier symbol and a label

See Also:

LABEL, *FONTS*

2.4.6 CLASS Expressions

MapServer supports three types of *CLASS Expressions* in a *LAYER* (*CLASSITEM* in *LAYER* determines the attribute to be used for the two first types of expressions):

1. String comparisons

```
EXPRESSION "africa"
```

2. Regular expressions

```
EXPRESSION /^9|^10/
```

3. Logical expressions

```
EXPRESSION ([POPULATION] > 50000 AND '[LANGUAGE]' eq 'FRENCH')
```

Note: Logical expressions should be avoided wherever possible as they are very costly in terms of drawing time.

See Also:

Expressions

2.4.7 INCLUDE

Added to MapServer 4.10, any part of the mapfile can now be stored in a separate file and added to the main mapfile using the *INCLUDE* parameter. The filename to be included can have any extension, and it is always relative to the main .map file. Here are some potential uses:

- *LAYER*s can be stored in files and included to any number of applications
- *STYLE*s can also be stored and included in multiple applications

The following is an example of using mapfile *includes* to include a layer definition in a separate file:

If ‘shadedrelief.lay’ contains:

```
LAYER
  NAME 'shadedrelief'
  STATUS ON
  TYPE RASTER
  DATA 'GLOBALeb3colshade.jpg'
END # LAYER
```

therefore the main mapfile would contain:

```
MAP
  ...
  INCLUDE "shadedrelief.lay"
  ...
END # MAP
```

The following is an example of a mapfile where all *LAYER* s are in separate .lay files, and all other objects (*WEB*, *REFERENCE*, *SCALEBAR*, etc.) are stored in a “.ref” file:

```
MAP
  NAME "base"
  #
  # include reference objects
  #
  INCLUDE ".../templates/template.ref"
  #
  # Start of layer definitions
  #
  INCLUDE ".../layers/usa/usa_outline.lay"
  INCLUDE ".../layers/canada/base/1m/provinces.lay"
```

```
INCLUDE ".../layers/canada/base/1m/roads_atlas_of_canada_1m.lay"
INCLUDE ".../layers/canada/base/1m/roads_atlas_of_canada_1m_shields.lay"
INCLUDE ".../layers/canada/base/1m/populated_places.lay"
END # MAP
```

Warning: *Mapfiles* must have the .map extension or MapServer will not recognize them. Include files can have any extension you want, however.

See Also:

INCLUDE

2.4.8 Get MapServer Running

You can test if MapServer is working by running the MapServer executable (mapserv) with the -v parameter on the command line (./mapserv -v). Depending on your configuration, the output could be something like this:

```
MapServer version 6.0.1 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG
SUPPORTS=PROJ SUPPORTS=AGG SUPPORTS=FREETYPE SUPPORTS=ICONV
SUPPORTS=WMS_SERVER INPUT=SHAPEFILE
```

You can also send a HTTP request directly to the MapServer CGI program without passing any configuration variables (e.g. <http://your.domain.name/cgi-bin/ms4/mapserv.exe>). If you receive the message, ‘No query information to decode. *QUERY_STRING* not set.’, your installation is working.

2.4.9 Get Demo Running

Download the [MapServer Demo](#). UnZip it and follow the directions in ReadMe.txt. You will need to move the demo files to their appropriate locations on your web server, and modify the Map File and HTML pages to reflect the paths and URLs of your server. Next, point your browser to init.html and hit the ‘initialize button’. If you get errors, verify that you have correctly modified the demo files.

2.5 Making the Site Your Own

Now that you have a working MapServer demo, you can use the demo to display your own data. Add new *LAYERs* to your Map file that refer to your own geographic data layers (you will probably want to delete the existing layers or set their status to *OFF*).

Unless you are adding layers that fall within the same geographic area as the demo, modify *MAP EXTENT* to match the extent of your data. To determine the extent of your data, you can use [ogrinfo](#). If you have access to a GIS, you could use that as well. The *MAP EXTENT* needs to be in the units of your output projection.

If you add geographic data layers with different geographical reference systems, you will need to modify your Map File to add a *PROJECTION* block to the *MAP* (defines the output projection / geographical reference system) and each of the *LAYERs* (defines the geographical reference system of the layer dataset).

2.5.1 Adding Data to Your Site

MapServer supports several data input formats ‘natively’, and many more if it is compiled with the open source libraries [GDAL](#) and [OGR](#).

2.5.2 Vector Data

Vector data includes features made up of points, lines, and polygons. MapServer support the ESRI Shape format by default, but it can be compiled to support spatially enabled databases such as [PostgreSQL-PostGIS](#), and file formats such as [Geography Markup Language \(GML\)](#), [MapInfo](#), delimited text files, and more formats with [OGR](#).

See the [Vector Data reference](#) for examples on how to add different geographic data sources to your MapServer project.

2.5.3 Raster Data

Raster data is image or grid data. By default, MapServer supports Tiff/GeoTiff, and EPPL7. With [GDAL](#), it supports GRASS, Jpeg2000, ArcInfo Grids, and [more formats](#). If you do compile MapServer with GDAL, which includes tiff support, do not compile with native tiff support, as this will cause a conflict. More specific information can be found in the [Raster Data reference](#).

2.5.4 Projections

Because the earth is round and your monitor (or paper map) is flat, distortions will occur when you display geographic data in a two-dimensional image. Projections allow you to represent geographic data on a flat surface. In doing so, some of the original properties (e.g. area, direction, distance, scale or conformity) of the data will be distorted. Different projections excel at accurately portraying different properties. A good [primer](#) on map projections can be found at the University of Colorado.

With MapServer, if you keep all of your spatial data sets in the same projection (or unprojected Latitude and Longitude), you do not need to include any projection info in your Map File. In building your first MapServer application, this simplification is recommended.

On-the-fly projection can be accomplished when MapServer is compiled with [Proj.4](#) support. Instructions on how to enable Proj.4 support on Windows can be found on the [Wiki](#).

2.6 Enhancing your site

2.6.1 Adding Query Capability

There are two primary ways to query spatial data. Both methods return data through the use of templates and CGI variable replacement. A [QUERYMAP](#) can be used to map the results of the query.

To be queryable, each mapfile [LAYER](#) must have a [TEMPLATE](#) defined, or each [CLASS](#) within the LAYER must have a TEMPLATE defined. More information about the CGI variables used to define queries can be found in the [MapServer CGI Reference](#).

2.6.2 Attribute queries

The user selects features based on data associated with that feature. ‘Show me all of the lakes where depth is greater than 100 feet’, with ‘depth’ being a field in the Shape dataset or the spatial database. Attribute queries are accomplished by passing query definition information to MapServer in the URL (or form post). Mode=itemquery returns a single result, and mode=itemnquery returns multiple result sets.

The request must also include a QLAYER, which identifies the layer to be queried, and a QSTRING which contains the query string. Optionally, QITEM, can be used in conjunction with QSTRING to define the field to be queried. Attribute queries only apply within the [EXTENT](#) set in the map file.

2.6.3 Spatial queries

The user selects features based on a click on the map or a user-defined selection box. Again the request is passed through a URL or form post. By setting mode=QUERY, a user click will return the one closest feature. In mode=NQUERY, all features found by a map click or user-defined selection box are returned. Additional query options can be found in the [CGI](#) documentation.

2.6.4 Interfaces

See: OpenLayers <http://openlayers.org>

2.6.5 Data Optimization

Data organization is at least as important as hardware configuration in optimizing a MapServer application for performance. MapServer is quite efficient at what it does, but by reducing the amount of processing that it needs to do at the time of a user request, you can greatly increase performance. Here are a few rules:

- **Index Your Data** - By creating spatial indexes for your Shape datasets using [*shptree*](#). Spatial indexes should also be created for spatially aware databases such as PostGIS and Oracle Spatial.
- **Tile Your Data** - Ideally, your data will be ‘sliced up’ into pieces about the size in which it will be displayed. There is unnecessary overhead when searching through a large Shape dataset or image of which you are only going to display a small area. By breaking the data up into tiles and creating a tile index, MapServer only needs to open up and search the data files of interest. Shape datasets can be broken into smaller tiles and then a tileindex Shape dataset can be created using the [*tile4ms*](#) utility. A [*tileindex*](#) Shape dataset for raster files can also be created.
- **Pre-Classify Your Data** - MapServer allows for the use of quite complex [*EXPRESSIONS*](#) to classify data. However, using logical and regular expressions is more resource intensive than string comparisons. To increase efficiency, you can divide your data into classes ahead of time, create a field to use as the [*CLASSITEM*](#) and populate it with a simple value that identifies the class, such as 1,2,3, or 4 for a four class data set. You can then do a simple string comparison for the class [*EXPRESSION*](#).
- **Pre-Process Your Images** - Do resource intensive processing up front. See the [*Raster Data reference*](#) for more info.
- **Generalize for Overview** - create a more simple, generalized data layer to display at small scales, and then use scale-dependent layers utilizing [*LAYER MINSCALE*](#) and [*LAYER MAXSCALE*](#) to show more detailed data layers as the user zooms in. This same concept applies to images.

See Also:

[*Optimization*](#)

2.7 How do I get Help?

2.7.1 Documentation

- Official MapServer documentation lives here on this [*site*](#).
- User contributed documentation exists on the MapServer [*Wiki*](#).

2.7.2 Users Mailing List

Register and post questions to the [MapServer Users](#) mailing list. Questions to the list are usually answered quickly and often by the developers themselves. A few things to remember:

1. [Search the archives](#) for your answer first, people get tired of answering the same questions over and over.
2. Provide version and configuration information for your MapServer installation, and relevant snippets of your map and template files.
3. Always post your responses back to the whole list, as opposed to just the person who replied to your question.

2.7.3 IRC

MapServer users and developers can be found on Internet Relay Chat. The channel is #mapserver on irc.freenode.net.

2.7.4 Reporting bugs

Bugs (software and documentation) are reported on the [MapServer issue tracker](#).

2.7.5 Gallery

See examples (*currently shut down*) of existing MapServer applications.

2.7.6 Tutorial

Perry Nacionales built a great [Tutorial](#) on how to build a MapServer application (MapServer version 5).

2.7.7 Test Suite

Download the [MapServer Test Suite](#) for a demonstration of some MapServer functionality.

2.7.8 Books

[Web Mapping Illustrated](#), a book by Tyler Mitchell that describes well and provides real-world examples for the use of Web mapping concepts, Open Source GIS software, MapServer, Web services, and PostGIS.

[Mapping Hacks](#), by Schuyler Erle, Rich Gibson, and Jo Walsh, creatively demonstrates digital mapping tools and concepts. MapServer only appears in a handful of the 100 hacks, but many more are useful for concepts and inspiration.

[Beginning MapServer: Opensource GIS Development](#), by Bill Kropla. According to the publisher, it covers installation and configuration, basic MapServer topics and features, incorporation of dynamic data, advanced topics, MapScript, and the creation of an actual application.

MapServer Tutorial

Author Pericles S. Nacionales

Contact pnaciona at gmail.com

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Updated 2010-04-07

This tutorial was designed to give new users a quick (relatively speaking) introduction to the concepts behind MapServer. It is arranged into four sections with each section having one or more examples and increasing in complexity. Users can jump to any section at any time although it is recommended that absolute beginners work on the first three sections sequentially.

Section one focuses on basic MapServer configuration concepts such as layer and class ordering, using vector and raster data, projections and labeling. Section two provides examples on how to use HTML templates to create a simple interface for an interactive web mapping application. Section three introduces the use of HTML templates to provide a “query” interface. Finally, section four introduces some advanced user interface concepts.

3.1 Tutorial background

3.1.1 Tutorial Timeframe

While some users can go through this tutorial in one day, those who work on each example in detail can probably expect to finish in one week.

3.1.2 Tutorial Data

The dataset used in this tutorial was taken from the U.S. Department of the Interior’s National Atlas of the United States. You can visit their web site at <http://www.nationalatlas.gov>. The dataset was clipped to the upper great lakes region (Minnesota, Michigan, and Wisconsin) to reduce storage size. Additional raster images were added courtesy of the TerraSIP project at the University of Minnesota. When using this tutorial, you are encouraged to use your own dataset.

Like MapServer itself, this tutorial is open and customizable to anyone. This was done in the hope that someone (or some folks) will help design and develop it further.

Download the data (and all html files) for this tutorial at <http://download.osgeo.org/mapserver/docs/mapserver-tutorial.zip>.

3.1.3 Before Using the Tutorial

There are some prerequisites to using this tutorial:

1. Users will need to have a web server installed and running on their computer. This web server has to have support for common gateway interface (CGI) programs.
2. Users should have a basic understanding of web servers and internet security. A poorly configured web server can easily be attacked by malicious people. At the very least your software installation will be corrupted and you'll lose hours of productivity, at worst your computer can be used to attack other computers on the internet.
3. It is recommended that users of this tutorial read the *Introduction to MapServer* before proceeding with this tutorial.
4. To use this tutorial, users will need to have a MapServer CGI program (mapserv or mapserv.exe) installed in their systems. MapServer source code is available for download [here](#). Documentation exists on how to compile and install MapServer:
 - for UNIX users, please read the *MapServer UNIX Compilation and Installation HOWTO*.
 - Windows users should read the *MapServer Win32 Compilation and Installation HOWTO*

In addition, precompiled binaries exist for a number of platform (see the [download page](#)).

3.1.4 Windows, UNIX/Linux Issues

Paths

This tutorial was created on Linux/UNIX but should work with minimal changes on Windows platform. The main differences are the paths in the map files. Windows users need to specify the drive letter of the hard disk where their tutorial files reside. Here's an example:

A UNIX map file might include a parameter like this:

```
SHAPEPATH "/data/projects/tutorial/data"
```

In Windows, the same parameters might look like this:

```
SHAPEPATH "C:/data/projects/tutorial/data"
```

or:

```
SHAPEPATH "C:\data\projects\tutorial\data".
```

Notice that either slash or backslash works in Windows. The usual backslash may work well for you if you want to make a distinction between virtual (as in URLs or web addresses) and local paths in your map file. However, if you plan to move your application to UNIX at some point, you'll have the tedious task of switching all backslashes to slashes.

While we're on the subject of paths, keep in mind that paths in mapfiles are typically relative to the system's root directory: the slash ("") in UNIX or some drive letter ("C:") in Windows. This is true except when specifically asked to enter a URL or when referencing a URL. When working with HTML template files, paths are relative to the web server's root directory. i.e., "/tutorial/" is relative to "<http://demo.mapserver.org/>". Please read <http://www.alistapart.com/articles/slashforward/> for a few insights on URLs.

Executable

Another issue is that UNIX executable files don't require a .EXE or .COM extensions, but they do in Windows. If you are using Windows, append .exe to all instances of "/cgi-bin/mapserv" or "/cgi-bin/mapserv50" to make it "/cgi-bin/mapserv.exe" or "/cgi-bin/mapserv50.exe".

3.1.5 Other Resources

Other documentation exist to give you better understanding of the many customizations MapServer offer. Please visit the MapServer documentation page at <http://www.mapserver.org>. There you will find several HOWTO documents, from getting started to using MapScript, a scripting interface for MapServer.

[Back to Tutorial home](#) | [Proceed to Section 1](#)

3.2 Section 1: Static Maps and the MapFile

- Take a Shapefile dataset. Any Shapefile dataset. We can use MapServer to display that Shapefile dataset in a web browser. Look...
 - *Example 1.1 - A map with a single layer*
- We can display the same Shapefile dataset repeatedly. We can display the polygon attributes in one LAYER and the line attributes in another...
 - *Example 1.2 - A map with two layers*
- And we can select which parts of the Shapefile dataset to display. We do this using the CLASS object...
 - *Example 1.3 - Using classes to make a “useful” map*
- We can also label our maps...
 - *Example 1.4 - Labeling layers and label layers*
- Or add raster data such as satellite images, aerial photographs, or shaded reliefs...
 - *Example 1.5 - Adding a raster layer*
- We can reproject our data from just about any projection to just about any... Yeah, check it out!
 - *Example 1.6 - Projection/Reprojection*
- And we can use layers from other map servers on the Internet (for example WMS servers)...
 - *Example 1.7 - Adding a WMS layer*
- MapServer can output to various formats such as PDF and GeoTIFF.
 - *Example 1.8 - A different output format*
- MapServer not only generates static maps, it can also create interactive maps...
 - *Example 1.9 - The difference between map mode and browse mode*

[Back to Tutorial home](#) | [Proceed to Section 2](#)

3.3 Section 2: CGI variables and the User Interface

So far we have only looked at the mapfile when creating maps. In creating web mapping applications, it is usually our intention to make maps that can be changed by the user (of the application) interactively. That is, a user should be able to change the content of (or the information in) the map. To accomplish this interactivity, we use the MapServer HTML templates.

3.3.1 HTML Templates

A MapServer HTML template is essentially an HTML file with a few MapServer specific tags. These tags are the MapServer CGI variables and are enclosed in square brackets “[]”. When the MapServer CGI program processes an application, it first parses the query string and the mapfile, and produces the necessary output. Some of this output will need to be written to the HTML template file which you would have to also specify in the mapfile using the web template keyword (or in a separate HTML initialization file). The CGI program will replace all the variables in the HTML template with the proper value before sending it back to the web browser. If you are to directly view an HTML template in a web browser, there won’t be any maps rendered and you will instead get blank images and other junk.

Variables

MapServer provides several variables for web mapping: the “img” variable which you’ve seen in Example 1.9 is but one example. There are a few core CGI variables originally designed as part of the mapping interface but practically all the mapfile parameters can be defined as variables. The definitive reference to the MapServer CGI variables can be found [here](#).

We can also define our own variables, which MapServer will pass along to our application. For example, we can create a variable called “root” to represent the root directory of this tutorial, the value for “root” will then be “/tutorial”. When the MapServer CGI program processes our HTML template, it will replace every instance of the “[root]” tag with “/tutorial”. You will see this in action for each of the following examples.

3.3.2 Examples

So, let’s build an interactive interface for our application...

- Users of a web mapping application should be able to pan and zoom on the map: [Example 2.1 - Pan and Zoom Controls](#)
 - They also should be able to turn on and off layers on a map: [Example 2.2 - Layer Control](#)
 - A map should always include a scalebar. [Example 2.3 - Adding a Scalebar](#)
 - If users are to navigate through the map, a reference map should be provided: [Example 2.4 - Adding a Reference Map](#)
 - The map should include a legend. [Example 2.5 - Adding a Legend](#)
-

[Back to Section 1 index](#) | [Proceed to Section 3](#)

3.4 Section 3: Query and more about HTML Templates

To learn more about query and HTML templates with MapServer, see examples 3.1 to 3.4 in the [Tutorial Viewer](#).

[Back to Section 2 index](#) | [Proceed to Section 4](#)

3.5 Section 4: Advanced User Interfaces

To learn more about advanced navigation such as pan and rubber-band zoom with Javascript and MapServer CGI, see examples 4.1 to 4.4 in the [Tutorial Viewer](#).

[Back to Section 3 index](#) | [Tutorial home](#)

[Begin tutorial](#)

Installation

4.1 Compiling on Unix

Author J.F. Doyon

Contact jdoyon at nrcan.gc.ca

Author Howard Butler

Contact hobu.inc at gmail.com

Revision \$Revision\$

Date \$Date\$

Table of Contents

- Compiling on Unix
 - Introduction
 - Obtaining the necessary software
 - libgd
 - Anti-Grain Geometry Support
 - OGC Support
 - Spatial Warehousing
 - Compiling
 - Installation

4.1.1 Introduction

The University of Minnesota's MapServer is an open-source and freely available map rendering engine for the web. Due to its open-source nature, it can be compiled on a wide variety of platforms and operating systems. We will focus on how to obtain, compile and install MapServer on UNIX-like platforms.

You might also check the [MapServerCompilation](#) wiki page for additional information.

4.1.2 Obtaining the necessary software

You can obtain the MapServer source code as well as the demo package from the [Download](#) section.

You can also get the latest MapServer source code from [GitHub](#).

Required External Libraries

- [libpng](#): libpng should be on your system by default. 1.2.12 is the current release with security patches, although versions all the way back to 1.2.7 should work.
- [freetype](#): Version 2.x or above is required by GD.
- [GD](#): libgd is used by MapServer for rendering images. Version 2.0.28 or greater required. Version 2.0.29 or later is required to use curved (following) labels, and version 2.0.34 is required for antialiasing (1 pixel wide lines/outlines).
- [zlib](#): Zlib should be on your system by default. 1.2.1 is the current release with security patches.

Highly Recommended Libraries

- [libproj](#): libproj provides projection support for MapServer. Version 4.4.6 or greater is required.
- [libcurl](#): libcurl is the foundation of OGC (WFS/WMS/WCS) client and server support. Version 7.10 or greater is required. Installing libcurl:

```
apt-get install -y libcurl4-gnutls-dev
```
- [OGR](#): OGR provides access to at least 18 different vector formats.
- [GDAL](#): GDAL provides access to at least 42 different raster formats.
- [AGG](#): AGG (Anti-Grain Geometry) is an optional dependency to enable high quality antialiased output for vector data. Currently versions 2.4 and 2.5 are identical feature-wise, and only vary in their license (2.4 is BSD, 2.5 is GPL)

Note: MapServer 5.6+ embeds AGG in its source tree and you do not need to install it separately.

Optional External Libraries

- [libtiff](#): libtiff provides TIFF (Tagged Image File Format) reading support to MapServer.

Warning: Direct libtiff support is deprecated in MapServer 5.8+, and you should now depend on GDAL for raster read support in MapServer.

- [libgeotiff](#) libgeotiff provides support to read GeoTIFF files (TIFF files with geographic referencing).

Warning: Direct GeoTIFF support is deprecated in MapServer 5.8+, and you should now depend on GDAL for raster read support in MapServer.

- [libjpeg](#): libjpeg allows MapServer to render images in JPEG format. A sufficient version should be installed by default on your system. Version 6b is the current version and dates back to 1998.

Warning: Direct JPEG support is deprecated in MapServer 5.8+, and you should now depend on GDAL for raster read support in MapServer.

- **GEOS:** GEOS allows MapServer to do spatial predicate and algebra operations (within, touches, etc & union, difference, intersection). New in version 4.10.
- **libxml:** libxml is required to use *OGC SOS* support in MapServer New in version 4.10.
- **SDE Client Library:** The client libraries for your platform should be part of the ArcSDE media kit. They are *not* publicly available for download.
- **Oracle Spatial OCI:** The client libraries for your platform are available for download from Oracle's website. Ideally, your client library matches the database you are querying from, but this is not a hard requirement.
- **libpq:** libpq is required to support the use of PostGIS geometries within the PostgreSQL database. Ideally, your client library matches the database you are querying from.
- **pdflib (lite):** PDFlib Lite is the Open Source version of PDFlib that allows MapServer to produce PDF output. Version 4.0.3 or greater is required.

Note: PDF output is supported through Cairo in recent versions of MapServer .

- **libming:** libming provides Macromedia Flash output to MapServer. Version 0.2a is required. Later versions are not known to work.

Note: SWF (flash) support was dropped in MapServer version 6.

- **libgif-dev:** giflib is one of the default renderers, but can be disabled with the “–without-gif” configure option.
- **FastCGI:** FastCGI is a popular protocol for interfacing MapServer with various web servers. You will need to install the development package if you use the “–with-fastcgi” configure option. More details on how to use this feature in MapServer is here *FastCGI*. On Ubuntu, that would be:

```
$ apt-get -y install libfcgi-dev
```

- **cairo (svg, pdf) support:** This library is required when using the “–with-cairo” configure option. If you’re on an ubuntu system, it can be installed with “apt-get install -y libcairo2-dev”
- **kml support:** This renderer is controlled with the “–with-kml” parameter.
- **opengl:** This renderer is highly experimental, and is controlled with the “–with-opengl[=DIR] ” parameter, where DIR is OpenGL’s install dir.

Optional Features

- **cairo svg parser support:** The “–with-lsvg-cairo” option is part of a proposal to improve SVG support. Using this feature requires installing the lsvg-cairo library available here: <http://cairographics.org/snapshots/> . You will need to compile and install cairo, lsvg, and lsvg-cairo.

4.1.3 libgd

There are a number of issues that you should be aware of when using GD in combination with MapServer.

Minimum libgd versions

MapServer aggressively takes advantage of new features and bug fixes in the latest versions of libgd. The minimum required version to run MapServer is 2.0.29. Upgrading to at least 2.0.34 is advised as it includes an important bug fix for antialiased lines. Configure should detect which version of libgd you have installed, but you can quickly check yourself by issuing the following command:

```
$ gdlib-config --version
```

libiconv

If you intend to use international character sets, your version of libgd *must* be compiled against the GNU iconv libraries. If you are using a pre-packaged version, it is very likely that this is the case. To check for yourself, issue the following command and look for ‘-liconv’ in the output:

```
$ gdlib-config --libs
```

Pre-packaged/system libraries

If you intend to use your system’s libgd, ensure that you have the development package also installed so MapServer can find and use the appropriate headers.

MacOSX

A useful FAQ on for libgd on OSX is available at http://www.libgd.org/DOC_INSTALL_OSX

FreeType support

The GD you compile MapServer against MUST be compiled against the FreeType library in order to use TrueType fonts. MapServer no longer uses it’s own interface to FreeType, using it through GD instead.

When you run your “configure” script, look for the following output:

```
using GD ( -DUSE_GD_GIF -DUSE_GD_PNG -DUSE_GD_JPEG  
-DUSE_GD_WBMP -DUSE_GD_TTF -DGD_HAS_GDIMAGEGIFPTR) from system libs.
```

If your GD is built against FreeType, you will see either “-DUSE_GD_TTF” (Or “-DUSE_GD_FT” for Freetype 2.x) part. If it’s missing, you will need to recompile your GD to make sure you include FreeType support. See the GD documentation for more information.

Also note that the configure script looks for the FreeType library separately as well, generating output looking somewhat like this:

```
checking where FreeType is installed...  
checking for FT_Init_FreeType in -lfreetype... yes  
using libfreetype -lfreetype from system libs.
```

Even though you have FreeType installed on your system *and* the configure script finds it, does *NOT* mean you will have TrueType font support. GD *MUST* be compiled against FreeType either way.

1px Anti-Aliasing and segfaults

Versions of libgd earlier than 2.0.34 contain a one very significant bug and will *always* cause a segfault if you attempt to do one pixel wide antialiasing. You can manually patch older gd's, or better yet upgrade to at least GD 2.0.34.

In gd.c, function gdImageSetAAPixelColor() change:

```
int dr,dg,db,p,r,g,b;
p = gdImageGetPixel(im,x,y);

to

int dr,dg,db,p,r,g,b;
if (!gdImageBoundsSafeMacro (im, x, y)) return;
p = gdImageGetPixel(im,x,y);
```

More detail about this patch (if you need any) was described by Steve Lime in a [post to mapserver-users](#).

Curved label support

ANGLE FOLLOW, a new feature that allows MapServer to draw curved labels about a linear feature like a road, requires libgd 2.0.29 and TrueType font support. Configure should autodetect if you have a sufficient libgd and TrueType support to be able to use this feature.

4.1.4 Anti-Grain Geometry Support

Since version 5.0 MapServer supports the AGG rendering backend. MapServer 5.6+ embeds it directly in the source tree and you do not have to do anything special to have support for it.

4.1.5 OGC Support

MapServer provides support for many [OGC](#) specifications. For an overview, see [MapServer OGC Specification support](#).

WMS support

WMS Server

Support for *WMS server* is automatically enabled when you include PROJ.4 support. (`-with-proj`) You can check this yourself by looking for the following in your “configure” output:

```
checking whether we should include WMS support...
  OGC WMS compatibility enabled (-DUSE_WMS).
```

If, for some reason you DON'T want WMS support, you can force it off by passing “`-without-wms`” to your configure script.

More information on using this feature is available in [WMS Server](#).

WMS Client

Cascading is also supported. This allows mapserver to transparently fetch remote layers over WMS, basically acting like a client, and combine them with other layers to generate the final map.

In order to enable this feature, you will need to pass the “–with-wmsclient” option to the configure script. MapServer will automatically look for libcurl, which is also required.

To verify that the WMS Client feature is enabled, check the output from the configure script:

```
checking whether we should include WMS Client Connections support...
  OGC WMS Client Connections enabled (-DUSE_WMS_LYR).
```

Note: This feature is disabled by default, you have to specifically request it.

More information on using this feature is available in [WMS Client](#).

WFS support

WFS Server

Support for *WFS server* is enabled by passing the configure script the “–with-wfs” option. OGR and PROJ.4 support is required.

You can check this yourself by looking for the following in your “configure” output:

```
checking whether we should include WFS Server support...
  OGC WFS Server support enabled (-DUSE_WFS_SVR).
```

Note: This feature is disabled by default, you have to specifically request it.

More information on using this feature is available in [WFS Server](#).

WFS Client

MapServer can also act as a WFS client. This effectively means that MapServer reads its data from a remote server’s WFS output and renders it into a map, just like it would when reading data from a shapefile.

In order to enable this feature, you will need to make sure you include OGR (Built with Xerces support) and PROJ.4 support, and pass the “–with-wfsclient” option to your configure script. MapServer will automatically look for libcurl, which is also required.

To verify that the *WFS Client* feature is enabled, check the output from the configure script:

```
checking whether we should include WFS Client Connections support...
  OGC WFS Client Connections enabled (-DUSE_WFS_LYR).
```

Note: This feature is disabled by default, you have to specifically request it.

More information on using this feature is available in [WFS Client](#).

WCS Server

Support for *WCS server* is enabled by passing the “–with-wcs” option to the configure script. WCS must be compiled against certain libraries. More information on this service is available in [WCS Server](#).

SOS Server

Support for SOS is enabled by passing the “–with-sos” option to the configure script. More information on this service is available in [SOS Server](#).

4.1.6 Spatial Warehousing

MapServer can use a wide variety of sources of data input. One of the solutions growing in popularity is to use spatially enabled databases to store data, and to use them directly to draw maps for the web.

Here you will find out how to enable mapserver to talk to one of these products. Please refer to the MapFile reference for more details on how to use these. This section only details how to compile MapServer for their use.

PostGIS

[PostGIS](#) adds support for geographic objects to the [PostgreSQL](#) object-relational database. In effect, PostGIS “spatially enables” the PostgreSQL server, allowing it to be used as a backend spatial database for geographic information systems (GIS), much like ESRI’s SDE or Oracle’s Spatial extension. PostGIS is included in many distributions’ packaging system, but you can also roll your own if needed.

MapServer can use PostGIS as a data source. In order to do so simply use “–with-postgis” when running your configure script:

```
--with-postgis=/usr/local/pgsql/bin/pg_config
```

ArcSDE

MapServer allows you to use SDE as a data source both for geometry and attributes. In order to achieve this, you must have the SDE client libraries at your disposition, and have them installed on the machine running MapServer.

In order to enable SDE support in MapServer, you have to compile it with two options specified:

```
--with-sde=/opt/sdeexe90  
--with-sde-version=90
```

Oracle Spatial

Oracle’s Spatial Warehousing cartridge is also supported by MapServer. In order to connect to it, you will need to compile MapServer against the Oracle libraries by passing the “–with-oraclespatial” argument to your configure script. You will very likely need an ORACLE_HOME environment variable set to have it configure things correctly:

```
--with-oraclespatial=/opt/oracle
```

4.1.7 Compiling

First prepare the ground by making sure all of your required and/or recommended libraries are installed before attempting to compile MapServer. This will make your life much less complicated ;). Here is the order that I usually use:

1. Compile GD. This often means acquiring libjpeg, libpng, zlib, and freetype before actually compiling the library. You shouldn't have too much trouble finding binaries of the libraries that GD requires, and often, they will already be installed with your system. On unix, I've had very little luck finding pre-compiled binaries of the required GD library. See [libgd](#) section for notes about patching libgd if you plan to use antialiasing.
2. Compile GDAL/OGR. Describing how to compile GDAL/OGR is beyond the scope of this document. If you have requirements for lots of different formats, make sure to install those libraries first. I often find that building up a GDAL/OGR library often takes as long as compiling MapServer itself!
3. Compile Proj.4. Proj.4 is a straight-forward configure/make/make install library.
4. Compile libcurl. libcurl is a straight-forward configure/make/make install library. This library is only used along with other features, so “–with-curl-config” won’t do anything unless something like “–with-wmsclient” or “–with-wfsclient” is also selected.

Note: If you want to configure MapServer to use SSL when accessing a WMS/WFS server libcurl must be configured / compiled with the “–with-ssl” option. Details about how to set this up is available in [How to set up MapServer as a client to access a service over https](#).

5. Compile/install optional libraries. These might include SDE, PostGIS, Oracle Spatial, AGG, Ming, PDFlib, or MyGIS. Mix and match as you need them.

6. Unpack the MapServer tarball and cd into the mapserver directory:

```
$ tar -zxvf mapserver-X.Y.Z.tar.gz
```

7. Configure your environment using “configure”. I often place my configure command in its own file and changes its mode to be executable (+x) to save typing and have a record of how MapServer was configured. This is meant to be an example, you will need to edit the following script. If you get “No such file or directory” errors, try removing the “#” comments in this script:

```
./configure --with-sde=/usr/sde/sdeexe90 \
--with-sde-version=90 \
--with-ogr=/usr/local/bin/gdal-config \
--with-gdal=/usr/local/bin/gdal-config \
--with-httpd=/usr/sbin/httpd \
--with-wfsclient \
--with-wmsclient \
--enable-debug \
--with-curl-config=/usr/bin/curl-config \
--with-proj=/usr/local \
--with-tiff \
--with-gd=/usr/local/ \
--with-jpeg \
--with-freetype=/usr/ \
--with-oraclespatial=/usr/oracle \
--with-threads \
--with-wcs \
--with-postgis=/usr/local/database/bin/pg_config \
--with-libiconv=/usr \ # new in 4.8
--with-geos=/usr/local/bin/geos-config \ # new in 4.8
--with-xml2-config=/usr/bin/xml2-config \ # new in 4.10
```

```
--with-sos \ # new in 4.10
--with-agg=/path/to/agg-2.4 \ # not needed with >= 5.6
```

8. Now that you have configured your build options and selected all the libraries you wish mapserver to use, you're ready to compile the source code into an executable.

This is actually quite simple, just execute "make":

```
$ make
```

9. Since MapServer 6.2 there is a *make install* step in the installation of MapServer (yes, you read that correctly). This will install the 'mapserver' libraries. The other output of the compilation of MapServer is a binary executable that you can use in a CGI execution environment:

```
# make install
```

To make sure all went well, look for the file called *mapserv*:

```
$ ls -al mapserv
-rwxr-xr-x    1 user      user        351177 Dec 21 11:38 mapserv
$
```

A simple test is to try and run it:

```
$ ./mapserv
This script can only be used to decode form results and
should be initiated as a CGI process via a httpd server.
$
```

The message above is perfectly normal, and means exactly what it says. If you get anything else, something went terribly wrong.

4.1.8 Installation

MapServer binary

The MapServer program itself consists of only one file, the "mapserv" binary executable. This is a CGI executable, meant to be called and run by your web server.

In this section, we will assume you are running Apache under its default directory structure in /usr/local/apache. You may need to have privileges to edit your httpd.conf (the main apache configuration file), or have someone (such as your webmaster) help you with the configuration details.

If you don't have apache installed, and you want apache, php, fastcgi, etc, that might look something like this:

```
$ apt-get install -y apache2 apache2-mpm-worker libapache2-mod-fastcgi
$ a2enmod actions fastcgi alias
$ apt-get install libapache2-mod-php5 php5-common php5-cli php5-fpm php5
```

The main goal is to get the "mapserv" binary installed in a publicly accessible directory that is configured to run CGI programs and scripts.

1. Locate your cgi-bin directory. Under a default configuration, the CGI directory is "/usr/local/apache/cgi-bin" (RedHat users will use "/home/httpd/cgi-bin"). if you're using apache, there should be a ScriptAlias directive in your httpd.conf, or default site, something like:

```
$ cat /etc/apache2/sites-available/default | grep 'cgi-bin'
ScriptAlias /cgi-bin/ /usr/lib/cgi-bin/
```

2. Locate the installation path of your freshly compiled mapserv executable. This is shown when you run “make install”, something like this:

```
libtool: install: /usr/bin/install -c .libs/mapserv /usr/local/bin/mapserv
```

3. You’ll want to setup a symlink to that executable from your cgi-bin directory:

```
# ln -s /usr/local/bin/mapserv /usr/lib/cgi-bin/mapserv
```

Warning: Make sure you are linking against the installed mapserv file (after running ‘make install’) and NOT against where it was compiled in your source tree.

Testing your new Install

Placing the mapserv file in this directory makes it accessible by the following URL: “<http://yourhostname.com/cgi-bin/mapserv>”. When accessing this URL through your web client, you should expect the following output if all has worked well: “No query information to decode. QUERY_STRING is set, but empty.” If you get this message, you’re done installing MapServer.

Common problems

File permissions

The most common problem one is likely to encounter when attempting to install the binary are permissions issues:

- You do not have write permissions into your web server’s CGI Directory. Ask your webmaster to install the file for you.
- The web server gives you a “403 Permission denied” error. Make sure the user the web server runs as (usually “nobody”) has execute permission on the binary executable. Making the file world executable is perfectly fine and safe:

```
$ chmod o+x mapserv
```

Apache errors

You may receive a few different type of errors as well if your web server configuration isn’t right:

- 500 Internal server error: This is a fairly generic error message. All it basically tells you is that the web server was unsuccessful in running the program. You will have to consult the web server’s error log to find out more, and may need to enlist the help of your webmaster/system administrator. The apache docs also have pointers on setting up cgi-bin here <http://httpd.apache.org/docs/2.2/howto/cgi.html>
:: Check your server logs \$ tail /var/log/apache2/error.log

Where to go once you’ve got it compiled

The *An Introduction to MapServer* document provides excellent coverage of getting started with MapServer.

4.2 Compiling on Win32

Author Pericles Nacionales

Contact pnaciona at gmail.com

Revision \$Revision\$

Date \$Date\$

Table of Contents

- Compiling on Win32
 - Introduction
 - Compiling
 - Set up a Project Directory
 - Download MapServer Source Code and Supporting Libraries
 - The MapServer source code
 - Set Compilation Options
 - Compile the Libraries
 - Compile MapServer
 - Compiling MapServer with PostGIS support
 - Common Compiling Errors
 - Installation
 - Other Helpful Information
 - Acknowledgements

4.2.1 Introduction

This document provides a simple set of compilation procedures for MapServer on Win32 platforms.

If you've made it this far, chances are you already know about MapServer and are at least tempted to try compiling it for yourself. Pre-compiled binaries for MapServer are available from a variety of sources. Refer to [Windows](#). Building MapServer for win32 platforms can be a daunting task, so if existing binaries are sufficient for your needs, it is strongly advised that they be used in preference to trying to build everything from source.

However, there can be a variety of reasons to want to build MapServer from source on win32. Reasons include the need to enable specific options, to build with alternate versions of support libraries (such as GDAL), the desire for MapScript support not part of the core builds, the need to debug and fix bugs or even to implement new features in MapServer. To make it easy for users and developers, I've made a list of steps to compile MapServer. Background information is provided in each step, along with examples. Each example is a continuation of the previous one and in the end will produce the MapServer DLL (libmap.dll), the CGI program (the mapserv.exe), and utility programs.

Warning: This document may refer to older library versions. You may want to try to use more recent library versions for your build.

4.2.2 Compiling

If you are new to Windows programming, please follow this document carefully. The compilation steps are fairly simple but I've added a few blurbs in each step to help you understand how MapServer compiles. For the more experienced programmers, perhaps reading the README.Win32 that accompanies the MapServer source code would be more useful. For those who are antsy, compiling MapServer involves download and unpacking the source codes,

editing the make files, and invoking Microsoft’s Visual C++ compiler from the command prompt. The resulting mapserv.exe is the CGI program that installs in the cgi-bin directory of your web server.

For those who are willing to take the time, the compilation steps follow.

4.2.3 Set up a Project Directory

Before you start to compile MapServer, I recommend creating a directory called “projects” where you can put the source code for MapServer and its supporting libraries. Since you will be working with DOS-style commands, you might as well get used to the Windows command prompt. For Windows 95/98 users the command processor would be called command.com. For Windows NT/2000/XP, it would be cmd.exe. So fire up the old command prompt and go to the drive where you want to create the project directory.

Here is an example of how to create a directory called projects on the C: drive:

```
C:\Users> mkdir C:\Projects
```

To go to that directory:

```
C:\Users> cd \Projects  
C:\Projects>
```

From the projects directory, you can extract the source codes for MapServer and its libraries. Now you’re ready to download the source codes.

4.2.4 Download MapServer Source Code and Supporting Libraries

After creating a project directory, download the MapServer source code and the codes for the supporting libraries and save the source code packages in the newly created “projects” directory. These source codes are usually packaged as ZIP, or as UNIX TAR and GZIP files. You’ll need a software that can unzip these packages. [7-Zip](#) is an example of software that can handle these files.

Cygwin is a free, open-source software package which is a port of these tools on Windows. You can use the gzip and tar utilities from this tool collection. Cygwin is available from <http://www.cygwin.com>.

In order to compile the MapServer CGI program, you must download a few required and optional libraries. At its simplest configuration, MapServer only requires the GD (to provide the image output) and REGEX (to provide regular expression support) libraries. This configuration allows the developer/data provider to use shapefiles as input and, depending on the version of GD library used, GIF or PNG images as output. Additional libraries are needed for input data in alternative formats. The libraries that work with MapServer are listed below.

4.2.5 The MapServer source code

The MapServer source code can be downloaded from the [download page](#). If you’d like to get the current development version of the software, following the nightly snapshot link under the Interim Builds title. The absolute latest copy of the source code can be obtained from [GitHub](#); however, the GitHub repository does not contain several important source files (maplexer.c, mapparser.c and mapparser.h) normally generated on unix, so if possible, using a nightly snapshot is substantially easier than working directly from [GitHub](#).

Required Libraries

GD Library: MapServer uses the GD graphics library for rendering map images in GIF, PNG and JPEG format.

These map images are displayed in web browser clients using the MapServer CGI. The current official version of GD is 2.0.33. The distributed makefiles are setup to use the prebuilt GD Win32 DLL binaries which include

GD, libjpeg, libpng, libz, libgif and FreeType 2 all within one DLL. This package is generally listed as “Windows DLL .zip” and the latest version is normally available at <http://www.boutell.com/gd/http/gdwin32.zip>.

Regex: Regex is the regular expression library used by MapServer. It can be downloaded at <http://ftp.gnu.org/old-gnu/regex/regex-0.12.tar.gz>

Optional Libraries

JPEG library: This library is required by GD to render JPEG images, if building GD from source. You may download this library at <http://www.ijg.org/files/jpegsrc.v6b.tar.gz>

PNG library: This library is required by GD to render PNG images, if building GD from source. You may download this library at <http://sourceforge.net/projects/libpng/>

Zlib: This library is required by libpng to provide graphics compression support. It can be downloaded along with the PNG library, or at <http://www.gzip.org/zlib.zip>.

FreeType 2: FreeType provides TrueType support in MapServer via GD. We only need to build FreeType separately if building GD from source. It can be downloaded at <http://gnuwin32.sourceforge.net/packages/freetype.htm>.

PROJ.4: Proj.4 provides on-the-fly projection support to MapServer. Users whose data are in different projection systems can use this library to reproject into a common projection. It is also required for WMS, WFS or WCS services.

GDAL/OGR: The GDAL/OGR library allows MapServer to read a variety of geospatial raster formats (GDAL) and vector formats (OGR). It can be downloaded at <http://www.gdal.org/>.

ArcSDE: ArcSDE is an ESRI proprietary spatial database engine. Most users will not have access to it but if you have ArcSDE license, you can use its libraries to give MapServer access to SDE databases.

EPPL7: This library allows MapServer to read EPPL7 datasets, as well as the older Erdas LAN/GIS files. This library is set as a default library in MapServer so there's no special source code to download.

Now that you have reviewed the libraries that provide support to MapServer, it is time to decide which ones to compile and use. We will work with the pre-built GD distributed on Boutell.com with PNG, GIF, JPEG, and FreeType “built in”. If you want to provide OGC Web Services (ie. WMS, WFS) or want to perform on the fly reprojection then the PROJ.4 library will be needed. If you need additional raster and vector data sources consider including GDAL/OGR support. GDAL is also required for WCS service.

Our example calls for the required libraries and on-the-fly projection support so we need to download GD, regex, and Proj.4 libraries. Go ahead and get those libraries.

4.2.6 Set Compilation Options

MapServer, like many of its support libraries, comes with a Visual C++ makefile called Makefile.vc. It includes the file nmake.opt which contains many of the site specific definitions. We will only need to edit the nmake.opt file to configure the build for our local site options, and support libraries. The Makefile.vc, and nmake.opt template file have been provided by Assefa Yewondwossen, and the DM Solutions folks.

As of MapServer 4.4, the default MapServer build options only include GD, and regex. MapServer is built using the /MD option (which means MSVCRT.DLL should be used), so if any support libraries are being built statically (rather than as DLLs) we need to use /MD when building them as well. By default modern PROJ.4 builds use /MD so we should be able to use the default PROJ.4 build without tweaking.

The example will compile with the GDWin32 pre-built DLL as well as regex-0.12, and PROJ.4. The PROJ.4 support will ensure we can enable MapServer OGC-WMS compatibility. Use notepad or another text editor to open the nmake.opt file and make the following changes.

Comments

Use the pound sign (#) to comment out the lines that you want to disable, or remove the pound sign to enable an option for NMAKE.

A. Enable PROJ.4 support, and update the path to the PROJ.4 directory. Uncomment the PROJ= line, and the PROJ_DIR= line as follows, and update the PROJ_DIR path to point to your PROJ build.

```
# Reprojecting.  
# If you would like mapserver to be able to reproject data from one  
# geographic projection to another, uncomment the following flag  
# Proj.4 distribution (cartographic projection routines). PROJ.4 is  
# also required for all OGC services (WMS, WFS, and WCS).  
#  
# For PROJ_DIR use full path to Proj.4 distribution  
PROJ=-DUSE_PROJ -DUSE_PROJ_API_H  
PROJ_DIR=c:\projects\proj-4.4.9
```

If you look down later in the file, you can see that once PROJ is enabled, MapServer will be linked with proj_i.lib, the PROJ.4 stub library, meaning that MapServer will be using the PROJ.DLL as opposed to statically linking in PROJ.4.

2. Uncomment the WMS option.

```
# Use this flag to compile with WMS Server support.  
# To find out more about the OpenGIS Web Map Server Specification go to  
# http://www.opengis.org/  
WMS=-DUSE_WMS_SVR
```

3. Update to use GD. Here's what it should look like in our example.

```
GD_DIR=c:/projects/gdwin32  
GD_LIB=$(GD_DIR)/bgd.lib
```

Note: As distributed the GDWin32 binary build does not include the bgd.lib stub library. It is necessary to run the **makemsvcimport.bat** script in the gdwin32 directory first.

D. Make sure the regex path is set correctly. In order for the “delete” command in the “nmake /f makefile.vc clean” target to work properly it is necessary to use backslashes in the REGEX_DIR definition.

```
# REGEX Library  
#  
# VC++ does not include the REGEX library... so we must provide our one.  
# The following definitions will try to build GNU regex-0.12 located in the  
# regex-0.12 sub-directory.  
# If it was not included in the source distribution, then you can get it from:  
  
#     ftp://ftp.gnu.org/pub/gnu/regex/regex-0.12.tar.gz  
# Provide the full path to the REGEX project directory  
# You do not need this library if you are compiling for PHP mapscript.  
# In that case the PHP regex library will be used instead  
!IFNDEF PHP  
REGEX_DIR=c:\projects\regex-0.12  
!ENDIF
```

Your Makefile is now set.

4.2.7 Compile the Libraries

Before compiling MapServer, you must first compile its supporting libraries. How this is done varies for each library. For the PROJ.4 library a **nmake /f makefile.vc** command in the proj-4.4.9src directory should be sufficient. The regex-0.12 code is actually built by the MapServer build process, so you don't need to do anything there.

Compiling libcurl

Previously, curl libraries can be compiled using the following command:

```
nmake /f makefile.vc6 CFG=release
```

This creates a static library, libcurl.lib, to which you compile against. Versions newer than version 7.10.x should be compiled as dynamic library. This is accomplished using the command:

```
nmake /f makefile.vc6 CFG=release-dll
```

You will then need to edit MapServer's nmake.opt to replace the CURL_LIB variable with this line:

```
CURL_LIB = $(CURL_DIR)/lib/libcurl_imp.lib
```

4.2.8 Compile MapServer

Once you have compiled the supporting libraries successfully, you are ready to take the final compilation step. If you have not already done so, open a command prompt and set the VC++ environment variables by running the vcvars32.bat usually located in **C:\Program Files\Microsoft Visual Studio\VC98\bin\vcvars32.bat**.

```
C:\Users> cd \projects\mapserver
C:\Projects\mapserver> C:\Program Files\Microsoft Visual Studio\VC98\Bin\vcvars32.bat"
C:\Projects\mapserver>

Setting environment for using Microsoft Visual C++ tool.
C:\Projects\mapserver>
```

Now issue the command: **nmake /f Makefile.vc** and wait for it to finish compiling. If it compiles successfully, you should get mapserver.lib, libmap.dll, mapserv.exe, and other .EXE files. That's it for the compilation process. If you run into problems, read section 4 about compiling errors. You can also ask for help from the helpful folks in the MapServer-dev e-mail list.

4.2.9 Compiling MapServer with PostGIS support

To compile PostGIS support into MapServer, here's what you need to do:

1. download the PostgreSQL 8.0.1 (or later) source from: <ftp://ftp.heanet.ie/pub/postgresql/source/>
2. I extracted them to C:projectspostgresql-8.0.1
3. download the [Microsoft Platform SDK](#) otherwise you get link errors on shfolder.lib.
4. compile libpq under C:projectspostgresql-8.0.1srcinterfaceslibpq using the win32.mak makefile
5. copy everything from C:projectspostgresql-8.0.1srcinterfaceslibpqrelease to C:projectspostgresql-8.0.1srcinterfaceslibpq as the MapServer makefile will try to find it there
6. Define the following in the nmake.opt for MapServer: POSTGIS =-DUSE_POSTGIS POSTGIS_DIR =c:/projects/postgresql-8.0.1/src

7. nmake /f makefile.vc
8. don't forget to copy libpq.dll (from C:\projects\postgresql-8.0.1\src\interfaces\libpq\release) into a location where MapServer can find it.

4.2.10 Common Compiling Errors

Following are a few common errors you may encounter while trying to build MapServer.

- Visual C++ Tools Not Properly Initialized.

```
C:\projects\mapserver> nmake -f /makefile.vc
'nmake' is not recognized as an internal or external command,
operable program or batch file.
```

This occurs if you have not properly defined the path and other environment variables required to use MS VisualC++ from the command shell. Invoke the VCVARS32.BAT script, usually with the command **C:\Program Files\Microsoft Visual Studio\VC98\bin\vcvars32.bat** or something similar if visual studio was installed in an alternate location. To test if VC++ is available, just type "nmake" or "cl" in the command shell and ensure it is found.

- Regex Build Problems.

```
regex.obj : error LNK2001: unresolved external symbol _printchar
libmap.dll : fatal error LNK1120: 1 unresolved externals
NMAKE : fatal error U1077: 'link' : return code '0x460'
Stop.
```

This occurs if you use the stock regex-0.12 we referenced. I work around this by commenting out the "extern" statement for the printchar() function, and replacing it with a stub implementation in regex-0.12regex.c.

```
//extern void printchar ();
void printchar( int i ) {}
```

- GD Import Library Missing.

```
LINK : fatal error LNK1104: cannot open file 'c:/projects/gdwin32/bgd.lib'
NMAKE : fatal error U1077: 'link' : return code '0x450'
Stop.
```

If you are using the pre-built GD binaries, you still need to run the **makemsvcimport.bat** script in the gdwin32 directory to create a VC++ compatible stub library (bgd.lib).

4.2.11 Installation

The file we are most interested in is mapserv.exe. The other executable files are the MapServer utility programs.

See Also:

MapServer Utilities

to learn more about these utilities.

To test that the CGI program is working, type mapserv.exe at the command prompt. You should see the following message:

```
This script can only be used to decode form results and
should be initiated as a CGI process via a httpd server.
```

You may instead get a popup indicating that a DLL (such as bgd.dll) is missing. You will need to copy all the required DLLs (ie. bgd.dll, and proj.dll) to the same directory as the mapserv.exe program.

Now type mapserv -v at the command prompt to get this message:

```
MapServer version 4.4.0-beta3 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP
SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER INPUT=SHAPEFILE
DEBUG=MSDEBUG
```

This tells us what data formats and other options are supported by mapserv.exe. Assuming you have your web server set up, copy mapserv.exe, libmap.dll, bgd.dll, proj.dll and any other required DLLs to the cgi-bin directory.

You are now ready to download the demo application and try out your own MapServer CGI program. If you wish, you can also create a directory to store the utility programs. I'd suggest making a subdirectory called "bin" under the directory "projects" and copy the executables to that subdirectory. You might find these programs useful as you develop MapServer applications.

4.2.12 Other Helpful Information

The MapServer Unix Compilation and Installation HOWTO has good descriptions of some MapServer compilation options and library issues. I will write more about those options and issues on the next revision of this HOWTO.

The README documents of each of the supporting libraries provide compilation instructions for Windows.

The MapServer User community has a collective knowledge of the nuances of MapServer compilation. Seek their advice wisely.

4.2.13 Acknowledgements

Thanks to Assefa Yewondwossen for providing the Makefile.vc. I would not have been able to write this HOWTO without that file.

Thanks to Bart van den Eijnden for the libcurl and PostGIS compilation info.

Thanks to the Steve Lime for developing MapServer and to the many developers who contribute time and effort in order to keep the MapServer project successful.

4.3 PHP MapScript Installation

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Revision \$Revision\$

Date \$Date\$

Table of Contents

- PHP MapScript Installation
 - Introduction
 - Obtaining, Compiling, and Installing PHP and the PHP/MapScript Module
 - FAQ / Common Problems

4.3.1 Introduction

The PHP/MapScript module is a PHP dynamically loadable module that makes MapServer's MapScript functions and classes available in a PHP environment.

The original version of MapScript (in Perl) uses [SWIG](#), but since SWIG does not support the PHP language, the module has to be maintained separately and may not always be in sync with the Perl version.

The PHP module was developed by [DM Solutions Group](#) and is currently maintained by [Mapgears](#).

This document assumes that you are already familiar with certain aspects of your operating system:

- For Unix/Linux users, a familiarity with the build environment, notably *make*.
- For Windows users, some compilation skills if you don't have ready access to a pre-compiled installation and need to compile your own copy of MapServer with the PHP/MapScript module.

Which version of PHP is supported?

PHP MapScript was originally developed for PHP-3.0.14 but after MapServer 3.5 support for PHP3 has been dropped and as of the last update of this document, PHP 4.3.11 or more recent was required (PHP5 is well supported).

The best combinations of MapScript and PHP versions are:

- MapScript 4.10 with PHP 5.2.1 and up
- MapScript 4.10 with PHP 4.4.6 and up

How to Get More Information on the PHP/MapScript Module for MapServer

- For a list of all classes, properties, and methods available in the module see the [PHP MapScript](#) reference document.
- More information on the PHP/MapScript module can be found on the [PHP/MapScript](#) page on MapTools.org.
- The [MapServer Wiki](#) also has PHP/MapScript build and installation notes and some php code snippets.
- Questions regarding the module should be forwarded to the [MapServer mailing list](#).

4.3.2 Obtaining, Compiling, and Installing PHP and the PHP/MapScript Module

Download PHP and PHP/MapScript

- The PHP source or the Win32 binaries can be obtained from the [PHP web site](#).
- Once you have verified that PHP is installed and is running, you need to get the latest [MapServer source](#) and compile MapServer and the PHP module.

Setting Up PHP on Your Server

Unix

- Check if you have PHP already installed (several Linux distributions have it built in).
- If not, see the PHP manual's "Installation on Unix systems" section.

Windows

- MS4W (MapServer For Windows) is a package that contains Apache, PHP, and PHP/MapScript ready to use in a simple zipfile. Several Open Source applications are also available for use in MS4W.
- Windows users can follow steps in the [Installing Apache, PHP and MySQL on Windows](#) tutorial to install Apache and PHP manually on their system.
- Window users running PWS/IIS can follow [php.net's howto](#) for installing PHP for PWS/IIS 3, PWS 4 or newer, and IIS 4 or newer.

Note: When setting up PHP on Windows, make sure that PHP is configured as a CGI and not as an Apache module because `php_mapscript.dll` is not thread-safe and does not work as an Apache module (See the [Example Steps of a Full Windows Installation](#) section of this document).

Build/Install the PHP/MapScript Module

Building on a Linux Box

NOTE: For UNIX users, see the `README.CONFIGURE` file in the MapServer source, or see the [Compiling on Unix](#) HowTo.

- The main MapServer configure script will automatically setup the main makefile to compile `php_mapscript.so` if you pass the `--with-php=DIR` argument to the configure script.
- Copy the `php_mapscript.so` library to your PHP extensions directory, and then use the `dl()` function to load the module at the beginning of your PHP scripts. See also the PHP function `extension_loaded()` to check whether an extension is already loaded.
- The file `mapscript/php3/examples/phpinfo_mapscript.phtml` will test that the `php_mapscript` module is properly installed and can be loaded.
- If you get an error from PHP complaining that it cannot load the library, then make sure that you recompiled and reinstalled PHP with support for dynamic libraries. On RedHat 5.x and 6.x, this means adding “`-rdynamic`” to the `CFLAGS` in the main PHP3 Makefile after running `./configure`. Also make sure all directories in the path to the location of `php_mapscript.so` are at least `r-x` for the `HTTPD` user (usually ‘nobody’), otherwise `dl()` may complain that it cannot find the file even if it’s there.

Building on Windows

- For Windows users, it is recommended to look for a precompiled binary for your PHP version on the [MapServer download page](#) or on [MapTools.org](#).
- If for some reason you really need to compile your own Windows binary then see the `README.WIN32` file in the MapServer source (good luck!).

Installing PHP/MapScript

Simply copy the file `php4_mapscript.dll` to your PHP4 extensions directory (path/to/php/extensions)

Using `phpinfo()`

To verify that PHP and PHP/MapScript were installed properly, create a ‘.php’ file containing the following code and try to access it through your web server:

```
<HTML>
<BODY>

<?php
if (PHP_OS == "WINNT" || PHP_OS == "WIN32")
```

```
{  
    dl("php_mapscript.dll");  
}  
else  
{  
    dl("php_mapscript.so");  
}  
phpinfo();  
?>  
  
</BODY>  
</HTML>
```

If PHP and PHP/MapScript were installed properly, several tables should be displayed on your page, and ‘MapScript’ should be listed in the ‘Extensions’ table.

Example Steps of a Full Windows Installation

Using MS4W (MapServer for Windows)

1. Download the latest [MS4W base package](#).
2. Extract the files in the archive to the root of one of your drives (e.g. C:/ or D:/).
3. Double-click the file /ms4w/apache-install.bat to install and start the Apache Web server.
4. In a web browser goto <http://127.0.0.1>. You should see an MS4W opening page. You are now running PHP, PHP/MapScript, and Apache.
5. You can now optionally install other applications that are pre-configured for MS4W, which are located on the [MS4W download page](#).

Manual Installation Using Apache Server

1. Download the [Apache Web Server](#) and extract it to the root of a directory (eg. D:/Apache).
2. Download [PHP4](#) and extract it to your Apache folder (eg. D:/Apache/PHP4).
3. Create a temp directory to store MapServer created GIFs. NOTE: This directory is specified in the IMAGEPATH parameter of the WEB Object in the *Mapfile* reference. For this example we will call the temp directory “ms_tmp” (eg. E:/tmp/ms_tmp).
4. Locate the file *httpd.conf* in the conf directory of Apache, and open it in a text viewer (eg. TextPad, Emacs, Notepad).

In the *Alias* section of this file, add aliases to the ms_tmp folder and any other folder you require (for this example we will use the *msapps* folder):

```
Alias      /ms_tmp/      "path/to/ms_tmp/"  
Alias      /msapps/      "path/to/msapps/"
```

In the *ScriptAlias* section of this file, add an alias for the PHP4 folder.

```
ScriptAlias      /cgi-php4/      "path/to/apache/php4/"
```

In the *AddType* section of this file, add a type for php4 files.

```
AddType application/x-httpd-php4      .php
```

In the *Action* section of this file, add an action for the php.exe file.

```
Action application/x-httdp-php4      "/cgi-php4/php.exe"
```

5. Copy the file *php4.ini-dist* located in your Apache/php4 directory and paste it into your WindowsNT folder (eg. c:/winnt), and then rename this file to *php.ini* in your WindowsNT folder.
6. If you want specific extensions loaded by default, open the *php.ini* file in a text viewer and uncomment the appropriate extension.
7. Place the file *php_mapscript.dll* into your Apache/php4/extensions folder.

Installation Using Microsoft's IIS

(please see the *IIS Setup for MapServer* document for up-to-date steps)

1. Install IIS if required (see the *IIS 4.0 installation procedure*).
2. Install PHP and PHP/MapScript (see above).
3. Open the Internet Service Manager (eg. C/WINNT/system32/inetsrv/inetmgr.exe).
4. Select the Default web site and create a virtual directory (right click, select New/Virtual directory). For this example we will call the directory *msapps*.
5. In the Alias field enter *msapps* and click Next.
6. Enter the path to the root of your application (eg. “c:/msapps”) and click Next.
7. Set the directory permissions and click Finish.
8. Select the *msapps* virtual directory previously created and open the directory property sheets (by right clicking and selecting properties) and then click on the Virtual directory tab.
9. Click on the Configuration button and then click the App Mapping tab.
10. Click Add and in the Executable box type: *path/to/php4/php.exe %s %s*. You MUST have the *%s %s* on the end, PHP will not function properly if you fail to do this. In the Extension box, type the file name extension to be associated with your PHP scripts. Usual extensions needed to be associated are phtml and php. You must repeat this step for each extension.
11. Create a temp directory in Explorer to store MapServer created GIFs.

Note: This directory is specified in the IMAGEPATH parameter of the WEB Object in the *Mapfile*. For this example we will call the temp directory *ms_tmp* (eg. C:/tmp/ms_tmp).

12. Open the Internet Service Manager again.
13. Select the Default web site and create a virtual directory called *ms_tmp* (right click, select New/Virtual directory). Set the path to the *ms_tmp* directory (eg. C:/tmp/ms_tmp). The directory permissions should at least be set to Read/Write Access.

4.3.3 FAQ / Common Problems

Questions Regarding Documentation

Q Is there any documentation available?

A The main reference document is the *PHP MapScript reference*, which describes all of the current classes, properties and methods associated with the PHP/MapScript module.

To get a more complete description of each class and the meaning of their member variables, see the *MapScript reference* and the *MapFile reference*.

The [MapServer Wiki](#) also has PHP/MapScript build and installation notes and some php code snippets.

Q Where can I find sample scripts?

A Some examples are included in directory `mapserver/mapscript/php3/examples/` in the MapServer source distribution. A good one to get started is `test_draw_map.phtml`: it's a very simple script that just draws a map, legend and scalebar in an HTML page.

A good intermediate example is the *PHP MapScript By Example guide* (note that this document was created for an earlier MapServer version but the code might be still useful).

The next example is the [GMap demo](#). You can download the whole source and data files from the [MapTools.org download page](#).

Questions About Installation

Q How can I tell that the module is properly installed on my server?

A Create a file called `phpinfo.phtml` with the following contents:

```
<?php  dl("php_mapscript.so");
       phpinfo();
?>
```

Make sure you replace the `php_mapscript.so` with the name under which you installed it, it could be `php_mapscript_46.so` on Unix, or `php_mapscript_46.dll` on Windows

You can then try the second test page `mapserver/mapscript/php3/examples/test_draw_map.phtml`. This page simply opens a MapServer .map file and inserts its map, legend, and scalebar in an HTML page. Modify the page to access one of your own MapServer .map files, and if you get the expected result, then everything is probably working fine.

Q I try to display my .phtml or .php page in my browser but the page is shown as it would in Notepad.

A The problem is that your PHP installation does not recognize ".phtml" as a PHP file extension. Assuming you're using PHP4 under Apache then you need to add the following line with the other PHP-related AddType lines in the httpd.conf:

```
AddType application/x-httpd-php .phtml
```

For a more detailed explanation, see the [Example Steps of a Full Windows Installation](#) section of this document.

Q I installed the PROJ.4, GDAL, or one of the support libraries on my system, it is recognized by MapServer's "configure" as a system lib but at runtime I get an error: "libproj.so.0: No such file or directory".

A You are probably running a RedHat Linux system if this happened to you. This happens because the libraries install themselves under `/usr/local/lib` but this directory is not part of the runtime library path by default on your system.

(I'm still surprised that "configure" picked proj.4 as a system lib since it's not in the system's lib path...probably something magic in autoconf that we'll have to look into)

There are a couple of possible solutions:

1. Add a “setenv LD_LIBRARY_PATH” to your httpd.conf to contain that directory
2. Edit /etc/ld.so.conf to add /usr/local/lib, and then run “/sbin/ldconfig”. This will permanently add /usr/local/lib to your system’s runtime lib path.
3. Configure MapServer with the following options:

```
--with-proj=/usr/local --enable-runpath
```

and the /usr/local/lib directory will be hardcoded in the exe and .so files

I (Daniel Morissette) personally prefer option #2 because it is permanent and applies to everything running on your system.

Q Does PHP/MapScript have to be setup as a CGI? If so, why?

A Yes, please see the [PHP/MapScript CGI page](#) in the MapServer Wiki for details.

Q I have compiled PHP as a CGI and when PHP tries to load the php_mapscript.so, I get an “undefined symbol: _register_list_destructors” error. What’s wrong?

A Your PHP CGI executable is probably not linked to support loading shared libraries. The MapServer configure script must have given you a message about a flag to add to the PHP Makefile to enable shared libs.

Edit the main PHP Makefile and add “-rdynamic” to the LDFLAGS at the top of the Makefile, then relink your PHP executable.

Note: The actual parameter to add to LDFLAGS may vary depending on the system you’re running on. On Linux it is “-rdynamic”, and on *BSD it is “-export-dynamic”.

Q What are the best combinations of MapScript and PHP versions?

A The best combinations are:

- MapScript 4.10 with PHP 5.2.1 and up
 - MapScript 4.10 with PHP 4.4.6 and up
-

Q I am dynamically loading gd.so and php_mapscript.so and running into problems, why?

A The source of the problems could be a mismatch of GD versions. The PHP GD module compiles its own version of libgd, and if the GD library is loaded before the mapscript library, mapscript will use the php-specific version. Wherever possible you should use a gd.so built with the same GD as PHPMapScript. A workaround is to load the php_mapscript module before the GD module.

4.4 .NET MapScript Compilation

Author Tamas Szekeres

Contact szekerest at gmail.com

Revision \$Revision\$

Date \$Date\$

4.4.1 Compilation

Before compiling C# MapScript you should compile MapServer with the options for your requirements. For more information about the compilation of MapServer please see [Win32 Compilation and Installation Guide](#). It is highly recommended to minimize the library dependency of your application, so when compiling MapServer enable only the features really needed. To compile the C# binding SWIG 1.3.31 or later is required.

Warning: This document may refer to older library versions. You may want to try to use more recent library versions for your build.

Win32 compilation targeting the MS.NET framework 1.1

You should compile MapServer, MapScript and all of the subsequent libraries using Visual Studio 2003. Download and uncompress the latest SWIGWIN package that contains the precompiled swig.exe Open the Visual Studio .NET 2003 Command Prompt and step into the /mapscript/csharp directory. Edit makefile.vc and set the SWIG variable to the location of your swig.exe

Use:

```
nmake -f makefile.vc
```

to compile mapscript.dll and mapscript_csharp.dll.

Win32 compilation targeting the MS.NET framework 2.0

You should compile MapServer, MapScript and all of the subsequent libraries using Visual Studio 2005. Download and uncompress the latest SWIGWIN package that contains the precompiled swig.exe Open the Visual Studio 2005 Command Prompt and step into the /mapscript/csharp directory Edit makefile.vc and set the SWIG variable to the location of your swig.exe.

Use:

```
nmake -f makefile.vc
```

to compile mapscript.dll and mapscript_csharp.dll.

Win32 compilation targeting the MONO framework

Before the compilation you should download and install the recent mono Win32 setup package (eg. mono-1.1.13.2-gtksharp-2.8.1-win32-1.exe) Edit makefile.vc and set the CSC variable to the location of your mcs.exe. Alternatively you can define:

```
MONO = YES
```

in your nmake.opt file.

You should use the same compiler for compiling MapScript as the compiler has been used for the MapServer compilation. To compile MapScript open the Command Prompt supplied with your compiler and use:

```
nmake -f makefile.vc
```

to compile mapscript.dll and mapscript_csharp.dll.

Alternative compilation methods on Windows

Beginning from MapServer 4.8.3 you can invoke the C# compilation from the MapServer directory by uncommenting DOT_NET in nmake.opt:

```
#~~~~~  
# .NET/C# MapScript  
# -----  
# .NET will of course only work with MSVC 7.0 and 7.1. Also note that  
# you will definitely want USE_THREAD defined.  
#~~~~~  
#DOT_NET = YES
```

and invoking the compilation by:

```
nmake -f makefile.vc csharp
```

You can also use:

```
nmake -f makefile.vc install
```

for making the compilation an copying the targets into a common output directory.

Testing the compilation

For testing the compilation and the runtime environment you can use:

```
nmake -f makefile.vc test
```

within the csharp directory for starting the sample applications compiled previously. Before making the test the location of the corresponding libraries should be included in the system PATH.

Linux compilation targeting the MONO framework

Before the compilation you should download and install the recent mono Linux package. Some distributions have pre-compiled binaries to install, but for using the latest version you might want to compile and install it from the source. Download and uncompress the latest SWIG release. You should probably compile it from the source if pre-compiled binaries are not available for your platform.

Before compiling MapScript, MapServer should be configured and compiled. Beginning from MapServer 4.8.2 during configuration the mapscript/csharp/Makefile will be created according to the configuration options. Edit this file and set the SWIG and CSC for the corresponding executable pathes if the files could not be accessed by default. To compile at a console step into the /mapscript/csharp directory use:

```
make
```

to compile libmapscript.so and mapscript_csharp.dll.

For testing the compilation and the runtime environment you can use:

```
make test
```

for starting the sample applications compiled previously.

OSX compilation targeting the MONO framework

Beginning from 4.10.0 the csharp/Makefile supports the OSX builds. Before making the build the recent MONO package should be installed on the system.

Before compiling MapScript, MapServer should be configured and compiled. Beginning from MapServer 4.8.2 during configuration the mapscript/csharp/Makefile will be created according to the configuration options. Edit this file and set the SWIG and CSC for the corresponding executable pathes if the files could not be accessed by default. To compile at a console step into the /mapscript/csharp directory use:

```
make
```

to compile libmapscript.dylib and mapscript_csharp.dll.

For testing the compilation and the runtime environment you can use:

```
make test
```

for starting the sample applications compiled previously.

To run the applications mapscript_csharp.dll.config is needed along with the mapscript_csharp.dll file. This file is created during the make process

4.4.2 Installation

The files required for your application should be manually installed. It is highly recommended to copy the files into the same folder as the executable resides.

4.4.3 Known issues

Visual Studio 2005 requires a manifest file to load the CRT native assembly wrapper

If you have compiled MapServer for using the CRT libraries and you are using the MS.NET framework 2.0 as the execution runtime you should supply a proper manifest file along with your executable, like:

```
<?xml version="1.0" encoding="utf-8"?>
<assembly xsi:schemaLocation="urn:schemas-microsoft-com:asm.v1
  assembly.adaptive.xsd" manifestVersion="1.0"
  xmlns:asmv1="urn:schemas-microsoft-com:asm.v1"
  xmlns:asmv2="urn:schemas-microsoft-com:asm.v2"
  xmlns:dsig="http://www.w3.org/2000/09/xmldsig#"
  xmlns="urn:schemas-microsoft-com:asm.v1"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<assemblyIdentity name="drawmap.exe" version="1.0.0.0" type="win32" />
<dependency>
<dependentAssembly asmv2:dependencyType="install"
  asmv2:codebase="Microsoft.VC80.CRT.manifest" asmv2:size="522">
<assemblyIdentity name="Microsoft.VC80.CRT" version="8.0.50608.0"
  publicKeyToken="1fc8b3b9a1e18e3b" processorArchitecture="x86"
  type="win32" />
<hash xmlns="urn:schemas-microsoft-com:asm.v2">
<dsig:Transforms>
<dsig:Transform Algorithm="urn:schemas-microsoft-com:HashTransforms.Identity" />
</dsig:Transforms>
<dsig:DigestMethod Algorithm="http://www.w3.org/2000/09/xmldsig#sha1" />
<dsig:DigestValue>UM0lhUBGeKRrrg9DaaPNgyhRjyM=</dsig:DigestValue>
</hash>
</dependentAssembly>
</dependency>
</assembly>
```

This will inform the CLR that your exe depends on the CRT and the proper assembly wrapper is to be used. If you are using the IDE the manifest file could be pregenerated by adding a reference to Microsoft.VC80.CRT.manifest within the /Microsoft Visual Studio 8/VC/redist/x86/Microsoft.VC80.CRT directory.

Manifests for the dll-s must be embedded as a resource

According to the windows makefile the MapScript compilation target (mapscript.dll) is linked with the /MD option. In this case the VS2005 linker will generate a manifest file containing the unmanaged assembly dependency. The sample contents of the manifest file are:

```
<?xml version='1.0' encoding='UTF-8' standalone='yes'?>
<assembly xmlns='urn:schemas-microsoft-com:asm.v1' manifestVersion='1.0'>
<dependency>
<dependentAssembly>
<assemblyIdentity type='win32' name='Microsoft.VC80.CRT'
version='8.0.50608.0' processorArchitecture='x86'
publicKeyToken='1fc8b3b9a1e18e3b' />
</dependentAssembly>
</dependency>
</assembly>
```

Like previously mentioned if you are creating a windows application the common language runtime will search for a manifest file for the application. The name of the manifest file should be the same as the executable append and end with the .manifest extension. However if the host process is not controlled by you (like web mapping applications using aspnet_wp.exe as the host process) you will not be certain if the host process (.exe) will have a manifest containing a reference to the CRT wrapper. In this case you may have to embed the manifest into the dll as a resource using the mt tool like:

```
mt /manifest mapscript.dll.manifest /outputresource:mapscript.dll;#2
```

the common language runtime will search for the embedded resource and load the CRT assembly properly.

Normally it is enough to load the CRT with the root dll (mapscript.dll), but it is not harmful embedding the manifest into the dependent libraries as well.

Issue with regex and Visual Studio 2005

When compiling with Microsoft Visual Studio 2005 variable name collision may occur between regex.c and crtdefs.h. For more details see:

<http://trac.osgeo.org/mapserver/ticket/1651>

C# MapScript library name mapping with MONO

Using the MapScript interface created by the SWIG interface generator the communication between the C# wrapper classes (mapscript_csharp.dll) and the C code (mapscript.dll) takes place using platform invoke like:

```
[DllImport ("mapscript", EntryPoint="CSharp_new_mapObj")]
public static extern IntPtr new_mapObj(string jarg1);
```

The DllImport declaration contains the library name, however to transform the library name into a file name is platform dependent. On Windows the library name is simply appended with the .dll extension (mapscript.dll). On the Unix systems the library file name normally starts with the lib prefix and appended with the .so extension (libmapscript.so).

Mapping of the library name may be manually controlled using a dll.config file. This simply maps the library file the DllImport is looking for to its unix equivalent. The file normally contains the following information (mapscript_csharp.dll.config):

```
<configuration>
  <dllmap dll="mapscript" target="libmapscript.so" />
</configuration>
```

and with the OSX builds:

```
<configuration>
  <dllmap dll="mapscript" target="libmapscript.dylib" />
</configuration>
```

The file should be placed along with the corresponding mapscript_csharp.dll file, and created by default during the make process. For more information see:

<http://trac.osgeo.org/mapserver/ticket/1596> http://www.mono-project.com/Interop_with_Native_Libraries

Localization issues with MONO/Linux

According to <http://trac.osgeo.org/mapserver/ticket/1762> MapServer may not operate equally well on different locale settings. Especially when the decimal separator is other than ‘.’ inside the locale of the process may cause parse errors when the mapfile contains float numbers. Since the MONO process takes over the locale settings of the environment it is worth considering to set the default locale to “C” of the host process, like:

```
LC_ALL=C mono ./drawmap.exe ../../tests/test.map test_csharp.png
```

4.4.4 Most frequent errors

This chapter will summarize the most frequent problems the user can run into. The issues were collected mainly from the -users list and the IRC.

Unable to load dll (MapScript)

You can get this problem on Windows and in most cases it can be dedicated to a missing or an unloadable shared library. The error message talks about mapscript.dll but surely one or more of the dll-s are missing that libmap.dll depends on. So firstly you might want to check for the dependencies of your libmap.dll in your application directory. You can use the Visual Studio Dependency Walker to accomplish this task. You can also use a file monitoring tool (like SysInternal’s filemon) to detect the dll-s that could not be loaded. I propose to store all of the dll-s required by your application in the application folder. If you can run the drawmap C# sample application with your mapfile your compilation might be correct and all of the dlls are available.

You may find that the MapScript C# interface behaves differently for the desktop and the ASP.NET applications. Although you can run the drawmap sample correctly you may encounter the dll loading problem with the ASP.NET applications. When creating an ASP.NET project your application folder will be ‘Inetpubwwwroot[YourApp]bin’ by default. The host process of the application will aspnet_wp.exe or w3wp.exe depending on your system. The application will run under a different security context than the interactive user (under the context of the ASPNET user by default). When placing the dll-s outside of your application directory you should consider that the PATH environment variable may differ between the interactive and the ASPNET user and/or you may not have enough permission to access a dll outside of your application folder.

4.4.5 Bug reports

If you find a problem dedicated to the MapScript C# interface feel free to file a bug report to the [Issue Tracker](#).

4.5 IIS Setup for MapServer

Author Debbie Paqurek

Last Updated 2005/12/12

Table of Contents

- [IIS Setup for MapServer](#)
 - [Base configuration](#)
 - [Php.ini file](#)
 - [Internet Services Manager](#)
 - [Under the tree for your new website - add virtual directories for](#)
 - [Test PHP](#)
 - [Mapfiles for IIS](#)
 - [Configuration files:](#)

Some help on how to set up MapServer/Chameleon/PhpPgAdmin on Microsoft IIS (v5.0). Contains note on changes to the php.ini file and necessary changes to the MapServer mapfiles. Please contribute or make changes as required.

4.5.1 Base configuration

- Windows 2000
- IIS 5.0
- MS4W 1.2.1
- Chameleon 2.2
- PHP 4.3.11
- MapServer 4.7
- PhpPgAdmin 3.5.4 (if using postgresql/postgis)
- Postgres 8.0.3 (if using postgresql/postgis)
- Postgis 1.0.3 (if using postgresql/postgis)

This setup assumes that MS4W was unzipped to form c:\ms4w\ directory.

4.5.2 Php.ini file

- session.save_path (absolute path to your tmp directory)
- extension_dir (relative path to your php/extensions directory)
- cgi.force_redirect = 0
- enable the pg_sql extension (php_pgsql.dll) (for Postgresql)

4.5.3 Internet Services Manager

Under your website tree, create a new website (e.g. msprojects). View the properties for the new website.

Web Site Tab

- set the IP address and under the Advanced tab put the complete Host Header name (e.g. msprojects.gc.ca).

Home Directory Tab

- content should come from: A directory located on this computer.
- Local Path: c:\ms4w\Apache\htdocs
- Read access + whatever else you need
- Execute Permissions: Scripts only
- Configuration button - App Mappings (Add extensions .php and .phtml, Executable is c:\ms4w\Apache\cgi-bin\php.exe, select All verbs, Script Engine, and check that file exists

Documents Tab

- Add index.php and index.html
- **Directory Security Tab**
 - Anonymous access and authentication control
 - Select Anonymous access and the edit button should indicate the IUSR_account

Server Extensions Tab

- Enable authoring is selected and client scripting says Javascript

4.5.4 Under the tree for your new website - add virtual directories for

cgi-bin Under Properties, virtual directory tab Local Path should point to c:\ms4w\apache\cgi-bin. Select Read. Execute Permissions should say “scripts and executables”

ms_tmp Under Properties, virtual directory tab Local Path should point to c:\ms4w\tmp\ms_tmp. Select Read, Write. Execute Permissions should say “scripts only”. This is where temporary images are written to so in the File system Security tab (use windows explorer), the c:\ms4w\tmp\ms_tmp directory should have permissions set for the Internet Guest Account (Read and execute, Read, Write, List Folder Contents).

tmp Under Properties, virtual directory tab Local Path should point to c:\ms4w\tmp. Select Read, Write. Execute Permissions should say “scripts only”. This is where chameleon writes sessions to so in the File system Security tab (use windows explorer), the c:\ms4w\tmp directory should have permissions set for the Internet Guest Account (Read and execute, Read, Write, List Folder Contents).

chameleon Under Properties, virtual directory tab Local Path should point to C:\ms4w\apps\chameleon\htdocs. Select Read. Execute Permissions should say “scripts only”. Under the Chameleon tree, you can add virtual directories for admin (c:\ms4w\apps\chameleon\admin\htdocs), samples (c:\ms4w\apps\chameleon\samples\htdocs), cwc2 (c:\ms4w\apps\chameleon\cwc2\htdocs)

phppgadmin If using postgresql/postgis, under Properties, virtual directory tab Local Path should point to C:\ms4w\Apache\htdocs\phpPgAdmin. Select Read, Write. Execute Permissions should say “scripts and executables”. Under Documents - add index.php.

Note: We had to unzip the phppgadmin package into this directory in order to get phppgadmin to show us the login page at <http://yourserver/phppgadmin/index.php>. You might want additional security on this directory.

gmap Good for testing purposes. Remember to change your mapfiles as discussed in Mapfiles for IIS below. Under Properties, virtual directory tab Local Path should point to C:\ms4w\apps\gmap\htdocs. Select Read. Execute Permissions should say “scripts only”.

4.5.5 Test PHP

In a command line window, navigate to c:\ms4w\apache\cgi-bin and run php -i. This should return the output that the phpinfo() function returns. I got an error about how it couldn't find ntwdblib.dll. I found this in c:\ms4w\apache\php\dlls and I copied it to the cgi-bin directory.

4.5.6 Mapfiles for IIS

- Add a config line to the MAP level of the mapfile

```
CONFIG PROJ_LIB "c:\ms4w\proj\nad\"
```

- change the IMAGEPATH to be an absolute path to your tmp/ms_tmp folder

```
IMAGEPATH "c:\ms4w\tmp\ms_tmp"
```

4.5.7 Configuration files:

For Chameleon

```
C:\ms4w\apps\chameleon\config\chameleon.xml
C:\ms4w\apps\chameleon\config\cwc2.xml
```

For phppgadmin: (if using postgresql/postgis)

```
C:\ms4w\apps\phpPgAdmin\conf\config.inc.php
```

4.6 Oracle Installation

Author Till Adams

Last Updated 2007/02/16

Table of Contents

- Oracle Installation
 - Preface
 - System Assumptions
 - Compile MapServer
 - Set Environment Variables

4.6.1 Preface

This document explains the whole configuration needed to get the connect between MapServer *CGI* and an Oracle database server on a linux (Ubuntu) box. The aim of this document is just to put a lot of googled knowledge in ONE place. Hopefully it will preserve many of people spending analog amount of time than I did!

This manual was written, because I spent several days googling around to get my UMN having access to an oracle database. I'm NOT an oracle expert, so the aim of this document is just to put a lot of googled knowledge in ONE place. Hopefully it will preserve many of people spending analog amount of time than I did! (Or: If you have the choice: Try [PostGIS](#) ;-))

Before we start, some basic knowledge, I didn't know before:

- MapServer can access oracle spatial as well as geodata from any oracle locator installation! Oracle locator comes with every oracle instance, there is no need for an extra license.
- There is no need for further installation of any packages beside oracle/oracle OCI

4.6.2 System Assumptions

We assume that Oracle is already installed, there is a database and there is some geodata in the database. The following paths should be known by the reader:

- ORACLE_HOME
- ORACLE_SID
- ORACLE_BASE
- LD_LIBRARY_PATH

We also assume that you have installed **apache2** (our version was 2.0.49) and you are used to work with Linux/UNIX systems. We also think you are able to handle the editor *vi/vim*.

We ensure that the Oracle user who later accesses the database has write-access to the oracle_home directory.

We also assume, that you already have setup the tnsnames.ora file. It should look like that:

```
MY_ORACLE =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP) (HOST = host) (PORT = 1521))
    (CONNECT_DATA =
      (SERVICE_NAME = your_name)
    )
  )
```

It is important that you know the NAME of the datasource, in this example this is "MY_ORACLE" and will be used further on. Done that, you're fine using User/Password@MY_ORACLE in your mapfile to connect to the oracle database. But first we have to do some more stuff.

4.6.3 Compile MapServer

Compile as normal compilation and set this flag:

```
--with-oraclespatial=/path/to/oracle/home/</p>
```

If MapServer configure and make runs well, try

```
./mapserv -v
```

This should at least give this output:

```
INPUT=ORACLESpatial
```

If you got that, you're fine from the MapServer point of view.

4.6.4 Set Environment Variables

It is important to set all environment variables correctly. There are one the one hand system-wide environment variables to be set, on the other hand there should be set some for the cgi-directory in your Apache configuration.

System Variables

On Ubuntu (and on many other systems) there is the file “/etc/profile” which sets environment variables for all users on the system (you may also dedicate user-specific environment variables by editing the users “.profile” file in their home directory, but usually the oracle database users are not users of the system with their own home)

Set the following variables:

```
$ cd /etc

$ echo export ORACLE_HOME=/path/to/oracle/home >> /etc/profile
# **(e.g. ORACLE_HOME=/app/oracle/ora10g)

$ echo export ORACLE_BASE=path/to/oracle >> /etc/profile
# **(e.g. ORACLE_HOME=/app/oracle)

$ echo export ORACLE_SID=MY_ORACLE >> /etc/profile

$ echo export LD_LIBRARY_PATH=path/to/oracle/home/lib >> /etc/profile
# **(e.g. ORACLE_HOME=/app/oracle/ora10g/lib)
```

The command comes silent, so there is no system output if you didn't mistype anything!

Setting the Apache Environment

Sometimes it is confusing WHERE to set WHAT in the splitted apache2.conf-files. In the folder “/etc/apache2/sites_available” you find your sites-file. If you did not do sth. Special e.g. installing virtual hosts, the file is named “default”. In this file, the apache cgi-directory is defined. Our file looks like this:

```
ScriptAlias /cgi-bin/ /var/www/cgi-bin/
<Directory "/var/www/cgi-bin">
    AllowOverride None
    Options ExecCGI -MultiViews +SymLinksIfOwnerMatch
    Order allow,deny
    Allow from all
</Directory></p>
```

In this file, the local apache environment variables must be set. We did it within a location-block like this:

```
<Location "/cgi-bin/">
    SetEnv ORACLE_HOME "/path/to/oracle/home"
</Location></p>
```

Where /cgi-bin/ in the opening location block refers to the script alias /cgi-bin/ and the TNS_ADMIN directory point to the location of the tnsnames.ora file.

Then restart apache:

```
$ /etc/init.d/apache2 force-reload
```

Create mapfile

Before we start creating our mapfile ensure that you have your access data (User/Password) and that you know the Oracle SRID, which could be different from the proj-[EPSG](#)!

The data access parameters:

- CONNECTIONTYPE oraclespatial
- CONNECTION ‘user/password@MY_ORACLE‘
- DATA ‘GEOM FROM MY_LAYER USING SRID 82032‘

[...]

Where:

- GEOM is the name of the geometry column
- MY_LAYER the name of the table
- 82032 is equivalent to the EPSG code 31468 (German projection system)

Testing & Error handling

So you are fine now. Load the mapfile in your application and try it. If everything goes well: Great, if not, possibly this ugly error-emssage occurs (this one came by querying MapServer through the WMS interface as a GetMap-request):

```
<ServiceExceptionReport version="1.0.1">
  <ServiceException>
    msDrawMap(): Image handling error. Failed to draw layer named 'test1'.
    msOracleSpatialLayerOpen(): OracleSpatial error. Cannot create OCI Handlers.
    Connection failure. Check the connection string. Error: .
  </ServiceException>
</ServiceExceptionReport>
```

This points us towards, that there might be a problem with the connection to the database. First of all, let's check, if the mapfile is all right. Therefore we use the MapServer utility program [shp2img](#).

Let's assume you are in the directory, where you compiled MapServer and run shp2img:

```
$ cd /var/src/mapserver_version/
$ shp2img -m /path/to/mapfile/mapfile.map -i png -o /path/to/output/output.png
```

The output of the command should look like this:

```
[Fri Feb  2 14:32:17 2007].522395 msDrawMap(): Layer 0 (test1), 0.074s
[Fri Feb  2 14:32:17 2007].522578 msDrawMap(): Drawing Label Cache, 0.000s
[Fri Feb  2 14:32:17 2007].522635 msDrawMap() total time: 0.075s
```

If not, this possibly points you towards any error in your mapfile or in the way to access the data directly. In this case, take a look at [Oracle Spatial](#). If there is a problem with your oracle connect, the same message as above (MsDrawMap() ...) occurs. Check your mapfile syntax and/or the environment settings for Oracle.

For Debian/Ubuntu it's worth also checking the file “/etc/environment” and test-wise to add the system variables comparable to [System Variables](#)

If the output is OK, you may have a look at the generated image (output.png). Then your problem reduces to the access of apache to oracle home directory. Carefully check your apache configuration. Please note, that the apache.config file differs in several linux-distributions. For this paper we talk about Ubuntu, which should be the same as Debian.

Mapfile

Author Steve Lime

Contact steve.lime at dnr.state.mn.us

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Author Jean-François Doyon

Contact jdoyon at ccrs.nrcan.gc.ca

The Mapfile is the heart of MapServer. It defines the relationships between objects, points MapServer to where data are located and defines how things are to be drawn.

The Mapfile consists of a *MAP* object, which has to start with the word *MAP*.

There are some important concepts that you must understand before you can reliably use mapfiles to configure MapServer. First is the concept of a *LAYER*. A layer is the combination of data plus styling. Data, in the form of attributes plus geometry, are given styling using *CLASS* and *STYLE* directives.

See Also:

An Introduction to MapServer for “An Introduction to the Mapfile”

5.1 Cartographical Symbol Construction with MapServer

Author Peter Freimuth

Contact pf at mapmedia.de

Author Arnulf Christl

Contact arnulf.christl at wherigroup.com

Author Håvard Tveite

Contact havard.tveite at umb.no

Revision \$Revision\$

Date \$Date\$

Table of Contents

- Abstract
- Introduction
 - Multiple Rendering and Overlay
 - Symbol Scaling
 - MapServer and symbol specification
- Using Cartographical Symbols in MapServer
 - Output formats
 - Symbol units
 - Scaling of Symbols
- Construction of Point Symbols
 - Symbols of *TYPE vector* and *ellipse*
 - Symbols of *TYPE truetype*
 - Symbols of *TYPE pixmap*
 - Symbol definitions for the figure that demonstrates point symbols
 - Combining symbols
- Construction of Line Symbols
 - Overlaying lines
 - Use of the *PATTERN* and *GAP* parameters
 - * *LINECAP*
 - * *LINEJOIN*
 - * *LINEJOINMAXSIZE* (only relevant for *LINEJOIN miter*)
 - Use of the *OFFSET* parameter
 - Asymmetrical line styling with point symbols
- Area Symbols
 - Hatch fill
 - Polygon fills with symbols of *TYPE pixmap*
 - Polygon fills with symbols of *TYPE vector*
 - * Excerpts from the map file for the polygon fill vector examples above
 - Polygon outlines
- Examples (MapServer 4)
 - Basic Symbols
 - Complex Symbols
- Tricks
 - Changing the center of a point symbol
- Mapfile changes related to symbols
 - Version 6.2
 - Version 6.0
- Current Problems / Open Issues
 - *GAP* - *PATTERN* incompatibility
- The End

5.1.1 Abstract

This Document refers to the syntax of *map* and *symbol* files for MapServer 6. The first version of the document was based on the results of a project carried out at the University of Hannover, Institute of Landscape and Nature Conservation. It was initiated by Mr. Dipl. Ing. Roland Hachmann. Parts have been taken from a study carried through by Karsten Hoffmann, student of Geography and Cartography at the FU Berlin. In the context of a hands-on training in the company GraS GmbH Mr. Hoffman mainly deal with the development of symbols. ([Download study report](#) in German) His degree dissertation will also concern this subject.

The document has been heavily revised for MapServer 6.

5.1.2 Introduction

A map is an abstract representation that makes use of point, line and area symbols. Bertin (1974) created a clear and logical symbol scheme in which symbols can be varied referring to graphical variables. The following graphical variables can be used within MapServer: FORM, SIZE, PATTERN, COLOR and LIGHTNESS. Point and area symbols as well as text fonts (ttf) can additionally be displayed with a frame which we call OUTLINE.

The following figure shows the theoretical structure of cartographical symbols, which is also used in MapServer:

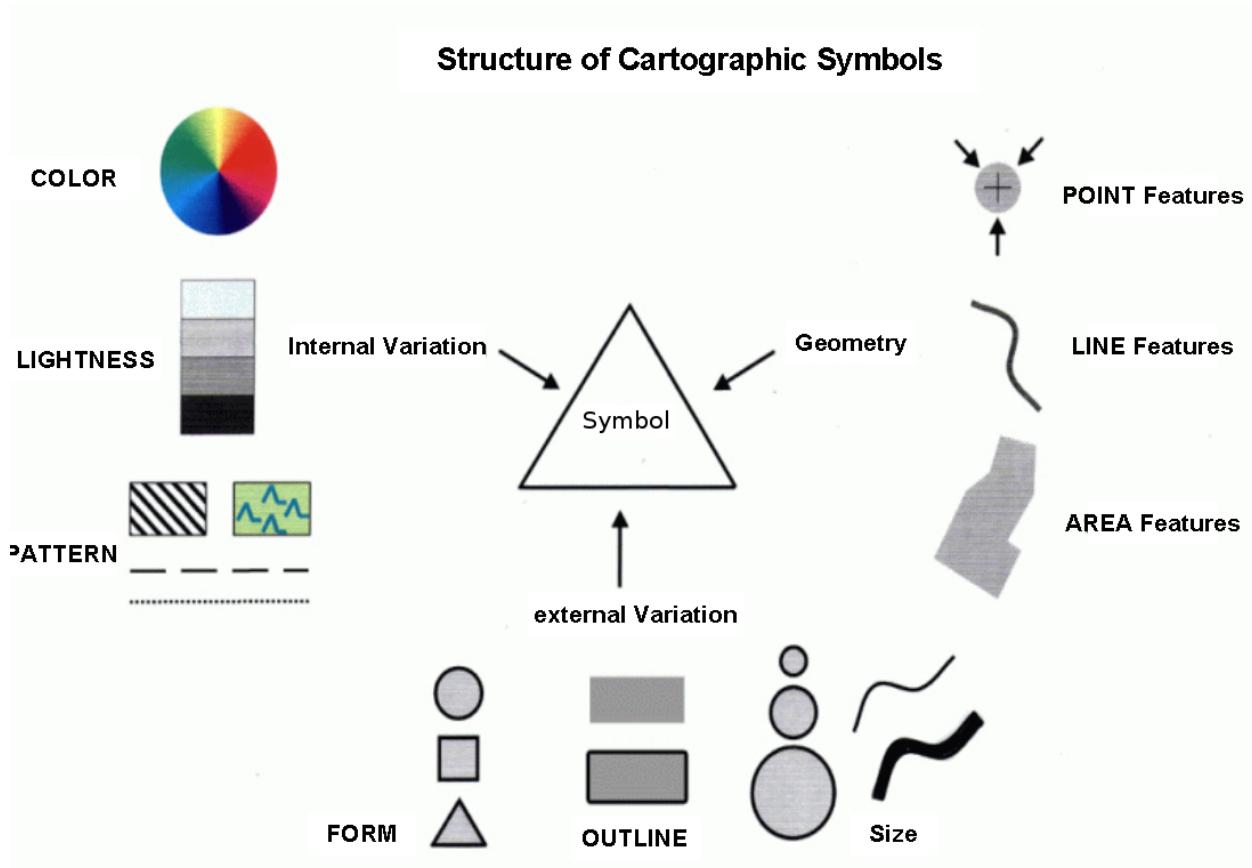


Figure 5.1: Structure of Cartographical Symbols⁴

Multiple Rendering and Overlay

Say you want to display a highway with a black border line, two yellow lanes and a red center lane. This calls for a combination of signatures.

Complex cartographical effects can be achieved by rendering the same vector data with different symbols, sizes and colours on top of each other. This can be done using separate [LAYERs](#). This could, however, have performance effects for the application, as every rendering process of the same geometry will take up additional processor time. The preferred solution is to use multiple [STYLEs](#) to create complex symbols by overlay.

To create the highway symbol mentioned above with a total width of 9 units, the lowest [STYLE](#) (in drawing order) will be a broad black line with a width of 9 units. The second level [STYLE](#) will be a yellow line with a width of 7 units,

and the topmost *STYLE* will be a red line with a width of 1 unit. That way each yellow coloured lane will have a width of $(7-1)/2 = 3$ units.

Combining symbols can be a solution for many kinds of cartographical questions. A combination of different geometry types is also possible. A polygon data set can be rendered as lines to frame the polygons with a line signature. It can also be rendered as polygons with a symbol filling the polygon. When the polygon fill is rendered on top of the lines, the inner part of the underlying outline is covered by the fill symbol of the polygon. What is observed here is a clipping effect that will result in an asymmetric symbol for the boundary line. To present the outline without clipping, just reorder the *LAYER*s or *STYLE*s and put the outline presentation on top of the fill.

Yet another way to construct advanced line signatures for framed polygons is to tamper with the original geometries by buffering or clipping the original geometry such that the new objects lie inside the original polygons or grow over the borders. PostGIS can help achieve a lot of effects.

The *OPACITY* parameter of *LAYER* and *STYLE* can be used to achieve transparency (making lower symbols “shine” through upper symbols).

Symbol Scaling

There are two basically different ways of handling the display size of symbols and cartographical elements in a map at different scales. The size of cartographical elements is either set in screen pixels or in real world units.

- If the size is set in real world units (for example meters), the symbol will shrink and grow according to the scale at which the map is displayed.
- If the size is set in screen pixels, symbols look the same at all scales.

The default behaviour of MapServer is to implement the “screen pixels” size type for displaying cartographical elements.

“Real world units”, as described above, can be achieved using either the *SIZEUNITS* or the *SYMBOLSCALEDENOM* parameter of the *LAYER*.

- When *SIZEUNITS* is set (and is not *pixels*), symbol sizes are specified in real world units (for instance meters). For available units, see the *SIZEUNIT* documentation.
- When *SYMBOLSCALEDENOM* is set, the given symbols size is used for the map scale 1:*SYMBOLSCALEDENOM*, for other scales, the symbols are scaled proportionally.

STYLE MAXSIZE and *MINSIZE* limits the scaling of symbols.

MapServer and symbol specification

In a MapServer application, *SYMBOL* parameters are organised in the *map* file as follows:

- Each *LAYER* has a *TYPE* parameter that defines the type of geometry (point, line or polygon). The symbols are rendered at points, along lines or over areas accordingly.
- Basic symbols are defined in *SYMBOL* elements, using the parameters *TYPE*, *POINTS*, *IMAGE*, *FILLED*, *ANCHORPOINT* and more (*SYMBOL* elements can be collected in separate *symbol files* for reuse).
- Colour, lightness, size and outline are defined inside the *STYLE* sections of a *CLASS* section using the parameters *COLOR*, *SIZE*, *WIDTH* and *OUTLINECOLOR*.
- Patterns for styling lines and polygons are defined in *STYLE* sections using *GAP* and *PATTERN*.
- Several basic elements can be combined to achieve a complex signature using several *STYLE*s inside one *CLASS*.

The following example shows the interaction of some of these elements and explains the configuration in the *LAYER* and the *SYMBOL* sections necessary for rendering a cartographical point symbol (a red square with a 1 pixel wide black outline and a smaller blue circle inside):



Figure 5.2: The generated overlay symbol

Table 5.1: Commented LAYER and SYMBOL sections.

LAYER section of the map file	SYMBOL (from a separate symbol file or in-line in the map file)
<pre> # Start of layer definition LAYER # Name of the layer NAME "mytest" # Point geometries TYPE POINT # Point geometries # Always draw STATUS DEFAULT # Always draw # Use the dataset test.shp DATA test # Start of a Class definition CLASS # Start of the first Style STYLE # Symbol to be used (reference) SYMBOL "square" # Size of the symbol in pixels SIZE 16 # Colour (RGB) - red COLOR 255 0 0 # Outline colour (RGB) - black OUTLINECOLOR 0 0 0 END # end of STYLE # Start of the second Style STYLE # Symbol to be used (reference) SYMBOL "circle" # Size of the symbol in pixels SIZE 10 # Colour (RGB) - blue COLOR 0 0 255 END # end of STYLE END # end of CLASS END # end of LAYER </pre>	<pre> # Start of symbol definition SYMBOL # Symbol name (referenced in STYLES) NAME "square" # Type of symbol TYPE vector # Type of symbol # Start of the symbol geometry POINTS 0 0 0 1 1 1 1 0 0 0 END # end of POINTS # The symbol should be filled FILLED true # Place the according to its center ANCHORPOINT 0.5 0.5 END # end of SYMBOL # Start of symbol definition SYMBOL # Symbol name (referenced in STYLES) NAME "circle" # Type of symbol TYPE ellipse # Type of symbol # Start of the symbol geometry POINTS 1 1 END # end of POINTS # The symbol should be filled FILLED true # Place the according to its center ANCHORPOINT 0.5 0.5 END # end of SYMBOL </pre>

5.1.3 Using Cartographical Symbols in MapServer

Vectors, truetype fonts and raster images are basic graphical elements that are defined by the **TYPE** parameter in the **STYLE** element. This and the following sections explain how these elements can be combined to create complex cartographical symbols, and they describes some other important aspects of map rendering in MapServer .

Output formats

MapServer support raster output formats (e.g. PNG, JPEG and GIF) and vector output formats (e.g. PDF, SVG). The raster formats (except for GIF) use anti-aliasing. See [OUTPUTFORMAT](#) (and [MAP IMAGETYPE](#)) for more.

Symbol units

The units used for specifying dimensions is defined in the *SIZEUNITS* parameter of the [LAYER](#). The available units are listed there. The default unit is *pixels*.

The *MAP* element's *RESOLUTION* and *DEFRESOLUTION* parameters will determine the resolution of the resulting map and hence the size in pixels of the symbols on the map. *DEFRESOLUTION* is by default 72 dpi (dots per inch). If *RESOLUTION* is set to 144 (and *DEFRESOLUTION* is 72), all dimensions specified in the map file will be multiplied by $144/72 = 2$. This can be used to produce higher resolution images.

Dimensions can be specified using decimals.

Scaling of Symbols

The *SYMBOLSCALEDENOM* parameter in the [LAYER](#) section specifies the scale at which the symbol or text label is displayed in exactly the dimensions defined in the [STYLES](#) (for instance using *SIZE* and *WIDTH*). Observe that all the parameters concerned with the symbol dimensions (*SIZE*, *WIDTH*, ...) are tightly connected to the *SYMBOLSCALEDENOM* parameter. The *MAXSIZE* and *MINSIZE* parameters inside the [STYLE](#) element limit the scaling of symbols to the maximum and minimum size specified here (but does not affect the size calculations).

When symbols are scaled as the scale changes, the elements (defined in [STYLES](#)) of a composite cartographical symbol may change their positions relative to each other. This is due to rounding effects when creating the image. The effect is most noticeable at small scales (large scale denominators), when the symbols get small. Due to the same effects, symbols can also slightly change their shape when they get small.

It is not possible to define the display intervals with *MINSCALEDENOM* and *MAXSCALEDENOM* in the [STYLE](#) section, so this kind of tuning has to be solved at the [LAYER](#) level. To do this, create several [LAYER](#)s with the same geometries for different scale levels.

Always observe that cartographical symbols depend a lot on the scale! So be careful with the interaction of content, symbols and scale. All three parameters heavily interact and have to be coordinated to produce a good map.

5.1.4 Construction of Point Symbols

In the figure below, point symbols of *TYPE truetype*, *pixmap*, *ellipse* and *vector* are demonstrated. The precise position of the point for which the symbol is rendered is shown with a small red dot. A small blue dot is used to show an offset position.

All point symbols can be rotated using the *ANGLE* parameter.

Since version 6.2, the anchor point / reference point of all point symbols can be set using the [SYMBOL ANCHORPOINT](#) parameter. The default anchorpoint is at the center of the boundingbox of the symbol (*ANCHORPOINT 0.5 0.5*).

Symbols of *TYPE vector* and *ellipse*

For symbols of *TYPE vector* and *ellipse* the shape of the symbol by setting X and Y values in a local two dimensional coordinate system with X values increasing to the right and Y values increasing downwards. The coordinates defining the symbol is listed in the *POINTS* parameter, which is explicitly ended using *END*. Negative values should not be used.

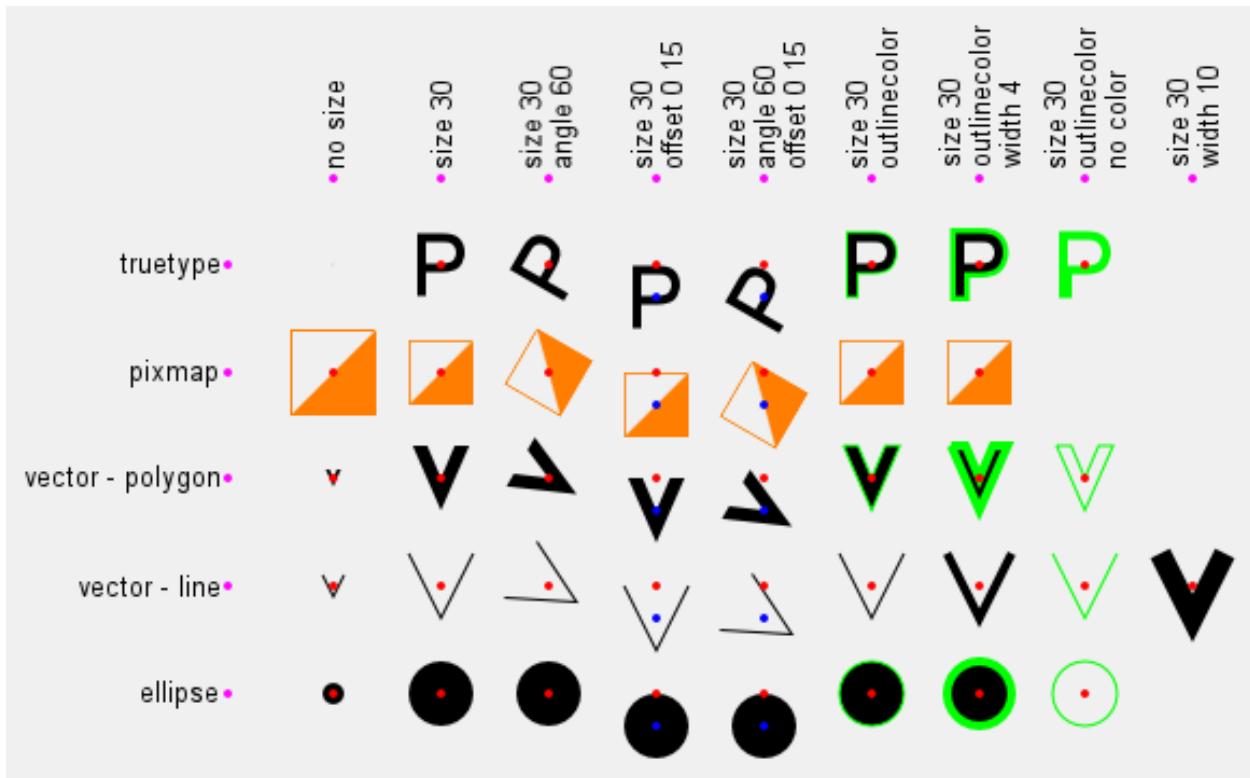


Figure 5.3: Basic point symbol *TYPEs*, showing effects of size, offset, angle and outlinecolor

- *TYPE ellipse* is used to create ellipses (and circles). The shape of the ellipse is defined in the *POINTS* parameter (X - size in the horizontal direction, Y - size in the vertical direction). To create a circle, let X and Y have the same value.
- *TYPE vector* is used to define advanced vector symbols. The shape of the symbol is defined in the *POINTS* parameter. A *vector* symbol can consist of several elements. The coordinates -99 -99 are used to separate the elements.

To create a polygon vector symbol, the *SYMBOL FILLED* parameter must be set to *true*. If the end point is not equal to the start point of a polygon geometry, it will be closed automatically.

The maximum number of points is 100, but this can be increased by changing the parameter *MS_MAXVECTORPOINTS* in the file *mapsymbols.h* before compilation.

When creating symbols of *TYPE vector* you should observe some style guidelines.

- Avoid downtilted lines in area symbols, as they will lead to heavy aliasing effects.
- Do not go below a useful minimum size. This is relevant for all types of symbols.
- Keep in mind that for pixel images, every symbol of *TYPE vector* has to be rendered using pixels.

Note: The bounding box of a vector symbol has (0,0) in the symbol coordinate system as its upper left corner. This can be used to precisely control symbol placement. Since version 6.2 *SYMBOL ANCHORPOINT* should be used instead.

Symbols of *TYPE truetype*

You can use symbols from truetype fonts. The symbol settings are defined in the *SYMBOL* element. Specify the character or the ASCII number of the character to be used in the *CHARACTER* parameter. The *FONT* parameter is used to specify the font to be used (the alias name from the font file - often “fonts.list”). The *FONTSET* parameter of the *MAP* element must be set for fonts to work.

For gif output (GD renderer), you can define that you want to apply antialiasing to the characters by using the parameter *ANTIALIAS*. It is recommended to do this especially with more complex symbols and whenever they don't fit well into the raster matrix or show a visible pixel structure.

Colours for *truetype* symbols can be specified in *LAYER CLASS STYLE* (as with symbols of the *TYPE vector* and *ellipse*). You can specify both fill colour and outline colour.

To find out the character number of a symbol use one of the following options:

- Use the software FontMap (Shareware, with free trial version for download, thanks Till!).
- Use the MS Windows truetype map.
- Trial and Error. :-)

Please note that the numbering of the so-called “symbol fonts” starts at 61440! So if you want to use character T, you have to use $61440 + 84 = \#161524$. (ain't that a pain!!)

You can also place truetype characters and strings on the map using *LABEL*. Then you can control the placing of the text by using the *POSITION* parameter [ulluclurlcclcrlllllcllr], that specifies the position relative to the geometric origin of the geometry.

Symbols of *TYPE pixmap*

Symbols of the *TYPE pixmap* are simply small raster images. The file name of the raster image is specified in the *IMAGE* parameter of the *SYMBOL* element. MapServer supports the raster formats GIF and PNG for *pixmap*s.

Observe the colour depth of the images and avoid using 24 bit PNG symbols displayed in 8 bit mode as this may cause unexpected colour leaps.

When using raster images, the colour cannot be modified in the *SYMBOL* element subsequently.

You can specify a colour with the *TRANSPARENT* parameter which will not be displayed - i.e. it will be transparent. As a result, underlying objects and colours are visible.

The *SIZE* parameter defines the height of *pixmap* symbols when rendered. The pixel structure will show when the *SIZE* grows too large. If you are using symbol scaling (*LAYER SYMBOLSCALEDENOM* is set or *LAYER SIZEUNITS* is not *pixels*) and want to prevent this from happening, you should set the *STYLE MAXSIZE* parameter.

Symbol definitions for the figure that demonstrates point symbols

This code was used to produce the symbols in the point symbol figure.

First, the symbol definitions:

```
SYMBOL
  NAME "o-flag-trans"
  TYPE pixmap
  IMAGE "o-flag-trans.png"
END # SYMBOL
```

```
SYMBOL
  NAME "circlelef"
```

```

TYPE ellipse
FILLED true
POINTS
  10 10
END # POINTS
END # SYMBOL

SYMBOL
  NAME "P"
  TYPE truetype
  FONT "arial"
  CHARACTER "P"
END # SYMBOL

SYMBOL
  NAME "v-line"
  TYPE vector
  FILLED false
  POINTS
    0 0
    5 10
    10 0
END # POINTS
END # SYMBOL

SYMBOL
  NAME "v-poly"
  TYPE vector
  FILLED true
  POINTS
    0 0
    3.5 8
    7 0
    5.2 0
    3.5 4
    1.8 0
    0 0
END # POINTS
END # SYMBOL

```

Then, the *LAYERs* and *STYLEs* used for producing the polygon V symbols in the point symbol figure:

```

LAYER # Vector v - polygon
  STATUS DEFAULT
  TYPE POINT
  FEATURE
    POINTS
      10 30
    END # Points
  END # Feature
  CLASS
    STYLE
      SYMBOL "v-poly"
      COLOR 0 0 0
    END # STYLE
    STYLE
      SYMBOL "circlelf"
      COLOR 255 0 0
      SIZE 4

```

```
    END # STYLE
  END # CLASS
END # LAYER

LAYER # Vector v - polygon, size
  STATUS DEFAULT
  TYPE POINT
  FEATURE
    POINTS
      20 30
    END # Points
  END # Feature
  CLASS
    STYLE
      SYMBOL "v-poly"
      COLOR 0 0 0
      SIZE 30
    END # STYLE
    STYLE
      SYMBOL "circlef"
      COLOR 255 0 0
      SIZE 4
    END # STYLE
  END # CLASS
END # LAYER

LAYER # Vector v - polygon, size, angle
  STATUS DEFAULT
  TYPE POINT
  FEATURE
    POINTS
      30 30
    END # Points
  END # Feature
  CLASS
    STYLE
      SYMBOL "v-poly"
      COLOR 0 0 0
      SIZE 30
      ANGLE 60
    END # STYLE
    STYLE
      SYMBOL "circlef"
      COLOR 255 0 0
      SIZE 4
    END # STYLE
  END # CLASS
END # LAYER

LAYER # Vector v - polygon, size, offset
  STATUS DEFAULT
  TYPE POINT
  FEATURE
    POINTS
      40 30
    END # Points
  END # Feature
  CLASS
```

```

STYLE
  SYMBOL "v-poly"
  COLOR 0 0 0
  SIZE 30
  OFFSET 0 15
END # STYLE
STYLE
  SYMBOL "circlef"
  COLOR 255 0 0
  SIZE 4
END # STYLE
END # CLASS
END # LAYER

LAYER # Vector v - polygon, size, angle, offset
  STATUS DEFAULT
  TYPE POINT
  FEATURE
    POINTS
      50 30
    END # Points
  END # Feature
  CLASS
    STYLE
      SYMBOL "v-poly"
      COLOR 0 0 0
      SIZE 30
      ANGLE 60
      OFFSET 0 15
    END # STYLE
    STYLE
      SYMBOL "circlef"
      COLOR 255 0 0
      SIZE 4
    END # STYLE
  END # CLASS
END # LAYER

LAYER # Vector v - polygon, size outline
  STATUS DEFAULT
  TYPE POINT
  FEATURE
    POINTS
      60 30
    END # Points
  END # Feature
  CLASS
    STYLE
      SYMBOL "v-poly"
      COLOR 0 0 0
      SIZE 30
      OUTLINECOLOR 0 255 0
    END # STYLE
    STYLE
      SYMBOL "circlef"
      COLOR 255 0 0
      SIZE 4
    END # STYLE

```

```
END # CLASS
END # LAYER

LAYER # Vector v - polygon, size, outline, width
  STATUS DEFAULT
  TYPE POINT
  FEATURE
    POINTS
      70 30
    END # Points
  END # Feature
  CLASS
    STYLE
      SYMBOL "v-poly"
      COLOR 0 0 0
      SIZE 30
      OUTLINECOLOR 0 255 0
      WIDTH 4
    END # STYLE
    STYLE
      SYMBOL "circlelf"
      COLOR 255 0 0
      SIZE 4
    END # STYLE
  END # CLASS
END # LAYER

LAYER # Vector v - polygon, size, outline, no color
  STATUS DEFAULT
  TYPE POINT
  FEATURE
    POINTS
      80 30
    END # Points
  END # Feature
  CLASS
    STYLE
      SYMBOL "v-poly"
      SIZE 30
      OUTLINECOLOR 0 255 0
    END # STYLE
    STYLE
      SYMBOL "circlelf"
      COLOR 255 0 0
      SIZE 4
    END # STYLE
  END # CLASS
END # LAYER
```

Combining symbols

The following figure shows how to combine several basic symbols to create a complex point symbol. The combination is achieved by adding several *STYLE*s within one *LAYER*. Each *STYLE* element references one *SYMBOL* element. All the basic symbols are centered and overlaid when rendered.

Notice that the *SIZE* parameter in the *STYLE* element refers to the height of the symbol (extent in the Y direction). A standing rectangle will thus display with a smaller area than a lying rectangle, although both have the same *SIZE*.

parameter and the same maximum Y value in the *SYMBOL* element. When combining several basic point symbols on top of each other, they will not always be centered correctly due to the integer mathematics required when rendering raster images. It is recommended not to combine elements with even and odd numbered *SIZE* parameters, as this tends to produce larger irregularities.

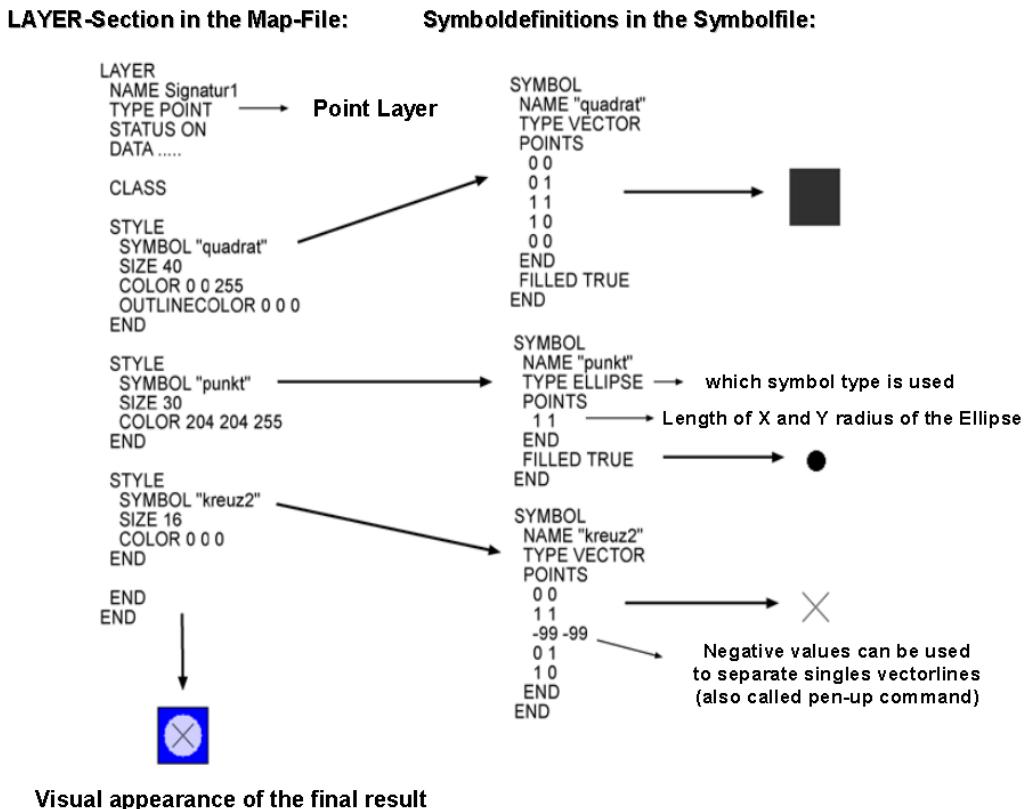


Figure 5.4: Construction of Point Symbols

5.1.5 Construction of Line Symbols

For displaying line geometries, you specify the width of the lines using the *WIDTH* parameter and the colour using the *COLOR* parameter. If no colour is specified, the line will not be rendered. If no width is specified, a thin line (one unit (pixel) wide) will be rendered. The *LINECAP*, *LINEJOIN* and *LINEJOINMAXSIZE* parameters are used to specify how line ends and corners are to be rendered.

Overlays lines

When combining several styles / symbols on a line, they will be positioned on the baseline which is defined by the geometry of the object. In most cases MapServer correctly centers symbols. The combination of a line displayed in 16 units width and overlaid with a 10 unit width line, results in a line symbol with a 3 unit border. If the cartographical symbol is to contain a centered line with a width of 1 pixel, then the widths should be reconfigured, for example to 11 and 17 units. As a rule of thumb don't combine even numbered and odd numbered widths.

Use of the *PATTERN* and *GAP* parameters

The *PATTERN* and *GAP* parameters can be used to produce styled lines in MapServer.

To create line patterns, use the *PATTERN* parameter of the *STYLE*. Here you define dashes by specifying the length of the first dash, followed by the length of the first gap, then the length of the second dash, followed by the second gap, and so on. This pattern will be repeated as many times as that pattern will fit into the line. *LINECAP* can be used to control how the ends of the dashes are rendered. *LINEJOIN* can be used to control how sharp bends are rendered. In the left column of the figure, you will find three examples where *PATTERN* has been used. Number 2 from below uses *LINECAP butt*, number 3 from below uses *LINECAP round* (and *LINEJOIN miter*) and number 4 from below uses *LINECAP butt* (and is overlayed over a wider, dark grey line). To produce dots, use 0 for dash length with *LINECAP* ‘round’.

Styled lines can be specified using *GAP* and a symbol for styling. In the figure, you will find examples where *GAP* has been used (in the right column). At the bottom a *SYMBOL* of *TYPE ellipse* has been used, then a *SYMBOL* of *TYPE vector*, then a *SYMBOL* of *TYPE font* and then a *SYMBOL* of *TYPE pixmap*. To control the placement of the symbols relative to the line (to get asymmetrical styling), use *SYMBOL ANCHORPOINT* (as explained later).

Note: Since version 6.2 it is possible to specify an offset (start gap) when creating asymmetrical patterns using the *STYLE INITIALGAP* parameter. *INITIALGAP* can be used with *GAP* and with *PATTERN*.

The following figure shows how to use styles to define different kinds of line symbols.

- *PATTERN* usage is demonstrated in the 2nd, 3rd, 4th and 5th symbol from the bottom in the left column.
- *GAP* usage is demonstrated in the 2nd symbol from the bottom in the left column and all the symbols in the right column.
- negative *GAP* value usage is demonstrated in the all the symbols in the right column, except for the one at the bottom.
- *INITIALGAP* usage is demonstrated in the 2nd and 5th symbol from the bottom in the left column.
- *STYLE OFFSET* usage is demonstrated in the 5th symbol from the bottom in the right column

Below you will find the *SYMBOLs* and *STYLEs* that were used to produce the line symbols in “Construction of Line Symbols”. The *LAYERs* are ordered from bottom to top of the figure.

Styles and symbols for lines

```
SYMBOL
  NAME "circlef"
  TYPE ellipse
  FILLED true
  POINTS
    1 1
  END # POINTS
END # SYMBOL
```

```
SYMBOL
  NAME "P"
  TYPE truetype
  FONT "arial"
  CHARACTER "P"
END # SYMBOL
```

```
SYMBOL
  NAME "vertline"
  TYPE vector
  FILLED true
```

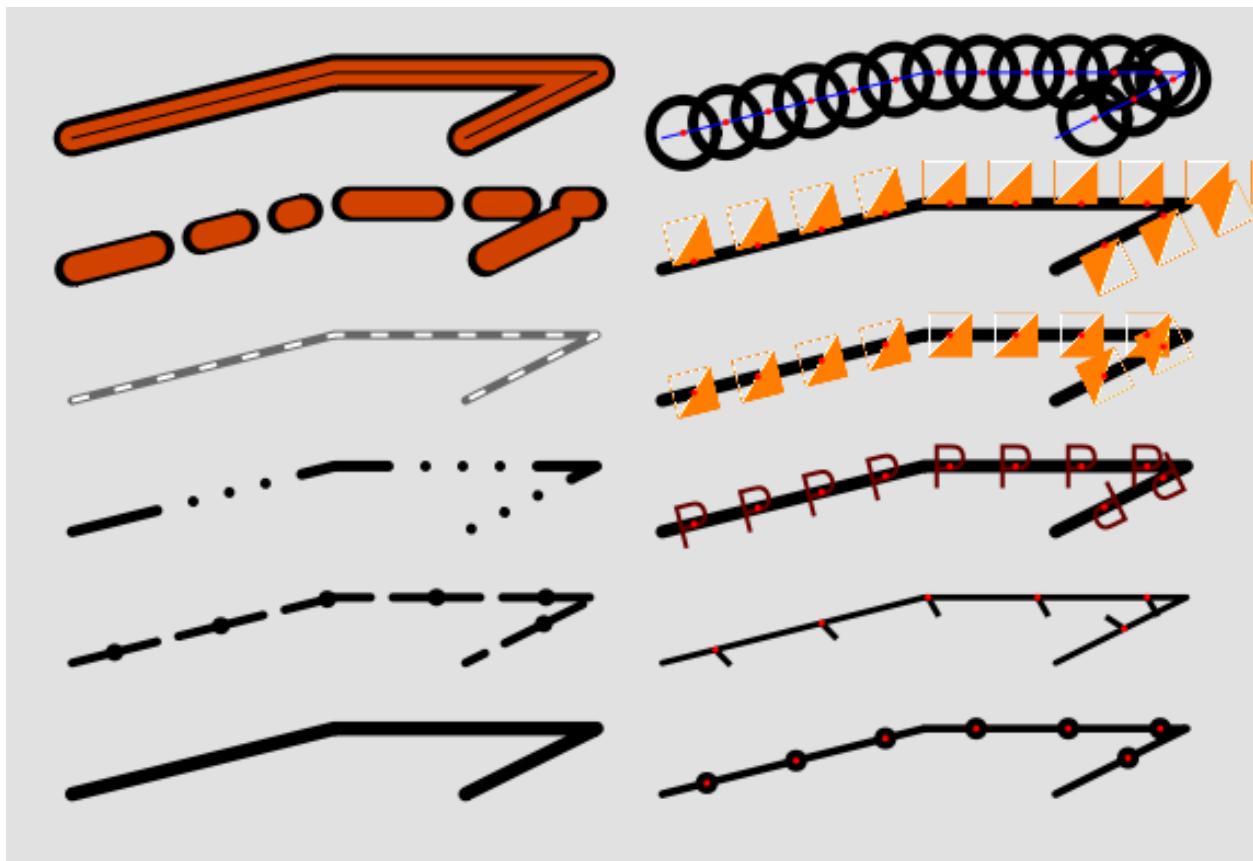


Figure 5.5: Construction of Line Symbols

```
POINTS
  0 0
  0 10
  2.8 10
  2.8 0
  0 0
END # POINTS
ANCHORPOINT 0.5 0
END # SYMBOL

SYMBOL
  NAME "o-flag-trans"
  TYPE pixmap
  IMAGE "o-flag-trans.png"
END # SYMBOL

##### Left column #####
LAYER # Simple line
  STATUS DEFAULT
  TYPE LINE
  FEATURE
    POINTS
      5 5
      25 10
      45 10
      35 5
    END # Points
  END # Feature
  CLASS
    STYLE
      COLOR 0 0 0
      WIDTH 6.5
    END # STYLE
  END # CLASS
END # LAYER

LAYER # Dashed line with symbol overlay
  STATUS DEFAULT
  TYPE LINE
  FEATURE
    POINTS
      5 15
      25 20
      45 20
      35 15
    END # Points
  END # Feature
  CLASS
    STYLE
      COLOR 0 0 0
      WIDTH 5.0
      PATTERN 40 10 END
    END # STYLE
    STYLE
      SYMBOL "circlef"
      COLOR 0 0 0
      SIZE 8
```

```

INITIALGAP 20
GAP 50
END
END # CLASS
END # LAYER

LAYER # Dashed line, varying
STATUS DEFAULT
TYPE LINE
FEATURE
POINTS
5 25
25 30
45 30
35 25
END # Points
END # Feature
CLASS
STYLE
COLOR 0 0 0
WIDTH 5.0
LINECAP round #[butt/round/square/triangle]
LINEJOIN miter #[round/miter/bevel]
LINEJOINMAXSIZE 3
PATTERN 40 17 0 17 0 17 0 17 END
END # STYLE
END # CLASS
END # LAYER

LAYER # Line dash overlay
STATUS DEFAULT
TYPE LINE
FEATURE
POINTS
5 35
25 40
45 40
35 35
END # Points
END # Feature
CLASS
STYLE
COLOR 102 102 102
WIDTH 4.0
END # STYLE
STYLE
COLOR 255 255 255
WIDTH 2.0
LINECAP BUTT
PATTERN 8 12 END
END # STYLE
END # CLASS
END # LAYER

LAYER # Line dashed with dashed overlay
STATUS DEFAULT
TYPE LINE
FEATURE

```

```
POINTS
  5 45
  25 50
  45 50
  35 45
END # Points
END # Feature
CLASS
  STYLE
    COLOR 0 0 0
    WIDTH 16.0
    PATTERN 40 20 20 20 10 20 END
  END # STYLE
  STYLE
    COLOR 209 66 0
    WIDTH 12.0
    INITIALGAP 2
    PATTERN 36 24 16 24 6 24 END
  END # STYLE
END # CLASS
END # LAYER

LAYER # Line overlay - 3
  STATUS DEFAULT
  TYPE LINE
  FEATURE
    POINTS
      5 55
      25 60
      45 60
      35 55
    END # Points
  END # Feature
  CLASS
    STYLE
      COLOR 0 0 0
      WIDTH 17.0
    END # STYLE
    STYLE
      COLOR 209 66 0
      WIDTH 11.0
    END # STYLE
    STYLE
      COLOR 0 0 0
      WIDTH 1.0
    END # STYLE
  END # CLASS
END # LAYER

##### right column #####
LAYER # Line - ellipse overlay
  STATUS DEFAULT
  TYPE LINE
  FEATURE
    POINTS
      50 5
      70 10
```

```

    90 10
    80 5
END # Points
END # Feature
CLASS
  STYLE
    COLOR 0 0 0
    WIDTH 3.6
END # STYLE
  STYLE
    COLOR 0 0 0
    SYMBOL "circlelef"
    SIZE 10
    GAP 42
END # STYLE
  STYLE
    COLOR 255 0 0
    SYMBOL "circlelef"
    SIZE 3
    GAP 42
END # STYLE
END # CLASS
END # LAYER

LAYER # Line - symbol overlay
  STATUS DEFAULT
  TYPE LINE
  FEATURE
    POINTS
      50 15
      70 20
      90 20
      80 15
    END # Points
  END # Feature
  CLASS
    STYLE
      COLOR 0 0 0
      WIDTH 2.8
    END # STYLE
    STYLE
      COLOR 0 0 0
      SYMBOL "vertline"
      SIZE 10.0
      ANGLE 30
      GAP -50
    END # STYLE
    STYLE
      COLOR 255 0 0
      SYMBOL "circlelef"
      SIZE 3
      GAP 50
    END # STYLE
  END # CLASS
END # LAYER

LAYER # Line - font overlay
  STATUS DEFAULT

```

```
TYPE LINE
FEATURE
  POINTS
    50 25
    70 30
    90 30
    80 25
  END # Points
END # Feature
CLASS
  STYLE
    COLOR 0 0 0
    WIDTH 6
  END # STYLE
  STYLE
    COLOR 102 0 0
    SYMBOL "P"
    SIZE 20
    GAP -30
  END # STYLE
  STYLE
    COLOR 255 0 0
    SYMBOL "circlef"
    SIZE 3
    GAP 30
  END # STYLE
END # CLASS
END # LAYER

LAYER # Line - pixmap overlay
  STATUS DEFAULT
  TYPE LINE
  FEATURE
    POINTS
      50 35
      70 40
      90 40
      80 35
    END # Points
  END # Feature
  CLASS
    STYLE
      COLOR 0 0 0
      WIDTH 6
    END # STYLE
    STYLE
      COLOR 102 0 0
      SYMBOL "o-flag-trans"
      SIZE 20
      GAP -30
    END # STYLE
    STYLE
      COLOR 255 0 0
      SYMBOL "circlef"
      SIZE 3
      GAP 30
    END # STYLE
  END # CLASS

```

```

END # LAYER

LAYER # Line - pixmap overlay
  STATUS DEFAULT
  TYPE LINE
  FEATURE
    POINTS
      50 45
      70 50
      90 50
      80 45
    END # Points
  END # Feature
  CLASS
    STYLE
      COLOR 0 0 0
      WIDTH 6
    END # STYLE
    STYLE
      COLOR 102 0 0
      SYMBOL "o-flag-trans"
      SIZE 20
      GAP -30
      OFFSET -10 -99
    END # STYLE
    STYLE
      COLOR 255 0 0
      SYMBOL "circlef"
      SIZE 3
      GAP 30
    END # STYLE
  END # CLASS
END # LAYER

```

LINECAP

By default, all lines (and patterns) will be drawn with rounded ends (extending the lines slightly beyond their ends). This effect gets more obvious the larger the width of the line is. It is possible to alter this behaviour using the *LINECAP* parameter of the **STYLE**. *LINECAP butt* will give butt ends (stops the line exactly at the end), with no extension of the line. *LINECAP square* will give square ends, with an extension of the line. *LINECAP round* is the default.

LINEJOIN

The different values for the parameter *LINEJOIN* have the following visual effects. Default is *round*. *miter* will follow line borders until they intersect and fill the resulting area. *none* will render each segment using linecap *butt*. The figure below illustrates the different linejoins.

LINEJOINMAXSIZE (only relevant for *LINEJOIN miter*)

Specify the maximum length of *miter* linejoin factor m (see the figure below). The value is a multiplication factor (default 3).

The max length of the *miter* join is calculated as follows (d is the line width, specified with the **WIDTH** parameter of the **STYLE**):

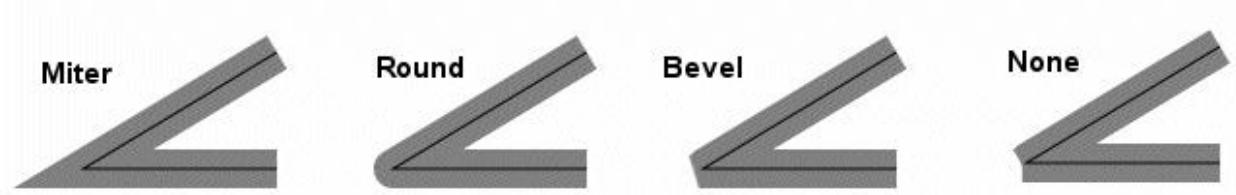


Figure 5.6: Different kinds of linejoins

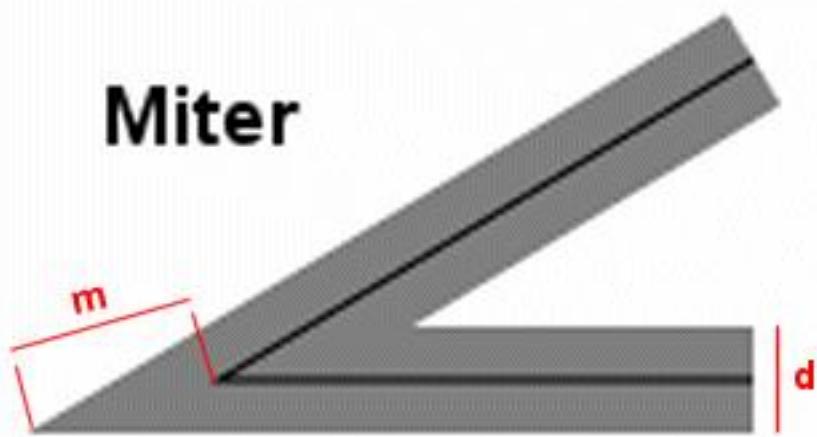


Figure 5.7: Miter linejoin

```
m_max = d * LINEJOINMAXSIZE
```

If $m > m_{max}$, then the connection length will be set to m_{max} .

Use of the *OFFSET* parameter

In *STYLE*, an *OFFSET* parameter can be set to shift symbols in the X and Y direction. The displacement is not influenced by the direction of the line geometry. Therefore the point symbols used for styling are all shifted in the same direction, independent of the direction of the line (as defined in style number 2 in the map file example below - red line in the map image). A positive X value shifts to the right. A positive Y value shifts downwards.

To generate lines that are shifted relative to the original lines, -99 has to be used for the Y value of the *OFFSET*. Then the X value defines the distance to the line from the original geometry (perpendicular to the line). A positive X value will shift to the right (when viewed in the direction of the line), a negative X value will shift to the left.

The example below shows how *OFFSET* works with the use of -99 (blue and green lines) and without the use of -99 (red line). The thin black line shows the location of the line geometry.

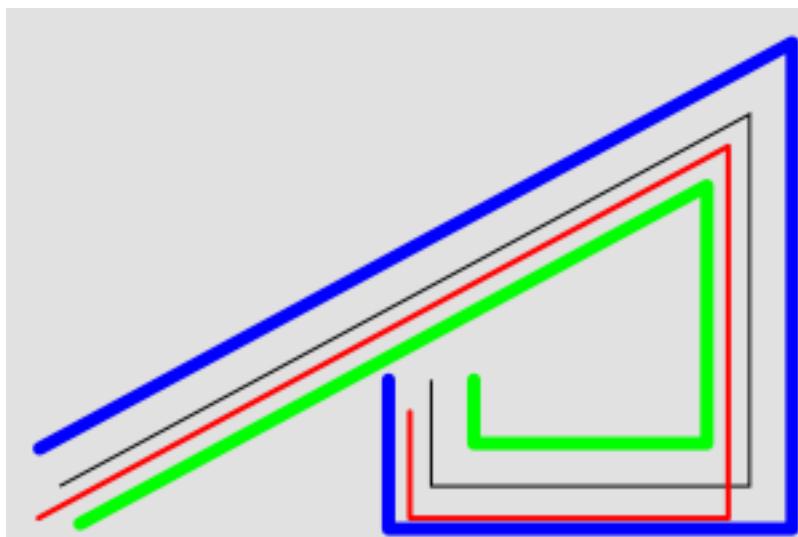


Figure 5.8: Use of the *OFFSET* parameter with lines - map image

Use of the *OFFSET* parameter with lines - Map file excerpt

```
LAYER #
  STATUS DEFAULT
  TYPE LINE
  FEATURE
    POINTS
      20 20
      280 160
      280 20
      160 20
      160 60
    END # Points
  END # Feature
  CLASS
    STYLE # no offset
      COLOR 0 0 0      # black
      WIDTH 1
    END # STYLE
    STYLE # simple offset left and down
      COLOR 255 0 0    # red
      WIDTH 2
      OFFSET -8 12
    END # STYLE
    STYLE # left offset rel. to line direction
      COLOR 0 0 255    # blue
      WIDTH 5
      OFFSET -16 -99
    END # STYLE
    STYLE # right offset rel. to line direction
      COLOR 0 255 0    # green
      WIDTH 5
      OFFSET 16 -99
    END # STYLE
  END # CLASS
END # LAYER
```

Asymmetrical line styling with point symbols

Line number 2 and 5 from the bottom in the right column of the “Construction of Line Symbols” figure are examples of asymmetrical line styling using a point symbol. This can be achieved either by using an *OFFSET* (with a Y value of -99), or by using *ANCHORPOINT*, as described in the tricks section below. Line number 2 from the bottom can be produced using *ANCHORPOINT* - this is the best method for placing symbols on lines. Line number 5 from the bottom is produced using *STYLE OFFSET*. As can be seen, the symbols are here rendered on the offset line, meaning that at sharp bends, some symbols will be placed far away from the line.

5.1.6 Area Symbols

Areas (polygons) can be filled with full colour. Areas can also be filled with symbols to create for instance hatches and graticules.

The symbols are by default used as tiles, and rendered (without spacing) one after the other in the x and y direction, filling the whole polygon.

If the *SIZE* parameter is used in the *STYLE*, the symbols will be scaled to the specified height.

The *GAP* parameter of the *STYLE* can be used to increase the spacing of the symbols.

The AGG renderer uses anti-aliasing by default, so edge effects around the symbols can occur.

Hatch fill

Simple line hatches (e.g. horizontal, vertical and diagonal) can be created by filling the polygon with a hatch symbol.

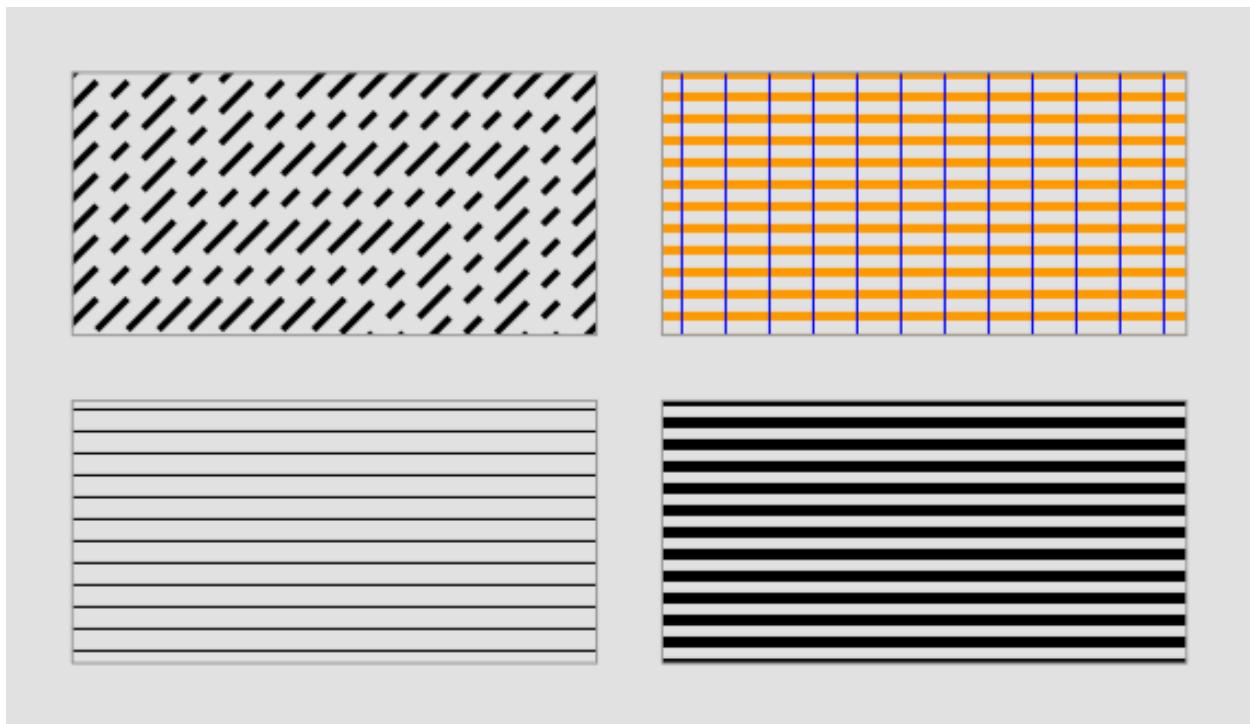


Figure 5.9: Hatch examples

The *SIZE* parameter in the *STYLE* that uses a *SYMBOL* of type *hatch* specifies the distance from center to center between the lines (the default is 1). The *WIDTH* parameter specifies the width of the lines in the hatch pattern (default is 1). The *ANGLE* parameter specifies the direction of the lines (default is 0 - horizontal lines). Since version 6.2, the *PATTERN* parameter can be used to create hatches with dashed lines.

The figure demonstrates the use of *SIZE* (bottom left); *WIDTH* (bottom right); *ANGLE*, *PATTERN* and *SIZE* (top left); and overlay (top right) of hatches.

The code below shows excerpts of the map file that was used to produce the figure.

First, the *SYMBOL* definition:

```
SYMBOL
  NAME "hatchsymbol"
  TYPE hatch
END
```

Then the *CLASS* definitions:

Table 5.2: Hatches

CLASS definitions
LAYER # hatch
...
CLASS
STYLE
SYMBOL "hatchsymbol"
COLOR 0 0 0
SIZE 10
END # <i>STYLE</i>
END # <i>CLASS</i>
END # <i>LAYER</i>
LAYER # hatch with angle and pattern
...
CLASS
STYLE
SYMBOL "hatchsymbol"
COLOR 0 0 0
SIZE 10
WIDTH 3
ANGLE 45
PATTERN 20 10 10 10 END
END # <i>STYLE</i>
END # <i>CLASS</i>
END # <i>LAYER</i>
LAYER # hatch with wide lines
...
CLASS
STYLE
SYMBOL "hatchsymbol"
COLOR 0 0 0
SIZE 10
WIDTH 5
END # <i>STYLE</i>
END # <i>CLASS</i>
END # <i>LAYER</i>
LAYER # cross hatch
...
CLASS
STYLE
SYMBOL "hatchsymbol"
COLOR 255 153 0
SIZE 10
WIDTH 4
END # <i>STYLE</i>
STYLE
SYMBOL "hatchsymbol"
COLOR 0 0 255
SIZE 20
ANGLE 90
END # <i>STYLE</i>
94 END # <i>CLASS</i>
END # <i>LAYER</i>

Polygon fills with symbols of *TYPE pixmap*

Polygons can be filled with pixmaps.

Note: If the *STYLE SIZE* parameter is different from the image height of the pixmap, there can be rendering artefacts around the pixmaps (visible as a grid with the “background” colour).

Pixmap symbols can be rotated using the *ANGLE* parameter, but for polygon fills, this produces strange effects, and is not recommended.

To create complex area symbols, e.g. with defined distances between single characters or hatches with broad lines, pixmap fill is probably the best option. Depending on the desired pattern you have to generate the raster image with high precision using a graphical editor. The figure below is an example of how to obtain a regular allocation of symbols with defined spacing.

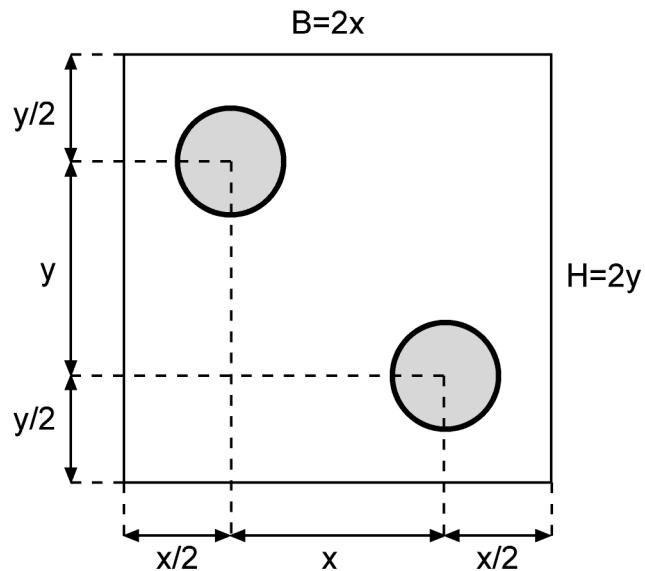


Figure 5.10: Raster image for a regular symbol fill

You can use other shapes than circles. B defines the width and H the height of the raster image. For a regular arrangement of symbols in a 45 degree angle $B = H$. For symbols, which are regularly arranged in parallel and without offset between each other one centered symbol with the same x and y distances to the imageborder is enough.

The following figure shows an example of how you can design a pixmap to produce a hatch with wide lines.

To create a 45 degree hatch use:

`B = H and x = y`

Note: When using the MapServer legend, observe that each raster *Pixmap* is displayed only once in the original size in the middle of the legend box.

The example below shows some *Pixmap* symbols which can be used as area symbols with transparency. The raster images were created using FreeHand, finished with Photoshop and exported to PNG with special attention to the colour palette.

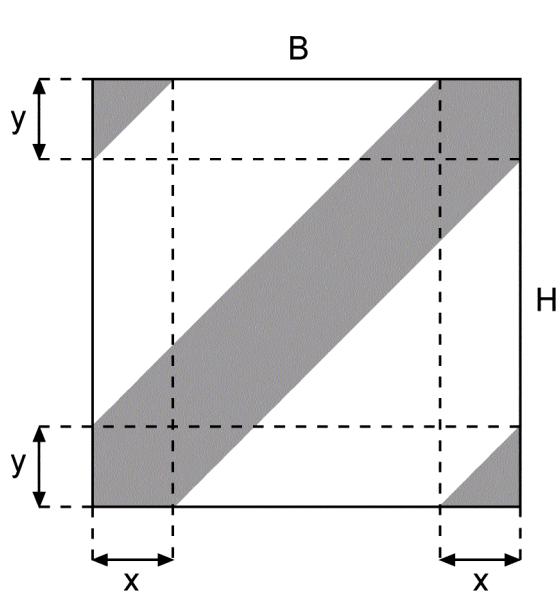


Figure 5.11: Raster image for a hatched fill

Table 5.3: Construction of a horizontally arranged area symbol

CLASS section	SYMBOL definition
<pre> CLASS STYLE COLOR 255 255 0 END STYLE SYMBOL "in_the_star" END STYLE OUTLINECOLOR 0 0 0 WIDTH 1 END END </pre>	<pre> SYMBOL NAME "in_the_star" TYPE PIXMAP IMAGE "stern.png" TRANSPARENT 8 END ★ </pre>



Figure 5.12: Polygon fill - regular grid pattern

Table 5.4: Construction of a diagonally arranged area symbol

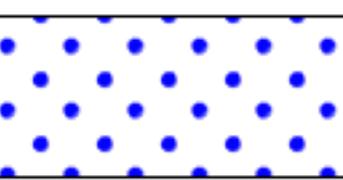
CLASS section	SYMBOL definition
<pre> CLASS STYLE SYMBOL "in_point1" END STYLE OUTLINECOLOR 0 0 0 WIDTH 1 END END </pre>	<pre> SYMBOL NAME "in_point1" TYPE PIXMAP IMAGE "flaeche1_1.png" TRANSPARENT 13 END </pre> 

Figure 5.13: Polygon fill - diagonal pattern

Table 5.5: Construction of a hatch

CLASS section	SYMBOL definition
<pre> CLASS STYLE COLOR 255 255 0 END STYLE SYMBOL "in_hatch" END STYLE OUTLINECOLOR 0 0 0 WIDTH 1 END END </pre>	<pre> SYMBOL NAME "in_hatch" TYPE PIXMAP IMAGE "schraffur.png" TRANSPARENT 2 END </pre> 

Figure 5.14: Polygon fill - hatch

Polygon fills with symbols of **TYPE vector**

Polygons can be filled with symbols of **TYPE vector**. As for the other symbol fills, the pattern will be generated by using the specified symbol for the tiles. The bounding box of the symbol is used when tiling.

Creating vector symbols for polygon fills is done in much the same way as for pixmap symbols. Precision is necessary to get nice symmetrical symbols.

The upper left corner of the bounding box of a symbol of *TYPE vector* is always (0, 0) in the symbol's coordinate system. The lower right corner of the bounding box is determined by the maximum x and y values of the symbol definition (*POINTS* parameter). The fact that the upper left corner always is at (0,0) makes it convenient to construct symbols such as the dash signature found as number two from the bottom in the centre column of the example below.

Both polygon (*FILLED true*) and line (*FILLED false*) vector symbols can be used. For line symbols, the *WIDTH* parameter of the *STYLE* will give the line width and the *SIZE* parameter will specify the height of the symbol.

Note: For vector line symbols (*FILL off*), if a width greater than 1 is specified, the lines will grow to extend outside the original bounding box of the symbol. The parts that are outside of the bounding box will be cut away.

STYLE ANGLE can be used for polygon fills, but will only rotate each individual symbol, not the pattern as a whole. It is therefore quite demanding to generate rotated patterns.

Below you will find some examples of vector symbols used for polygon fills. The polygon fill is accompanied by the vector symbol used for the fill. The center of the vector symbol is indicated with a red dot.

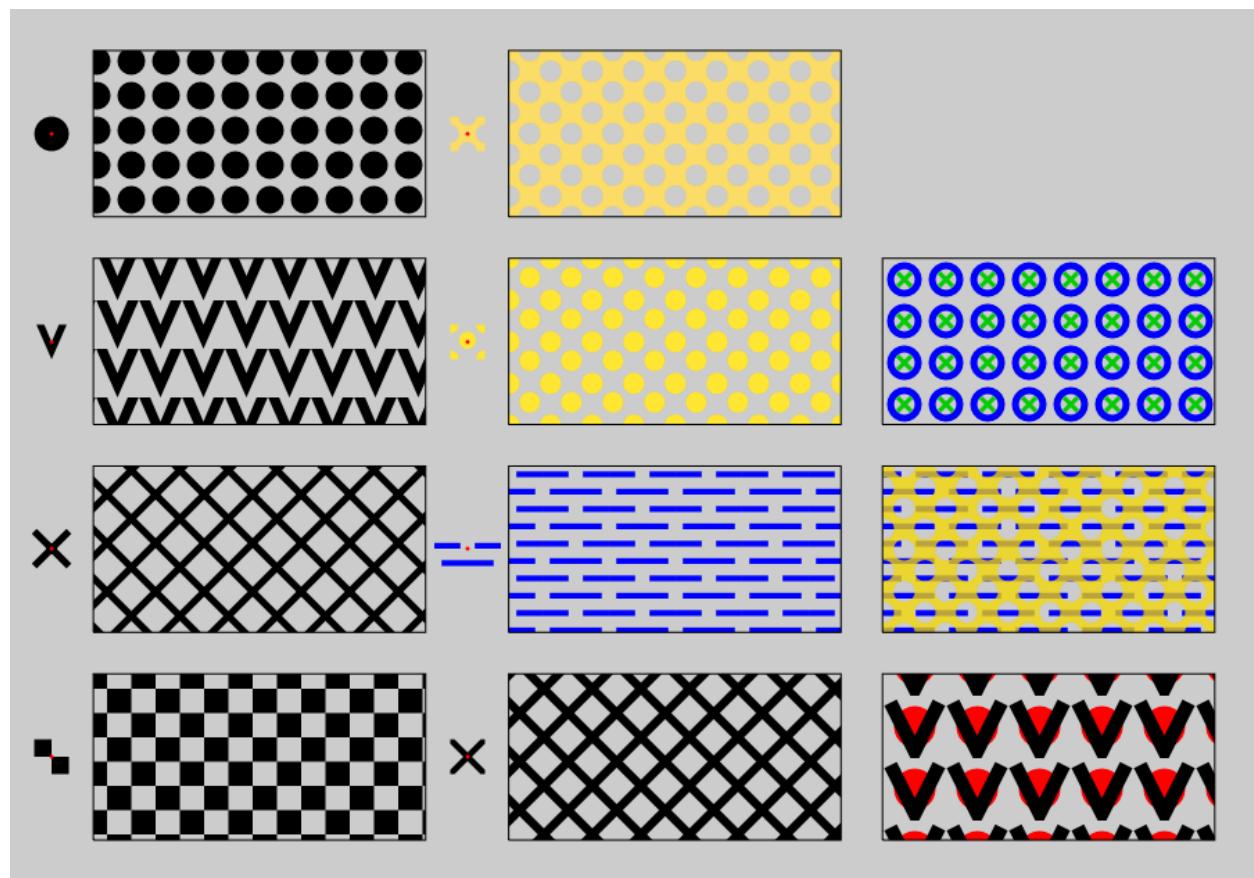


Figure 5.15: Polygon fills - vector

Excerpts from the map file for the polygon fill vector examples above

First, the *LAYER*s

```

LAYER # chess board
  STATUS DEFAULT
  TYPE POLYGON
  FEATURE
    POINTS
      5 5
      5 25
      45 25
      45 5
      5 5
    END # Points
  END # Feature
  CLASS
    STYLE
      SYMBOL "chess"
      COLOR 0 0 0
      SIZE 35
    END # STYLE
  END # CLASS
END # LAYER

LAYER # x - line
  STATUS DEFAULT
  TYPE POLYGON
  FEATURE
    POINTS
      5 30
      5 50
      45 50
      45 30
      5 30
    END # Points
  END # Feature
  CLASS
    STYLE
      SYMBOL "x-line"
      COLOR 0 0 0
      WIDTH 5
      SIZE 35
    END # STYLE
  END # CLASS
END # LAYER

LAYER # v polygon
  STATUS DEFAULT
  TYPE POLYGON
  FEATURE
    POINTS
      5 55
      5 75
      45 75
      45 55
      5 55
    END # Points
  END # Feature
  CLASS
    STYLE
      SYMBOL "v-poly"

```

```
COLOR 0 0 0
SIZE 35
END # STYLE
END # CLASS
END # LAYER

LAYER # Circles
STATUS DEFAULT
TYPE POLYGON
FEATURE
POINTS
5 80
5 100
45 100
45 80
5 80
END # Points
END # Feature
CLASS
STYLE
SYMBOL "circlelef"
COLOR 0 0 0
SIZE 20
GAP 25
END # STYLE
END # CLASS
END # LAYER

LAYER # x polygon
STATUS DEFAULT
TYPE POLYGON
FEATURE
POINTS
55 5
55 25
95 25
95 5
55 5
END # Points
END # Feature
CLASS
STYLE
COLOR 0 0 0
SYMBOL "x-poly-fill"
SIZE 35
END # STYLE
END # CLASS
END # LAYER

LAYER # indistinct marsh
STATUS DEFAULT
TYPE POLYGON
FEATURE
POINTS
55 30
55 50
95 50
95 30
```

```

      55 30
  END # Points
END # Feature
CLASS
  STYLE
    COLOR 0 0 255
    SYMBOL "ind_marsh_poly"
    SIZE 25
  END # STYLE
END # CLASS
END # LAYER

LAYER # diagonal circles
  STATUS DEFAULT
  TYPE POLYGON
  FEATURE
    POINTS
      55 55
      55 75
      95 75
      95 55
      55 55
  END # Points
END # Feature
CLASS
  STYLE
    COLOR 255 230 51
    SYMBOL "diag_dots"
    SIZE 30
  END # STYLE
END # CLASS
END # LAYER

LAYER # diagonal holes in yellow
  STATUS DEFAULT
  TYPE POLYGON
  FEATURE
    POINTS
      55 80
      55 100
      95 100
      95 80
      55 80
  END # Points
END # Feature
CLASS
  STYLE
    SYMBOL "diag_holes"
    SIZE 30
    COLOR 250 220 102
  END # STYLE
END # CLASS
END # LAYER

LAYER # v line + circle
  STATUS DEFAULT
  TYPE POLYGON

```

```
FEATURE
  POINTS
    100 5
    100 25
    140 25
    140 5
    100 5
  END # Points
END # Feature
CLASS
  STYLE
    COLOR 255 0 0
    SYMBOL "circlelef"
    SIZE 30
    GAP 45
  END # STYLE
  STYLE
    COLOR 0 0 0
    SYMBOL "v-line"
    LINEJOIN miter
    LINECAP butt
    SIZE 35
    WIDTH 10
    GAP 45
  END # STYLE
END # CLASS
END # LAYER

LAYER # indistinct marsh + diagonal holes in yellow
  STATUS DEFAULT
  TYPE POLYGON
  FEATURE
    POINTS
      100 30
      100 50
      140 50
      140 30
      100 30
    END # Points
  END # Feature
  CLASS
    STYLE
      COLOR 0 0 255
      SYMBOL "ind_marsh_poly"
      SIZE 25
    END # STYLE
    STYLE
      SYMBOL "diag_holes"
      SIZE 30
      COLOR 250 220 0
      OPACITY 75
    END # STYLE
  END # CLASS
END # LAYER

LAYER # x line + circle
  STATUS DEFAULT
  TYPE POLYGON
```

```

FEATURE
  POINTS
    100 55
    100 75
    140 75
    140 55
    100 55
  END # Points
END # Feature
CLASS
  STYLE
    COLOR 0 0 255
    SYMBOL "circle"
    WIDTH 5
    SIZE 20
    GAP 30
  END # STYLE
  STYLE
    COLOR 0 204 0
    SYMBOL "x-line"
    SIZE 10
    WIDTH 3
    GAP 30
  END # STYLE
END # CLASS
END # LAYER

```

Then the *SYMBOLS*:

```

SYMBOL
  NAME "circlelf"
  TYPE ellipse
  FILLED true
  POINTS
    10 10
  END # POINTS
END # SYMBOL

SYMBOL
  NAME "circle"
  TYPE ellipse
  FILLED false
  POINTS
    10 10
  END # POINTS
END # SYMBOL

SYMBOL
  NAME "v-line"
  TYPE vector
  POINTS
    0 0
    5 10
    10 0
  END
END

SYMBOL
  NAME "v-poly"

```

```
TYPE vector
FILLED false
FILLED true
POINTS
  0  0
  3.5 8
  7 0
  5.2 0
  3.5 4
  1.8 0
  0 0
END
END

SYMBOL
  NAME "x-line"
  TYPE vector
  POINTS
    0 0
    1 1
    -99 -99
    0 1
    1 0
  END
END

SYMBOL
  NAME "chess"
  TYPE vector
  FILLED true
  POINTS
    0 0
    10 0
    10 10
    0 10
    0 0
    -99 -99
    10 10
    20 10
    20 20
    10 20
    10 10
  END
END

SYMBOL
  NAME "x-poly-fill"
  TYPE vector
  FILLED true
  POINTS
    0      1.131
    0      0
    1.131 0
    4.566 3.434
    8      0
    9.131 0
    9.131 1.131
    5.697 4.566
```

```

9.131 8
9.131 9.131
8 9.131
4.566 5.697
1.131 9.131
0 9.131
0 8
3.434 4.566
0 1.131
END # POINTS
END # SYMBOL

SYMBOL
  NAME "ind_marsh_poly"
  TYPE vector
  FILLED true
  POINTS
    # Half line
    0 2
    4.5 2
    4.5 3
    0 3
    0 2
    -99 -99
    # Half line
    7 2
    11.5 2
    11.5 3
    7 3
    7 2
    -99 -99
    # Hole line
    1.25 5
    10.25 5
    10.25 6
    1.25 6
    1.25 5
  END
END

SYMBOL
  NAME "diag_dots"
  TYPE vector
  FILLED true
  POINTS
    # Central circle:
    0.7450 0.4500
    0.7365 0.5147
    0.7115 0.5750
    0.6718 0.6268
    0.6200 0.6665
    0.5597 0.6915
    0.4950 0.7000
    0.4303 0.6915
    0.3700 0.6665
    0.3182 0.6268
    0.2785 0.5750
    0.2535 0.5147

```

```
0.2450    0.4500
0.2535    0.3853
0.2785    0.3250
0.3182    0.2732
0.3700    0.2335
0.4303    0.2085
0.4950    0.2000
0.5597    0.2085
0.6200    0.2335
0.6718    0.2732
0.7115    0.3250
0.7365    0.3853
0.7450    0.4500
-99 -99
0.25      0.0
0.2415    0.0647
0.2165    0.1250
0.1768    0.1768
0.1250    0.2165
0.0647    0.2415
0.0       0.25
0.0       0.0
0.25      0.0
-99 -99
1 0.25
0.9252    0.2415
0.8649    0.2165
0.8132    0.1768
0.7734    0.1250
0.7485    0.0647
0.74      0.0
1 0.0
1 0.25
-99 -99
0.74      1
0.7485    0.9252
0.7734    0.8649
0.8132    0.8132
0.8649    0.7734
0.9252    0.7485
1 0.74
1 1
0.74      1
-99 -99
0.0       0.74
0.0647    0.7485
0.1250    0.7734
0.1768    0.8132
0.2165    0.8649
0.2415    0.9252
0.25      1
0.0       1
0.0       0.74
END
END

SYMBOL
NAME "diag_holes"
```

```
TYPE vector
FILLED true
POINTS
  0.0      0.0
  # Left half circle
  0.0      0.24
  0.0647   0.2485
  0.1250   0.2734
  0.1768   0.3132
  0.2165   0.3649
  0.2415   0.4252
  0.25      0.5
  0.2415   0.5647
  0.2165   0.6250
  0.1768   0.6768
  0.1250   0.7165
  0.0647   0.7415
  0.0      0.75

  0.0      1.0
  # Bottom half circle
  0.24     1
  0.2485   0.9252
  0.2734   0.8649
  0.3132   0.8132
  0.3649   0.7734
  0.4252   0.7485
  0.5      0.74
  0.5647   0.7485
  0.6250   0.7734
  0.6768   0.8132
  0.7165   0.8649
  0.7415   0.9252
  0.75     1

  1.0      1.0
  # Right half circle
  1 0.75
  0.9252   0.7415
  0.8649   0.7165
  0.8132   0.6768
  0.7734   0.6250
  0.7485   0.5647
  0.74     0.5
  0.7485   0.4252
  0.7734   0.3649
  0.8132   0.3132
  0.8649   0.2734
  0.9252   0.2485
  1 0.24

  1.0      0.0
  # Top half circle
  0.75     0.0
  0.7415   0.0647
  0.7165   0.1250
  0.6768   0.1768
  0.6250   0.2165
```

```
0.5647    0.2415
0.5        0.25
0.4252    0.2415
0.3649    0.2165
0.3132    0.1768
0.2734    0.1250
0.2485    0.0647
0.24        0.0

0.0        0.0
END
END
```

Polygon outlines

Polygon outlines can be created by using *OUTLINECOLOR* in the *STYLE*. *WIDTH* specifies the width of the outline.

```
STYLE
  OUTLINECOLOR 0 255 0
  WIDTH 3
END # STYLE
```

Dashed polygon outlines can be achieved by using *OUTLINECOLOR*, *WIDTH* and *PATTERN* (together with *LINECAP*, *LINEJOIN* and *LINEJOINMAXSIZE*). For more information on the use of *PATTERN*, see [Use of the PATTERN and GAP parameters](#).

```
STYLE
  OUTLINECOLOR 0 255 0
  WIDTH 3
  PATTERN
    10 5
  END # PATTERN
  LINECAP BUTT
END # STYLE
```

For some symbol types, it is even possible to style polygon outlines using *OUTLINECOLOR*, *SYMBOL* and *GAP*.

```
STYLE
  OUTLINECOLOR 0 255 0
  SYMBOL 'circle'
  SIZE 5
  GAP 15
END # STYLE
```

5.1.7 Examples (MapServer 4)

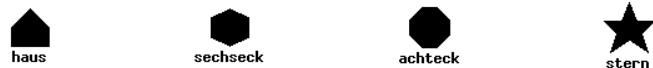
The examples in this section were made for MapServer 4.

Note: Many of these symbols will not work with later versions of MapServer , but they contain a lot of useful symbol definitions and are therefore provided as reference.

The symbols were created with *map* files and *symbol* files ([download_old_symbols](#)). If you want to use these MAP files please note, that your MapServer must at least be able to handle 50 symbols. Otherwise you will get an error while loading the *symbol* files.

Basic Symbols

Graphic Primitives for Point-Symbolizers located in the defined Symbolfile symbols.sym



Symboldefinitions from TrueTypeFont-Files



Graphic Primitives for Line-Symbolizers located in the defined Symbolfile symbols.sym

----- linie-gestr1 -----

----- linie-gestr2 -----

----- linie-gestr3 -----

----- linie-gestr4 -----

..... linie-gepunkt1

..... linie-gepunkt2

..... linie-gepunkt3

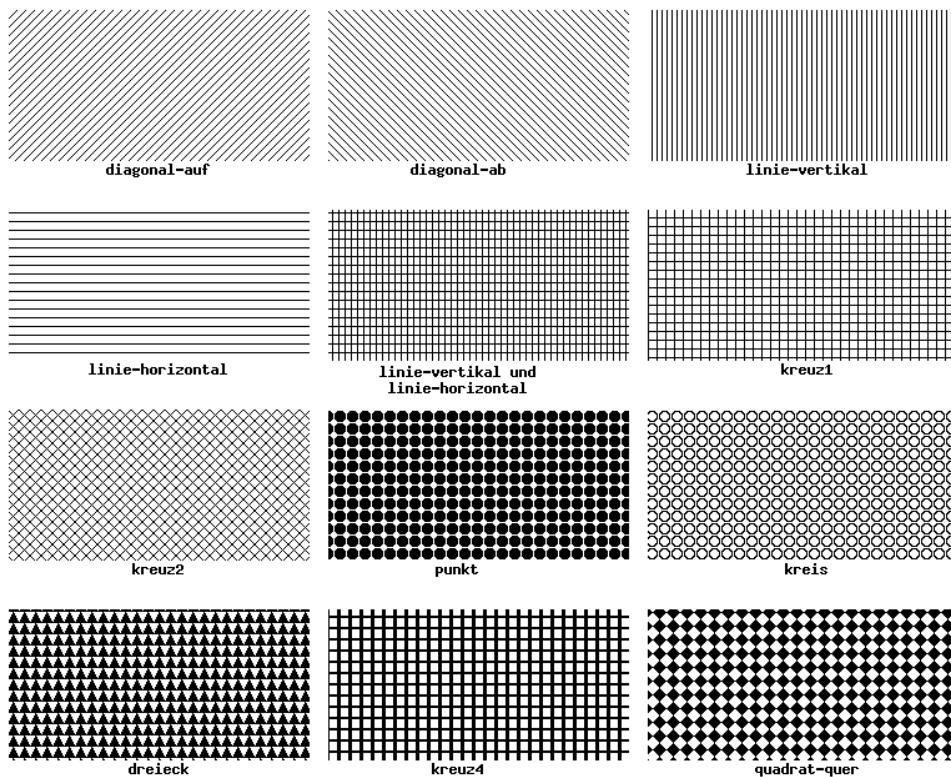
----- grenze1 (based on circle symbol of type ELLIPSE) -----

----- grenze2 (based on rectangle symbol of type VECTOR) -----

----- rechteck-quer-st -----

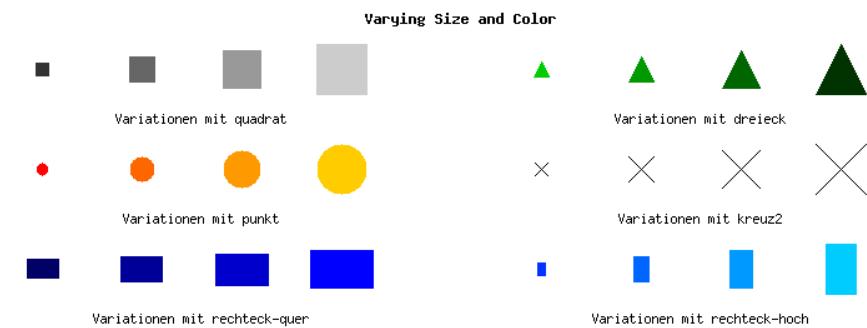
----- rechteck-bahn -----

Graphical Primitives for Polygon-Symbolizers located in the defined Symbolfile symbols.sym



Complex Symbols

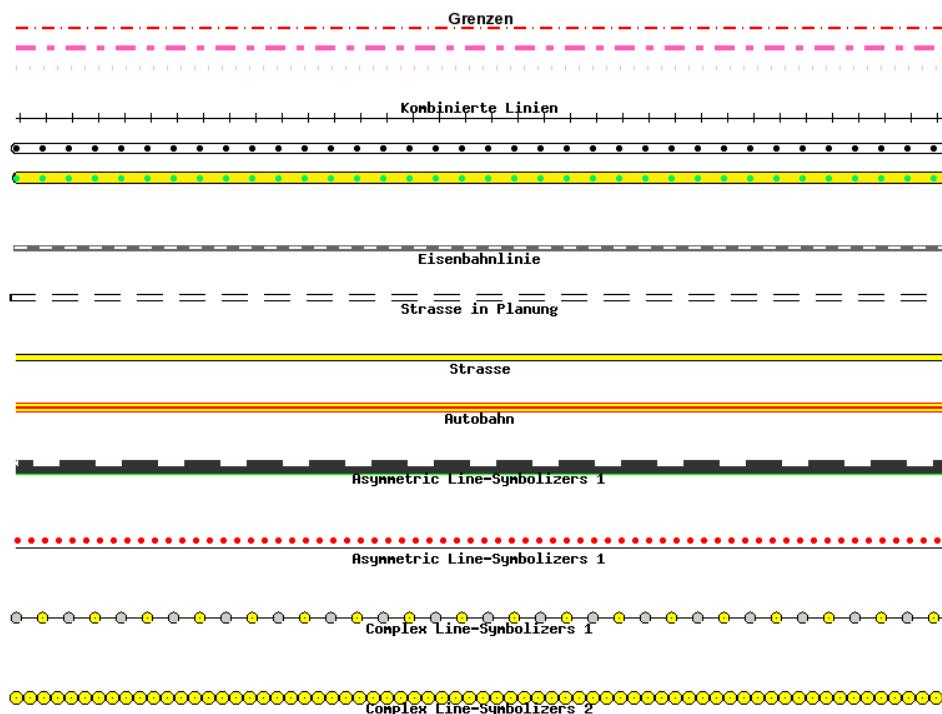
Examples of Point-Symbolizers varying some graphical Attributes

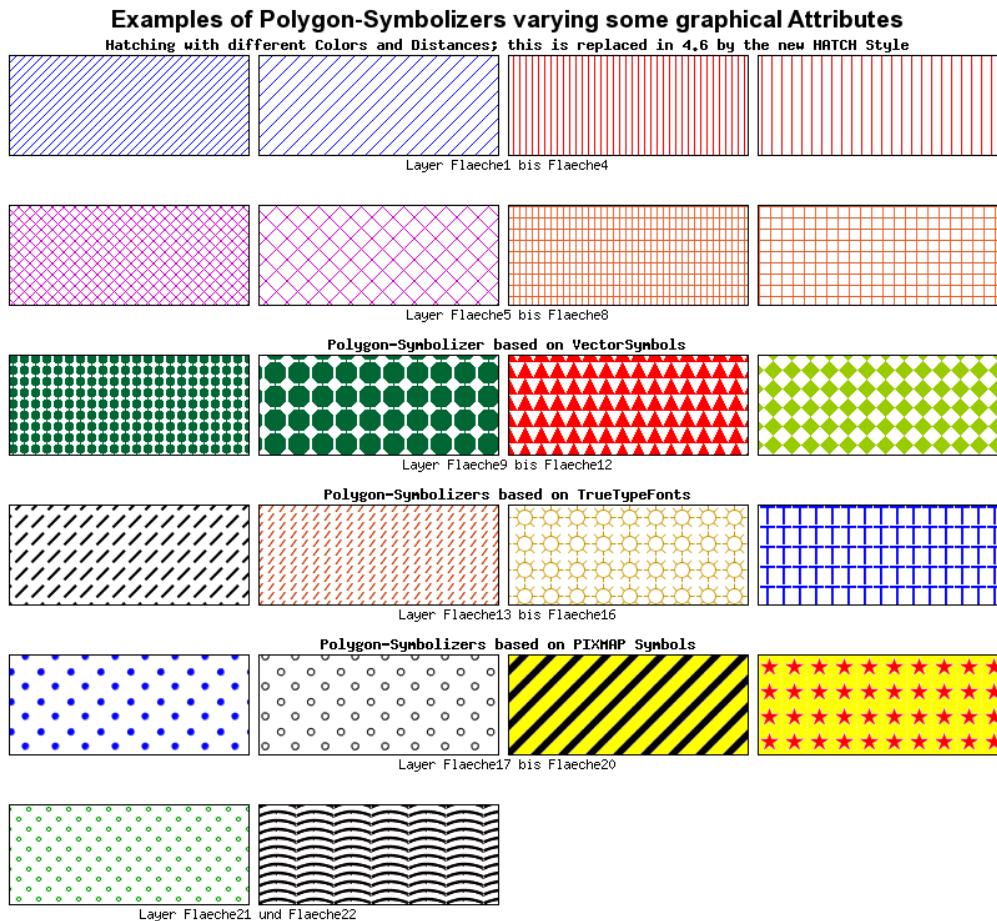


Examples for combinations of several Basetypes



Examples of combined Line-Symbolizers varying some graphical Attributes





5.1.8 Tricks

Changing the center of a point symbol

MapServer does all transformations (offset, rotation) with respect to the symbol anchor point. By default, the anchor point is calculated from the symbol's bounding box. In some cases it can be useful to change the anchor point of a symbol. Since version 6.2, this can be done using the *SYMBOL ANCHORPOINT*.

Here are some examples of what can be achieved by using the *ANCHORPOINT* mechanisms for point symbols and decorated lines. There are three examples in the illustration, and each example shows the result with and without the use of *ANCHORPOINT*. At the top, arrows are added to lines using *GEOMTRANSFORM start / end*. In the middle, tags are added to lines using *GAP* and *ANGLE*. At the bottom, a point symbol is shifted and rotated. The red dots represent the center points, and the blue dots the offsets.

Below you will find three tables that contain the *SYMBOLS* and the *STYLE* mechanisms that were used to generate the shifted symbols in the illustration.

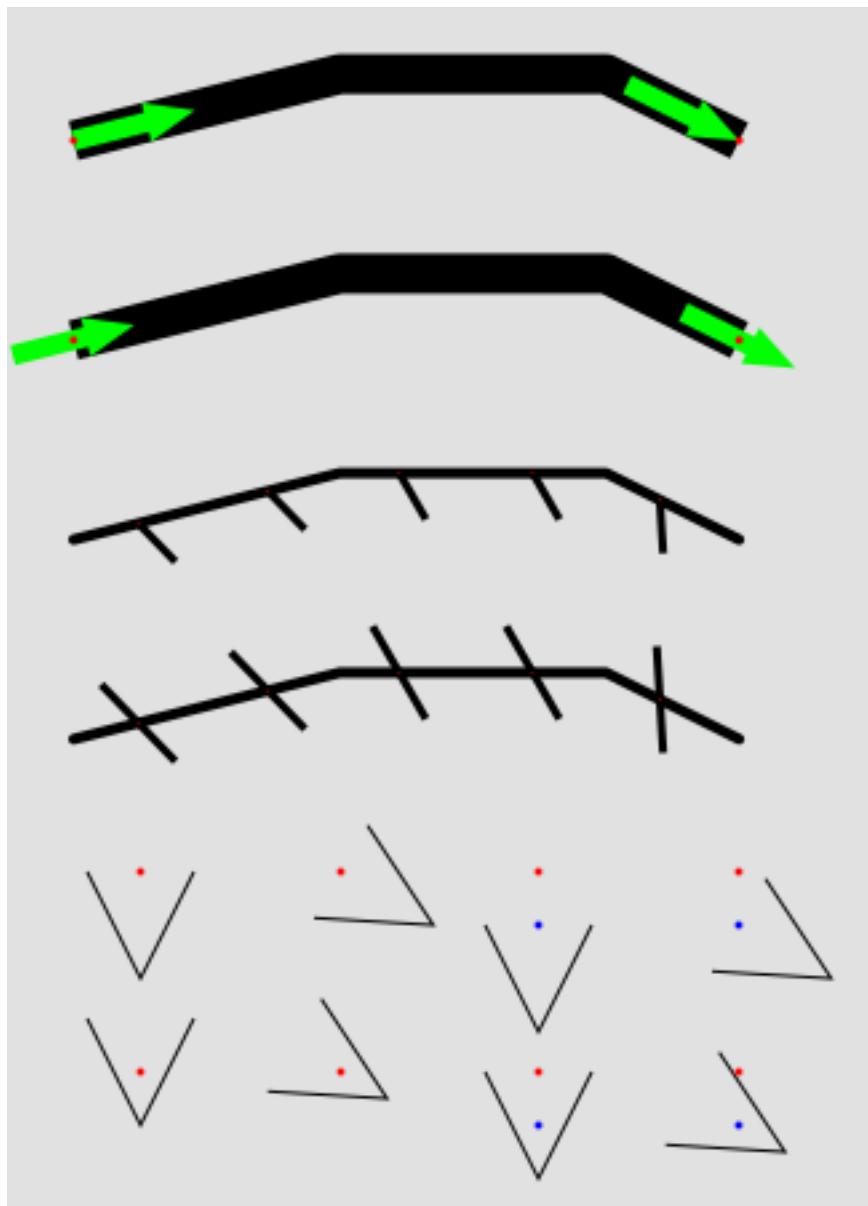


Figure 5.16: Shifting trick

Table 5.6: Symbol tricks - shift - arrows

SYMBOLS	LAYER STYLES
<pre> SYMBOL NAME "arrow-start" TYPE vector FILLED true POINTS 0 0.4 3 0.4 3 0 5 0.8 3 1.6 3 1.2 0 1.2 0 0.4 END # <i>POINTS</i> ANCHORPOINT 0 0.5 END # <i>SYMBOL</i> SYMBOL NAME "arrow-end" TYPE vector FILLED true POINTS 0 0.4 3 0.4 3 0 5 0.8 3 1.6 3 1.2 0 1.2 0 0.4 END # <i>POINTS</i> ANCHORPOINT 1 0.5 END # <i>SYMBOL</i> </pre>	<pre> LAYER # <i>Line</i> STATUS DEFAULT TYPE LINE FEATURE POINTS 20 80 40 85 60 85 70 80 END # <i>Points</i> END # <i>Feature</i> CLASS STYLE COLOR 0 0 0 WIDTH 15 LINECAP butt END # <i>STYLE</i> STYLE GEOMTRANSFORM "start" COLOR 0 255 0 SYMBOL "arrow-start" SIZE 15.0 ANGLE AUTO END # <i>STYLE</i> STYLE GEOMTRANSFORM "start" COLOR 255 0 0 SYMBOL "circlelef" SIZE 3 END # <i>STYLE</i> STYLE GEOMTRANSFORM "end" COLOR 0 255 0 SYMBOL "arrow-end" SIZE 15.0 ANGLE AUTO END # <i>STYLE</i> STYLE GEOMTRANSFORM "end" COLOR 255 0 0 SYMBOL "circlelef" SIZE 3 END # <i>STYLE</i> END # <i>CLASS</i> END # <i>LAYER</i> </pre>

Table 5.7: Symbol tricks - shift - asymmetrical tags

SYMBOLS	LAYER STYLES
<pre> SYMBOL NAME "vert-line-shift" TYPE vector POINTS 0 0 0 10 END # <i>POINTS</i> ANCHORPOINT 0.5 0 END # <i>SYMBOL</i> SYMBOL NAME "vert-line" TYPE vector POINTS 0 0 0 10 END # <i>POINTS</i> END # <i>SYMBOL</i> </pre>	<pre> LAYER # <i>Line - symbol overlay</i> STATUS DEFAULT TYPE LINE FEATURE POINTS 20 50 40 55 60 55 70 50 END # <i>Points</i> END # <i>Feature</i> CLASS STYLE COLOR 0 0 0 WIDTH 4 END # <i>STYLE</i> STYLE COLOR 0 0 0 SYMBOL "vert-line-shift" SIZE 20.0 WIDTH 3 ANGLE 30 GAP -50 END # <i>STYLE</i> STYLE COLOR 255 0 0 SYMBOL "circlelef" SIZE 3 GAP 50 END # <i>STYLE</i> END # <i>CLASS</i> END # <i>LAYER</i> </pre>

Table 5.8: Symbol tricks. Unshifted symbol (top) and shifted symbol

SYMBOLS
<pre> SYMBOL NAME "v-line" TYPE vector POINTS 0 0 5 10 10 0 END # <i>POINTS</i> END # <i>SYMBOL</i> SYMBOL NAME "v-line-shift" TYPE vector POINTS 0 0 5 10 10 0 END # <i>POINTS</i> ANCHORPOINT 0.5 0 END # <i>SYMBOL</i> </pre>

5.1.9 Mapfile changes related to symbols

Version 6.2

The *ANCHORPOINT SYMBOL* parameter was added.

The *INITIALGAP STYLE* parameter was added.

The *GAP STYLE* parameter's behaviour was modified to specify center to center spacing.

PATTERN support for symbols of *TYPE hatch*.

Version 6.0

Parameters related to styling was moved from the *SYMBOL* element to the *STYLE* element of *CLASS* (in *LAYER*):

PATTERN (introduced in 5.0, previously called *STYLE*), *GAP*, *LINECAP*, *LINEJOIN*, *LINEJOINMAXSIZE*

The *SYMBOL TYPE cartoline* is no longer needed, and therefore not available in version 6.0.

5.1.10 Current Problems / Open Issues

GAP - PATTERN incompatibility

Creating advanced line symbols involving dashed lines is difficult due to the incompatibility of the dashed line mechanisms (*PATTERN*) and the symbol on line placement mechanisms (*GAP*). A solution could be to allow *GAP* to be a list instead of a single number (perhaps renaming to *GAPS* or *DISTANCES*), but it would also be necessary to introduce

a new parameter to specify the distance to the first symbol on the line (INITIALGAP has been implemented in the development version - 6.2).

GAP does not support two dimensions (relevant for polygon fills), so the same gap will have to be used for the x and the y directions. The introduction of new parameters - GAPX and GAPY could be a solution to this.

5.1.11 The End

We hope that this document will help you to present your data in a cartographically nice manner with MapServer and explains some basics and possibilities of the concept of MapServer as well as some weaknesses. It would be great to put together a cartographical symbols library for the profit of everyone. This especially concerns truetype fonts, which have been developed for some projects and contain some typical signatures for cartographical needs.

You can also view the [discussion paper for the improvement of the MapServer Graphic-Kernel](#) (German only).

5.2 CLASS

BACKGROUNDCOLOR [r] [g] [b] - *deprecated*

Deprecated since version 6.0: Use *CLASS STYLES*.

COLOR [r] [g] [b]

Deprecated since version 6.0: Use *CLASS STYLES*.

DEBUG [on|off] Enables debugging of the class object. Verbose output is generated and sent to the standard error output (STDERR) or the MapServer logfile if one is set using the *LOG* parameter in the *WEB* object.

See Also:

[MS RFC 28: Redesign of LOG/DEBUG output mechanisms](#)

EXPRESSION [string] Four types of expressions are now supported to define which class a feature belongs to: String comparisons, regular expressions, logical expressions, and string functions (see [Expressions](#)). If no expression is given, then all features are said to belong to this class.

- String comparisons are case sensitive and are the fastest to evaluate. No special delimiters are necessary although strings must be quoted if they contain special characters. (As a matter of good habit, it is recommended that you quote all strings). The attribute to use for comparison is defined in the *LAYER CLASSITEM* parameter.
- Regular expression are limited using slashes (/regex/). The attribute to use for comparison is defined in the *LAYER CLASSITEM* parameter.
- Logical expressions allow the building of fairly complex tests based on one or more attributes and therefore are only available with shapefiles. Logical expressions are delimited by parentheses "(expression)". Attribute names are delimited by square brackets "[ATTRIBUTE]". Attribute names are case sensitive and must match the items in the shapefile. For example:

EXPRESSION ([P O P U L A T I O N] > 50000 AND '[LANGUAGE]' eq 'FRENCH')

The following logical operators are supported: =, >, <, <=, >=, =, or, and, lt, gt, ge, le, eq, ne, in, ~, ~*. As one might expect, this level of complexity is slower to process.

- One string function exists: length(). It computes the length of a string:

EXPRESSION (length('NAME_E') < 8)

String comparisons and regular expressions work from the classitem defined at the layer level. You may mix expression types within the different classes of a layer.

GROUP [string] Allows for grouping of classes. It is only used when a *CLASSGROUP* at the *LAYER* level is set. If the *CLASSGROUP* parameter is set, only classes that have the same group name would be considered at rendering time. An example of a layer with grouped classes might contain:

```
LAYER
...
CLASSGROUP "group1"
...
CLASS
  NAME "name1"
  GROUP "group1"
...
END
CLASS
  NAME "name2"
  GROUP "group2"
...
END
CLASS
  NAME "name3"
  GROUP "group1"
...
END
...
END # layer
```

KEYIMAGE [filename] Full filename of the legend image for the *CLASS*. This image is used when building a legend (or requesting a legend icon via MapScript or the *CGI application*).

LABEL Signals the start of a *LABEL* object. A class can contain multiple labels (since MapServer 6.2).

LEADER Signals the start of a *LEADER* object. Use this along with a *LABEL* object to create label leader lines. New in version 6.2.

MAXSCALEDENOM [double] Minimum scale at which this *CLASS* is drawn. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated *MAXSCALE* parameter.

See Also:

Map Scale

MAXSIZE [integer]

Deprecated since version 6.0: Use *CLASS STYLES*.

MINSCALEDENOM [double] Maximum scale at which this *CLASS* is drawn. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated *MINSCALE* parameter.

See Also:

Map Scale

MINSIZE [integer]

Deprecated since version 6.0: Use *CLASS STYLES*.

NAME [string] Name to use in legends for this class. If not set class won't show up in legend.

OUTLINECOLOR [r] [g] [b]

Deprecated since version 6.0: Use *CLASS STYLES*.

SIZE [integer]

Deprecated since version 6.0: Use *CLASS STYLES*.

STATUS [on|off] Sets the current display status of the class. Default turns the class on.

STYLE Signals the start of a *STYLE* object. A class can contain multiple styles. Multiple styles can be used to create complex symbols (by overlay/stacking). See *Cartographical Symbol Construction with MapServer* for more information on advanced symbol construction.

SYMBOL [integer|string|filename]

Deprecated since version 6.0: Use *CLASS STYLES*.

TEMPLATE [filename] Template file or URL to use in presenting query results to the user. See *Templating* for more info.

TEXT [stringexpression] Text to label features in this class with. This overrides values obtained from the *LAYER LABELITEM*. The string can contain references to feature attributes. This allows you to concatenate multiple attributes into a single label. You can for example concatenate the attributes FIRSTNAME and LASTNAME like this:

```
TEXT '[FIRSTNAME] [LASTNAME]'
```

More advanced *Expressions* can be used to specify the labels. Since version 6.0, there are functions available for formatting numbers:

```
TEXT ("Area is: " + tostring([area], "%,.2f"))
```

VALIDATION Signals the start of a *VALIDATION* block.

As of MapServer 5.4.0, *VALIDATION* blocks are the preferred mechanism for specifying validation patterns for CGI param runtime substitutions. See *Run-time Substitution*.

5.3 CLUSTER

Table of Contents

- **CLUSTER**
 - Description
 - Supported Layer Types
 - Mapfile Parameters
 - Supported Processing Options
 - Mapfile Snippet
 - Feature attributes
 - PHP MapScript Usage
 - Example: Clustering Railway Stations

5.3.1 Description

Since version 6.0, MapServer has the ability to combine multiple features from a point layer into single (aggregated) features based on their relative positions. Only *POINT* layers are supported. This feature was added through *MS RFC 69: Support for clustering of features in point layers*.

5.3.2 Supported Layer Types

POINT

5.3.3 Mapfile Parameters

MAXDISTANCE [double] Specifies the distance of the search region (rectangle or ellipse) in pixel positions.

REGION [string] Defines the search region around a feature in which the neighbouring features are negotiated. Can be ‘rectangle’ or ‘ellipse’.

BUFFER [double] Defines a buffer region around the map extent in pixels. Default is 0. Using a buffer allows that the neighbouring shapes around the map are also considered during the cluster creation.

GROUP [string] This expression evaluates to a string and only the features that have the same group value are negotiated. This parameter can be omitted. The evaluated group value is available in the ‘Cluster:Group’ feature attribute.

FILTER [string] We can define the FILTER expression filter some of the features from the final output. This expression evaluates to a boolean value and if this value is false the corresponding shape is filtered out. This expression is evaluated after the the feature negotiation is completed, therefore the ‘Cluster:FeatureCount’ parameter can also be used, which provides the option to filter the shapes having too many or to few neighbors within the search region.

5.3.4 Supported Processing Options

The following processing options can be used with the cluster layers:

CLUSTER_GET_ALL_SHAPES Return all shapes contained by a cluster instead of a single shape. This setting affects both the drawing and the query processing.

5.3.5 Mapfile Snippet

```
LAYER
  NAME "my-cluster"
  TYPE POINT
  ...
  CLUSTER
    MAXDISTANCE 20 # in pixels
    REGION "ellipse" # can be rectangle or ellipse
    GROUP (expression) # an expression to create separate groups for each value
    FILTER (expression) # a logical expression to specify the grouping condition
  END
  LABELITEM "Cluster:FeatureCount"
  CLASS
    ...
    LABEL
    ...
  END
END
...
END
```

5.3.6 Feature attributes

The clustered layer itself provides the following aggregated attributes:

1. Cluster:FeatureCount - count of the features in the clustered shape
2. Cluster:Group - The group value of the cluster (to which the group expression is evaluated)

These attributes (in addition to the attributes provided by the original data source) can be used to configure the labels of the features and can also be used in expressions. The ITEMS processing option can be used to specify a subset of the attributes from the original layer in the query operations according to the user's preference.

We can use simple aggregate functions (Min, Max, Sum, Count) to specify how the clustered attribute should be calculated from the original attributes. The aggregate function should be specified as a prefix separated by ':' in the attribute definition, like: [Max:itemname]. If we don't specify aggregate functions for the source layer attributes, then the actual value of the cluster attribute will be non-deterministic if the cluster contains multiple shapes with different values. The Count aggregate function in fact provides the same value as Cluster:FeatureCount.

5.3.7 PHP MapScript Usage

The *CLUSTER object* is exposed through PHP MapScript. An example follows:

```
$map = ms_newMapobj("/var/www/vhosts/mysite/httpdocs/test.map");
$layer1=$map->getLayerByName("test1");
$layer1->cluster;
```

5.3.8 Example: Clustering Railway Stations

The following example uses a point datasource, in this case in KML format, to display clusters of railway stations. Two classes are used: one to style and label the cluster, and one to style and label the single railway station.

Note: Since we can't declare 2 labelitems, for the single railway class we use the *TEXT* parameter to label the station.

Mapfile Layer

```
#####
# Lightrail Stations
#####
SYMBOL
  NAME "lightrail"
  TYPE PIXMAP
  IMAGE "../etc/lightrail.png"
END
LAYER
  NAME "lightrail"
  GROUP "default"
  STATUS DEFAULT
  TYPE POINT
  CONNECTIONTYPE OGR
  CONNECTION "lightrail-stations.kml"
  DATA "lightrail-stations"
  LABELITEM "Cluster:FeatureCount"
  CLASSITEM "Cluster:FeatureCount"
#####
```

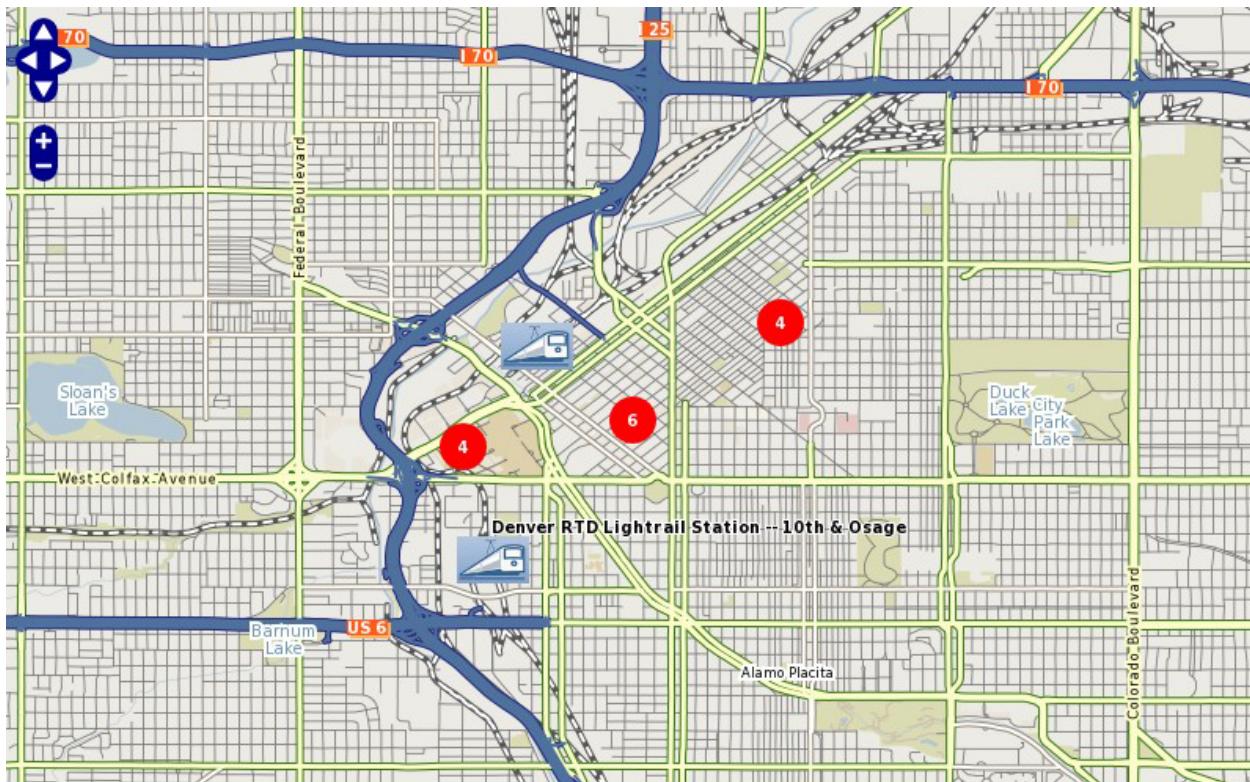
```

# Define the cluster object
#####
CLUSTER
  MAXDISTANCE 50
  REGION "ellipse"
END
#####
# Class1: For the cluster symbol
#####
CLASS
  NAME "Clustered Lightrail Stations"
  EXPRESSION ("[Cluster:FeatureCount]" != "1")
  STYLE
    SIZE 30
    SYMBOL "citycircle"
    COLOR 255 0 0
  END
  LABEL
    FONT [s|c|b]
    TYPE TRUETYPE
    SIZE 8
    COLOR 255 255 255
    ALIGN CENTER
    PRIORITY 10
    BUFFER 1
    PARTIALS TRUE
    POSITION cc
  END
END
#####
# Class2: For the single station
#####
CLASS
  NAME "Lightrail Stations"
  EXPRESSION "1"
  STYLE
    SIZE 30
    SYMBOL "lightrail"
  END
  TEXT "[Name]"
  LABEL
    FONT [s|c|b]
    TYPE TRUETYPE
    SIZE 8
    COLOR 0 0 0
    OUTLINECOLOR 255 255 255
    ALIGN CENTER
    PRIORITY 9
    BUFFER 1
    PARTIALS FALSE
    POSITION ur
  END
END
# the following is used for a query
TOLERANCE 50
UNITS PIXELS
HEADER ".../htdocs/templates/cluster_header.html"
FOOTER ".../htdocs/templates/cluster_footer.html"

```

```
TEMPLATE ".../htdocs/templates/cluster_query.html"
END
```

Map Image



5.4 Display of International Characters in MapServer

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Revision \$Revision: 12506 \$

Date \$Date: 2011-08-29 14:26:49 +0200 (Mon, 29 Aug 2011) \$

Table of Contents

- Display of International Characters in MapServer
 - Credit
 - Related Links
 - Requirements
 - How to Enable in Your Mapfile
 - * Step 1: Verify ICONV Support and MapServer Version
 - * Step 2: Verify That Your Files' Encoding is Supported by ICONV
 - * Step 3: Add ENCODING Parameter to your LABEL Object
 - * Step 4: Test with the shp2img utility
 - Example Using PHP MapScript
 - Notes

5.4.1 Credit

The following functionality was added to MapServer 4.4.0 as a part of a project sponsored by the Information-technology Promotion Agency (IPA), in Japan. Project members included: Venkatesh Raghavan, Masumoto Shinji, Nonogaki Susumu, Nemoto Tatsuya, Hirai Naoki (Osaka City University, Japan), Mario Basa, Hagiwara Akira, Niwa Makoto, Mori Toru (Orkney Inc., Japan), and Hattori Norihiro (E-Solution Service, Inc., Japan).

5.4.2 Related Links

- MapServer [ticket:858](#)

5.4.3 Requirements

- MapServer >= 4.4.0
- MapServer compiled with the libiconv library

5.4.4 How to Enable in Your Mapfile

The mapfile *LABEL* object's parameter named *ENCODING* can be used to convert strings from its original encoding system into one that can be understood by the True Type Fonts. The *ENCODING* parameter accepts the encoding name as its parameter.

MapServer uses GNU's libiconv library (<http://www.gnu.org/software/libiconv/>) to deal with encodings. The libiconv web site has a list of supported encodings. One can also use the “iconv -l” command on a system with libiconv installed to get the complete list of supported encodings on that specific system.

So, theoretically, every string with an encoding system supported by libiconv can be displayed as labels in MapServer as long as it has a matching font-set.

Step 1: Verify ICONV Support and MapServer Version

Execute “mapserv -v” at the commandline, and verify that your MapServer version >= 4.4.0 and it includes “SUPPORTS=ICONV”, such as:

```
> mapserv -v

MapServer version 5.6.5 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG
OUTPUT=WBMP OUTPUT=PDF OUTPUT=SWF OUTPUT=SVG SUPPORTS=PROJ
SUPPORTS=AGG SUPPORTS=FREETYPE SUPPORTS=ICONV SUPPORTS=FRIBIDI
SUPPORTS=WMS_SERVER SUPPORTS=WMS_CLIENT SUPPORTS=WFS_SERVER
SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER SUPPORTS=SOS_SERVER
SUPPORTS=FASTCGI SUPPORTS=THREADS SUPPORTS=GEOS SUPPORTS=RGBA_PNG
SUPPORTS=TILECACHE INPUT=JPEG INPUT=POSTGIS INPUT=OGR INPUT=GDAL
INPUT=SHAPEFILE
```

Step 2: Verify That Your Files' Encoding is Supported by ICONV

Since MapServer uses the libiconv library to handle encodings, you can check the list of supported encodings here: <http://www.gnu.org/software/libiconv/>

Unix users can also use the *iconv -l* command on a system with libiconv installed to get the complete list of supported encodings on that specific system.

Step 3: Add ENCODING Parameter to your LABEL Object

Now you can simply add the ENCODING parameter to your mapfile LAYER object, such as:

```
MAP
...
LAYER
...
CLASS
...
LABEL
...
ENCODING "SHIFT_JIS"
END
END
END
END
```

One of the benefits of having an “ENCODING” parameter within the LABEL object is that different LAYERS with different encoding systems can be combined together and display labels within a single map. For example, labels from a Layer using Shapefile as it source which contains attributes in SHIFT-JIS can be combined with a Layer from a PostGIS database server with EUC-JP attributes. A sample Mapfile can look like this:

```
LAYER
  NAME "chimei"
  DATA chimei
  STATUS DEFAULT
  TYPE POINT
  LABELITEM "NAMAE"
  CLASS
    NAME "CHIMEI"
    STYLE
      COLOR 10 100 100
    END
    LABEL
      TYPE TRUETYPE
      FONT kochi-gothic
      COLOR 220 20 20
      SIZE 10
      POSITION CL
      PARTIALS FALSE
      BUFFER 0
      ENCODING SHIFT_JIS
    END
  END
END

LAYER
  NAME "chimeipg"
  CONNECTION "user=username password=password dbname=gis host=localhost port=5432"
  CONNECTIONTYPE postgis
  DATA "the_geom from chimei"
  STATUS DEFAULT
  TYPE POINT
  LABELITEM "NAMAE"
  CLASS
    NAME "CHIMEI PG"
    STYLE
      COLOR 10 100 100
```

```

END
LABEL
  TYPE TRUETYPE
  FONT k o c h i - m i n c h o
  COLOR 20 220 20
  SIZE 10
  POSITION CL
  PARTIALS FALSE
  BUFFER 0
  ENCODING EUC-JP
END
END
END

```

Step 4: Test with the shp2img utility

- see [shp2img commandline utility](#)

5.4.5 Example Using PHP MapScript

For PHP Mapscript, the *Encoding* parameter is included in the LabelObj Class, so that the encoding parameter of a layer can be modified such as:

```

// Loading the php_mapscript library
dl("php_mapscript.so");

// Loading the map file
$map = ms_newMapObj("example.map");

// get the desired layer
$layer = $map->getLayerByName("chimei");

// get the layer's class object
$class = $layer->getClass(0);

// get the class object's label object
$clabel= $class->label;

// get encoding parameter
$encode_str = $clabel->encoding;
print "Encoding = ".$encode_str."\n";

// set encoding parameter
$clabel->set("encoding", "UTF-8");

```

5.4.6 Notes

Note: During initial implementation, this functionality was tested using the different Japanese encoding systems: Shift-JIS, EUC-JP, UTF-8, as well as Thai's TIS-620 encoding system.

Examples of encodings for the Latin alphabet supported by libiconv are: ISO-8859-1 (Latin alphabet No. 1 - also known as LATIN-1 - western European languages), ISO-8859-2 (Latin alphabet No. 2 - also known as LATIN-2 - eastern European languages), CP1252 (Microsoft Windows Latin alphabet encoding - English and some other Western languages).

5.5 Expressions

Author Dirk Tilger

Contact [dirk at MIRIUP.DE](mailto:dirk@mriup.de)

Author Umberto Nicoletti

Contact [umberto.nicoletti at gmail.com](mailto:umberto.nicoletti@gmail.com)

Revision \$Revision\$

Date \$Date\$

Last Updated 2011/06/30

Contents

- Expressions
 - Introduction
 - * String quotation
 - * Quotes escaping in strings
 - * Using attributes
 - * Character encoding
 - Expression Types
 - * String comparison (equality)
 - * Regular expression comparison
 - “MapServer expressions”
 - * Logical expressions
 - * String expressions that return a logical value
 - * Arithmetic expressions that return a logical value
 - * Spatial expressions that return a logical value (GEOS)
 - * String operations that return a string
 - * Functions that return a string
 - * String functions that return a number
 - * Arithmetic operations and functions that return a number
 - * Spatial functions that return a number (GEOS)
 - * Spatial functions that return a shape (GEOS)
 - * Temporal expressions

5.5.1 Introduction

As of version 6.0, expressions are used in four places:

- In *LAYER FILTER* to specify the features of the dataset that are to be included in the layer.
- In *CLASS EXPRESSION* to specify to which features of the dataset the *CLASS* applies to.
- In *CLASS TEXT* to specify text for labeling features.
- In *STYLE GEOMTRANSFORM*.

String quotation

Strings can be quoted using single or double quotes:

```
' This is a string'
"And this is also a string"
```

Quotes escaping in strings

Note: Quotes escaping is not supported in MapServer versions lower than 5.0.

Starting with MapServer 5.0, if your dataset contains double-quotes, you can use a C-like escape sequence:

```
"National \"hero\" statue"
```

To escape a single quote use the following sequence instead:

```
"National \'hero\' statue"
```

Starting with MapServer 6.0 you don't need to escape single quotes within double quoted strings and you don't need to escape double quotes within single quoted strings. In 6.0 you can also write the string as follows:

```
'National "hero" statue'
...  

```

To escape a single quote use the following sequence instead:

```
"National 'hero' statue"
```

Using attributes

Attribute values can be referenced in the Map file and used in expressions. Attribute references are case sensitive and can be used in the following types of expressions:

- In *LAYER FILTER*
- In *CLASS EXPRESSION*
- In *CLASS TEXT*

Referencing an attribute is done by enclosing the attribute name in square brackets, like this: [ATTRIBUTENAME]. Then, every occurrence of “[ATTRIBUTENAME]” will be replaced by the actual value of the attribute “ATTRIBUTE-NAME”.

Example: The data set of our layer has the attribute “BUILDING_NAME”. We want the value of this attribute to appear inside a string. This can be accomplished as follows (single or double quotes):

```
' The [BUILDING_NAME] building'
```

For the building which has its BUILDING_NAME attribute set to “Historical Museum”, the resulting string is:

```
' The Historical Museum building'
```

For *Raster Data* layers special attributes have been defined that can be used for classification, for example:

- [PIXEL] ... will become the pixel value as number
- [RED], [GREEN], [BLUE] ... will become the color value for the red, green and blue component in the pixel value, respectively.

Character encoding

With MapServer there is no way to specify the character encoding of the mapfile or the layer data sources, so MapServer can't do the character encoding translation. If the character encoding of the data source is not the same as the character encoding of the map file, they could be converted to a common encoding.

5.5.2 Expression Types

Expressions are used to match attribute values with certain logical checks. There are three different types of expressions you can use with MapServer:

- String comparisons: A single attribute is compared with a string value.
- Regular expressions: A single attribute is matched with a regular expression.
- Logical “MapServer expressions”: One or more attributes are compared using logical expressions.

String comparison (equality)

String comparison means, as the name suggests, that attribute values are checked if they are equal to some value. String comparisons are the simplest form of MapServer expressions and the fastest option.

To use a string comparison for filtering a *LAYER*, both *FILTERITEM* and *FILTER* must be set. *FILTERITEM* is set to the attribute name. *FILTER* is set to the value for comparison. The same rule applies to *CLASSITEM* in the *LAYER* object and *EXPRESSION* in the *CLASS* object.

Example for a simple string comparison filter

```
FILTER "2005"
FILTERITEM "year"
```

would match all records that have the attribute “year” set to “2005”. The rendered map would appear as if the dataset would only contain those items that have the “year” set to “2005”.

Similarly, a classification for the items matched above would be done by setting the *CLASSITEM* in the *LAYER* and the *EXPRESSION* in the *CLASS*:

```
LAYER
  NAME "example"
  CLASSITEM "year"
  ...
  CLASS
    NAME "year-2005"
    EXPRESSION "2005"
  ...
END
END
```

For reasons explained later, the values for both *CLASSITEM* and *FILTERITEM* should start with neither a ‘/’ nor a ‘(‘ character.

Regular expression comparison

Regular expressions are a standard text pattern matching mechanism from the Unix world. The functionality of regular expression matching is provided by the operating system on UNIX systems and therefore slightly operating system dependent. However, their minimum set of features are those defined by the POSIX standard. The documentation of the particular regular expression library is usually in the “regex” manual page (“man regex”) on Unix systems.

Regular expression with MapServer work similarly to string comparison, but allow more complex operation. They are slower than pure string comparisons, but might be still faster than logical expression. As for string comparison, when using a regular expressions, *FILTERITEM* (*LAYER FILTER*) or *CLASSITEM* (*CLASS EXPRESSION*) has to be defined if the items are not included in the *LAYER FILTER* or *CLASS EXPRESSION*.

A regular expression typically consists of characters with special meanings and characters that are interpreted as they are. Alphanumeric characters (A-Z, a-z and 0-9) are taken as they are. Characters with special meanings are:

- . will match a single character.
- [and] are used for grouping. For example [A-Z] would match the characters A,B,C,...,X,Y,Z.
- {, }, and * are used to specify how often something should match.
- ^ matches the beginning, \$ matches the end of the value.
- The backslash \ is used to take away the special meaning. For example \\$ would match the dollar sign.

MapServer supports two regex operators:

- ~ case insensitive regular expression
- ~* case sensitive regular expression

The following *LAYER* configuration would have all records rendered on the map that have “hotel” in the attribute named “placename”

```
LAYER
  NAME 'regexp-example'
  FILTERITEM 'placename'
  FILTER /hotel/
  ...
END
```

Note: For *FILTER*, the regular expression is case-sensitive, thus records having “Hotel” in them would not have matched.

Example: Match records that have a value from 2000 to 2010 in the attribute “year”:

```
FILTERITEM "year"
FILTER /^20[0-9][0-9]/
```

Example: Match all the records that are either purely numerical or empty

```
FILTER /^[0-9]*$/
```

Example: Match all the features where the *name* attribute ends with “by”, “BY”, “By” or “bY” (case insensitive matching):

```
EXPRESSION ('[name]' ~* 'by$')
```

Example: Match all the features where the *rdname* attribute starts with “Main”.

```
LAYER
  ...
  CLASSITEM 'rdname'
  CLASS
    EXPRESSION /^Main.*$/
```

Note: If you experience frequently segmentation faults when working with MapServer and regular expressions, it might be that your current working environment is linked against more than one regular expression library. This can happen when MapServer is linked with components that bring their own copy, like the Apache httpd or PHP. In these cases the author has made best experiences with making all those components using the regular expression library of the operating system (i.e. the one in libc). That involved editing the build files of some of the components, however.

5.5.3 “MapServer expressions”

MapServer expressions are the most complex and depending how they are written can become quite slow. They can match any of the attributes and thus allow filtering and classification depending on more than one attribute. Besides pure logical operations there are also expressions that allow certain arithmetic, string and time operations.

To be able to use a MapServer expression for a FILTER or EXPRESSION value, the expression has to finally become a logical value.

Logical expressions

Syntactically, a logical expression is everything encapsulated in round brackets. Logical expressions take logical values as their input and return logical values. A logical expression is either ‘true’ or ‘false’.

- ((Expression1) AND (Expression2))
((Expression1) && (Expression2))
returns true when both of the logical expressions (Expression1 and Expression2) are true.
- ((Expression1) OR (Expression2))
((Expression1) || (Expression2))
returns true when at least one of the logical expressions (Expression1 or Expression2) is true.
- NOT (Expression1)
! (Expression1)
returns true when Expression1 is false.

String expressions that return a logical value

Syntactically, a string is something encapsulated in single or double quotes.

- (“String1” eq “String2”)
(“String1” == “String2”) - deprecated since 6.0
(“String1” = “String2”)
returns true when the strings are equal. Case sensitive.
- (“String1” =* “String2”)
returns true when the strings are equal. Case insensitive.
- (“String1” != “String2”)
(“String1” ne “String2”)
returns true when the strings are not equal.

- (“String1” < “String2”)
 - (“String1” lt “String2”)

returns true when “String1” is lexicographically smaller than “String2”
 - (“String1” > “String2”)
 - (“String1” gt “String2”)

returns true when “String1” is lexicographically larger than “String2”.
 - (“String1” <= “String2”)
 - (“String1” le “String2”)

returns true when “String1” is lexicographically smaller than or equal to “String2”
 - (“String1” >= “String2”)
 - (“String1” ge “String2”)

returns true when “String1” is lexicographically larger than or equal to “String2”.
 - (“String1” IN “token1,token2,...,tokenN”)
 - returns true when “String1” is equal to one of the given tokens.
-

Note: The separator for the tokens is the comma. That means that there can not be unnecessary white space in the list and that tokens that have commas in them cannot be compared.

- (“String1” ~ “regexp”)
 - returns true when “String1” matches the regular expression “regexp”. This operation is identical to the regular expression matching described earlier.
- (“String1” ~* “regexp”)
 - returns true when “String1” matches the regular expression “regexp” (case insensitive). This operation is identical to the regular expression matching described earlier.

Arithmetic expressions that return a logical value

The basic element for arithmetic operations is the number. Arithmetic operations that return numbers will be covered in the next section.

- (n1 eq n2)
 - (n1 == n2) - deprecated since 6.0
 - (n1 = n2)

returns true when the numbers are equal.
- (n1 != n2)
 - (n1 ne n2)

returns true when the numbers are not equal.
- (n1 < n2)
 - (n1 lt n2)

returns true when n1 is smaller than n2.

- (n1 > n2)
(n1 gt n2)
returns true when n1 is larger than n2.
- (n1 <= n2)
(n1 le n2)
returns true when n1 is smaller than or equal to n2.
- (n1 >= n2)
(n1 ge n2)
returns true when n1 is larger than or equal to n2.
- (n1 IN “number1,number2,...,numberN”)
returns true when n1 is equal to one of the given numbers.

Spatial expressions that return a logical value (GEOS)

- (shape1 eq shape2)
returns true if shape1 and shape2 are equal
- (shape1 intersects shape2)
returns true if shape1 and shape2 intersect New in version 6.0.
- (shape1 disjoint shape2)
returns true if shape1 and shape2 are disjoint New in version 6.0.
- (shape1 touches shape2)
returns true if shape1 and shape2 touch New in version 6.0.
- (shape1 overlaps shape2)
returns true if shape1 and shape2 overlap New in version 6.0.
- (shape1 crosses shape2)
returns true if shape1 and shape2 cross New in version 6.0.
- (shape1 within shape2)
returns true if shape1 is within shape2 New in version 6.0.
- (shape1 contains shape2)
returns true if shape1 contains shape2 New in version 6.0.
- (shape1 dwithin shape2)
returns true if the distance between shape1 and shape2 is equal to 0 New in version 6.0.
- (shape1 beyond shape2)
returns true if the distance between shape1 and shape2 is greater than 0 New in version 6.0.

String operations that return a string

- “String1” + “String2”
returns “String1String2”, that is, the two strings concatenated to each other.

Functions that return a string

- `tostring (n1, “Format1”)`
uses “Format1” to format the number n1 (C style formatting - sprintf). New in version 6.0.
- `commify (“String1”)`
adds thousands separators (commas) to a long number to make it more readable New in version 6.0.

String functions that return a number

- `length (“String1”)`
returns the number of characters of “String1”

Arithmetic operations and functions that return a number

- `round (n1 , n2)`
returns n1 rounded to a multiple of n2: $n2 * \text{round}(n1/n2)$ New in version 6.0.
- `n1 + n2`
returns the sum of n1 and n2
- `n1 - n2`
returns n2 subtracted from n1
- `n1 * n2`
returns n1 multiplicated with n2
- `n1 / n2`
returns n1 divided by n2
- `-n1`
returns n1 negated
- `n1 ^ n2`
returns n1 to the power of n2

Note: When the numerical operations above are used like logical operations, the following rule applies: values equal to zero will be taken as ‘false’ and everything else will be ‘true’. That means the expression

(6 + 5)

would return true, but

(5 - 5)

would return false.

Spatial functions that return a number (GEOS)

- `area (shape1)`

returns the area of shape1 New in version 6.0.

Spatial functions that return a shape (GEOS)

- `fromtext ("String1")`

returns the shape corresponding to String1 (WKT - well known text)

```
fromText ('POINT(500000 5000000)')
```

New in version 6.0.

- `buffer (shape1 , n1)`

returns the shape that results when shape1 is buffered with bufferdistance n1 New in version 6.0.

- `difference (shape1 , shape2)`

returns the shape that results when the common area of shape1 and shape2 is subtracted from shape1 New in version 6.0.

Temporal expressions

MapServer uses an internal time type to do comparison. To convert a string into this time type it will check the list below from the top and down to check if the specified time matches, and if so, it will do the conversion. The following are integer values: **YYYY** - year, **MM** - month, **DD** - date, **hh** - hours, **mm** - minutes, **ss** - seconds. The following are character elements of the format: - (dash) - date separator, : (colon) - time separator, **T** - marks the start of the time component (ISO 8601), space - marks the end of the date and start of the time component, **Z** - zulu time (0 UTC offset).

- `YYYY-MM-DDThh:mm:ssZ`
- `YYYY-MM-DDThh:mm:ss`
- `YYYY-MM-DD hh:mm:ss`
- `YYYY-MM-DDThh:mm`
- `YYYY-MM-DD hh:mm`
- `YYYY-MM-DDThh`
- `YYYY-MM-DD hh`
- `YYYY-MM-DD`
- `YYYY-MM`
- `YYYY`
- `Thh:mm:ssZ`
- `Thh:mm:ss`

For temporal values obtained this way, the following operations are supported:

- (t1 eq t2)
 - (t1 == t2) - deprecated since 6.0
 - (t1 = t2)

returns true when the times are equal.
- (t1 != t2)
 - (t1 ne t2)

returns true when the times are not equal.
- (t1 < t2)
 - (t1 lt t2)

returns true when t1 is earlier than t2
- (t1 > t2)
 - (t1 gt t2)

returns true when t1 is later than t2.
- (t1 <= t2)
 - (t1 le t2)

returns true when t1 is earlier than or equal to t2
- (t1 >= t2)
 - (t1 ge t2)

returns true when t1 is later than or equal to t2.

5.6 FEATURE

POINTS A set of xy pairs terminated with an END, for example:

```
POINTS 1 1 50 50 1 50 1 1 END
```

Note: POLYGON/POLYLINE layers POINTS must start and end with the same point (i.e. close the feature).

ITEMS Comma separated list of the feature attributes:

```
ITEMS "value1,value2,value3"
```

Note: Specifying the same number of items is recommended for each features of the same layer. The item names should be specified as a PROCESSING option of the layer.

TEXT [string] String to use for labeling this feature.

WKT [string] A geometry expressed in OpenGIS Well Known Text geometry format. This feature is only supported if MapServer is built with OGR or GEOS support.

```
WKT "POLYGON((500 500, 3500 500, 3500 2500, 500 2500, 500 500))"
WKT "POINT(2000 2500)"
```

Note: Inline features should be defined as their own layers in the mapfile. If another CONNECTIONTYPE is specified in the same layer, MapServer will always use the inline features to draw the layer and ignore the other CONNECTIONTYPES.

5.7 FONTSET

Author Kari Guerts

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Revision \$Revision\$

Date \$Date\$

Last Updated 2008/10/08

Contents

- FONTSET
 - Format of the fontset file

FONTSET is a [MAP](#) parameter. The syntax is:

```
FONTSET [filename]
```

Where *filename* gives the location of the fontset file of the system. The location of the system fontset file could for instance be /usr/share/fonts/truetype/font.list (Debian). The location can be specified using a relative or absolute path.

5.7.1 Format of the fontset file

The format of the fontset file is very simple. Each line contains 2 items: An alias and the name/path of the font separated by white space. The alias is simply the name you refer to the font as in your [Mapfile](#) (eg. times-bold). The name is the actual name of the TrueType file. If not full path then it is interpreted as relative to the location of the fontset. Here's the fontset I use (the font.list file and all .ttf files are stored in the same sub-directory).

Note: Aliases are case sensitive. Excellent reference information about the TrueType format and online font resources is available from the [FreeType](#).

arial	arial.ttf
arial-bold	arialbd.ttf
arial-italic	ariali.ttf
arial-bold-italic	arialbi.ttf
arial_black	ariblk.ttf
comic_sans	comic.ttf
comic_sans-bold	comicbd.ttf
courier	cour.ttf
courier-bold	courbd.ttf
courier-italic	couri.ttf
courier-bold-italic	courbi.ttf
georgia	georgia.ttf

georgia-bold	georgiaab.ttf
georgia-italic	georgiai.ttf
georgia-bold-italic	georgiaz.ttf
impact	impact.ttf
monotype.com	monotype.ttf
recreation_symbols	recreate.ttf
times	times.ttf
times-bold	timesbd.ttf
times-italic	timesi.ttf
times-bold-italic	timesbi.ttf
trebuchet_ms	trebuchet.ttf
trebuchet_ms-bold	trebuchetbd.ttf
trebuchet_ms-italic	trebuchetit.ttf
trebuchet_ms-bold-italic	trebuchetbi.ttf
verdana	verdana.ttf
verdana-bold	verdanab.ttf
verdana-italic	verdanai.ttf
verdana-bold-italic	verdanaz.ttf

5.8 GRID

5.8.1 Description

The GRID object can be used to add labeled graticule lines to your map. Initially developed in 2003 by John Novak, the GRID object is designed to be used inside a [LAYER](#) object to allow multiple GRID objects for a single map (allowing for example: a lat/long GRID, a State Plane GRID, and a UTM GRID to be displayed on the same map image).

5.8.2 Mapfile Parameters:

LABELFORMAT [DD|DDMM|DDMMSS|C format string] Format of the label. “DD” for degrees, “DDMM” for degrees minutes, and “DDMMSS” for degrees, minutes, seconds. A C-style formatting string is also allowed, such as “%g°” to show decimal degrees with a degree symbol. The default is decimal display of whatever SRS you’re rendering the GRID with.

MINARCS [double] The minimum number of arcs to draw. Increase this parameter to get more lines. Optional.

MAXARCS [double] The maximum number of arcs to draw. Decrease this parameter to get fewer lines. Optional.

MININTERVAL [double] The minimum number of intervals to try to use. The distance between the grid lines, in the units of the grid’s coordinate system. Optional.

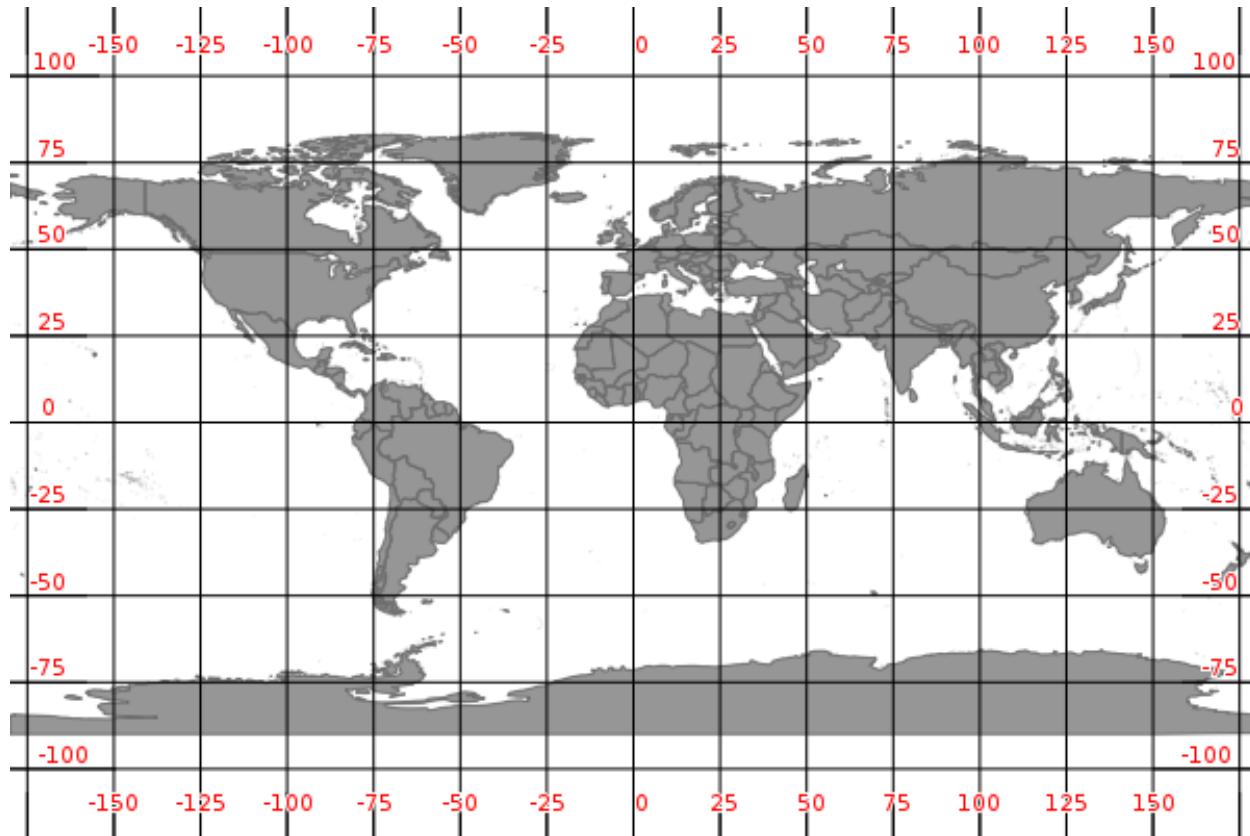
MAXINTERVAL [double] The maximum number of intervals to try to use. The distance between the grid lines, in the units of the grid’s coordinate system. Optional.

MINSUBDIVIDE [double] The minimum number of segments to use when rendering an arc. If the lines should be very curved, use this to smooth the lines by adding more segments. Optional.

MAXSUBDIVIDE [double] The maximum number of segments to use when rendering an arc. If the graticule should be very straight, use this to minimize the number of points for faster rendering. Optional, default 256.

5.8.3 Example1: Grid Displaying Degrees

```
LAYER
  NAME "grid"
  METADATA
    "DESCRIPTION" "Grid"
  END
  TYPE LINE
  STATUS ON
  CLASS
    NAME "Graticule"
    COLOR 0 0 0
    LABEL
      COLOR 255 0 0
      FONT "sans"
      TYPE truetype
      SIZE 8
      POSITION AUTO
      PARTIALS FALSE
      BUFFER 2
      OUTLINECOLOR 255 255 255
    END
  END
  PROJECTION
    "init=epsg:4326"
  END
  GRID
    LABELFORMAT "DD"
  END
END # Layer
```

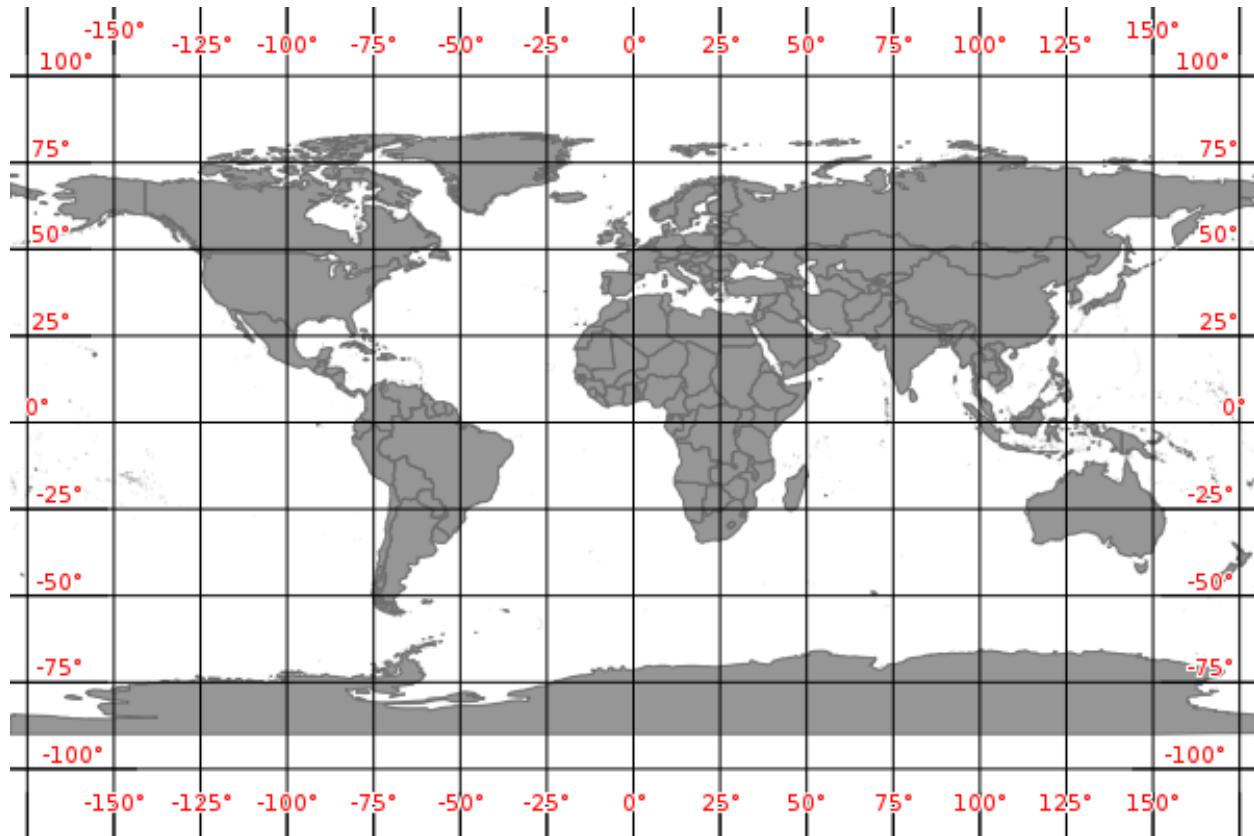


5.8.4 Example2: Grid Displaying Degrees with Symbol

```

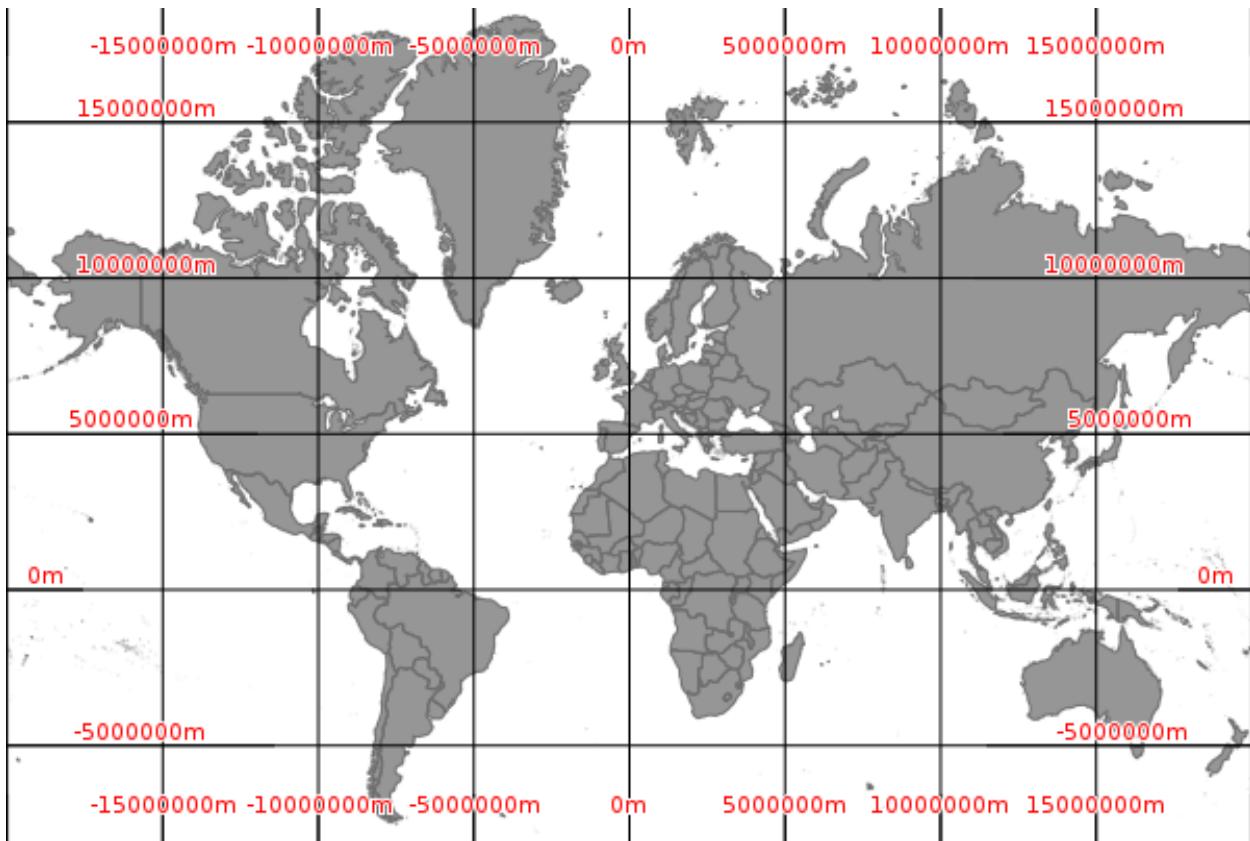
LAYER
  NAME "grid"
  METADATA
    "DESCRIPTION" "Grid"
  END
  TYPE LINE
  STATUS ON
  CLASS
    NAME "Graticule"
    COLOR 0 0 0
    LABEL
      COLOR 255 0 0
      FONT "sans"
      TYPE truetype
      SIZE 8
      POSITION AUTO
      PARTIALS FALSE
      BUFFER 2
      OUTLINECOLOR 255 255 255
    END
  END
  PROJECTION
    "init=epsg:4326"
  END
  GRID
    LABELFORMAT '%g°'
  END
END # Layer

```



5.8.5 Example2: Grid Displayed in Other Projection (Google Mercator)

```
LAYER
  NAME "grid"
  METADATA
    "DESCRIPTION" "Grid"
  END
  TYPE LINE
  STATUS ON
  CLASS
    NAME "Graticule"
    COLOR 0 0 0
    LABEL
      COLOR 255 0 0
      FONT "sans"
      TYPE truetype
      SIZE 8
      POSITION AUTO
      PARTIALS FALSE
      BUFFER 2
      OUTLINECOLOR 255 255 255
    END
  END
  PROJECTION
    "init=epsg:3857"
  END
  GRID
    LABELFORMAT '%.0fm'
    MININTERVAL 5000000
  END
END # Layer
```



Note: Pay attention to the values you use for the INTERVAL parameter; it is possible to confuse/overload MapServer by telling it to draw a graticule line every meter (MININTERVAL 1).

5.9 INCLUDE

When this directive is encountered parsing switches to the included file immediately. As a result the included file can be comprised of any valid mapfile syntax. For example:

```
INCLUDE 'myLayer.map'
```

Performance does not seem to be seriously impacted with limited use, however in high performance instances you may want to use includes in a pre-processing step to build a production mapfile. The C pre-processor can also be used (albeit with a different syntax) and is far more powerful.

5.9.1 Notes

- Supported in versions 4.10 and higher.
- The name of the file to be included **MUST be quoted** (single or double quotes).
- Includes may be nested, up to 5 deep.
- File location can be given as a full path to the file, or (in MapServer >= 4.10.1) as a path relative to the mapfile.
- Debugging can be problematic because:

1. the file an error occurs in does not get output to the user
2. the line number counter is not reset for each file. Here is one possible error that is thrown when the include file cannot be found:

```
msyylex(): Unable to access file. Error opening included file "parks_include.map"
```

5.9.2 Example

```
MAP
  NAME "include_mapfile"
  EXTENT 0 0 500 500
  SIZE 250 250

  INCLUDE "test_include_symbols.map"
  INCLUDE "test_include_layer.map"
END
```

where test_include_symbols.map contains:

```
SYMBOL
  NAME 'square'
  TYPE VECTOR
  FILLED TRUE
  POINTS 0 0 0 1 1 1 1 0 0 0 END
END
```

and test_include_layer.map contains:

```
LAYER
  TYPE POINT
  STATUS DEFAULT
  FEATURE
    POINTS 10 10 40 20 300 300 400 10 10 400 END
  END
  CLASS
    NAME 'Church'
    COLOR 0 0 0
    SYMBOL 'square'
    SIZE 7
    STYLE
      SYMBOL "square"
      SIZE 5
      COLOR 255 255 255
    END
    STYLE
      SYMBOL "square"
      SIZE 3
      COLOR 0 0 255
    END
  END
END
```

5.10 JOIN

5.10.1 Description

Joins are defined within a *LAYER* object. It is important to understand that JOINS are *ONLY* available once a query has been processed. You cannot use joins to affect the look of a map. The primary purpose is to enable lookup tables for coded data (e.g. 1 => Forest) but there are other possible uses.

5.10.2 Supported Formats

- DBF/XBase files
- CSV (comma delimited text file)
- PostgreSQL tables
- MySQL tables

5.10.3 Mapfile Parameters:

CONNECTION [string] Parameters required for the join table's database connection (not required for DBF or CSV joins). The following is an example connection for *PostgreSQL*:

```
CONNECTION "host=127.0.0.1 port=5432 user=postgres password=postgres dbname=somename"
CONNECTIONTYPE POSTGRESQL
```

CONNECTIONTYPE [csv|mysql|postgresql] Type of connection (not required for DBF joins). For PostgreSQL use *postgresql*, for CSV use *csv*, for MySQL use *mysql*.

FOOTER [filename] Template to use *after* a layer's set of results have been sent. In other words, this header HTML will be displayed after the contents of the *TEMPLATE* HTML.

FROM [item] Join item in the dataset. This is case sensitive.

HEADER [filename] Template to use *before* a layer's set of results have been sent. In other words, this header HTML will be displayed before the contents of the *TEMPLATE* HTML.

NAME [string] Unique name for this join. Required.

TABLE [filename|tablename] For file-based joins this is the name of XBase or comma delimited file (relative to the location of the mapfile) to join TO. For PostgreSQL support this is the name of the PostgreSQL table to join TO.

TEMPLATE [filename] Template to use with one-to-many joins. The template is processed once for each record and can only contain substitutions for items in the joined table. Refer to the column in the joined table in your template like *[joinname_columnname]*, where *joinname* is the NAME specified for the JOIN object.

TO [item] Join item in the table to be joined. This is case sensitive.

TYPE [ONE-TO-ONE|ONE-TO-MANY] The type of join. Default is one-to-one.

5.10.4 Example 1: Join from Shape dataset to DBF file

Mapfile Layer

```
LAYER
  NAME "prov_bound"
  TYPE POLYGON
  STATUS DEFAULT
  DATA "prov.shp"
  CLASS
    NAME "Province"
    STYLE
      OUTLINECOLOR 120 120 120
      COLOR 255 255 0
    END
  END
  TEMPLATE ".../htdocs/cgi-query-templates/prov.html"
  HEADER ".../htdocs/cgi-query-templates/prov-header.html"
  FOOTER ".../htdocs/cgi-query-templates/footer.html"
  JOIN
    NAME "test"
    TABLE ".../data/lookup.dbf"
    FROM "ID"
    TO "IDENT"
    TYPE ONE-TO-ONE
  END
END # layer
```

Ogrinfo

```
>ogrinfo lookup.dbf lookup -summary
INFO: Open of 'lookup.dbf'
using driver 'ESRI Shapefile' successful.
```

```
Layer name: lookup
Geometry: None
Feature Count: 12
Layer SRS WKT:
(unknown)
IDENT: Integer (2.0)
VAL: Integer (2.0)
```

```
>ogrinfo prov.shp prov -summary
INFO: Open of 'prov.shp'
using driver 'ESRI Shapefile' successful.
```

```
Layer name: prov
Geometry: Polygon
Feature Count: 12
Extent: (-2340603.750000, -719746.062500) - (3009430.500000, 3836605.250000)
Layer SRS WKT:
(unknown)
NAME: String (30.0)
ID: Integer (2.0)
```

Template

```
<tr bgcolor="#EFEFEF">
  <td align="left">[NAME]</td>
  <td align="left">[test_VAL]</td>
</tr>
```

5.10.5 Example 2: Join from Shape dataset to PostgreSQL table

Mapfile Layer

```
LAYER
  NAME "prov_bound"
  TYPE POLYGON
  STATUS DEFAULT
  DATA "prov.shp"
  CLASS
    NAME "Province"
    STYLE
      OUTLINECOLOR 120 120 120
      COLOR 255 255 0
    END
  END
  TOLERANCE 20
  TEMPLATE ".../htdocs/cgi-query-templates/prov.html"
  HEADER ".../htdocs/cgi-query-templates/prov-header.html"
  FOOTER ".../htdocs/cgi-query-templates/footer.html"
  JOIN
    NAME "test"
    CONNECTION "host=127.0.0.1 port=5432 user=postgres password=postgres dbname=join"
    CONNECTIONTYPE postgresql
    TABLE "lookup"
    FROM "ID"
    TO "ident"
    TYPE ONE-TO-ONE
  END
END # layer
```

Ogrinfo

```
>ogrinfo -ro PG:"host=127.0.0.1 port=5432 user=postgres password=postgres
      dbname=join" lookup -summary
INFO: Open of 'PG:host=127.0.0.1 port=5432 user=postgres password=postgres
      dbname=join'
using driver 'PostgreSQL' successful.
```

```
Layer name: lookup
Geometry: Unknown (any)
Feature Count: 12
Layer SRS WKT:
(unknown)
ident: Integer (0.0)
val: Integer (0.0)
```

Template

```
<tr bgcolor="#EFEFEF">
  <td align="left">[NAME]</td>
  <td align="left">[test_val]</td>
</tr>
```

5.10.6 Example 3: Join from Shape dataset to CSV file

Mapfile Layer

```
LAYER
  NAME "prov_bound"
  TYPE POLYGON
  STATUS DEFAULT
  DATA "prov.shp"
  CLASS
    NAME "Province"
    STYLE
      OUTLINECOLOR 120 120 120
      COLOR 255 255 0
    END
  END
  TOLERANCE 20
  TEMPLATE ".../htdocs/cgi-query-templates/prov.html"
  HEADER ".../htdocs/cgi-query-templates/prov-header.html"
  FOOTER ".../htdocs/cgi-query-templates/footer.html"
  JOIN
    NAME "test"
    CONNECTIONTYPE CSV
    TABLE ".../data/lookup.csv"
    FROM "ID"
    #TO "IDENT" # see note below
    TO "1" # see note below
    TYPE ONE-TO-ONE
  END
END # layer
```

CSV File Structure

```
"IDENT", "VAL"
1,12
2,11
3,10
4,9
5,8
6,7
7,6
8,5
9,4
10,3
11,2
12,1
```

Note: The CSV driver currently doesn't read column names from the first row. It just uses indexes (1, 2, ... n) to reference the columns. It's ok to leave column names as the first row since they likely won't match anything but they aren't used. Typically you'd see something like TO "1" in the JOIN block. Then in the template you'd use [name_1], [name_2], etc...

Ogrinfo

```
>ogrinfo lookup.csv lookup -summary
INFO: Open of 'lookup.csv'
using driver 'CSV' successful.

Layer name: lookup
Geometry: None
Feature Count: 12
Layer SRS WKT:
(unknown)
IDENT: String (0.0)
VAL: String (0.0)
```

Template (prov.html)

Ideally this the template should look like this:

```
<!-- MapServer Template -->
<tr bgcolor="#EFEFEF">
  <td align="left">[NAME]</td>
  <td align="left">[test_VAL]</td>
</tr>
```

But since attribute names are not supported for CSV files (see note above), the following will have to be used:

```
<!-- MapServer Template -->
<tr bgcolor="#EFEFEF">
  <td align="left">[NAME]</td>
  <td align="left">[test_2]</td>
</tr>
```

5.10.7 Example 4: Join from Shape dataset to MySQL

Mapfile Layer

```
LAYER
  NAME "prov_bound"
  TYPE POLYGON
  STATUS DEFAULT
  DATA "prov.shp"
  CLASS
    NAME "Province"
    STYLE
      OUTLINECOLOR 120 120 120
      COLOR 255 255 0
    END # style
  END # class
```

```
TOLERANCE 20
TEMPLATE ".../htdocs/cgi-query-templates/prov.html"
HEADER ".../htdocs/cgi-query-templates/prov-header.html"
FOOTER ".../htdocs/cgi-query-templates/footer.html"
JOIN
  NAME "mysql-join"
  CONNECTIONTYPE MYSQL
  CONNECTION 'server:user:password:database'
  TABLE "mysql-tablename"
  FROM "ID"
  TO "mysql-column"
  TYPE ONE-TO-ONE
END # join
END # layer
```

5.11 LABEL

ALIGN [left|center|right] Specifies text alignment for multiline labels (see [WRAP](#)) Note that the alignment algorithm is far from precise, so don't expect fabulous results (especially for *right* alignment) if you're not using a fixed width font. New in version 5.4.

ANGLE [double|auto|auto2|follow|attribute]

- Angle, given in degrees, to draw the label.
- AUTO allows MapServer to compute the angle. Valid for LINE layers only.
- AUTO2 same as AUTO, except no logic is applied to try to keep the text from being rendered in reading orientation (i.e. the text may be rendered upside down). Useful when adding text arrows indicating the line direction.
- FOLLOW was introduced in version 4.10 and tells MapServer to compute a curved label for appropriate linear features (see [MS RFC 11: Support for Curved Labels](#) for specifics). See also *MAXOVERLAPANGLE*.
- [*Attribute*] was introduced in version 5.0, to specify the item name in the attribute table to use for angle values. The hard brackets [] are required. For example, if your shapefile's DBF has a field named "MYANGLE" that holds angle values for each record, your LABEL object might contain:

```
LABEL
  COLOR 150 150 150
  OUTLINECOLOR 255 255 255
  FONT "sans"
  TYPE truetype
  SIZE 6
  ANGLE [MYANGLE]
  POSITION AUTO
  PARTIALS FALSE
END
```

The associated RFC document for this feature is [MS RFC 19: Style & Label attribute binding](#).

ANTIALIAS [true|false] Should text be antialiased? Note that this requires more available colors, decreases drawing performance, and results in slightly larger output images. Only useful for GD (gif) rendering. Default is false. Has no effect for the other renderers (where anti-aliasing can not be turned off).

BACKGROUNDCOLOR [r] [g] [b] Color to draw a background rectangle (i.e. billboard). Off by default.

Note: Removed in 6.0. Use a [LABEL STYLE](#) object with *GEOMTRANSFORM* *labelpoly* and *COLOR*.

BACKGROUNDSHADOWCOLOR [r] [g] [b] Color to draw a background rectangle (i.e. billboard) shadow. Off by default.

Note: Removed in 6.0. Use a [LABEL STYLE](#) object with *GEOMTRANSFORM* *labelpoly*, *COLOR* and *OFFSET*.

BACKGROUNDSHADOWSIZE [x][y] How far should the background rectangle be offset? Default is 1.

Note: Removed in 6.0. Use a [LABEL STYLE](#) object with *GEOMTRANSFORM* *labelpoly*, *COLOR* and *OFFSET*.

BUFFER [integer] Padding, in pixels, around labels. Useful for maintaining spacing around text to enhance readability. Available only for cached labels. Default is 0.

COLOR [r] [g] [b] | [attribute]

- Color to draw text with.
- [Attribute] was introduced in version 5.0, to specify the item name in the attribute table to use for color values. The hard brackets [] are required. For example, if your shapefile's DBF has a field named "MY-COLOR" that holds color values for each record, your *LABEL* object might contain:

```
LABEL
  COLOR [MYCOLOR]
  OUTLINECOLOR 255 255 255
  FONT "sans"
  TYPE truetype
  SIZE 6
  POSITION AUTO
  PARTIALS FALSE
END
```

The associated RFC document for this feature is [MS RFC 19: Style & Label attribute binding](#).

ENCODING [string] Supported encoding format to be used for labels. If the format is not supported, the label will not be drawn. Requires the iconv library (present on most systems). The library is always detected if present on the system, but if not, the label will not be drawn.

Required for displaying international characters in MapServer. More information can be found in the [Label Encoding document](#).

EXPRESSION [string] Expression that determines when the *LABEL* is to be applied. See *EXPRESSION* in [CLASS](#).
New in version 6.2.

FONT [name|attribute]

- Font alias (as defined in the *FONTS*) to use for labeling.
- [Attribute] was introduced in version 5.6 to specify the font alias.
- May contain a comma-separated list of up to *MS_MAX_LABEL_FONTS* (usually 5) font aliases used as fallback fonts in renderers supporting it, if a glyph is not available in a font. If specified directly, be sure to enclose the list with quotes. See *RFC80*.

FORCE [true|false] Forces labels for a particular class on, regardless of collisions. Available only for cached labels. Default is false. If *FORCE* is true and *PARTIALS* is false, *FORCE* takes precedence, and partial labels are drawn.

MAXLENGTH [integer] This keyword interacts with the [WRAP](#) keyword so that line breaks only occur after the defined number of characters.

Table 5.9: Interaction with WRAP keyword

	maxlength = 0	maxlength > 0	maxlength < 0
wrap = 'char'	always wrap at the WRAP character	newline at the first WRAP character after MAXLENGTH characters	hard wrap (always break at exactly MAXLENGTH characters)
no wrap	no processing	skip label if it contains more than MAXLENGTH characters	hard wrap (always break at exactly MAXLENGTH characters)

The associated RFC document for this feature is [MS RFC 40: Support Label Text Transformations](#). New in version 5.4.

MAXOVERLAPANGLE [double] Angle threshold to use in filtering out ANGLE FOLLOW labels in which characters overlap (floating point value in degrees). This filtering will be enabled by default starting with MapServer 6.0. The default MAXOVERLAPANGLE value will be 22.5 degrees, which also matches the default in GeoServer. Users will be free to tune the value up or down depending on the type of data they are dealing with and their tolerance to bad overlap in labels. As per RFC 60, if MAXOVERLAPANGLE is set to 0, then we fall back on pre-6.0 behavior which was to use maxoverlapangle = 0.4*MS_PI (40% of 180 degrees = 72degree).

The associated RFC document for this feature is [MS RFC 60: Labeling enhancement: ability to skip ANGLE FOLLOW labels with too much character overlap](#).

MAXSCALEDENOM [double] Minimum scale at which this [LABEL](#) is drawn. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. New in version 5.4.

See Also:

[Map Scale](#)

MAXSIZE [double] Maximum font size to use when scaling text (pixels). Default is 256. Starting from version 5.4, the value can also be a fractional value (and not only integer). See [LAYER SYMBOLSCALEDENOM](#).

MINDISTANCE [integer] Minimum distance between duplicate labels. Given in pixels.

MINFEATURESIZE [integer|auto] Minimum size a feature must be to be labeled. Given in pixels. For line data the overall length of the displayed line is used, for polygons features the smallest dimension of the bounding box is used. “Auto” keyword tells MapServer to only label features that are larger than their corresponding label. Available for cached labels only.

MINSCALEDENOM [double] Maximum scale at which this [LABEL](#) is drawn. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. New in version 5.4.

See Also:

[Map Scale](#)

MINSIZE [double] Minimum font size to use when scaling text (pixels). Default is 4. Starting from version 5.4, the value can also be a fractional value (and not only integer). See [LAYER SYMBOLSCALEDENOM](#).

OFFSET [x][y] Offset values for labels, relative to the lower left hand corner of the label and the label point. Given in pixels. In the case of rotated text specify the values as if all labels are horizontal and any rotation will be compensated for.

When used with FOLLOW angle, two additional options are available to render the label parallel to the original feature:

- OFFSET x -99 : will render the label to the left or to the right of the feature, depending on the sign of {x}.
- OFFSET x 99 : will render the label above or below the feature, depending on the sign of {x}.

See [LAYER SYMBOLSCALEDENOM](#).

OUTLINECOLOR [r] [g] [b] | [attribute]

- Color to draw a one pixel outline around the characters in the text.
- [attribute] was introduced in version 5.0, to specify the item name in the attribute table to use for color values. The hard brackets [] are required. For example, if your shapefile's DBF has a field named "MY-OUTCOLOR" that holds color values for each record, your LABEL object might contain:

```
LABEL
  COLOR 150 150 150
  OUTLINECOLOR [MYOUTCOLOR]
  FONT "sans"
  TYPE truetype
  SIZE 6
  POSITION AUTO
  PARTIALS FALSE
END
```

The associated RFC document for this feature is [MS RFC 19: Style & Label attribute binding](#).

OUTLINEWIDTH [integer] Width of the outline if **OUTLINECOLOR** has been set. Defaults to 1. Currently only the AGG renderer supports values greater than 1, and renders these as a 'halo' effect: recommended values are 3 or 5.

PARTIALS [true|false] Can text run off the edge of the map? Default is true. If **FORCE** is true and **PARTIALS** is false, **FORCE** takes precedence, and partial labels are drawn.

POSITION [ull|ucl|ur|cl|cc|cr|ll|lc|lr|auto] Position of the label relative to the labeling point (layers only). First letter is "Y" position, second letter is "X" position. "Auto" tells MapServer to calculate a label position that will not interfere with other labels. With points, MapServer selects from the 8 outer positions (i.e. excluding cc). With polygons, MapServer selects from cc (added in MapServer 5.4), uc, lc, cl and cr as possible positions. With lines, it only uses lc or uc, until it finds a position that doesn't collide with labels that have already been drawn. If all positions cause a conflict, then the label is not drawn (Unless the label's **FORCE** a parameter is set to "true"). "Auto" placement is only available with cached labels.

PRIORITY [integer]||[item_name]||[attribute] The priority parameter takes an integer value between 1 (lowest) and 10 (highest). The default value is 1. It is also possible to bind the priority to an attribute (item_name) using square brackets around the [item_name]. e.g. "PRIORITY [someattribute]"

Labels are stored in the label cache and rendered in order of priority, with the highest priority levels rendered first. Specifying an out of range PRIORITY value inside a map file will result in a parsing error. An out of range value set via MapScript or coming from a shape attribute will be clamped to the min/max values at rendering time. There is no expected impact on performance for using label priorities.

[Attribute] was introduced in version 5.6. New in version 5.0.

REPEATDISTANCE [integer] The label will be repeated on every line of a multiline shape and will be repeated multiple times along a given line at an interval of REPEATDISTANCE pixels.

The associated RFC document for this feature is [MS RFC 57: Labeling enhancements: ability to repeat labels along a line/multiline](#). New in version 5.6.

SHADOWCOLOR [r] [g] [b] Color of drop shadow. A label with the same text will be rendered in this color before the main label is drawn, resulting in a shadow effect on the the label characters. The offset of the rendered shadow is set with SHADOWSIZE.

SHADOWSIZE [x][y]||[attribute][attribute]||[x][attribute]||[attribute][y] Shadow offset in pixels, see SHADOWCOLOR.

[Attribute] was introduced in version 6.0, and can be used like:

```
SHADOWSIZE 2 2
SHADOWSIZE [shadowsizeX] 2
SHADOWSIZE 2 [shadowsizeY]
SHADOWSIZE [shadowsize] [shadowsize]
```

SIZE [double][[tiny|small|medium|large|giant]][[attribute]]

- Text size. Use a number to give the size in pixels of your TrueType font based label, or any of the other 5 listed keywords for bitmap fonts.

When scaling is in effect (*SYMBOLSCALEDENOM* is specified for the *LAYER*), *SIZE* gives the size of the font to be used at the map scale 1:*SYMBOLSCALEDENOM*.

- Starting from version 5.4, the value can also be a fractional value (and not only integer).
- [*Attribute*] was introduced in version 5.0, to specify the item name in the attribute table to use for size values. The hard brackets [] are required. For example, if your shapefile's DBF has a field named "MYSIZE" that holds size values for each record, your *LABEL* object might contain:

```
LABEL
  COLOR 150 150 150
  OUTLINECOLOR 255 255 255
  FONT "sans"
  TYPE truetype
  SIZE [MYSIZE]
  POSITION AUTO
  PARTIALS FALSE
END
```

The associated RFC document for this feature is *MS RFC 19: Style & Label attribute binding*.

STYLE The start of a *STYLE* object.

Label specific mechanisms of the *STYLE* object are the GEOMTRANSFORM options:

GEOMTRANSFORM [labelpnt|labelpoly] Creates a geometry that can be used for styling the label.

- *labelpnt* draws a marker on the geographic position the label is attached to. This corresponds to the center of the label text only if the label is in position CC.
- *labelpoly* generates the bounding rectangle for the text, with 1 pixel of padding added in all directions.

The resulting geometries can be styled using the mechanisms available in the *STYLE* object.

Example - draw a red background rectangle for the labels (i.e. billboard) with a "shadow" in gray:

```
STYLE
  GEOMTRANSFORM 'labelpoly'
  COLOR 153 153 153
  OFFSET 3 2
END # STYLE
STYLE
  GEOMTRANSFORM 'labelpoly'
  COLOR 255 0 0
END # STYLE
```

New in version 6.0.

TEXT [stringexpression] Text to label features with (useful when multiple labels are used). Overrides values obtained from the *LAYER LABELITEM* and the *CLASS TEXT*. See *TEXT* in *CLASS*.

New in version 6.2.

TYPE [bitmap|truetype] Type of font to use. Generally bitmap fonts are faster to draw than TrueType fonts. However, TrueType fonts are scalable and available in a variety of faces. Be sure to set the FONT parameter if you select TrueType.

Note: Bitmap fonts are only supported with the AGG and GD renderers.

WRAP [character] Character that represents an end-of-line condition in label text, thus resulting in a multi-line label.
Interacts with **MAXLENGTH** for conditional line wrapping after a given number of characters

5.12 LAYER

CLASS Signals the start of a **CLASS** object.

Inside a layer, only a single class will be used for the rendering of a feature. Each feature is tested against each class in the order in which they are defined in the mapfile. The first class that matches the its min/max scale constraints and its **EXPRESSION** check for the current feature will be used for rendering.

CLASSGROUP [string] Specify the class's group that would be considered at rendering time. The **CLASS** object's GROUP parameter must be used in combination with CLASSGROUP.

CLASSITEM [attribute] Item name in attribute table to use for class lookups.

CLUSTER Signals the start of a **CLUSTER** object.

The CLUSTER configuration option provides to combine multiple features from the layer into single (aggregated) features based on their relative positions. Supported only for POINT layers.

See Also:

MS RFC 69: Support for clustering of features in point layers

CONNECTION [string] Database connection string to retrieve remote data.

An SDE connection string consists of a hostname, instance name, database name, username and password separated by commas.

A PostGIS connection string is basically a regular PostgreSQL connection string, it takes the form of “user=nobody password=***** dbname=dbname host=localhost port=5432”

An Oracle connection string: user/pass[@db]

See Also:

See *Vector Data* for specific connection information for various data sources.

CONNECTIONTYPE [local|ogr|oracle|spatial|plugin|postgis|sde|union|luvraster|wfs|wms] Type of connection. Default is local. See additional documentation for any other type.

See Also:

See *Vector Data* for specific connection information for various data sources. See *Union Layer* for combining layers, added in MapServer 6.0

Note: *mygis* is another connectiontype, but it is deprecated; please see the *MySQL section* of the Vector Data document for connection details.

DATA [filename][[sde parameters][postgis table/column][oracle table/column]] Full filename of the spatial data to process. No file extension is necessary for shapefiles. Can be specified relative to the SHAPEPATH option from the Map Object.

If this is an SDE layer, the parameter should include the name of the layer as well as the geometry column, i.e. “mylayer,shape,myversion”.

If this is a PostGIS layer, the parameter should be in the form of “<columnname> from <tablename>”, where “columnname” is the name of the column containing the geometry objects and “tablename” is the name of the table from which the geometry data will be read.

For Oracle, use “shape FROM table” or “shape FROM (SELECT statement)” or even more complex Oracle compliant queries! Note that there are important performance impacts when using spatial subqueries however. Try using MapServer’s [FILTER](#) whenever possible instead. You can also see the SQL submitted by forcing an error, for instance by submitting a DATA parameter you know won’t work, using for example a bad column name.

See Also:

See [Vector Data](#) for specific connection information for various data sources.

DEBUG [off|0|1|2|3|4|5] Enables debugging of a layer in the current map.

Debugging with MapServer versions >= 5.0:

Verbose output is generated and sent to the standard error output (STDERR) or the MapServer errorfile if one is set using the “MS_ERRORFILE” environment variable. You can set the environment variable by using the CONFIG parameter at the MAP level of the mapfile, such as:

```
CONFIG "MS_ERRORFILE" "/ms4w/tmp/ms_error.txt"
```

You can also set the environment variable in Apache by adding the following to your httpd.conf:

```
SetEnv MS_ERRORFILE "/ms4w/tmp/ms_error.txt"
```

Once the environment variable is set, the DEBUG mapfile parameter can be used to control the level of debugging output. Here is a description of the possible DEBUG values:

- **DEBUG 0 or OFF** - only mssetError() calls are logged to MS_ERRORFILE. No msDebug() output at all. This is the default and corresponds to the original behavior of MS_ERRORFILE in MapServer 4.x
- **DEBUG 1 or ON** - includes all output from DEBUG 0 plus msDebug() warnings about common pitfalls, failed assertions or non-fatal error situations (e.g. missing or invalid values for some parameters, missing shapefiles in tileindex, timeout error from remote WMS/WFS servers, etc.)
- **DEBUG 2** - includes all output from DEBUG 1 plus notices and timing information useful for tuning mapfiles and applications
- **DEBUG 3** - all of DEBUG 2 plus some debug output useful in troubleshooting problems such as WMS connection URLs being called, database connection calls, etc. This is the recommended level for debugging mapfiles.
- **DEBUG 4** - DEBUG 3 plus even more details...
- **DEBUG 5** - DEBUG 4 plus any msDebug() output that might be more useful to the developers than to the users.

You can also set the debug level by using the “MS_DEBUGLEVEL” environment variable.

The DEBUG setting can also be specified for the entire map, by setting the DEBUG parameter in the [MAP](#) object.

For more details on this debugging mechanism, please see [MS RFC 28: Redesign of LOG/DEBUG output mechanisms](#).

Debugging with MapServer versions < 5:

Verbose output is generated and sent to the standard error output (STDERR) or the MapServer logfile if one is set using the LOG parameter in the WEB object. Apache users will see timing details for drawing in Apache's error_log file. Requires MapServer to be built with the DEBUG=MSDEBUG option (-with-debug configure option).

DUMP [truefalse] Since 6.0, *DUMP* is not used anymore. *LAYER METADATA* is used instead.

Switch to allow MapServer to return data in GML format. Useful when used with WMS GetFeatureInfo operations. "false" by default. Deprecated since version 6.0: *LAYER METADATA* is used instead.

See Also:

[WMS Server](#)

EXTENT [minx] [miny] [maxx] [maxy] The spatial extent of the data. In most cases you will not need to specify this, but it can be used to avoid the speed cost of having MapServer compute the extents of the data. An application can also possibly use this value to override the extents of the map.

FEATURE Signals the start of a *FEATURE* object.

FILTER [string] This parameter allows for data specific attribute filtering that is done at the same time spatial filtering is done, but before any CLASS expressions are evaluated. For OGR and shapefiles the string is simply a mapserver regular expression. For spatial databases the string is a SQL WHERE clause that is valid with respect to the underlying database.

For example: FILTER ([type]='road' and [size]<2)

FILTERITEM [attribute] Item to use with simple **FILTER** expressions. OGR and shapefiles only.

FOOTER [filename] Template to use *after* a layer's set of results have been sent. Multiresult query modes only.

GRID Signals the start of a *GRID* object.

GROUP [name] Name of a group that this layer belongs to. The group name can then be reference as a regular layer name in the template files, allowing to do things like turning on and off a group of layers at once.

If a group name is present in the LAYERS parameter of a CGI request, all the layers of the group are returned (the STATUS of the LAYERs have no effect).

HEADER [filename] Template to use *before* a layer's set of results have been sent. Multiresult query modes only.

JOIN Signals the start of a *JOIN* object.

LABELANGLEITEM [attribute] (As of MapServer 5.0 this parameter is no longer available. Please see the **LABEL** object's ANGLE parameter) For MapServer versions < 5.0, this is the item name in attribute table to use for class annotation angles. Values should be in degrees. Deprecated since version 5.0.

LABELCACHE [onoff] Specifies whether labels should be drawn as the features for this layer are drawn, or whether they should be cached and drawn after all layers have been drawn. Default is on. Label overlap removal, auto placement etc... are only available when the label cache is active.

LABELITEM [attribute] Item name in attribute table to use for class annotation (i.e. labeling).

LABELMAXSCALEDENOM [double] Minimum scale at which this LAYER is labeled. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated LABELMAXSCALE parameter.

See Also:

[Map Scale](#)

LABELMINSCALEDENOM [double] Maximum scale at which this LAYER is labeled. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated LABELMINSCALE parameter.

See Also:

Map Scale

LABELREQUIRES [expression] Sets context for labeling this layer, for example:

```
LABELREQUIRES "![orthoquads]"
```

means that this layer would NOT be labeled if a layer named “orthoquads” is on. The expression consists of a boolean expression based on the status of other layers, each [layer name] substring is replaced by a 0 or a 1 depending on that layer’s **STATUS** and then evaluated as normal. Logical operators AND and OR can be used.

LABELSIZEITEM [attribute] (As of MapServer 5.0 this parameter is no longer available. Please see the [LABEL](#) object’s SIZE parameter) For MapServer versions < 5.0, this is the item name in attribute table to use for class annotation sizes. Values should be in pixels. Deprecated since version 5.0.

MASK [layername] The data from the current layer will only be rendered where it intersects features from the [layername] layer. [layername] must reference the NAME of another **LAYER** defined in the current mapfile. can be any kind of mapserver layer, i.e. vector or raster. If the current layer has labelling configured, then only labels who’s label-point fall inside the unmasked area will be added to the labelcache (the actual glyphs for the label may be rendered ontop of the masked-out area).

Note: Unless you want the features of [layername] to actually appear on the generated map, [layername] should usually be set to **STATUS OFF**.

See Also:

MS RFC 79: Layer Masking

MAXFEATURES [integer] Specifies the number of features that should be drawn for this layer in the CURRENT window. Has some interesting uses with annotation and with sorted data (i.e. lakes by area).

MAXGEOWIDTH [double] Maximum width, in the map’s geographic units, at which this **LAYER** is drawn. If **MAXSCALEDENOM** is also specified then **MAXSCALEDENOM** will be used instead. (*added in MapServer 5.4.0*)

The width of a map in geographic units can be found by calculating the following from the extents:

```
[maxx] - [minx]
```

MAXSCALEDENOM [double] Minimum scale at which this **LAYER** is drawn. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated **MAXSCALE** parameter.

See Also:

Map Scale

METADATA This keyword allows for arbitrary data to be stored as name value pairs. This is used with [OGC WMS](#) to define things such as layer title. It can also allow more flexibility in creating templates, as anything you put in here will be accessible via template tags.

Example:

```
METADATA
  "title" "My layer title"
  "author" "Me!"
END
```

MINGEOWIDTH [double] Minimum width, in the map’s geographic units, at which this **LAYER** is drawn. If **MINSCALEDENOM** is also specified then **MINSCALEDENOM** will be used instead. (*added in MapServer 5.4.0*)

The width of a map in geographic units can be found by calculating the following from the extents:

```
[maxx] - [minx]
```

MINSCALEDENOM [double] Maximum scale at which this LAYER is drawn. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated MINSCALE parameter.

See Also:

Map Scale

NAME [string] Short name for this layer. This name is the link between the mapfile and web interfaces that refer to this name. They must be identical. The name should be unique, unless one layer replaces another at different scales. Use the GROUP option to associate layers with each other. It is recommended that the name not contain spaces, special characters, or begin with a number (which could cause problems through interfaces such as OGC services).

OFFSITE [r] [g] [b] Sets the color index to treat as transparent for raster layers.

OPACITY [integer|alpha] Sets the opacity level (or the inability to see through the layer) of all classed pixels for a given layer. The value can either be an integer in the range (0-100) or the named symbol “ALPHA”. A value of 100 is opaque and 0 is fully transparent. Implemented in MapServer 5.0, to replace the deprecated TRANSPARENCY parameter.

The “ALPHA” symbol directs the MapServer rendering code to honor the indexed or alpha transparency of pixmap symbols used to style a layer. This is only needed in the case of RGB output formats, and should be used only when necessary as it is expensive to render transparent pixmap symbols onto an RGB map image.

PLUGIN [filename] Additional library to load by MapServer, for this layer. This is commonly used to load specific support for SDE and Microsoft SQL Server layers, such as:

```
CONNECTIONTYPE PLUGIN
CONNECTION "hostname,port:xxx, database,username,password"
PLUGIN "C:/ms4w/Apache/specialplugins/msplugin_sde_92.dll"
DATA "layername,geometrycolumn,SDE.DEFAULT"
```

POSTLABELCACHE [true|false] Tells MapServer to render this layer after all labels in the cache have been drawn. Useful for adding neatlines and similar elements. Default is false.

PROCESSING [string] Passes a processing directive to be used with this layer. The supported processing directives vary by layer type, and the underlying driver that processes them.

- **Attributes Directive** - The ITEMS processing option allows to specify the name of attributes for inline layers or specify the subset of the attributes to be used by the layer, such as:

```
PROCESSING "ITEMS=itemname1,itemname2,itemname3"
```

- **Connection Pooling Directive** - This is where you can enable connection pooling for certain layer types. Connection pooling will allow MapServer to share the handle to an open database or layer connection throughout a single map draw process. Additionally, if you have FastCGI enabled, the connection handle will stay open indefinitely, or according to the options specified in the *FastCGI* configuration. *Oracle Spatial*, *ArcSDE*, *OGR* and *PostGIS/PostgreSQL* currently support this approach.

```
PROCESSING "CLOSE_CONNECTION=DEFER"
```

- **Label Directive** - The LABEL_NO_CLIP processing option can be used to skip clipping of shapes when determining associated label anchor points. This avoids changes in label position as extents change between map draws. It also avoids duplicate labels where features appear in multiple adjacent tiles when creating tiled maps.

```
PROCESSING "LABEL_NO_CLIP=True"
```

- **Line Rendering Directive** - The POLYLINE_NO_CLIP processing option can be used to skip clipping of shapes when rendering styled lines (dashed or styled with symbols). This avoids changes in the line styling as extents change between map draws. It also avoids edge effects where features appear in multiple adjacent tiles when creating tiled maps.

```
PROCESSING "POLYLINE_NO_CLIP=True"
```

- **OGR Styles Directive** - This directive can be used for obtaining label styles through MapScript. For more information see the *MapServer's OGR document*.

```
PROCESSING "GETSHAPE_STYLE_ITEMS=all"
```

- **Raster Directives** - All raster processing options are described in *Raster Data*. Here we see the SCALE and BANDS directives used to autoscale raster data and alter the band mapping.

```
PROCESSING "SCALE=AUTO"
```

```
PROCESSING "BANDS=3,2,1"
```

PROJECTION Signals the start of a *PROJECTION* object.

REQUIRES [expression] Sets context for displaying this layer (see *LABELREQUIRES*).

SIZEUNITS [feet|inches|kilometers|meters|miles|nauticalmiles|pixels] Sets the unit of *CLASS* object SIZE values (default is pixels). Useful for simulating buffering. *Nauticalmiles* was added in MapServer 5.6.

STATUS [on|off|default] Sets the current status of the layer. Often modified by MapServer itself. Default turns the layer on permanently.

Note: In *CGI* mode, layers with STATUS DEFAULT cannot be turned off using normal mechanisms. It is recommended to set layers to STATUS DEFAULT while debugging a problem, but set them back to ON/OFF in normal use.

Note: For *WMS*, layers in the server mapfile with STATUS DEFAULT are always sent to the client.

Note: The STATUS of the individual layers of a GROUP has no effect when the group name is present in the LAYERS parameter of a CGI request - all the layers of the group will be returned.

STYLEITEM [<attribute>|auto] Item to use for feature specific styling. The style information may be represented by a separate attribute (style string) attached to the feature. MapServer supports the following style string representations:

- **MapServer STYLE definition** - The style string can be represented as a MapServer *STYLE* block according to the following example:

```
STYLE BACKGROUNDCOLOR 128 0 0 COLOR 0 0 208 END
```

- **MapServer CLASS definition** - By specifying the entire *CLASS* instead of a single style allows to use further options (like setting expressions, label attributes, multiple styles) on a per feature basis.

- **OGR Style String** - MapServer support rendering the OGR style string format according to the *OGR - Feature Style Specification* documentation. Currently only a few data sources support storing the styles along with the features (like MapInfo, AutoCAD DXF, Microstation DGN), however those styles can easily be transferred to many other data sources as a separate attribute by using the *ogr2ogr* command line tool as follows:

```
ogr2ogr -sql "select *, OGR_STYLE from srclayer" "dstlayer" "srclayer"
```

The value: *AUTO* can be used for automatic styling.

- Automatic styling can be provided by the driver. Currently, only the OGR driver supports automatic styling.
- When used for a *Union Layer*, the styles from the source layers will be used.

SYMBOLSCALEDENOM [double] The scale at which symbols and/or text appear full size. This allows for dynamic scaling of objects based on the scale of the map. If not set then this layer will always appear at the same size. Scaling only takes place within the limits of MINSIZE and MAXSIZE as described above. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated SYMBOLSCALE parameter.

See Also:

Map Scale

TEMPLATE [file|url] Used as a global alternative to *CLASS TEMPLATE*. See *Templating* for more info.

TILEINDEX [filename|layername] Name of the tileindex file or layer. A tileindex is similar to an ArcInfo library index. The tileindex contains polygon features for each tile. The item that contains the location of the tiled data is given using the TILEITEM parameter. When a file is used as the tileindex for shapefile or raster layers, the tileindex should be a shapefile. For CONNECTIONTYPE OGR layers, any OGR supported datasource can be a tileindex. Normally the location should contain the path to the tile file relative to the shapepath, not relative to the tileindex itself. If the DATA parameter contains a value then it is added to the end of the location. When a tileindex layer is used, it works similarly to directly referring to a file, but any supported feature source can be used (ie. postgres, oracle).

Note: All files in the tileindex should have the same coordinate system, and for vector files the same set of attributes in the same order.

TILEITEM [attribute] Item that contains the location of an individual tile, default is “location”.

TOLERANCE [double] Sensitivity for point based queries (i.e. via mouse and/or map coordinates). Given in TOLERANCEUNITS. If the layer is a POINT or a LINE, the default is 3. For all other layer types, the default is 0. To restrict polygon searches so that the point must occur in the polygon set the tolerance to zero.

TOLERANCEUNITS [pixels|feet|inches|kilometers|meters|miles|nauticalmiles|dd] Units of the TOLERANCE value. Default is pixels. *Nauticalmiles* was added in MapServer 5.6.

TRANSPARENCY [integer|alpha] - deprecated Since MapServer 5.0 the proper parameter to use is OPACITY. The deprecated TRANSPARENCY parameter sets the transparency level of all classed pixels for a given layer. The value can either be an integer in the range (0-100) or the named symbol “ALPHA”. Although this parameter is named “transparency”, the integer values actually parameterize layer opacity. A value of 100 is opaque and 0 is fully transparent.

The “ALPHA” symbol directs the MapServer rendering code to honor the indexed or alpha transparency of pixmap symbols used to style a layer. This is only needed in the case of RGB output formats, and should be used only when necessary as it is expensive to render transparent pixmap symbols onto an RGB map image. Deprecated since version 5.0.

See Also:

OPACITY

TRANSFORM [true|false ull|ulur|lclcl|rll|rll|lcl|r] Tells MapServer whether or not a particular layer needs to be transformed from some coordinate system to image coordinates. Default is true. This allows you to create shapefiles in image/graphics coordinates and therefore have features that will always be displayed in the same

location on every map. Ideal for placing logos or text in maps. Remember that the graphics coordinate system has an origin in the upper left hand corner of the image, contrary to most map coordinate systems.

Version 4.10 introduces the ability to define features with coordinates given in pixels (or percentages, see UNITS), most often inline features, relative to something other than the UL corner of an image. That is what ‘TRANSFORM FALSE’ means. By setting an alternative origin it allows you to anchor something like a copyright statement to another portion of the image in a way that is independent of image size.

TYPE [chart|circle|line|point|polygon|raster|query] Specifies how the data should be drawn. Need not be the same as the shapefile type. For example, a polygon shapefile may be drawn as a point layer, but a point shapefile may not be drawn as a polygon layer. Common sense rules.

In order to differentiate between POLYGONS and POLYLINES (which do not exist as a type), simply respectively use or omit the COLOR keyword when classifying. If you use it, it’s a polygon with a fill color, otherwise it’s a polyline with only an OUTLINECOLOR.

A *circle* must be defined by a minimum bounding rectangle. That is, two points that define the smallest square that can contain it. These two points are the two opposite corners of said box. The following is an example using inline points to draw a circle:

```
LAYER
  NAME 'inline_circles'
  TYPE CIRCLE
  STATUS ON
  FEATURE
    POINTS
      74.01 -53.8
      110.7 -22.16
    END
  END
  CLASS
    STYLE
      COLOR 0 0 255
    END
  END
END
```

TYPE query means the layer can be queried but not drawn.

Note: *TYPE annotation* has been deprecated since version 6.2. Identical functionality can be obtained by adding *LABEL* level *STYLE* blocks, and do not require loading the datasets twice in two different layers as was the case with layers of *TYPE annotation*.

See Also:

The [Dynamic Charting](#) HowTo for *TYPE chart*.

UNITS [dd|feet|inches|kilometers|meters|miles|nauticalmiles|percentages|pixels] Units of the layer. *percentages* (in this case a value between 0 and 1) was added in MapServer 4.10 and is mostly geared for inline features. *nauticalmiles* was added in MapServer 5.6.

VALIDATION Signals the start of a *VALIDATION* block.

As of MapServer 5.4.0, *VALIDATION* blocks are the preferred mechanism for specifying validation patterns for CGI param runtime substitutions. See [Run-time Substitution](#).

5.13 LEADER

Table of Contents

- **LEADER**
 - Description
 - Supported Layer Types
 - Mapfile Parameters
 - Mapfile Snippet
 - Example: World Countries Labels

5.13.1 Description

Since version 6.2, MapServer has the ability to draw label lines to features where space is an issue for the label (often when the label text is larger than the polygon being labelled). This feature was added through [MS RFC 81: Offset Labels with Leader Lines](#).

5.13.2 Supported Layer Types

POLYGON

5.13.3 Mapfile Parameters

GRIDSTEP [integer] Specifies the number of pixels between positions that are tested for a label line. You might start with a value of 5, and increase depending on performance (see example below).

MAXDISTANCE [integer] Specifies the maximum distance in pixels from the normal label location that a leader line can be drawn. You might start with a value of 30, and increase depending on the resulting placement (see example below).

STYLE Signals the start of a **STYLE** object. Use this to style the leader line.

5.13.4 Mapfile Snippet

```
LAYER
  NAME "my-labels"
  TYPE POLYGON
  ...
  CLASS
    ...
    LABEL
    ...
  END
  LEADER
    GRIDSTEP 5 # number of pixels between positions that are tested
    MAXDISTANCE 30 # distance in pixels that leader text can be drawn
    STYLE # normal line styles are supported
      COLOR 255 0 0
      WIDTH 1
    END
  END
END
```

5.13.5 Example: World Countries Labels

The following example uses a polygon layer to display country labels.

Note: The data and mapfile for this example are available for download at: <http://download.osgeo.org/mapserver/tickets/label-leader.zip> (11MB).

Mapfile Example #1

```
MAP
  NAME "leader-test"
  STATUS ON
  SIZE 800 600
  SYMBOLSET "../etc/symbols.txt"
  EXTENT -43 10 83 83
  UNITS DD
  SHAPEPATH "../data"
  IMAGECOLOR 255 255 255
  FONTSET "../etc/fonts.txt"

  WEB
    IMAGEPATH "/ms4w/tmp/ms_tmp/"
    IMAGEURL "/ms_tmp/"
  END

  #
  # Start of layer definitions
  #

  LAYER
    NAME "continents"
    TYPE POLYGON
    STATUS ON
    DATA "world_countries-dissolve"
    LABELITEM "NA2DESC"
    CLASS
      NAME "World Countries"
      STYLE
        COLOR 200 200 200
        OUTLINECOLOR 120 120 120
      END
    LABEL
      COLOR 0 0 0
      FONT sans
      TYPE truetype
      SIZE 8
      POSITION AUTO
      PARTIALS FALSE
      OUTLINECOLOR 255 255 255
      MINFEATURESIZE 2
      MINDISTANCE 1000
      BUFFER 5
    END
  #####

```

```

# Leader Object
#####
LEADER
  GRIDSTEP 40
  MAXDISTANCE 1000
  STYLE
    COLOR 200 100 100
    WIDTH 2
  END
END
END
END
END # Map File

```

Map Image



Mapfile Example #2

This time use a shorter maximum leader line (MAXDISTANCE) and increase the number of tests (GRIDSTEP).

MAP

```
LAYER
  ...
  CLASS
    ...
      LABEL
      ...
    END
  #####
  # Leader Object
  #####
  LEADER
    GRIDSTEP 10
    MAXDISTANCE 100
    STYLE
      COLOR 200 100 100
      WIDTH 2
    END
  END
END

END # Map File
```

Map Image



5.14 LEGEND

The size of the legend image is NOT known prior to creation so be careful not to hard-code width and height in the tag in the template file.

IMAGECOLOR [r] [g] [b] Color to initialize the legend with (i.e. the background).

INTERLACE [on|off] Default is [on]. This keyword is now deprecated in favor of using the FORMATOPTION “INTERLACE=ON” line in the *OUTPUTFORMAT* declaration. Deprecated since version 4.6.

KEYSIZE [x][y] Size of symbol key boxes in pixels. Default is 20 by 10.

KEYSPACING [x][y] Spacing between symbol key boxes ([y]) and labels ([x]) in pixels. Default is 5 by 5.

LABEL Signals the start of a *LABEL* object

OUTLINECOLOR [r] [g] [b] Color to use for outlining symbol key boxes.

POSITION [ul|uc|ur|ll|lc|lr] Where to place an embedded legend in the map. Default is lr.

POSTLABELCACHE [true|false] Tells MapServer to render this legend after all labels in the cache have been drawn. Useful for adding neatlines and similar elements. Default is false.

STATUS [on|off|embeded] Is the legend image to be created.

TEMPLATE [filename] HTML legend template file.

See Also:

[HTML Legends with MapServer](#)

TRANSPARENT [on|off] Should the background color for the legend be transparent. This flag is now deprecated in favor of declaring transparency within [OUTPUTFORMAT](#) declarations. Default is off. Deprecated since version 4.6.

5.15 MAP

Note: The map object is started with the word *MAP*, and ended with the word *END*.

ANGLE [double] Angle, given in degrees, to rotate the map. Default is 0. The rendered map will rotate in a clockwise direction. The following are important notes:

- Requires a [PROJECTION](#) object specified at the MAP level and for each [LAYER](#) object (even if all layers are in the same projection).
- Requires [MapScript \(SWIG, PHP MapScript\)](#). Does not work with [CGI](#) mode.
- If using the [LABEL](#) object's ANGLE or the [LAYER](#) object's *LABELANGLEITEM* parameters as well, these parameters are relative to the map's orientation (i.e. they are computed after the *MAP* object's *ANGLE*). For example, if you have specified an *ANGLE* for the map of 45, and then have a layer *LABELANGLEITEM* value of 45, the resulting label will not appear rotated (because the resulting map is rotated clockwise 45 degrees and the label is rotated counter-clockwise 45 degrees).
- More information can be found on the [MapRotation Wiki Page](#).

CONFIG [key] [value] This can be used to specify several values at run-time, for both MapServer and GDAL/OGR libraries. Developers: values will be passed on to CPLSetConfigOption(). Details on GDAL/OGR options are found in their associated driver documentation pages ([GDAL/OGR](#)). The following options are available specifically for MapServer:

CGI_CONTEXT_URL [value] This *CONFIG* parameter can be used to enable loading a map context from a URL. See the [Map Context HowTo](#) for more info.

MS_ENCRYPTION_KEY [filename] This *CONFIG* parameter can be used to specify an encryption key that is used with MapServer's *msencryp utility*.

MS_ERRORFILE [filename] This *CONFIG* parameter can be used to write MapServer errors to a file (as of MapServer 5.0). With MapServer 5.x, a full path (absolute reference) is required, including the filename. Starting with MapServer 6.0, a filename with relative path can be passed via this *CONFIG* directive, in which case the filename is relative to the mapfile location. Note that setting MS_ERRORFILE via an environment variable always requires an absolute path since there would be no mapfile to make the path relative to. For more on this see the *DEBUG* parameter below.

MS_NONSQUARE [yes|no] This *CONFIG* parameter can be used to allow non-square pixels (meaning that the pixels represent non-square regions). For “MS_NONSQUARE” “yes” to work, the [MAP](#), and each [LAYER](#) will have to have a [PROJECTION](#) object.

Note: Has no effect for WMS.

ON_MISSING_DATA [FAIL|LOG|IGNORE] This *CONFIG* parameter can be used to tell MapServer how to handle missing data in tile indexes (as of MapServer 5.3-dev, r8015). Previous MapServer versions required a compile-time switch (“IGNORE_MISSING_DATA”), but this is no longer required.

FAIL This will cause MapServer to throw an error and exit (to crash, in other words) on a missing file in a tile index. This is the default.

```
CONFIG "ON_MISSING_DATA" "FAIL"
```

LOG This will cause MapServer to log the error message for a missing file in a tile index, and continue with the map creation. Note: *DEBUG* parameter and CONFIG “MS_ERRORFILE” need to be set for logging to occur, so please see the *DEBUG* parameter below for more information.

```
CONFIG "ON_MISSING_DATA" "LOG"
```

IGNORE This will cause MapServer to not report or log any errors for missing files, and map creation will occur normally.

```
CONFIG "ON_MISSING_DATA" "IGNORE"
```

PROJ_LIB [path] This *CONFIG* parameter can be used to define the location of your EPSG files for the *Proj.4* library. Setting the [key] to PROJ_LIB and the [value] to the location of your EPSG files will force PROJ.4 to use this value. Using *CONFIG* allows you to avoid setting environment variables to point to your PROJ_LIB directory. Here are some examples:

1. Unix

```
CONFIG "PROJ_LIB" "/usr/local/share/proj/"
```

2. Windows

```
CONFIG "PROJ_LIB" "C:/somedir/proj/nad/"
```

DATAPATTERN [regular expression] This defines a regular expression to be applied to requests to change *DATA* parameters via URL requests (i.e. *map_layername_data=...*). If a pattern doesn’t exist then web users can’t monkey with support files via URLs. This allows you to isolate one application from another if you desire, with the default operation being very conservative. See also [TEMPLATEPATTERN](#).

DEBUG [off|on|0|1|2|3|4|5] Enables debugging of all of the layers in the current map.

Debugging with MapServer versions >= 5.0:

Verbose output is generated and sent to the standard error output (STDERR) or the MapServer errorfile if one is set using the “MS_ERRORFILE” environment variable. You can set the environment variable by using the *CONFIG* parameter at the MAP level of the mapfile, such as:

```
CONFIG "MS_ERRORFILE" "/ms4w/tmp/ms_error.txt"
```

You can also set the environment variable in Apache by adding the following to your httpd.conf:

```
SetEnv MS_ERRORFILE "/ms4w/tmp/ms_error.txt"
```

Once the environment variable is set, the *DEBUG* mapfile parameter can be used to control the level of debugging output. Here is a description of the possible *DEBUG* values:

- **DEBUG 0 or OFF** - only mssetError() calls are logged to MS_ERRORFILE. No msDebug() output at all. This is the default and corresponds to the original behavior of MS_ERRORFILE in MapServer 4.x.
- **DEBUG 1 or ON** - includes all output from *DEBUG 0* plus msDebug() warnings about common pitfalls, failed assertions or non-fatal error situations (e.g. missing or invalid values for some parameters, missing shapefiles in tileindex, timeout error from remote WMS/WFS servers, etc.).

- **DEBUG 2** - includes all output from *DEBUG 1* plus notices and timing information useful for tuning mapfiles and applications.
- **DEBUG 3** - all of *DEBUG 2* plus some debug output useful in troubleshooting problems such as WMS connection URLs being called, database connection calls, etc. This is the recommended level for debugging mapfiles.
- **DEBUG 4** - *DEBUG 3* plus even more details...
- **DEBUG 5** - *DEBUG 4* plus any msDebug() output that might be more useful to the developers than to the users.

You can also set the debug level by using the “MS_DEBUGLEVEL” environment variable.

The *DEBUG* setting can also be specified for a layer, by setting the *DEBUG* parameter in the [LAYER](#) object.

For more details on this debugging mechanism, please see the [Debugging MapServer](#) document.

Debugging with MapServer versions < 5:

Verbose output is generated and sent to the standard error output (STDERR) or the MapServer logfile if one is set using the *LOG* parameter in the *WEB* object. Apache users will see timing details for drawing in Apache’s *error_log* file. Requires MapServer to be built with the *DEBUG=MSDEBUG* option (*-with-debug* configure option).

DEFRESOLUTION [int] Sets the reference resolution (pixels per inch) used for symbology. Default is 72.

Used to automatically scale the symbology when *RESOLUTION* is changed, so the map maintains the same look at each resolution. The scale factor is *RESOLUTION / DEFRESOLUTION*. New in version 5.6.

EXTENT [minx] [miny] [maxx] [maxy] The spatial extent of the map to be created. In most cases you will need to specify this, although MapServer can sometimes (expensively) calculate one if it is not specified.

FONTSET [filename] Filename of fontset file to use. Can be a path relative to the mapfile, or a full path.

IMAGECOLOR [r] [g] [b] Color to initialize the map with (i.e. background color). When transparency is enabled (*TRANSPARENT ON* in [OUTPUTFORMAT](#)) for the typical case of 8-bit pseudocolored map generation, this color will be marked as transparent in the output file palette. Any other map components drawn in this color will also be transparent, so for map generation with transparency it is best to use an otherwise unused color as the background color.

IMAGEQUALITY [int] *Deprecated* Use **FORMATOPTION “QUALITY=n”** in the [OUTPUTFORMAT](#) declaration to specify compression quality for JPEG output. Deprecated since version 4.6.

IMAGETYPE [jpeg|pdf|png|svg|...|userdefined] Output format (raster or vector) to generate. The name used here must match the ‘NAME’ of a user defined or internally available [OUTPUTFORMAT](#). For a complete list of available *IMAGEFORMATS*, see the [OUTPUTFORMAT](#) section.

INTERLACE [on|off] *Deprecated* Use **FORMATOPTION “INTERLACE=ON”** in the [OUTPUTFORMAT](#) declaration to specify if the output images should be interlaced. Deprecated since version 4.6.

LAYER Signals the start of a [LAYER](#) object.

LEGEND Signals the start of a [LEGEND](#) object.

MAXSIZE [integer] Sets the maximum size of the map image. This will override the default value. For example, setting this to 2048 means that you can have up to 2048 pixels in both dimensions (i.e. max of 2048x2048). Default is 2048.

NAME [name] Prefix attached to map, scalebar and legend GIF filenames created using this mapfile. It should be kept short.

PROJECTION Signals the start of a [PROJECTION](#) object.

QUERYMAP Signals the start of a [QUERYMAP](#) object.

REFERENCE Signals the start of a **REFERENCE** MAP object.

RESOLUTION [int] Sets the pixels per inch for output, only affects scale computations. Default is 72.

SCALEDENOM [double] Computed scale of the map. Set most often by the application. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated **SCALE** parameter.

See Also:

Map Scale

SCALEBAR Signals the start of a **SCALEBAR** object.

SHAPEPATH [filename] Path to the directory holding the shapefiles or tiles. There can be further subdirectories under **SHAPEPATH**.

SIZE [x][y] Size in pixels of the output image (i.e. the map).

STATUS [onoff] Is the map active? Sometimes you may wish to turn this off to use only the reference map or scale bar.

SYMBOLSET [filename] Filename of the symbolset to use. Can be a path relative to the mapfile, or a full path.

Note: The **SYMBOLSET** file must start with the word **SYMBOLSET** and end with the word **END**.

SYMBOL Signals the start of a **SYMBOL** object.

TEMPLATEPATTERN [regular expression] This defines a regular expression to be applied to requests to change the **TEMPLATE** parameters via URL requests (i.e. `map_layername_template=...`). If a pattern doesn't exist then web users can't monkey with support files via URLs. This allows you to isolate one application from another if you desire, with the default operation being very conservative. See also **DATAPATTERN**.

TRANSPARENT [onoff]

Deprecated since version 4.6. Use **TRANSPARENT ON** in the **OUTPUTFORMAT** declaration to specify if the output images should be transparent.

UNITS [ddfeet|inches|kilometers|meters|miles|nauticalmiles] Units of the map coordinates. Used for scalebar and scale computations. *Nauticalmiles* was added in MapServer 5.6.

WEB Signals the start of a **WEB** object.

5.16 OUTPUTFORMAT

A map file may have zero, one or more **OUTPUTFORMAT** object declarations, defining available output formats supported including formats like PNG, GIF, JPEG, GeoTIFF, SVG, PDF and KML.

If **OUTPUTFORMAT** sections declarations are not found in the map file, the following implicit declarations will be made. Only those for which support is compiled in will actually be available. The GeoTIFF depends on building with GDAL support, and the PDF and SVG depend on building with cairo support.

```
OUTPUTFORMAT
  NAME "png"
  DRIVER AGG/PNG
  MIMETYPE "image/png"
  IMAGEMODE RGB
  EXTENSION "png"
  FORMATOPTION "GAMMA=0.75"
END
```

```
OUTPUTFORMAT
  NAME "gif"
  DRIVER GD/GIF
  MIMETYPE "image/gif"
  IMAGEMODE PC256
  EXTENSION "gif"
END
OUTPUTFORMAT
  NAME "png8"
  DRIVER AGG/PNG8
  MIMETYPE "image/png; mode=8bit"
  IMAGEMODE RGB
  EXTENSION "png"
  FORMATOPTION "QUANTIZE_FORCE=on"
  FORMATOPTION "QUANTIZE_COLORS=256"
  FORMATOPTION "GAMMA=0.75"
END
OUTPUTFORMAT
  NAME "jpeg"
  DRIVER AGG/JPEG
  MIMETYPE "image/jpeg"
  IMAGEMODE RGB
  EXTENSION "jpg"
  FORMATOPTION "GAMMA=0.75"
END
OUTPUTFORMAT
  NAME "svg"
  DRIVER CAIRO/SVG
  MIMETYPE "image/svg+xml"
  IMAGEMODE RGB
  EXTENSION "svg"
END
OUTPUTFORMAT
  NAME "pdf"
  DRIVER CAIRO/PDF
  MIMETYPE "application/x-pdf"
  IMAGEMODE RGB
  EXTENSION "pdf"
END
OUTPUTFORMAT
  NAME "GTiff"
  DRIVER GDAL/GTiff
  MIMETYPE "image/tiff"
  IMAGEMODE RGB
  EXTENSION "tif"
END
OUTPUTFORMAT
  NAME "kml"
  DRIVER KML
  MIMETYPE "application/vnd.google-earth.kml+xml"
  IMAGEMODE RGB
  EXTENSION "kml"
END
OUTPUTFORMAT
  NAME "kmz"
  DRIVER KMZ
  MIMETYPE "application/vnd.google-earth.kmz"
  IMAGEMODE RGB
```

```

EXTENSION "kmz"
END
OUTPUTFORMAT
  NAME "cairopng"
  DRIVER CAIRO/PNG
  MIMETYPE "image/png"
  IMAGEMODE RGB
  EXTENSION "png"
END

```

DRIVER [name] The name of the driver to use to generate this output format. Some driver names include the definition of the format if the driver supports multiple formats. For AGG, the possible driver names are “AGG/PNG” and “AGG/JPEG”. For GD the possible driver names are “GD/Gif” and “GD/PNG”. For output through OGR the OGR driver name is appended, such as “OGR/Mapinfo File”. For output through GDAL the GDAL shortname for the format is appended, such as “GDAL/GTiff”. Note that PNG, JPEG and GIF output can be generated with either GDAL or GD (GD is generally more efficient). TEMPLATE should be used for template based output. (mandatory)

EXTENSION [type] Provide the extension to use when creating files of this type. (optional)

FORMATOPTION [option] Provides a driver or format specific option. Zero or more FORMATOPTION statement may be present within a OUTPUTFORMAT declaration. (optional)

- AGG/*: “GAMMA=n” is used to specify the gamma correction to apply to polygon rendering. Allowed values are [0.0,1.0] , default is 0.75. This value is used to prevent artifacts from appearing on the border of contiguous polygons. Set to 1.0 to disable gamma correction.
- AGG/JPEG: The “QUALITY=n” option may be used to set the quality of jpeg produced (value from 0-100).
- AGG/PNG: “COMPRESSION=n” is used to determine the ZLIB compression applied to the png creation. n is expected to be an integer value from 0 to 9, with 0 meaning *no* compression (not recommended), 1 meaning fastest compression, and 9 meaning best compression. The compression levels come at a cost (be it in terms of cpu processing or file size, chose the setting that suits you most). The default is COMPRESSION=6.
- AGG/PNG supports quantizing from 24/32 bits to 8bits, in order to reduce the final image size (and therefore save bandwidth) (see also <http://trac.osgeo.org/mapserver/ticket/2436#comment:4> for strategies when applying these options):
 - “QUANTIZE_FORCE=on” used to reduce an RGB or RGBA image into an 8bit (or less) palettes images. The colors used in the palette are selected to best fit the actual colors in the RGB or RGBA image.
 - “QUANTIZE_COLORS=256” used to specify the number of colors to be used when applying quantization. Maximum value is 256. Specifying anything between 17 and 255 is probably a waste of quality as each pixel is still encoded with a full byte. Specifying a value under 16 will produce tiny images, but severely degraded.
 - “PALETTE=/path/to/palette.txt” is used to define the absolute path where palette colors can be found. This file must contain 256 entries of r,g,b triplets for RGB imagemodes, or r,g,b,a quadruplets for RGBA imagemodes. The expected format is one triplet (or quadruplet) per line, each value separated by commas, and each triplet/quadruplet on a single line. If you want to use transparency with a palette, it is important to have these two colors in the palette file: 0,0,0,0 and 255,255,255,255.

Note: 0,0,0,0 is important if you have fully transparent areas. 255,255,255,255 is opaque white. The important colors to have in your palette really depend on your actual map, although 0,0,0,0 , 0,0,0,255 , and 255,255,255,255 are very likely to show up most of the time.

- “PALETTE_FORCE=on” is used to reduce image depth with a predefined palette. This option is incompatible with the previous quantization options. To allow additional colours for anti-aliasing other than those in the predefined palette, use with “QUANTIZE_COLORS”.
- CAIRO/PDF:
 - “GEO_ENCODING=ISO32000” or “GEO_ENCODING=OGC_BP”: Geospatial PDF will be generated. Requires GDAL 2.0 with PDF driver. See the [GDAL Geospatial PDF documentation](#) for requirements. New in version 6.2.
 - “METADATA_ITEM:option=value”: Additional PDF options can be provided using the METADATA_ITEM prefix. The following options are available: *AUTHOR*, *CREATOR*, *CREATION_DATE*, *KEYWORDS*, *PRODUCER*, *SUBJECT*, *TITLE*. New in version 6.2.

Example:

```
OUTPUTFORMAT
  NAME pdf
  DRIVER "CAIRO/PDF"
  MIMETYPE "application/x-pdf"
  IMAGEMODE RGB
  EXTENSION "pdf"
  FORMATOPTION "GEO_ENCODING=ISO32000"
  FORMATOPTION "METADATA_ITEM:CREATOR=MapServer, with GDAL trunk"
  FORMATOPTION "METADATA_ITEM:PRODUCER=MapServer, with GDAL trunk"
END
```

- GD/PNG: The “INTERLACE=[ON/OFF]” option may be used to turn interlacing on or off.
- GD/GIF: The “INTERLACE=[ON/OFF]” option may be used to turn interlacing on or off.
- GDAL/GTiff: Supports the “TILED=YES”, “BLOCKXSIZE=n”, “BLOCKYSIZE=n”, “INTERLEAVE=[PIXEL/BAND]” and “COMPRESS=[NONE,PACKBITS,JPEG,LZW,DEFLATE]” format specific options.
- GDAL/*: All FORMATOPTIONS are passed onto the GDAL create function. Options supported by GDAL are described in the detailed documentation for each GDAL format.
- GDAL/*: “NULLVALUE=n” is used in raw image modes (IMAGEMODE BYTE/INT16/FLOAT) to pre-initialize the raster and an attempt is made to record this in the resulting file as the nodata value. This is automatically set in WCS mode if rangeset_nullvalue is set.
- OGR/*: See the [OGR Output](#) document for details of OGR format options.

IMAGEMODE [PC256/RGB/RGBA/INT16/FLOAT32/FEATURE] Selects the imaging mode in which the output is generated. Does matter for non-raster formats like Flash. Not all formats support all combinations. For instance GD supports only PC256. (optional)

- PC256: Produced a pseudocolored result with up to 256 colors in the palette (legacy MapServer mode). Only supported for GD/GIF and GD/PNG.
- RGB: Render in 24bit Red/Green/Blue mode. Supports all colors but does not support transparency.
- RGBA: Render in 32bit Red/Green/Blue/Alpha mode. Supports all colors, and alpha based transparency. All features are rendered against an initially transparent background.
- BYTE: Render raw 8bit pixel values (no presentation). Only works for RASTER layers (through GDAL) and WMS layers currently.
- INT16: Render raw 16bit signed pixel values (no presentation). Only works for RASTER layers (through GDAL) and WMS layers currently.

- FLOAT32: Render raw 32bit floating point pixel values (no presentation). Only works for RASTER layers (through GDAL) and WMS layers currently.
- FEATURE: Output is a non-image result, such as features written via templates or OGR.

MIMETYPE [type] Provide the mime type to be used when returning results over the web. (optional)

NAME [name] The name to use in the IMAGETYPE keyword of the map file to select this output format. This name is also used in metadata describing wxs formats allowed, and can be used (sometimes along with mimetype) to select the output format via keywords in OGC requests. (optional)

TRANSPARENT [ON/OFF] Indicates whether transparency should be enabled for this format. Note that transparency does not work for IMAGEMODE RGB output. Not all formats support transparency (optional). When transparency is enabled for the typical case of 8-bit pseudocolored map generation, the IMAGECOLOR color will be marked as transparent in the output file palette. Any other map components drawn in this color will also be transparent, so for map generation with transparency it is best to use an otherwise unused color as the background color.

5.17 PROJECTION

There are thousands of geographical reference systems. In order to combine datasets with different geographical reference systems into a map, the datasets will have to be transformed (projected) to the chosen geographical reference system of the map. If you want to know more about geographical reference systems and map projections, you could take some Geomatics courses (Geographical Information Systems, Cartography, Geodesy, ...).

To set up projections you must define one projection object for the output image (in the [MAP](#) object) and one projection object for each layer (in the [LAYER](#) objects) to be projected. MapServer relies on the [Proj.4](#) library for projections. Projection objects therefore consist of a series of PROJ.4 keywords, which are either specified within the object directly or referred to in an [EPSG](#) file. An EPSG file is a lookup file containing projection parameters, and is part of the PROJ.4 library.

The following two examples both define the same projection (UTM zone 15, NAD83), but use 2 different methods:

Example 1: Inline Projection Parameters

PROJECTION

```
"proj=utm"
"ellps=GRS80"
"datum=NAD83"
"zone=15"
"units=m"
"north"
"no_defs"
```

END

Note: For a list of all of the possible PROJ.4 projection parameters, see the [PROJ.4 parameters](#) page.

Example 2: EPSG Projection Use

PROJECTION

```
"init=epsg:26915"
```

END

Note: This refers to an EPSG lookup file that contains a ‘26915’ code with the full projection parameters. “epsg” in this instance is case-sensitive because it is referring to a file name. If your file system is case-sensitive, this must be lower case, or MapServer (Proj.4 actually) will complain about not being able to find this file.

Note: See <http://spatialreference.org/ref/epsg/26915> for more information on this coordinate system.

The next two examples both display how to possibly define unprojected lat/long (“geographic”):

Example 3: Inline Projection Parameters

PROJECTION

```
"proj=latlong"  
"ellps=WGS84"  
"datum=WGS84"
```

END

Example 4: epsg Projection Use

PROJECTION

```
"init=epsg:4326"
```

END

5.17.1 Important Notes

- If all of your data in the mapfile is in the same projection, you DO NOT have to specify any projection objects. MapServer will assume that all of the data is in the same projection.
- Think of the *MAP*-level projection object as your output projection. The *EXTENT* and *UNITS* values at the *MAP*-level must be in the output projection units. Also, if you have layers in other projections (other than the *MAP*-level projection) then you must define *PROJECTION* objects for those layers, to tell MapServer what projections they are in.
- If you specify a *MAP*-level projection, and then only one other *LAYER* projection object, MapServer will assume that all of the other layers are in the specified *MAP*-level projection.
- Always refer to the EPSG file in lowercase, because it is a lowercase filename and on Linux/Unix systems this parameter is case sensitive.

5.17.2 For More Information

- If you get projection errors, refer to the [Errors](#) to check if your exact error has been discussed.
- Search the [MapServer-users email list archives](#), odds are that someone has faced your exact issue before.
- See the [PROJ.4](#) user guides for complete descriptions of supported projections and coordinate systems.
- Refer to the [Cartographical Map Projections](#) page for background information on projections.

5.18 QUERYMAP

COLOR [r] [g] [b] Color in which features are highlighted. Default is yellow.

SIZE [x][y] Size of the map in pixels. Defaults to the size defined in the map object.

STATUS [on|off] Is the query map to be drawn?

STYLE [normal|hilit|selected] Sets how selected features are to be handled. Layers not queried are drawn as usual.

- Normal: Draws all features according to the settings for that layer.

- Hilite: Draws selected features using COLOR. Non-selected features are drawn normally.
- Selected: draws only the selected features normally.

5.19 REFERENCE

Three types of reference maps are supported. The most common would be one showing the extent of a map in an interactive interface. It is also possible to request reference maps as part of a query. Point queries will generate an image with a marker (see below) placed at the query point. Region based queries will depict the extent of the area of interest. Finally, feature based queries will display the selection feature(s) used.

COLOR [r] [g] [b] Color in which the reference box is drawn. Set any component to -1 for no fill. Default is red.

EXTENT [minx][miny][maxx][maxy] The spatial extent of the base reference image.

IMAGE [filename] Full filename of the base reference image. Must be a GIF image.

MARKER [integer|string] Defines a symbol (from the symbol file) to use when the box becomes too small (see MINBOXSIZE and MAXBOXSIZE below). Uses a crosshair by default.

MARKERSIZE [integer] Defines the size of the symbol to use instead of a box (see MARKER above).

MINBOXSIZE [integer] If box is smaller than MINBOXSIZE (use box width or height) then use the symbol defined by MARKER and MARKERSIZE.

MAXBOXSIZE [integer] If box is greater than MAXBOXSIZE (use box width or height) then draw nothing (Often the whole map gets covered when zoomed way out and it's perfectly obvious where you are).

OUTLINECOLOR [r] [g] [b] Color to use for outlining the reference box. Set any component to -1 for no outline.

SIZE [x][y] Size, in pixels, of the base reference image.

STATUS [on|off] Is the reference map to be created? Default it off.

5.20 SCALEBAR

Scalebars currently do not make use of TrueType fonts. The size of the scalebar image is NOT known prior to rendering, so be careful not to hard-code width and height in the tag in the template file. Future versions will make the image size available.

ALIGN [left|center|right] Defines how the scalebar is aligned within the scalebar image. Default is center. Available in versions 5.2 and higher. New in version 5.2.

BACKGROUNDCOLOR [r] [g] [b] Color to use for scalebar background, not the image background.

COLOR [r] [g] [b] Color to use for drawing all features if attribute tables are not used.

IMAGECOLOR [r] [g] [b] Color to initialize the scalebar with (i.e. background).

INTERLACE [true|false] Should output images be interlaced? Default is [on]. This keyword is now deprecated in favour of using the FORMATOPTION “INTERLACE=ON” line in the **OUTPUTFORMAT** declaration. Deprecated since version 4.6.

INTERVALS [integer] Number of intervals to break the scalebar into. Default is 4.

LABEL Signals the start of a **LABEL** object.

OUTLINECOLOR [r] [g] [b] Color to use for outlining individual intervals. Set any component to -1 for no outline which is the default.

POSITION [ull|ucur|ll|lc|lr] Where to place an embedded scalebar in the image. Default is lr.

POSTLABELCACHE [true|false] For use with embedded scalebars only. Tells the MapServer to embed the scalebar after all labels in the cache have been drawn. Default is false.

SIZE [x][y] Size in pixels of the scalebar. Labeling is not taken into account.

STATUS [on|off|embedded] Is the scalebar image to be created, and if so should it be embedded into the image? Default is off. (Please note that embedding scalebars require that you define a markerset. In essence the scalebar becomes a custom marker that is handled just like any other annotation.)

STYLE [integer] Chooses the scalebar style. Valid styles are 0 and 1.

TRANSPARENT [on|off] Should the background color for the scalebar be transparent. This flag is now deprecated in favor of declaring transparency within **OUTPUTFORMAT** declarations. Default is off. Deprecated since version 4.6.

UNITS [feet|inches|kilometers|meters|miles|nauticalmiles] Output scalebar units, default is miles. Used in conjunction with the map's units to develop the actual graphic. Note that decimal degrees are not valid scalebar units. *Nauticalmiles* was added in MapServer 5.6.

5.21 STYLE

Style holds parameters for symbolization and styling. Multiple styles may be applied within a **CLASS** or **LABEL**.

This object appeared in 4.0 and the intention is to separate logic from looks. The final intent is to have named styles (**Not yet supported**) that will be re-usable through the mapfile. This is the way of defining the appearance of an object (a **CLASS** or a **LABEL**).

ANGLE [double|attribute|AUTO] Angle, given in degrees, to rotate the symbol (counter clockwise). Default is 0 (no rotation). If you have an attribute that specifies angles in a clockwise direction (compass direction), you have to adjust the angle attribute values before they reach MapServer (360-ANGLE), as it is not possible to use a mathematical expression for **ANGLE**.

- For points, it specifies the rotation of the symbol around its center.
- For decorated lines, the behaviour depends on the value of the **GAP** element.
 - For negative **GAP** values it specifies the rotation of the decoration symbol relative to the direction of the line. An angle of 0 means that the symbol's x-axis is oriented along the direction of the line.
 - For non-negativ (or absent) **GAP** values it specifies the rotation of the decoration symbol around its center. An angle of 0 means that the symbol is not rotated.
- For polygons, it specifies the angle of the lines in a HATCH symbol (0 - horizontal lines), or it specifies the rotation of the symbol used to generate the pattern in a polygon fill (it does not specify the rotation of the fill as a whole). For its use with hatched lines, see Example #7 in the [symbology examples](#).
- **[attribute]** was introduced in version 5.0, to specify the attribute to use for angle values. The hard brackets [] are required. For example, if your data source has an attribute named "MYROTATE" that holds angle values for each feature, your **STYLE** object for hatched lines might contain:

```
STYLE
  SYMBOL 'hatch-test'
  COLOR 255 0 0
  ANGLE [MYROTATE]
  SIZE 4.0
  WIDTH 3.0
END
```

The associated RFC document for this feature is [MS RFC 19: Style & Label attribute binding](#).

- The *AUTO* keyword was added in version 5.4, and currently only applies when coupled with the *GEOM-TRANSFORM* keyword.

Note: Rotation using *ANGLE* is not supported for *SYMBOLs* of *TYPE ellipse* with the GD renderer (gif).

ANGLEITEM [string] *ANGLE[attribute]* must now be used instead. Deprecated since version 5.0.

ANTIALIAS [truelfalse] Should TrueType fonts be antialiased. Only useful for GD (gif) rendering. Default is false. Has no effect for the other renderers (where anti-aliasing can not be turned off).

BACKGROUNDCOLOR [r] [g] [b] - *deprecated* Color to use for non-transparent symbols.

Note: Multiple *STYLEs* can be used instead:

```
STYLE
  BACKGROUNDCOLOR 0 0 0
  SYMBOL "foo"
  COLOR 255 0 0
END
```

can be replaced with:

```
STYLE
  COLOR 0 0 0
END
STYLE
  SYMBOL "foo"
  COLOR 255 0 0
END
```

Deprecated since version 6.2.

COLOR [r] [g] [b] | [attribute] Color to use for drawing features.

- r*, *g* and *b* shall be integers [0..255]. To specify green, the following is used:

```
COLOR 0 255 0
```

- [*attribute*] was introduced in version 5.0, to specify the attribute to use for color values. The hard brackets [] are required. For example, if your data set has an attribute named “MYPAIN” that holds color values for each record, use: object for might contain:

```
COLOR [MYPAIN]
```

If *COLOR* is not specified, and it is not a *SYMBOL* of *TYPE pixmap*, then the symbol will not be rendered.

The associated RFC document for this feature is *MS RFC 19: Style & Label attribute binding*.

GAP [double] *GAP* specifies the distance between *SYMBOLs* (center to center) for decorated lines and polygon fills in layer *SIZEUNITS*. For polygon fills, *GAP* specifies the distance between *SYMBOLs* in both the X and the Y direction. For lines, the centers of the *SYMBOLs* are placed on the line. As of MapServer 5.0 this also applies to PixMap symbols.

When scaling of symbols is in effect (*SYMBOLSCALEDENOM* is specified for the *LAYER*), *GAP* specifies the distance in layer *SIZEUNITS* at the map scale 1:*SYMBOLSCALEDENOM*.

- For lines, if *INITIALGAP* is not specified, the first symbol will be placed *GAP*/2 from the start of the line.
- For lines, a negative *GAP* value will cause the symbols’ X axis to be aligned relative to the tangent of the line.

- For lines, a positive *GAP* value aligns the symbols' X axis relative to the X axis of the output device.
- For lines, a *GAP* of 0 (the default value) will cause the symbols to be rendered edge to edge
- For polygons, a missing *GAP* or a *GAP* of less than or equal to the size of the symbol will cause the symbols to be rendered edge to edge.

Symbols can be rotated using *ANGLE*. New in version 6.0: moved from *SYMBOL*

Note: The behaviour of *GAP* has not been stable over time. It has specified the amount of space between the symbols, and also something in between the amount of space between the symbols and the center to center distance. Since 6.2 *GAP* specifies the center to center distance between the symbols.

GEOMTRANSFORM [bbox|end|labelpnt|labelpoly|start|vertices|<expression>] Used to indicate that the current feature will be transformed before the actual style is applied. Introduced in version 5.4.

- *bbox*: produces the bounding box of the current feature geometry.
- *centroid*: produces the centroid of the current feature geometry.
- *end*: produces the last point of the current feature geometry. When used with *ANGLE AUTO*, it can for instance be used to render arrowheads on line segments.
- *labelpnt*: used for *LABEL* styles. Draws a marker on the geographic position the label is attached to. This corresponds to the center of the label text only if the label is in position CC.
- *labelpoly*: used for *LABEL* styles. Produces a polygon that covers the label plus a 1 pixel padding.
- *start*: produces the first point of the current feature geometry. When used with *ANGLE AUTO*, it can for instance be used to render arrow tails on line segments.
- *vertices*: produces all the intermediate vertices (points) of the current feature geometry (the start and end are excluded). When used with *ANGLE AUTO*, the marker is oriented by the half angle formed by the two adjacent line segments.
- *<expression>*: Applies the given expression to the geometry. Supported expressions:
 - (*buffer([shape],dist)*): Buffer the geometry (*[shape]*) using *dist* pixels as buffer distance. For polygons, a negative *dist* will produce a setback.

Note: Depends on GEOS.

Example (polygon data set) - draw a two pixel wide line 5 pixels inside the boundary of the polygon:

```
STYLE
    OUTLINECOLOR 255 0 0
    WIDTH 2
    GEOMTRANSFORM (buffer([shape],-5))
END
```

INITIALGAP [double] *INITIALGAP* is useful for styling dashed lines.

If used with *GAP*, *INITIALGAP* specifies the distance to the first symbol on a styled line.

If used with *PATTERN*, *INITIALGAP* specifies the distance to the first dash on a dashed line.

Example 1 - dashed line styled with circles:

```
STYLE
    COLOR 0 0 0
    WIDTH 4
```

```

PATTERN 40 10 END
END
STYLE
  SYMBOL "circlelf"
  COLOR 0 0 0
  SIZE 8
  INITIALGAP 20
  GAP 50
END

```

Example 1 - dashed line styled with dashed line overlay:

```

STYLE
  COLOR 0 0 0
  WIDTH 6
  PATTERN 40 10 END
END
STYLE
  COLOR 255 255 255
  WIDTH 4
  INITIALGAP 2
  PATTERN 36 14 END
END

```

New in version 6.2.

LINECAP [butt|round|square] Sets the line cap type for lines. Default is *round*. See *Cartographical Symbol Construction with MapServer* for explanation and examples. New in version 6.0: moved from *SYMBOL*

LINEJOIN [round|miter|bevel] Sets the line join type for lines. Default is *round*. See *Cartographical Symbol Construction with MapServer* for explanation and examples. New in version 6.0: moved from *SYMBOL*

LINEJOINMAXSIZE [int] Sets the max length of the *miter* *LINEJOIN* type. The value represents a coefficient which multiplies a current symbol size. Default is 3. See *Cartographical Symbol Construction with MapServer* for explanation and examples. New in version 6.0: moved from *SYMBOL*

MAXSCALEDENOM [double] Minimum scale at which this *STYLE* is drawn. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. New in version 5.4.

See Also:

Map Scale

MAXSIZE [double] Maximum size in pixels to draw a symbol. Default is 500. Starting from version 5.4, the value can also be a decimal value (and not only integer). See *LAYER SYMBOLSCALEDENOM*.

MAXWIDTH [double] Maximum width in pixels to draw the line work. Default is 32. Starting from version 5.4, the value can also be a decimal value (and not only integer). See *LAYER SYMBOLSCALEDENOM*.

MINSCALEDENOM [double] Maximum scale at which this *STYLE* is drawn. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. New in version 5.4.

See Also:

Map Scale

MINSIZE [double] Minimum size in pixels to draw a symbol. Default is 0. Starting from version 5.4, the value can also be a decimal value (and not only integer). See *LAYER SYMBOLSCALEDENOM*.

MINWIDTH [double] Minimum width in pixels to draw the line work. Default is 0. Starting from version 5.4, the value can also be a decimal value (and not only integer). See *LAYER SYMBOLSCALEDENOM*.

OFFSET [x][y] Geometry offset values in layer *SIZEUNITS*.

When scaling of symbols is in effect (*SYMBOLSCALEDENOM* is specified for the *LAYER*), *OFFSET* gives offset values in layer *SIZEUNITS* at the map scale 1:*SYMBOLSCALEDENOM*.

An *OFFSET* of 20 40 will shift the geometry 20 *SIZEUNITS* to the left and 40 *SIZEUNITS* down before rendering.

For lines, an *OFFSET* of *n* -99 will produce a line geometry that is shifted *n* *SIZEUNITS* perpendicular to the original line geometry. A positive *n* shifts the line to the right when seen along the direction of the line. A negative *n* shifts the line to the left when seen along the direction of the line.

OPACITY [integer|attribute] Opacity to draw the current style (applies to 5.2+, *AGG Rendering Specifics* only, does not apply to pixmap symbols)

- *[attribute]* was introduced in version 5.6, to specify the attribute to use for opacity values.

OUTLINECOLOR [r] [g] [b] | [attribute] Color to use for outlining polygons and certain marker symbols (*ellipse*, *vector* polygons and *truetype*). Has no effect for lines. The width of the outline can be specified using *WIDTH*. If no *WIDTH* is specified, an outline of one pixel will be drawn.

If there is a *SYMBOL* defined for the *STYLE*, the *OUTLINECOLOR* will be used to create an outline for that *SYMBOL* (only *ellipse*, *truetype* and polygon *vector* symbols will get an outline). If there is no *SYMBOL* defined for the *STYLE*, the polygon will get an outline.

- *r*, *g* and *b* shall be integers [0..255]. To specify green, the following is used:

```
OUTLINECOLOR 0 255 0
WIDTH 3.0
```

- *[attribute]* was introduced in version 5.0, to specify the attribute to use for color values. The hard brackets [] are required. For example, if your data set has an attribute named “*MYPAINT*” that holds color values for each record, use: object for might contain:

```
OUTLINECOLOR [MYPAINt]
```

The associated RFC document for this feature is [MS RFC 19: Style & Label attribute binding](#).

OUTLINEWIDTH [double|attribute] Width in pixels for the outline. Default is 0.0. The thickness of the outline will not depend on the scale. New in version 5.4.

PATTERN [double on] [double off] [double on] [double off] ... END Used to define a dash pattern for line work (lines, polygon outlines, hatch lines, ...). The numbers (doubles) specify the lengths of the dashes and gaps of the dash pattern in layer *SIZEUNITS*. When scaling of symbols is in effect (*SYMBOLSCALEDENOM* is specified for the *LAYER*), the numbers specify the lengths of the dashes and gaps in layer *SIZEUNITS* at the map scale 1:*SYMBOLSCALEDENOM*.

LINECAP, *LINEJOIN* and *LINEJOINMAXSIZE* can be used to control the appearance of the dashed lines.

To specify a dashed line that is 5 units wide, with dash lengths of 5 units and gaps of 5 units, the following style can be used:

```
STYLE
  COLOR 0 0 0
  WIDTH 5.0
  LINECAP BUTT
  PATTERN 5.0 5.0 END
END
```

Since version 6.2, *PATTERN* can be used to create dashed lines for *SYMBOLS* of *TYPE hatch*. Patterns for hatches are always drawn with *LINECAP butt*. The patterns are generated relative to the edges of the bounding box of the polygon (an illustrated example can be found in the [hatch fill section of the symbol construction document](#)). New in version 6.0: moved from *SYMBOL*

POLAROFFSET [double|attribute] [double|attribute] Offset given in polar coordinates.

The first parameter is a double value in layer *SIZEUNITS* (or the name of a layer attribute) that specifies the radius/distance.

The second parameter is a double value (or the name of a layer attribute) that specifies the angle (counter clockwise).

When scaling of symbols is in effect (*SYMBOLSCALEDENOM* is specified for the *LAYER*), *POLAROFFSET* gives the distance in layer *SIZEUNITS* at the map scale 1:*SYMBOLSCALEDENOM*.

A *POLAROFFSET* of 20 40 will shift the geometry to a position that is 20 *SIZEUNITS* away along a line that is at an angle of 40 degrees with a line that goes horizontally to the right.

When *POLAROFFSET* is used with layers that have *CONNECTIONTYPE uvraster* (*vector field*), the special attributes *uv_length*, *uv_length_2*, *uv_angle* and *uv_minus_angle* are available, making it convenient to specify arrow heads and tails. Example:

```
LAYER
  ...
  TYPE POINT
  CONNECTIONTYPE uvraster
  ...
  CLASS
    STYLE
      SYMBOL "arrowbody"
      ANGLE [uv_angle]
      SIZE [uv_length]
      WIDTH 3
      COLOR 100 255 0
    END
    STYLE
      SYMBOL "arrowhead"
      ANGLE [uv_angle]
      SIZE 10
      COLOR 255 0 0
      POLAROFFSET [uv_length_2] [uv_angle]
    END
    STYLE
      SYMBOL "arrowtail"
      ANGLE [uv_angle]
      SIZE 10
      COLOR 255 0 0
      POLAROFFSET [uv_length_2] [uv_minus_angle]
    END
  END #class
END #layer
```

New in version 6.2: (*MS RFC 78: Vector Field Rendering (CONNECTIONTYPE UVRASTER)*)

SIZE [double|attribute] Height, in layer *SIZEUNITS*, of the symbol/pattern to be used. Default value depends on the *SYMBOL TYPE*. For *pixmap*: the height (in pixels) of the pixmap; for *ellipse* and *vector*: the maximum y value of the *SYMBOL POINTS* parameter, for *hatch*: 1.0, for *truetype*: 1.0.

When scaling of symbols is in effect (*SYMBOLSCALEDENOM* is specified for the *LAYER*), *SIZE* gives the height, in layer *SIZEUNITS*, of the symbol/pattern to be used at the map scale 1:*SYMBOLSCALEDENOM*.

- For symbols of *TYPE hatch*, the *SIZE* is the center to center distance between the lines. For its use with hatched lines, see Example#8 in the *symbology examples*.
- [*attribute*] was introduced in version 5.0, to specify the attribute to use for size values. The hard brackets

[] are required. For example, if your data set has an attribute named “MYHIGHT” that holds size values for each feature, your STYLE object for hatched lines might contain:

```
STYLE
  SYMBOL 'hatch-test'
  COLOR 255 0 0
  ANGLE 45
  SIZE [MYHIGHT]
  WIDTH 3.0
END
```

The associated RFC document for this feature is [MS RFC 19: Style & Label attribute binding](#).

- Starting from version 5.4, the value can also be a decimal value (and not only integer).

SYMBOL [integer|string|filename|url|attribute] The symbol to use for rendering the features.

- Integer is the index of the symbol in the symbol set, starting at 1 (the 5th symbol is symbol number 5).
- String is the name of the symbol (as defined using the *SYMBOL NAME* parameter).
- Filename specifies the path to a file containing a symbol. For example a PNG file. Specify the path relative to the directory containing the mapfile.
- URL specifies the address of a file containing a pixmap symbol. For example a PNG file. A URL must start with “http”:

```
SYMBOL "http://myserver.org/path/to/file.png"
```

New in version 6.0.

- [attribute] allows individual rendering of features by using an attribute in the dataset that specifies the symbol name (as defined in the *SYMBOL NAME* parameter). The hard brackets [] are required. New in version 5.6.

If *SYMBOL* is not specified, the behaviour depends on the type of feature.

- For points, nothing will be rendered.
- For lines, *SYMBOL* is only relevant if you want to style the lines using symbols, so the absence of *SYMBOL* means that you will get lines as specified using the relevant line rendering parameters (*COLOR*, *WIDTH*, *PATTERN*, *LINECAP*, ...).
- For polygons, the interior of the polygons will be rendered using a solid fill of the color specified in the *COLOR* parameter.

See Also:

[SYMBOL](#)

WIDTH [double|attribute] *WIDTH* refers to the thickness of line work drawn, in layer *SIZEUNITS*. Default is 1.0.

When scaling of symbols is in effect (*SYMBOLSCALEDENOM* is specified for the [LAYER](#)), *WIDTH* refers to the thickness of the line work in layer *SIZEUNITS* at the map scale 1:*SYMBOLSCALEDENOM*.

- If used with *SYMBOL* and *OUTLINECOLOR*, *WIDTH* specifies the width of the symbol outlines. This applies to *SYMBOL TYPE* vector (polygons), ellipse and truetype.
- For lines, *WIDTH* specifies the width of the line.
- For polygons, if used with *OUTLINECOLOR*, *WIDTH* specifies the thickness of the polygon outline.
- For a symbol of *SYMBOL TYPE* hatch, *WIDTH* specifies the thickness of the hatched lines. For its use with hatched lines, see Example #7 in the [symbology examples](#).

- [attribute] was added in version 5.4 to specify the attribute to use for the width value. The hard brackets [] are required.
- Starting from version 5.4, the value can also be a decimal value (and not only integer).

5.22 SYMBOL

- Symbol definitions can be included within the main map file or, more commonly, in a separate file. Symbol definitions in a separate file are designated using the *SYMBOLSET* keyword, as part of the *MAP object*. This recommended setup is ideal for re-using symbol definitions across multiple MapServer applications.
- There are 3 main types of symbols in MapServer: Markers, Lines and Shadsets.
- Symbol 0 is always the degenerate case for a particular class of symbol. For points, symbol 0 is a single pixel, for shading (i.e. filled polygons) symbol 0 is a solid fill, and for lines, symbol 0 is a single pixel wide line.
- Symbol definitions contain no color information, colors are set within *STYLE* objects.
- Line styling was moved to *CLASS STYLE* in MapServer version 5. The mechanisms are no longer available in *SYMBOL*.
- For MapServer versions < 5 there is a maximum of 64 symbols per file. This can be changed by editing mapsymbol.h and changing the value of MS_MAXSYMBOLS at the top of the file. As of MapServer 5.0 there is no symbol limit.
- More information can be found in the *Construction of Cartographic Symbols* document.

ANCHORPOINT [x] [y] Used to specify the location (within the symbol) that is to be used as an anchorpoint when rotating the symbol and placing the symbol on a map. Default is **0.5 0.5** (corresponding to the center of the symbol).

x: A double in the range [0,1] that specifies the location within the symbol along the x axis. 0 specifies the left edge of the symbol, 1 specifies the right edge of the symbol. 0.5 specifies the center of the symbol (in the x direction).

y: A double in the range [0,1] that specifies the location within the symbol along the y axis. 0 specifies the top edge of the symbol, 1 specifies the lower edge of the symbol. 0.5 specifies the center of the symbol (in the y direction).

ANCHORPOINT can be used with *SYMBOLs* of *TYPE ellipse, pixmap, svg, truetype and vector*. To ensure proper behaviour for vector symbols, the left and top edges of the bounding box of the symbol should be at 0. New in version 6.2.

ANTIALIAS [true|false] Should TrueType fonts be antialiased. Only useful for GD (gif) rendering. Default is false. Has no effect for the other renderers (where anti-aliasing can not be turned off).

CHARACTER [char] Character used to reference a particular TrueType font character. You'll need to figure out the mapping from the keyboard character to font character.

FILLED [true|false] If *true*, the symbol will be filled with a user defined color (using *STYLE COLOR*). Default is *false*.

If *true*, symbols of *TYPE ellipse and vector* will be treated as polygons (fill color specified using *STYLE COLOR* and outline specified using *STYLE OUTLINECOLOR* and *WIDTH*).

If *false*, symbols of *TYPE ellipse and vector* will be treated as lines (the lines can be given a color using *STYLE COLOR* and a width using *STYLE WIDTH*).

FONT [string] Name of TrueType font to use as defined in the *FONTSET*.

IMAGE [string] Image (GIF or PNG) to use as a marker or brush for type *pixmap* symbols.

NAME [string] Alias for the symbol. To be used in [CLASS STYLE](#) objects.

POINTS [x y] [x y] ... END

Signifies the start of a sequence of points that make up a symbol of *TYPE vector* or that define the x and y radius of a symbol of *TYPE ellipse*. The end of this section is signified with the keyword *END*. The x and y values can be given using decimal numbers. The maximum x and y values define the bounding box of the symbol. The size (actually height) of a symbol is defined in the [STYLE](#). You can create non-contiguous paths by inserting “-99 -99” at the appropriate places.

x values increase to the right, y values increase downwards.

For symbols of *TYPE ellipse*, a single point is specified that defines the x and y radius of the ellipse. Circles are created when x and y are equal.

Note: If a [STYLE](#) using this symbol doesn’t contain an explicit size, then the default symbol size will be based on the range of “y” values in the point coordinates. e.g. if the y coordinates of the points in the symbol range from 0 to 5, then the default size for this symbol will be assumed to be 5.

TRANSPARENT [color index] Sets a transparent color for the input image for pixmap symbols, or determines whether all shade symbols should have a transparent background. For shade symbols it may be desirable to have background features “show through” a transparent hatching pattern, creating a more complex map. By default a symbol’s background is the same as the parent image (i.e. color 0). This is user configurable.

Note: The default (AGG) renderer does not support the *TRANSPARENT* parameter. It is supported by the GD renderer (GIF).

TYPE [ellipsethatch|pixmap|svg|truetype|vector]

- *ellipse*: radius values in the x and y directions define an ellipse.
- *hatch*: produces hatched lines throughout the (polygon) shape.
- *pixmap*: a user supplied image will be used as the symbol.
- *svg*: scalable vector graphics (SVG) symbol. Requires the libsvg-cairo library.
- *truetype*: TrueType font to use as defined in the [MAP FONTSET](#).
- *vector*: a vector drawing is used to define the shape of the symbol.

Note: *TYPE cartoline* is no longer used. Dashed lines are specified using *PATTERN*, *LINECAP*, *LINEJOIN* and *LINEJOINMAXSIZE* in [STYLE](#). Examples in [Construction of Cartographic Symbols](#).

5.23 Symbology Examples

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Author Håvard Tveite

Contact havard.tveite at umb.no

Date \$Date\$

Revision \$Revision\$

Last Updated 2011/05/11

Table of Contents

- Symbology Examples
 - Example 1. Dashed Line
 - Example 2. TrueType font marker symbol
 - Example 3. Vector triangle marker symbol
 - Example 4. Non-contiguous vector marker symbol (Cross)
 - Example 5. Circle vector symbol
 - Example 6. Downward diagonal fill
 - Example 7. Using the Symbol Type HATCH (new in 4.6)
 - Example 8. Styled lines using GAP

5.23.1 Example 1. Dashed Line

This example creates a dashed line that is *5 SIZEUNITS* wide, with 10 *SIZEUNITS* on, 5 off, 5 on, 10 off ...

```
LAYER
  ...
  CLASS
    ...
    STYLE
      COLOR 0 0 0
      WIDTH 5
      LINECAP butt
      PATTERN 10 5 5 10 END
    END
  END
END
```

5.23.2 Example 2. TrueType font marker symbol

This example symbol is a star, used to represent the national capital, hence the name. The font name is defined in the *FONTSET* file. The code number “114” varies, you can use MS Windows’ character map to figure it out, or guestimate.

```
SYMBOL
  NAME "natcap"
  TYPE TRUETYPE
  FONT "geo"
  FILLED true
  ANTIALIAS true # only necessary for GD rendering
  CHARACTER "&#114;"
END
```

5.23.3 Example 3. Vector triangle marker symbol

This example is fairly straight forward. Note that to have 3 sides you need 4 points, hence the first and last points are identical. The triangle is not filled.

```
SYMBOL
  NAME "triangle"
  TYPE vector
  POINTS
    0 4
    2 0
    4 4
    0 4
  END
END
```

5.23.4 Example 4. Non-contiguous vector marker symbol (Cross)

This example draws a cross, that is 2 lines (vectors) that are not connected end-to-end (Like the triangle in the previous example). The negative values separate the two.

```
SYMBOL
  NAME "cross"
  TYPE vector
  POINTS
    2.0 0.0
    2.0 4.0
    -99 -99
    0.0 2.0
    4.0 2.0
  END
END
```

5.23.5 Example 5. Circle vector symbol

This example creates a simple filled circle. Using non-equal values for the point will give you an actual ellipse.

```
SYMBOL
  NAME "circle"
  TYPE ellipse
  FILLED true
  POINTS
    1 1
  END
END
```

5.23.6 Example 6. Downward diagonal fill

This example creates a symbol that can be used to create a downward diagonal fill for polygons.

```
SYMBOL
  NAME "downwarddiagonalfill"
  TYPE vector
  TRANSPARENT 0
  POINTS
    0 1
    1 0
  END
END
```

5.23.7 Example 7. Using the Symbol Type HATCH (new in 4.6)

As of MapServer 4.6, you can use the symbol type HATCH to produce hatched lines. The following will display hatched lines at a 45 degree angle, 10 *SIZEUNITS* apart (center to center), and 3 *SIZEUNITS* wide.

Symbol definition:

```
SYMBOL
  NAME 'hatch-test'
  TYPE HATCH
END
```

Layer definition:

```
LAYER
  ...
  CLASS
    ...
    STYLE
      SYMBOL 'hatch-test'
      COLOR 255 0 0
      ANGLE 45
      SIZE 10
      WIDTH 3
    END
  END
END
```

Other parameters available for HATCH are: MINSIZE, MAXSIZE, MINWIDTH, and MAXWIDTH.

5.23.8 Example 8. Styled lines using GAP

This example shows how to style lines with symbols.

A 5 *SIZEUNITS* wide black line is decorated with ellipses that are 15 *SIZEUNITS* long (and 7.5 *SIZEUNITS* wide). The ellipses are placed 30 *SIZEUNITS* apart, and the negative *GAP* value ensures that the ellipses are oriented relative to the direction of the line. The ellipses are rotated 30 degrees counter clock-wise from their position along the line.

Symbol definition:

```
SYMBOL
  NAME "ellipse2"
  TYPE ellipse
  FILLED true
  POINTS
    1 2
  END
END
```

Layer definition:

```
LAYER
  ...
  CLASS
    ...
    STYLE
      WIDTH 5
      COLOR 0 0 0
    END
    STYLE
```

```
SYMBOL 'ellipse2'
COLOR 0 0 0
ANGLE 30
SIZE 15
GAP -30
END
END
END
```

5.24 Templating

Author Frank Koormann

Contact frank.koormann at intevation.de

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Revision \$Revision\$

Date \$Date\$

Table of Contents

- [Templating](#)
 - [Introduction](#)
 - [Format](#)
 - [Example Template](#)

5.24.1 Introduction

Templates are used:

- to define the look of a MapServer CGI application interface and
- to present the results of a query.

They guide the presentation of results, either a query or a map, to the user. Templates are almost always HTML files although they can also be a URL (e.g.. [http://www.somewhere.com/\[ATTRIBUTE\]/info.html](http://www.somewhere.com/[ATTRIBUTE]/info.html)). URL templates can only be used with simple QUERY or ITEMQUERY results so many substitutions defined below are not available for them. Simple pan/zoom interfaces use a single template file while complicated queries often require many templates. Templates often use JavaScript to enhance the basic interface.

Notes

- Templates *must* contain the magic string ‘mapserver template’ in the first line of the template. Often this takes the form of an HTML, javascript or XML comment. This line is *not* written to the client. The magic string is not case sensitive.
- All *CGI parameters* can be referenced in template substitutions, MapServer specific parameters as well as user defined ones. In principle parameters are handed through by the MapServer 1:1. This feature is essential for implementing MapServer applications.

The reference below only lists special template substitution strings which are needed to obtain information modified by the MapServer, e.g. a new scale, query results, etc.

- Template substitution strings are case sensitive.
- Attribute item substitutions must be the same case as the item names in the dbase file.
- ArcView and ArcInfo generally produce dbase files with item names that are all uppercase. Appropriate URL encoding (i.e. ‘ ‘ to ‘+’) is applied when templates are URLs.
- Some substitutions are also available in escaped form (i.e. URL encoded).

As an example this is needed when generating links within a template. This might pass the current mapextent to a new MapServer call. *[mapext]* is substituted by a space delimited set of lower left and upper right coordinates. This would break the URL. *[mapext_esc]* is substituted by a proper encoded set.

5.24.2 Format

Templates are simply HTML files or URL strings that contains special characters that are replaced by *mapserv* each time the template is processed. The simple substitution allows information such as active layers or the spatial extent to be passed from the user to *mapserv* and back again. Most often the new values are dumped into form variables that will be passed on again. The list of special characters and form variables is given below. HTML templates can include just about anything including JavaScript and Java calls.

In HTML files, the attribute values can be inside quotes (“ ”). Writing attribute values inside quotes allows you to set special characters in value that you couldn’t use normally (ie:],=,” and space). To write a single quote in a attribute value, just use two quotes (“ ”).

General

[date] Outputs the date (as per the web server’s clock). The default format is the same as is used by Apache’s Common Log format, which looks like:

```
01/Dec/2010:17:34:58 -0800
```

Available arguments:

- **format=** A format string as supported by the standard C strftime() function. As an example, the default format is defined as:

```
[date format="%d/%b/%Y:%H:%M:%S %z"]
```

- **tz=** timezone to use for the date returned. Default is “local”. Valid values are:

- “**gmt**” Output date will be Greenwich time
- “**local**” Output the time in the web server’s local time zone.

Additionally or alternatively, the %z and %Z strftime format strings allow the timezone offset or name to be output.

[version] The MapServer version number.

[id] Unique session id. The id can be passed in via a form but is more commonly generated by the software. In that case the id is a concatenation of UNIX time (or NT equivalent) and the process id. Unless you’re getting more requests in a second than the system has process ids the id can be considered unique. ;>

[host] Hostname of the web server.

[port] Port the web server is listening to.

[post or get variable name], [post or get variable name_esc] The contents of any variables passed to the MapServer, whether they were used or not, can be echoed this way. One use might be to have the user set a map title or north arrow style in an interactive map composer. The system doesn't care about the values, but they might be real important in creating the final output, e.g. if you specified a CGI parameter like myvalue=.... you can access this in the template file with [myvalue].

Also available as escaped version.

[web_meta data key],[web_meta data key_esc] Web object meta data access (e.g [web_projection]

Also available as escaped version.

[errmsg],[errmsg_esc] Current error stack output. Various error messages are delimited by semi-colons.

Also available as escaped version.

File Reference

[img] Path (relative to document root) of the new image, just the image name if IMAGE_URL is not set in the mapfile.

In a map interface template, [img] is substituted with the path to the map image. In a query results template, it is substituted with the path to the querymap image (if a *QUERYMAP* object is defined in the *Mapfile*).

[ref] Path (relative to document root) of the new reference image.

[legend] Path (relative to document root) of new legend image rendered by the MapServer.

Since version 3.5.1 a new HTML Legend template is provided by MapServer. If a template is defined in the *Mapfile* the [legend] string is replaced by the processed legend as. See the *HTML Legends with MapServer* for details.

[scalebar] Path (relative to document root) of new scalebar image.

[queryfile] Path to the query file (if savequery was set as a *CGI Parameter*).

[map] Path to the map file (if savemap was set as a *CGI Parameter*).

Image Geometry

[center] Computed image center in pixels. Useful for setting imgxy form variable when map sizes change.

[center_x], [center_y] Computed image center X or Y coordinate in pixels.

[mapsize], [mapsize_esc] Current image size in cols and rows (separated by spaces).

Also available as escaped version.

[mapwidth], [mapheight] Current image width or height.

[scaledenom] Current image scale. The exact value is not appropriate for user information but essential for some applications. The value can be rounded e.g. using JavaScript or server side post processing.

[scale] - deprecated Since MapServer 5.0 the proper parameter to use is [scaledenom] instead. The deprecated [scale] is the current image scale. The exact value is not appropriate for user information but essential for some applications. The value can be rounded e.g. using JavaScript or server side post processing.

[cellsize] Size of an pixel in the current image in map units. Useful for distance measurement tools in user interfaces.

Map Geometry

[mapx], [mapy] X and Y coordinate of mouse click.

[mapext], [mapext_esc] Full mapextent (separated by spaces).

Also available as escaped version. (mapext_esc is deprecated in MapServer 5.2. You should use the “escape=” argument instead)

The default template [mapext] returns coordinates in the format of: mixx miny maxx maxy

Available arguments:

- **escape=** Escape the coordinates returned. Default is “none”. Valid values are:
 - “url” Use URL escape codes to encode the coordinates returned.
 - “none” Do not escape.
- **expand=** Expand the bounds of the extents by a specific value. Specified in map coordinates. For example, [mapext] might return:

123456 123456 567890 567890

and [mapext expand=1000] would therefore return:

122456 122456 568890 568890

- **format=** Format of the coordinates. Default is “\$minx \$miny \$maxx \$maxy”. For example, to add commas to the coordinates you would use:

[mapext format="\$minx,\$miny,\$maxx,\$maxy"]

- **precision=** The number of decimal places to output for coordinates (default is 0).

[minx], [miny], [maxx], [maxy] Minimum / maximum X or Y coordinate of new map extent.

[dx], [dy] The differences of minimum / maximum X or Y coordinate of new map extent.

Useful for creating cachable extents (i.e. 0 0 dx dy) with legends and scalebars

[rawext], [rawext_esc] Raw mapextent, that is the extent before fitting to a window size (separated by spaces). In cases where input came from imgbox (via Java or whatever) rawext refers to imgbox coordinates transformed to map units. Useful for spatial query building.

Also available as escaped version. (rawext_esc is deprecated in MapServer 5.2. You should use the “escape=” argument instead)

The default template [rawext] returns coordinates in the format of: mixx miny maxx maxy

Available arguments:

- **escape=** Escape the coordinates returned. Default is “none”. Valid values are:
 - “url” Use URL escape codes to encode the coordinates returned.
 - “none” Do not escape.
- **expand=** Expand the bounds of the extents by a specific value. Specified in map coordinates. For example, [rawext] might return:

123456 123456 567890 567890

and [rawext expand=1000] would therefore return:

122456 122456 568890 568890

- **format=** Format of the coordinates. Default is “\$minx \$miny \$maxx \$maxy”. For example, to add commas to the coordinates you would use:

```
[rawext format="$minx,$miny,$maxx,$maxy"]
```

- **precision=** The number of decimal places to output for coordinates (default is 0).

[rawminx], [rawminy], [rawmaxx], [rawmaxy] Minimum / maximum X or Y coordinate of a raw map/search extent.

The following substitutions are only available if the MapServer was compiled with PROJ support and a *PROJECTION* is defined in the *Mapfile*.

[maplon], [maplat] Longitude / latitude value of mouse click. Available only when projection enabled.

[mapext_latlon], [mapext_latlon_esc] Full mapextent (separated by spaces). Available only when projection enabled.

Also available as escaped version. (`mapext_latlon_esc` is deprecated in MapServer 5.2. You should use the “escape=” argument instead)

The default template `[mapext_latlon]` returns coordinates in the format of: mixx miny maxx maxy

Available arguments:

- **escape=** Escape the coordinates returned. Default is “none”. Valid values are:
 - “url” Use URL escape codes to encode the coordinates returned.
 - “none” Do not escape.
- **expand=** Expand the bounds of the extents by a specific value. Specified in map coordinates. For example, `[mapext_latlon]` might return:

123456 123456 567890 567890

and `[mapext_latlon expand=1000]` would therefore return:

122456 122456 568890 568890

- **format=** Format of the coordinates. Default is “\$minx \$miny \$maxx \$maxy”. For example, to add commas to the coordinates you would use:

```
[mapext_latlon format="$minx,$miny,$maxx,$maxy"]
```

- **precision=** The number of decimal places to output for coordinates (default is 0).

[minlon], [minlat], [maxlon] [maxlat] Minimum / maximum longitude or latitude value of mapextent. Available only when projection enabled.

[refext], [refext_esc] Reference map extent (separated by spaces).

This template has been added with version 4.6 on behalf of an enhancement request. See the thread in the [MapServer ticket#1102](#) for potential use cases.

Also available as escaped version. (`refext_esc` is deprecated in MapServer 5.2. You should use the “escape=” argument instead)

The default template `[refext]` returns coordinates in the format of: mixx miny maxx maxy

Available arguments:

- **escape=** Escape the coordinates returned. Default is “none”. Valid values are:
 - “url” Use URL escape codes to encode the coordinates returned.
 - “none” Do not escape.
- **expand=** Expand the bounds of the extents by a specific value. Specified in map coordinates. For example, [refext] might return:

123456 123456 567890 567890

and [refext expand=1000] would therefore return:

122456 122456 568890 568890

- **format=** Format of the coordinates. Default is “\$minx \$miny \$maxx \$maxy”. For example, to add commas to the coordinates you would use:

[refwext format="\$minx,\$miny,\$maxx,\$maxy"]

- **precision=** The number of decimal places to output for coordinates (default is 0).

Layer

[layers] | **[layers_esc]** All active layers space delimited. Used for a “POST” request.

Also available as escaped version.

[toggle_layers] | **[toggle_layers_esc]** List of all layers that can be toggled, i.e. all layers defined in the *Mapfile* which status is currently not default.

Also available as escaped version.

[layername_check|select] Used for making layers persistent across a map creation session. String is replaced with the keyword “checked”, “selected” or “” if layername is on. Layername is the name of a layer as it appears in the *Mapfile*. Does not work for default layers.

[layername_meta data key] Layer meta data access (e.g. [streets_build] the underscore is essential).

Zoom

[zoom_minzoom to maxzoom_check|select] Used for making the zoom factor persistent. Zoom values can range from -25 to 25 by default. The string is replaced with the HTML keyword “checked”, “selected” or “” depending on the current zoom value.

E.g. if the zoom is 12, a [zoom_12_select] is replaced with “selected”, while a [zoom_13_select] in the same HTML template file is not.

[zoomdir_-1|0|1_check|select] Used for making the zoom direction persistent. Use check with a radio control or select with a selection list. See the demo for an example. The string is replaced with the HTML keyword “checked”, “selected” or “” depending on the current value of zoomdir.

Query

The following substitutions are only available when the template is processed as a result of a query.

[shpext], [shpext_esc] Extent of current shape plus a 5 percent buffer. Available only when processing query results.

The default template [shpext] returns coordinates in the format of: mixx miny maxx maxy

Available arguments:

- **escape=** Escape the coordinates returned. Default is “none”. Valid values are:
 - “url”
Use URL escape codes to encode the coordinates returned.
 - “none” Do not escape.
- **expand=** Expand the bounds of the extents by a specific value. Specified in map coordinates. For example, [shpext] might return:

123456 123456 567890 567890

and [shpext expand=1000] would therefore return:

122456 122456 568890 568890

- **format=** Format of the coordinates. Default is “\$minx \$miny \$maxx \$maxy”. For example, to add commas to the coordinates you would use:

[shpext format="\$minx,\$miny,\$maxx,\$maxy"]

- **precision=** The number of decimal places to output for coordinates (default is 0).

[shpminx], [shpminy], [shpmaxx], [shpmaxy] Minimum / maximum X or Y coordinate of shape extent. Available only when processing query results.

[shpmid] Middle of the extent of current shape. Available only when processing query results.

[shpmidx], [shpmidy] X or Y coordinate of middle of the extent of the current shape. Available only when processing query results.

[shpidx] Index value of the current shape. Available only when processing query results.

[shpclass] Classindex value of the current shape. Available only when processing query results.

[shpxy formatting options] The list of shape coordinates, with list formatting options, especially useful for SVG.

The default template [shpxy] returns a comma separated list of space delimited of coordinates (i.e. x1 y1, x2 y2, x3 y3).

Available only when processing query results.

Available attributes (h = header, f=footer, s=separator):

- **buffer=**, Buffer size, currently the only unit available is pixels. Default is 0.
- **centroid=** Should only the centroid of the shape be used? true or false (case insensitive). Default is false.
- **cs=** Coordinate separator. Default is “,”.
- **irh=, irf=, orh=, orf=**

Characters to be put before (*irh*) and after (*irf*) inner rings, and before (*orh*) and after (*orf*) outer rings of polygons with holes. Defaults are “”.

Note: Within each polygon, the outer ring is always output first, followed by the inner rings.

If neither *irh* nor *orh* are set, rings are output as “parts” using *ph/pf/pf*.

- **ph=, pf=, ps=** Characters to put before (*ph*) and after (*pf*) and separators between (*ps*) feature parts (e.g. rings of multigeometries). Defaults are ph=“”, pf=“” and ps=“”.
- **precision=** The number of decimal places to output for coordinates. Default is 0.
- **proj=** The output projection definition for the coordinates, a special value of “image” will convert to image coordinates. Default is none.
- **scale=, scale_x=, scale_y=** Scaling factor for coordinates: Both axes (*scale*), x axis (*scale_x*) and y axis (*scale_y*). Defaults are 1.0.
- **sh=, sf=** Characters to put before (*sh*) and after (*sf*) a feature. Defaults are “”.
- **xh=, xf=** Characters to put before (*xh*) and after (*xf*) the x coordinates. Defaults are xh=“” and xf=“”.
- **yh= yf=** Characters to put before (*yh*) and after (*yf*) the y coordinates. Defaults are “”.

As a simple example:

```
[shpxy xh="(" yf="")"] will result in: (x1 y1), (x2 y2), (x3 y3)
```

And a more complicated example of outputting KML for multipolygons which may potentially have holes (note that the parameters must all be on one line):

```
<MultiGeometry>
  <Point>
    <coordinates>[shplabel proj=epsg:4326 precision=10],0</coordinates>
  </Point>
  [shpxy ph="<Polygon><tessellate>1</tessellate>" pf="</Polygon>" xf=","
   xh=" " yh=" " yf=",0 " orh="<outerBoundaryIs><LinearRing><coordinates>" 
   orf="</coordinates></LinearRing></outerBoundaryIs>" 
   irh="<innerBoundaryIs><LinearRing><coordinates>" 
   irf="</coordinates></LinearRing></innerBoundaryIs>" proj=epsg:4326
   precision=10]
</MultiGeometry>
```

[tileindex] Index value of the current tile. If no tiles used for the current shape this is replaced by “-1”. Available only when processing query results.

[item formatting options] An attribute table “item”, with list formatting options. The “name” attribute is required.

Available only when processing query results.

Available attributes:

- **name =** The name of an attribute, case insensitive. (required)
- **precision =** The number of decimal places to use for numeric data. Use of this will force display as a number and will lead to unpredictable results with non-numeric data.
- **pattern =** Regular expression to compare the value of an item against. The tag is output only if there is a match.
- **uc =** Set this attribute to “true” to convert the attribute value to upper case.
- **lc =** Set this attribute to “true” to convert the attribute value to lower case.

- **commify** = Set this attribute to “true” to add commas to a numeric value. Again, only useful with numeric data.
- **escape** = Default escaping is for HTML, but you can escape for inclusion in a URL (=url), or not escape at all (=none).
- **format** = A format string used to output the attribute value. The token “\$value” is used to place the value in a more complex presentation. Default is to output only the value.
- **nullformat** = String to output if the attribute value is NULL, empty or doesn’t match the pattern (if defined). If not set and any of these conditions occur the item tag is replaced with an empty string.

As a simple example:

```
[item name="area" precision="2" commify="2" format="Area is $value"]
```

[attribute name],[attribute name_esc],[attribute item name_raw] Attribute name from the data table of a queried layer. Only attributes for the active query layers are accessible. Case must be the same as what is stored in the data file. ArcView, for example, uses all caps for shapefile field names. Available only when processing query results.

By default the attributes are encoded especially for HTML representation. In addition the escaped version (for use in URLs) as well as the raw data is available.

[Join name_attribute name],[Join name_attribute name_esc], [Join name_attribute name_raw]

One-to-one joins: First the join name (as specified in the *Mapfile*) has to be given, second the tables fields can be accessed similar to the layers attribute data. Available only when processing query results.

By default the attributes are encoded especially for HTML representation. In addition the escaped version (for use in URLs) as well as the raw data is available.

[join_Join name] One-to-many joins: The more complex variant. If the join type is multiple (one-to-many) the template is replaced by the set of header, template file and footer specified in the *Mapfile*.

[metadata_meta data key],[metadata_meta data key_esc] Queried layer meta data access (e.g. [metadata_projection])

Also available as escaped version.

For query modes that allow for multiple result sets, the following string substitutions are available. For FEATURESELECT and FEATURENSELECT modes the totals are adjusted so as not to include the selection layer. The selection layer results ARE available for display to the user.

[nr] Total number of results. Useful in web header and footers. Available only when processing query results.

[nl] Number of layers returning results. Useful in web header and footers. Available only when processing query results.

[nlr] Total number of results within the current layer. Useful in web header and footers. Available only when processing query results.

[rn] Result number within all layers. Starts at 1. Useful in web header and footers. Available only when processing query results.

[lrn] Result number within the current layer. Starts at 1. Useful in query templates. Available only when processing query results.

[cl] Current layer name. Useful in layer headers and footers. Available only when processing query results.

5.24.3 Example Template

A small example to give an idea how to work with templates. Note that it covers MapServer specific templates (e.g. the [map], [mapext]) and user defined templates (e.g. [htmlroot] or [program]) used to store application settings.

```

1  <!-- MapServer Template -->
2  <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
3   "http://www.w3.org/TR/html4/transitional.dtd">
4  <html>
5   <head>
6     <title>MapServer Template Sample</title>
7   </head>
8
9  <body>
10    MapServer Template Sample<br>
11
12    <!-- The central form the application is based on. -->
13    <form method="GET" action="[program]">
14
15      <!-- CGI MapServer applications are server stateless in principle,
16          all information must be "stored" in the client. This includes
17          some basic settings as below.
18          The example is based on the pan and zoom test suite:
19          http://maps.dnr.state.mn.us/mapserver_demos/tests36/ -->
20      <input type="hidden" name="map" value="[map]">
21      <input type="hidden" name="imgext" value="[mapext]">
22      <input type="hidden" name="imgxy" value="149.5 199.5">
23      <input type="hidden" name="program" value="[program]">
24      <input type="hidden" name="htmlroot" value="[htmlroot]">
25      <input type="hidden" name="map_web" value="[map_web]">
26
27      <!-- A table for minimal page formatting. -->
28      <table border=0 cellpadding=5>
29        <tr>
30          <!-- First column: Map and scale bar -->
31          <td align=center>
32            <!-- The map -->
33            <input type="image" name="img" src="[img]"
34              style="border:0; width:300; height:400">
35            <br>
36            <!-- The scale bar-->
37            
38        </td>
39
40          <!-- Second column: Zoom direction, Legend and Reference -->
41          <td valign=top>
42            <!-- Zoom direction -->
43            <b>Map Controls</b><br>
44            Set your zoom option:<br>
45            <select name="zoom" size="1">
46              <option value="2" [zoom - 2 - select]> Zoom in 2 times
47              <option value="1" [zoom - 1 - select]> Recenter Map
48              <option value="-2" [zoom - - 2 - select]> Zoom out 2 times
49            </select>
50            <br>
51
52            <!-- Legend -->
53            <b>Legend</b><br>
```

```
54     <br><br><br><br>
55
56     <!-- Reference map -->
57     <input type="image" name="ref" src="[ref]"
58         style="border:0;width:150;height:150">
59
60     </td>
61
62     </tr>
63
64     </table>
65
66 </form>
</body>
</html>
```

5.25 Union Layer

Author Tamas Szekeres

Contact szekerest at gmail.com

Author Jeff McKenna

Contact jmcn at gatewaygeomatics.com

Last Updated 2011-04-11

Table of Contents

- Union Layer
 - Description
 - Requirements
 - Mapfile Configuration
 - Feature attributes
 - Classes and Styles
 - Projections
 - Supported Processing Options
 - Examples
 - * Mapfile Example
 - * PHP MapScript Example

5.25.1 Description

Since version 6.0, MapServer has the ability to display features from multiple layers (called ‘*source layers*’) in a single mapfile layer. This feature was added through [MS RFC 68: Support for combining features from multiple layers](#).

5.25.2 Requirements

This is a native MapServer option that doesn’t use any external libraries to support it.

5.25.3 Mapfile Configuration

- The CONNECTIONTYPE parameter must be set to UNION.
- The CONNECTION parameter must contain a comma separated list of the source layer names.
- All of the source layers and the union layer must be the same TYPE (e.g. all must be TYPE POINT, or all TYPE POLYGON etc.)

Note: You may wish to disable the visibility (change their STATUS) of the source layers to avoid displaying the features twice.

For example:

```
LAYER
  NAME "union-layer"
  TYPE POINT
  STATUS DEFAULT
  CONNECTIONTYPE UNION
  CONNECTION "layer1,layer2,layer3" # reference to the source layers
  PROCESSING "ITEMS=itemname1,itemname2,itemname3"
  ...
END
LAYER
  NAME "layer1"
  TYPE POINT
  STATUS OFF
  CONNECTIONTYPE OGR
  CONNECTION ...
  ...
END
LAYER
  NAME "layer2"
  TYPE POINT
  STATUS OFF
  CONNECTIONTYPE OGR
  CONNECTION ...
  ...
END
LAYER
  NAME "layer3"
  TYPE POINT
  STATUS OFF
  CONNECTIONTYPE OGR
  CONNECTION ...
  ...
END
```

5.25.4 Feature attributes

In the LAYER definition you may refer to any attributes supported by each of the source layers. In addition to the source layer attributes the union layer provides the following additional attributes:

1. Combine:SourceLayerName - The name of the source layer the feature belongs to
2. Combine:SourceLayerGroup - The group of the source layer the feature belongs to

During the selection / feature query operations only the ‘Combine:SourceLayerName’ and ‘Combine:SourceLayerGroup’ attributes are provided by default. The set of the provided attributes can manually be overridden (and further attributes can be exposed) by using the ITEMS processing option (refer to the example above).

5.25.5 Classes and Styles

We can define the symbology and labelling for the union layers in the same way as for any other layer by specifying the classes and styles. In addition the STYLEITEM AUTO option is also supported for the union layer, which provides to display the features as specified at the source layers. The source layers may also use the STYLEITEM AUTO setting if the underlying data source provides that.

5.25.6 Projections

For speed, it is recommended to always use the same projection for the union layer and source layers. However MapServer will reproject the source layers to the union layer if requested. (for more information on projections in MapServer refer to [PROJECTION](#))

5.25.7 Supported Processing Options

The following processing options can be used with the union layers:

UNION_STATUS_CHECK (TRUE or FALSE) Controls whether the status of the source layers should be checked and the invisible layers (STATUS=OFF) should be skipped. Default value is FALSE.

UNION_SCALE_CHECK (TRUE or FALSE) Controls whether the scale range of the source layers should be checked and the invisible layers (falling outside of the scale range and zoom range) should be skipped. Default value is TRUE.

UNION_SRCLAYER_CLOSE_CONNECTION Override the connection pool setting of the source layers. By introducing this setting we alter the current behaviour which is equivalent to:

```
UNION_SRCLAYER_CLOSE_CONNECTION=ALWAYS
```

5.25.8 Examples

Mapfile Example

The follow example contains 3 source layers in different formats, and one layer (yellow) in a different projection. The union layer uses the **STYLEITEM “AUTO”** parameter to draw the styles from the source layers. (in this case MapServer will reproject the yellow features, in EPSG:4326, for the union layer, which is in EPSG:3978).



```
MAP
...
PROJECTION
    "init=epsg:3978"
END
...
LAYER
    NAME 'unioned'
    TYPE POLYGON
    STATUS DEFAULT
    CONNECTIONTYPE UNION
    CONNECTION "red,green,yellow"
    STYLEITEM "AUTO"
    # Define an empty class that will be filled at runtime from the color and
    # styles read from each source layer.
    CLASS
    END
    PROJECTION
        "init=epsg:3978"
    END
END

LAYER
    NAME 'red'
    TYPE POLYGON
    STATUS OFF
    DATA 'nb.shp'
    CLASS
        NAME 'red'
        STYLE
```

```
    OUTLINECOLOR 0 0 0
    COLOR 255 85 0
  END
END

LAYER
  NAME 'green'
  TYPE POLYGON
  STATUS OFF
  CONNECTIONTYPE OGR
  CONNECTION 'ns.mif'
  CLASS
    NAME 'green'
    STYLE
      OUTLINECOLOR 0 0 0
      COLOR 90 218 71
    END
  END
END

LAYER
  NAME 'yellow'
  TYPE POLYGON
  STATUS OFF
  CONNECTIONTYPE OGR
  CONNECTION 'pei.gml'
  CLASS
    NAME 'yellow'
    STYLE
      OUTLINECOLOR 0 0 0
      COLOR 255 255 0
    END
  END
  PROJECTION
    "init=epsg:4326"
  END
END

END # Map
```

PHP MapScript Example

```
<?php

// open map
$oMap = ms_newMapObj( "D:/ms4w/apps/osm/map/osm.map" );

// create union layer
$oLayer = ms_newLayerObj($oMap);
$oLayer->set("name", "united");
$oLayer->set("type", MS_LAYER_POLYGON);
$oLayer->set("status", MS_ON);
$oLayer->setConnectionType(MS_UNION);
$oLayer->set("connection", "red,green,yellow");
$oLayer->set("styleitem", "AUTO");
$oLayer->setProjection("init=epsg:3978");
```

```
// create empty class
$OfClass = ms_newClassObj($oLayer);
...
?>
```

5.26 WEB

BROWSEFORMAT [mime-type] Format of the interface output, using MapServer CGI. (*added to MapServer 4.8.0*)

The default value is “text/html”. Example:

```
BROWSEFORMAT "image/svg+xml"
```

EMPTY [url] URL to forward users to if a query fails. If not defined the value for ERROR is used.

ERROR [url] URL to forward users to if an error occurs. Ugly old MapServer error messages will appear if this is not defined

FOOTER [filename] Template to use AFTER anything else is sent. Multiresult query modes only.

HEADER [filename] Template to use BEFORE everything else has been sent. Multiresult query modes only.

IMAGEPATH [path] Path to the temporary directory for writing temporary files and images. Must be writable by the user the web server is running as. Must end with a / or depending on your platform.

IMAGEURL [path] Base URL for IMAGEPATH. This is the URL that will take the web browser to IMAGEPATH to get the images.

LEGENDFORMAT [mime-type] Format of the legend output, using MapServer CGI. (*added to MapServer 4.8.0*)

The default value is “text/html”. Example:

```
LEGENDFORMAT "image/svg+xml"
```

LOG [filename] Since MapServer 5.0 the recommended parameters to use for debugging are the *MAP* object’s CONFIG and DEBUG parameters instead (see the *Debugging MapServer* document).

File to log MapServer activity in. Must be writable by the user the web server is running as. Deprecated since version 5.0.

MAXSCALEDENOM [double] Minimum scale at which this interface is valid. When a user requests a map at a smaller scale, MapServer automatically returns the map at this scale. This effectively prevents user from zooming too far out. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated MAXSCALE parameter.

See Also:

Map scale

MAXSCALE [double] - deprecated Since MapServer 5.0 the proper parameter to use is MAXSCALEDENOM instead. The deprecated MAXSCALE is the minimum scale at which this interface is valid. When a user requests a map at a smaller scale, MapServer automatically returns the map at this scale. This effectively prevents user from zooming too far out. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Deprecated since version 5.0.

MAXTEMPLATE [file|url] Template to be used if below the minimum scale for the app (the denominator of the requested scale is larger than MAXSCALEDENOM), useful for nesting apps.

METADATA This keyword allows for arbitrary data to be stored as name value pairs.

- Used with OGC services ([WMS Server](#), [WFS Server](#), [WCS Server](#), [SOS Server](#), ...) to define things such as layer title.
- It can also allow more flexibility in creating templates, as anything you put in here will be accessible via template tags.
- If you have XMP support enabled, you can also embed *xmp_metadata* in your output images by specifying XMP tag information here. Example:

```
METADATA
    title "My layer title"
    author "Me!"
    [x|m|p|_d|c|_Title "My Map Title"
END
```

- **labelcache_map_edge_buffer**

For tiling, the amount of gutter around an image where no labels are to be placed is controlled by the parameter *labelcache_map_edge_buffer*. The unit is pixels. The value had to be a negative value for 6.0 and earlier versions. From 6.2 the absolute value is taken, so the sign does not matter.

```
METADATA
    "labelcache_map_edge_buffer" "10"
END
```

MINSCALEDENOM [double] Maximum scale at which this interface is valid. When a user requests a map at a larger scale, MapServer automatically returns the map at this scale. This effectively prevents the user from zooming in too far. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated MINSCALE parameter.

See Also:

[Map scale](#)

MINSCALE [double] - deprecated Since MapServer 5.0 the proper parameter to use is MINSCALEDENOM instead. The deprecated MINSCALE is the maximum scale at which this interface is valid. When a user requests a map at a larger scale, MapServer automatically returns the map at this scale. This effectively prevents the user from zooming in too far. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Deprecated since version 5.0.

MINTEMPLATE Template to be used if above the maximum scale for the app (the denominator of the requested scale is smaller than MINSCALEDENOM), useful for nesting apps.

QUERYFORMAT [mime-type] Format of the query output. (*added to MapServer 4.8.0*) This works for mode=query (using query templates in CGI mode), but not for mode=browse. The default value is “text/html”. Example:

```
QUERYFORMAT "image/svg+xml"
```

TEMPLATE [filename|url]

Template file or URL to use in presenting the results to the user in an interactive mode (i.e. map generates map and so on ...).

URL is not a remote file, rather a template. For example:

```
TEMPLATE 'http://someurl/somescript.cgi?mapext=[mapext]'
```

TEMPPATH Path for storing temporary files. If not set, the standard system temporary file path will be used (e.g. tmp for unix). *TEMPPATH* can also be set using the environment variable *MS_TEMPPATH*.

TEMPPATH is used in many contexts (see rfc66).

Make sure that that MapServer has sufficient rights to read and write files at the specified location. New in version 6.0.

VALIDATION Signals the start of a *VALIDATION* block.

As of MapServer 5.4.0, *VALIDATION* blocks are the preferred mechanism for specifying validation patterns for CGI param runtime substitutions. See *Run-time Substitution*.

5.27 XML Mapfile support

MapServer is able to load XML mapfiles automatically, without user XSLT tranformations. Basicly, MapServer will simply do an XSLT transformation when the mapfile passed to it is an XML one, convert it to a text mapfile in a temporary file on disk, then process the mapfile normally.

New Dependencies

- libxslt
- libexslt

5.27.1 Enabling the support

You can enable the XML mapfile support by adding the following option: `--with-xml-mapfile`. This configure option will enable the libxslt and libexslt check up. If your libxslt/libexslt are not installed in /usr, you'll have to add the following options:

```
--with-xslt=/path/to/xslt/installation  
--with-exslt=/path/to/exslt/installation
```

5.27.2 Usage:

In order to enable this feature, set the `MS_XMLMAPFILE_XSLT` environment variable to point to the location of the XSLT to use for the XML->text mapfile conversion. e.g. in Apache:

```
SetEnv MS_XMLMAPFILE_XSLT /path/to/mapfile.xsl  
PassEnv MS_XMLMAPFILE_XSLT
```

With this enabled, passing an .xml filename to the CGI *map* parameter will automatically trigger the conversion.

Note: This is a first step to XML mapfile loading support. Obviously, there is a cost to parse and translate the XML mapfile, but this allows easier use of XML mapfiles.

5.28 Notes

- The Mapfile is NOT case-sensitive.
- The Mapfile is read from top to bottom by MapServer; this means that LAYERs near the top of your Mapfile will be drawn before those near the bottom. Therefore users commonly place background imagery and other background layer types near the top of their mapfile, and lines and points near the bottom of their mapfile.

- Strings containing non-alphanumeric characters or a MapServer keyword MUST be quoted. It is recommended to put ALL strings in double-quotes.
- For MapServer versions < 5, there was a default maximum of 200 layers per mapfile (there is no layer limit with MapServer ≥ 5). This can be changed by editing the map.h file to change the value of MS_MAXLAYERS to the desired number and recompiling. Here are other important default limits when using a MapServer version < 5:
 - MAXCLASSES 250 (set in map.h)
 - MAXSTYLES 5 (set in map.h)
 - MAXSYMBOLS 64 (set in mapsymbol.h)

MapServer versions ≥ 5 have no limits for classes, styles, symbols, or layers.

- File paths may be given as absolute paths, or as paths relative to the location of the mapfile. In addition, data files may be specified relative to the SHAPEPATH.
- The mapfile has a hierarchical structure, with the MAP object being the “root”. All other objects fall under this one.
- Comments are designated with a #.
- Attributes are named using the following syntax: [ATTRIBUTENAME].

Note: that the name of the attribute included between the square brackets *IS CASE SENSITIVE*. Generally ESRI generated shape data sets have their attributes (.dbf column names) all in upper-case for instance, and for PostGIS, *ALWAYS* use lower-case.

-
- MapServer Regular Expressions are used through the operating system’s C Library. For information on how to use and write Regular Expressions on your system, you should read the documentation provided with your C Library. On Linux, this is GLibC, and you can read “man 7 regex” ... This man page is also available on most UNIX’s. Since these RegEx’s are POSIX compliant, they should be the same on Windows as well, so windows users can try searching the web for “man 7 regex” since man pages are available all over the web.

MapScript

Release 6.2.0

Date December 27, 2012

6.1 Introduction

This is language agnostic documentation for the MapScript interface to MapServer generated by SWIG. This document is intended for developers and to serve as a reference for writers of more extensive, language specific documentation located at [Mapfile](#)

6.1.1 Appendices

Language-specific extensions are described in the following appendices

[Python Appendix](#)

6.1.2 Documentation Elements

Classes will be documented in alphabetical order in the manner outlined below. Attributes and methods will be formatted as definition lists with the attribute or method as item, the type or return type as classifier, and a concise description. To make the document as agnostic as possible, we refer to the following types: int, float, and string. There are yet no mapscript methods that return arrays or sequences or accept array or sequence arguments.

We will use the SWIG term *immutable* to indicate that an attribute's value is read-only.

6.1.3 fooObj

A paragraph or two about class fooObj.

fooObj Attributes

attribute [type [access]] Concise description of the attribute.

Attribute names are completely lower case. Multiple words are packed together like *outlinecolor*.

Note that because of the way that mapscript is generated many confusing, meaningless, and even dangerous attributes are creeping into objects. See `outputFormatObj.refcount` for example. Until we get a grip on the structure members we are exposing to SWIG this problem will continue to grow.

fooObj Methods

method(type mandatory_parameter [, type optional_parameter=default]) [type] Description of the method including elaboration on the method arguments, the method's actions, and returned values. Optional parameters and their default values are enclosed in brackets.

Class method names are camel case with a leading lower case character like `getExpressionString`.

6.1.4 Additional Documentation

There's no point in duplicating the MapServer Mapfile Reference, which remains the primary reference for mapscript class attributes.

6.2 SWIG MapScript API Reference

Author Sean Gillies

Author Steve Lime

Contact steve.lime at dnr.state.mn.us

Author Frank Warmerdam

Contact warmerdam at pobox.com

Author Umberto Nicoletti

Contact umberto.nicoletti at gmail.com

Author Tamas Szekeres

Contact szekerest at gmail.com

Author Daniel Morissette

Contact dmorisette at mapgears.com

Revision \$Revision\$

Date \$Date\$

Contents

- SWIG MapScript API Reference
 - Introduction
 - * Appendices
 - * Documentation Elements
 - * fooObj
 - * Additional Documentation
 - MapScript Functions
 - MapScript Classes
 - * classObj
 - * colorObj
 - * errorObj
 - * fontSetObj
 - * hashTableObj
 - * imageObj
 - * intarray
 - * labelCacheMemberObj
 - * labelCacheObj
 - * labelObj
 - * layerObj
 - * legendObj
 - * lineObj
 - * mapObj
 - * markerCacheMemberObj
 - * outputFormatObj
 - * OWSRequest
 - * pointObj
 - * projectionObj
 - * rectObj
 - * referenceMapObj
 - * resultCacheMemberObj
 - * resultCacheObj
 - * scalebarObj
 - * shapefileObj
 - * shapeObj
 - * styleObj
 - * symbolObj
 - * symbolSetObj
 - * webObj

6.2.1 Introduction

This is language agnostic documentation for the mapscript interface to MapServer generated by SWIG. This document is intended for developers and to serve as a reference for writers of more extensive, language specific documentation in DocBook format for the MDP.

Appendices

Language-specific extensions are described in the following appendices

Python MapScript Appendix

Documentation Elements

Classes will be documented in alphabetical order in the manner outlined below. Attributes and methods will be formatted as definition lists with the attribute or method as item, the type or return type as classifier, and a concise description. To make the document as agnostic as possible, we refer to the following types: int, float, and string. There are yet no mapscript methods that return arrays or sequences or accept array or sequence arguments.

We will use the SWIG term *immutable* to indicate that an attribute's value is read-only.

fooObj

A paragraph or two about class fooObj.

fooObj Attributes

attribute [type [access]] Concise description of the attribute.

Attribute names are completely lower case. Multiple words are packed together like *outlinecolor*.

Note that because of the way that mapscript is generated many confusing, meaningless, and even dangerous attributes might be exposed by objects.

fooObj Methods

method(type mandatory_parameter [, type optional_parameter=default]) [type] Description of the method including elaboration on the method arguments, the method's actions, and returned values. Optional parameters and their default values are enclosed in brackets.

Method names are camel case with a leading lower case character like *getExpressionString*.

Additional Documentation

There's no point in duplicating the MapServer Mapfile Reference, which remains the primary reference for mapscript class attributes.

6.2.2 MapScript Functions

msCleanup() [void] msCleanup() attempts to recover all dynamically allocated resources allocated by MapServer code and dependent libraries. It is used primarily for final cleanup in scripts that need to do memory leak testing to get rid of "noise" one-time allocations. It should not normally be used by production code.

msGetVersion() [string] Returns a string containing MapServer version information, and details on what optional components are built in. The same report as produced by "mapserv -v".

msGetVersionInt() [int] Returns the MapServer version number (x.y.z) as an integer ($x*10000 + y*100 + z$). (New in v5.0) e.g. V5.4.3 would return 50403.

msResetErrorList() [void] Clears the current error stack.

msIO_installStdoutToBuffer() [void] Installs a mapserver IO handler directing future stdout output to a memory buffer.

msIO_installStdinFromBuffer() [void] Installs a mapserver IO handler directing future stdin reading (ie. post request capture) to come from a buffer.

msIO_resetHandlers() [void] Resets the default stdin and stdout handlers in place of “buffer” based handlers.

msIO_getStdoutBufferString() [string] Fetch the current stdout buffer contents as a string. This method does not clear the buffer.

msIO_getStdoutBufferBytes() [binary data] Fetch the current stdout buffer contents as a binary buffer. The exact form of this buffer will vary by mapscript language (eg. string in Python, byte[] array in Java and C#, unhandled in perl)

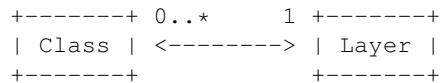
msIO_stripStdoutBufferContentType() [string] Strip the Content-type header off the stdout buffer if it has one, and if a content type is found it is return (otherwise NULL/None/etc).

msIO_stripStdoutBufferContentHeaders(): void Strip all Content-* headers off the stdout buffer if it has ones.

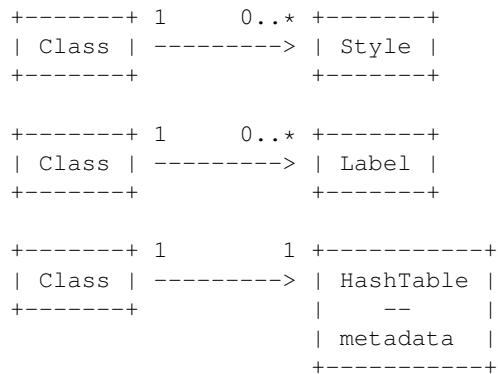
6.2.3 MapScript Classes

classObj

An instance of classObj is associated with with one instance of [layerObj](#).



The other important associations for classObj are with [styleObj](#), [labelObj](#), and [hashTableObj](#).



Multiple class styles have been supported since 4.1, and multiple class labels since 6.2. See the [styleObj](#) section for details on use of multiple class styles.

classObj Attributes

debug [int] MS_TRUE or MS_FALSE

keyimage [string] **TODO** Not sure what this attribute is for

label [[labelObj](#) immutable] Definition of class labeling. Removed (6.2) - use [addLabel](#), [getLabel](#) and [removeLabel](#) instead.

layer [[layerObj](#) immutable] Reference to the parent layer

maxscaledenom [float] The minimum scale at which class is drawn

metadata [[hashTableObj](#) immutable] class metadata hash table.

minscaledenom [float] The maximum scale at which class is drawn

name [string] Unique within a layer

numlabels [int] Number of labels for class. New in version 6.2.

numstyles [int] Number of styles for class. In the future, probably the 4.4 release, this attribute will be made *immutable*.

status [int] MS_ON or MS_OFF. Draw features of this class or do not.

template [string] Template for queries

title [string] Text used for legend labeling

type [int] The layer type of its parent layer

classObj Methods

new classObj([layerObj parent_layer=NULL]) [classObj] Create a new child classObj instance at the tail (highest index) of the class array of the *parent_layer*. A class can be created outside the context of a parent layer by omitting the single constructor argument.

addLabel(labelObj) [int] Add a labelObj to the classObj and return its index in the labels array. New in version 6.2.

clone() [classObj] Return an independent copy of the class without a parent layer.

createLegendIcon(mapObj map, layerObj layer, int width, int height) [imageObj] Draw and return a new legend icon.

drawLegendIcon(mapObj map, layerObj layer, int width, int height, imageObj image, int dstx, int dsty) [int]
Draw the legend icon onto *image* at *dstx*, *dsty*. Returns MS_SUCCESS or MS_FAILURE.

getExpressionString() [string] Return a string representation of the expression enclosed in the quote characters appropriate to the expression type.

getFirstMetaDataKey() [string] Returns the first key in the metadata hash table. With getNextMetaDataKey(), provides an opaque iterator over keys.

Note: `getFirstMetaDataKey()`, `getMetaData()`, and `getNextMetaDataKey()` are deprecated and will be removed in a future version. Replaced by direct metadata access, see [hashTableObj](#).

getLabel(int index) [labelObj] Return a reference to the labelObj at *index* in the labels array.

See the [labelObj](#) section for more details on multiple class labels. New in version 6.2.

getMetaData(string key) [string] Return the value of the classObj metadata at *key*.

Note: `getFirstMetaDataKey()`, `getMetaData()`, and `getNextMetaDataKey()` are deprecated and will be removed in a future version. Replaced by direct metadata access, see [hashTableObj](#).

getNextMetaDataKey(string lastkey) [string] Returns the next key in the metadata hash table or NULL if *lastkey* is the last valid key. If *lastkey* is NULL, returns the first key of the metadata hash table.

Note: `getFirstMetaDataKey()`, `getMetaData()`, and `getNextMetaDataKey()` are deprecated and will be removed in a future version. Replaced by direct metadata access, see [hashTableObj](#).

getStyle(int index) [styleObj] Return a reference to the styleObj at *index* in the styles array.

See the [styleObj](#) section for more details on multiple class styles.

getTextString() [string] Return a string representation of the text enclosed in the quote characters appropriate to the text expression type (logical or simple string).

insertStyle(styleObj style [, int index=-1]) [int] Insert a **copy** of *style* into the styles array at index *index*. Default is -1, or the end of the array. Returns the index at which the style was inserted.

moveStyleDown(int index) [int] Swap the styleObj at *index* with the styleObj *index + 1*.

moveStyleUp(int index) [int] Swap the styleObj at *index* with the styleObj *index - 1*.

removeLabel(int index) [labelObj] Remove the labelObj at *index* from the labels array and return a reference to the labelObj. numlabels is decremented, and the array is updated. New in version 6.2.

removeStyle(int index) [styleObj] Remove the styleObj at *index* from the styles array and return a copy.

setExpression(string expression) [int] Set expression string where *expression* is a MapServer regular, logical or string expression. Returns MS_SUCCESS or MS_FAILURE.

setMetaData(string key, string value) [int] Insert *value* into the classObj metadata at *key*. Returns MS_SUCCESS or MS_FAILURE.

Note: `setMetaData()` is deprecated and will be removed in a future version. Replaced by direct metadata access, see `hashTableObj`.

setText(string text) [int] Set text string where *text* is a MapServer text expression. Returns MS_SUCCESS or MS_FAILURE.

Note: Older versions of MapScript (pre-4.8) featured the an undocumented `setText()` method that required a layerObj be passed as the first argument. That argument was completely bogus and has been removed.

colorObj

Since the 4.0 release, MapServer colors are instances of colorObj. A colorObj may be a lone object or an attribute of other objects and have no other associations.

colorObj Attributes

blue [int] Blue component of color in range [0-255]

green [int] Green component of color in range [0-255]

red [int] Red component of color in range [0-255]

pen [int] Don't mess with this unless you know what you are doing!

Note: Because of the issue with `pen`, setting colors by individual components is unreliable. Best practice is to use `setRGB()`, `setHex()`, or assign to a new instance of `colorObj()`.

colorObj Methods

new colorObj([int red=0, int green=0, int blue=0, int pens=-4]) [colorObj] Create a new instance. The color arguments are optional.

setRGB(int red, int green, int blue) [int] Set all three RGB components. Returns MS_SUCCESS or MS_FAILURE.

setHex(string hexcolor) [int] Set the color to values specified in case-independent hexadecimal notation. Calling setHex('#ffffff') assigns values of 255 to each color component. Returns MS_SUCCESS or MS_FAILURE.

toHex() [string] Complement to setHex, returning a hexadecimal representation of the color components.

errorObj

This class allows inspection of the MapServer error stack. Only needed for the Perl module as the other language modules expose the error stack through exceptions.

errorObj Attributes

code [int] MapServer error code such as MS_IMGERR (1).

message [string] Context-dependent error message.

routine [string] MapServer function in which the error was set.

errorObj Methods

next [errorObj] Returns the next error in the stack or NULL if the end has been reached.

fontSetObj

A fontSetObj is always a ‘fontset’ attribute of a mapObj.

fontSetObj Attributes

filename [string immutable] Path to the fontset file on disk.

fonts [hashTableObj immutable] Mapping of fonts.

numfonts [int immutable] Number of fonts in set.

fontSetObj Methods

None

hashTableObj

A hashTableObj is a very simple mapping of case-insensitive string keys to single string values. Map, Layer, and Class *metadata* have always been hash tables and now these are exposed directly. This is a limited hash that can contain no more than 41 values.

hashTableObj Attributes

numitems [int immutable] Number of hash items.

hashTableObj Methods

clear() [void] Empties the table of all items.

get(string key [, string default=NULL]) [string] Returns the value of the item by its *key*, or *default* if the key does not exist.

nextKey([string key=NULL]) [string] Returns the name of the next key or NULL if there is no valid next key. If the input *key* is NULL, returns the first key.

remove(string key) [int] Removes the hash item by its *key*. Returns MS_SUCCESS or MS_FAILURE.

set(string key, string value) [int] Sets a hash item. Returns MS_SUCCESS or MS_FAILURE.

imageObj

An image object is a wrapper for GD and GDAL images.

imageObj Attributes

format [[outputFormatObj](#) immutable] Image format.

height [int immutable] Image height in pixels.

imagepath [string immutable] If image is drawn by `mapObj.draw()`, this is the `mapObj`'s `web.imagepath`.

imageurl [string immutable] If image is drawn by `mapObj.draw()`, this is the `mapObj`'s `web.imageurl`.

renderer [int] MS_RENDER_WITH_GD, MS_RENDER_WITH_SWF, MS_RENDER_WITH_RAWDATA, MS_RENDER_WITH_PDF, or MS_RENDER_WITH_IMAGEMAP. Don't mess with this!

size [int immutable] To access this attribute use the `getSize` method.

Note: the `getSize` method is inefficient as it does a call to `getBytes` and then computes the size of the byte array. The `bytearray` is then immediately discarded. In most cases it is more efficient to call `getBytes` directly.

width [int immutable] Image width in pixels.

imageObj Methods

new imageObj(int width, int height [, outputFormatObj format=NULL [, string filename=NULL]])

[`imageObj`] Create new instance of `imageObj`. If *filename* is specified, an `imageObj` is created from the file and any specified *width*, *height*, and *format* parameters will be overridden by values of the image in *filename*. Otherwise, if *format* is specified an `imageObj` is created using that format. See the *format* attribute above for details. If *filename* is not specified, then *width* and *height* should be specified.

getBytes() [binary data] Returns the image contents as a binary buffer. The exact form of this buffer will vary by mapscript language (eg. string in Python, byte[] array in Java and C#, unhandled in perl)

getSize() [int] Resturns the size of the binary buffer representing the image buffer.

Note: the `getSize` method is inefficient as it does a call to `getBytes` and then computes the size of the byte array. The byte array is then immediately discarded. In most cases it is more efficient to call `getBytes` directly.

save(string filename [, mapObj parent_map=NULL]) [int] Save image to *filename*. The optional *parent_map* parameter must be specified if saving GeoTIFF images.

write([FILE file=NULL]) [int] Write image data to an open file descriptor or, by default, to *stdout*. Returns MS_SUCCESS or MS_FAILURE.

Note: This method is current enabled for Python and C# only. C# supports writing onto a Stream object. User-contributed typemaps are needed for Perl, Ruby, and Java.

Note: The free() method of imageObj has been deprecated. In MapServer revisions 4+ all instances of imageObj will be properly disposed of by the interpreter's garbage collector. If the application can't wait for garbage collection, then the instance can simply be deleted or undef'd.

intarray

An intarray is a utility class generated by SWIG useful for manipulating map layer drawing order. See mapObj::getLayersDrawingOrder for discussion of mapscript use and see http://www.swig.org/Doc1.3/Library.html#Library_nn5 for a complete reference.

intarray Attributes

None

intarray Methods

new intarray(int numitems) [intarray] Returns a new instance of the specified length.

labelCacheMemberObj

An individual feature label. The labelCacheMemberObj class is associated with labelCacheObj.

```
+-----+ 0..*      1 +-----+
| LabelCacheMember | <----- | LabelCache |
+-----+           +-----+
```

labelCacheMemberObj Attributes

classindex [int immutable] Index of the class of the labeled feature.

featuresize [float immutable] **TODO**

label [[labelObj](#) immutable] Copied from the class of the labeled feature.

layerindex [int immutable] The index of the layer of the labeled feature.

numstyles [int immutable] Number of styles as for the class of the labeled feature.

point [[pointObj](#) immutable] Label point.

poly [[shapeObj](#) immutable] Label bounding box.

shapeindex [int immutable] Index within shapefile of the labeled feature.

status [int immutable] Has the label been drawn or not?
styles [styleObj immutable] **TODO** this should be protected from SWIG.
text [string immutable] Label text.
tileindex [int immutable] Tileindex of the layer of the labeled feature.

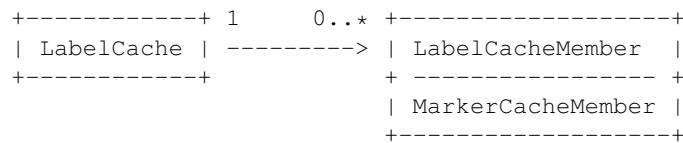
labelCacheMemberObj Methods

None.

Note: No real scripting control over labeling currently, but there may be some interesting new possibilities if users have control over labeling text, position, and status.

labelCacheObj

Set of a map's cached labels. Has no other existence other than as a 'labelcache' attribute of a mapObj. Associated with labelCacheMemberObj and markerCacheMemberObj.



labelCacheObj Attributes

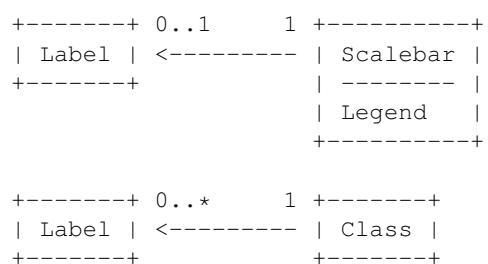
cachesize [int immutable] **TODO**
markercachesize [int immutable] **TODO**
numlabels [int immutable] Number of label members.
nummarkers [int immutable] Number of marker members.

labelCacheObj Methods

freeCache() [void] Free the labelcache.

labelObj

A labelObj is associated with a classObj, a scalebarObj, or a legendObj.



An instance of labelObj can exist outside of a classObj container and be explicitly inserted into the classObj:

```
new_label = new labelObj()  
the_class.addLabel(new_label)
```

labelObj Attributes

angle [float] TODO

antialias [int] MS_TRUE or MS_FALSE

autoangle [int] MS_TRUE or MS_FALSE

autofollow [int] MS_TRUE or MS_FALSE. Tells mapserver to compute a curved label for appropriate linear features (see [MS RFC 11: Support for Curved Labels](#) for specifics).

autominfeaturesize: int MS_TRUE or MS_FALSE

backgroundcolor [colorObj] Color of background rectangle or billboard. Deprecated since version 6.0: Use styleObj and geomtransform.

backgroundshadowcolor [colorObj] Color of background rectangle or billboard shadow. Deprecated since version 6.0: Use styleObj and geomtransform.

backgroundshadowsizex [int] Horizontal offset of drop shadow in pixels. Deprecated since version 6.0: Use styleObj and geomtransform.

backgroundshadowsizey [int] Vertical offset of drop shadow in pixels. Deprecated since version 6.0: Use styleObj and geomtransform.

buffer [int] Maybe this should've been named 'padding' since that's what it is: padding in pixels around a label.

color [colorObj] Foreground color.

encoding [string] Supported encoding format to be used for labels. If the format is not supported, the label will not be drawn. Requires the iconv library (present on most systems). The library is always detected if present on the system, but if not the label will not be drawn. Required for displaying international characters in MapServer. More information can be found at: <http://www.foss4g.org/FOSS4G/MAPSERVER/mpsnf-i18n-en.html>.

font [string] Name of TrueType font.

force [int] MS_TRUE or MS_FALSE.

maxsize [int] Maximum height in pixels for scaled labels. See symbolscale attribute of layerObj.

mindistance [int] Minimum distance in pixels between duplicate labels.

minfeaturesize [int] Features of this size of greater will be labeled.

minsize [int] Minimum height in pixels.

numstyles [int] Number of label styles

offsetx [int] Horizontal offset of label.

offsety [int] Vertical offset of label.

outlinecolor [colorObj] Color of one point outline.

partials [int] MS_TRUE (default) or MS_FALSE. Whether or not labels can flow past the map edges.

position [int] MS_UL, MS_UC, MS_UR, MS_CL, MS_CC, MS_CR, MS_LL, MS_LC, MS_LR, or MS_AUTO.

shadowcolor [colorObj] Color of drop shadow.

shadowsizex [int] Horizontal offset of drop shadow in pixels.

shadowsizey [int] Vertical offset of drop shadow in pixels.

size [int] Annotation height in pixels.

type [int] MS_BITMAP or MS_TRUETYPE.

wrap [string] Character on which legend text will be broken to make multi-line legends.

labelObj Methods

getBinding(int binding) [string] Get the attribute binding for a specified label property. Returns NULL if there is no binding for this property.

getStyle(int index) [styleObj] Return a reference to the styleObj at *index* in the styles array.

insertStyle(styleObj style [, int index=-1]) [int] Insert a **copy** of *style* into the styles array at index *index*. Default is -1, or the end of the array. Returns the index at which the style was inserted.

moveStyleDown(int index) [int] Swap the styleObj at *index* with the styleObj *index + 1*.

moveStyleUp(int index) [int] Swap the styleObj at *index* with the styleObj *index - 1*.

removeStyle(int index) [styleObj] Remove the styleObj at *index* from the styles array and return a copy.

removeBinding(int binding) [int] Remove the attribute binding for a specfiled label property.

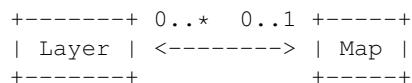
setBinding (int binding, string item) [int] Set the attribute binding for a specified label property. Binding constants look like this: MS_LABEL_BINDING_[attribute name].

```
setBinding(MS_LABEL_BINDING_COLOR, "FIELD_NAME_COLOR");
```

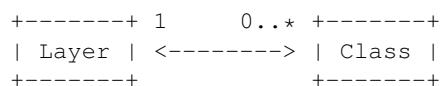
updateFromString (string snippet) [int] Update a label from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

layerObj

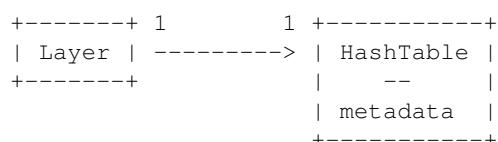
A layerObj is associated with mapObj. In the most recent revision, an instance of layerObj can exist outside of a mapObj.



The other important association for layerObj is with classObj



and hashTableObj



layerObj Attributes

bandsitem [string] The attribute from the index file used to select the source raster band(s) to be used. Normally NULL for default bands processing.

classitem [string] The attribute used to classify layer data.

connection [string] Layer connection or DSN.

connectiontype [int] See MS_CONNECTION_TYPE in mapserver.h for possible values. When setting the connection type setConnectionType() should be used in order to initialize the layer vtable properly.

data [string] Layer data definition, values depend upon connectiontype.

debug [int] Enable debugging of layer. MS_ON or MS_OFF (default).

dump [int] Since 6.0, *dump* is not available anymore. metadata is used instead.

Switch to allow mapserver to return data in GML format. MS_TRUE or MS_FALSE. Default is MS_FALSE.
Deprecated since version 6.0: metadata is used instead.

extent [rectObj] optional limiting extent for layer features.

filteritem [string] Attribute defining filter.

footer [string] TODO

group [string] Name of a group of layers.

header [string] TODO

index [int immutable] Index of layer within parent map's layers array.

labelangleitem [string] Attribute defining label angle.

labelcache [int] MS_ON or MS_OFF. Default is MS_ON.

labelitem [string] Attribute defining feature label text.

labelmaxscaledenom [float] Minimum scale at which layer will be labeled.

labelminscaledenom [float] Maximum scale at which layer will be labeled.

labelrequires [string] Logical expression.

labelsizeitem [string] Attribute defining label size.

map [mapObj immutable] Reference to parent map.

mask [string] Layer name for masking. ([MS RFC 79: Layer Masking](#))

maxfeatures [int] Maximum number of layer features that will be drawn. For shapefile data this means the first N features where N = maxfeatures.

maxscaledenom [float] Minimum scale at which layer will be drawn.

metadata [hashTableObj immutable] Layer metadata.

minscaledenom [float] Maximum scale at which layer will be drawn.

name [string] Unique identifier for layer.

numclasses [int immutable] Number of layer classes.

numitems [int immutable] Number of layer feature attributes (items).

numjoins [int immutable] Number of layer joins.

numprocessing [int immutable] Number of raster processing directives.

offsite [colorObj] transparent pixel value for raster layers.

opacity [int] Layer opacity percentage in range [0, 100]. The special value of MS_GD_ALPHA (1000) indicates that the alpha transparency of pixmap symbols should be honored, and should be used only for layers that use RGBA pixmap symbols.

postlabelcache [int] MS_TRUE or MS_FALSE. Default is MS_FALSE.

requires [string] Logical expression.

sizeunits [int] Units of class size values. MS_INCHES, MS_FEET, MS_MILES, MS_NAUTICALMILES, MS_METERS, MS_KILOMETERS, MS_DD or MS_PIXELS

status [int] MS_ON, MS_OFF, or MS_DEFAULT.

styleitem [string] Attribute defining styles.

symbolscaledenom [float] Scale at which symbols are default size.

template [string] Template file. Note that for historical reasons, the query attribute must be non-NULL for a layer to be queryable.

tileindex [string] Layer index file for tiling support.

tileitem [string] Attribute defining tile paths.

tolerance [float] Search buffer for point and line queries.

toleranceunits [int] MS_INCHES, MS_FEET, MS_MILES, MS_NAUTICALMILES, MS_METERS, MS_KILOMETERS, MS_DD or MS_PIXELS

transform [int] Whether or not layer data is to be transformed to image units. MS_TRUE or MS_FALSE. Default is MS_TRUE. Case of MS_FALSE is for data that are in image coordinates such as annotation points.

type [int] See MS_LAYER_TYPE in mapserver.h.

units [int] Units of the layer. See MS_UNITS in mapserver.h.

layerObj Methods

new layerObj([mapObj parent_map=NULL]) [layerObj] Create a new layerObj in *parent_map*. The layer index of the new layerObj will be equal to the *parent_map* numlayers - 1. The *parent_map* arg is now optional and Layers can exist outside of a Map.

addFeature(shapeObj shape) [int] Add a new inline feature on a layer. Returns -1 on error. **TODO:** Is this similar to inline features in a mapfile? Does it work for any kind of layer or connection type?

addProcessing(string directive) [void] Adds a new processing directive line to a layer, similar to the PROCESSING directive in a map file. Processing directives supported are specific to the layer type and underlying renderer.

applySLD(string sld, string stylelayer) [int] Apply the SLD document to the layer object. The matching between the sld document and the layer will be done using the layer's name. If a namedlayer argument is passed (argument is optional), the NamedLayer in the sld that matchs it will be used to style the layer. See SLD HOWTO for more information on the SLD support.

applySLDURL(string sld, string stylelayer) [int] Apply the SLD document pointed by the URL to the layer object. The matching between the sld document and the layer will be done using the layer's name. If a namedlayer argument is passed (argument is optional), the NamedLayer in the sld that matchs it will be used to style the layer. See SLD HOWTO for more information on the SLD support.

clearProcessing() [int] Clears the layer's raster processing directives. Returns the subsequent number of directives, which will equal MS_SUCCESS if the directives have been cleared.

clone() [layerObj] Return an independent copy of the layer with no parent map.

close() [void] Close the underlying layer.

Note: demote() is removed in MapServer 4.4

draw(mapObj map, imageObj image) [int] Renders this layer into the target image, adding labels to the cache if required. Returns MS_SUCCESS or MS_FAILURE. **TODO:** Does the map need to be the map on which the layer is defined? I suspect so.

drawQuery(mapObj map, imageObj image): Draw query map for a single layer into the target image. Returns MS_SUCCESS or MS_FAILURE.

executeWFSGetFeature(layer) [string] Executes a GetFeature request on a WFS layer and returns the name of the temporary GML file created. Returns an empty string on error.

generateSLD() [void] Returns an SLD XML string based on all the classes found in the layer (the layer must have *STATUS on*).

getClass(int i) [classObj] Fetch the requested class object. Returns NULL if the class index is out of the legal range. The numclasses field contains the number of classes available, and the first class is index 0.

getExtent() [rectObj] Fetches the extents of the data in the layer. This normally requires a full read pass through the features of the layer and does not work for raster layers.

getFeature(int shapeindex [, int tileindex=-1]) [shapeObj] Return the layer feature at *shapeindex* and *tileindex*.

Note: getFeature has been removed as of version 6.0 and replaced by getShape

getFilterString() [string] Returns the current filter expression.

getFirstMetaDataKey() [string] Returns the first key in the metadata hash table. With getNextMetaDataKey(), provides an opaque iterator over keys.

Note: getFirstMetaDataKey(), getMetaData(), and getNextMetaDataKey() are deprecated and will be removed in a future version. Replaced by direct metadata access, see [hashTableObj](#).

getItem(int i) [string] Returns the requested item. Items are attribute fields, and this method returns the item name (field name). The numitems field contains the number of items available, and the first item is index zero.

getMetaData(string key) [string] Return the value at *key* from the metadata hash table.

Note: getFirstMetaDataKey(), getMetaData(), and getNextMetaDataKey() are deprecated and will be removed in a future version. Replaced by direct metadata access, see [hashTableObj](#).

getNextMetaDataKey(string lastkey) [string] Returns the next key in the metadata hash table or NULL if *lastkey* is the last valid key. If *lastkey* is NULL, returns the first key of the metadata hash table.

Note: getFirstMetaDataKey(), getMetaData(), and getNextMetaDataKey() are deprecated and will be removed in a future version. Replaced by direct metadata access, see [hashTableObj](#).

getNumFeatures() [int] Returns the number of inline features in a layer. **TODO:** is this really only online features or will it return the number of non-inline features on a regular layer?

getNumResults() [int] Returns the number of entries in the query result cache for this layer.

getProcessing(int index) [string] Return the raster processing directive at *index*.

getProjection() [string] Returns the PROJ.4 definition of the layer's projection.

getResult(int i) [resultCacheMemberObj] Fetches the requested query result cache entry, or NULL if the index is outside the range of available results. This method would normally only be used after issuing a query operation.

getResults() [resultCacheObj] Returns a reference to layer's result cache. Should be NULL prior to any query, or after a failed query or query with no results.

getResultsBounds() [rectObj] Returns the bounds of the features in the result cache.

getShape(resultCacheMemberObj result) [int] Get a shape from layer data. Argument is a result cache member from layerObj::getResult(i)

getWMSFeatureInfoURL(mapObj map, int click_x, int click_y, int feature_count, string info_format)
 [string] Return a WMS GetFeatureInfo URL (works only for WMS layers) clickX, clickY is the location of to query in pixel coordinates with (0,0) at the top left of the image. featureCount is the number of results to return. infoFormat is the format the result should be requested. Depends on remote server's capabilities. MapServer WMS servers support only "MIME" (and should support "GML.1" soon). Returns "" and outputs a warning if layer is not a WMS layer or if it is not queriable.

insertClass(classObj class [, int index=-1]) [int] Insert a *copy* of the class into the layer at the requested *index*. Default index of -1 means insertion at the end of the array of classes. Returns the index at which the class was inserted.

isVisible() [int] Returns MS_TRUE or MS_FALSE after considering the layer status, minscaledenom, and maxscaledenom within the context of the parent map.

moveClassDown(int class) [int] The class specified by the class index will be moved up into the array of layers. Returns MS_SUCCESS or MS_FAILURE. ex. moveClassDown(1) will have the effect of moving class 1 down to position 2, and the class at position 2 will be moved to position 1.

moveClassUp(int class) [int] The class specified by the class index will be moved up into the array of layers. Returns MS_SUCCESS or MS_FAILURE. ex. moveClassUp(1) will have the effect of moving class 1 up to position 0, and the class at position 0 will be moved to position 1.

nextShape() [shapeObj] Called after msWhichShapes has been called to actually retrieve shapes within a given area returns a shape object or MS_FALSE

example of usage :

```
mapObj map = new mapObj("d:/msapps/gmap-ms40/htdocs/gmap75.map");
layerObj layer = map.getLayerByName('road');
int status = layer.open();
status = layer.whichShapes(map.extent);
shapeObj shape;
while ((shape = layer.nextShape()) != null)
{
  ...
}
layer.close();
```

open() [void] Opens the underlying layer. This is required before operations like getFeature() will work, but is not required before a draw or query call.

Note: promote() is eliminated in MapServer 4.4.

queryByAttributes(mapObj map, string qitem, string qstring, int mode) [int] Query layer for shapes that intersect current map extents. qitem is the item (attribute) on which the query is performed, and qstring is the expres-

sion to match. The query is performed on all the shapes that are part of a CLASS that contains a TEMPLATE value or that match any class in a layer that contains a LAYER TEMPLATE value.

Note that the layer's FILTER/FILTERITEM are ignored by this function. Mode is MS_SINGLE or MS_MULTIPLE depending on number of results you want. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened.

queryByFeatures(mapObj map, int slayer) [int] Perform a query set based on a previous set of results from another layer. At present the results MUST be based on a polygon layer. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened

queryByIndex(mapObj map, int shapeindex, int tileindex [, int bAddToQuery=MS_FALSE]) [int] Pop a query result member into the layer's result cache. By default clobbers existing cache. Returns MS_SUCCESS or MS_FAILURE.

queryByPoint(mapObj map, pointObj point, int mode, float buffer) [int] Query layer at point location specified in georeferenced map coordinates (i.e. not pixels). The query is performed on all the shapes that are part of a CLASS that contains a TEMPLATE value or that match any class in a layer that contains a LAYER TEMPLATE value. Mode is MS_SINGLE or MS_MULTIPLE depending on number of results you want. Passing buffer <=0 defaults to tolerances set in the map file (in pixels) but you can use a constant buffer (specified in ground units) instead. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened.

queryByRect(mapObj map, rectObj rect) [int] Query layer using a rectangle specified in georeferenced map coordinates (i.e. not pixels). The query is performed on all the shapes that are part of a CLASS that contains a TEMPLATE value or that match any class in a layer that contains a LAYER TEMPLATE value. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened.

queryByShape(mapObj map, shapeObj shape) [int] Query layer based on a single shape, the shape has to be a polygon at this point. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened

removeClass(int index) [classObj] Removes the class indicated and returns a copy, or NULL in the case of a failure. Note that subsequent classes will be renumbered by this operation. The numclasses field contains the number of classes available.

removeMetaData(string key) [int] Delete the metadata hash at *key*. Returns MS_SUCCESS or MS_FAILURE.

Note: removeMetaData() is deprecated and will be removed in a future version. Replaced by direct metadata access, see [hashTableObj](#).

setConnectionType(int connectiontype, string library_str) [int] Changes the connectiontype of the layer and recreates the vtable according to the new connection type. This method should be used instead of setting the connectiontype parameter directly. In case when the layer.connectiontype = MS_PLUGIN the library_str parameter should also be specified so as to select the library to load by mapserver. For the other connection types this parameter is not used.

setExtent(float minx, float miny, float maxx, float maxy) [int] Sets the extent of a layer. Returns MS_SUCCESS or MS_FAILURE.

setFilter(string filter) [int] Sets a filter expression similarly to the FILTER expression in a map file. Returns MS_SUCCESS on success or MS_FAILURE if the expression fails to parse.

setMetaData(string key, string value) [int] Assign *value* to the metadata hash at *key*. Return MS_SUCCESS or MS_FAILURE.

Note: setMetaData() is deprecated and will be removed in a future version. Replaced by direct metadata access, see [hashTableObj](#).

setProcessingKey(string key, string value) [void] Adds or replaces a processing directive of the form “key=value”.

Unlike the addProcessing() call, this will replace an existing processing directive for the given key value. Processing directives supported are specific to the layer type and underlying renderer.

setProjection(string proj4) [int] Set the layer projection using a PROJ.4 format projection definition (ie. “+proj=utm +zone=11 +datum=WGS84” or “init=EPSG:26911”). Returns MS_SUCCESS or MS_FAILURE.

setWKTProjection(string wkt) [int] Set the layer projection using OpenGIS Well Known Text format. Returns MS_SUCCESS or MS_FAILURE.

int whichShapes(rectObj rect) [int] Performs a spatial, and optionally an attribute based feature search. The function basically prepares things so that candidate features can be accessed by query or drawing functions (eg using nextShape function). Returns MS_SUCCESS, MS_FAILURE or MS_DONE. MS_DONE is returned if the layer extent does not overlap rect.

resultsGetShape(int shapeindex [, int tileindex = -1]) [shapeObj] Retrieve shapeObj from a layer’s resultset by index. Tileindex is optional and is used only for tiled shapefiles, Simply omit or pass tileindex = -1 for other data sources. Added in MapServer 5.6.0 due to the one-pass query implementation.

legendObj

legendObj is associated with [mapObj](#)

```
+-----+ 0 .. 1      1 +-----+
| Legend | <-----> | Map  |
+-----+             +-----+
```

and with [labelObj](#).

```
+-----+ 1      1 +-----+
| Legend | -----> | Label |
+-----+           +-----+
```

legendObj Attributes

height [int] Legend height.

imagecolor [colorObj] Legend background color.

keysizex [int] Width in pixels of legend keys.

keysizey [int] Pixels.

keyspacingx [int] Horizontal padding around keys in pixels.

keyspacingy [int] Vertical padding.

label [[labelObj](#) immutable] legend label.

map [[mapObj](#) immutable] Reference to parent mapObj.

outlinecolor [colorObj] key outline color.

position [int] MS_UL, MS_UC, MS_UR, MS_LL, MS_LC, or MS_LR.

postlabelcache [int] MS_TRUE or MS_FALSE.

status [int] MS_ON, MS_OFF, or MS_EMBED.

template [string] Path to template file.

width [int] Label width.

legendObj Methods

None

lineObj

A lineObj is composed of one or more [pointObj](#) instances.

```
+----+ 0..1 1..* +-----+
| Line | -----> | Point |
+----+           +-----+
```

lineObj Attributes

numpoints [int immutable] Number of points in the line.

lineObj Methods

new lineObj() [lineObj] Create a new instance.

add([pointObj](#) point) [int] Add *point* to the line. Returns MS_SUCCESS or MS_FAILURE.

get(int index) [[pointObj](#)] Return reference to point at *index*.

project([projectionObj](#) proj_in, [projectionObj](#) proj_out) [int] Transform line in place from *proj_in* to *proj_out*. Returns MS_SUCCESS or MS_FAILURE.

set(int index, [pointObj](#) point) [int] Set the point at *index* to *point*. Returns MS_SUCCESS or MS_FAILURE.

mapObj

A mapObj is primarily associated with instances of [layerObj](#).

```
+----+ 0..1 0..* +-----+
| Map | <-----> | Layer |
+----+           +-----+
```

Secondary associations are with [legendObj](#), [scalebarObj](#), [referenceMapObj](#),

```
+----+ 1      0..1 +-----+
| Map | -----> | Legend      |
+----+           | -----|
                  | Scalebar    |
                  | -----|
                  | ReferenceMap|
+-----+           +-----+
```

[outputFormatObj](#).

```
+----+ 1      1..* +-----+
| Map | -----> | OutputFormat |
+----+           +-----+ +-----+
```

mapObj Attributes

cellsize [float] Pixel size in map units.

configoptions [hashObj immutable] A hash table of configuration options from CONFIG keywords in the .map. Direct access to config options is discouraged. Use the setConfigOption() and getConfigOption() methods instead.

datapattern [string] **TODO** not sure this is meaningful for mapscript.

debug [int] MS_TRUE or MS_FALSE.

extent [rectObj] Map's spatial extent.

fontset [fontSetObj immutable] The map's defined fonts.

height [int] Map's output image height in pixels.

Note: direct setting of *height* is deprecated in MapServer version 4.4. Users should set width and height simultaneously using setSize().

imagecolor [colorObj] Initial map background color.

imagequality [int] JPEG image quality.

Note: map imagequality is deprecated in MapServer 4.4 and should instead be managed through map outputformats.

imagetype [string immutable] Name of the current output format.

interlace [int] Output image interlacing.

Note: map interlace is deprecated in MapServer 4.4 and should instead be managed through map outputformats.

labelcache [labelCacheObj immutable] Map's labelcache.

legend [legendObj immutable] Reference to map's legend.

mappath [string] Filesystem path of the map's mapfile.

maxsize [int] **TODO** ?

name [string] Unique identifier.

numlayers [int immutable] Number of map layers.

numoutputformats [int] The number of output formats currently configured on the map object. Can be used to iterate over the list of output formats with the getOutputFormat(idx) method (see below).

outputformat [outputFormatObj] The currently selected output format.

Note: Map outputformat should not be modified directly. Use the selectOutputFormat() method to select named formats.

outputformatlist [outputFormatObj[]] Array of the available output formats.

Note: Currently only available for C#. A proper typemaps should be implemented for the other languages.

Note: As of 6.2 other languages can use the `getoutputFormat(idx)` and `getNumoutputformats()` functions to iterate over the format array.

querymap [queryMapObj immutable] **TODO** should this be exposed to mapscript?

reference [referenceMapObj immutable] Reference to reference map.

resolution [float] Nominal DPI resolution. Default is 72.

scaledenom [float] The nominal map scale. A value of 25000 means 1:25000 scale.

scalebar [scalebarObj immutable] Reference to the scale bar.

shapepath [string] Base filesystem path to layer data.

status [int] MS_OFF, MS_ON, or MS_DEFAULT.

symbolset [symbolSetObj immutable] The map's set of symbols.

templatepattern [string] **TODO** not sure this is meaningful for mapscript.

transparent [int] MS_TRUE or MS_FALSE.

Note: map transparent is deprecated in MapServer 4.4 and should instead be managed through map outputformats.

units [int] MS_DD, MS_METERS, etc.

web [webObj immutable] Reference to map's web definitions.

width [int] Map's output image width in pixels.

Note: direct setting of `width` is deprecated in MapServer version 4.4. Users should set width and height simultaneously using `setSize()`.

mapObj Methods

new mapObj([string filename=""]) [mapObj] Create a new instance of mapObj. Note that the filename is now optional.

appendOutputFormat(outputFormatObj format) [int] Attach `format` to the map's output format list. Returns the updated number of output formats.

applyConfigOptions() [void] Apply the defined configuration options set by `setConfigOption()`.

applySLD(string sldxml) [int] Parse the SLD XML string `sldxml` and apply to map layers. Returns MS_SUCCESS or MS_FAILURE.

applySLDURL(string sldurl) [int] Fetch SLD XML from the URL `sldurl` and apply to map layers. Returns MS_SUCCESS or MS_FAILURE.

clone() [mapObj] Returns a independent copy of the map, less any caches.

Note: In the Java module this method is named 'cloneMap'.

draw() [imageObj] Draw the map, processing layers according to their defined order and status. Return an imageObj.

drawLabelCache(imageObj image) [int] Draw map's label cache on `image`. Returns MS_SUCCESS or MS_FAILURE.

drawLegend() [imageObj] Draw map legend, returning an imageObj.

drawQuery() [imageObj] Draw query map, returning an imageObj.

drawReferenceMap() [imageObj] Draw reference map, returning an imageObj.

drawScalebar() [imageObj] Draw scale bar, returning an imageObj.

embedLegend(imageObj image) [int] Embed map's legend in *image*. Returns MS_SUCCESS or MS_FAILURE.

embedScalebar(imageObj image) [int] Embed map's scalebar in *image*. Returns MS_SUCCESS or MS_FAILURE.

freeQuery([int qlayer=-1]) [void] Clear layer query result caches. Default is -1, or *all* layers.

generateSLD() [string] Return SLD XML as a string for map layers that have *STATUS on*.

getConfigOption(string key) [string] Fetches the value of the requested configuration key if set. Returns NULL if the key is not set.

getFirstMetaDataKey() [string] Returns the first key in the web.metadata hash table. With getNextMetaDataKey(), provides an opaque iterator over keys.

getLayer(int index) [layerObj] Returns a reference to the layer at *index*.

getLayerByName(string name) [layerObj] Returns a reference to the named layer.

getLayersDrawingOrder() [int*] Returns an array of layer indexes in drawing order.

Note: Unless the proper typemap is implemented for the module's language a user is more likely to get back an unuseable SWIG pointer to the integer array.

getMetaData(string key) [string] Return the value at *key* from the web.metadata hash table.

getNextMetaDataKey(string lastkey) [string] Returns the next key in the web.metadata hash table or NULL if *lastkey* is the last valid key. If *lastkey* is NULL, returns the first key of the metadata hash table.

getNumSymbols() [int] Return the number of symbols in map.

getOutputFormatByName(string imagetype) [outputFormatObj] Return the output format corresponding to driver name *imagetype* or to format name *imagetype*. This works exactly the same as the IMAGETYPE directive in a mapfile, is case insensitive and allows an output format to be found either by driver (like 'GD/PNG') or name (like 'PNG24').

getProjection() [string] Returns the PROJ.4 definition of the map's projection.

getSymbolByName(string name) [int] Return the index of the named symbol in the map's symbolset.

Note: This method is poorly named and too indirect. It is preferable to use the getSymbolByName method of symbolSetObj, which really does return a symbolObj reference, or use the index method of symbolSetObj to get a symbol's index number.

insertLayer(layerObj layer [, int nIndex=-1]) [int] Insert a copy of *layer* into the Map at index *nIndex*. The default value of *nIndex* is -1, which means the last possible index. Returns the index of the new Layer, or -1 in the case of a failure.

loadMapContext(string filename [, int useUniqueNames=MS_FALSE]) [int] Load an OGC map context file to define extents and layers of a map.

loadOWSParameters(OWSRequest request [, string version='1.1.1']) [int] Load OWS request parameters (BBOX, LAYERS, &c.) into map. Returns MS_SUCCESS or MS_FAILURE.

loadQuery(string filename) [int] Load a saved query. Returns MS_SUCCESS or MS_FAILURE.

moveLayerDown(int layerindex) [int] Move the layer at *layerindex* down in the drawing order array, meaning that it is drawn later. Returns MS_SUCCESS or MS_FAILURE.

moveLayerUp(int layerindex) [int] Move the layer at *layerindex* up in the drawing order array, meaning that it is drawn earlier. Returns MS_SUCCESS or MS_FAILURE.

nextLabel() [labelCacheMemberObj] Return the next label from the map's labelcache, allowing iteration over labels.

Note: nextLabel() is deprecated and will be removed in a future version. Replaced by getLabel().

getLabel(int labelindex) [labelCacheMemberObj] Return label at specified index from the map's labelcache.

OWSDispatch(OWSRequest req) [int] Processes and executes the passed OpenGIS Web Services request on the map. Returns MS_DONE (2) if there is no valid OWS request in the *req* object, MS_SUCCESS (0) if an OWS request was successfully processed and MS_FAILURE (1) if an OWS request was not successfully processed. OWS requests include WMS, WFS, WCS and SOS requests supported by MapServer. Results of a dispatched request are written to stdout and can be captured using the msIO services (ie. msIO_installStdoutToBuffer() and msIO_getStdoutBufferString())

prepareImage() [imageObj] Returns an imageObj initialized to map extents and outputformat.

prepareQuery() [void] **TODO** this function only calculates the scale or am I missing something?

processLegendTemplate(string names[], string values[], int numitems) [string] Process MapServer legend template and return HTML.

Note: None of the three template processing methods will be useable unless the proper typemaps are implemented in the module for the target language. Currently the typemaps are not implemented.

processQueryTemplate(string names[], string values[], int numitems) [string] Process MapServer query template and return HTML.

Note: None of the three template processing methods will be useable unless the proper typemaps are implemented in the module for the target language. Currently the typemaps are not implemented.

processTemplate(int generateimages, string names[], string values[], int numitems) [string] Process MapServer template and return HTML.

Note: None of the three template processing methods will be useable unless the proper typemaps are implemented in the module for the target language. Currently the typemaps are not implemented.

queryByFeatures(int layerindex) [int] Query map layers, result sets contain features that intersect or are contained within the features in the result set of the MS_LAYER_POLYGON type layer at *layerindex*. Returns MS_SUCCESS or MS_FAILURE.

queryByPoint(pointObj point, int mode, float buffer) [int] Query map layers, result sets contain one or more features, depending on *mode*, that intersect *point* within a tolerance *buffer*. Returns MS_SUCCESS or MS_FAILURE.

queryByRect(rectObj rect) [int] Query map layers, result sets contain features that intersect or are contained within *rect*. Returns MS_SUCCESS or MS_FAILURE.

queryByShape(shapeObj shape) [int] Query map layers, result sets contain features that intersect or are contained within *shape*. Returns MS_SUCCESS or MS_FAILURE.

removeLayer(int index) [int] Remove the layer at *index*.

removeMetaData(string key) [int] Delete the web.metadata hash at *key*. Returns MS_SUCCESS or MS_FAILURE.

removeOutputFormat(string name) [int] Removes the format named *name* from the map's output format list. Returns MS_SUCCESS or MS_FAILURE.

save(string filename) [int] Save map to disk as a new map file. Returns MS_SUCCESS or MS_FAILURE.

saveMapContext(string filename) [int] Save map definition to disk as OGC-compliant XML. Returns MS_SUCCESS or MS_FAILURE.

saveQuery(string filename) [int] Save query to disk. Returns MS_SUCCESS or MS_FAILURE.

saveQueryAsGML(string filename) [int] Save query to disk. Returns MS_SUCCESS or MS_FAILURE.

selectOutputFormat(string imagetype) [void] Set the map's active output format to the internal format named *imagetype*. Built-in formats are "PNG", "PNG24", "JPEG", "GIF", "GTIFF".

getOutputFormat(int i): outputFormatObj Returns the output format at the specified *i* index from the output formats array or null if *i* is beyond the array bounds. The number of outputformats can be retrieved by calling *getNumoutputformats*.

setConfigOption(string key, string value) [void] Set the indicated key configuration option to the indicated value. Equivalent to including a CONFIG keyword in a map file.

setExtent(float minx, float miny, float maxx, float maxy) [int] Set the map extent, returns MS_SUCCESS or MS_FAILURE. This method will correct the extents (width/height ratio) before setting the minx,miny,maxx,maxy values. See extent properties to set up a custom extent from *rectObj*.

offsetExtent(float x, float y) [int] Offset the map extent based on the given distances in map coordinates, returns MS_SUCCESS or MS_FAILURE.

scaleExtent(float zoomfactor, float minscaledenom, float maxscaledenom) [int] Scale the map extent using the zoomfactor and ensure the extent within the minscaledenom and maxscaledenom domain. If minscaledenom and/or maxscaledenom is 0 then the parameter is not taken into account. returns MS_SUCCESS or MS_FAILURE.

setCenter(pointObj center) [int] Set the map center to the given map point, returns MS_SUCCESS or MS_FAILURE.

setFontSet(string filename) [int] Load fonts defined in *filename* into map fontset. The existing fontset is cleared. Returns MS_SUCCESS or MS_FAILURE.

setImageType(string name) [void] Sets map outputformat to the named format.

Note: setImageType() remains in the module but it's use is deprecated in favor of selectOutputFormat().

setLayersDrawingOrder(int layerindexes[]) [int] Set map layer drawing order.

Note: Unless the proper typemap is implemented for the module's language users will not be able to pass arrays or lists to this method and it will be unusable.

setMetaData(string key, string value) [int] Assign *value* to the web.metadata hash at *key*. Return MS_SUCCESS or MS_FAILURE.

setOutputFormat(outputFormatObj format) [void] Sets map outputformat.

setProjection(string proj4) [int] Set map projection from PROJ.4 definition string *proj4*.

setRotation(float rotation_angle) [int] Set map rotation angle. The map view rectangle (specified in EXTENTS) will be rotated by the indicated angle in the counter-clockwise direction. Note that this implies the rendered map will be rotated by the angle in the clockwise direction. Returns MS_SUCCESS or MS_FAILURE.

setSize(int width, int height) [int] Set map's image width and height together and carry out the necessary subsequent geotransform computation. Returns MS_SUCCESS or MS_FAILURE.

setSymbolSet(string filename) [int] Load symbols defined in *filename* into map symbolset. The existing symbolset is cleared. Returns MS_SUCCESS or MS_FAILURE.

setWKTProjection(string wkt) [int] Sets map projection from OGC definition *wkt*.

zoomPoint(int zoomfactor, pointObj imgpoint, int width, int height, rectObj extent, rectObj maxextent) [int] Zoom by *zoomfactor* to *imgpoint* in pixel units within the image of *height* and *width* dimensions and georeferenced *extent*. Zooming can be constrained to a maximum *maxextent*. Returns MS_SUCCESS or MS_FAILURE.

zoomRectangle(rectObj imgrect, int width, int height, rectObj extent, rectObj maxextent) : int Zoom to a pixel coordinate rectangle in the image of *width* and *height* dimensions and georeferencing *extent*. Zooming can be constrained to a maximum *maxextent*. The *imgrect* rectangle contains the coordinates of the LL and UR coordinates in pixel: the maxy in the rect object should be < miny value. Returns MS_SUCCESS or MS_FAILURE.

```
----- UR (values in the rect object : maxx, maxy)
|       |
|       |
|       |
-----  
LL (values in the rectobject minx, miny)
```

zoomScale(float scale, pointObj imgpoint, int width, int height, rectObj extent, rectObj maxextent) [int] Like the previous methods, but zooms to the point at a specified scale.

markerCacheMemberObj

An individual marker. The markerCacheMemberObj class is associated with labelCacheObj.

```
+-----+ 0..*      1 +-----+
| MarkerCacheMember | <-----+ | LabelCache |  
+-----+           +-----+
```

markerCacheMemberObj Attributes

id [int immutable] Id of the marker.

poly [shapeObj immutable] Marker bounding box.

markerCacheMemberObj Methods

None.

outputFormatObj

An outputFormatObj is associated with a [mapObj](#)

```
+-----+ 1...*      1 +----+
| OutputFormat | <----- | Map |
+-----+           +----+
```

and can also be an attribute of an `imageObj`.

`outputFormatObj` Attributes

bands [int] The number of bands in the raster. Only used for the “raw” modes, `MS_IMAGEMODE_BYTE`, `MS_IMAGEMODE_INT16`, and `MS_IMAGEMODE_FLOAT32`. Normally set via the `BAND_COUNT` formatoption ... this field should be considered read-only.

driver [string] A string such as ‘GD/PNG’ or ‘GDAL/GTiff’.

extension [string] Format file extension such as ‘png’.

imagemode [int] `MS_IMAGEMODE_PC256`, `MS_IMAGEMODE_RGB`, `MS_IMAGEMODE_RGBA`, `MS_IMAGEMODE_INT16`, `MS_IMAGEMODE_FLOAT32`, `MS_IMAGEMODE_BYTE`, or `MS_IMAGEMODE_NULL`.

mimetype [string] Format mimetype such as ‘image/png’.

name [string] A unique identifier.

renderer [int] `MS_RENDER_WITH_GD`, `MS_RENDER_WITH_SWF`, `MS_RENDER_WITH_RAWDATA`, `MS_RENDER_WITH_PDF`, or `MS_RENDER_WITH_IMAGEMAP`. Normally set internally based on the driver and some other setting in the constructor.

transparent [int] `MS_ON` or `MS_OFF`.

numformatoptions: int The number of option values set on this format. Can be used to iterate over the options array in conjunction with `getOptionAt`

`outputFormatObj` Methods

new outputFormatObj(string driver [, string name=driver]) [`outputFormatObj`] Create new instance. If `name` is not provided, the value of `driver` is used as a name.

getOption(string key [, string defaultvalue=""]) [string] Return the format option at `key` or `defaultvalue` if `key` is not a valid hash index.

setExtension(string extension) [void] Set file extension for output format such as ‘png’ or ‘jpg’. Method could probably be deprecated since the extension attribute is mutable.

setMimetype(string mimetype) [void] Set mimetype for output format such as ‘image/png’ or ‘image/jpeg’. Method could probably be deprecated since the mimetype attribute is mutable.

setOption(string key, string value) [void] Set the format option at `key` to `value`. Format options are mostly driver specific.

getOptionAt(int idx): string Returns the option at `idx` or null if the index is beyond the array bounds. The option is returned as the original KEY=VALUE string. The number of available options can be obtained by calling `getNumformatoptions`.

validate() [int] Checks some internal consistency issues, and returns `MS_TRUE` if things are OK and `MS_FALSE` if there are problems. Some problems are fixed up internally. May produce debug output if issues encountered.

OWSRequest

Not associated with other mapscript classes. Serves as a message intermediary between an application and MapServer's OWS capabilities. Using it permits creation of lightweight WMS services:

```
wms_map = mapscript.mapObj('wms.map')
wms_request = mapscript.OWSRequest()

# Convert application request parameters (req.args)
for param, value in req.args.items():
    wms_request.setParam(param, value)

# Map loads parameters from OWSRequest, adjusting its SRS, extents,
# active layers accordingly
wms_map.loadWMSRequest('1.1.0', wms_request)

# Render the Map
img = wms_map.draw()
```

OWSRequest Attributes

NumParams [int immutable] Number of request parameters. Eventually should be changed to numparams lowercase like other attributes.

postrequest [string] TODO

type [int] MS_GET_REQUEST or MS_POST_REQUEST.

OWSRequest Methods

new OWSRequest() [OWSRequest] Create a new instance.

Note: MapServer's OWSRequest supports only single valued parameters.

setParameter(string name, string value) [void] Set a request parameter. For example

```
request.setParameter('REQUEST', 'GetMap')
request.setParameter('BBOX', '-107.0,40.0,-106.0,41.0')
```

addParameter(string name, string value) [void] Add a request parameter, even if the parameter key was previously set. This is useful when multiple parameters with the same key are required. For example

```
request.addParameter('SIZE', 'x(100)')
request.addParameter('SIZE', 'y(100)')
```

getName(int index) [string] Return the name of the parameter at *index* in the request's array of parameter names.

getValue(int index) [string] Return the value of the parameter at *index* in the request's array of parameter values.

getValueByName(string name) [string] Return the value associated with the parameter *name*.

loadParams() [int] Initializes the OWSRequest object from the cgi environment variables REQUEST_METHOD, QUERY_STRING and HTTP_COOKIE. Returns the number of name/value pairs collected. Warning: most errors will result in a process exit!

loadParamsFromURL(string url) [int] Initializes the OWSRequest object from the provided URL which is treated like a QUERY_STRING. Note that REQUEST_METHOD=GET and no post data is assumed in this case. This method was added in MapServer 6.0.

pointObj

A pointObj instance may be associated with a lineObj.

```
+-----+ 1..* 0..1 +-----+
| Point | <----- | Line |
+-----+           +-----+
```

pointObj Attributes

m [float] Measure. Meaningful only for measured shapefiles. Given value -2e38 if not otherwise assigned to indicate “nodata”.

x [float] Easting

y [float] Northing

z [float] Elevation

pointObj Methods

new pointObj([float x=0.0, float y=0.0, float z=0.0, float m=-2e38]) [pointObj] Create new instance. Easting, northing, and measure arguments are optional.

distanceToPoint(pointObj point) [float] Returns the distance to *point*.

distanceToSegment(pointObj point1, pointObj point2) [float] Returns the minimum distance to a hypothetical line segment connecting *point1* and *point2*.

distanceToShape(shapeObj shape) [float] Returns the minimum distance to *shape*.

draw(mapObj map, layerObj layer, imageObj image, int classindex, string text) [int] Draw the point using the styles defined by the *classindex* class of *layer* and labeled with string *text*. Returns MS_SUCCESS or MS_FAILURE.

project(projectionObj proj_in, projectionObj proj_out) [int] Reproject point from *proj_in* to *proj_out*. Transformation is done in place. Returns MS_SUCCESS or MS_FAILURE.

setXY(float x, float y [, float m=2e-38]) [int] Set spatial coordinate and, optionally, measure values simultaneously. The measure will be set only if the value of *m* is greater than the ESRI measure no-data value of 1e-38. Returns MS_SUCCESS or MS_FAILURE.

setXYZ(float x, float y, float z [, float m=-2e38]) [int] Set spatial coordinate and, optionally, measure values simultaneously. The measure will be set only if the value of *m* is greater than the ESRI measure no-data value of -1e38. Returns MS_SUCCESS or MS_FAILURE.

setXYZM(float x, float y, float z, float m) [int] Set spatial coordinate and, optionally, measure values simultaneously. The measure will be set only if the value of *m* is greater than the ESRI measure no-data value of -1e38. Returns MS_SUCCESS or MS_FAILURE.

toString() [string] Return a string formatted like

```
{ 'x': %f, 'y': %f, 'z': %f }
```

with the coordinate values substituted appropriately. Python users can get the same effect via the `pointObj` `__str__` method

```
>>> p = mapscript.pointObj(1, 1)
>>> str(p)
{ 'x': 1.000000, 'y': 1.000000, 'z': 1.000000 }
```

toShape() [shapeObj] Convience method to quickly turn a point into a shapeObj.

projectionObj

This class is not really fully implemented yet. MapServer's Maps and Layers have Projection attributes, and these are C `projectionObj` structures, but are not directly exposed by the `mapscript` module. Currently we have to do some round-a-bout logic like this

```
point.project(projectionObj(mapobj.getProjection(),
                             projectionObj(layer.getProjection())))
```

to project a point from map to layer reference system.

projectionObj Attributes

numargs [int immutable] Number of PROJ.4 arguments.

projectionObj Methods

new projectionObj(string proj4) [projectionObj] Create new instance of `projectionObj`. Input parameter `proj4` is a PROJ.4 definition string such as “init=EPSG:4269”.

getUnits() [int] Returns the units of a projection object. Returns -1 on error.

rectObj

A `rectObj` may be a lone object or an attribute of another object and has no other associations.

rectObj Attributes

maxx [float] Maximum easting

maxy [float] Maximum northing

minx [float] Minimum easting

miny [float] Minimum northing

rectObj Methods

new rectObj([float minx=-1.0, float miny=-1.0, float maxx=-1.0, float maxy=-1.0, int imageunits=MS_FALSE]) [rectObj] Create new instance. The four easting and northing arguments are optional and default to -1.0. Note the new optional fifth argument which allows creation of rectangles in image (pixel/line) units which are also tested for validity.

draw(mapObj map, layerObj layer, imageObj img, int classindex, string text) [int] Draw rectangle into *img* using style defined by the *classindex* class of *layer*. The rectangle is labeled with the string *text*. Returns MS_SUCCESS or MS_FAILURE.

getCenter() [pointObj] Return the center point of the rectangle.

project(projectionObj proj_in, projectionObj proj_out) [int] Reproject rectangle from *proj_in* to *proj_out*. Transformation is done in place. Returns MS_SUCCESS or MS_FAILURE.

toPolygon() [shapeObj] Convert to a polygon of five vertices.

toString() [string] Return a string formatted like

```
{ 'minx': %f , 'miny': %f , 'maxx': %f , 'maxy': %f }
```

with the bounding values substituted appropriately. Python users can get the same effect via the `rectObj __str__` method

```
>>> r = mapscript.rectObj(0, 0, 1, 1)
>>> str(r)
{ 'minx': 0 , 'miny': 0 , 'maxx': 1 , 'maxy': 1 }
```

referenceMapObj

A referenceMapObj is associated with `mapObj`.

```
+-----+ 0 .. 1      1 +-----+
| ReferenceMap | <-----> | Map |
+-----+           +-----+
```

referenceMapObj Attributes

color [colorObj] Color of reference box.

extent [rectObj] Spatial extent of reference in units of parent map.

height [int] Height of reference map in pixels.

image [string] Filename of reference map image.

map [mapObj immutable] Reference to parent mapObj.

marker [int] Index of a symbol in the map symbol set to use for marker.

markername [string] Name of a symbol.

markersize [int] Size of marker.

maxboxsize [int] Pixels.

minboxsize [int] Pixels.

outlinecolor [colorObj] Outline color of reference box.

status [int] MS_ON or MS_OFF.

width [int] In pixels.

referenceMapObj Methods

None

resultCacheMemberObj

Has no associations with other MapScript classes and has no methods. By using several indexes, a resultCacheMemberObj refers to a single layer feature.

resultCacheMemberObj Attributes

classindex [int immutable] The index of the layer class into which the feature has been classified.

shapeindex [int immutable] Index of the feature within the layer.

tileindex [int immutable] Meaningful for tiled layers only, index of the shapefile data tile.

resultCacheObj

See querying-HOWTO.txt for extra guidance in using the new 4.4 query API.

resultCacheObj Attributes

bounds [rectObj immutable] Bounding box of query results.

numresults [int immutable] Length of result set.

resultCacheObj Methods

getResult(int i) [resultCacheMemberObj] Returns the result at index *i*, like layerObj::getResult, or NULL if index is outside the range of results.

scalebarObj

A scalebarObj is associated with mapObj.

```
+-----+ 0..1      1 +----+
| Scalebar | <-----| Map |
+-----+           +----+
```

and also with labelObj

```
+-----+ 1      1 +----+
| Scalebar | ----->| Label |
+-----+           +----+
```

scalebarObj Attributes

backgroundcolor [colorObj] Scalebar background color.

color [colorObj] Scalebar foreground color.

imagecolor [colorObj] Background color of scalebar.

height [int] Pixels.

intervals [int] Number of intervals.

label [labelObj] Scalebar label.
outlinecolor [colorObj] Foreground outline color.
position [int] MS_UL, MS_UC, MS_UR, MS_LL, MS_LC, or MS_LR.
postlabelcache [int] MS_TRUE or MS_FALSE.
status [int] MS_ON, MS_OFF, or MS_EMBED.
style [int] 0 or 1.
units [int] See MS_UNITS in mapserver.h.
width [int] Pixels.

scalebarObj Methods

None

shapefileObj

shapefileObj Attributes

bounds [rectObj] Extent of shapes
numshapes [int] Number of shapes
type [int] See mapshape.h for values of type.

shapefileObj Methods

new shapefileObj(string filename [, int type=-1]) [shapefileObj] Create a new instance. Omit the *type* argument or use a value of -1 to open an existing shapefile.
add(shapeObj shape) [int] Add shape to the shapefile. Returns MS_SUCCESS or MS_FAILURE.
get(int i, shapeObj shape) [int] Get the shapefile feature from index *i* and store it in *shape*. Returns MS_SUCCESS or MS_FAILURE.
getShape(int i) [shapeObj] Returns the shapefile feature at index *i*. More effecient than *get*.

TODO

shapeObj

Each feature of a layer's data is a shapeObj. Each part of the shape is a closed lineObj.

```
+-----+ 1      1..* +-----+
| Shape | -----> | Line |
+-----+           +-----+
```

shapeObj Attributes

bounds [rectObj] Bounding box of shape.

classindex [int] The class index for features of a classified layer.

index [int] Feature index within the layer.

numlines [int immutable] Number of parts.

numvalues [int immutable] Number of shape attributes.

text [string] Shape annotation.

tileindex [int] Index of tiled file for tileindexed layers.

type [int] MS_SHAPE_POINT, MS_SHAPE_LINE, MS_SHAPE_POLYGON, or MS_SHAPE_NULL.

shapeObj Methods

new shapeObj(int type) [shapeObj] Return a new shapeObj of the specified *type*. See the type attribute above. No attribute values created by default. initValues should be explicitly called to create the required number of values.

add(lineObj line) [int] Add *line* (i.e. a part) to the shape. Returns MS_SUCCESS or MS_FAILURE.

boundary() [shapeObj] Returns the boundary of the existing shape. Requires GEOS support. Returns NULL/undef on failure.

buffer(int distance) [shapeObj] Returns a new buffered shapeObj based on the supplied distance (given in the co-ordinates of the existing shapeObj). Requires GEOS support. Returns NULL/undef on failure.

contains(pointObj point) [int] Returns MS_TRUE if the point is inside the shape, MS_FALSE otherwise.

contains(shapeObj shape2) [int] Returns MS_TRUE if shape2 is entirely within the shape. Returns -1 on error and MS_FALSE otherwise. Requires GEOS support.

convexHull() [shapeObj] Returns the convex hull of the existing shape. Requires GEOS support. Returns NULL/undef on failure.

copy(shapeObj shape_copy) [int] Copy the shape to *shape_copy*. Returns MS_SUCCESS or MS_FAILURE.

clone() [shapeObj] Return an independent copy of the shape.

crosses(shapeObj shape2) [int] Returns MS_TRUE if shape2 crosses the shape. Returns -1 on error and MS_FALSE otherwise. Requires GEOS support.

difference(shapeObj shape) [shapeObj] Returns the computed difference of the supplied and existing shape. Requires GEOS support. Returns NULL/undef on failure.

disjoint(shapeObj shape2) [int] Returns MS_TRUE if shape2 and the shape are disjoint. Returns -1 on error and MS_FALSE otherwise. Requires GEOS support.

distanceToPoint(pointObj point) [float] Return distance to *point*.

distanceToShape(shapeObj shape) [float] Return the minimum distance to *shape*.

draw(mapObj map, layerObj layer, imageObj img) [int] Draws the individual shape using *layer*. Returns MS_SUCCESS or MS_FAILURE.

equals(shapeObj shape2) [int] Returns MS_TRUE if the shape and shape2 are equal (geometry only). Returns -1 on error and MS_FALSE otherwise. Requires GEOS support.

fromWKT(char *wkt) [shapeObj] Returns a new shapeObj based on a well-known text representation of a geometry. Requires GEOS support. Returns NULL/undef on failure.

get(int index) [lineObj] Returns a reference to part at *index*. Reference is valid only during the life of the shapeObj.

getArea() [double] Returns the area of the shape (if applicable). Requires GEOS support.

getCentroid() [pointObj] Returns the centroid for the existing shape. Requires GEOS support. Returns NULL/undef on failure.

getLength() [double] Returns the length (or perimeter) of a shape. Requires GEOS support.

getValue(int i) [string] Return the shape attribute at index *i*.

initValues(int numvalues) [void] Allocates memory for the requested number of values.

intersects(shapeObj shape) [int] Returns MS_TRUE if the two shapes intersect, MS_FALSE otherwise.

Note: Does not require GEOS support but will use GEOS functions if available.

intersection(shapeObj shape) [shapeObj] Returns the computed intersection of the supplied and existing shape. Requires GEOS support. Returns NULL/undef on failure.

overlaps(shapeObj shape2) [int] Returns MS_TRUE if shape2 overlaps shape. Returns -1 on error and MS_FALSE otherwise. Requires GEOS support.

project(projectionObj proj_in, projectionObj proj_out) [int] Reproject shape from *proj_in* to *proj_out*. Transformation is done in place. Returns MS_SUCCESS or MS_FAILURE.

setBounds [void] Must be called to calculate new bounding box after new parts have been added.

TODO: should return int and set msSetError.

setValue(int i, string value) [int] Set the shape value at index *i* to *value*.

simplify(double tolerance): **shapeObj** Given a tolerance, returns a simplified shape object or NULL on error. Requires GEOS support (>=3.0).

symDifference(shapeObj shape) [shapeObj] Returns the computed symmetric difference of the supplied and existing shape. Requires GEOS support. Returns NULL/undef on failure.

topologySimplifyPreservingSimplify(double tolerance): **shapeObj** Given a tolerance, returns a simplified shape object or NULL on error. Requires GEOS support (>=3.0).

touches(shapeObj shape2) [int] Returns MS_TRUE if the shape and shape2 touch. Returns -1 on error and MS_FALSE otherwise. Requires GEOS support.

toWKT() [string] Returns the well-known text representation of a shapeObj. Requires GEOS support. Returns NULL/undef on failure.

Union(shapeObj shape) [shapeObj] Returns the union of the existing and supplied shape. Shapes must be of the same type. Requires GEOS support. Returns NULL/undef on failure.

within(shapeObj shape2) [int] Returns MS_TRUE if the shape is entirely within shape2. Returns -1 on error and MS_FALSE otherwise. Requires GEOS support.

styleObj

An instance of styleObj is associated with one instance of classObj.

```
+-----+ 0 .. *      1 +-----+
| Style | <-----+ | Class |
+-----+           +-----+
```

An instance of styleObj can exist outside of a classObj container and be explicitly inserted into the classObj for use in mapping.

```
new_style = new styleObj()  
the_class.insertStyle(new_style)
```

It is important to understand that insertStyle inserts a **copy** of the styleObj instance, not a reference to the instance itself.

The older use case

```
new_style = new styleObj(the_class)
```

remains supported. These will be the only ways to access the styles of a class. Programmers should no longer directly access the styles attribute.

styleObj Attributes

angle [double] Angle, given in degrees, to draw the line work. Default is 0. For symbols of Type HATCH, this is the angle of the hatched lines.

angleitem [string] Deprecated since version 5.0: Use setBinding.

antialias [int] MS_TRUE or MS_FALSE. Should TrueType fonts be antialiased.

backgroundcolor [colorObj] Background pen color.

color [colorObj] Foreground or fill pen color.

mincolor [colorObj] Attribute for Color Range Mapping ([MS RFC 6: Color Range Mapping of Continuous Feature Values](#)). mincolor, minValue, maxcolor, maxValue define the range for mapping a continuous feature value to a continuous range of colors when rendering the feature on the map.

minsize [int] Minimum pen or symbol width for scaling styles.

minvalue [double] Attribute for Color Range Mapping ([MS RFC 6: Color Range Mapping of Continuous Feature Values](#)). mincolor, minValue, maxcolor, maxValue define the range for mapping a continuous feature value to a continuous range of colors when rendering the feature on the map.

minwidth [int] Minimum width of the symbol.

maxcolor [colorObj] Attribute for Color Range Mapping ([MS RFC 6: Color Range Mapping of Continuous Feature Values](#)). mincolor, minValue, maxcolor, maxValue define the range for mapping a continuous feature value to a continuous range of colors when rendering the feature on the map.

maxsize [int] Maximum pen or symbol width for scaling.

maxvalue [double] Attribute for Color Range Mapping ([MS RFC 6: Color Range Mapping of Continuous Feature Values](#)). mincolor, minValue, maxcolor, maxValue define the range for mapping a continuous feature value to a continuous range of colors when rendering the feature on the map.

maxwidth [int] Maximum width of the symbol.

offsetx [int] Draw with pen or symbol offset from map data.

offsety [int] Draw with pen or symbol offset from map data.

outlinecolor [colorObj] Outline pen color.

rangeitem [string] Attribute/field that stores the values for the Color Range Mapping ([MS RFC 6: Color Range Mapping of Continuous Feature Values](#)).

size [int] Pixel width of the style's pen or symbol.

sizeitem [string] Deprecated since version 5.0: Use setBinding.

symbol [int] The index within the map symbolset of the style's symbol.

symbolname [string immutable] Name of the style's symbol.

width [int] Width refers to the thickness of line work drawn, in pixels. Default is 1. For symbols of Type HATCH, the width is how thick the hatched lines are.

styleObj Methods

new styleObj([classObj parent_class]) [styleObj] Returns new default style Obj instance. The *parent_class* is optional.

clone [styleObj] Returns an independent copy of the style with no parent class.

getBinding(int binding) [string] Get the attribute binding for a specified style property. Returns NULL if there is no binding for this property.

removeBinding(int binding) [int] Remove the attribute binding for a specified style property.

setBinding (int binding, string item) [int] Set the attribute binding for a specified style property. Binding constants look like this: MS_STYLE_BINDING_[attribute name].

```
setBinding (MS_STYLE_BINDING_SIZE, 'mySizeItem');
```

updateFromString (string snippet) [int] Update a style from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

setSymbolByName(mapObj map, string symbolname) [int] Setting the symbol of the styleObj given the reference of the map object and the symbol name.

updateFromString (string snippet) [int] Update a style from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

symbolObj

A symbolObj is associated with one symbolSetObj.

```
+-----+ 0..*      1 +-----+
| Symbol | <-----| SymbolSet |
+-----+           +-----+
```

A styleObj will often refer to a symbolObj by name or index, but this is not really an object association, is it?

symbolObj Attributes

antialias [int] MS_TRUE or MS_FALSE.

character [string] For TrueType symbols.

filled [int] MS_TRUE or MS_FALSE.

font [string] For TrueType symbols.

gap [int] Moved to STYLE

imagepath [string] Path to pixmap file.

inmapfile [int] If set to TRUE, the symbol will be saved inside the mapfile. Added in MapServer 5.6.1

linecap [int] Moved to STYLE

linejoin [int] Moved to STYLE

linejoinmaxsize [float] Moved to STYLE

name [string] Symbol name

numpoints [int immutable] Number of points of a vector symbol.

position [int] No more available?

sizex [float] **TODO** what is this?

sizey [float] **TODO** what is this?

stylelength [int] Number of intervals

transparent [int] **TODO** what is this?

transparentcolor [int] **TODO** is this a derelict attribute?

type [int] MS_SYMBOL_SIMPLE, MS_SYMBOL_VECTOR, MS_SYMBOL_ELLIPSE,
MS_SYMBOL_PIXMAP, or MS_SYMBOL_TRUETYPE.

symbolObj Methods

new symbolObj(string symbolname [, string imagefile]) [symbolObj] Create new default symbol named *name*.

If *imagefile* is specified, then the symbol will be of type MS_SYMBOL_PIXMAP.

getImage() [imageObj] Returns a pixmap symbol's imagery as an imageObj.

getPoints() [lineObj] Returns the symbol points as a lineObj.

setImage(imageObj image) [int] Set a pixmap symbol's imagery from *image*.

setPoints(lineObj line) [int] Sets the symbol points from the points of *line*. Returns the updated number of points.

setStyle(int index, int value) [int] Set the style at *index* to *value*. Returns MS_SUCCESS or MS_FAILURE.

symbolSetObj

A symbolSetObj is an attribute of a mapObj and is associated with instances of symbolObj.

```
+-----+ 1      0..* +-----+
| SymbolSet | -----> | Symbol |
+-----+           +-----+
```

symbolSetObj Attributes

filename [string] Symbolset filename

numsymbols [int immutable] Number of symbols in the set.

symbolSetObj Methods

new symbolSetObj([string symbolfile]) [symbolSetObj] Create new instance. If *symbolfile* is specified, symbols will be loaded from the file.

appendSymbol(symbolObj symbol) [int] Add a copy of *symbol* to the symbolset and return its index.

getSymbol(int index) [symbolObj] Returns a reference to the symbol at *index*.

getSymbolByName(string name) [symbolObj] Returns a reference to the symbol named *name*.

index(string name) [int] Return the index of the symbol named *name* or -1 in the case that no such symbol is found.

removeSymbol(int index) [symbolObj] Remove the symbol at *index* and return a copy of the symbol.

save(string filename) [int] Save symbol set to a file. Returns MS_SUCCESS or MS_FAILURE.

webObj

Has no other existence than as an attribute of a mapObj. Serves as a container for various run-time web application definitions like temporary file paths, template paths, etc.

webObj Attributes

empty [string] TODO

error [string] TODO

extent [rectObj] Clipping extent.

footer [string] Path to footer document.

header [string] Path to header document.

imagepath [string] Filesystem path to temporary image location.

imageurl [string] URL to temporary image location.

log [string] TODO

map [mapObj immutable] Reference to parent mapObj.

maxscaledenom [float] Minimum map scale.

maxtemplate [string] TODO

metadata [hashTableObj immutable] metadata hash table.

minscaledenom [float] Maximum map scale.

mintemplate [string] TODO

queryformat [string] TODO

template [string] Path to template document.

webObj Methods

None.

6.3 PHP MapScript

Author Daniel Morissette

Contact dmorissette at mapgears.com

Author Yewondwossen Assefa

Contact yassefa at dmsolutions.ca

Author Alan Boudreault

Contact aboudreault at mapgears.com

Revision \$Revision\$

Date \$Date\$

Note: If you are using MapServer 5.6 and older, please refer to the *PHP MapScript 5.6 documentation* instead.

Note: If you are migrating your existing application that is based on MapServer 5.6 or older, to MapServer 6.0 or beyond, please read the *PHP MapScript Migration Guide* for important changes.

Contents

- PHP MapScript
 - Introduction
 - Versions Supported
 - How to Get More Information on PHP MapScript
 - Important Note
 - Constants
 - Functions
 - Classes
 - * classObj
 - * clusterObj
 - * colorObj
 - * errorObj
 - * gridObj
 - * hashTableObj
 - * imageObj
 - * labelcacheMemberObj
 - * labelcacheObj
 - * labelObj
 - * layerObj
 - * legendObj
 - * lineObj
 - * mapObj
 - * outputformatObj
 - * OwsrequestObj
 - * pointObj
 - * projectionObj
 - * querymapObj
 - * rectObj
 - * referenceMapObj
 - * resultObj
 - * scalebarObj
 - * shapefileObj
 - * shapeObj
 - * styleObj
 - * symbolObj
 - * webObj
 - Memory Management

6.3.1 Introduction

This is a [PHP](#) module that makes MapServer's MapScript functionalities available in a PHP Dynamically Loadable Library. In simple terms, this module will allow you to use the powerful PHP scripting language to dynamically create and modify map images in MapServer.

6.3.2 Versions Supported

PHP 5.2.0 or more recent is required; since MapServer 6.0, support for PHP 4, PHP 5.0 and PHP 5.1 have been dropped. PHP MapScript was originally developed for PHP 3.0.14, and after MapServer 3.5 support for PHP 3 was dropped.

The module has been tested and used on Linux, Solaris, *BSD, and Windows.

6.3.3 How to Get More Information on PHP MapScript

- For installation questions regarding the PHP MapScript module, see [PHP MapScript Installation](#).
- The [MapServer Wiki](#) has information on this module, that was contributed by users.
- New PHP MapScript users should read the *php_example* document.
- The project's home is the [PHP/MapScript page](#) on MapTools.org.
- Also, see the [MapScript](#), and the [Mapfile](#) sections of this site.
- Refer to the main [PHP](#) site for their official documentation.

6.3.4 Important Note

- Constant names and class member variable names are case-sensitive in PHP.

6.3.5 Constants

The following MapServer constants are available:

Boolean values MS_TRUE, MS_FALSE, MS_ON, MS_OFF, MS_YES, MS_NO

Map units MS_INCHES, MS_FEET, MS_MILES, MS_METERS, MS_KILOMETERS, MS_DD, MS_PIXELS, MS_NAUTICALMILES

Layer types MS_LAYER_POINT, MS_LAYER_LINE, MS_LAYER_POLYGON, MS_LAYER_RASTER, MS_LAYER_ANNOTATION (deprecated since 6.2), MS_LAYER_QUERY, MS_LAYER_CIRCLE, MS_LAYER_TILEINDEX, MS_LAYER_CHART

Layer/Legend/Scalebar/Class Status MS_ON, MS_OFF, MS_DEFAULT, MS_EMBED, MS_DELETE

Layer alpha transparency allows alpha transparent pixmaps to be used with RGB map images MS_GD_ALPHA

Font types MS_TRUETYPE, MS_BITMAP

Label positions MS_UL, MS_LR, MS UR, MS_LL, MS_CR, MS_CL, MS_UC, MS_LC, MS_CC, MS_XY, MS_AUTO, MS_AUTO2, MS_FOLLOW, MS_NONE

Bitmap font styles MS_TINY, MS_SMALL, MS_MEDIUM, MS_LARGE, MS_GIANT

Shape types MS_SHAPE_POINT, MS_SHAPE_LINE, MS_SHAPE_POLYGON, MS_SHAPE_NULL

Shapefile types MS_SHP_POINT, MS_SHP_ARC, MS_SHP_POLYGON, MS_SHP_MULTIPOINT

Query/join types MS_SINGLE, MS_MULTIPLE

Querymap styles MS_NORMAL, MS_HILITE, MS_SELECTED

Connection Types MS_INLINE, MS_SHAPEFILE, MS_TILED_SHAPEFILE, MS_SDE, MS_OGR, MS_TILED_OGR, MS_POSTGIS, MS_WMS, MS_ORACLESPATIAL, MS_WFS, MS_GRATICULE, MS_RASTER, MS_PLUGIN, MS_UNION

Error codes MS_NOERR, MS_IOERR, MS_MEMERR, MS_TYPEERR, MS_SYMERR, MS_REGEXERR, MS_TTFERR, MS_DBFERR, MS_GDERR, MS_IDENTERR, MS_EOFERR, MS_PROJERR, MS_MISCERR, MS_CGIERR, MS_WEBERR, MS_IMGERR, MS_HASHERR, MS_JOINERR, MS_NOTFOUND, MS_SHPERR, MS_PARSEERR, MS_SDEERR, MS_OGRERR, MS_QUERYERR,

MS_WMSERR, MS_WMSCONNERR, MS_ORACLESPATIALERR, MS_WFSERR, MS_WFSCONNERR,
MS_MAPCONTEXTERR, MS_HTTPERR, MS_WCSERR

Symbol types MS_SYMBOL_SIMPLE, MS_SYMBOL_VECTOR, MS_SYMBOL_ELLIPSE,
MS_SYMBOL_PIXMAP, MS_SYMBOL_TRUETYPE

Image Mode types (*outputFormatObj*) MS_IMAGEMODE_PC256, MS_IMAGEMODE_RGB,
MS_IMAGEMODE_RGBA, MS_IMAGEMODE_INT16, MS_IMAGEMODE_FLOAT32,
MS_IMAGEMODE_BYTE, MS_IMAGEMODE_FEATURE, MS_IMAGEMODE_NULL

Style/Attribute binding MS_STYLE_BINDING_SIZE, MS_STYLE_BINDING_ANGLE,
MS_STYLE_BINDING_COLOR, MS_STYLE_BINDING_OUTLINECOLOR,
MS_STYLE_BINDING_SYMBOL, MS_STYLE_BINDING_WIDTH

Label/Attribute binding MS_LABEL_BINDING_SIZE, MS_LABEL_BINDING_ANGLE,
MS_LABEL_BINDING_COLOR, MS_LABEL_BINDING_OUTLINECOLOR,
MS_LABEL_BINDING_FONT, MS_LABEL_BINDING_PRIORITY, MS_LABEL_BINDING_POSITION,
MS_LABEL_BINDING_SHADOWSIZEX, MS_LABEL_BINDING_SHADOWSIZEY

Alignment MS_ALIGN_LEFT, MS_ALIGN_CENTER, MS_ALIGN_RIGHT

OwsRequest MS_GET_REQUEST, MS_POST_REQUEST

6.3.6 Functions

string ms_GetVersion() Returns the MapServer version and options in a string. This string can be parsed to find out which modules were compiled in, etc.

int ms_GetVersionInt() Returns the MapServer version number (x.y.z) as an integer (x*10000 + y*100 + z). (New in v5.0) e.g. V5.4.3 would return 50403.

int ms_iogetStdoutBufferBytes() Writes the current buffer to stdout. The PHP header() function should be used to set the documents's content-type prior to calling the function. Returns the number of bytes written if output is sent to stdout. See *MapScript Wrappers for WxS Services* for more info.

void ms_iogetstdoutbufferstring() Fetch the current stdout buffer contents as a string. This method does not clear the buffer.

void ms_ioinstallstdinfrombuffer() Installs a mapserver IO handler directing future stdin reading (ie. post request capture) to come from a buffer.

void ms_ioinstallstdouttobuffer() Installs a mapserver IO handler directing future stdout output to a memory buffer.

void ms_ioresethandlers() Resets the default stdin and stdout handlers in place of "buffer" based handlers.

string ms_iostripstdoutbuffercontenttype() Strip the Content-type header off the stdout buffer if it has one, and if a content type is found it is return. Otherwise return false.

void ms_iostripstdoutbuffercontentheaders() Strip all the Content-* headers off the stdout buffer if it has some.

array ms_TokenizeMap(string map_file_name) Prepares a mapfile through the MapServer parser and return an array with one item for each token from the mapfile. Strings, logical expressions, regex expressions and comments are returned as individual tokens.

6.3.7 Classes

The following class objects are available through PHP MapScript.

classObj

Constructor

Class Objects can be returned by the `layerObj` class, or can be created using:

```
new classObj(layerObj layer [, classObj class])
```

or using the old constructor

```
classObj ms_newClassObj(layerObj layer [, classObj class])
```

The second argument `class` is optional. If given, the new class created will be a copy of this class.

Members

Type	Name	Note
string	group	
string	keyimage	
labelObj	label	Removed (6.2) - use addLabel, getLabel, ...
double	maxscaledenom	
hashTableObj	metadata	
double	minscaledenom	
string	name	
int	numlabels	read-only (since 6.2)
int	numstyles	read-only
int	status	MS_ON, MS_OFF or MS_DELETE
string	template	
string	title	
int	type	

Methods

int addLabel(labelObj label) Add a labelObj to the classObj and return its index in the labels array. New in version 6.2.

imageObj createLegendIcon(int width, int height) Draw the legend icon and return a new imageObj.

int deletestyle(int index) Delete the style specified by the style index. If there are any style that follow the deleted style, their index will decrease by 1.

int drawLegendIcon(int width, int height, imageObj im, int dstX, int dstY) Draw the legend icon on im object at dstX, dstY. Returns MS_SUCCESS/MS_FAILURE.

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

string getExpressionString() Returns the *expression* string for the class object.

labelObj getLabel(int index) Return a reference to the labelObj at *index* in the labels array.

See the `labelObj` section for more details on multiple class labels. New in version 6.2.

int getMetaData(string name) Fetch class metadata entry by name. Returns "" if no entry matches the name. Note that the search is case sensitive.

Note: `getMetaData`'s query is case sensitive.

styleObj `getStyle(int index)` Return the style object using an index. `index >= 0 && index < class->numstyles`.

string `getTextString()` Returns the text string for the class object.

int `movestyledown(int index)` The style specified by the style index will be moved down into the array of classes.

Returns MS_SUCCESS or MS_FAILURE. ex `class->movestyledown(0)` will have the effect of moving style 0 up to position 1, and the style at position 1 will be moved to position 0.

int `movestyleup(int index)` The style specified by the style index will be moved up into the array of classes. Returns MS_SUCCESS or MS_FAILURE. ex `class->movestyleup(1)` will have the effect of moving style 1 up to position 0, and the style at position 0 will be moved to position 1.

labelObj `removeLabel(int index)` Remove the `labelObj` at `index` from the `labels` array and return a reference to the `labelObj`. `numlabels` is decremented, and the array is updated. New in version 6.2.

int `removeMetaData(string name)` Remove a metadata entry for the class. Returns MS_SUCCESS/MS_FAILURE.

int `set(string property_name, new_value)` Set object property to a new value.

int `setExpression(string expression)` Set the `expression` string for the class object.

int `setMetaData(string name, string value)` Set a metadata entry for the class. Returns MS_SUCCESS/MS_FAILURE.

int `setText(string text)` Set the text string for the class object.

int `updateFromString(string snippet)` Update a class from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

```
/*set the color */
$oClass->updateFromString('CLASS STYLE COLOR 255 0 255 END END');
```

clusterObj

Constructor

Instance of `clusterObj` is always embedded inside the `layerObj`.

Members

Type	Name
double	buffer
double	maxdistance
string	region

Methods

string `getFilterString()` Returns the `expression` for this cluster filter or NULL on error.

string `getGroupString()` Returns the `expression` for this cluster group or NULL on error.

int `setFilter(string expression)` Set layer filter `expression`.

int `setGroup(string expression)` Set layer group `expression`.

colorObj

Constructor

Instances of colorObj are always embedded inside other classes.

Members

Type	Name
int	red
int	green
int	blue

Methods

void setRGB(int red, int green, int blue) Set red, green, blue values.

errorObj

Instances of errorObj are created internally by MapServer as errors happen. Errors are managed as a chained list with the first item being the most recent error. The head of the list can be fetched using ms_GetErrorObj(), and the list can be cleared using ms_ResetErrorList()

Functions

errorObj ms_GetErrorObj() Returns a reference to the head of the list of errorObj.

void ms_ResetErrorList() Clear the current error list. Note that clearing the list invalidates any errorObj handles obtained via the \$error->next() method.

Members

Type	Name
int	code //See error code constants above
string	message
string	routine

Method

errorObj next() Returns the next errorObj in the list, or NULL if we reached the end of the list.

Example

This example draws a map and reports all errors generated during the draw() call, errors can potentially come from multiple layers.

```

ms_ResetErrorList();
$img = $map->draw();
$error = ms_GetErrorObj();
while($error && $error->code != MS_NOERR)
{
    printf("Error in %s: %s<br>\n", $error->routine, $error->message);
    $error = $error->next();
}

```

gridObj

Constructor

The grid is always embedded inside a layer object defined as a grid (layer->connectiontype = MS_GRATICULE) (for more docs : <https://github.com/mapserver/mapserver/wiki/MapServerGrid>)

A layer can become a grid layer by adding a grid object to it using : ms_newGridObj(layerObj layer)

```

$oLayer = ms_newlayerobj($oMap);
$oLayer->set("name", "GRID");
ms_newgridobj($oLayer);
$oLayer->grid->set("labelformat", "DDMMSS");

```

Members

Type	Name
string	labelformat
double	maxacrs
double	maxinterval
double	maxsubdivide
double	minacrs
double	mininterval
double	minsubdivide

Methods

int set(string property_name, new_value) Set object property to a new value.

hashTableObj

Constructor

Instance of hashTableObj is always embedded inside the classObj, layerObj, mapObj and webObj. It is uses a read only.

```

$hashTable = $oLayer->metadata;
$key = null;
while ($key = $hashTable->nextkey($key))
    echo "Key: ".$key." value: ".$hashTable->get($key)."<br/>";

```

Methods

void clear() Clear all items in the hashTable (To NULL).

string get(string key) Fetch class metadata entry by name. Returns “” if no entry matches the name. Note that the search is case sensitive.

string nextkey(string previousKey) Return the next key or first key if previousKey = NULL. Return NULL if no item is in the hashTable or end of hashTable is reached

int remove(string key) Remove a metadata entry in the hashTable. Returns MS_SUCCESS/MS_FAILURE.

int set(string key, string value) Set a metadata entry in the hashTable. Returns MS_SUCCESS/MS_FAILURE.

imageObj

Constructor

Instances of imageObj are always created by the [mapObj](#) class methods.

Members

Type	Name	Note
int	width	read-only
int	height	read-only
int	resolution	read-only
int	resolutionfactor	read-only
string	imagepath	
string	imageurl	

Methods

void pasteImage(imageObj srcImg, int transparentColorHex [[, int dstX, int dstY], int angle]) Copy srcImg on top of the current imageObj. transparentColorHex is the color (in 0xrrggb format) from srcImg that should be considered transparent (i.e. those pixels won't be copied). Pass -1 if you don't want any transparent color. If optional dstx,dsty are provided then it defines the position where the image should be copied (dstx,dsty = top-left corner position). The optional angle is a value between 0 and 360 degrees to rotate the source image counterclockwise. Note that if an angle is specified (even if its value is zero) then the dstx and dsty coordinates specify the CENTER of the destination area. Note: this function works only with 8 bits GD images (PNG or GIF).

int saveImage([string filename, MapObj oMap]) Writes image object to specified filename. Passing no filename or an empty filename sends output to stdout. In this case, the PHP header() function should be used to set the document's content-type prior to calling saveImage(). The output format is the one that is currently selected in the map file. The second argument oMap is not mandatory. It is useful when saving to formats like GTIFF that needs georeference informations contained in the map file. On success, it returns either MS_SUCCESS if writing to an external file, or the number of bytes written if output is sent to stdout.

string saveWebImage() Writes image to temp directory. Returns image URL. The output format is the one that is currently selected in the map file.

labelcacheMemberObj

Accessible only through the [mapObj](#) (`map->getLabel()`).

Members

Type	Name	Note
int	classindex	read-only
int	featuresize	read-only
int	layerindex	read-only
int	markerid	read-only
int	numstyles	read-only
int	shapeindex	read-only
int	status	read-only
string	text	read-only
int	tileindex	read-only

Method

None

labelcacheObj

Accessible only through the [mapObj](#) (`map->labelcache`). This object is only used to give the possibility to free the label cache (`map->labelcache->freeCache()`)

Method

boolean freeCache() Free the label cache. Always returns MS_SUCCESS. Ex : `map->labelcache->freeCache();`

labelObj**Constructor**

`labelObj` are always embedded inside other classes.

```
new labelObj()
```

Members

Type	Name
int	align
double	angle
int	anglemode
int	antialias
int	autominfeaturesize

Continued on next page

Table 6.1 – continued from previous page

Type	Name
colorObj	backgroundcolor (deprecated since 6.0)
colorObj	backgroundshadowcolor (deprecated since 6.0)
int	backgroundshadowsizex (deprecated since 6.0)
int	backgroundshadowsizey (deprecated since 6.0)
int	buffer
colorObj	color
string	encoding
string	font
int	force
int	maxlength
int	maxsize
int	mindistance
int	minfeaturesize
int	minlength
int	minsize
int	numstyles
int	offsetx
int	offsety
colorObj	outlinecolor
int	outlinewidth
int	partials
int	position
int	priority
int	repeatdistance
colorObj	shadowcolor
int	shadowsizex
int	shadowsizey
int	size
int	type
int	wrap

Methods

int deleteStyle(int index) Delete the style specified by the style index. If there are any style that follow the deleted style, their index will decrease by 1.

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

string getBinding(const labelbinding) Get the attribute binding for a specified label property. Returns NULL if there is no binding for this property.

Example:

```
$oLabel->setbinding(MS_LABEL_BINDING_COLOR, "FIELD_NAME_COLOR");
echo $oLabel->getbinding(MS_LABEL_BINDING_COLOR); // FIELD_NAME_COLOR
```

styleObjgetStyle(int index) Return the style object using an index. index >= 0 && index < label->numstyles.

int moveStyleDown(int index) The style specified by the style index will be moved down into the array of classes. Returns MS_SUCCESS or MS_FAILURE. ex label->movestyledown(0) will have the effect of moving style 0 up to position 1, and the style at position 1 will be moved to position 0.

int moveStyleUp(int index) The style specified by the style index will be moved up into the array of classes. Returns MS_SUCCESS or MS_FAILURE. ex label->movestyleup(1) will have the effect of moving style 1 up to position 0, and the style at position 0 will be moved to position 1.

int removeBinding(const labelbinding) Remove the attribute binding for a specfiled style property.

Example:

```
$oStyle->removebinding (MS_LABEL_BINDING_COLOR) ;
```

int set(string property_name, new_value) Set object property to a new value.

int setBinding(const labelbinding, string value) Set the attribute binding for a specified label property.

Example:

```
$oLabel->setbinding (MS_LABEL_BINDING_COLOR, "FIELD_NAME_COLOR") ;
```

This would bind the color parameter with the data (ie will extract the value of the color from the field called “FIELD_NAME_COLOR”)

int updateFromString(string snippet) Update a label from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

layerObj

Constructor

Layer Objects can be returned by the [mapObj](#) class, or can be created using:

```
layerObj ms_newLayerObj(MapObj map [, layerObj layer])
```

A second optional argument can be given to `ms_newLayerObj()` to create the new layer as a copy of an existing layer. If a layer is given as argument then all members of a this layer will be copied in the new layer created.

Members

Type	Name	Note
int	annotate	
hashTableObj	bindvals	
string	classgroup	
string	classitem	
clusterObj	cluster	
string	connection	
int	connectiontype	read-only, use <code>setConnectionType()</code> to set it
string	data	
int	debug	
int	dump	deprecated since 6.0
string	filteritem	
string	footer	
gridObj	grid	only available on a layer defined as grid (MS_GRATICULE)
string	group	
string	header	
int	index	read-only

Continued on next page

Table 6.2 – continued from previous page

Type	Name	Note
int	labelcache	
string	labelitem	
double	labelmaxscaledenom	
double	labelminscaledenom	
string	labelrequires	
string	mask	
int	maxfeatures	
double	maxscaledenom	
hashTableObj	metadata	
double	minscaledenom	
string	name	
int	num_processing	
int	numclasses	read-only
colorObj	offsite	
int	opacity	
projectionObj	projection	
int	postlabelcache	
string	requires	
int	sizeunits	
int	startindex	
int	status	MS_ON, MS_OFF, MS_DEFAULT or MS_DELETE
string	styleitem	
double	symbolscaledenom	
string	template	
string	tileindex	
string	tileitem	
double	tolerance	
int	toleranceunits	
int	transform	
int	type	

Methods

int addFeature(shapeObj shape) Add a new feature in a layer. Returns MS_SUCCESS or MS_FAILURE on error.

int applySLD(string sldxml, string namedlayer) Apply the *SLD* document to the layer object. The matching between the sld document and the layer will be done using the layer's name. If a namedlayer argument is passed (argument is optional), the NamedLayer in the sld that matches it will be used to style the layer. See *SLD HowTo* for more information on the SLD support.

int applySLDURL(string sldurl, string namedlayer) Apply the *SLD* document pointed by the URL to the layer object. The matching between the sld document and the layer will be done using the layer's name. If a namedlayer argument is passed (argument is optional), the NamedLayer in the sld that matches it will be used to style the layer. See *SLD HowTo* for more information on the SLD support.

void clearProcessing() Clears all the processing strings.

void close() Close layer previously opened with open().

int draw(imageObj image) Draw a single layer, add labels to cache if required. Returns MS_SUCCESS or MS_FAILURE on error.

int drawQuery(imageObj image) Draw query map for a single layer.

string executeWFSGetfeature() Executes a GetFeature request on a WFS layer and returns the name of the temporary GML file created. Returns an empty string on error.

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

string generateSLD() Returns an SLD XML string based on all the classes found in the layer (the layer must have *STATUS on*).

classObj getClass(int classIndex) Returns a classObj from the layer given an index value (0=first class)

int getClassIndex(shape [, classgroup, numclasses]) Get the class index of a shape for a given scale. Returns -1 if no class matches. classgroup is an array of class ids to check (Optionnal). numclasses is the number of classes that the classgroup array contains. By default, all the layer classes will be checked.

rectObj getExtent() Returns the layer's data extents or NULL on error. If the layer's EXTENT member is set then this value is used, otherwise this call opens/closes the layer to read the extents. This is quick on shapefiles, but can be an expensive operation on some file formats or data sources. This function is safe to use on both opened or closed layers: it is not necessary to call open()/close() before/after calling it.

string getFilterString() Returns the *expression* for this layer or NULL on error.

array getGridIntersectionCoordinates() Returns an array containing the grid intersection coordinates. If there are no coordinates, it returns an empty array.

array getItems() Returns an array containing the items. Must call open function first. If there are no items, it returns an empty array.

int getMetaData(string name) Fetch layer metadata entry by name. Returns "" if no entry matches the name. Note that the search is case sensitive.

Note: getMetaData's query is case sensitive.

int getNumResults() Returns the number of results in the last query.

array getProcessing() Returns an array containing the processing strings. If there are no processing strings, it returns an empty array.

string getProjection() Returns a string representation of the *projection*. Returns NULL on error or if no projection is set.

resultObj getResult(int index) Returns a resultObj by index from a layer object with index in the range 0 to numresults-1. Returns a valid object or FALSE(0) if index is invalid.

rectObj getResultsBounds() Returns the bounding box of the latest result.

shapeObj getShape(resultObj result) If the resultObj passed has a valid resultindex, retrieve shapeObj from a layer's resultset. (You get it from the resultObj returned by getResult() for instance). Otherwise, it will do a single query on the layer to fetch the shapeindex

```
$map = new mapObj("gmap75.map");
$l = $map->getLayerByName("popplace");
$l->queryByRect ($map->extent);
for ($i=0; $i<$l->getNumResults(); $i++) {
    $s = $l->getShape($l->getResult($i));
    echo $s->getValue($l, "Name");
    echo "\n";
}
```

string getWMSFeatureInfoURL(int clickX, int clickY, int featureCount, string infoFormat) Returns a WMS GetFeatureInfo URL (works only for WMS layers) clickX, clickY is the location of to query in pixel coordinates with (0,0) at the top left of the image. featureCount is the number of results to return. infoFormat is the

format the format in which the result should be requested. Depends on remote server's capabilities. MapServer WMS servers support only "MIME" (and should support "GML.1" soon). Returns "" and outputs a warning if layer is not a WMS layer or if it is not queriable.

boolean isVisible() Returns MS_TRUE/MS_FALSE depending on whether the layer is currently visible in the map (i.e. turned on, in scale, etc.).

int moveclassdown(int index) The class specified by the class index will be moved down into the array of layers. Returns MS_SUCCESS or MS_FAILURE. ex layer->moveclassdown(0) will have the effect of moving class 0 up to position 1, and the class at position 1 will be moved to position 0.

int moveclassup(int index) The class specified by the class index will be moved up into the array of layers. Returns MS_SUCCESS or MS_FAILURE. ex layer->moveclassup(1) will have the effect of moving class 1 up to position 0, and the class at position 0 will be moved to position 1.

int open() Open the layer for use with getShape(). Returns MS_SUCCESS/MS_FAILURE.

shapeobj nextShape() Called after msWhichShapes has been called to actually retrieve shapes within a given area. Returns a shape object or NULL on error.

```
$map = ms_newmapobj ("d:/msapps/gmap-ms40/htdocs/gmap75.map");
$layer = $map->getLayerByName ('road');
$status = $layer->open();
$status = $layer->whichShapes ($map->extent);
while ($shape = $layer->nextShape ())
{
    echo $shape->index . "<br>\n";
}
$layer->close();
```

int queryByAttributes(string qitem, string qstring, int mode) Query layer for shapes that intersect current map extents. qitem is the item (attribute) on which the query is performed, and qstring is the expression to match. The query is performed on all the shapes that are part of a *CLASS* that contains a *TEMPLATE* value or that match any class in a layer that contains a *LAYER TEMPLATE* value. Note that the layer's FILTER/FILTERITEM are ignored by this function. Mode is MS_SINGLE or MS_MULTIPLE depending on number of results you want. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened (note that the error message in case nothing was found can be avoided in PHP using the '@' control operator).

int queryByFeatures(int slayer) Perform a query set based on a previous set of results from another layer. At present the results MUST be based on a polygon layer. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened (note that the error message in case nothing was found can be avoided in PHP using the '@' control operator).

int queryByPoint(pointObj point, int mode, double buffer) Query layer at point location specified in georeferenced map coordinates (i.e. not pixels). The query is performed on all the shapes that are part of a *CLASS* that contains a *TEMPLATE* value or that match any class in a layer that contains a *LAYER TEMPLATE* value. Mode is MS_SINGLE or MS_MULTIPLE depending on number of results you want. Passing buffer -1 defaults to tolerances set in the map file (in pixels) but you can use a constant buffer (specified in ground units) instead. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened (note that the error message in case nothing was found can be avoided in PHP using the '@' control operator).

int queryByRect(rectObj rect) Query layer using a rectangle specified in georeferenced map coordinates (i.e. not pixels). The query is performed on all the shapes that are part of a *CLASS* that contains a *TEMPLATE* value or that match any class in a layer that contains a *LAYER TEMPLATE* value. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened (note that the error message in case nothing was found can be avoided in PHP using the '@' control operator).

int queryByShape(shapeObj shape) Query layer based on a single shape, the shape has to be a polygon at this point. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened (note that the error message in case nothing was found can be avoided in PHP using the '@' control operator).

classObj removeClass(int index) Removes the class indicated and returns a copy, or NULL in the case of a failure. Note that subsequent classes will be renumbered by this operation. The numclasses field contains the number of classes available.

int removeMetaData(string name) Remove a metadata entry for the layer. Returns MS_SUCCESS/MS_FAILURE.

int set(string property_name, new_value) Set object property to a new value.

int setConnectionType(int connectiontype [,string plugin_library]) Changes the connectiontype of the layer and recreates the vtable according to the new connection type. This method should be used instead of setting the connectiontype parameter directly. In the case when the layer.connectiontype = MS_PLUGIN the plugin_library parameter should also be specified so as to select the library to load by MapServer. For the other connection types this parameter is not used.

int setFilter(string expression) Set layer filter *expression*.

int setMetaData(string name, string value) Set a metadata entry for the layer. Returns MS_SUCCESS/MS_FAILURE.

int setProcessing(string) Add the string to the processing string list for the layer. The layer->num_processing is incremented by 1. Returns MS_SUCCESS or MS_FAILURE on error.

```
$oLayer->setprocessing("SCALE_1=AUTO");
$oLayer->setprocessing("SCALE_2=AUTO");
```

int setProjection(string proj_params) Set layer *projection* and coordinate system. Parameters are given as a single string of comma-delimited PROJ.4 parameters. Returns MS_SUCCESS or MS_FAILURE on error.

int setWKTProjection(string proj_params) Same as setProjection(), but takes an OGC WKT projection definition string as input.

Note: setWKTProjection requires GDAL support

int updateFromString(string snippet) Update a layer from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

```
/*modify the name */
$oLayer->updateFromString('LAYER NAME land_fn2 END');
/*add a new class*/
$oLayer->updateFromString('LAYER CLASS STYLE COLOR 255 255 0 END END END');
```

int whichshapes(rectobj) Performs a spatial, and optionally an attribute based feature search. The function basically prepares things so that candidate features can be accessed by query or drawing functions (eg using nextshape function). Returns MS_SUCCESS, MS_FAILURE or MS_DONE. MS_DONE is returned if the layer extent does not overlap the rectObj.

legendObj

Constructor

Instances of legendObj are always embedded inside the mapObj.

Members

Type	Name	Note
int	height	
colorObj	imagecolor	
int	keysizex	
int	keysizey	
int	keyspacingx	
int	keyspacingy	
labelObj	label	
colorObj	outlinecolor	Color of outline of box, -1 for no outline
int	position	for embeded legends, MS_UL, MS_UC, ...
int	postlabelcache	MS_TRUE, MS_FALSE
int	status	MS_ON, MS_OFF, MS_EMBED
string	template	
int	width	

Methods

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

int set(string property_name, new_value) Set object property to a new value.

int updateFromString(string snippet) Update a legend from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

lineObj**Constructor**

```
new lineObj()
```

or using the old constructor

```
LineObj ms_newLineObj()
```

Members

Type	Name	Note
int	numpoints	read-only

Methods

int add(pointObj point) Add a point to the end of line. Returns MS_SUCCESS/MS_FAILURE.

int addXY(double x, double y [, double m]) Add a point to the end of line. Returns MS_SUCCESS/MS_FAILURE.

Note: the 3rd parameter m is used for measured shape files only. It is not mandatory.

int addXYZ(double x, double y, double z [, double m]) Add a point to the end of line. Returns MS_SUCCESS/MS_FAILURE.

Note: the 4th parameter m is used for measured shape files only. It is not mandatory.

PointObj point(int i) Returns a reference to point number i.

int project(projectionObj in, projectionObj out) Project the line from “in” projection (1st argument) to “out” projection (2nd argument). Returns MS_SUCCESS/MS_FAILURE.

mapObj

Constructor

```
new mapObj(string map_file_name [, string new_map_path])
```

or using the old constructors

mapObj ms_newMapObj(string map_file_name [, string new_map_path]) Returns a new object to deal with a MapServer map file.

mapObj ms_newMapObjFromString(string map_file_string [, string new_map_path]) Construct a new mapObj from a mapfile string. Returns a new object to deal with a MapServer map file.

Note: By default, the SYMBOLSET, FONTSET, and other paths in the mapfile are relative to the mapfile location. If new_map_path is provided then this directory will be used as the base path for all the relative paths inside the mapfile.

Members

Type	Name	Note
double	cellsize	
int	debug	
double	defresolution	pixels per inch, defaults to 72
rectObj	extent;	
string	fontsetfilename	read-only, set by setFontSet()
int	height	see setSize()
colorObj	imagecolor	
int	keysizex	
int	keysizey	
int	keyspacingx	
int	keyspacingy	
labelcacheObj	labelcache	no members. Used only to free the label cache (map->labelcache->free())
legendObj	legend	
string	mappath	
int	maxsize	
hashTableObj	metadata	
string	name	
int	numlayers	read-only

Continued on next page

Table 6.3 – continued from previous page

Type	Name	Note
outputformatObj	outputformat	
int	numoutputformats	read-only
projectionObj	projection	
querymapObj	querymap	
referenceMapObj	reference	
double	resolution	pixels per inch, defaults to 72
scalebarObj	scalebar	
double	scaledenom	read-only, set by drawMap()
string	shapepath	
int	status	
string	symbolsetfilename	read-only, set by setSymbolSet()
int	units	map units type
webObj	web	
int	width	see setSize()

Methods

int applyconfigoptions() Applies the config options set in the map file. For example setting the PROJ_LIB using the setconfigoption only modifies the value in the map object. applyconfigoptions will actually change the PROJ_LIB value that will be used when dealing with projection.

int applySLD(string sldxml) Apply the *SLD* document to the map file. The matching between the sld document and the map file will be done using the layer's name. See *SLD HowTo* for more information on the SLD support.

int applySLDURL(string sldurl) Apply the SLD document pointed by the URL to the map file. The matching between the sld document and the map file will be done using the layer's name. See *SLD HowTo* for more information on the SLD support.

imageObj draw() Render map and return an image object or NULL on error.

int drawLabelCache(imageObj image) Renders the labels for a map. Returns MS_SUCCESS or MS_FAILURE on error.

imageObj drawLegend() Render legend and return an image object.

imageObj drawQuery() Render a query map and return an image object or NULL on error.

imageObj drawReferenceMap() Render reference map and return an image object.

imageObj drawScaleBar() Render scale bar and return an image object.

int embedLegend(imageObj image) embeds a legend. Actually the legend is just added to the label cache so you must invoke drawLabelCache() to actually do the rendering (unless postlabelcache is set in which case it is drawn right away). Returns MS_SUCCESS or MS_FAILURE on error.

int embedScalebar(imageObj image) embeds a scalebar. Actually the scalebar is just added to the label cache so you must invoke drawLabelCache() to actually do the rendering (unless postlabelcache is set in which case it is drawn right away). Returns MS_SUCCESS or MS_FAILURE on error.

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

void freeQuery(layerindex) Frees the query result on a specified layer. If the layerindex is -1, all queries on layers will be freed.

string generateSLD() Returns an SLD XML string based on all the classes found in all the layers that have *STATUS on*.

array getAllGroupNames() Return an array containing all the group names used in the layers. If there are no groups, it returns an empty array.

array getAllLayerNames() Return an array containing all the layer names. If there are no layers, it returns an empty array.

colorObj getColorbyIndex(int iCloIndex) Returns a colorObj corresponding to the color index in the palette.

string getConfigOption(string key) Returns the config value associated with the key. Returns an empty sting if key not found.

labelcacheMemberObj getLabel(int index) Returns a labelcacheMemberObj from the map given an index value (0=first label). Labelcache has to be enabled.

```
while ($oLabelCacheMember = $oMap->getLabel($i)) {
    /* do something with the labelcachemember */
    ++$i;
}
```

layerObj getLayer(int index) Returns a layerObj from the map given an index value (0=first layer)

layerObj getLayerByName(string layer_name) Returns a layerObj from the map given a layer name. Returns NULL if layer doesn't exist.

array getLayersDrawingOrder() Return an array containing layer's index in the order which they are drawn. If there are no layers, it returns an empty array.

array getLayersIndexByGroup(string groupname) Return an array containing all the layer's indexes given a group name. If there are no layers, it returns an empty array.

int getMetaData(string name) Fetch metadata entry by name (stored in the [WEB](#) object in the map file). Returns "" if no entry matches the name.

Note: getMetaData's query is case sensitive.

int getNumSymbols() Return the number of symbols in map.

string getProjection() Returns a string representation of the projection. Returns NULL on error or if no projection is set.

int getSymbolByName(string symbol_name) Returns the symbol index using the name.

symbol getSymbolObjectById(int symbolid) Returns the symbol object using a symbol id. Refer to the symbol object reference section for more details.

int insertLayer(layerObj layer [, int nIndex=-1]) Insert a copy of *layer* into the Map at index *nIndex*. The default value of *nIndex* is -1, which means the last possible index. Returns the index of the new Layer, or -1 in the case of a failure.

int loadMapContext(string filename [, boolean unique_layer_name]) Available only if WMS support is enabled. Load a [WMS Map Context](#) XML file into the current mapObj. If the map already contains some layers then the layers defined in the WMS Map context document are added to the current map. The 2nd argument unique_layer_name is optional and if set to MS_TRUE layers created will have a unique name (unique prefix added to the name). If set to MS_FALSE the layer name will be the same name as in the context. The default value is MS_FALSE. Returns MS_SUCCESS/MS_FAILURE.

int loadOWSParameters(owsrequest request, string version) Load OWS request parameters (BBOX, LAYERS, &c.) into map. Returns MS_SUCCESS or MS_FAILURE. 2nd argument version is not mandatory. If not given, the version will be set to 1.1.1

int loadQuery(filename) Loads a query from a file. Returns MS_SUCESS or MS_FAILURE. To be used with save-query.

int moveLayerDown(int layerindex) Move layer down in the hierarchy of drawing. Returns MS_SUCCESS or MS_FAILURE on error.

int moveLayerUp(int layerindex) Move layer up in the hierarchy of drawing. Returns MS_SUCCESS or MS_FAILURE on error.

int offsetExtent(double x, double y) Offset the map extent based on the given distances in map coordinates. Returns MS_SUCCESS or MS_FAILURE.

int owsDispatch(owsrequest request) Processes and executes the passed OpenGIS Web Services request on the map. Returns MS_DONE (2) if there is no valid OWS request in the req object, MS_SUCCESS (0) if an OWS request was successfully processed and MS_FAILURE (1) if an OWS request was not successfully processed. OWS requests include [WMS](#), [WFS](#), [WCS](#) and [SOS](#) requests supported by MapServer. Results of a dispatched request are written to stdout and can be captured using the msIO services (ie. `ms_iostinstallstdouttobuffer()` and `ms_iogetstdoutbufferstring()`)

imageObj prepareImage() Return a blank image object.

void prepareQuery() Calculate the scale of the map and set map->scaledenom.

string processLegendTemplate(array params) Process legend template files and return the result in a buffer.

See Also:

processstemplate

string processQueryTemplate(array params, boolean generateimages) Process query template files and return the result in a buffer. Second argument generateimages is not mandatory. If not given it will be set to TRUE.

See Also:

processstemplate

string processTemplate(array params, boolean generateimages) Process the template file specified in the web object and return the result in a buffer. The processing consists of opening the template file and replace all the tags found in it. Only tags that have an equivalent element in the map object are replaced (ex [scaledenom]). There are two exceptions to the previous statement :

- [img], [scalebar], [ref], [legend] would be replaced with the appropriate url if the parameter generateimages is set to MS_TRUE. (Note : the images corresponding to the different objects are generated if the object is set to MS_ON in the map file)
- the user can use the params parameter to specify tags and their values. For example if the user have a specific tag call [my_tag] and would like it to be replaced by “value_of_my_tag” he would do

```
$tmparray["my_tag"] = "value_of_my_tag";
$map->processstemplate($tmparray, MS_FALSE);
```

int queryByFeatures(int slayer) Perform a query based on a previous set of results from a layer. At present the results MUST be based on a polygon layer. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened (note that the error message in case nothing was found can be avoided in PHP using the ‘@’ control operator).

int queryByIndex(layerindex, tileindex, shapeindex[, addtoquery]) Add a specific shape on a given layer to the query result. If addtoquery (which is a non mandatory argument) is set to MS_TRUE, the shape will be added to the existing query list. Default behavior is to free the existing query list and add only the new shape.

int queryByPoint(pointObj point, int mode, double buffer) Query all selected layers in map at point location specified in georeferenced map coordinates (i.e. not pixels). The query is performed on all the shapes that are part of a [CLASS](#) that contains a [Templating](#) value or that match any class in a layer that contains a [LAYER TEMPLATE](#) value. Mode is MS_SINGLE or MS_MULTIPLE depending on number of results you want. Passing buffer -1 defaults to tolerances set in the map file (in pixels) but you can use a constant buffer (specified in ground units) instead. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other

error happened (note that the error message in case nothing was found can be avoided in PHP using the '@' control operator).

int queryByRect(rectObj rect) Query all selected layers in map using a rectangle specified in georeferenced map coordinates (i.e. not pixels). The query is performed on all the shapes that are part of a *CLASS* that contains a *Templating* value or that match any class in a layer that contains a *LAYER TEMPLATE* value. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened (note that the error message in case nothing was found can be avoided in PHP using the '@' control operator).

int queryByShape(shapeObj shape) Query all selected layers in map based on a single shape, the shape has to be a polygon at this point. Returns MS_SUCCESS if shapes were found or MS_FAILURE if nothing was found or if some other error happened (note that the error message in case nothing was found can be avoided in PHP using the '@' control operator).

layerObj removeLayer(int nIndex) Remove a layer from the mapObj. The argument is the index of the layer to be removed. Returns the removed layerObj on success, else null.

int removeMetaData(string name) Remove a metadata entry for the map (stored in the WEB object in the map file). Returns MS_SUCCESS/MS_FAILURE.

int save(string filename) Save current map object state to a file. Returns -1 on error. Use absolute path. If a relative path is used, then it will be relative to the mapfile location.

int saveMapContext(string filename) Available only if WMS support is enabled. Save current map object state in *WMS Map Context* format. Only WMS layers are saved in the WMS Map Context XML file. Returns MS_SUCCESS/MS_FAILURE.

int saveQuery(string filename[, int results]) Save the current query in a file. Results determines the save format - MS_TRUE (or 1/true) saves the query results (tile index and shape index), MS_FALSE (or 0/false) the query parameters (and the query will be re-run in loadquery). Returns MS_SUCCESS or MS_FAILURE. Either save format can be used with loadquery. See RFC 65 and ticket #3647 for details of different save formats.

int scaleExtent(double zoomfactor, double minscaledenom, double maxscaledenom) Scale the map extent using the zoomfactor and ensure the extent within the minscaledenom and maxscaledenom domain. If minscaledenom and/or maxscaledenom is 0 then the parameter is not taken into account. Returns MS_SUCCESS or MS_FAILURE.

int selectOutputFormat(string type) Selects the output format to be used in the map. Returns MS_SUCCESS/MS_FAILURE.

Note: the type used should correspond to one of the output formats declared in the map file. The type argument passed is compared with the mimetype parameter in the output format structure and then to the name parameter in the structure.

int appendOutputFormat(outputFormatObj outputFormat) Appends outputformat object in the map object. Returns the new numoutputformats value.

int removeOutputFormat(string name) Remove outputformat from the map. Returns MS_SUCCESS/MS_FAILURE.

outputFormatObj getOutputFormat(int index) Returns the outputformat at index position.

int set(string property_name, new_value) Set map object property to new value.

int setCenter(pointObj center) Set the map center to the given map point. Returns MS_SUCCESS or MS_FAILURE.

int setConfigOption(string key, string value) Sets a config parameter using the key and the value passed

void setExtent(double minx, double miny, double maxx, double maxy) Set the map extents using the georef extents passed in argument. Returns MS_SUCCESS or MS_FAILURE on error.

int setFontSet(string fileName) Load and set a new *FONTSET*.

boolean setLayersDrawingOrder(array layerIndex) Set the layer's order array. The argument passed must be a valid array with all the layer's index. Returns MS_SUCCESS or MS_FAILURE on error.

int setMetaData(string name, string value) Set a metadata entry for the map (stored in the WEB object in the map file). Returns MS_SUCCESS/MS_FAILURE.

int setProjection(string proj_params, boolean bSetUnitsAndExtents) Set map projection and coordinate system. Returns MS_SUCCESS or MS_FAILURE on error.

Parameters are given as a single string of comma-delimited PROJ.4 parameters. The argument : bSetUnitsAndExtents is used to automatically update the map units and extents based on the new projection. Possible values are MS_TRUE and MS_FALSE. By default it is set at MS_FALSE.

int setRotation(double rotation_angle) Set map rotation angle. The map view rectangle (specified in EXTENTS) will be rotated by the indicated angle in the counter-clockwise direction. Note that this implies the rendered map will be rotated by the angle in the clockwise direction. Returns MS_SUCCESS or MS_FAILURE.

int setSize(int width, int height) Set the map width and height. This method updates the internal geotransform and other data structures required for map rotation so it should be used instead of setting the width and height members directly. Returns MS_SUCCESS or MS_FAILURE.

int setSymbolSet(string fileName) Load and set a symbol file dynamically.

int setWKTProjection(string proj_params, boolean bSetUnitsAndExtents) Same as setProjection(), but takes an OGC WKT projection definition string as input. Returns MS_SUCCESS or MS_FAILURE on error.

Note: setWKTProjection requires GDAL support

int zoomPoint(int nZoomFactor, pointObj oPixelPos, int nImageWidth, int nImageHeight, rectObj oGeorefExt)
Zoom to a given XY position. Returns MS_SUCCESS or MS_FAILURE on error.

Parameters are :

- Zoom factor : positive values do zoom in, negative values zoom out. Factor of 1 will recenter.
- Pixel position (pointObj) : x, y coordinates of the click, with (0,0) at the top-left
- Width : width in pixel of the current image.
- Height : Height in pixel of the current image.
- Georef extent (rectObj) : current georef extents.
- MaxGeoref extent (rectObj) : (optional) maximum georef extents. If provided then it will be impossible to zoom/pan outside of those extents.

int zoomRectangle(rectObj oPixelExt, int nImageWidth, int nImageHeight, rectObj oGeorefExt) Set the map extents to a given extents. Returns MS_SUCCESS or MS_FAILURE on error.

Parameters are :

- oPixelExt (rect object) : Pixel Extents
- Width : width in pixel of the current image.
- Height : Height in pixel of the current image.
- Georef extent (rectObj) : current georef extents.

int zoomScale(double nScaleDenom, pointObj oPixelPos, int nImageWidth, int nImageHeight, rectObj oGeorefExt [, rectObj o

Zoom in or out to a given XY position so that the map is displayed at specified scale. Returns MS_SUCCESS or MS_FAILURE on error.

Parameters are :

- ScaleDenom : Scale denominator of the scale at which the map should be displayed.
- Pixel position (pointObj) : x, y coordinates of the click, with (0,0) at the top-left
- Width : width in pixel of the current image.
- Height : Height in pixel of the current image.
- Georef extent (rectObj) : current georef extents.
- MaxGeoref extent (rectObj) : (optional) maximum georef extents. If provided then it will be impossible to zoom/pan outside of those extents.

outputformatObj**Constructor**

Instance of outputformatObj is always embedded inside the [mapObj](#). It is uses a read only.

No constructor available (coming soon, see ticket 979)

Members

Type	Name	Note
string	driver	
string	extension	
int	imagemode	MS_IMAGEMODE_* value.
string	mimetype	
string	name	
int	renderer	
int	transparent	

Methods

stringgetOption(string property_name) Returns the associated value for the format option property passed as argument. Returns an empty string if property not found.

int set(string property_name, new_value) Set object property to a new value.

void setOption(string property_name, string new_value) Add or Modify the format option list. return true on success.

```
$oMap->outputformat->setOption ("OUTPUT_TYPE", "RASTER");
```

int validate() Checks some internal consistency issues, Returns MS_SUCCESS or MS_FAILURE. Some problems are fixed up internally. May produce debug output if issues encountered.

OwsrequestObj

Constructor

```
new OWSRequestObj()
```

or using the old constructor

```
request = ms_newOwsrequestObj();
```

Create a new ows request object.

Members

Type	Name
int	numparams (read-only)
int	type (read-only): MS_GET_REQUEST or MS_POST_REQUEST

Methods

int addParameter(string name, string value) Add a request parameter, even if the parameter key was previously set. This is useful when multiple parameters with the same key are required. For example :

```
$request->addparameter('SIZE', 'x(100)');
$request->addparameter('SIZE', 'y(100)');
```

string getName(int index) Return the name of the parameter at *index* in the request's array of parameter names.

string getValue(int index) Return the value of the parameter at *index* in the request's array of parameter values.

string getValueByName(string name) Return the value associated with the parameter *name*.

int loadParams() Initializes the OWSRequest object from the cgi environment variables REQUEST_METHOD, QUERY_STRING and HTTP_COOKIE. Returns the number of name/value pairs collected.

int setParameter(string name, string value) Set a request parameter. For example :

```
$request->setparameter('REQUEST', 'GetMap');
```

pointObj

Constructor

```
new pointObj()
```

or using the old constructor

```
PointObj ms_newPointObj()
```

Members

Type	Name	Note
double	x	
double	y	
double	z	used for 3d shape files. set to 0 for other types
double	m	used only for measured shape files - set to 0 for other types

Methods

double distanceToLine(pointObject p1, pointObject p2) Calculates distance between a point ad a lined defined by the two points passed in argument.

double distanceToPoint(pointObj poPoint) Calculates distance between two points.

double distanceToShape(shapeObj shape) Calculates the minimum distance between a point and a shape.

int draw(mapObj map, layerObj layer, imageObj img, int class_index [, string text]) Draws the individual point using layer. The class_index is used to classify the point based on the classes defined for the layer. The text string is used to annotate the point. (Optional) Returns MS_SUCCESS/MS_FAILURE.

int project(projectionObj in, projectionObj out) Project the point from “in” projection (1st argument) to “out” projection (2nd argument). Returns MS_SUCCESS/MS_FAILURE.

int setXY(double x, double y [, double m]) Set X,Y coordinate values.

Note: the 3rd parameter m is used for measured shape files only. It is not mandatory.

int setXYZ(double x, double y , double z, [, double m]) Set X,Y,Z coordinate values.

Note: the 4th parameter m is used for measured shape files only. It is not mandatory.

projectionObj**Constructor**

```
new projectionObj(string projectionString)
```

or using the old constructor

```
ProjectionObj ms_newProjectionObj(string projectionString)
```

Creates a projection object based on the projection string passed as argument.

```
$projInObj = ms_newprojectionobj("proj=latlong")
```

will create a geographic projection class.

The following example will convert a lat/long point to an LCC projection:

```
$projInObj = ms_newprojectionobj("proj=latlong");
$projOutObj = ms_newprojectionobj("proj=lcc,ellps=GRS80,lat_0=49," .
"lon_0=-95,lat_1=49,lat_2=77");
$poPoint = ms_newpointobj();
```

```
$poPoint->setXY(-92.0, 62.0);
$poPoint->project($projInObj, $projOutObj);
```

Methods

int getUnits() Returns the units of a projection object. Returns -1 on error.

querymapObj

Constructor

Instances of querymapObj are always embedded inside the [mapObj](#).

Members

Type	Name	Note
colorObj	color	
int	height	
int	width	
int	style	MS_NORMAL, MS_HILITE, MS_SELECTED

Methods

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

int set(string property_name, new_value) Set object property to a new value.

int updateFromString(string snippet) Update a queryMap object from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

rectObj

Constructor

rectObj are sometimes embedded inside other objects. New ones can also be created with:

```
new rectObj()
```

or using the old constructor

```
RectObj ms_newRectObj()
```

Note: the members (minx, miny, maxx ,maxy) are initialized to -1;

Members:

Type	Name
double	minx
double	miny
double	maxx
double	maxy

Methods

int draw(mapObj map, layerObj layer, imageObj img, int class_index [, string text]) Draws the individual rectangle using layer. The class_index is used to classify the rectangle based on the classes defined for the layer. The text string is used to annotate the rectangle. (Optional) Returns MS_SUCCESS/MS_FAILURE.

double fit(int width, int height) Adjust extents of the rectangle to fit the width/height specified.

int project(projectionObj in, projectionObj out) Project the rectangle from “in” projection (1st argument) to “out” projection (2nd argument). Returns MS_SUCCESS/MS_FAILURE.

int set(string property_name, new_value) Set object property to a new value.

void setextent(double minx, double miny, double maxx, double maxy) Set the rectangle extents.

referenceMapObj**Constructor**

Instances of referenceMapObj are always embedded inside the [mapObj](#).

Members

Type	Name
ColorObj	color
int	height
rectObj	extent
string	image
int	marker
string	markername
int	markersize
int	maxboxsize
int	minboxsize
ColorObj	outlinecolor
int	status
int	width

Methods

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

int set(string property_name, new_value) Set object property to a new value.

int updateFromString(string snippet) Update a referenceMap object from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

resultObj

Constructor

`new resultObj(int shapeindex)`

or using the `layerObj`'s `getResult()` method.

Members

Type	Name	Note
int	classindex	read-only
int	resultindex	read-only
int	shapeindex	read-only
int	tileindex	read-only

Method

None

scalebarObj

Constructor

Instances of scalebarObj are always embedded inside the `mapObj`.

Members

Type	Name	Note
int	align	
colorObj	backgroundcolor	
colorObj	color	
int	height	
colorObj	imagecolor	
int	intervals	
labelObj	label	
colorObj	outlinecolor	
int	position	for embeded scalebars, MS_UL, MS_UC, ...
int	postlabelcache	
int	status	MS_ON, MS_OFF, MS_EMBED
int	style	
int	units	
int	width	

Methods

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

int set(string property_name, new_value) Set object property to a new value.

int setImageColor(int red, int green, int blue) Sets the imagecolor property (background) of the object. Returns MS_SUCCESS or MS_FAILURE on error.

int updateFromString(string snippet) Update a scalebar from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

shapefileObj

Constructor

```
new shapefileObj(string filename, int type)
```

or using the old constructor

```
shapefileObj ms_newShapefileObj(string filename, int type)
```

Opens a shapefile and returns a new object to deal with it. Filename should be passed with no extension. To create a new file (or overwrite an existing one), type should be one of MS_SHP_POINT, MS_SHP_ARC, MS_SHP_POLYGON or MS_SHP_MULTIPOINT. Pass type as -1 to open an existing file for read-only access, and type=-2 to open an existing file for update (append).

Members

Type	Name	Note
rectObj	bounds	read-only
int	numshapes	read-only
string	source	read-only
int	type	read-only

Methods

int addPoint(pointObj point) Appends a point to an open shapefile.

int addShape(shapeObj shape) Appends a shape to an open shapefile.

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

Note: The shape file is closed (and changes committed) when the object is destroyed. You can explicitly close and save the changes by calling \$shapefile->free(); unset(\$shapefile), which will also free the php object.

rectObj getExtent(int i) Retrieve a shape's bounding box by index.

shapeObj getPoint(int i) Retrieve point by index.

shapeObj getShape(int i) Retrieve shape by index.

shapeObj getTransformed(mapObj map, int i) Retrieve shape by index.

shapeObj

Constructor

```
new shapeObj(int type)
```

or using the old constructor

```
ShapeObj ms_newShapeObj(int type)
```

'type' is one of MS_SHAPE_POINT, MS_SHAPE_LINE, MS_SHAPE_POLYGON or MS_SHAPE_NULL

```
ShapeObj ms_shapeObjFromWkt(string wkt)
```

Creates new shape object from WKT string.

Members

Type	Name	Note
rectObj	bounds	read-only
int	classindex	
int	index	
int	numlines	read-only
int	numvalues	read-only
int	tileindex	read-only
string	text	
int	type	read-only
array	values	read-only

The values array is an associative array with the attribute values for this shape. It is set only on shapes obtained from layer->getShape(). The key to the values in the array is the attribute name, e.g.

```
$population = $shape->values["Population"];
```

Methods

int add(lineObj line) Add a line (i.e. a part) to the shape.

shapeobj boundary() Returns the boundary of the shape. Only available if php/mapscript is built with GEOS library.

shapeobj buffer(width) Returns a new buffered shapeObj based on the supplied distance (given in the coordinates of the existing shapeObj). Only available if php/mapscript is built with GEOS library.

int containsShape(shapeobj shape2) Returns true if shape2 passed as argument is entirely within the shape. Else return false. Only available if php/mapscript is built with GEOS library.

shapeobj convexhull() Returns a shape object representing the convex hull of shape. Only available if php/mapscript is built with GEOS library.

boolean contains(pointObj point) Returns MS_TRUE if the point is inside the shape, MS_FALSE otherwise.

int crosses(shapeobj shape) Returns true if the shape passed as argument crosses the shape. Else return false. Only available if php/mapscript is built with GEOS library.

shapeobj difference(shapeobj shape) Returns a shape object representing the difference of the shape object with the one passed as parameter. Only available if php/mapscript is built with GEOS library.

int disjoint(shapeobj shape) Returns true if the shape passed as argument is disjoint to the shape. Else return false. Only available if php/mapscript is built with GEOS library.

int draw(mapObj map, layerObj layer, imageObj img) Draws the individual shape using layer. Returns MS_SUCCESS/MS_FAILURE.

int equals(shapeobj shape) Returns true if the shape passed as argument is equal to the shape (geometry only). Else return false. Only available if php/mapscript is built with GEOS library.

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

double getArea() Returns the area of the shape (if applicable). Only available if php/mapscript is built with GEOS library.

pointObj getCentroid() Returns a point object representing the centroid of the shape. Only available if php/mapscript is built with GEOS library.

pointObj getLabelPoint() Returns a point object with coordinates suitable for labelling the shape.

double getLength() Returns the length (or perimeter) of the shape. Only available if php/mapscript is built with GEOS library.

pointObj getMeasureUsingPoint(pointObject point) Apply only on Measured shape files. Given an XY Location, find the nearest point on the shape object. Return a point object of this point with the m value set.

pointObj getPointUsingMeasure(double m) Apply only on Measured shape files. Given a measure m, return the corresponding XY location on the shapeobject.

string getValue(layerObj layer, string filedname) Returns the value for a given field name.

shapeobj intersection(shapeobj shape) Returns a shape object representing the intersection of the shape object with the one passed as parameter. Only available if php/mapscript is built with GEOS library.

boolean intersects(shapeObj shape) Returns MS_TRUE if the two shapes intersect, MS_FALSE otherwise.

LineObj line(int i) Returns a reference to line number i.

int overlaps(shapeobj shape) Returns true if the shape passed as argument overlaps the shape. Else returns false. Only available if php/mapscript is built with GEOS library.

int project(projectionObj in, projectionObj out) Project the shape from “in” projection (1st argument) to “out” projection (2nd argument). Returns MS_SUCCESS/MS_FAILURE.

int set(string property_name, new_value) Set object property to a new value.

int setBounds() Updates the bounds property of the shape. Must be called to calculate new bounding box after new parts have been added.

shapeObj simplify(double tolerance) Given a tolerance, returns a simplified shape object or NULL on error. Only available if php/mapscript is built with GEOS library (>=3.0).

shapeobj symdifference(shapeobj shape) Returns the computed symmetric difference of the supplied and existing shape. Only available if php/mapscript is built with GEOS library.

shapeObj topologySimplifyPreservingSimplify(double tolerance) Given a tolerance, returns a simplified shape object or NULL on error. Only available if php/mapscript is built with GEOS library (>=3.0).

int touches(shapeobj shape) Returns true if the shape passed as argument touches the shape. Else return false. Only available if php/mapscript is built with GEOS library.

string toWkt() Returns WKT representation of the shape’s geometry.

shapeobj union(shapeobj shape) Returns a shape object representing the union of the shape object with the one passed as parameter. Only available if php/mapscript is built with GEOS library

int within(shapeobj shape2) Returns true if the shape is entirely within the shape2 passed as argument. Else returns false. Only available if php/mapscript is built with GEOS library.

styleObj

Constructor

Instances of styleObj are always embedded inside a `classObj` or `labelObj`.

```
new styleObj(classObj class [, styleObj style])
// or
new styleObj(labelObj label [, styleObj style])
```

or using the old constructor (do not support a labelObj at first argument)

```
styleObj ms_newStyleObj(classObj class [, styleObj style])
```

The second argument ‘style’ is optional. If given, the new style created will be a copy of the style passed as argument.

Members

Type	Name	Note
double	angle	
int	antialias	
colorObj	backgroundcolor	
colorObj	color	
double	maxsize	
double	maxvalue	
double	maxwidth	
double	minsize	
double	minvalue	
double	minwidth	
int	offsetx	
int	offsety	
int	opacity	only supported for the AGG driver
colorObj	outlinecolor	
string	rangeitem	
double	size	
int	symbol	
string	symbolname	
double	width	

Methods

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

string getBinding(const stylebinding) Get the attribute binding for a specified style property. Returns NULL if there is no binding for this property.

```
$oStyle->setbinding(MS_STYLE_BINDING_COLOR, "FIELD_NAME_COLOR");
echo $oStyle->getbinding(MS_STYLE_BINDING_COLOR); // FIELD_NAME_COLOR
```

```

string getGeomTransform()

int removeBinding(const stylebinding) Remove the attribute binding for a specified style property. Added in MapServer 5.0.

    $oStyle->removebinding(MS_STYLE_BINDING_COLOR);

int set(string property_name, new_value) Set object property to a new value.

int setBinding(const stylebinding, string value) Set the attribute binding for a specified style property. Added in MapServer 5.0.

    $oStyle->setbinding(MS_STYLE_BINDING_COLOR, "FIELD_NAME_COLOR");

This would bind the color parameter with the data (ie will extract the value of the color from the field called "FIELD_NAME_COLOR")

int setGeomTransform(string value)

int updateFromString(string snippet) Update a style from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

```

symbolObj

Constructor

```

new symbolObj(mapObj map, string symbolname)

or using the old constructor

int ms_newSymbolObj(mapObj map, string symbolname)

```

Creates a new symbol with default values in the symbolist.

Note: Using the new constructor, the symbol is automatically returned. The old constructor returns the id of the new symbol.

If a symbol with the same name exists, it (or its id) will be returned. To get a symbol object using the old constructor, you need to use a method on the map object:

```

$nId = ms_newSymbolObj($map, "symbol-test");
$oSymbol = $map->getSymbolObjectById($nId);

```

Members

Type	Name	Note
int	antialias	
string	character	
int	filled	
string	font	
string	imagepath	read-only
int	inmapfile	If set to TRUE, the symbol will be saved inside the mapfile.
int	patternlength	read-only
int	position	
string	name	
int	numpoints	read-only
double	sizex	
double	sizey	
int	transparent	
int	transparentcolor	

Methods

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

array getPatternArray() Returns an array containing the pattern. If there is no pattern, it returns an empty array.

array getPointsArray() Returns an array containing the points of the symbol. Refer to setpoints to see how the array should be interpreted. If there are no points, it returns an empty array.

int set(string property_name, new_value) Set object property to a new value.

int setImagePath(char filename) Loads a pixmap symbol specified by the filename. The file should be of either Gif or Png format.

int setPattern(array int) Set the pattern of the symbol (used for dash patterns). Returns MS_SUCCESS/MS_FAILURE.

int setPoints(array double) Set the points of the symbol. Note that the values passed is an array containing the x and y values of the points. Returns MS_SUCCESS/MS_FAILURE. Example:

```
$array[0] = 1 # x value of the first point  
$array[1] = 0 # y values of the first point  
$array[2] = 1 # x value of the 2nd point  
....
```

Example of usage

1. create a symbol to be used as a dash line

```
$nId = ms_newsymbolobj($gpoMap, "mydash");  
$oSymbol = $gpoMap->getsymbolobjectbyid($nId);  
$oSymbol->set("filled", MS_TRUE);  
$oSymbol->set("sizex", 1);  
$oSymbol->set("sizey", 1);  
$oSymbol->set("inmapfile", MS_TRUE);
```

```

$aPoints[0] = 1;
$aPoints[1] = 1;
$oSymbol->setpoints($aPoints);

$aPattern[0] = 10;
$aPattern[1] = 5;
$aPattern[2] = 5;
$aPattern[3] = 10;
$oSymbol->setpattern($aPattern);

$style->set("symbolname", "mydash");

```

2. Create a TrueType symbol

```

$nId = ms_newSymbolObj($gpoMap, "ttfSymbol");
$oSymbol = $gpoMap->getSymbolObjectById($nId);
$oSymbol->set("type", MS_SYMBOL_TRUETYPE);
$oSymbol->set("filled", true);
$oSymbol->set("character", "&#68;");
$oSymbol->set("font", "ttfFontName");

```

webObj

Constructor

Instances of webObj are always embedded inside the mapObj.

Members

Type	Name	Note
string	browseformat	
string	empty	read-only
string	error	read-only
rectObj	extent	read-only
string	footer	
string	header	
string	imagepath	
string	imageurl	
string	legendformat	
string	log	
double	maxscaledenom	
string	maxtemplate	
hashTableObj	metadata	
double	minscaledenom	
string	mintemplate	
string	queryformat	
string	template	
string	temppath	

Methods

void free() Free the object properties and break the internal references. Note that you have to unset the php variable to free totally the resources.

int set(string property_name, new_value) Set object property to a new value.

int updateFromString(string snippet) Update a web object from a string snippet. Returns MS_SUCCESS/MS_FAILURE.

6.3.8 Memory Management

Normally, you should not have to worry about the memory management because php has a garbage collector and will free resources for you. If you write only small scripts that don't do a lot of processing, it's not worth to care about that. Everything will be freed at the end of the script.

However, it may be useful to free resources during the execution if the script executes many tasks. To do so, you'll have to call the **free()** method of the mapscript objects and unset the php variables. The purpose of the free methods is to break the circular references between an object and its properties to allow the zend engine to free the resources.

Here's an example of a script that doesn't free things during the execution:

```
$map = new mapObj("mapfile.map");
$of = $map->outputformat;
echo $map->extent->minx." - ".$map->extent->miny." - ".$map->extent->maxx.
      " - ".$map->extent->maxy."\n";
echo "Outputformat name: $of->name\n";
unset($of);
unset($map); // Even if we unset the php variables, resources wont be freed
// Resources will be only freed at the end of the script
```

and the same script that frees resources as soon as it can

```
$map = new mapObj("mapfile.map");
$of = $map->outputformat;
echo $map->extent->minx." - ".$map->extent->miny." - ".$map->extent->maxx." - ".$map->extent->maxy."\n";
echo "Outputformat name: $of->name\n";
unset($of);
$map->free(); // break the circular references
// at this place, the outputformat ($of) and the rect object ($map->extent) resources are freed
unset($map);
// the map object is immediately freed after the unset (before the end of the script)
```

6.4 Python MapScript Appendix

Author Sean Gillies

Revision \$Revision\$

Date \$Date\$

Contents

- Python MapScript Appendix
 - Introduction
 - Classes
 - Exception Handling

6.4.1 Introduction

The Python MapScript module contains some class extension methods that have not yet been implemented for other languages.

6.4.2 Classes

References to sections below will be added here as the documentation grows.

imageObj

The Python Imaging Library, <http://www.pythonware.com/products/pil/>, is an indispensable tool for image manipulation. The extensions to imageObj are all geared towards better integration of PIL in MapScript applications.

imageObj Methods

imageObj(PyObject arg1, PyObject arg2 [, PyObject arg3]) [imageObj] Create a new instance which is either empty or read from a Python file-like object that refers to a GD format image.

The constructor has 2 different modes. In the blank image mode, arg1 and arg2 should be the desired width and height in pixels, and the optional arg3 should be either an instance of outputFormatObj or a GD driver name as a shortcut to a format. In the image file mode, arg1 should be a filename or a Python file or file-like object. If the file-like object does not have a “seek” attribute (such as a urllib resource handle), then a GD driver name *must* be provided as arg2.

Here’s an example of creating a 320 pixel wide by 240 pixel high JPEG using the constructor’s blank image mode:

```
image = mapscript.imageObj(320, 240, 'GD/JPEG')
```

In image file mode, interesting values of *arg1* to try are instances of *StringIO*:

```
s = StringIO()
pil_image.save(s)      # Save an image manipulated with PIL
ms_image = imageObj(s)
```

Or the file-like object returned from *urlopen*

```
url = urllib.urlopen('http://mapserver.gis.umn.edu/bugs/ant.jpg')
ms_image = imageObj(url, 'GD/JPEG')
```

write([PyObject file]) [void] Write image data to a Python file-like object. Default is stdout.

pointObj

pointObj Methods

`__str__()` [string] Return a string formatted like

```
{ 'x': %f , 'y': %f }
```

with the coordinate values substituted appropriately. Usage example:

```
>>> p = mapscript.pointObj(1, 1)
>>> str(p)
{ 'x': 1.000000 , 'y': 1.000000 }
```

Note that the return value can be conveniently eval'd into a Python dictionary:

```
>>> p_dict = eval(str(p))
>>> p_dict['x']
1.000000
```

rectObj

rectObj Methods

`__contains__(pointObj point)` [boolean] Returns True if *point* is inside the rectangle, otherwise returns False.

```
>>> r = mapscript.rectObj(0, 0, 1, 1)
>>> p = mapscript.pointObj(2, 0)      # outside
>>> p in r
False
>>> p not in r
True
```

`__str__()` [string] Return a string formatted like

```
{ 'minx': %f , 'miny': %f , 'maxx': %f , 'maxy': %f }
```

with the bounding values substituted appropriately. Usage example:

```
>>> r = mapscript.rectObj(0, 0, 1, 1)
>>> str(r)
{ 'minx': 0.000000 , 'miny': 0.000000 , 'maxx': 1.000000 , 'maxy': 1.000000 }
```

Note that the return value can be conveniently eval'd into a Python dictionary:

```
>>> r_dict = eval(str(r))
>>> r_dict['minx']
0.000000
```

6.4.3 Exception Handling

The Python MapScript module maps a few MapServer errors into Python exceptions. Attempting to load a non-existent mapfile raises an 'IOError', for example

```

>>> import mapscript
>>> mapfile = '/no/such/file.map'
>>> m = mapscript.mapObj(mapfile)
Traceback (most recent call last):
  File "<stdin>", line 1, in ?
  File "/usr/lib/python2.3/site-packages/mapscript.py", line 799, in __init__
    newobj = _mapscript.new_mapObj(*args)
IOError: msLoadMap(): Unable to access file. (/no/such/file.map)
>>>

```

The message of the error is written by ‘msSetError’ and so is the same message that CGI mapserv users see in error logs.

6.5 Python MapScript Image Generation

Author Sean Gillies

Revision \$Revision\$

Date \$Date\$

Last Updated 2008/07/15

Table of Contents

- Python MapScript Image Generation
 - Introduction
 - Imagery Overview
 - The imageObj Class
 - Image Output
 - Images and Symbols

6.5.1 Introduction

The MapScript HOWTO docs are intended to complement the API reference with examples of usage for specific subjects. All examples in this document refer to the mapfile and testing layers distributed with MapServer 4.2+ and found under mapserver/tests.

Pseudocode

All examples will use a pseudocode that is consistent with the language independent API reference. Each line is a statement. For object attributes and methods we use the dot, ‘.’, operator. Creation and deletion of objects will be indicated by ‘new’ and ‘del’ keywords. Other than that, the pseudocode looks a lot like Python.

6.5.2 Imagery Overview

The most common use of MapServer and MapScript is to create map imagery using the built-in GD format drivers: GD/GIF, GD/PNG, GD/PNG24, and GD/JPEG. This imagery might be saved to a file on disk or be streamed directly to another device.

6.5.3 The imageObj Class

Imagery is represented in MapScript by the imageObj class. Please see the API Reference (MapScript.txt) for class attribute and method details.

Creating imageObj from a mapObj

The mapObj class has two methods that return instances of imageObj: ‘draw’, and ‘prepareImage’. The first returns a full-fledged map image just as one would obtain from the mapserv CGI program

```
test_map = MapScript.mapObj('tests/test.map')
map_image = test_map.draw()
```

A properly sized and formatted blank image, without any layers, symbols, or labels, will be generated by ‘prepareImage’

```
blank_image = test_map.prepareImage()
```

Creating a new imageObj

The imageObj class constructor creates new instances without need of a map

```
format = MapScript.outputFormatObj('GD/JPEG')
image = MapScript.imageObj(300, 200, format)    # 300 wide, 200 high JPEG
```

and can even initialize from a file on disk

```
# First three args are overridden by attributes of the disk image file
disk_image = MapScript.imageObj(-1, -1, NULL, 'tests/test.png')
```

6.5.4 Image Output

Creating files on disk

Imagery is saved to disk by using the ‘save’ method. By accessing the ‘extension’ attribute of an image’s format, the proper file extension can be used without making any assumptions

```
filename = 'test.' + map_image.format.extension
map_image.save(filename)
```

If the image is using a GDAL/GTiff-based format, a GeoTIFF file can be created on disk by adding a mapObj as a second optional argument to ‘save’

```
map_image.save(filename, test_map)
```

Direct Output

An image can be dumped to an open filehandle using the ‘write’ method. By default, the filehandle is ‘stdout’

```
# Send an image to a web browser
print "Content-type: " + map_image.format.mimetype + "\n\n"
map_image.write()
```

This method is not fully functional for all SWIG MapScript languages. See the API Reference (MapScript.txt) for details. The ‘write’ method is new in 4.4.

6.5.5 Images and Symbols

The symbolObj::getImage() method will return an instance of imageObj for pixmap symbols

```
symbol = test_map.symbolset.getSymbolByName('home-png')
image = symbol.getImage()
```

There is a symmetric ‘setImage’ method which loads imagery into a symbol, allowing pixmap symbols to be created dynamically

```
new_symbol = MapScript.symbolObj('from_image')
new_symbol.type = MapScript.MS_SYMBOL_PIXMAP
new_symbol.setImage(image)
index = test_map.symbolset.appendSymbol(new_symbol)
```

The get/setImage methods are new in MapServer 4.4.

6.6 Mapfile Manipulation

Author Sean Gillies

Revision \$Revision\$

Date \$Date\$

Contents

- Mapfile Manipulation
 - Introduction
 - Mapfile Overview
 - The mapObj Class
 - Children of mapObj
 - Metadata

6.6.1 Introduction

The MapScript HowTo docs are intended to complement the API reference with examples of usage for specific subjects. All examples in this document refer to the mapfile and testing layers distributed with MapServer 4.2+ and found under mapserver/tests.

Pseudocode

All examples will use a pseudocode that is consistent with the language independent API reference. Each line is a statement. For object attributes and methods we use the dot, ‘.’, operator. Creation and deletion of objects will be indicated by ‘new’ and ‘del’ keywords. Other than that, the pseudocode looks a lot like Python.

6.6.2 Mapfile Overview

By “Mapfile” here, I mean all the elements that can occur in (nearly) arbitrary numbers within a MapScript mapObj: Layers, Classes, and Styles. MapServer 4.4 has greatly improved capability to manipulate these objects.

6.6.3 The mapObj Class

An instance of mapObj is a parent for zero to many layerObj children.

New instances

The mapfile path argument to the mapscrip.mapObj constructor is now optional

```
empty_map = new mapscrip.mapObj
```

generates a default mapObj with no layers. A mapObj is initialized from a mapfile on disk in the usual manner:

```
test_map = new mapscrip.mapObj('tests/test.map')
```

Cloning

An independent copy, less result and label caches, of a mapObj can be produced by the new mapObj.clone() method:

```
clone_map = test_map.clone()
```

Note: the Java MapScript module implements a “cloneMap” method to avoid conflict with the clone method of Java’s Object class.

Saving

A mapObj can be saved to disk using the save method:

```
clone_map.save('clone.map')
```

Frankly, the msSaveMap() function which is the foundation for mapObj::save is incomplete. Your mileage may vary.

6.6.4 Children of mapObj

There is a common parent/child object API for Layers, Classes, and Styles in MapServer 4.4.

Referencing a Child

References to Layer, Class, and Style children are obtained by “getChild”-like methods of their parent:

```
layer_i = test_map.getLayer(i)
class_ij = layer_i.getClass(j)
style_ijk = class_ij.getStyle(k)
```

These references are for convenience only. MapScript doesn’t have any reference counting, and you are certain to run into trouble if you try to use these references after the parent mapObj has been deleted and freed from memory.

Cloning a Child

A completely independent Layer, Class, or Style can be created using the `clone` method of `layerObj`, `classObj`, and `styleObj`:

```
clone_layer = layer_i.clone()
```

This instance has no parent, and is self-owned.

New Children

Uninitialized instances of `layerObj`, `classObj`, or `styleObj` can be created with the new constructors:

```
new_layer = new mapscript.layerObj
new_class = new mapscript.classObj
new_style = new mapscript.styleObj
```

and are added to a parent object using “`insertChild`”-like methods of the parent which returns the index at which the child was inserted:

```
li = test_map.insertLayer(new_layer)
ci = test_map.getLayer(li).insertClass(new_class)
si = test_map.getLayer(li).getClass(ci).insertStyle(new_style)
```

The `insert*` methods create a completely new copy of the object and store it in the parent with all ownership taken on by the parent.

see the API reference for more details.

Backwards Compatibility

The old style child object constructors with the parent object as a single argument:

```
new_layer = new mapscript.layerObj(test_map)
new_class = new mapscript.classObj(new_layer)
new_style = new mapscript.styleObj(new_class)
```

remain in MapServer 4.4.

Removing Children

Child objects can be removed with “`removeChild`”-like methods of parents, which return independent copies of the removed object:

```
# following from the insertion example ...
# remove the inserted style, returns a copy of the original new_style
removed_style = test_map.getLayer(li).getClass(ci).removeStyle(si)
removed_class = test_map.getLayer(li).removeClass(ci)
removed_layer = test_map.removeLayer(li)
```

6.6.5 Metadata

Map, Layer, and Class metadata are the other arbitrarily numbered elements (well, up to the built-in limit of 41) of a mapfile.

New API

In MapServer 4.4, the metadata attributes of mapObj.web, layerObj, and classObj are instances of hashTableObj, a class which functions like a limited dictionary

```
layer.metadata.set('wms_name', 'foo')
name = layer.metadata.get('wms_name')      # returns 'foo'
```

You can iterate over all keys in a hashTableObj like

```
key = NULL
while (1):
    key = layer.metadata.nextKey(key)
    if key == NULL:
        break
    value = layer.metadata.get(key)
    ...
```

See the API Reference (mapscript.txt) for more details.

Backwards Compatibility for Metadata

The old getMetaData and setMetaData methods of mapObj, layerObj, and classObj remain for use by older programs.

6.7 Querying

Author Sean Gillies

Revision \$Revision\$

Date \$Date\$

Contents

- [Querying](#)
 - [Introduction](#)
 - [Querying Overview](#)
 - [Attribute Queries](#)
 - [Spatial Queries](#)

6.7.1 Introduction

All examples in this document refer to the mapfile and testing layers distributed with MapServer 4.2+ and found under mapserver/tests.

Pseudocode

All examples will use a pseudocode that is consistent with the language independent API reference. Each line is a statement. For object attributes and methods we use the dot, '.', operator. Creation and deletion of objects will be indicated by 'new' and 'del' keywords. Other than that, the pseudocode looks a lot like Python.

6.7.2 Querying Overview

The Query Result Set

Map layers can be queried to select features using spatial query methods or the attribute query method. Ignoring for the moment whether we are executing a spatial or attribute query, results are obtained like so:

```
layer.query()                                # not an actual method!
results = layer.getResults()
```

In the case of a failed query or query with zero results, ‘getResults’ returns NULL.

Result Set Members

Individual members of the query results are obtained like:

```
...                                         # continued

if results:
    for i in range(results.numresults):      # iterate over results
        result = results.getResult(i)
```

This result object is a handle, of sorts, for a feature of the layer, having ‘shapeindex’ and ‘tileindex’ attributes that can be used as arguments to ‘getFeature’.

Resulting Features

The previous example code can now be extended to the case of obtaining all queried features:

```
layer.query()
results = layer.getResults()
if results:
    # open layer in preparation of reading shapes
    layer.open()

    for i in range(results.numresults):
        result = results.getResult(i)

        layer.getFeature(result)

    ... # do something with this feature

    # Close when done
    layer.close()
```

Backwards Compatibility

The API changed substantially with version 6.0 and backward compatibility was broken. Scripts will have to be updated to work with the new API.

6.7.3 Attribute Queries

By Attributes

`queryByAttributes()`

6.7.4 Spatial Queries

By Rectangle

`queryByRect()`

By Point

`queryByRect()`

By Shape

`queryByShape()`

By Selection

`queryByFeatures()`

6.8 MapScript Variables

Author Howard Butler

Contact hobu.inc at gmail.com

Revision \$Revision\$

Date \$Date\$

Contents

- MapScript Variables
 - Version
 - Logical Control - Boolean Values
 - Logical Control - Status Values
 - Map Units
 - Layer Types
 - Font Types
 - Label Positions
 - Label Size (Bitmap only)
 - Shape Types
 - Measured Shape Types
 - Shapefile Types
 - Query Types
 - File Types
 - Querymap Styles
 - Connection Types
 - DB Connection Types
 - Join Types
 - Line Join Types (for rendering)
 - Image Types
 - Image Modes
 - Symbol Types
 - Return Codes
 - Limiters
 - Error Return Codes

6.8.1 Version

Name	Type	Value
MS_VERSION	character	5.2

6.8.2 Logical Control - Boolean Values

Name	Type	Value
MS_TRUE	integer	1
MS_ON	integer	1
MS_YES	integer	1
MS_FALSE	integer	0
MS_OFF	integer	0
MS_NO	integer	0

6.8.3 Logical Control - Status Values

Name	Type	Value
MS_DEFAULT	integer	2
MS_EMBED	integer	3
MS_DELETE	integer	4

6.8.4 Map Units

Name	Type	Value
MS_DD	integer	
MS_FEET	integer	
MS_INCHES	integer	
MS_METERS	integer	
MS_MILES	integer	
MS_NAUTICALMILES	integer	
MS_PIXELS	integer	

6.8.5 Layer Types

Name	Type	Value
MS_LAYER_POINT	integer	
MS_LAYER_LINE	integer	
MS_LAYER_POLYGON	integer	
MS_LAYER_RASTER	integer	
MS_LAYER_ANNOTATION (deprecated since 6.2)	integer	
MS_LAYER_QUERY	integer	
MS_LAYER_CIRCLE	integer	
MS_LAYER_TILEINDEX	integer	

6.8.6 Font Types

Name	Type	Value
MS_TRUETYPE	integer	
MS_BITMAP	integer	

6.8.7 Label Positions

Name	Type	Value
MS_UL	integer	
MS_LL	integer	
MS UR	integer	
MS_LR	integer	
MS_CL	integer	
MS_CR	integer	
MS_UC	integer	
MS_LC	integer	
MS_CC	integer	
MS_AUTO	integer	

6.8.8 Label Size (Bitmap only)

Name	Type	Value
MS_TINY	integer	
MS_SMALL	integer	
MS_MEDIUM	integer	
MS_LARGE	integer	
MS_GIANT	integer	

6.8.9 Shape Types

Name	Type	Value
MS_SHAPE_POINT	integer	
MS_SHAPE_LINE	integer	
MS_SHAPE_POLYGON	integer	
MS_SHAPE_NULL	integer	

6.8.10 Measured Shape Types

Name	Type	Value
MS_SHP_POINTM	integer	21
MS_SHP_ARCM	integer	23
MS_SHP_POLYGONM	integer	25
MS_SHP_MULTIPOINTM	integer	28

6.8.11 Shapefile Types

Name	Type	Value
MS_SHAPEFILE_POINT	integer	1
MS_SHAPEFILE_ARC	integer	3
MS_SHAPEFILE_POLYGON	integer	5
MS_SHAPEFILE_MULTIPOINT	integer	8

6.8.12 Query Types

Name	Type	Value
MS_SINGLE	integer	0
MS_MULTIPLE	integer	1

6.8.13 File Types

Name	Type	Value
MS_FILE_MAP	integer	
MS_FILE_SYMBOL	integer	

6.8.14 Querymap Styles

Name	Type	Value
MS_NORMAL	integer	
MS_HILITE	integer	
MS_SELECTED	integer	

6.8.15 Connection Types

Name	Type	Value
MS_INLINE	integer	
MS_SHAPEFILE	integer	
MS_TILED_SHAPEFILE	integer	
MS_SDE	integer	
MS_OGR	integer	
MS_POSTGIS	integer	
MS_WMS	integer	
MS_ORACLESPATIAL	integer	
MS_WFS	integer	
MS_GRATICULE	integer	
MS_MYGIS	integer	
MS_RASTER	integer	

6.8.16 DB Connection Types

Name	Type	Value
MS_DB_XBASE	integer	
MS_DB_CSV	integer	
MS_DB_MYSQL	integer	
MS_DB_ORACLE	integer	
MS_DB_POSTGRES	integer	

6.8.17 Join Types

Name	Type	Value
MS_JOIN_ONE_TO_ONE	integer	
MS_JOIN_ONE_TO_MANY	integer	

6.8.18 Line Join Types (for rendering)

Name	Type	Value
MS_CJC_NONE	integer	
MS_CJC_BEVEL	integer	
MS_CJC_BUTT	integer	
MS_CJC_MITER	integer	
MS_CJC_ROUND	integer	
MS_CJC_SQUARE	integer	
MS_CJC_TRIANGLE	integer	

6.8.19 Image Types

Name	Type	Value
GD/GIF	integer	
GD/PNG	integer	
GD/PNG24	integer	
GD/JPEG	integer	
GD/WBMP	integer	
swf	integer	
imagemap	integer	
pdf	integer	
GDAL/GTiff	integer	

6.8.20 Image Modes

Name	Type	Value
MS_IMAGEMODE_PC256	integer	
MS_IMAGEMODE_RGB	integer	
MS_IMAGEMODE_RGBA	integer	
MS_IMAGEMODE_INT16	integer	
MS_IMAGEMODE_FLOAT32	integer	
MS_IMAGEMODE_BYTE	integer	
MS_IMAGEMODE_NULL	integer	
MS_NO OVERRIDE	integer	
MS_GD_ALPHA	integer	1000

6.8.21 Symbol Types

Name	Type	Value
MS_SYMBOL_SIMPLE	integer	
MS_SYMBOL_VECTOR	integer	
MS_SYMBOL_ELLIPSE	integer	
MS_SYMBOL_PIXMAP	integer	
MS_SYMBOL_TRUETYPE	integer	

6.8.22 Return Codes

Name	Type	Value
MS_SUCCESS	integer	
MS_FAILURE	integer	
MS_DONE	integer	

6.8.23 Limiters

Name	Type	Value
MS_MAXSYMBOLS	long	
MS_MAXVECTORPOINTS	long	
MS_MAXSTYLELENGTH	long	
MS_IMAGECACHESIZE	long	

6.8.24 Error Return Codes

Name	Type	Value
MS_NOERR	long	0
MS_IOERR	long	1
MS_MEMERR	long	2
MS_TYPEERR	long	3
MS_SYMERR	long	4
MS_REGEXERR	long	5
MS_TTFERR	long	6
MS_DBFERR	long	7
MS_GDERR	long	8
MS_IDENTERR	long	9
MS_EOFERR	long	10
MS_PROJERR	long	11
MS_MISCERR	long	12
MS_CGIERR	long	13
MS_WEBERR	long	14
MS_IMGERR	long	15
MS_HASHERR	long	16
MS_JOINERR	long	17
MS_NOTFOUND	long	18
MS_SHPERR	long	19
MS_PARSEERR	long	20
MS_SDEERR	long	21
MS_OGRERR	long	22
MS_QUERYERR	long	23
MS_WMSERR	long	24
MS_WMSCONNERR	long	25
MS_ORACLESPATIALERR	long	26
MS_WFSERR	long	27
MS_WFSCONNERR	long	28
MS_MAPCONTEXTERR	long	29
MS_HTTPERR	long	30
MS_CHILDERR	long	31
MS_WCSERR	long	32
MS_NUMERRORCODES	long	33
MESSAGELENGTH	long	33
ROUTINELENGTH	long	33

MapCache

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

MapCache is a server that implements tile caching to speed up access to WMS layers. The primary objectives are to be fast and easily deployable, while offering the essential features (and more!) expected from a tile caching solution.

7.1 Compilation & Installation

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

Author Alan Boudreault

Contact aboudreaut at magears.com

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Table of Contents

- Compilation & Installation
 - Getting the Source
 - Linux Instructions
 - * Apache Module Specific Instructions
 - * Nginx Specific Instructions
 - * CGI/FastCGI Specific Instructions
 - * Customizing the build, or if something went wrong
 - * Experimental options, use at your own risk
 - Windows Instructions
 - * Dependencies
 - * Configure Your Makefile
 - * Compilation
 - * Move the Module into Apache Directory
 - * Configure Your Installed Apache
 - * Test Your MapCache Module

7.1.1 Getting the Source

The MapCache project is located at <https://github.com/mapserver/mapcache>, and can be checked out with either:

```
# readonly
git clone git://github.com/mapserver/mapcache.git
# ssh authenticated
git clone git@github.com:mapserver/mapcache.git
# tarball
wget https://github.com/mapserver/mapcache/zipball/master
```

7.1.2 Linux Instructions

These instructions target a debian/ubuntu setup, but should apply with few modifications to any linux installation.

MapCache requires a number of library headers in order to compile correctly:

- **apache / apr / apr-util / apx2**: these are included in the *apache2-prefork-dev* or *apache2-threaded-dev* packages, depending on what apache mpm you are running. This package will pull in the necessary apr headers, that you would have to manually install if you are not building an apache module (*libaprutil1-dev* and *libapr1-dev*)
- **png**: *libpng12-dev*
- **jpeg**: *libjpeg62-dev*
- **curl**: *libcurl4-gnutls-dev*

The following libraries are not required, but recommended:

- **pcre**: *libpcre3-dev*. This will give you more powerfull regular expression syntax when creating validation expressions for dimensions
- **pixman**: *libpixman-1-dev*. The pixel manipulation library is used for scaling and alpha-compositing images. MapCache ships with some code to perform these tasks, but pixman is generally faster as it includes code optimized for modern cpus (sse2, mmx, etc...)

The following libraries are not required, but needed to enable additional functionalities:

- **fcgi**: *libfcgi-dev*. Needed to build a fastcgi program if you don't want to run mapcache as an apache module.

- **gdal / geos:** *libgdal1-dev libgeos-dev*. Needed to enable advanced seeding options (for only seeding tiles that intersect a given geographical feature)
- **sqlite:** *libsqLite3-dev*. For enabling the sqlite backend storages
- **tiff:** *libtiff4-dev*. For enabling the TIFF backend storages

For unix users where all packages are in the default locations, the compilation process should resume to:

```
$ ./configure
$ make
$ sudo make install
```

Apache Module Specific Instructions

The make install above installs the apache module, but if you need to specifically need to install only the apache module you can do the following

```
$ sudo make install-module
$ sudo ldconfig
```

The installation script takes care of putting the built module in the apache module directory. The process for activating a module is usually distro specific, but can be resumed by the following snippet that should be present in the apache configuration file (e.g. /usr/local/httpd/conf/httpd.conf or /etc/apache2/sites-available/default):

```
LoadModule mapcache_module      modules/mod_mapcache.so
```

Next, a mapcache configuration is mapped to the server url with the following snippet

For apache < 2.4:

```
<IfModule mapcache_module>
  <Directory /path/to/directory>
    Order Allow,Deny
    Allow from all
  </Directory>
  MapCacheAlias /mapcache "/path/to/directory/mapcache.xml"
</IfModule>
```

For apache >= 2.4:

```
<IfModule mapcache_module>
  <Directory /path/to/directory>
    Require all granted
  </Directory>
  MapCacheAlias /mapcache "/path/to/directory/mapcache.xml"
</IfModule>
```

Finally, restart apache to take the modified configuration into account

```
$ sudo apachectl restart
```

If you have not disabled the demo service, you should now have access to it on <http://myserver/mapcache/demo>

Nginx Specific Instructions

Warning: Working with nginx is still somewhat experimental. The following workflow has only been tested on the development version, i.e. nginx-1.1.x

For nginx support you need to build mapcache's nginx module against the nginx source. Download the nginx source code:

```
$ cd /usr/local/src
$ mkdir nginx
$ cd nginx
$ wget http://nginx.org/download/nginx-1.1.19.tar.gz
$ tar -xzvf nginx-1.1.19.tar.gz
$ cd nginx-1.1.19/
```

Run the configure command with the flag `--add-module`. This flag must point to mapcache's nginx child directory. Assuming that mapserver source was cloned or un tarred into to `/usr/local/src`, an example configure command for nginx would look like this:

```
$ ./configure --add-module=/usr/local/src/mapcache/nginx
```

Then build nginx:

```
$ make
$ sudo make install
```

Due to nginx's non-blocking architecture, the mapcache nginx module does not perform any operations that may lead to a worker process being blocked by a long computation (i.e.: requesting a (meta)tile to be rendered if not in the cache, proxying a request to an upstream wms server, or waiting for a tile to be rendered by another worker), it will instead issue a 404 error. This behavior is essential so as not to occupy all nginx worker threads, therefore preventing it from responding to all other incoming requests. While this isn't an issue for completely seeded tilesets, this implies that these kinds of requests need to be proxied to another mapcache instance that does not suffer from these starvation issues (i.e. either a fastcgi mapcache, or an internal proxied apache server). In this scenario, both the nginx mapcache instance and the apache/fastcgi mapcache instance should be running with the same `mapcache.xml` configuration file.

Mapcache supplies a `nginx.conf` in its nginx child directory. The conf contains an example configuration to load mapcache. The most relevant part of the configuration is the location directive that points the `^/mapcache` URI to the `mapcache.xml` path. You will need to change this path to point to your own `mapcache.xml` in the mapcache source

The basic configuration without any proxying (which will return 404 errors on unseeded tile requests) is:

```
location ~ ^/mapcache(?:<path_info>/.*|$) {
    set $url_prefix "/mapcache";
    mapcache /usr/local/src/mapcache/mapcache.xml;
}
```

If proxying unseeded tile requests to a mapcache instance running on an apache server, we will proxy all 404 mapcache errors to a `mapcache.apache.tld` server listening on port 8080, configured to respond to mapcache requests on the `/mapcache` location.

```
location ~ ^/mapcache(?:<path_info>/.*|$) {
    set $url_prefix "/mapcache";
    mapcache /usr/local/src/mapcache/mapcache.xml;
    error_page 404 = @apache_mapcache;
}

location @apache_mapcache {
    proxy_pass http://mapcache.apache.tld:8080;
}
```

If using fastcgi instances of mapcache, spawned with e.g. `spawn-fcgi` or `supervisord` on port 9001 (make sure to enable fastcgi when building mapcache, and to set the `MAPCACHE_CONFIG_FILE` environment variable before spawning):

```

location ~ ^/mapcache(?:<path_info>/.*|$) {
    set $url_prefix "/mapcache";
    mapcache /usr/local/src/mapcache/mapcache.xml;
    error_page 404 = @fastcgi_mapcache;
}

location @fastcgi_mapcache {
    fastcgi_pass   localhost:9001;
    fastcgi_param QUERY_STRING      $query_string;
    fastcgi_param REQUEST_METHOD    $request_method;
    fastcgi_param CONTENT_TYPE     $content_type;
    fastcgi_param CONTENT_LENGTH    $content_length;
    fastcgi_param PATH_INFO        $path_info;
    fastcgi_param SERVER_NAME      $server_name;
    fastcgi_param SERVER_PORT      $server_port;
    fastcgi_param SCRIPT_NAME      "/mapcache";
}

```

Copy the relevant sections of nginx.conf from mapcache's nginx directory into nginx's conf file (in this case /usr/local/nginx/conf/nginx.conf) , you should now have access to the demo at <http://myserver/mapcache/demo>

CGI/FastCGI Specific Instructions

Warning: Fastcgi support is not built in by default, you must explicitly enable it at compile time, see [FastCGI](#)

A binary cgi/fastcgi is located in the mapcache/ subfolder, and is named “mapcache”. Activating fastcgi for the mapcache program on your web server is not part of these instructions, more details may be found on the [FastCGI](#) page or on more general web pages across the web.

The MapCache fastcgi program looks for it's configuration file in the environment variable called MAPCACHE_CONFIG_FILE, which must be set by the web server before spawning the mapcache processes.

See Also:

[Configuration File](#)

For apache with mod_cgi:

```
SetEnv "MAPCACHE_CONFIG_FILE" "/path/to/mapcache/mapcache.xml"
```

For apache with mod_fcgid:

```
FcgidInitialEnv "MAPCACHE_CONFIG_FILE" "/path/to/mapcache/mapcache.xml"
```

If you have not disabled the demo service, you should now have access to it on <http://myserver/fcgi-bin/mapcache/demo> supposing your fcgi processes are accessed under the fcgi-bin alias.

With a working mod_fcgid apache instance, the full httpd.conf snippet to activate mapcache could be:

```

<IfModule mod_fcgid.c>
    IPCCommTimeout 120
    MaxProcessCount 10
    FcgidInitialEnv "MAPCACHE_CONFIG_FILE" "/path/to/mapcache/mapcache.xml"
<Location /map.fcgi>
    Order Allow,Deny
    Allow from all
    SetHandler fcgid-script

```

```
</Location>
ScriptAlias /map.cgi "/path/to/mapcache/src/mapcache"
</IfModule>
```

The mapcache service would then be accessible at [http://myserver/map.cgi\[/demo\]](http://myserver/map.cgi[/demo])

Customizing the build, or if something went wrong

The configure script will try to locate dependant libraries in default system locations, that can be overriden or specified with switches (`./configure --help` should give you a full list).

Apache apxs

```
--with-apxs=/path/to/apxs
```

apxs is the apache extension tool that is used for building and installing the module to a local apache instance. it should be installed along with a standard apache build, or supplied by distros when installing the apache development packages. apxs is sometimes called apxs2 (notably on debian)

Apr

```
--with-apr-config=/path/to/apr-config
```

apr-config is sometimes called apr-1-config on some systems. The path to the apr libraries is usually determined from the previous apxs utility. you can use this switch to override which apr will be used. beware that using a different version of apr than the one that is linked to by apache will likely cause bugs.

Apr-Util

```
--with-apu-config=/path/to/apu-config
```

apu-config is sometimes called apu-1-config.

Libcurl

```
--with-curl-config=/path/to/curl-config
```

Libpng

```
--with-png=/path/to/png/prefix
```

this is the path where the libpng headers and libs can be located. the configure script will be looking for [path]/include/png.h and [path]/lib/libpng.so

Libjpeg

```
--with-jpeg=/path/to/jpeg/prefix
```

this is the path where the libjpeg headers and libs can be located. the configure script will be looking for [path]/include/jpeg.h and [path]/lib/libjpeg.so

Pixman (recommended)

```
--with-pixman=[yes|no|/path/to/pkgconfig/pixman.pc]
```

Pixman is a pixel manipulation library used to assemble image tiles when responding to non-tiled wms requests. Pixman support is recommended as it is highly optimized and will take advantage of recent processor extensions (mms, sse, ...) to speed up blending and resampling operations. In case the pixman library is not found, mod-mapcache will fall back to internal pixel operations that are slower.

Sqlite (optional)

```
--with-sqlite[=yes|no|/path/to/sqlite-prefix]
```

Sqlite is used to enable the sqlite and mbtiles cache backend. version 3.5.0 or newer is required.

See Also:

Sqlite Caches

GDAL/OGR (optional, also requires geos)

```
--with-gdal[=yes|no|/path/to/gdal-config]
```

Gdal (actually ogr) is used by the seeding utility to allow the seeding of tiles only intersecting a given polygon, e.g. to preseed all the tiles of a given country.

GEOS (optional)

```
--with-geos=/path/to/geos-config
```

Along with gdal/ogr, geos is needed by the seeder to test for the intersection of tiles with geographical features. A sufficiently recent version of geos (with support for prepared geometries) is required (but not enforced by the configure script, so you'll end up with compilation errors if a too old geos version is used)

PCRE (optional)

```
--with-pcre=/path/to/pcre-prefix
```

Pcre (perl compatible regular expressions) can be used instead of posix regular expressions for validating WMS dimensions. they are more powerfull than posix REs (and might be slower). You don't need this if you aren't planning on using WMS dimension support with regex validation, or if your validation needs are covered by posix REs.

See Also:

Tileset Dimensions

FastCGI Support (optional)

```
--with-fastcgi=/path/to/fastcgi-prefix
```

MapCache can run as a fastcgi executable. Note that the overhead of fastcgi is non-negligable with respect to the throughput you may obtain with a native apache module. The fastcgi build is less tested, and may lag behind compared to the apache module version on some minor details, YMMV.

TIFF Readonly Cache Support (optional)

```
--with-tiff=/path/to/libtiff-prefix
```

See Also:

(Geo)TIFF Caches

Debug Mode

```
--enable-debug
```

enables some extra tests inside the code, and prints out many more debugging messages to the server logs. you should probably not enable this unless you want to track down a problem happening inside MapCache.

Memcached Cache Support (optional)

The memcached cache backend is enabled by default, as it does not depend on other external libraries (support is obtained through apr-util). You can optionally disable it if you have no need for it.

```
--disable-memcache
```

See Also:

Memcache Caches

Apache Module Options

You can disable the apache module building if you only plan on using the fastcgi executable or the seeder.

```
--disable-module
```

MapCache adds itself to the version string reported by the apache server. This can be disabled with

```
--disable-version-string
```

Experimental options, use at your own risk

TIFF read/write Cache Support (optional)

TIFF write support (for creating new TIFF files and adding tiles to existing TIFF files) is still experimental and disabled by default. There is a risk in ending up with corrupt TIFF files if they are placed on a filesystem that does not honour file locking, as in that case multiple processes might end up writing to the same file. File locking across concurrent threads is also problematic, although MapCache tries to detect this situation and apply sufficient locking workarounds.

To stay on the safe side, write support should for now only be enabled on local filesystems, with a prefork mpm or fastcgi MapCache install.

```
--enable-tiff-write-support
```

See Also:

(Geo)TIFF Caches

When writing TIFF files, mapcache can also optionally add georeferencing information if compiled with libtiff support. GeoTiff writing does not produce the full tags needed for defining which projection the grid is in, but will only produce those defining the pixel scale and the tiepoints (i.e. the equivalent information found in the accompanying .tfw files)

```
--enable-geotiff[=yes|no|/path/to/libgeotiffprefix]
```

Native MapServer Mode

MapCache is by default not linked to MapServer in any way, and communicates through the WMS protocol only. For performance reasons, there is a possibility to directly use the mapserver C library and avoid an http request and an image compression/decompression. This integration is still experimental and should be used cautiously

```
--enable-mapserver=/path/to/mapserver-srkdir
```

This will use the libmapserver.so from mapserver's install directory. MapServer itself should be compiled with thread-safety enabled, unless you plan use the prefork mpm or fastcgi, **and** you do not plan to use the seeder. For thread safety on the mapserver side, you might want to have a look at tickets #4041 and #4044.

7.1.3 Windows Instructions

These instructions target a Windows 7 setup with an Apache httpd compiled from source. The Apache MapCache module has been successfully built with Microsoft Visual Studio C++ versions 2003, 2008 and 2010.

Dependencies

Required:

- **Apache / APR / APR-UTIL:** included with apache httpd installation

Those can be installed manually, or using the appropriate Windows SDK from: <http://vbkto.dyndns.org/sdk/>

- **PNG**
- **JPEG**
- **CURL**

Recommended:

- **PCRE:** <ftp://ftp.gnu.org/pub/gnu/regex/regex-0.12.tar.gz>

Optional:

- **FCGI:** Needed to build a fastcgi program if you don't want to run mapcache as an apache module.
- **GDAL / GEOS:** Needed to enable advanced seeding options (for only seeding tiles that intersect a given geographical feature)
- **SQLITE:** For enabling the sqlite backend storages

- **TIFF:** For enabling the TIFF backend storages

Configure Your Makefile

Open nmake.opt and modify the paths to point to the various libraries.

Compilation

```
$ nmake /f Makefile.vc
```

If successful, the resulting libraries and executables will be generated in their associated directories:

apache/ Apache module (mod_mapcache.dll)
cgi/ FastCGI MapCache executable (mapcache.exe)
util/ MapCache utilities (mapcache_seed.exe)

Move the Module into Apache Directory

Copy the *mod_mapcache.dll* file into one of your Apache subdirectories.

Note: Although other modules are installed into */Apache/modules/*, you should place mod_mapcache.dll wherever its required dll files (libcurl.dll, zlib.dll, etc.) live, to avoid any loading issues later on.

Configure Your Installed Apache

- Modify your *httpd.conf* file to load the module:

```
LoadModule mapcache_module "D:/ms4w/Apache/cgi-bin/mod_mapcache.dll"
```

- Next, configure your mapcache directory with the following snippet

```
<IfModule mapcache_module>
    <Directory "D:/ms4w/apps/mapcache/">
        Order Allow,Deny
        Allow from all
    </Directory>
    MapCacheAlias /mapcache "D:/ms4w/apps/mapcache/mapcache.xml"
</IfModule>
```

- Configure your *mapcache.xml* file (see the *Configuration* section for help)

Warning: If you receive an error such as “cache disk: host system does not support file symbolic linking” you should comment the line “*<symlink_blank/>*” in your *mapcache.xml* file, such as:

```
<cache name="disk" type="disk">
    <base>D:/ms4w/tmp/ms_tmp/cache</base>
    <!--<symlink_blank/>-->
</cache>
```

- Finally, restart your Apache. You should see a message in Apache’s error.log with a message similar to:

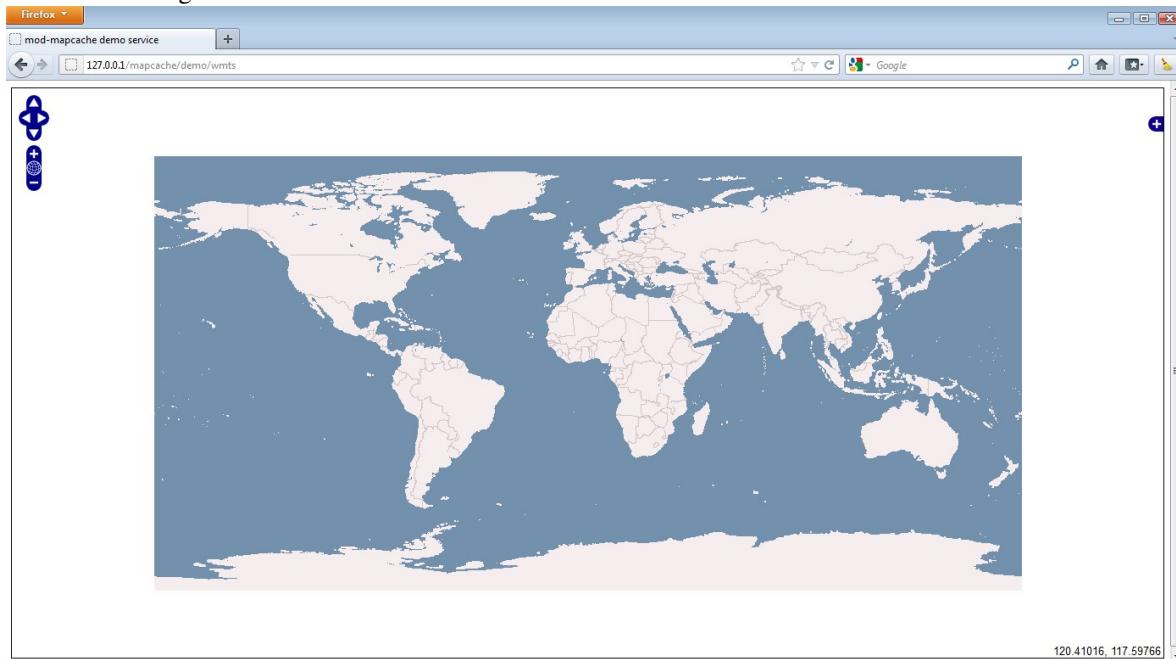
```
[notice] Apache/2.2.21 (Win32) mod-mapcache/0.5-dev configured -- resuming normal operations
```

Test Your MapCache Module

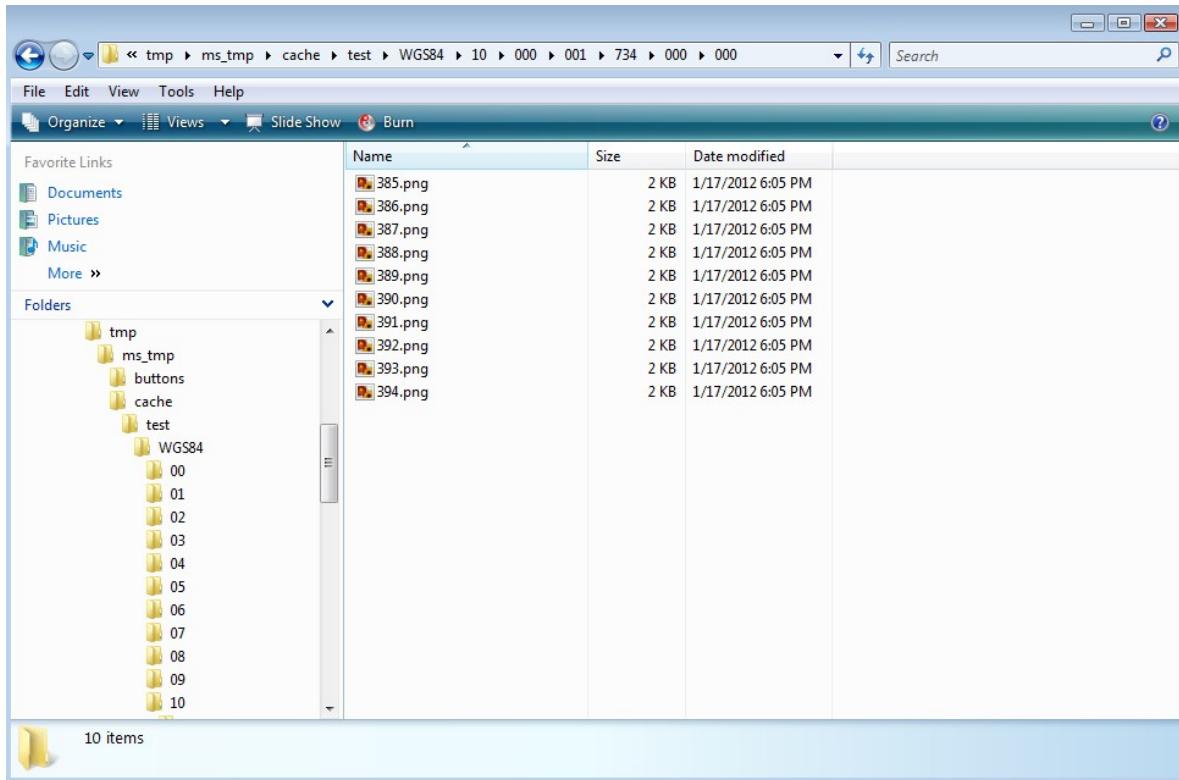
- In your web browser, goto the local MapCache demo page: <http://127.0.0.1/mapcache/demo/> You should see a clickable list of demo links:

tms
wmts
gmaps
kml
ve
wms

- Click on one of the demos (such as <http://127.0.0.1/mapcache/demo/wmts>), a map viewer should load, similar to the image below.



- Zoom in a few times, and your configured cache location should be generating tiles (in this case inside D:/ms4w/tmp/ms_tmp/cache/).



7.2 Configuration File

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

The configuration files determines what and how mod-mapcache will serve incoming requests. It is an xml file that comprises a list of entries, as outlined here:

```
<mapcache>
  <grid>....</grid>
  <source>....</source>
  <cache>....</cache>
  <format>....</format>
  <tilesheet>....</tilesheet>
  <services>....</services>
</mapcache>
```

7.2.1 Source

A source is a service mod-mapcache can query to obtain image data. This is typically a WMS server accessible by a url (there are currently no other sources than WMS implemented, others may be added later if the need arises)

```
<source name="vmap0" type="wms">
  <!--
    extra parameters that will be added to the GetMap request. you can specify any
    parameter here, e.g. VERSION if you want to override the version of the WMS
```

```

request.
the LAYERS parameter is mandatory.
usual parameters here are FORMAT , or MAP if using mapserver
-->
<getmap>
  <params>
    <FORMAT>image/png</FORMAT>
    <LAYERS>basic</LAYERS>
  </params>
</getmap>

<!-- http url and parameters that will be used when making WMS requests --&gt;
&lt;http&gt;

  &lt!-- url of the wms service, without any parameters --&gt;
  &lt;url&gt;http://vmap0.tiles.osgeo.org/wms/vmap0&lt;/url&gt;

  &lt;!--
    http headers added to request. make sure you know what you are
    doing when adding a header here, as they take precedence over any
    default headers curl will be adding to the request.
    typical headers that can be added here are User-Agent and Referer.

    when adding a &lt;key&gt;value&lt;/key&gt; element here, the request to the
    wms source will contain the

      key: value\r\n

    HTTP header.
  --&gt;
  &lt;headers&gt;
    &lt;User-Agent&gt;mod-mapcache/r175&lt;/User-Agent&gt;
    &lt;Referer&gt;http://www.mysite.com?param=2&amp;param=4&lt;/Referer&gt;
  &lt;/headers&gt;

  &lt;!-- timeout in seconds before bailing out from a request --&gt;
  &lt;connection_timeout&gt;30&lt;/connection_timeout&gt;
&lt;/http&gt;
&lt;/source&gt;
</pre>

```

- The name and type attributes are straightforward: type is “wms”, and name is
- the key by which this source will be referenced <url> is the http location
- where the service can be accessed <wmtparams> is a list of parameters that
- will be added to the wms request. You should probably at the very least add
- the FORMAT and LAYERS parameters. By convention(?), WMS parameters are
- uppercase, and you should respect this convention in your configuration file.
- This is where you can also override some default WMS parameters if needed. By
- default, the parameters that will be used are: <REQUEST>GetMap</REQUEST>
- <SERVICE>WMS</SERVICE> <STYLES></STYLES> <VERSION>1.1.0</VERSION>

7.2.2 Cache

A cache is a location where received tiles will be stored.

```
<cache name="disk" type="disk">

    <!-- base

        absolute filesystem path where the tile structure will be stored.
        this directory needs to be readable and writable by the user running
        apache
    -->
    <base>/tmp</base>

    <!-- symlink_blank

        enable blank (i.e. uniform color) tile detection. blank tiles will be
        detected at creation time and linked to a single blank tile on disk to
        preserve disk space.
    -->
    <symlink_blank/>
</cache>

<cache name="tmpl" type="disk">
    <!-- template

        string template that will be used to map a tile (by tileset, grid name, dimension,
        format, x, y, and z) to a filename on the filesystem.
        the following replacements are performed:
        - {tileset} : the tileset name
        - {grid} : the grid name
        - {dim} : a string that concatenates the tile's dimension
        - {ext} : the filename extension for the tile's image format
        - {x}, {y}, {z} : the tile x,y,z values
        - {inv_x}, {inv_y}, {inv_z} : inverted x,y,z values (inv_x = level->maxx - x - 1). This
            is mainly used to support grids where one axis is inverted (e.g. the google schema)
            and you want to create an offline cache.

        * note that this type of cache does not support blank-tile detection and symlinking.

        * warning: it is up to you to make sure that the template you chose creates a unique
            filename for your given tilesets. e.g. do not omit the {grid} parameter if your
            tilesets reference multiple grids. Failure to do so will result in filename
            collisions !
    -->
    <template>/tmp/template-test/{tileset}#{grid}#{dim}/{z}/{x}/{y}.{ext}</template>
</cache>

    <!-- memcache cache
        entry accepts multiple <server> entries
        requires a fairly recent apr-util library and headers
    -->
    <cache name="memcache" type="memcache">
        <server>
            <host>localhost</host>
            <port>11211</port>
        </server>
    </cache>
```

```

<!-- sqlite cache
   requires building with "with-sqlite"
-->
<cache name="sqlite" type="sqlite3">
  <!-- dbfile

    absolute filename path of the sqlite database file to use.
    this file needs to be readable and writable by the user running
    the mapcache instance
  -->
</cache>

<cache name="mbtiles" type="mbtiles">
  <dbfile>/path/to/MapBox/tiles/natural-earth-1.mbtiles</dbfile>
</cache>

```

7.2.3 Format

A format is an image format that will be used to return tile data to clients, and to store tile data on disk.

```

<format name="PNGQ_FAST" type ="PNG">

  <!-- compression

    png compression: best or fast
    note that "best" compression is cpu intensive for little gain over the default
    default compression is obtained by leaving out this tag.
  -->
  <compression>fast</compression>

  <!-- colors

    if supplied, this enables png quantization which reduces the number of colors
    in an image to attain higher compression. this operation is destructive, and can
    cause artifacts in the stored image.
    the number of colors can be between 2 and 256
  -->
  <colors>256</colors>
</format>
<format name="myjpeg" type ="JPEG">
  <!-- quality

    JPEG compression quality, ranging from 0 to 100
    95 produces high quality images with few visual artifacts
    values under around 80 produce small images but with visible artifacts.
    YMMV
  -->
  <quality>75</quality>

  <!-- photometric

    photometric interpretation of the bands created in the jpeg image.
    default is ycbcr and produces the smallest images. can also be "rgb"
    which usually results in x2 or x3 image sizes.
  -->
  <photometric>ycbcr</photometric>

```

```
</format>
<format name="PNG_BEST" type ="PNG">
  <compression>best</compression>
</format>

<format name="mixed" type="MIXED">
  <transparent>PNG_BEST</transparent>
  <opaque>JPEG</opaque>
</format>
```

7.2.4 Grid

A grid is the matrix that maps tiles on an area, and consists of a spatial reference, a geographic extent, resolutions, and tile sizes.

Mandatory Configuration Options

- **<size>**: The width and height of an individual tile, in pixels. Must be specified as two positive integers separated by a space character. The most common entry for this is:

```
<size>256 256</size>
```

- **<extent>**: The geographical extent covered by the grid, in ground units (e.g. meters, degrees, feet, ...). Must be specified as four floating point numbers separated by spaces, order like minx, miny, maxx, maxy. The (minx,miny) point defines the origin of the grid, i.e. the pixel at the bottom left of the bottom-leftmost tile is always placed on the (minx,miny) geographical point.

The (maxx,maxy) point is used to determine how many tiles there are for each zoom level.

```
<extent>-180 -90 180 90</extent>
```

- **<srs>**: The projection of the grid, usually given by its epsg identifier. The actual meaning of the value put here isn't used directly by mapcache to compute reprojections, it is only used to lookup which grid to use when receiving WMS requests.

```
<srs>epsg:4326</srs>
```

Note: This is the value that is passed on to the *source* when requesting a tile that is not already cached for the current grid. You must make sure that the source that is queried is capable of returning image data for this srs.

- **<units>**: The ground units used by the grid's projection. This entry is not used directly by mapcache aside from calculating scales for the WMPS capabilities document. Allowed values are:

- **m**: meters
- **dd**: decimal degrees
- **ft**: feet

```
<units>dd</units>
```

- **<resolutions>**: This is a list of resolutions for each of the zoom levels defined by the grid. This must be supplied as a list of positive floating point values, separated by a space and ordered from largest to smallest. The largest value will correspond to the grid's zoom level 0. Resolutions are expressed in "units-per-pixel", depending on the unit used by the grid (e.g. resolutions are in meters per pixel for most grids used in webmapping).

```
<resolutions>0.7031250000000000 0.3515625000000000 0.1757812500000000 8.78906250000000e-2 4.3945312
```

Optional Configuration Options

- **<srsalias>**: This tag can be specified multiple times, and allows the user to add multiple srs entries for a given grid. This is especially useful if the epsg id for a given projection has evolved over time, or to support other catalogues than the epsg one (which is the only catalog supported by the wms specification).

```
<srs>EPSG:310024802</srs>
<srsalias>IGNF:GEOPORTALFXX</srsalias>
<srsalias>EPSG:310024001</srsalias>
```

- **<metadata>**:

- **<title>**: The name of the grid, in human readable form. Appears in the capabilities documents.

```
<title>This grid covers the area blah blah blah</title>
```

- **<WellKnownScaleSet>**: see the WMTS keyword. This will add a WellKnownScaleSet entry to the WMTS capabilities document. It is up to the user to make sure that the supplied resolutions for the grid actually match the pre-defined WellKnownScaleSet.

```
<WellKnownScaleSet>urn:ogc:def:wkss:OGC:1.0:GoogleCRS84Quad</WellKnownScaleSet>
```

Preconfigured Grids

There are three predefined grids you can use without referencing them in the mapcache.xml file:

- the “WGS84” grid corresponds to a grid where the whole world is rendered on 2 times 1 256x256 pixel tiles at level 0 (i.e. the (-180,-90,180,90) extent fits on a 512x256 image). It goes down to zoom level 17.

```
<grid name="WGS84">
  <metadata>
    <title>GoogleCRS84Quad</title>
    <WellKnownScaleSet>urn:ogc:def:wkss:OGC:1.0:GoogleCRS84Quad</WellKnownScaleSet>
  </metadata>
  <extent>-180 -90 180 90</extent>
  <srs>EPSG:4326</srs>
  <units>dd</units>
  <size>256 256</size>
  <resolutions>0.7031250000000000 0.3515625000000000 0.1757812500000000 8.78906250000000e-2 4.3945312
```

- the “g” grid corresponds to the case when you wish to overlay tiles on top of googlemaps, and is the default tiling scheme used in webmapping applications. This grid goes down to zoom level 18. Level 0 is a single 256x256 tile. This grid’s default srs is EPSG:900913 which is non-standard, but in wider use than than its official EPSG:3857 entry.

```
<grid name="GoogleMapsCompatible">
  <metadata>
    <title>GoogleMapsCompatible</title>
    <WellKnownScaleSet>urn:ogc:def:wkss:OGC:1.0:GoogleMapsCompatible</WellKnownScaleSet>
  </metadata>
  <extent>-20037508.3427892480 -20037508.3427892480 20037508.3427892480 20037508.3427892480</extent>
  <srs>EPSG:900913</srs>
  <srsalias>EPSG:3857</srsalias>
  <units>m</units>
```

```
<size>256 256</size>
<resolutions>156543.0339280410 78271.51696402048 39135.75848201023 19567.87924100512 9783.939
```

- the “GoogleMapsCompatible” grid is nearly identical to the “g” grid, except its default srs is EPSG:3857 instead of EPSG:900913.

```
<grid name="GoogleMapsCompatible">
  <metadata>
    <title>GoogleMapsCompatible</title>
    <WellKnownScaleSet>urn:ogc:def:wkss:OGC:1.0:GoogleMapsCompatible</WellKnownScaleSet>
  </metadata>
  <extent>-20037508.3427892480 -20037508.3427892480 20037508.3427892480 20037508.3427892480</extent>
  <srs>EPSG:3857</srs>
  <srsalias>EPSG:900913</srsalias>
  <units>m</units>
  <size>256 256</size>
  <resolutions>156543.0339280410 78271.51696402048 39135.75848201023 19567.87924100512 9783.939
</grid>
```

7.2.5 Tileset

A tileset is the essential configuration item for mod-mapcache, and corresponds to a set of tiles coming from a *source*, stored in a *cache*, and returned to the client in a given *format*.

```
<tileset name="test">

  <!-- source: the "name" attribute of a preconfigured <source> -->
  <source>vmap0</source>

  <!-- cache: the "name" attribute of a preconfigured <cache> -->
  <cache>sqlite</cache>

  <!-- grid: the "name" attribute of a preconfigured <grid>
       you can also use the following notation to limit the area that will be cached and served to clients
       <grid restricted_extent="-10 40 10 50">WGS84</grid>
       this way is better than using a grid with a limited extent, as in this way the tiles that are already
       cached are not invalidated should you want to modify the restricted extent in the future. When
       setting the restricted_extent attribute, you should give the corresponding information to the client that
       is going to be using the service.

  NOTE: when adding a <grid> element, you *MUST* make sure that the source you have selected is able
        to return images in the grid's srs.
  -->
  <grid restricted_extent="-10 40 10 50">WGS84</grid>
  <grid>g</grid>

  <!-- metadata
       optional metadata tags used for responding to GetCapabilities request.
       you can put anything in here, although only the title and abstract tags
       are currently used to populate the GetCapabilities document.
  -->
  <metadata>
    <title>vmap0 map</title>
    <abstract>blabla</abstract>
  </metadata>
```

```

<!-- watermark
optional tag to add a watermark to the tiles *before* storing them to cache
the supplied image MUST be exactly the same size as the size of the tiles
configured in the <grid>
the supplied image is read when the configuration is loaded.
if you make changes to the image, they will NOT be reflected on tiles already
stored in the cache, nor on newly stored tiles until the server is restarted
<watermark>/path/to/static/watermark.png</watermark>
-->

<!-- format
(optional) format to use when storing a tile. this should be a format with high
compression, eg. png with compression "best", as the compression operation is only
done once at creation time.
if left out, no recompression is applied to the image, mod-mapcache will store the
exact image received from the <source>
note that the <format> tag is mandatory if metatile, metabuffer or watermark are
supplied, as in those cases a recompression has to be done.
-->
<format>PNG</format>

<!-- metatile
number of columns and rows to use for metatiling, see http://geowebcache.org/docs/current/conce
-->
<metatile>5 5</metatile>

<!-- metabuffer
area around the tile or metatile that will be cut off to prevent some edge artifacts.
if using this, the configured source must be instructed not to put any labels inside
this area, as otherwise this will result in truncated labels (for mapserver, this is
the "labelcache_map_edge_buffer" "-10" metadata entry, along with label PARTIALS FALSE
-->
<metabuffer>10</metabuffer>

<!-- expires
optional expiration value in seconds for a tile. this is expressed in a number of seconds
after the creation date of the tile
This is the value that will be set in the HTTP Expires and Cache-Control headers, and has
no effect on the actual expiration of tiles on the caches. See <auto_expire> for that.
-->
<expires>3600</expires>

<!-- auto_expire
automatically re-request tiles and update the cache once they are older than the given number
of seconds after their creation.
Note that this will only delete tiles from the cache when they are accessed, you cannot
use this configuration to limit the size of the created cache.
Note that if set, this value overrides the value given by <expires>
-->
<auto_expire>86400</auto_expire>

<!-- dimensions
optional dimensions that should be cached
the order of the <dimension> tags inside the <dimensions> is important as it is used
to create the directory structure for the disk cache. i.e. if you change the order of these
values, any tiles that have been previously cached are invalidated (but not removed from the
cache, it's just they don't exist anymore for mod-mapcache

```

```
-->
<dimensions>
    <!-- values dimension
        the example here creates a DIM1 dimension
        * WMS and WMTS clients can now add a &DIM1=value to their request string. If they don't
        specify this key/value, the default will be to use DIM1=foobar
        * the allowed values for DIM1= are foobar (it is important to add the default value to the
        allowed values entry), foobarbaz, foo and bar.
        * the value specified for DIM1 will be forwarded to the WMS source
        * the produced tile will be stored in base/gridname/DIM1/value/xx/xx/xx/xx/xx.png
        file. i.e. there are as many different caches created as there are values in the
        <values> tag.
    -->
<dimension type="values" name="DIM1" default="foobar">foobar,foobarbaz,foo,bar</dimension>

    <!-- regex dimension
        the following creates a MAPFILE dimension, for using the same mod-mapcache tileset with dif-
        mapserver mapfiles. the name of the mapfiles need not be known to mod-mapcache, and can the-
        created even after mod-mapcache has been started.
        when a user passes a MAPFILE=/path/to/mapfile, the string "/path/to/mapfile" is validated ag-
        the supplied (PCRE) regular expression. The one in this example allows a name composed of ap-
        speparated by slashes (/) and finishing with ".map" ([a-zA-Z0-9\.]*\.\map$), but will fail if
        are two consecutive dots (..) in the path, to prevent filesystem traversal ((?!.*\.\.).).
    -->
<dimension type="regex" name="MAPFILE" default="/path/to/mapfile.map">^(?!\.*\.\.)[a-zA-Z0-9\.]*\.\map$</dimension>

    <!-- intervals dimension
        the syntax is the same as common-ows, i.e. a comma separated list of "min/max/resolution" ex-
        eg:
        * 0/5000/1000 allows the values 0,1000,2000,3000,4000 and 5000
        * 0/100/0 allows any values between 0 and 100
        * both values can be combined: 0/5000/1000,0/100/0
    -->
<dimension name="ELEVATION" type="intervals" default="0">0/5000/1000</dimension>

    <!-- coming in a future version: support for ISO8601 date/time dimensions -->

</dimensions>
</tileset>
```

7.2.6 Services

Services are the type of request that mod-mapcache will respond to. You should of course enable at least one.

```
<service type="wms" enabled="true">
    <!-- this service should actually be called "ogc". It is different from the other
        services as it does not listen on the /wms endpoint, but directly on /.
        It will intercept wms getmap requests that can be treated from configured
        tilesets, and can optionally forward all the rest to (an)other server(s)
        TODO: this needs way more documenting
    <forwarding_rule name="foo rule">
        <append_pathinfo>true</append_pathinfo>
        <http>
            <url>http://localhost/mapcacheproxy</url>
        </http>
    </forwarding_rule>
-->
```

```

<!-- full_wms
    configure response to wms requests that are not aligned to a tileset's grids.
    responding to requests that are not in the SRS of a configured grid is not supported, but
    this should never happen as only the supported SRSS are publicized in the capabilities
    document.

    allowed values are:
        - error: return a 404 error (default)
        - assemble: build the full image by assembling the tiles from the cache
        - forward: forward the request to the configured source.

-->
<full_wms>assemble</full_wms>
<!-- resample mode
filter applied when resampling tiles for full wms requests.
can be either:
    - nearest : fastest, poor quality
    - bilinear: slower, higher qulity
-->
<resample_mode>bilinear</resample_mode>

<!-- format
image format to use when assembling tiles
-->
<format>myjpeg</format>

</service>
<service type="wmts" enabled="true"/>
<service type="tms" enabled="true"/>
<service type="kml" enabled="true"/>
<service type="gmaps" enabled="true"/>
<service type="ve" enabled="true"/>
<service type="demo" enabled="true"/>

```

7.2.7 Miscellaneous

```

<!-- default_format
format to use when a client asks for an image that is dynamically created from multiple
tiles from the cache.

note that using a png format with "best" compression is not recommended
here as it comes with a very compression overhead in terms of cpu processing. it is
recommended to use a png format with "fast"compression here, unless you have plenty
of server cpu power and or limited bandwidth

-->
<default_format>JPEG</default_format>

<!-- services
services that will be responded to by mod-mapcache
each service is accessible at the url http://host/path/to/mapcache/{service},
eg http://myhost/mapcache/wms for OGC WMS.

-->

<!-- errors
configure how error will be reported back to a client:
    - log : no error is reported back, except an http error code.
    - report : return the error message to the client in textual format
    - empty_img : return an empty image to the client. the actual error code is in the X-Mapcache

```

```
- report_img : return an image with the error text included inside. not implemented yet.

the default setting is to report the error message back to the user. In production, you might want
if you're paranoid, or to "empty_img" if you want to play nice with non-conforming clients.
-->
<errors>report</errors>

<!--
location to put lockfiles (to block other clients while a metatile is being rendered.
defaults to /tmp
this location should be writable by the apache user
-->
<lock_dir>/tmp</lock_dir>

<!--
interval in microseconds to sleep before checking that a lockfile is still present.
default is 1/100th of a second (i.e. 10000 microseconds)
-->
<lock_retry>10000</lock_retry>

<!-- log_level
For CGI/FastCGI only - For the apache module use the httpd.conf
LogLevel key.
Defines the verbosity of the what is sent to the logs.
- debug
- info
- notice
- warn (default)
- error
- crit
- alert
- emerg
-->
<log_level>warn</log_level>

<!-- auto_reload
For FastCGI only. If set to true, the configuration will be automatically
reloaded if the configuration file has changed.
default is false.
-->
<auto_reload>true</auto_reload>
```

7.3 Supported Tile Services

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

Author Stephen Woodbridge

MapCache has the ability to serve tiles using a variety of different request protocols and tile naming conventions. This document is to describe these. The various services must be turned on in the mapcache.xml file for MapCache to respond to those specific requests.

All services are available on the demo interface, from which you are highly encouraged to copy/paste the javascript code to get started when creating your own pages accessing the MapCache tiles.

The following notation is used on this page and refer to object names in the mapcache.xml configuration file.

- <tileset_name> - name of a configured tileset
- <grid_name> - name of explicitly or implicitly defined grid
- <quadkey> - specific to the Virtual Earth Tile service
- <z> - Zoom level in zxy naming scheme
- <y> - row number in zxy naming scheme
- <x> - column number in zxy naming scheme

7.3.1 TMS service

The TMS service uses a z/x/y tile naming scheme where:

- z is the zoom level
- x is the column number
- y is the row number

To activate the TMS service, add these lines to the mapcache.xml configuration file:

```
<service type="tms" enabled="true"/>
```

A “capabilities” document can be fetched via:

<http://myhost.com/mapcache/tms/1.0.0/>

Tiles are requested using this scheme:

http://myhost.com/mapcache/tms/1.0.0/<tileset_name>@<grid_name>/<z>/<x>/<y>.png

For epsg:3857 or epsg:900913 or GoogleMapsCompatible grids, with cell = [z/x/y]:

z0:

[0/0/0]

z1:

[1/0/0] [1/1/0]
[1/0/1] [1/1/1]

z2:

[2/0/0] [2/1/0] [2/2/0] [2/3/0]
[2/0/1] [2/1/1] [2/2/1] [2/3/1]
[2/0/2]...
[2/0/3]...

etc...

For epsg:4326 or WGS84 grids:

Note: The OGC WMTS specification rather absurdly requires the GoogleCRS84Quad WellKnownScaleset to have a level 0 who's extent is -180,-180,180,180. The default “WGS84” MapCache grid honors this, which may cause some incompatibilities with software that expects level 0 to be 2x1 tiles with extent -180,-90,180,90

z0:

[0/0/0]

z1:

[1/0/0] [1/1/0]

z2:

[2/0/0] [2/1/0] [2/2/0] [2/3/0]
[2/0/1] [2/1/1] [2/2/1] [2/3/1]

etc...

7.3.2 KML Service

The KML service produces [Super-Overlays](#) for tilesets that are aligned to the WGS84 / epsg:4326 grids. A Super-Overlay is a KML file that links to an image url, and to a set of other KML urls corresponding to neighbouring resolutions. The KML service uses a z/x/y tile naming scheme where:

- z is the zoom level
- x is the column number
- y is the row number

Note: For the KML service to be functional, the TMS service must also be activated, as the KML super-overlays link to images using this spec.

To activate the KML service, add these lines to the mapcache.xml configuration file:

```
<service type="tms" enabled="true"/>
<service type="kml" enabled="true"/>
```

Tiles are requested using this scheme:

`http://myhost.com/mapcache/kml/<tileset_name>@<grid_name>/<z>/<x>/<y>.kml`

7.3.3 OGC WMTS Service

To activate the WMTS service, add these lines to the mapcache.xml configuration file:

```
<service type="wmts" enabled="true"/>
```

This service follows the standard OGC WMTS requests and supports both the classical OGC style KVP encoded and REST style requests.

`http://myhost.com/mapcache/wmts?SERVICE=WMTS&VERSION=1.0.0&...`
`http://myhost.com/mapcache/wmts/1.0.0/....`

The capabilities are obtained through:

`http://myhost.com/mapcache/wmts?service=wmts&request=getcapabilities&version=1.0.0`
`http://myhost.com/mapcache/wmts/1.0.0/WMTSCapabilities.xml`

See Also:

[FeatureInfo Requests](#)

See Also:*Tileset Dimensions*

7.3.4 OGC WMS Service

MapCache responds to WMS version 1.1.1 requests, and has limited support for version 1.3.0 ones.

```
<service type="wms" enabled="true"/>
```

Note: Note that the WMS service is a little different than the other MapCache services, as it listens on the root of the configured instance instead of on an additional endpoint (i.e. the service replies on <http://server/mapcache/?> and not on <http://server/mapcache/wms?>). This behavior is required in order to enable *proxying of unsupported requests* while offering a single endpoint for all OGC services.

Note: MapCache primarily supports version 1.1.1 WMS requests, but has limited support for the newer version 1.3.0 ones. For the 1.3.0 requests, MapCache will determine which *grid* to use by using the CRS= parameter instead of the SRS= one, and will correctly honor axis ordering for the epsg reference systems that switch the usual x/y ordering of the BBOX parameter.

See Also:*FeatureInfo Requests***See Also:***Tileset Dimensions***See Also:***Tile Assembling*

WMS requests follow the classical KVP encoded style:

```
http://myhost.com/mapcache?SERVICE=WMS&VERSION=1.1.1&REQUEST=....
```

The capabilities document is returned by:

```
http://myhost.com/mapcache?service=wms&request=getcapabilities
```

7.3.5 GoogleMaps XYZ Service

```
<service type="gmaps" enabled="true"/>
```

Prerequisites: your WMS should be capable of producing images in the EPSG:900913 or EPSG:3857 SRS, i.e. it should reference the “g” or “GoogleMapsCompatible” grid

This is the minimal html page that should get you going. The important bits are in the urlTemplate (for V2) and getTileURL (for V3) variables:

- /mapcache is the apache path where MapCache handles requests
- test@g is the tileset and grid name to use, joined by a ‘@’ - the {Z}/{X}/{Y} should be left alone
- the final extemision should be changed to “jpg” if you are using a jpeg format with your tileset.

V2 API

```
<!DOCTYPE html
PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="content-type" content="text/html; charset=utf-8"/>
<title>Google/MapServer Tile Example</title>
<script src="http://maps.google.com/maps?file=api&v=2&key=ABQIAAAAnfs7bKE82qgb3Zc2YyS-oBT2yXp_ZAY8_u"
        type="text/javascript"></script>
<script type="text/javascript">

function load() {
    if (GBrowserIsCompatible()) {
        var urlTemplate = '/mapcache/gmaps/test@g/{Z}/{X}/{Y}.png';
        var myLayer = new GTileLayer(null,0,18,{
            tileUrlTemplate:urlTemplate,
            isPng:true,
            opacity:0.8 });
        var map = new GMap2(document.getElementById("map"));
        map.addControl(new GLargeMapControl());
        map.addControl(new GMapTypeControl());
        map.setCenter(new GLatLng(0, 0), 1);
        map.addOverlay(new GTileLayerOverlay(myLayer));
    }
}

</script>
</head>
<body onload="load()" onunload="GUnload()">
    <div id="map" style="width: 500px; height: 500px"></div>
</body>
</html>
```

V3 API

The previous javascript for the V2 example should be slightly changed to:

```
var map = new google.maps.Map("<element-id>", { /*options*/ });
var layerOptions = {
    getTileUrl: function(coord, zoom) {
        return "/mapcache/gmaps/test@g/" + zoom + "/" + coord.x + "/" + coord.y + ".png";
    },
    tileSize: new google.maps.Size(256,256) // or whatever
};
map.overlayMapTypes.insertAt(0, new google.maps.ImageMapType(layerOptions));
```

7.3.6 Virtual Earth Tile service

Tiles are organized in one of two different layouts depending on whether they are using a Spherical Mercator project, like epsg:3857 or epsg:900913, or if they are using the geographical projection, like epsg:4326.

Tiles are requested using this scheme:

`http://myhost.com/mapcache/ve?LAYER=<tileset_name>@<grid_name>&tile=<quadkey>`

For epsg:3857 or epsg:900913 or GoogleMapsCompatible grids, <quadkey> are arranged:

z0:

[0]

`http://myhost.com/mapcache/ve?LAYER=osm@GoogleMapsCompatible&tile=0`

z1:

[00] [01]

[02] [03]

`http://myhost.com/mapcache/ve?LAYER=osm@GoogleMapsCompatible&tile=00`
`http://myhost.com/mapcache/ve?LAYER=osm@GoogleMapsCompatible&tile=01`
`http://myhost.com/mapcache/ve?LAYER=osm@GoogleMapsCompatible&tile=02`
`http://myhost.com/mapcache/ve?LAYER=osm@GoogleMapsCompatible&tile=03`

etc...

For epsg:4326 or WGS84 grids, <quadkey> are arranged:

z1:

[0] [1]

`http://myhost.com/mapcache/ve?LAYER=osm@WGS84&tile=0`
`http://myhost.com/mapcache/ve?LAYER=osm@WGS84&tile=1`

z2:

[00] [01] [10] [11]

[02] [03] [12] [13]

`http://myhost.com/mapcache/ve?LAYER=osm@WGS84&tile=00`
`http://myhost.com/mapcache/ve?LAYER=osm@WGS84&tile=01`
`http://myhost.com/mapcache/ve?LAYER=osm@WGS84&tile=02`
`http://myhost.com/mapcache/ve?LAYER=osm@WGS84&tile=03`
`http://myhost.com/mapcache/ve?LAYER=osm@WGS84&tile=10`
`http://myhost.com/mapcache/ve?LAYER=osm@WGS84&tile=11`
`http://myhost.com/mapcache/ve?LAYER=osm@WGS84&tile=12`
`http://myhost.com/mapcache/ve?LAYER=osm@WGS84&tile=13`

etc...

7.4 Seeder

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

Mod-mapcache ships with an advanced seeding tool, whose main features are:

- configurable number of seeding threads, to speed up the rendering.
- ability to reseed tiles older than a certain timestamp
- ability to seed tiles given a shapefile/ogr datasource

7.4.1 Usage

The seeding utility is named mapcache_seed, and is located in the mapcache/src/ directory of the project

Commandline options

```
-c [file] : path to the mapcache.xml configuration file that contains the
            tilesets that need to be seeded.
-t [tileset]: name of the tileset that must be seeded
-g [grid]: name of the grid that must be seeded (the selected
            tileset must reference the given grid)
-z minzoom,maxzoom: (optional) start and end zoom levels that must be seeded.
-e minx,miny,maxx,maxy: (optional) bounding box of the area to seed
-o (timestamp|now): (optional) only seed tiles that are older than the given value.
            The value can either be the string "now", or a date formatted
            like year/month/day hour:minute, eg: "2011/01/31 20:45".
            (note that a full timestamp should be quoted).
-n nthreads: number of parallel threads that should be used to request
            tiles from the wms source. The default is 1, but can be set higher
            if the WMS server can withstand parallel requests (as a rule of thumb,
            the value chosen here should never be much higher than the number
            of cpus on the wms server)
-q: don't print progress messages to the standard output
-v: print verbose debugging info (if compiled in)
-D "DIMENSION=VALUE": used to specify which dimension to use if the tileset supports
            dimensions. Can be used multiple times to set multiple
            dimensions, e.g. -D "DIM1=VAL1" -D "DIM2=VAL2"
```

Optional Commandline options when using OGR/GEOS

At compile time, if ogr and geos where found on the system, the seeder tool supports additional options to seed only the tiles that cover an arbitrary geographical area. *Important:* Note that for the time being, the OGR datasource should be in the same projection as the grid you are seeding, as there is no automatic reprojection from the datasource projection to the grid projection.

```
-d [ogr_datasource]: ogr connection to the spatial source. Consult the OGR
            documentation for all that is supported. In the simplest case (e.g. a
            Shapefile), this is just the full filename of the shapefile
-l [ogr_layer]: (optional) for datasources that contain multiple layers (e.g. postgis, with
            multiple tables), determines which layer will be used
-s [ogr_sql]: OGR sql expression that can be applied (see http://www.gdal.org/ogr/ogr\_sql.html )
-w [ogr_where]: sql "where" expression to filter out returned values. This would
            typically be used to select only the geometry of a given country if the
            datasource contains all the world contours
```

Important Note

The seeding utility must be run under the same user account as the user running the webserver. This is required so the permissions on the tiles created by the seeder are accessible by the webserver, and conversely so the seeder has the rights to write files to directories created by the webserver.

A sample seeding session goes like this:

```
[user@host]$ sudo www-data
[www-data@host]$ /path/to/mapcache/src/mapcache_seed -c /path/to/www/conf/mapcache.xml [[options]]
[www-data@host]$ logout
[user@host]$
```

Examples

Seed the “osm” tileset with the “g” (google/web-mercator) grid:

```
./src/mapcache_seed -c mapcache.xml -t osm -g g
```

Seed levels 0 through 12:

```
./src/mapcache_seed -c mapcache.xml -t osm -g g -z 0,12
```

Given a shapefile that contains the world country countours, seed only the areas that are covered by land (i.e. skip the oceans). Also use 4 request threads in parallel:

```
./src/mapcache_seed -c mapcache.xml -t osm -g g -z 0,12 -n 4 -d /path/to/seed.shp
```

Same as beforehand, but only seed the USA (notice the quote usage, required to create valid sql with a single-quoted ‘US’):

```
./src/mapcache_seed -c mapcache.xml -t osm -g g -z 0,12 -n 4 -d /path/to/seed.shp -w "FIPS_A2='US'"
```

Reseed levels 0 to 12 (this could also be done by deleting the cache for levels 0 to 12 and doing a classic seed, but doing so this way does not slow down the access from web clients):

```
./src/mapcache_seed -c mapcache.xml -t osm -g g -z 0,12 -o now
```

7.5 Cache Types

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

This document details the different cache backends that can be used to store tiles

7.5.1 Disk Caches

The disk based cache is the simplest cache to configure, and the one with the the fastest access to existing tiles. It is ideal for small tile repositories, but may cause trouble for sites hosting millions of tiles, as the number of files or directory may rapidly overcome the capabilities of the underlying filesystem. Additionally, the block size chosen for the filesystem must closely match the mean size of a stored tile: ideally, any given tile should just fit inside a filesystem block, so as not to waste storage space inside each block, and not have to use up multiple blocks per tile.

The location of the files/directories has to be readable and writable by the user running the tile server.

There are two types of disk caches, that create a different hierarchy of files:

Default Structure

The default disk cache stores tiles in a structure nearly identical to the file/directory hierarchy used by TileCache. The only change is that a top level directory corresponding to the name of the grid is added (as MapCache supports multiple grids per tileset)

This cache is capable of detecting blank (i.e. uniform color) tiles and using a symbolic link to a single blank tile to gain disk space.

```
<cache name="disk" type="disk">
  <base>/tmp</base>
  <symlink_blank/>
</cache>
```

The two only configuration keys are the root directory where the tiles will be stored, and a key to activate the symbolic linking of blank tiles

Template Structure

The template based disk cache allows you to create (or reuse an existing) tile structure that you define in advance. The `<template>` parameter takes a string argument where various template entries will be replaced at runtime by the correct value for each tile to store.

```
<cache name="tmpl" type="disk">
  <!-- template

    string template that will be used to map a tile (by tileset, grid name, dimension,
    format, x, y, and z) to a filename on the filesystem.
    the following replacements are performed:
    - {tileset} : the tileset name
    - {grid} : the grid name
    - {dim} : a string that concatenates the tile's dimension
    - {ext} : the filename extension for the tile's image format
    - {x}, {y}, {z} : the tile x,y,z values
    - {inv_x}, {inv_y}, {inv_z} : inverted x,y,z values (inv_x = level->maxx - x - 1). This
      is mainly used to support grids where one axis is inverted (e.g. the google schema)
      and you want to create on offline cache.

    * note that this type of cache does not support blank-tile detection and symlinking.

    * warning: it is up to you to make sure that the template you chose creates a unique
      filename for your given tilesets. e.g. do not omit the {grid} parameter if your
      tilesets reference multiple grids. Failure to do so will result in filename
      collisions !

  -->
  <template>/tmp/template-test/{tileset}#{grid}#{dim}/{z}/{x}/{y}.{ext}</template>
</cache>
```

7.5.2 BerkeleyDB Caches

The BerkeleyDB cache backend stores tiles in a key-value flat-file database. and therefore does not have the disadvantages of disk caches with regards to the number of files stored on the filesystem. As the image blobs are stored contiguously, the block size chosen for the filesystem has no influence on the storage capacity of the volume.

Note that for a given bdb cache, only a single database file is created, which will store the tiles of its associated tilesets (i.e. there is not a database file created per tileset, grid, and or dimension). If you need to store different tilesets to

different files, then use multiple dbd cache entries. It is not possible to use multiple database files for tileset grids or dimensions.

The berkeleyDB based caches are a bit faster than the disk based caches during reads, but may be a bit slower during concurrent writes if a high number of threads all try to insert new tiles concurrently.

```
<cache name="bdb" type="bdb">
  <!-- base (required)
    absolute filesystem path where the berkeley db database file is to be stored.
    this directory must exist, and be writable
  -->
  <base>/tmp/foo/</base>

  <!-- key_template (optional)
    string template used to create the key for a tile entry in the database.
    defaults to the value below. you should include {tileset}, {grid} and {dim} here
    unless you know what you are doing, or you will end up with mixed tiles
  <key_template>{tileset}-{grid}-{dim}-{z}-{y}-{x}.{ext}</key_template>
  -->
</cache>
```

7.5.3 Sqlite Caches

There are two different sqlite caches that vary by the database schema they create and query. Sqlite caches have the advantage that they store tiles as blobs inside a single database file, and therefore do not have the disadvantages of disk caches with regards to the number of files stored. As the image blobs are stored contiguously, the block size chosen for the filesystem has no influence on the storage capacity of the volume.

The sqlite based caches are a bit slower than the disk based caches, and may have write-locking issues at seed time if a high number of threads all try to insert new tiles concurrently.

Default Schema

Tiles are stored in the configured sqlite file created by mapcache with

```
create table if not exists tiles(
  tileset text,
  grid text,
  x integer,
  y integer,
  z integer,
  data blob,
  dim text,
  ctime datetime,
  primary key(tileset,grid,x,y,z,dim)
);

<cache name="sqlite" type="sqlite3">
</cache>
```

You may also add custom sqlite pragmas that will be executed when first connecting to a sqlite db, e.g. to override some compiled in sqlite defaults

```
<cache name="sqlitetemplate" type="sqlite3">
  <dbfile>/tmp/sqlitefile.db</dbfile>
  <pragma name="max_page_count">10000000</pragma>
</cache>
```

<pragma> entries will result in a call to

```
PRAGMA max_page_count = 1000000;
```

Custom Schema

This cache can use any database schema, it is up to you to supply the SQL that will be executed to select or insert a new tile.

This cache type is not fully implemented yet (there is no way to configure it from the mapcache.xml configuration file yet)

MBTiles Schema

This cache type is a shortcut to the previous custom schema sqlite cache, with pre-populated SQL queries that correspond to the MBTiles specification.

Although the default mbtiles schema is very simple, mapcache uses the same multi-table schema found in most downloadable mbtiles file, to notably enable storing blank (i.e. uniform) tiles without duplicating the encoded image data (in the same way the disk cache supports tile symlinking).

The mbtiles schema is created with:

```
create table if not exists images(
    tile_id text,
    tile_data blob,
    primary key(tile_id));
create table if not exists map (
    zoom_level integer,
    tile_column integer,
    tile_row integer,
    tile_id text,
    foreign key(tile_id) references images(tile_id),
    primary key(tile_row,tile_column,zoom_level));
create table if not exists metadata(
    name text,
    value text); -- not used or populated yet
create view if not exists tiles
as select
    map.zoom_level as zoom_level,
    map.tile_column as tile_column,
    map.tile_row as tile_row,
    images.tile_data as tile_data
from map
join images on images.tile_id = map.tile_id;

<cache name="mbtiles" type="mbtiles">
    <dbfile>/Users/XXX/Documents/MapBox/tiles/natural-earth-1.mbtiles</dbfile>
</cache>
```

Note: Contrarily to the standard sqlite mapcache schema, the mbtiles db file only supports a single tileset per cache. The behavior if multiple tilesets are associated to the same mbtiles cache is undefined, and will definitely produce incorrect results.

7.5.4 Memcache Caches

This cache type stores tile to an external memcached server running on the local machine or accessible on the network. This cache type has the advantage that memcached takes care of expiring tiles, so the size of the cache will never exceed what has been configured in the memcache instance.

Memcache support requires a rather recent version of the apr-util library. Note that under very high loads (usually only attainable on synthetic benchmarks on localhost), the memcache implementation of apr-util may fail and start dropping connections for some intervals of time before coming back online afterwards.

You can add multiple <server> entries.

```
<cache name="memcache" type="memcache">
  <server>
    <host>localhost</host>
    <port>11211</port>
  </server>
</cache>
```

Note: Tiles stored in memcache backends are configured to expire in 1 day by default. This can be overridden at the tileset level with the <auto_expire> keyword.

7.5.5 (Geo)TIFF Caches

TIFF caches are the most recent addition to the family of caches, and use the internal tile structure of the TIFF specification to access tile data. Tiles can be stored in JPEG only (TIFF does not support PNG tiles).

As a single tiff file may contain many tiles, there is a drastic reduction in the number of files that have to be stored on the filesystem, which solves the major shortcomings of the disk cache. Another advantage is that the same TIFF files can be used by programs or WMS servers that only understand regular GIS raster formats, and be served up with high performance for tile access.

The TIFF cache should be considered read-only for the time being. Write access is already possible but should be considered experimental as there might be some file corruption issues, notably on network file-systems. Note that until all the tiles in a given tiff file have been seeded/created, the TIFF file is said to be “sparse” in the sense that it is missing a number of jpeg tiles. As such most non-gdal based programs will have problems opening these incomplete files.

Note that the tiff tile structure must exactly match the structure of the grid used by the tileset, and the tif file names must follow strict naming rules.

Defining the TIFF file sizes

The number of tiles stored in each the horizontal and vertical direction must be defined:

- <xcount> the number of tiles stored along the x (horizontal) direction of the TIFF file.
- <ycount> the number of tiles stored along the y (vertical) direction of the TIFF file.

```
<cache name="tiff" type="tiff">
  <xcount>64</xcount>
  <ycount>64</ycount>
  ...
</cache>
```

Setting up the file naming convention

The <template> tag sets the template to use when looking up a TIFF file name given the x,y,z of the requested tile

```
<cache name="tiff" type="tiff">
  <template>/data/tiffs/{tileset}/{grid}/L{z}/R{inv_y}/C{x}.tif</template>
  ...
</cache>
```

The following template keys are available for operating on the given tile's x,y, and z:

- {x} is replaced by the x value of the leftmost tile inside the TIFF file containing the requested tile
- {inv_x} is replaced by the x value of the rightmost tile.
- {y} is replaced by the y value of the bottommost tile.
- {inv_y} is replaced by the y value of the topmost tile.
- {div_x} is replaced by the index of the TIFF file starting from the left of the grid (i.e. {div_x} = {x}/{<countx>})
- {inv_div_x} same as {div_x} but starting from the right.
- {div_y} is replaced by the index of the TIFF file starting from the bottom of the grid (i.e. {div_y} = {y}/{<county>})
- {inv_div_y} same as {div_y} but starting from the top.

Note: {inv_x} and {inv_div_x} will probably be rarely used, whereas {inv_y} and {inv_div_y} will find some usage for people who prefer to index their TIFF files from top to bottom rather than bottom to top.

Customizing the template keys

In some occurrences, it may be desirable to have a precise hand on the filename to use for a given x,y,z, tile lookup, e.g. to look for a file named “Z03-R00003-C000009.tif” instead of just “Z3-R3-C9.tif”. The <template> entry supports formatting attributes, following the unix printf syntax (c.f.: <http://linux.die.net/man/3/printf>), by suffixing each template key with “_fmt”, e.g.:

```
<cache name="tiff" type="tiff">
  <template
    x_fmt="%08d"
    inv_y_fmt="%08d"
  >/data/tiffs/{tileset}/{grid}/L{z}/R{inv_y}/C{x}.tif</template>
</cache>
```

Note: If not specified, the default behavior is to use “%d” for formatting.

Setting JPEG compression options

An additional optional parameter defines which JPEG compression should be applied to the tiles when saved into the TIFF file:

- <format> the name of the (jpeg) format to use

See Also:

JPEG Format

```
<cache name="tiff" type="tiff">
  ...
  <format>myjpeg</format>
</cache>
```

In this example, assuming a grid using 256x256 tiles, the files that are read to load the tiles are tiled TIFFs with jpeg compression, who's size are 16384x16384. The number of files to store on disk is thus reduced 4096 times compared to the basic disk cache.

GeoTIFF Support

If compiled with GeoTiff and write support, MapCache will add referencing information to the TIFF files it creates, so that the TIFF files can be used in any geotiff- enabled software. Write support does not produce full geotiffs with the definition of the projection used, but only the pixel scale and tie-points, i.e. what is usually found in .tfw files.

For reference, here is the gdalinfo output on a TIFF file created by MapCache when compiled with geotiff support:

```
LOCAL_CS["unnamed",
  UNIT["metre",1,
    AUTHORITY["EPSG","9001"]]]
Origin = (-20037508.342789247632027,20037508.342789247632027)
Pixel Size = (156543.033928040997125,-156543.033928040997125)
Metadata:
  AREA_OR_POINT=Area
Image Structure Metadata:
  COMPRESSION=YCbCr JPEG
  INTERLEAVE=PIXEL
  SOURCE_COLOR_SPACE=YCbCr
Corner Coordinates:
Upper Left  (-20037508.343,20037508.343)
Lower Left  (-20037508.343,-20037508.343)
Upper Right (20037508.343,20037508.343)
Lower Right (20037508.343,-20037508.343)
Center      ( 0.0000000, 0.0000000)
```

7.6 Image Formats

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

MapCache allows you to configure how the image should be saved to a cache once it has been requested from a source. The JPEG format should mostly be used for raster imagery, whereas the PNG format is most usefull for vector based imagery where there are large uniform areas.

7.6.1 JPEG Format

The JPEG format saves tiles to jpeg, you can configure the JPEG compression level (from 1 to 100) and the colorspace that should be used (rgb or ycbcr)

```
<format name="myjpeg" type="JPEG">
  <quality>85</quality>
  <photometric>ycbcr</photometric>
</format>
```

- *quality*: this is the typical jpeg quality setting. Values under 50 produce lighter images but with notable compression artifacts. 100 should be avoided as it produces very heavy images
- *photometric*: By default the YCbCr colorspace is used as it produces images that tend to be 2 to 3 times lighter. Use `rgb` if you don't want the default.

7.6.2 PNG Format

The PNG format creates PNG images, with optional quantization (reduction of the number of colors to create an 8bit paletted PNG)

```
<format name="mypng" type="PNG">
  <compression>fast</compression>
  <colors>256</colors>
</format>
```

- *compression*: choose which zlib compression to apply to the image data. Recognized values are “fast” and “best”. Omit the key to use the default zlib compression.
- *colors*: number of colors to use for quantization. Ommit this key to produce 24 or 32 bit RGB/RGBA pngs, or set to a value between 2 and 256 to create an 8-bit paletted png. The quantization step is destructive, there is no guarantee that pixels will not have a noticeable shift in color in the case when the tile contains many colors.

7.6.3 Mixed Format

There is a third special format which mixes JPEG and PNG compression depending on the contents of the image. This format allows to create caches for raster imagery using JPEG compression (which is more efficient) on zones with imagery data, and PNG compression (which supports transparency) on zones with no imagery or on a boundary between imagery and emptiness.

```
<format name="mymixed" type="MIXED">
  <opaque>myjpeg</opaque>
  <transparent>mypng</transparent>
</format>
```

- *opaque*: the format to use when the image has only fully opaque pixels
- *transparent*: the format to use if when the image has some transparent or semi-opaque pixels.

7.7 Tileset Dimensions

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

7.8 FeatureInfo Requests

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

TBD

7.9 Proxying Unsupported Requests

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

Note: This page is a work in progress

MapCache has the ability to forward any incoming request that it cannot natively respond to (either by returning a tile directly, by *merging* multiple tiles, etc...).

This setup allows mapcache to be placed transparently in front of an existing OGC-service supplying server to accelerate tiled or getmap requests for a selected number of *grids*, while maintaining service compatibility for, e.g., unsupported grids, WFS requests, ...

Note: The proxying of requests is configured inside the *WMS* MapCache service, which is semantically awkward.

The configuration for this behavior is activated by a succession of entries inside the `<forwarding_rule>` element of the wms `<service>`. Rules are tested for in the order in which they appear in the mapcache.xml configuration file, and the first one that matches is used. If no rules are defined, or if no rule matches the incoming request, an error is returned to the user.

```
<service type="wms" enabled="true">
  <forwarding_rule name="first rule">
    <!-- rule tests -->
    <!-- proxy destination -->
  </forwarding_rule>
  <forwarding_rule name="second rule">
    <!-- rule tests -->
    <!-- proxy destination -->
  </forwarding_rule>
</service>
```

A `<forwarding_rule>` consists of a set of matching rules and an `<http>` block defining where the request should be forwarded to.

7.9.1 Parameter Filtering

The rules apply to the KVP parameters that were passed in the incoming request, and are added with the `<param>` keyword:

```
<forwarding_rule name="first rule">
  <param name="SERVICE" type="values">WFS, WCS</param>
  <!-- ... !>
<forwarding_rule>
```

The “type” attribute is the same that what is allowed for *dimensions*, i.e. allowed values are “values”, “regex”, and “intervals”. In the previous example, the rule would match any incoming request having ...&SERVICE=WFS&... or ...&SERVICE=WCS&... in its request parameters.

```
<forwarding_rule name="first rule">
  <param name="SERVICE" type="values">WFS, WCS</param>
  <param name="LAYERS" type="values">somelayername</param>
  <!-- ... !>
<forwarding_rule>
```

Multiple rules can be used if the filtering has to be done on multiple parameters. In the previous example, the rule would match a WFS or WCS request that concerns the “somelayername” layer only.

A <forwarding_rule> that has no <param> child will match any incoming request that could not be serviced by MapCache directly from its cache, and can be used to forward all unsupported request to a full OGC compliant server so that an un-cached response can be returned to the client.

See Also:

mapcache_dimension

7.9.2 Proxy Destination

Once a <forwarding_rule> matches, its <http> child will be used to proxy the request to another server.

```
<forwarding_rule name="first rule">
  <!-- ... !>
  <http>
    <url>http://wmsserver/ogc.cgi?</url>
  </http>
</forwarding_rule>
```

See Also:

HTTP Service Definition

7.10 Data Sources

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

Note: This page is a work in progress

MapCache uses the concept of a “source” as a service that is able to return image data given a set of parameters (namely an extent, an image size, and a projection). Typically, a source is the third party WMS server that you want to put a tilecache in front of.

7.10.1 HTTP Service Definition

7.10.2 WMS Sources

7.10.3 MapFile Sources

7.11 Tile Assembling

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

TBD

See Also:

MapCache presentation slides at FOSS4G2011

7.12 Features

- services WMS, WMTS, TMS, VirtualEarth/Bing and Googlemaps requests: [Supported Tile Services](#)
- ability to respond to un-tiled WMS requests by merging tiles from the cache or forwarding them to the wms source: [Tile Assembling](#)
- responds to WMS/WMTS [GetFeatureInfo](#) requests (forwarded to source service)
- [KML](#) superoverlay generation
- data provided by WMS backends (GDAL supported sources planned)
- cache types:
 - [Disk](#)
 - [BerkeleyDB](#)
 - [Sqlite](#)
 - [Memcached](#)
 - [Tiled TIFFs](#)
- configurable metatiling
- on-the-fly tile merging for combining multiple tiles into a single image
- image post-processing (recompression and quantization) when arriving from a backend
- interprets and produces cache control headers: Last-Modified, If-Modified-Since, Expires
- multithreaded [seeding utility](#), that can seed specific zoom levels or specific areas (e.g.: seed levels 0 to 12 of all tiles intersecting Colorado)
- ability to add a custom watermark on stored tiles
- produces a CGI/fastCGI executable for using with other webservers than apache
- configurable symbolic linking of blank tiles to gain disk storage
- configurable error reporting: plain http error code, textual message, or empty (blank) image
- ability to specify vendor params or dimensions to be forwarded to the WMS backend (and build a cache that takes these parameters into account): [Tilesset Dimensions](#)

Data Input

8.1 Vector Data

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Author Tyler Mitchell

Contact tmitchell at osgeo.org

Last Updated 2011-07-18

This work is licensed under the Creative Commons Attribution-ShareAlike License. To view a copy of this license, visit: <http://creativecommons.org/licenses/by-sa/2.0/ca/> or send a letter to Creative Commons, 559 Nathan Abbott Way, Stanford, California 94305, USA.

What is vector data? This quote from is a good description of what vector data is:

Vector: “An abstraction of the real world where positional data is represented in the form of coordinates. In vector data, the basic units of spatial information are points, lines and polygons. Each of these units is composed simply as a series of one or more coordinate points. For example, a line is a collection of related points, and a polygon is a collection of related lines. Vector images are defined mathematically as a series of points joined by lines. Vector-based drawings are resolution independent. This means that they appear at the maximum resolution of the output device, such as a printer or monitor. Each object is self-contained, with properties such as color, shape, outline, size, and position on the screen.”

From: http://www8.nos.noaa.gov/coris_glossary/index.aspx?letter=v

The rest of this document is the data format guide. This guide is structured to show the fundamentals of each MapServer supported data format. Each section discusses one format, ranging from one to several pages in length. The sections typically start with a summary of the most important information about the format, followed by examples of file listings, connection methods, ogrinfo usage and MapServer map file syntax examples.

Each section has been designed to stand alone, so you may notice that certain warnings and comments are repeated or redundant. This is intentional. Each format is presented in rough order of popular use, based on a survey of the MapServer community.

The following formats are included:

8.1.1 Data Format Types

Each type of data is made up of a data source and (one or more) layers. These two definitions apply to MapServer and OGR.

Data Source - a group of layers stored in a common repository. This may be a file that handles several layers within it, or a folder that has several files.

Layer - a sub-set of a data source often containing information in one type of vector format (point, line, polygon).

There are three types of data mapping and GIS data formats. Each type is handled differently. Below are the types and some example formats:

- File-based- Shapefiles, Microstation Design Files (DGN), GeoTIFF images
- Directory-based - ESRI ArcInfo Coverages, US Census TIGER
- Database connections - PostGIS, ESRI ArcSDE, MySQL

File-based Data

File-based data consists of one or more files stored in any arbitrary folder. In many cases a single file is used (e.g. DGN) but ESRI Shapefiles, for example, consist of at least 3 files each with a different filename extension: SHP, DBF, SHX. In this case all 3 files are required because they each perform a different task internally.

Filenames usually serve as the data source name and contain layers that may or may not be obvious from the filename. In Shapefiles, for example, there is one data source per shapefile and one layer which has the same name as that of the file.

Directory-based Data

Directory-based data consists of one or more files stored in a particular way within a parent folder. In some cases (e.g. Coverages) they may also require additional folders in other locations in the file tree in order to be accessed. The directory itself may be the data source. Different files within the directory often represent the layers of data available.

For example, ESRI ArcInfo Coverages consist of more than one file with an ADF file extension, within a folder. The PAL.ADF file represents the Polygon data. ARC.ADF holds the arc or line string data. The folder holds the data source and each ADF file is a layer.

Database Connections

Database Connections are very similar to file and directory-based structures in one respect: they provide geographic coordinate data for MapServer to interpret. That may be oversimplifying what is happening inside MapServer, but in essence all you need is access to the coordinates making up the vector datasets.

Database connections provide a stream of coordinate data that is temporarily stored (e.g. in memory) and read by MapServer to create the map. Other attribute or tabular data may also be required, but the focus of this guide is coordinate data.

One important distinction between databases must be made. The databases discuss here are spatial databases, those which can hold geographic data in its own data type. This is opposed to strictly tabular databases which cannot hold geographic coordinates in the same way. It is possible to store some very simple coordinate data in regular tables, but for anything but the most simple use a spatial database is required. There are spatial extensions to many databases (open source and commercial). One of the most robust is the PostGIS extension to the PostgreSQL database. This database not only allows the storage of geographic data, but also allows the manipulation of that data using SQL commands. The other open source database with spatial capabilities is MySQL.

Connections to databases usually consist of the following pieces of connection information:

Host - Directions to the server or computer hosting the database.

Database name - The name of the database you wish to access that is running on the host.

User name / passwords - Access privileges are usually restricted by user.

Note: Some databases (e.g. Oracle) use a name service identifier that includes both the host and database names.

Access to specific pieces of coordinate data usually require:

Table/View name - The name of the table or view holding the coordinate data.

Geographic column name - Where the geometry or coordinates are stored.

8.1.2 ArcInfo

ESRI ArcInfo Coverage Files are also known as simply as Coverages and less commonly as ADF files.

File listing

Coverages are made up of a set of files within a folder. The folder itself is the coverage name. The files roughly represent different layers, usually representing different types of topology or feature types.

```
> ls /data/coverage/brazil
aat.adf arc.adf arx.adf bnd.adf lab.adf prj.adf tic.adf tol.adf
```

A folder with the name INFO is also part of the coverage. It sits at the same hierarchical level as the coverage folder itself. Therefore, to copy a coverage (using regular file system tools) the coverage folder and the INFO folder must both be copied. The INFO folder holds some catalogue information about the coverage.

```
> ls /data/coverage/info
arc0000.dat arc0001.dat arc0002.dat arc.dir
arc0000.nit arc0001.nit arc0002.nit
```

Data Access / Connection Method

- CONNECTIONTYPE OGR must be used. The ability to use coverages is not built into MapServer.
- The path to the coverage folder name is required.
- The layer name (feature type) is specified in the DATA parameter

OGRINFO Examples

The directory is the data source. Layers are found within the directory. Using ogrinfo on a coverage directory:

```
> ogrinfo /data/coverage/brazil -summary
INFO: Open of 'brazil'
using driver 'AVCBin' successful.
1: ARC (Line String)
2: CNT (Point)
3: LAB (Point)
4: PAL (Polygon)
```

Using ogrinfo to examine the structure of a layer:

```
> ogrinfo /data/coverage/brazil PAL -summary
Had to open data source read-only.
INFO: Open of 'brazil'
using driver 'AVCBin' successful.

Layer name: PAL
Geometry: Polygon
Feature Count: 1
Extent: (1272793.274958, 795381.617050) - (1287078.382785, 807302.747284)
Layer SRS WKT:
(unknown)
ArcIds: IntegerList (0.0)
AREA: Real (18.5)
PERIMETER: Real (18.5)
F_OPER#: Integer (5.0)
F_OPER-ID: Integer (5.0)
OPER: String (2.0)
FCODE: String (10.0)
```

Map File Example:

```
LAYER
  NAME Brazil_bounds
  TYPE POLYGON
  STATUS DEFAULT
  CONNECTIONTYPE OGR
  CONNECTION "/data/coverage/brazil"
  DATA "PAL"
  CLASS
    NAME "Brazil Admin Areas"
    STYLE
      OUTLINECOLOR 153 102 0
      SIZE 2
    END
  END
END
```

8.1.3 ArcSDE

Spatial Database Engine (SDE) is one of [ESRI's](#) products which enables spatial data to be stored, managed, and quickly retrieved from leading commercial database management systems like Oracle, Microsoft SQL Server, Sybase, IBM DB2, and Informix.

Supported ArcSDE Operations

- Versioned queries (query geometry and attributes from a specified version)
- queryByAttributes (select geometry and attributes based on the values of an attribute)
- Limited join support for within-database tables
- queryByRect (select geometry based on an extent)
- Projection on the fly
- SDE for Coverages (a read-only type of SDE for coverage, shapefile, and ArcStorm/ArcLibrarian repositories)

- SDE 8.1, 8.2, 8.3, 9.0, 9.1, and 9.2
- Linux, Windows, and Solaris (platforms that have SDE C API support)

Unsupported ArcSDE Operations

- queryByShape (pass in a shape with MapScript and use it for queries)
- Direct Connect (bypass SDE to connect directly to the database with the SDE C API)

How to make a connection to SDE:

- Install the SDE C API client libraries for your platform (preferably matched to the server version you are using, ie 8.2 client -> 8.2 server, 8.3 client -> 8.3 server)
- Compile MapServer with SDE support *MapServer Unix Compilation Howto* for specific details)
- Define a LAYER block in a MapFile that uses SDE as the CONNECTIONTYPE

```
LAYER
  NAME          states
  TYPE          POLYGON
  CONNECTION "sdemachine.iastate.edu, port:5151, sde, username, password"
  CONNECTIONTYPE SDE
  DATA "HOBUS STATES_LAYER, SHAPE, SDE.DEFAULT"
  FILTER "where MYCOLUMN is not NULL"
  PROCESSING "QUERYORDER=ATTRIBUTE" # <-- MapServer 4.10 and above

  # Within database one-to-one join support

  # MapServer 5.0 and above
  PROCESSING "JOINTABLE=SDE_MASTER.GEOSERVWRITE.JOINTABLE"

  # MapServer 5.0 and above
  CLASSITEM "SDE_MASTER.GEOSERVWRITE.JOINTABLE.VAL"

  # MapServer 5.0 and above
  FILTER "SDE_MASTER.GEOSERVWRITE.JOINTABLE.AQ_TAG=SDE_MASTER.GEOSERVWRITE.JOINTESTLAYER.AQ_TAG"

  # ObjectId column manipulation
  # MapServer 5.0 and above
  PROCESSING "OBJECTID=OBJECTID"

  TEMPLATE '/where/the/template/file/is/located'
  CLASS
    STYLE
      SYMBOL 'circle'
      SIZE 3
      COLOR -1 -1 -1
      OUTLINECOLOR 0 0 0
    END
  END
END
```

CONNECTION - Order is important!

- **sdemachine.iastate.edu** - The name of the machine you are connecting to. In some instances, this may need to be the IP address of the machine rather than the name if the server running MapServer is not configured to cascade DNS lookups
- **port:5151** - The port number of SDE. The *port*: is important as SDE expects you to define the **service** in this slot, and it can be other names like **sde:oracle** (for direct connect) or **esri_sde** (for systems with port 5151 defined as esri_sde in /etc/services)
- **sde** - The database username that the SDE server is using to connect to your database. It is often only important for SDE setups that are connecting to Oracle (and even then, not so important). Just leave it as **sde** if you don't know what it should be.
- **username** - The username that will be connecting to SDE. This user must have been granted rights to select the layer that you will be specifying in the *DATA* directive. You can use ArcCatalog or the SDE command-line utilities to grant the appropriate rights to layers.
- **password** - Password of the user connecting to SDE. **Case Sensitive**.

DATA - Order is important!

- **HOBUSTATES_LAYER** - The layer name you are querying. This is the *full* name of the table in which the layer resides. If you are using Oracle or Microsoft SQL Server as the DB for SDE, the schema name must also be supplied.
- **SHAPE** - The column that contains the geometry. SDE technically allows for storage of multiple geometry types in the same layer, but in practice this isn't desirable. Also, expect to have problems if there are invalid or null geometries in the layer (or versions of the layer).
- **SDE.DEFAULT** - As of MapServer 4.2, you can query against a specific version of the layer. SDE supports multi-user editing with versions. If a layer has been Registered with the GeoDatabase and Registered as Versioned (ArcGIS terms), MapServer can query against specified versions of those edits. If not specified, *SDE.DEFAULT* will be used for all queries. **Case Sensitive**.

Note: The version parameter is located in a different spot than MapServer 4.2, which had it on the CONNECTION string.

TEMPLATE

- **/where/the/template/file/is/located** - A template directive must be specified (can point to a dummy file) in order for MapServer to be able to query attributes from SDE. If you are only going to be drawing layers, this directive is unnecessary and will slow down the query operations of SDE (especially for layers with lots of attribute columns).

PROCESSING

- **PROCESSING “QUERYORDER=ATTRIBUTE”** - Allows you to force SDE to use the WHERE clause that was defined in your FILTER statement first, without attempting to hit the spatial index. Only in very special cases will you want to do this.

- **PROCESSING “OBJECTID=OBJECTID”** - If you are having trouble with the SDE driver detecting your unique ID column, you can override it with this processing parameter. Doing so will also have a slight performance benefit because it will save a couple of extra queries to the database.
- **PROCESSING “ATTRIBUTE_QUALIFIED=TRUE”** - User can set this option to always use fully qualified attribute names.

Within-database Join Support

MapServer’s SDE driver, as of MapServer 5.0, allows you to join a single attribute table that has no geometries to the layer that you are rendering. This feature allows you to use the data in the joined table much as you would in a composite query that was made with something like PostGIS or Oracle Spatial. That is, the columns in the right table of the join are available for CLASSITEM, LABELITEM and so on. The biggest constraint, however, is that **fully qualified** names must be used or it most likely will not work. The join support is activated through PROCESSING options.

- **PROCESSING “JOINTABLE=SDE_MASTER.GEOSERVWRITE.JOINTABLE”** - The JOINTABLE processing option tells the driver which table you are joining the current layer to.
- **CLASSITEM “SDE_MASTER.GEOSERVWRITE.JOINTABLE.VAL”** - A CLASSITEM or LABELITEM for a joined table using this mechanism must be fully qualified.
- **FILTER “SDE_MASTER.GEOSERVWRITE.JOINTABLE.AQ_TAG=SDE_MASTER.GEOSERVWRITE.JOINTESTL”**
- An important part of the join is defining how the join is to be made. Use a FILTER to do so.

8.1.4 DGN

File listing

Data are encapsulated in a single file, usually with the suffix .dgn.

0824t.dgn

Data Access / Connection Method

- Access is available in MapServer through OGR.
- The CONNECTIONTYPE OGR parameter must be used.
- The path to the dgn file is required, file extension is needed.
- All types of features in a DGN file are held in one “layer” of data. The layer is called elements and is the first and only layer.
- The type of feature to be read from the DGN depends on the TYPE parameter in the map file.
- DGN files typically contain POINT, LINE, POLYGON and ANNOTATION feature types.
- DGN files contain “styling” information - how to color and present the data. This is used, optionally, by specifying the STYLEITEM “AUTO” parameter.

Note: DGN files typically use white as a color for their features and therefore are not visible on maps with white backgrounds.

OGRINFO Examples

Using ogrinfo on a single DGN file:

```
> ogrinfo /data/dgn/0824t.dgn
Had to open data source read-only.
INFO: Open of '0824t.dgn'
using driver 'DGN' successful.
1: elements
```

Note: No geometry/feature type for the layer is identified because it can be multiple types.

DGN files are not really GIS data files. They evolved from drafting formats used by computer aided drafting/design (CADD) programs.

They carry a few key attributes which are usually consistent across all DGN files. Most of the attributes relate to graphical styling of features for map presentation, such as ColorIndex, Style, etc.

Spatial reference system information is not always encoded into DGN files. This can be a major problem when trying to adequately reference the DGN data in another mapping program.

Measurement units can be a problem. In some cases the features could be located in kilometres or feet even though it is not obvious from the output of ogrinfo. Sometimes the only way to identify or correct a problem with units is to open the file in Microstation software.

Using ogrinfo to examine the structure of the file/layer:

```
> ogrinfo -summary /data/dgn/0824t.dgn elements
INFO: Open of '0824t.dgn'
using driver 'DGN' successful.

Layer name: elements
Geometry: Unknown (any)
Feature Count: 22685
Extent: (-513183.050000, 150292.930000) - (-224583.220000, 407463.360000)
Layer SRS WKT:
(unknown)

Type: Integer (2.0)
Level: Integer (2.0)
GraphicGroup: Integer (4.0)
ColorIndex: Integer (3.0)
Weight: Integer (2.0)
Style: Integer (1.0)
EntityNum: Integer (8.0)
MSLink: Integer (10.0)
Text: String (0.0)
```

Map File Example:

```
LAYER
  NAME dgn
  TYPE LINE
  STATUS DEFAULT
  CONNECTIONTYPE OGR
  CONNECTION "dgn/0824t.dgn"
  STYLEITEM "AUTO"
  CLASS
  END
END # Layer
```

8.1.5 ESRI File Geodatabase

ESRI File Geodatabases exist in a file folder and offer improved performance and size limitations. For more information see the ESRI [description page](#).

Note: Only file geodatabases created by ArcGIS 10.0 and above can be read by GDAL/MapServer.

File listing

File geodatabases are made up of a set of files within a folder. The files are made up of geographic data, attribute data, index files, and lock files. A better description of the file contents can be found [here](#).

Data Access / Connection Method

File geodatabase access is available through OGR. See the OGR [driver page](#) for specific driver information. The driver is available for GDAL >= 1.9.0.

The CONNECTION parameter must be used to point to the name of the file folder, and the DATA parameter should be the name of the spatial table (or OGR layer).

```
CONNECTIONTYPE ogr
CONNECTION "filegdb-folder"
DATA "layername"
```

Note: The CONNECTION path is relative to the mapfile (SHAPEPATH is not used here). Full paths can also be used.

OGRINFO Examples

First you should make sure that your GDAL/OGR build contains the file geodatabase “FileGDB” driver, by using the ‘–formats’ command:

```
>ogrinfo --formats
Supported Formats:
...
"FileGDB" (read/write)
"ESRI Shapefile" (read/write)
"MapInfo File" (read/write)
"UK .NTF" (readonly)
"SDTS" (readonly)
"TIGER" (read/write)
...
```

If you don’t have the driver, see GDAL’s [BuildHints](#) page for compiling the driver.

Once you have the FileGDB driver you are ready to try an ogrinfo command on your database to get a list of spatial tables. In the example below our folder is named *us_states.gdb*:

```
ogrinfo us_states.gdb
INFO: Open of 'us_states.gdb'
using driver 'FileGDB' successful.
1: statesp020 (Multi Polygon)
```

Now use ogrinfo to get information on the structure of the *statesp020* table:

```
ogrinfo us_states.gdb statesp020 -summary
INFO: Open of 'us_states.gdb'
      using driver 'FileGDB' successful.

Layer name: statesp020
Geometry: Multi Polygon
Feature Count: 2895
Extent: (-179.000000, 17.000000) - (179.000000, 71.000000)
Layer SRS WKT:
GEOGCS["GCS_North_American_1983",
  DATUM["North_American_Datum_1983",
    SPHEROID["GRS_1980",6378137.0,298.257222101]],
  PRIMEM["Greenwich",0.0],
  UNIT["Degree",0.017453292519943295]]
FID Column = OBJECTID
Geometry Column = SHAPE
AREA: Real (0.0)
PERIMETER: Real (0.0)
STATESP020: Real (0.0)
STATE: String (0.0)
STATE_FIPS: String (0.0)
```

Mapfile Example

```
LAYER
  NAME "fgdb_poly"
  TYPE POLYGON
  STATUS ON
  CONNECTIONTYPE OGR
  CONNECTION ".../data/filegdb/us_states.gdb"
  DATA "statesp020"
  LABELITEM "STATE"
  CLASS
    NAME "US States"
    STYLE
      COLOR 120 120 120
      OUTLINECOLOR 0 0 0
    END
    LABEL
      COLOR 255 255 255
      OUTLINECOLOR 0 0 0
    END
  END
END
```

8.1.6 ESRI Personal Geodatabase (MDB)

ESRI Personal Geodatabases are basically Microsoft Access files that contain spatial information. For more information see the ESRI [description page](#).

File listing

Similar to other database formats, the mdb file consists of several tables. The geometry is held in a BLOB table column.

Data Access / Connection Method

Personal geodatabase access is available through OGR. See the [OGR driver page](#) for specific driver information. The driver is standard in any win32 build of GDAL/OGR version 1.3.2 or later. For Linux/Unix, [MDBTools](#) ODBC drivers can be used for this (with some difficulty).

OGR uses the names of spatial tables within the personal geodatabase (tables with a Shape column) as layers.

The CONNECTION parameter must include the mdb extension, and the DATA parameter should be the name of the spatial table (or OGR layer).

```
CONNECTIONTYPE ogr
CONNECTION "pgeodatabase.mdb"
DATA "layername"
```

OGRINFO Examples

First you should make sure that your GDAL/OGR build contains the personal geodatabase “PGeo” driver, by using the ‘–formats’ command:

```
>ogrinfo --formats
Loaded OGR Format Drivers:
...
-> "ODBC" (read/write)
-> "PGeo" (readonly)
-> "PostgreSQL" (read/write)
...
```

If you don’t have the driver, you might want to try the [FWTools](#) or [MS4W](#) packages, which include the driver.

Once you have the PGeo driver you are ready to try an ogrinfo command on your database to get a list of spatial tables:

```
>ogrinfo test.mdb
INFO: Open of 'test.mdb'
using driver 'PGeo' successful.
1: counties
```

Now use ogrinfo to get information on the structure of the spatial table:

```
>ogrinfo test.mdb counties -summary
INFO: Open of 'test.mdb'
using driver 'PGeo' successful.

Layer name: counties
Geometry: Unknown (any)
Feature Count: 67
Extent: (-87.634943, 24.543945) - (-80.031369, 31.000975)
Layer SRS WKT:
GEOGCS["GCS_WGS_1984",
    DATUM["WGS_1984",
        SPHEROID["WGS_1984", 6378137.0, 298.257223563]],
    PRIMEM["Greenwich", 0.0],
    UNIT["Degree", 0.0174532925199433]]
```

```
OBJECTID_1: Integer (10.0)
OBJECTID: Integer (10.0)
NAME: String (32.0)
STATE_NAME: String (25.0)
STATE_FIPS: String (2.0)
CNTY_FIPS: String (3.0)
FIPS: String (5.0)
...
```

Note that you can also use an ODBC connection to access all of the tables in your geodatabase:

```
>ogrinfo PGeo:testDSN counties -summary
INFO: Open of 'testDSN'
using driver 'PGeo' successful.

1: counties
2: counties_Shape_Index
...
```

(where “testDSN” is the name of your System DSN)

Mapfile Example

Direct Access to MDB

```
LAYER
  NAME my_geodatabase
  TYPE POLYGON
  CONNECTIONTYPE ogr
  CONNECTION "test.mdb"
  DATA "counties"
  STATUS ON
  CLASS
    NAME "counties"
    STYLE
      COLOR 255 255 120
    END
  END
END
```

Through an ODBC Connection

```
LAYER
  NAME my_geodatabase
  TYPE POLYGON
  CONNECTIONTYPE ogr
  CONNECTION "PGeo:testDSN"
  DATA "counties"
  STATUS ON
  CLASS
    NAME "counties"
    STYLE
      COLOR 255 255 120
    END
  END
END
```

8.1.7 ESRI Shapefiles (SHP)

Also known as ESRI ArcView Shapefiles or ESRI Shapefiles. ESRI is the company that introduced this format. ArcView was the first product to use shapefiles.

File listing

Shapefiles are made up of a minimum of three similarly named files, with different suffixes:

```
Countries_area.dbf
Countries_area.shp
Countries_area.shx
```

Data Access / Connection Method

Shapefile access is built directly into MapServer. It is also available through OGR, but direct access without OGR is recommended and discussed here. The path to the shapefile is required. No file extension should be specified. Shapefiles only hold one layer of data, therefore no distinction needs to be made.

OGRINFO Examples

- The directory can serve as a data source.
- Each shapefile in a directory serves as a layer.
- A shapefile can also be a data source. In this case the layer has the same prefix as the shapefile.

Using ogrinfo on a directory with multiple shapefiles:

```
> ogrinfo /data/shapefiles/
INFO: Open of '/data/shapefiles/'  
using driver 'ESRI Shapefile' successful.  
1: wpg_h2o (Line String)  
2: wpg_roads (Line String)  
3: wpg_roads_dis (Line String)  
4: wpgrestaurants (Point)
```

Using ogrinfo on a single shapefile:

```
> ogrinfo /data/shapefiles/Countries_area.shp
Had to open data source read-only.
INFO: Open of 'Countries_area.shp'  
using driver 'ESRI Shapefile' successful.
1: Countries_area (Polygon)
```

Using ogrinfo to examine the structure of the file/layer:

```
> ogrinfo -summary /data/shapefiles/Countries_area.shp Countries_area
Had to open data source read-only.
INFO: Open of 'Countries_area.shp'  
using driver 'ESRI Shapefile' successful.
```

```
Layer name: Countries_area
Geometry: Polygon
Feature Count: 27458
Extent: (-180.000000, -90.000000) - (180.000000, 83.627419)
Layer SRS WKT:
```

```
(unknown)
FAC_ID: Integer (5.0)
TILE: Integer (3.0)
ARCLIST: String (254.0)
NAM: String (77.0)
PERIMETER: Real (22.17)
POLYGONCOU: Integer (6.0)
NA2DESC: String (45.0)
```

Map File Example:

```
LAYER
    NAME my_shapefile
    TYPE POLYGON
    DATA countries_area
    STATUS OFF
    CLASS
        NAME "Countries"
        OUTLINECOLOR 0 0 0
    END
END
```

8.1.8 GML

Also known as Geographic Markup Language and GML/XML. GML is a text-based, XML format that can represent vector and attribute data. This is an Open Geospatial Consortium specification for data interchange. More information is available at <http://www.opengeospatial.org/standards/gml>

File listing

GML files are usually a single text file with a GML filename extension. Some may use XML as the filename extension:

coal_dep.gml

XML schema documents often accompany GML files that have been translated from some other format (e.g. using the ogr2ogr utility).

GML uses sets of nested tags to define attributes and geometry coordinates. Example of text in a GML file:

```
<gml:featureMember>
<Coal_Deposits fid="1">
<UNKNOWN>0.000</UNKNOWN>
<NA>0.000</NA>
<ID>2</ID>
<ID2>2</ID2>
<MARK>7</MARK>
<COALKEY>110</COALKEY>
<COALKEY2>110</COALKEY2>
<ogr:geometryProperty>
<gml:Point>
<gml:coordinates>78.531,50.694</gml:coordinates>
</gml:Point>
</ogr:geometryProperty>
</Coal_Deposits>
</gml:featureMember>
```

Data Access / Connection Method

- GML access is available in MapServer through OGR. More information on OGR GML support is available at http://www.gdal.org/ogr/drv_gml.html
- The CONNECTIONTYPE OGR parameter must be used.
- The path to the GML file is required, including file extension. There can be multiple layers in a GML file, including multiple feature types.

OGRINFO Examples

Using ogrinfo on a single GML file:

```
> ogrinfo /data/gml/coal_dep.gml
Had to open data source read-only.
INFO: Open of 'coal_dep.gml'
using driver 'GML' successful.
1: Coal_Deposits
```

Using ogrinfo to examine the structure of one layer:

```
> ogrinfo -summary /data/gml/coal_dep.gml Coal_Deposits
Had to open data source read-only.
INFO: Open of 'coal_dep.gml'
using driver 'GML' successful.
```

```
Layer name: Coal_Deposits
Geometry: Unknown (any)
Feature Count: 266
Extent: (23.293650, 37.986340) - (179.272550, 80.969670)
Layer SRS WKT:
(unknown)
UNKNOWN: Real (0.0)
NA: Real (0.0)
ID: Integer (0.0)
ID2: Integer (0.0)
MARK: Integer (0.0)
COALKEY: Integer (0.0)
COALKEY2: Integer (0.0)
LONG: Real (0.0)
LAT: Real (0.0)
```

Map File Example:

```
LAYER
NAME coal_deposits
TYPE POINT
STATUS DEFAULT
CONNECTIONTYPE OGR
CONNECTION "gml/coal_dep.gml"
CLASS
  STYLE
    COLOR 0 0 0
    SYMBOL 'circle'
    SIZE 6
  END
END
END
```

8.1.9 GPS Exchange Format (GPX)

GPX (the GPS Exchange Format) is a light-weight XML data format containing GPS data (waypoints, routes, and tracks). For more information see the official [GPX site](#).

File listing

All waypoints, routes, and tracks are stored in a single .gpx file.

Data Access / Connection Method

- GPX access is available through OGR. See the OGR [driver page](#) for specific driver information.
- A relative path to the .gpx file can be used in the mapfile LAYER's CONNECTION string.
- **The feature type is specified in the DATA parameter**
 - the “tracks” feature type will usually be the track line
 - the “track_points” feature type will usually be the points that make up the track line

OGRINFO Examples

First you should make sure that your GDAL/OGR build contains the “GPX” driver, by using the ‘–formats’ command:

```
>ogrinfo --formats
Loaded OGR Format Drivers:
...
-> "CSV" (read/write)
-> "GML" (read/write)
-> "GPX" (read/write)
-> "KML" (read/write)
...
```

If you don’t have the driver, you might want to try the [FWTools](#) or [MS4W](#) packages, which include the driver.

Once you have the GPX driver you are ready to try an ogrinfo command on your file to get a list of feature types:

```
>ogrinfo test.gpx
INFO: Open of 'test.gpx'
      using driver 'GPX' successful.
1: waypoints (Point)
2: routes (Line String)
3: tracks (Multi Line String)
4: route_points (Point)
5: track_points (Point)
```

Now use ogrinfo to get information on one of the feature types:

```
>ogrinfo test.gpx track_points -summary
INFO: Open of 'test.gpx'
      using driver 'GPX' successful.

Layer name: track_points
Geometry: Point
Feature Count: 661
Extent: (-66.694270, 47.985570) - (-66.675222, 47.990791)
Layer SRS WKT:
```

```

GEOGCS["WGS 84",
    DATUM["WGS_1984",
        SPHEROID["WGS 84",6378137,298.257223563,
            AUTHORITY["EPSG","7030"]],
        AUTHORITY["EPSG","6326"]],
    PRIMEM["Greenwich",0,
        AUTHORITY["EPSG","8901"]],
    UNIT["degree",0.01745329251994328,
        AUTHORITY["EPSG","9122"]],
    AUTHORITY["EPSG","4326"]]
track_fid: Integer (0.0)
track_seg_id: Integer (0.0)
track_seg_point_id: Integer (0.0)
ele: Real (0.0)
time: DateTime (0.0)
magvar: Real (0.0)
geoidheight: Real (0.0)
name: String (0.0)
cmt: String (0.0)
desc: String (0.0)
src: String (0.0)
...

```

Mapfile Example

Since you have confirmed that OGR can read your GPX file, now you can create a MapServer layer:

```

LAYER
    NAME gpx
    TYPE POINT
    STATUS ON
    CONNECTIONTYPE OGR
    CONNECTION test.gpx
    DATA "track_points"
    CLASS
        NAME "gpx"
        STYLE
            SYMBOL 'circle'
            COLOR 0 119 255
            SIZE 2
        END
    END
END # layer

```

8.1.10 Inline

Inline features refer to coordinates entered directly into the map file. They are not a file or database format and do not require any DATA or CONNECTION parameters. Instead they use a FEATURE section to define the coordinates.

Inline features can be used to define points, lines and polygons as if taken from an external file. This requires direct entry of coordinate pairs in the map file using a particular syntax.

Data Access / Connection Method

This is a native MapServer option that doesn't use any external libraries to support it.

Map File Example

Points

- Each FEATURE..END section defines a feature.
- Multiple points can be defined in a FEATURE section. If multiple points are defined in the same layer, they will have the same CLASS settings, e.g. for colours and styles.
- Coordinates are entered in the units set in the layer's projection. In this case it is assuming the map file projection is using decimal degrees.

```
LAYER
  NAME inline_stops
  TYPE POINT
  STATUS DEFAULT
  FEATURE
    POINTS
      72.36 33.82
    END
    TEXT "My House"
  END
  FEATURE
    POINTS
      69.43 35.15
      71.21 37.95
      72.02 38.60
    END
    TEXT "My Stores"
  END
  CLASS
    STYLE
      COLOR 0 0 250
      SYMBOL 'circle'
      SIZE 6
    END
  END
END
```

Lines

Lines are simply a list of points strung together, but the layer must be TYPE LINE instead of TYPE POINT.

```
LAYER
  NAME inline_track
  TYPE LINE
  STATUS DEFAULT
  MAXSCALE 10000000
  FEATURE
    POINTS
      72.36 33.82
      70.85 34.32
      69.43 35.15
      70.82 36.08
      70.90 37.05
      71.21 37.95
    END
```

```

END
CLASS
  STYLE
    COLOR 255 10 0
    SYMBOL 'circle'
    SIZE 2
  END
END
END

```

Polygons

Polygons are the same as the line example, just a list of points. They require the TYPE POLYGON parameter. Polygons also require the final coordinate pair to be the same as the first, making it a closed polygon.

8.1.11 KML - Keyhole Markup Language

Table of Contents

- KML - Keyhole Markup Language
 - Links to KML-Related Information
 - Data Access / Connection Method
 - Example 1: Displaying a .KML file
 - Example 2: Displaying a .KMZ file

Keyhole Markup Language (KML) is an XML-based language for managing the display of 3D geospatial data. KML is a standard maintained by the Open Geospatial Consortium (OGC).

Links to KML-Related Information

- Google's KML Reference
- OGC's KML Specification
- [KML Validator](#)
- [KML Validator](#) (against OGC KML 2.2)

Data Access / Connection Method

KML access in MapServer is available through OGR. See the OGR [driver page](#) for specific driver information. Read support was initially added to GDAL/OGR version 1.5.0. A more complete KML reader was added to GDAL/OGR in version 1.8.0, through the [libKML driver](#) (including the ability to read multigeometry, and KMZ files).

The CONNECTION parameter must include the kml or kmz extension, and the DATA parameter should be the name of the layer.

```

CONNECTIONTYPE OGR
CONNECTION "filename.kml"
DATA "layername"

```

Example 1: Displaying a .KML file

OGRINFO

First you should make sure that your GDAL/OGR build contains the “KML” driver, by using the ‘–formats’ command:

```
>ogrinfo --formats
Loaded OGR Format Drivers:
...
-> "GML" (read/write)
-> "GPX" (read/write)
-> "KML" (read/write)
...
```

If you don’t have the driver, you might want to try the [FWTools](#) or [MS4W](#) packages, which include the driver.

Once you have the KML driver you are ready to try an ogrinfo command on your file to get a list of available layers:

```
>ogrinfo myplaces.kml
INFO: Open of 'myplaces.kml'
using driver 'KML' successful.
1: Layer #0 (Point)
```

Now use ogrinfo to get information on the structure of the layer:

```
>ogrinfo fountains-hotel.kml "Layer #0" -summary
Had to open data source read-only.
INFO: Open of 'fountains-hotel.kml'
using driver 'KML' successful.

Layer name: Layer #0
Geometry: Point
Feature Count: 1
Extent: (18.424930, -33.919627) - (18.424930, -33.919627)
Layer SRS WKT:
GEOGCS["WGS 84",
    DATUM["WGS_1984",
        SPHEROID["WGS 84",6378137,298.257223563,
            AUTHORITY["EPSG","7030"]]],
    AUTHORITY["EPSG","6326"]],
PRIMEM["Greenwich",0,
    AUTHORITY["EPSG","8901"]],
UNIT["degree",0.01745329251994328,
    AUTHORITY["EPSG","9122"]],
AUTHORITY["EPSG","4326"]]
Name: String (0.0)
Description: String (0.0)
```

Mapfile Example

```
LAYER
  NAME "kml_example"
  TYPE POINT
  STATUS DEFAULT
  CONNECTIONTYPE OGR
  CONNECTION "kml/fountains-hotel.kml"
  DATA "Layer #0"
```

```

LABELITEM "NAME"
CLASS
  NAME "My Places"
  STYLE
    COLOR 250 0 0
    OUTLINECOLOR 255 255 255
    SYMBOL 'circle'
    SIZE 6
  END
END
LABEL
  SIZE TINY
  COLOR 0 0 0
  OUTLINECOLOR 255 255 255
  POSITION AUTO
END
END
END

```

Example 2: Displaying a .KMZ file

OGRINFO

First you should make sure that your GDAL/OGR build contains the “LIBKML” driver, by using the ‘–formats’ command:

```

>ogrinfo --formats
Loaded OGR Format Drivers:
...
-> "GML" (read/write)
-> "GPX" (read/write)
-> "LIBKML" (read/write)
-> "KML" (read/write)
...

```

If you don’t have the driver, you might want to try the [FWTools](#) or [MS4W](#) packages, which include the driver. Or you can follow the [compiling notes](#) for libKML and GDAL/OGR.

Once you have the LIBKML driver you are ready to try an ogrinfo command on your file to get a list of available layers:

```

>ogrinfo Lunenburg_Municipality.kmz
INFO: Open of 'Lunenburg_Municipality.kmz'
using driver 'LIBKML' successful.
1: Lunenburg_Municipality

```

Now use ogrinfo to get information on the structure of the layer:

```

>ogrinfo Lunenburg_Municipality.kmz Lunenburg_Municipality -summary
INFO: Open of 'Lunenburg_Municipality.kmz'
using driver 'LIBKML' successful.

Layer name: Lunenburg_Municipality
Geometry: Unknown (any)
Feature Count: 1
Extent: (-64.946433, 44.133207) - (-64.230281, 44.735125)
Layer SRS WKT:
  GEOGCS["WGS 84",

```

```
DATUM["WGS_1984",
    SPHEROID["WGS 84",6378137,298.257223563,
        AUTHORITY["EPSG","7030"]],
    TOWGS84[0,0,0,0,0,0,0],
    AUTHORITY["EPSG","6326"]],
PRIMEM["Greenwich",0,
    AUTHORITY["EPSG","8901"]],
UNIT["degree",0.0174532925199433,
    AUTHORITY["EPSG","9108"]],
    AUTHORITY["EPSG","4326"]]
Name: String (0.0)
description: String (0.0)
timestamp: DateTime (0.0)
begin: DateTime (0.0)
end: DateTime (0.0)
altitudeMode: String (0.0)
tessellate: Integer (0.0)
extrude: Integer (0.0)
visibility: Integer (0.0)
```

Mapfile Example

```
LAYER
  NAME "lunenburg"
  TYPE POLYGON
  STATUS DEFAULT
  CONNECTIONTYPE OGR
  CONNECTION "Lunenburg_Municipality.kmz"
  DATA "Lunenburg_Municipality"
  CLASS
    NAME "Lunenburg"
    STYLE
      COLOR 244 244 16
      OUTLINECOLOR 199 199 199
    END
  END
END # layer
```

8.1.12 MapInfo

File listing

The following files are also associated with .TAB files: .DAT, .ID, .MAP. An example is:

```
border.DAT
border.ID
border.MAP
border.TAB
```

The term MID/MIF refers to files with .MID and .MIF extension.

Data Access / Connection Method

TAB and MID/MIF access is available in MapServer through OGR.

- The CONNECTIONTYPE OGR parameter must be used.
- The path to the (*.tab or *.mif) file is required, and the file extension is needed.
- The path may be relative to the SHAPEPATH
- MapInfo files already contain styling information. This styling information can be used optionally by specifying the STYLEITEM “AUTO” parameter in the LAYER object of the map file.

Note: If you use STYLEITEM “AUTO” you must have an empty class in the layer.

OGRINFO Examples

Using ogrinfo on a single TAB file

```
> ogrinfo elev5_poly.TAB
Had to open data source read-only.
INFO: Open of 'elev5_poly.TAB'
using driver 'MapInfo File' successful.
1: elev5_poly (Polygon)
```

Using ogrinfo to examine the structure of the file/layer

```
> ogrinfo elev5_poly.TAB elev5_poly
Had to open data source read-only.
INFO: Open of 'elev5_poly.TAB'
using driver 'MapInfo File' successful.

Layer name: elev5_poly
Geometry: Polygon
Feature Count: 2236
Extent: (-141.000000, 60.000000) - (-124.403310, 69.300251)
Layer SRS WKT:
GEOGCS["unnamed",
DATUM["MIF 0",
SPHEROID["WGS 84 (MAPINFO Datum 0)", 6378137.01298.257223563],
TOWGS84[0,0,0,0,0,0,0]],
PRIMEM["Greenwich",0],
UNIT["degree",0.0174532925199433]]
AREA: Real (0.0)
PERIMETER: Real (0.0)
ELEV5_: Integer (0.0)
ELEV5_ID: Integer (0.0)
TYPE: Real (4.0)
ELEV5: Real (4.0)
...
...
```

Map File Example

```
LAYER
NAME Elevation_Poly_5
TYPE POLYGON
STATUS DEFAULT
CONNECTIONTYPE OGR
CONNECTION "./hypso/elev5_poly.TAB"
STYLEITEM "AUTO"
```

```
CLASS
    NAME "Elevation Poly 5"
END
END # Layer
```

8.1.13 MSSQL

Author Tamas Szekeres

Contact szekerest at gmail.com

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Last Updated 2012-09-26

Contents

- [MSSQL](#)
 - [Introduction](#)
 - [Creating Spatial Data Tables in MSSQL 2008](#)
 - [Connecting to Spatial Data in MSSQL 2008](#)
 - * [OPTION 1: Connect Through OGR](#)
 - [Verify Local Support for MSSQLSpatial](#)
 - [Test OGR Connection Parameters](#)
 - [Create MapServer Layer using CONNECTIONTYPE OGR](#)
 - * [OPTION 2: Connect Through MapServer Plugin](#)
 - [Create MapServer Layer](#)
 - [Selecting the Type of the Geometry Column](#)
 - [Expected Location of the MSSQL Plugin](#)
 - [Binaries Containing the MSSQL Plugin](#)
 - * [Using Spatial Indexes](#)
 - * [Layer Processing Options](#)
 - [More Information](#)

Introduction

Microsoft SQL Server 2008+ supports storing spatial data by using the built-in geometry/geography data types. MapServer can connect to MSSQL through either: 1) an OGR connectiontype, or 2) a driver that accesses these tables containing spatial columns, which is compiled as a plugin (“msplugin_mssql2008.dll”).

Creating Spatial Data Tables in MSSQL 2008

There are several ways to create spatial data tables in MSSQL 2008. You can easily upload existing data to an MSSQL table by using the [ogr2ogr](#) commandline tool and the OGR’s [MSSQL Spatial driver](#). Here is an example that uploads a shapefile (province.shp) into an MSSQL 2008 instance:

```
ogr2ogr -f MSSQLSpatial -a_srs EPSG:4326 "MSSQL:server=.\SQLEXPRESS;database=geo;trusted_connection=y
```

Connecting to Spatial Data in MSSQL 2008

In order to connect to the MSSQL 2008 spatial database you should set up a valid connection string to the database like the following examples:

```
Server=.\MSSQLSERVER2008;Database=Maps;Integrated Security=true

Server=55.55.55.55,1433;uid=a_user;pwd=a_password;database=a_database;
Integrated Security=True

Server=55.55.55.55\SQLEXPRESS,1433;uid=a_user;pwd=a_password;
database=a_database;Integrated Security=True
```

OPTION 1: Connect Through OGR

GDAL/OGR (and therefore MapServer) can read spatial tables in MSSQL 2008 through the [MSSQLSpatial](#) driver.

Verify Local Support for MSSQLSpatial Use the command “ogrinfo –formats” to verify that your local GDAL is built with support for MSSQL; the response should contain “MSSQLSpatial” such as:

```
Supported Formats:
-> "OCI" (read/write)
-> "ESRI Shapefile" (read/write)
-> "MapInfo File" (read/write)
...
-> "MSSQLSpatial" (read/write)
...
```

Test OGR Connection Parameters Use the ogrinfo commandline utility to test your connection through the MSSQLSpatial driver, such as:

```
ogrinfo "MSSQL:server=.\SQLEXPRESS;database=geo;trusted_connection=yes" province -summary
```

Create MapServer Layer using CONNECTIONTYPE OGR Your layer should contain a CONNECTIONTYPE OGR statement, as well as a CONNECTION. The connection should also contact a “tables=” parameter, and also the name of the geometry column in brackets. You do not need to specify the DATA parameter unless you define an sql select statement starting with the ‘WHERE’ keyword. For example:

```
LAYER
  NAME "provinces"
  TYPE POLYGON
  STATUS ON
  #####
  CONNECTIONTYPE OGR
  CONNECTION "MSSQL:server=.\SQLEXPRESS;uid=xx;pwd=xxx;database=geo;trusted_connection=yes;tables=provinces"
  #####
  PROJECTION
    "init=epsg:4326"
  END
  CLASS
    NAME "Land"
    STYLE
      COLOR 240 240 240
      OUTLINECOLOR 199 199 199
```

```
    END
  END
  PROCESSING 'CLOSE_CONNECTION=DEFER'
END # layer
```

Note: The usual CONNECTIONTYPE terms ‘using unique’ and ‘using srid’ are not meaningful for the OGR driver in this case, as these parameters are automatically retrieved from the ‘geometry_columns’ metadata table.

OPTION 2: Connect Through MapServer Plugin

Create MapServer Layer Once the connection can be established to the server the layer can be configured to access MSSQL2008 as follows:

```
LAYER
  NAME "rivers_mssql_spatial"
  TYPE POLYGON
  STATUS DEFAULT
  CONNECTIONTYPE PLUGIN
  PLUGIN "msplugin_mssql2008.dll"
  CONNECTION "Server=.\MSSQLSERVER2008;Database=Maps;Integrated Security=true"
  DATA "ogr_geometry from rivers USING UNIQUE ogr_fid USING SRID=4326"
  ...
END
```

The DATA parameter is used to perform the SQL select statement to access your table in MSSQL. The geometry column is required in the select statement; in the above example the ogr_geometry column is the geometry column in the rivers table. The table should also have an unique column (ogr_fid) which is provided for random access to the features in the feature query operations.

The DATA section should also contain the spatial reference id (SRID) of the features in the data table. The SRID is used when specifying the search shapes during the intersect operations which should match with the SRID of the features otherwise no features are returned in a particular query. If you omit specifying the SRID value in the DATA section the driver will use SRID=0 when defining the search shapes.

Selecting the Type of the Geometry Column For the geometry columns MSSQL supports 2 data types: “geometry” and “geography”. By default the driver considers the type of the geometry column is “geometry”. In case if the type of the geometry column is “geography” we must specify the data type in the DATA section explicitly, like:

```
DATA "ogr_geometry(geography) from rivers USING UNIQUE ogr_fid USING SRID=4326"
```

Expected Location of the MSSQL Plugin On Windows platforms the DLLs needed by the program are searched for in the following order:

1. The directory from which the application loaded.
2. The current directory.
3. The system directory. Use the [GetSystemDirectory](#) function to get the path of this directory.
4. The 16-bit system directory.
5. The Windows directory. Use the [GetWindowsDirectory](#) function to get the path of this directory.
6. The directories that are listed in the PATH environment variable.

Binaries Containing the MSSQL Plugin Currently the following binary distributions contain msplugin_mssql2008.dll:

- MapServer and GDAL binary and SDK packages
- MS4W distributions

Using Spatial Indexes

In order to speed up the access to the features a spatial index should be created to the geometry column which could easily be done with the OGR MSSQL Spatial driver like:

```
ogrinfo -sql "create spatial index on rivers"
    "MSSQL:server=.\MSSQLSERVER2008;database=Maps;
    Integrated Security=true"
```

In general we can safely rely on the query optimizer to select the most appropriate index in the sql query operations. In some cases - however - we should force the optimizer to use the spatial index by specifying the index hint in the DATA section like:

```
DATA "ogr_geometry from rivers using index ogr_geometry_sidx
    USING UNIQUE ogr_fid USING SRID=4326"
```

Layer Processing Options

We can control the behaviour of the MSSQL driver by using the following PROCESSING options:

- **CLOSE_CONNECTION=DEFER** - This is where you can enable connection pooling for certain layer types. Connection pooling will allow MapServer to share the handle to an open database or layer connection throughout a single map draw process.
- **MSSQL_READ_WKB=TRUE** - Uses WKB (Well Known Binary) format instead of native format when fetching geometries.

More Information

- [OGR MSSQL Spatial driver page](#) (describes the OGR MSSQL support)
- [ogr2ogr application](#) (describes the ogr2ogr commandline application)
- [Vector Data](#) (MapServer Vector Data Access Guide)

8.1.14 MySQL

Author David Fawcett

Contact david.fawcett at moea.state.mn.us

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Last Updated 2010-07-29

Contents

- MySQL
 - Introduction
 - Connecting to Spatial Data in MySQL
 - * Requirements
 - * Verify MySQL Support in OGR Build
 - * Test Connection with ogrinfo
 - * Create MapServer Layer
 - Connecting to non-Spatial Data in MySQL
 - * Requirements
 - * Create .ovf file
 - * Test Connection with ogrinfo
 - * Create MapServer Layer
 - More Information

Introduction

The following methods connect to MySQL through OGR's [MySQL driver](#), thus avoiding the need to set up an ODBC connection.

Connecting to Spatial Data in MySQL

This section describes how to display a spatial MySQL table (meaning that the table has a column of type geometry) in MapServer. OGR's [MySQL driver](#) was expanded in OGR version 1.3.2 to support access to MySQL spatial tables.

Requirements

- MapServer compiled with OGR support
- OGR/GDAL version 1.3.2 or more recent compiled with MySQL support

Verify MySQL Support in OGR Build

You can verify that your local build of OGR contains MySQL support by using the ogrinfo commandline utility, and making sure that "MySQL" is returned:

```
ogrinfo --formats
```

```
Supported Formats:  
-> "ESRI Shapefile" (read/write)  
-> "MapInfo File" (read/write)  
...  
-> "PostgreSQL" (read/write)  
-> "MySQL" (read/write)  
...
```

Test Connection with ogrinfo

MySQL connection strings in OGR are in the following format:

```
MYSQL:database,host=yourhost,user=youruser,password=yourpass,tables=yourtable
```

Therefore an example ogrinfo command would be:

```
> ogrinfo MYSQL:test,user=root,password=mysql,port=3306
```

which should return a list of all of your tables in the ‘test’ database:

```
INFO: Open of 'MYSQL:test,user=root,password=mysql,port=3306'
      using driver 'MySQL' successful.
1: province (Polygon)
```

and you can return a summary of the MySQL spatial layer:

```
> ogrinfo MYSQL:test,user=root,password=mysql,port=3306 province -summary
```

```
INFO: Open of 'MYSQL:test,user=root,password=mysql,port=3306'
      using driver 'MySQL' successful.

Layer name: province
Geometry: Polygon
Feature Count: 48
Extent: (-13702.315770, 3973784.599548) - (1127752.921471, 4859616.714055)
Layer SRS WKT:
PROJCS["ED50_UTM_zone_30N",
...
FID Column = OGR_FID
Geometry Column = SHAPE
id: Real (2.0)
...
```

Create MapServer Layer

```
LAYER
  NAME "spain_provinces_mysql_spatial"
  TYPE POLYGON
  STATUS DEFAULT
  CONNECTIONTYPE OGR
  CONNECTION "MySQL:test,user=root,password=mysql,port=3306"
  DATA "SELECT SHAPE,admin_name from province"
  LABELITEM "admin_name"
  CLASS
    NAME "Spain Provinces"
    STYLE
      COLOR 240 240 240
      OUTLINECOLOR 199 199 199
    END
    LABEL
      COLOR 0 0 0
      FONT sans
      TYPE truetype
      SIZE 8
      POSITION AUTO
      PARTIALS FALSE
      OUTLINECOLOR 255 255 255
    END
```

```
END  
END # layer
```

The DATA parameter is used to perform the SQL select statement to access your table in MySQL. The geometry column is required in the select statement; in the above example the *SHAPE* column is the geometry column in the *province* table.

Connecting to non-Spatial Data in MySQL

This section describes how to display a non-spatial MySQL table (meaning the table does not have a column of type geometry) in MapServer.

Support for this functionality is found in GDAL/OGR 1.2.6 and older on Windows and GDAL/OGR 1.3.2 on Linux.

Requirements

- MySQL database containing a table with fields containing x and y coordinates
- .ovf file, a small xml file you will create
- MapServer compiled with OGR version supporting this functionality

Create .ovf file

Here is the .ovf file named aqidata.ovf

```
<OGRVRTDataSource>  
  <OGRVRTLayer name="aqidata">  
    <SrcDataSource>MySQL:aqiTTest, user=uuuuu, password=ppppp, host=192.170.1.100, port=3306, tables=testdata</SrcDataSource>  
    <SrcSQL>SELECT areaID, x, y, sampleValue FROM testdata</SrcSQL>  
    <GeometryType>wkbPoint</GeometryType>  
    <GeometryField encoding="PointFromColumns" x="x" y="y"/>  
  </OGRVRTLayer>  
</OGRVRTDataSource>
```

If you look at the connection string in <SrcDataSource>

- The MySQL database name is ‘aqiTTest’
- ‘testdata’ is the table containing the coordinate data
- host and port are for MySQL server

Use the GeometryField element to tell OGR which fields store the x and y coordinate data. Mine are simply named x and y.

Test Connection with ogrinfo

```
# /usr/local/bin/ogrinfo /maps/aqidata.ovf
```

ogrinfo returns

```
ERROR 4: Update access not supported for VRT datasources.  
Had to open data source read-only.  
INFO: Open of '/maps/aqidata.ovf'
```

```
using driver 'VRT' successful.
1: aqidata (Point)
```

Don't worry about the error, this is just telling you that it is a read-only driver. If it really bugs you, call ogrinfo with the -ro (read only) flag.

To see the actual data

```
# /usr/local/bin/ogrinfo /maps/aqidata.ovf -al
```

Create MapServer Layer

```
LAYER
  NAME "MyAqi"
  STATUS DEFAULT
  TYPE POINT
  CONNECTIONTYPE OGR
  CONNECTION "aqidata.ovf"
  DATA "aqidata"
  CLASS
    NAME "MyClass"
    STYLE
      SYMBOL 'circle'
      SIZE 15
      COLOR 0 255 0
  END
END
END
```

DATA in the LAYER definition should be the same as the name attribute of the OGRVRTLayer element in the ovf file.

For this to draw, you need to have a SYMBOLSET defined in your mapfile and have a symbol called 'circle' in your symbols.sym file.

More Information

- [OGR](#) (MapServer OGR document)
- [Vector Data](#) (MapServer Vector Data Access Guide)
- [MySQL](#) wiki page (describes the deprecated mygis support)

8.1.15 NTF

NTF files are mostly used by the United Kingdom Ordnance Survey (OS). For more on the Ordnance Survey, see their website at: <http://www.ordnancesurvey.co.uk/oswebsite/>

File listing

NTF files have an NTF extension.

Data Access / Connection Method

- NTF access requires OGR.
- The path to the NTF file is required in the CONNECTION string. It may be relative to the SHAPEPATH setting in the map file or the full path.
- The DATA parameter is used to specify the layer to use

OGRINFO Examples

Using ogrinfo on an NTF file to retrieve layer names:

```
> ogrinfo llcontours.ntf
ERROR 4: NTF Driver doesn't support update.
Had to open data source read-only.
INFO: Open of 'llcontours.ntf'
using driver 'UK .NTF' successful.
1: LANDLINE_POINT (Point)
2: LANDLINE_LINE (Line String)
3: LANDLINE_NAME (Point)
4: FEATURE_CLASSES (None)
```

Using ogrinfo to examine the structure of an NTF layer:

```
> ogrinfo llcontours.ntf LANDLINE_LINE -summary
ERROR 4: NTF Driver doesn't support update.
Had to open data source read-only.
INFO: Open of 'llcontours.ntf'
using driver 'UK .NTF' successful.

Layer name: LANDLINE_LINE
Geometry: Line String
Feature Count: 491
Extent: (279000.000000, 187000.000000) - (280000.000000, 188000.000000)
Layer SRS WKT:
PROJCS["OSGB 1936 / British National Grid",
    GEOGCS["OSGB 1936",
        DATUM["OSGB_1936",
            SPHEROID["Airy 1830", 6377563.396, 299.3249646,
                AUTHORITY["EPSG", "7001"]],
            AUTHORITY["EPSG", "6277"]],
        PRIMEM["Greenwich", 0,
            AUTHORITY["EPSG", "8901"]],
        UNIT["degree", 0.0174532925199433],
            AUTHORITY["EPSG", "4277"]],
    PROJECTION["Transverse_Mercator"],
    PARAMETER["latitude_of_origin", 49],
    PARAMETER["central_meridian", -2],
    PARAMETER["scale_factor", 0.999601272],
    PARAMETER["false_easting", 400000],
    PARAMETER["false_northing", -100000],
    UNIT["metre", 1,
        AUTHORITY["EPSG", "9001"]],
        AUTHORITY["EPSG", "27700"]]
LINE_ID: Integer (6.0)
FEAT_CODE: String (4.0)
...
```

Map File Example:

```

LAYER
  NAME ntf_uk
  TYPE LINE
  CONNECTIONTYPE OGR
  CONNECTION "./ntf/llcontours.ntf"
DATA "LANDLINE_LINE"
  STATUS DEFAULT
  CLASS
    NAME "Contours"
  STYLE
    COLOR 0 150 200
  END
END
END

```

8.1.16 OGR

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Last Updated 2010-10-16

Table of Contents

- **OGR**
 - Introduction
 - What is OGR?
 - Obtaining and Compiling MapServer with OGR Support
 - Integrating OGR Support with MapServer Applications
 - STYLEITEM “AUTO” - Rendering Layers Using Style Information from the OGR File
 - Sample Sites Using OGR/MapServer
 - FAQ / Common Problems

Introduction

Starting with version 3.5, MapServer included the ability to access vector data sets in formats other than Shapefile in their native format using the OGR library. The following document describes the process for implementing OGR support within MapServer applications.

Note: Experimental OGR support was included in MapServer version 3.4 but this initial implementation had some limitations and is not covered in this document.

This document assumes that you are already familiar with certain aspects of MapServer:

- MapServer application development and especially setting up *.map files*.
- Some compilation skills if you don't have ready access to a pre-compiled installation and need to compile your own copy of MapServer with OGR support.
- access to OGR utilities, such as *ogrinfo*, which are available in the **FWTools** and **MS4W** packages.

Readers should also check out the [Vector Data Access Guide](#), which has lots of examples of how to access specific vector formats.

What is OGR?

The OGR Simple Features Library is a C++ open source library (and command-line tools) providing read (and sometimes write) access to a variety of vector file formats including ESRI Shapefiles, and MapInfo mid/mif and TAB formats.

OGR is actually part of the GDAL library, so you will notice that some references point to GDAL (such as the mailing list).

What Does OGR Add to MapServer?

The OGR Simple Features Library allows MapServer users to display several types of vector data files in their native formats. For example, MapInfo Mid/Mif and TAB data do not need to be converted to ESRI shapefiles when using OGR support with MapServer.

What Data Formats are Supported?

See http://www.gdal.org/ogr/ogr_formats.html for the latest list of supported formats. At the date this document was written, the following formats were supported:

- [ArcInfo Binary Coverages](#)
- [ArcInfo E00 Coverages](#)
- [Atlas BNA](#)
- [Comma Separated Value \(.csv\)](#)
- [DODS/OPeNDAP](#)
- [ESRI ArcSDE](#)
- [ESRI Personal GeoDatabase](#)
- [ESRI Shapefiles](#)
- [FMEObjects Gateway](#)
- [Géoconcept Export](#)
- [GeoJSON](#)
- [GeoRSS](#)
- [GML](#)
- [GMT](#)
- [GRASS](#)
- [GPX](#)
- [Informix DataBlade](#)
- [INGRES](#)
- [INTERLIS](#)
- [KML](#)

- MapInfo files
- Memory
- Microstation DGN files
- MySQL
- ODBC
- OGDI Vectors
- Oracle Spatial
- PostgreSQL
- SDTS
- SQLite
- UK.NTF (National Transfer Format)
- US Census TIGER/Line
- VRT - Virtual Datasource
- X-Plane/Flightgear aeronautical data

Note: Some of the above formats (e.g. OGDI) have external dependencies and are not always included in the pre-compiled binary distributions of MapServer with OGR support.*

Note: Some of the above formats are not well suited for random access by nature, that's the case of MapInfo MIF/MID files which is a TEXT format and will give very poor performance for a web application. On the other hand, some binary formats such as MapInfo TAB are better suited for random access and will give performance comparable to native shapefile access in MapServer.*

How to Get More Information on the OGR Project

- More information on the OGR Simple Features Project can be found at <http://www.gdal.org/ogr/>.
- The [GDAL mailing list](#) can be used for OGR related questions. Always search the list archives before sending new questions.
- The [GDAL Wiki](#) has lots of good information for users and developers.
- The #gdal IRC channel on irc.freenode.net might also be of help. For info on IRC see the [MapServer IRC page](#).

The main developer of the OGR library is Frank Warmerdam and the integration of OGR within MapServer was done by Daniel Morissette.

Obtaining and Compiling MapServer with OGR Support

- Follow the instructions on the [OGR page](#) to compile/install OGR/GDAL.
- Obtain the MapServer [source](#).

For UNIX users, see the README.CONFIGURE file in the MapServer source, or see the [UNIX Compilation and Installation](#). If GDAL/OGR is normally installed it should be sufficient to add --with-ogr to the configure line before (re)building MapServer. Linux users might want to try [FGS](#), a Linux installer for MapServer.

For Windows users, it is recommended to look for a pre-compiled binary on the MapServer site ([MS4W](#) is recommended). If you want to compile your own then see the README.WIN32 file in the MapServer source.

Integrating OGR Support with MapServer Applications

The only change that is needed to integrate OGR support with a MapServer application is with the .map file. The LAYER's DATA parameter is expanded to three parameters (CONNECTIONTYPE OGR, CONNECTION and DATA).

The syntax for this differs depending on the type of data being used (the [Vector Data Access Guide](#) is an excellent resource for this). In OGR, a data source can be either a set of files that share a common basename (e.g. .shp/.shx/.dbf for ArcView Shapefiles, or .tab/.map/.dat/.ind/.id for MapInfo TAB files) or a whole directory of files (e.g. TIGER).

Let's call the former "File-based data sources" and the later "Directory-based data sources". When accessing a **file-based data source** you specify the filename of one of the files in the set (e.g. roads.shp or roads.tab) and when accessing a **directory-based data source** you specify the directory name and OGR reads all the files in the directory as a single data source with potentially several layers (e.g. TIGER files).

Some OGR drivers (e.g. SHP, TAB) can have dual behaviors, that is if they're pointed to a single file then they behave as a file-based data source and if they're pointed to a directory then they will behave as a directory-based data source and then every file in the directory becomes a new layer in the data source.

See the [OGR formats page](#) for more info on the specific file format you're using. (Click on the format name for more specific driver info on that format)

Using OGR Data Sources in the Map File

The .map file LAYER definition for file-based sources is as follows:

```
LAYER
  ...
  CONNECTIONTYPE OGR
  CONNECTION "<datasource_name>"
  DATA "<layer_definition>"
  ...
END
```

<datasource_name> is the name of the datasource to read from and is prefixed by the CONNECTION keyword. The exact organization depends on the format driver in use. The format driver to use is automatically selected by OGR based on the nature of the string passed as the datasource, and/or the format of the file referenced by it.

- For file based datasources this is the name of the file, including the extension, using an absolute path, or a relative path. Relative paths are interpreted relative to the SHAPEPATH first, if not found then we try again relative to the .map file location.

Note: Before version 4.1 the SHAPEPATH was ignored for OGR datasources.

-
- For directory based datasources, such as TIGER/Line, or Arc/Info Binary Coverages this is the name of the directory containing the files. If the path is relative it is interpreted relative to the .map file.
 - For virtual datasources such as database systems, and OGDI this is the service connection string and is generally not related to the filesystem. For instance, for Oracle Spatial this might be "OCI:warmerda/Password@gdal800.velocet.ca".

<layer_definition> is the name, number or SQL definition of the layer to use from the datasource. It is indicated via the DATA keyword in the map file.

- Layer Name: The (case insensitive) layer name may be used to select a layer.
- Layer Number: The layer number (starting from 0 for the first layer) may be used to select a layer. Generally the layer name is preferred to this since it is more self describing.
- Omitted: If no DATA keyword is provided, this is equivalent to selecting layer 0.
- SQL SELECT: If an SQL SELECT statement is used, it is interpreted in a driver specific manner to try and generate a temporary pseudo-layer. For some formats this a restricted subset of SQL is interpreted within OGR. For RDBMS based drivers (such as PostGIS and Oracle) this is passed through to the underlying database.

The OGRINFO utility can be used to find out the list of layers and their names in a data source.

Examples of Layer Definitions Using OGR

Please see the *Vector Data Access Guide* for details and examples of each data format supported.

Example 1. MapInfo TAB file

```
LAYER
  NAME "Builtup_Areas_tab"
  TYPE POLYGON
  CONNECTIONTYPE OGR
  CONNECTION "data/tab/092b06_builtup_a.tab"
  STATUS ON
  CLASS
  ...
END
...
END
```

Example 2. Microstation DGN file using <layer_index>

The entire DGN file is represented in OGR as one layer (see the [DGN driver page](#) for more details):

```
LAYER
  NAME "dgn"
  TYPE LINE
  CONNECTIONTYPE OGR
  CONNECTION "dgn/santabarbara02.dgn"
  DATA "0"
  STATUS ON
  STYLEITEM "AUTO"
  CLASS
  END
END # Layer
```

Example 3. TIGER/Line file using <layer_name>

```
LAYER
  NAME "Roads_tig"
  TYPE line
  CONNECTIONTYPE OGR
  CONNECTION "full/path/to/tiger/TGR25001"
  DATA "CompleteChain"
  STATUS ON
  CLASS
  ...
END
END
```

Example 4. Directory of Shapefiles using SQL JOIN

```
LAYER
  NAME "Parks_cov"
  TYPE POLYGON
  CONNECTIONTYPE OGR
  CONNECTION "data/shppoly"
  DATA "SELECT eas_id, idlink.Name FROM poly LEFT JOIN idlink ON poly.eas_id = idlink.eas_id"
  STATUS ON
  CLASSITEM "idlink.Name"
  CLASS
  ...
END
END
```

How to Use “OGRINFO”

OGRINFO is part of the GDAL/OGR distribution (it is also included in [FWTools](#) and [MS4W](#)). It is an executable that can be used to obtain layer information about OGR supported files. The parameters are:

```
ogrinfo [-ro] [-q] datasource_name [layer [layer...]]
```

- -ro opens the file as read only (optional)
- -q executes in quiet mode, only the layer index line will be returned (optional)
- datasource_name is the filename including extension (eg. roads.tab); for TIGER/Line files, datasource_name is the directory containing the TIGER files (eg. ogrinfo TGR25001)

Example 5. To get the list of layers in a file:

```
$ ogrinfo popplace.tab

Had to open data source read-only.
INFO: Open of 'popplace.tab'
using driver 'MapInfo File' successful.
1: popplace (Point)
```

which shows that there is one point layer in the popplace.tab file.

Example 6. To get a dump of a specific layer, including field names, projection, etc:

```
$ ogrinfo popplace.tab popplace

Had to open data source read-only.
INFO: Open of 'popplace.tab'
using driver 'MapInfo File' successful.

Layer name: popplace
Geometry: Point
Feature Count: 497
Layer SRS WKT: PROJCS["unnamed",GEOGCS["unnamed",DATUM["North ...snipped...
AREA: Real (15.3)
PERIMETER: Real (15.3)
POPPLACE_: Real (11.0)
POPPLACE_I: Real (15.0)
NAME: String (50.0)
OGRFeature(popplace):1
  AREA (Real) =          0.000
  PERIMETER (Real) =      0.000
```

```

POPPLACE_ (Real) =           1
POPPLACE_I (Real) =          1
NAME (String) = Port Hope Simpson
POINT (2437287.249 1153656.751)

OGRFeature(popplace):2
  AREA (Real) =      0.000
  PERIMETER (Real) =     0.000
  POPPLACE_ (Real) =      2
  POPPLACE_I (Real) =      1
  NAME (String) = Hopedale

...
...

```

Example 7. To get a list of layers in a TIGER/Line Directory:

```

$ ogrinfo TGR25001

Had to open data source read-only.
INFO: Open of 'TGR25001'
using driver 'TIGER' successful.
1: CompleteChain (Line String)
2: AltName (None)
3: FeatureIds (None)
4: ZipCodes (None)
5: Landmarks (Point)
6: AreaLandmarks (None)
7: KeyFeatures (None)
8: Polygon (None)
9: EntityNames (Point)
10: IDHistory (None)
11: PolyChainLink (None)
12: PIP (Point)
13: TLIDRange (None)
14: ZipPlus4 (None)

```

The above example shows that there are 14 layers in the TGR25001 directory.

Example 8. To get a summary of a specific TIGER layer, including only field names, projection, and extent

```

$ ogrinfo TGR25001 Landmarks -summary

Had to open data source read-only.
INFO: Open of 'TGR25001'
using driver 'TIGER' successful.

Layer name: Landmarks
Geometry: Point
Feature Count: 777
Extent: (-70.674324, 41.519817) - (-69.969211, 42.046868)
Layer SRS WKT: GEOGCS["NAD83",DATUM["North_American_Datum_1983",
SPHEROID["GRS 1980",6378137,298.257222101],PRIMEM["Greenwich",0],
UNIT["degree",0.0174532925199433]]
MODULE: String (8.0)
FILE: String (5.0)
STATE: Integer (2.0)
COUNTY: Integer (3.0)
LAND: Integer (10.0)

```

```
SOURCE: String (1.0)
CFCC: String (3.0)
LANAME: String (30.0)
```

Queries Through OGR Format

OGR layers can be queried the same way as regular shapefiles in MapServer.

TILEINDEX with OGR

OGR layers can utilize tile indexes in a similar fashion to Shapefile based layers. The TILEINDEX keyword should contain the connection string for the tile index file. The tile index file may be any supported OGR format, including shapefiles.

The TILEITEM keyword in the LAYER definition indicates what attribute from the tile index file should be used as the datasource location. If omitted, the default TILEITEM value is “location”. The value in the location field should be a connection string the same as would have been used in the CONNECTION field for OGR layers. The CONNECTION keyword is not needed (and will be ignored) for layers using the OGR connection type and having the TILEINDEX keyword.

Tileindex files can be prepared in an external GIS, or using the OGR utility ogrtindex. Details can be found on the [OGR Utilities Page](#).

The following is a simple example of a point layer using a tile index.

```
LAYER
  NAME "ogr_points"
  TYPE POINT
  CONNECTIONTYPE OGR
  TILEINDEX "PIP_ogr_tiles.shp,0"
  STATUS ON
  CLASS
    NAME "points"
    STYLE
      SYMBOL "default-circle"
      COLOR 255 0 0
      SIZE 6
    END
  END
END
```

OGR tileindex layers should support all normal query and attribute fetching mechanisms, including from MapScript; however, this has not been heavily tested as of April/2002. Please report problems via the MapServer Trac. If auto projection support is used for tileindexed OGR layers, the tileindex is read for the projection (not the component tiles). Problems may (or may not) be encountered if the component tiles have differing schemas (different sets of attributes).

Connection Pooling

For some OGR supported formats, connecting to the dataset is quite expensive in terms of CPU use and amount of disk IO. For instance, establishing access to an S-57 dataset results in a complete read into memory of the data files. Connection pooling control aims at reducing this overhead in situations where the same file is used for several different map layers.

To ensure that an OGR supported dataset is only opened once per map render (instead of separately for each map LAYER referencing the dataset, use the CLOSE_CONNECTION PROCESSING option. The default value is for

CLOSE_CONNECTION is NORMAL, but if set to DEFER the dataset will be kept open till the map render is complete. It will be reused by any other layers with using the same datasource.

Example 9. Preserve S-57 connection for two layers

In this example, we are using the same dataset (NO410810.000) for two layers. To avoid re-reading the dataset, we mark the first layer to defer closing the connection till layer. In the second (or last) layer we request NORMAL connection handling (though this could have been left out as normal handling is the default).

```
LAYER
  NAME "AdminAreas"
  TYPE POLYGON
  CONNECTIONTYPE OGR
  CONNECTION "NO410810.000"
  DATA "ADMARE"
  PROCESSING "CLOSE_CONNECTION=DEFER"
  STATUS ON
  ...
END
LAYER
  NAME "Land Areas"
  TYPE POLYGON
  CONNECTIONTYPE OGR
  CONNECTION "NO410810.000"
  DATA "LNDARE"
  PROCESSING "CLOSE_CONNECTION=NORMAL"
  STATUS ON
  ...
END
```

1. The text of the CONNECTION keyword must match exactly between layers for the connection to be reused.
2. Some dataset connections are quite memory expensive, and keeping them open may result in increased memory use.
3. If all layers rendered for a particular connection defer closing the connection, it will remain open till MapServer terminates. For normal cgi or MapScript use this is likely OK.
4. This use of CLOSE_CONNECTION handling is unique to OGR layers, and may be changed at some point in the future as part of a broader implementation of connection pooling in MapServer.

STYLEITEM “AUTO” - Rendering Layers Using Style Information from the OGR File

Note: This feature is only supported with MapInfo TAB and Microstation DGN files at the moment, but eventually other formats that carry colors and styles at the shape-level may also be supported through OGR.*

In MapServer, ArcView, and other shapefile-based applications, colors and styles are usually defined at the layer level. This means that all the shapes in a given layer are usually rendered using the same color and styles.

On the other hand, some formats supported by OGR such as MapInfo TAB do have color and style information attached to each shape. OGR adds support for the ‘‘STYLEITEM “AUTO”’’ layer parameter which allows you to request that the shapes in a layer be rendered using colors and styles coming from the data source instead of being driven by CLASSES as was traditionally done with MapServer.

How to Implement

In order to have a layer rendered using colours and styles coming from the OGR data source, you must do the following:

- Your layer definition must contain the STYLEITEM “AUTO” parameter.
- Your layer definition needs to contain at least one CLASS (which may be empty) and optionally a CLASSITEM to match the expressions if your CLASS contains an expression. The empty CLASS in the layer will be updated dynamically at runtime to contain colours and styles coming from the data source for each shape.

Examples

Example 10. Layer Definition Using STYLEITEM “AUTO” without a CLASSITEM

```
LAYER
  NAME "test_dgn"
  STATUS ON
  TYPE POLYGON
  CONNECTIONTYPE OGR
  CONNECTION ".../data/dgn/test.dgn"

  # This enables use of colors and styles from the source file.
  STYLEITEM "AUTO"

  # Define an empty class that will be filled at runtime from the color and
  # styles read on each shape in the source file.
  CLASS
  END
END # layer
```

Example 11. Layer Definition Using STYLEITEM “AUTO” with a CLASSITEM

```
LAYER
  NAME "Builtup_Areas_tab"
  TYPE POLYGON
  CONNECTIONTYPE OGR
  CONNECTION "data/tab/092b06_builtin_a.tab"
  STATUS ON

  # This enables use of colors and styles from the source file.
  STYLEITEM "AUTO"

  # Define an empty class that will be filled at runtime from the color and
  # styles read on each shape in the source file.
  CLASSITEM "CATEGORY"
  CLASS
    EXPRESSION "1"
  END
END
```

Please Note:

CLASS EXPRESSIONs are still working, so it is still possible to query and classify layers that are using STYLEITEM “AUTO”. The only difference is that instead of using static class definitions, the colors and style will be read from the data file.

Important Notes

NOTE 1 Even though MapInfo and other OGR data sources may support layers with mixed geometry types (e.g. points, lines and polygons in the same file) this is not yet supported in MapServer. So you still have to define a layer ‘TYPE’ and make sure that all the shapes in the OGR data source are compatible with that layer type, otherwise MapServer may produce an error about incompatible geometry types at runtime.

NOTE 2 Due to the dynamic nature of this feature, it is not compatible with the labelcache, so the labelcache is automatically disabled for layers that make use of ‘STYLEITEM “AUTO”’.

NOTE 3 When you use STYLEITEM AUTO, MapServer tries to match symbol names returned by OGR to names in your symbol file. For a quick solution, try using the following symbol file:

http://demo.mapserver.org/ogr-demos/yk_demo/etc/symbols_mapinfo.txt

The name of the symbols returned by OGR to MapServer depends on the file format. In the case of MapInfo files, it will be:

- For “old-style” symbols (default MapInfo 3.0 symbols numbered 32 to 67) the symbol name will be ‘mapinfo-sym-##’ where ‘##’ is the symbol number, e.g. ‘mapinfo-sym-32’.
- For “Font Symbols”, the symbol name is also ‘mapinfo-sym-##’ where ‘##’ is the symbol number in the font. In this case, the name of the font itself is ignored by MapServer.
- MapInfo also supports “custom symbols” (bitmap symbols)... I’m not sure what you would get from OGR for this, but I’m pretty sure that MapServer doesn’t do anything useful with them.

The OGRINFO utility can be used to find out exactly which symbol names OGR will return to MapServer. Look at the “Style” string in the ogrinfo output for each shape that is read.

Mapping of OGR Style Info to the MapServer CLASS Members

Here is the list of style parameters that are currently supported from OGR data sources and how they’re mapped in MapServer:

Line color The line colour is mapped to CLASS.COLOR

Line thickness The line thickness is mapped to CLASS.STYLE.WIDTH. The default will be 1 pixel line (as it always is with MapServer).

Polygon fill color Polygon fill color is mapped directly to CLASS.COLOR

Note that at this time, transparent polygons are not supported (they’re always opaque).

Polygon outline If a polygon has an outline color and thickness defined in the data source then the same rule as for line color and thickness above will apply, except that the outline color is mapped to CLASS.OUTLINECOLOR

Point symbols Point symbol color is directly mapped to CLASS.COLOR. Point symbol size is directly mapped to CLASS.SIZE.

If your symbolset contains a symbol called “default-marker” then this symbol will be used, otherwise the default will be CLASS.SYMBOL=0 (i.e. a 1 pixel dot)

It is also possible (with a bit of work) to control which symbol gets used in rendering point symbols. OGR provides MapServer with symbol names, and if the symbol name returned by OGR to MapServer matches the name of one of the symbols in your symbolset then this symbol will be used.

For MapInfo point symbols (numbered 32 to 67 in the MapInfo MIF spec), the name returned by OGR is “mapinfo-sym-X” where X should be replaced with the MapInfo symbol number (e.g. “mapinfo-sym-35” is the star symbol).

If the OGR symbol id is a web reference (<http://.../mysymbol.png>), the symbol will be downloaded and a new symbol entry will be created referring to it.

Text labels The text string is mapped to CLASS.TEXT

Text color is mapped to CLASS.LABEL.COLOR

Text background color is mapped to CLASS.LABEL.BACKGROUNDCOLOR

Text height is mapped to CLASS.LABEL.SIZE

Text angle is mapped to CLASS.LABEL.ANGLE

Text font mapping follows the following rules:

1. If TTF fonts are supported:

(a) If the native font name (e.g. “Arial”) is found in your fontset then this font will be used. The font styles *bold* and *italic* are supported as follows: Arial bold fontname maps to *arial-bold*. Arial italic fontname maps to *arial-italic*. Arial bold italic fontname maps to *arial-bold-italic*. If the styles are not available, arial will be used.

(b) If 1a. failed and a font called “default” is present in your fontset then this “default” font will be used.

2. If TTF fonts are not supported or if all above cases failed, then BITMAP MEDIUM font will be used.

Transparency If the color parameter from the OGR style contains an alpha value, the value will be used to set the *OPACITY* parameter in the *STYLE* object.

Accessing OGR STYLEITEMAUTO Label Styles Through MapScript

OGR STYLEITEMAUTO label styles can be accessed through MapScript, such as PHP/MapScript’s `getshape()` or `getvalue()` methods, by setting the LAYER’s PROCESSING parameter to “`GETSHAPE_STYLE_ITEMS=all`”. Therefore, the LAYER may contain:

```
LAYER
...
PROCESSING "GETSHAPE_STYLE_ITEMS=all"
...
END
```

The following label styles are supported:

Label Style	Description	MapServer Version Implemented
OGR:LabelFont	Comma-delimited list of fonts names	5.4
OGR:LabelSize	Numeric value with units	5.2.0
OGR:LabelText	Label text string	5.2.0
OGR:LabelAngle	Rotation angle (in degrees)	5.2.0
OGR:LabelFCColor	Foreground color	5.4
OGR:LabelBColor	Background color	5.4
OGR:LabelPlacem	How is the text drawn relative to the feature's geometry	5.4
OGR:LabelAnchor	A value from 1 to 12 defining the label's position relative to the point to which it is attached.	5.4
OGR:LabelDx	X offset	5.4
OGR:LabelDy	Y offset	5.4
OGR:LabelPerp	Perpendicular offset	5.4
OGR:LabelBold	Bold text	5.4
OGR:LabelItalic	Italic text	5.4
OGR:LabelUnderlined	Underlined text	5.4
OGR:LabelPriority	Numeric value defining the order in which style parts should be drawn.	5.4
OGR:LabelStrikeout	Strike out text (gdal >= 1.4.0)	5.4
OGR:LabelStretch	Stretch factor changes the width of all characters in the font by factor percent. (gdal >= 1.4.0)	5.4
OGR:LabelAdjHor	Horizontally adjacent text (gdal >= 1.4.0)	5.4
OGR:LabelAdjVer	Vertically adjacent text (gdal >= 1.4.0)	5.4
OGR:LabelHColor	Shadow color (gdal >= 1.4.0)	5.4
OGR:LabelOCColor	Outline color (gdal > 1.6.0)	5.4

Please see the [OGR Feature Style Specification](#) document for more details on those specific styles.

Sample Sites Using OGR/MapServer

The following sites use OGR's STYLEITEM "AUTO" feature:

- http://demo.mapserver.org/ogr-demos/yk_demo/demo_init.html
- http://demo.mapserver.org/ogr-demos/nfld_demo/demo_init.html

The following site uses OGR, as well as MapInfo's 'Seamless Map Layers' feature:

- http://demo.mapserver.org/ogr-demos/ro_demo/demo_init.html

The following site uses OGR to display TIGER 2000 files:

- http://demo.mapserver.org/ogr-demos/tig_demo/demo_init.html

FAQ / Common Problems

Q What Does "OGR" Stand For?

A Basically, OGR does not stand for anything. For a detailed explanation of how OGR was named, see GDAL's FAQ at <http://trac.osgeo.org/gdal/wiki/FAQ>.

Q When using STYLEITEM AUTO, what should I have in my .sym symbols file?

A When you use STYLEITEM AUTO, MapServer tries to match symbol names returned by OGR to names in your symbol file. For a quick solution, try using the following symbol file:

http://demo.mapserver.org/ogr-demos/yk_demo/etc/symbols_mapinfo.txt

The name of the symbols returned by OGR to MapServer depends on the file format. In the case of MapInfo files, it will be:

- For “old-style” symbols (default MapInfo 3.0 symbols numbered 32 to 67) the symbol name will be ‘mapinfo-sym-##’ where ‘##’ is the symbol number, e.g. ‘mapinfo-sym-32’.
- For “Font Symbols”, the symbol name is also ‘mapinfo-sym-##’ where ‘##’ is the symbol number in the font. In this case, the name of the font itself is ignored by MapServer.
- MapInfo also supports “custom symbols” (bitmap symbols)... I’m not sure what you would get from OGR for this, but I’m pretty sure that MapServer doesn’t do anything useful with them.

The OGRINFO utility can be used to find out exactly which symbol names OGR will return to MapServer. Look at the “Style” string in the ogrinfo output for each shape that is read.

8.1.17 Oracle Spatial

Author Bart van den Eijnden

Last Updated 2005/12/12

Table of Contents

- Oracle Spatial
 - What MapServer 5.2 with Oracle Spatial
 - Binaries
 - Installation
 - Two options for using Oracle Spatial with MapServer
 - Mapfile syntax for native Oracle Spatial support
 - Using subselects in the DATA statement
 - Additional keywords - [FUNCTION]
 - Additional keywords - [VERSION]
 - More information
 - Example of a *LAYER*
 - *Mapfile* syntax for OGR Oracle Spatial support

Oracle Spatial is a spatial cartridge for the Oracle database. Remember that all Oracle databases come with Locator, which has less features than Oracle Spatial. The differences between Locator and Spatial can be found in the [Oracle Spatial FAQ](#).

You can also see the original [OracleSpatial wiki page](#) that this document was based on.

What MapServer 5.2 with Oracle Spatial

- mode=map
- query modes: query, nquery, itemnquery
- *MapScript* query functions such as querybyattributes
- *OGC:WMS*: GetCapabilities, GetMap, GetFeatureInfo, DescribeLayer
- *OGC:WFS*, GetCapabilities, DescribeFeatureType, GetFeature

Binaries

MapServer Windows plugins with Oracle spatial support can be downloaded from [MS4W](#). But you need Oracle client software in the server on which you are running MapServer. Oracle client software can be obtained for development purposes from the Oracle website, but you need to register, which by the way is free. The most recent version is Oracle Database 10g Release 1 Client. The ORACLE TECHNOLOGY NETWORK DEVELOPMENT LICENSE AGREEMENT applies to this software. The instant client will be satisfactory, and you can download the [instant client](#). Make sure though your MapServer is compiled against the same version as your Oracle client, for compiling you need a full client install, not just the instant client.

Installation

See [Oracle Installation](#) for more configuration and installation information for MapServer's native Oracle support

Note: If you receive error messages like “Error: .”. It’s likely related to MapServer being unable access or locate the ORACLE_HOME.

Two options for using Oracle Spatial with MapServer

Oracle Spatial layers in MapServer can be used through 2 interfaces:

- The native built-in support through maporaclespatial.c
- OGR, but watch out: OGR is not compiled with Oracle Spatial support so it won’t work without compiling in OCI (Oracle client) yourself. This requires both recompiling GDAL/OGR as well as recompiling MapServer itself against the new GDAL/OGR !!!!

Mapfile syntax for native Oracle Spatial support

The DATA statement for a LAYER of CONNECTIONTYPE oraclespatial can now have 4 options. This change is backwards compatible, i.e. the old ways of specifying DATA still work. The new options are an extension to the old DATA statements, as they needed to include identification of the primary key to be used for the query modes (UNIQUE).

The following options are valid DATA statements:

```
"[geom_column]
FROM
[table] | [(
    SELECT [...]
    FROM [table] | [Spatial Operator]
    [WHERE condition] )
[USING [UNIQUE column]
    | [SRID #srid]
    | [FUNCTION]
    | [VERSION #version]
] "
```

Example 1

The most simple DATA statement, in this case you only need to define one geometry column and one table. This option assumes you do not have an SRID defined.

```
LAYER
  ...
  CONNECTIONTYPE oraclespatial
  DATA "MYGEOMETRY FROM MYTABLE"
  ...
END
```

Example 2

It's composed of the first option plus the USING UNIQUE parameter. These new features are necessary when you want to use any query function. When it is used you must pass a numeric column type. This option assumes you do not have an SRID defined.

```
LAYER
  ...
  CONNECTIONTYPE oraclespatial
  DATA "MYGEOMETRY FROM MYTABLE USING UNIQUE MYTABLE_ID"
  ...
END
```

Example 3

This option is an extension to the first option. In this mode you must define the USING SRID parameter when the SRID value in your data is different from NULL.

```
LAYER
  ...
  CONNECTIONTYPE oraclespatial
  DATA "MYGEOMETRY FROM MYTABLE USING SRID 90112"
  ...
END
```

Example 4

This option is a combination of examples 2 and 3.

```
LAYER
  ...
  CONNECTIONTYPE oraclespatial
  DATA "MYGEOMETRY FROM MYTABLE USING UNIQUE MYTABLE_ID SRID 90112"
  ...
END
```

Using subselects in the DATA statement

It is possible to define the source of the date as a subselect and not only as a table. As source of data, used in FROM token, you can define any SQL, table, function, or operator that returns a SDO_GEOMETRY. For example:

```
DATA "[geom_column] FROM (SELECT [columns] FROM [table] | [Spatial function])"
```

If the LAYER definition contains a CLASSITEM, LABELITEM or FILTER, it is necessary that the fields used are returned by the query. When you define CLASSITEM you can use an expression without any problems.

Additional keywords - [FUNCTION]

You can add three keywords to the DATA statement for [FUNCTION] option that influence the query which will be executed in Oracle:

USING FILTER

```
"[geom_column] FROM [table] | ([Subselect]) USING FILTER"
```

Using this keyword triggers MapServer to use the Oracle Spatial SDO_FILTER operator. This operator executes only the Oracle Spatial primary filter over your query data. In the Oracle User guide they explain: The primary filter compares geometric approximations, it returns a superset of exact result. The primary filter therefore should be as efficient (that is, selective yet fast) as possible. This operator uses the spatial index, so you need to define your spatial index correctly to retrieve an exact result. If the result of the query is not exact you can try the next option.

USING RELATE

```
"[geom_column] FROM [table] | ([Subselect]) USING RELATE"
```

Using this keyword triggers MapServer to use the Oracle Spatial SDO_RELATE operator. This operator applies the primary and secondary Oracle Spatial filters. It's performance can be slightly slow but the result is extremely correct. You can use this mode when you want a perfect result or when you can't readjust the spatial index.

USING GEOMRELATE

```
"[geom_column] FROM [table] | ([Subselect]) USING GEOMRELATE"
```

Using this keyword triggers MapServer to use the geometry function SDO_GEOM.RELATE, a function that searches the relations between geometries. SDO_GEOM.RELATE does not use the spatial index and your performance is more slow than operators but it's very accurate. You can use this mode when you can't use the spatial index or when it doesn't exist.

USING NONE

```
"[geom_column] FROM [table] | ([Subselect]) USING NONE"
```

Using this keyword triggers MapServer to don't use any geometry function or spatial operator. So, the internal SQL don't restrict, bases in the extent, the data from source. All the data from source will be returned for MapServer. The NONE token is very useful when the source of the data don't contains any spatial index. It's usually occur when the source is a function like SDO_BUFFER, SDO_XOR, SDO_INTERSECTION..... So this mode is recommended when you can't use the spatial index or when it doesn't exist.

Additional keywords - [VERSION]

You can define what version of database you are using to improve the internal sql. This is very useful when using geodetic SRIDs and MapServer functions that retrieve the extent from data.

USING VERSION 8i

```
"[geom_column] FROM [table] | ([Subselect]) USING VERSION 8i"
```

This indicates MapServer to use a internal SQL that it's compatible with Oracle 8i version.

USING VERSION 9i

```
"[geom_column] FROM [table] | ([Subselect]) USING VERSION 9i"
```

The second indicates MapServer to use 9i version, is recommended to use this parameter if you are using 9i version because the internal SQL will use specific spatial functions that is need to retrieve data correctly from 9i Oracle Spatial versions.

USING VERSION 10g

```
"[geom_column] FROM [table] | ([Subselect]) USING VERSION 10g"
```

This indicates MapServer to use a internal SQL that it's compatible with Oracle 10g version.

More information

- You can define any *PROJECTION* to your *LAYER* without problem, can be used for data with or without an SRID in Oracle.
- The native support for Oracle Spatial supports the defaults definition for SDO_GEOmetry in database, the Oracle Spatial SDO package.
- Information about the primary and secondary Oracle Spatial filters can be found in the Oracle Spatial User Guide (the “Query Model” section). Information about the SDO_FILTER and SDO_RELATE operators can be found in the “Spatial Operators” section, and information about the SDO_Geom.RELATE function can be found in the “Geometry Function” section of the Oracle Spatial User Guide.

Example of a *LAYER*

```
LAYER
  NAME kwadranten
  TYPE POLYGON
  CONNECTIONTYPE oraclespatial
  CONNECTION "user/pwd"
  DATA "GEOMETRIE FROM KWADRANTEN USING SRID 90112"
  CLASS
    STYLE
      OUTLINECOLOR 0 0 0
      COLOR 0 128 128
    END
  END
END
```

You can specify the SID for your database, the SID alias needs to be supplied in the tnsnames.ora file of the Oracle client, e.g.

Example for tnsnames.ora:

```

MYDB =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP) (HOST = server_ip) (PORT = 1521))
    )
    (CONNECT_DATA =
      (SERVICE_NAME = DB1)
    )
  )
)

```

So after this you can define your layer connection as:

```
CONNECTION "user/pwd@MYDB"
```

Mapfile syntax for OGR Oracle Spatial support

Syntax for your MAP file:

```

CONNECTION "OCI:user/pwd@service"
CONNECTIONTYPE OGR
DATA "Tablename"

```

Note: Make sure you set the wms_extent METADATA for the LAYER, as otherwise the “Getcapabilities” request takes a lot of time.

8.1.18 PostGIS/PostgreSQL

Table of Contents

- PostGIS/PostgreSQL
 - PostGIS/PostgreSQL
 - Data Access /Connection Method
 - OGRINFO Examples
 - Mapfile Example
 - Support for SQL/MM Curves
 - * Example#1: CircularString in MapServer
 - * Example#2: CompoundCurve in MapServer
 - * Example#3: CurvePolygon in MapServer
 - * Example#4: MultiCurve in MapServer
 - * Example#5: MultiSurface in MapServer
 - * Using MapServer < 6.0

PostGIS/PostgreSQL

PostGIS spatially enables the Open Source PostgreSQL database.

The [PostGIS](#) wiki page may include additional information.

Data Access /Connection Method

PostGIS is supported directly by MapServer and must be compiled into MapServer to work.

The PostgreSQL client libraries (libpq.so or libpq.dll) must be present in the system's path environment for functionality to be present.

The CONNECTIONTYPE parameter must be set to POSTGIS.

The CONNECTION parameter is used to specify the parameters to connect to the database. CONNECTION parameters can be in any order. Most are optional. dbname is required. user is required. host defaults to localhost, port defaults to 5432 (the standard port for PostgreSQL).

The DATA parameter is used to specify the data used to draw the map. The form of DATA is “[geometry_column] from [table_name|sql_subquery] using unique [unique_key] using srid=[spatial_reference_id]”. The “using unique” and “using srid=” clauses are optional when drawing features, but using them improves performance. If you want to make MapServer query calls to a PostGIS layer, your DATA parameter must include “using unique”. Omitting it will cause the query to fail.

Here is a simple generic example:

```
CONNECTIONTYPE POSTGIS
CONNECTION "host=yourhostname dbname=yourdatabasename user=yourdbusername
            password=yourdbpassword port=yourpgport"
DATA "geometrycolumn from yourtablename"
```

This example shows specifying the unique key and srid in the DATA line:

```
CONNECTIONTYPE POSTGIS
CONNECTION "dbname=yourdatabasename user=yourdbusername"
DATA "the_geom from the_database using unique gid using srid=4326"
```

This example shows using a SQL subquery to perform a join inside the database and map the result in MapServer. Note the “as subquery” string in the statement – everything between “from” and “using” is sent to the database for evaluation:

```
CONNECTIONTYPE POSTGIS
CONNECTION "dbname=yourdatabasename user=yourdbusername"
DATA "the_geom from (select g.gid, g.the_geom, a.attr1, a.attr2 from
           geotable g join attrtable a on g.gid = a.aid) as subquery
           using unique gid using srid=4326"
```

This example shows using a geometry function and database sort to limit the number of features and vertices returned to MapServer:

```
CONNECTIONTYPE POSTGIS
CONNECTION "dbname=yourdatabasename user=yourdbusername"
DATA "the_geom from (select g.gid, ST_Simplify(g.the_geom, 10.0) as
           the_geom from geotable g order by ST_Area(g.the_geom) desc
           limit 10) as subquery using unique gid using srid=4326"
```

This example shows the use of the !BOX! substitution string to over-ride the default inclusion of the map bounding box in the SQL. By default the spatial box clause is appended to the SQL in the DATA clause, but you can use !BOX! to insert it anywhere you like in the statement. In general, you won't need to use !BOX!, because the PostgreSQL planner will generate the optimal plan from the generated SQL, but in some cases (complex sub-queries) a better plan can be generated by placing the !BOX! closer to the middle of the query:

```
CONNECTIONTYPE POSTGIS
CONNECTION "dbname=yourdatabasename user=yourdbusername"
DATA "the_geom from (select g.gid, ST_Union(g.the_geom, 10.0) as
```

```
the_geom from geotable g where ST_Intersects(g.geom, !BOX!) ) as
subquery using unique gid using srid=4326"
```

OGRINFO Examples

OGRINFO can be used to read out metadata about PostGIS tables directly from the database.

First you should make sure that your GDAL/OGR build contains the PostgreSQL driver, by using the ‘–formats’ command:

```
>ogrinfo --formats
Loaded OGR Format Drivers:
...
-> "PGeo" (readonly)
-> "PostgreSQL" (read/write)
-> "MySQL" (read/write)
...
```

If you don’t have the driver, you might want to try the [FWTools](#) or [MS4W](#) packages, which include the driver.

Once you have the driver you are ready to try an ogrinfo command on your database to get a list of spatial tables:

```
>ogrinfo PG:"host=127.0.0.1 user=postgres password=postgres dbname=canada port=5432"
      using driver 'PostgreSQL' successful.
1: province (Multi Polygon)
```

Now use ogrinfo to get information on the structure of the spatial table:

```
>ogrinfo PG:"host=127.0.0.1 user=postgres password=postgres dbname=canada port=5432"
      province -summary
INFO: Open of 'PG:host=127.0.0.1 user=postgres password=postgres dbname=canada'
      using driver 'PostgreSQL' successful.

Layer name: province
Geometry: Multi Polygon
Feature Count: 1068
Extent: (-2340603.750000, -719746.062500) - (3009430.500000, 3836605.250000)
Layer SRS WKT:
(unknown)
FID Column = gid
Geometry Column = the_geom
area: Real (0.0)
island: String (30.0)
island_e: String (30.0)
island_f: String (30.0)
name: String (30.0)
...
...
```

Mapfile Example

```
LAYER
  NAME "province"
  STATUS ON
  TYPE POLYGON
  CONNECTIONTYPE POSTGIS
  CONNECTION "host=127.0.0.1 port=5432 dbname=canada user=postgres password=postgres"
  DATA "the_geom from province"
```

```
CLASS
  ...
END
END
```

For more info about PostGIS and MapServer see the PostGIS docs: <http://postgis.org/documentation/>

Support for SQL/MM Curves

PostGIS is able to store circular interpolated curves, as part of the SQL Multimedia Applications Spatial specification (read about the [SQL/MM specification](#)).

For more information about PostGIS' support, see the *SQL-MM Part 3* section in the PostGIS documentation, such as [here](#).

As of MapServer 6.0, the PostGIS features CircularString, CompoundCurve, CurvePolygon, MultiCurve, and Multi-Surface can be drawn through MapServer directly.

Example#1: CircularString in MapServer

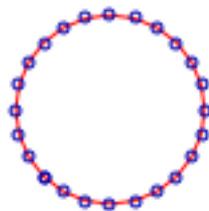
The following is the Well Known Text of the feature loading into PostGIS:

```
INSERT INTO test ( g, id ) VALUES ( ST_GeomFromText('CIRCULARSTRING(0 0,
 4 0, 4 4, 0 4, 0 0)', -1), 2 );
```

An example MapServer layer might look like:

```
LAYER
  NAME "curves_poly"
  STATUS DEFAULT
  TYPE POLYGON
  CONNECTIONTYPE postgis
  CONNECTION "user=postgres password=postgres dbname=curves host=localhost port=5432"
  DATA "g from test using SRID=-1 using unique id"
  CLASS
    STYLE
      COLOR 128 128 128
      ANTIALIAS true
    END
  END
END
```

And testing with *shp2img* should produce a map image of:



Example#2: CompoundCurve in MapServer

The following is the Well Known Text of the feature loading into PostGIS:

```
INSERT INTO test ( g, id ) VALUES ( ST_GeomFromText('COMPOUNDCURVE(
    CIRCULARSTRING(0 0, 1 1, 1 0),(1 0, 0 1))', -1), 3);
```

An example MapServer layer might look like:

```
LAYER
  NAME "curves_poly"
  STATUS DEFAULT
  TYPE POLYGON
  CONNECTIONTYPE postgis
  CONNECTION "user=postgres password=postgres dbname=curves host=localhost port=5432"
  DATA "g from test using SRID=-1 using unique id"
  CLASS
    STYLE
      COLOR 128 128 128
      ANTIALIAS true
    END
  END
END
```

And testing with [shp2img](#) should produce a map image of:



Example#3: CurvePolygon in MapServer

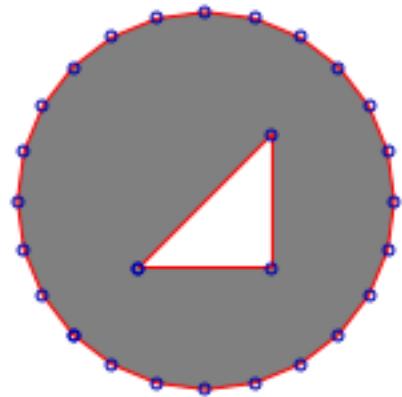
The following is the Well Known Text of the feature loading into PostGIS:

```
INSERT INTO test ( g, id ) VALUES ( ST_GeomFromText('CURVEPOLYGON(
    CIRCULARSTRING(0 0, 4 0, 4 4, 0 4, 0 0),(1 1, 3 3,
    3 1, 1 1))', -1), 4);
```

An example MapServer layer might look like:

```
LAYER
  NAME "curves_poly"
  STATUS DEFAULT
  TYPE POLYGON
  CONNECTIONTYPE postgis
  CONNECTION "user=postgres password=postgres dbname=curves host=localhost port=5432"
  DATA "g from test using SRID=-1 using unique id"
  CLASS
    STYLE
      COLOR 128 128 128
      ANTIALIAS true
    END
  END
END
```

And testing with *shp2img* should produce a map image of:



Example#4: MultiCurve in MapServer

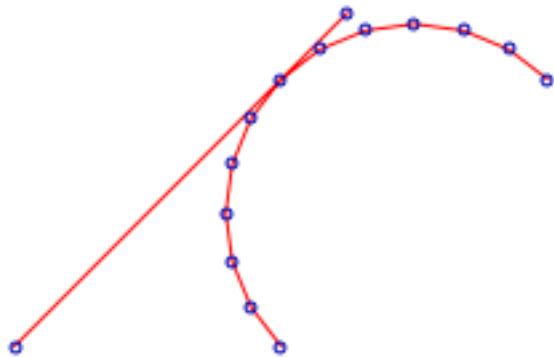
The following is the Well Known Text of the feature loading into PostGIS:

```
INSERT INTO test ( g, id ) VALUES ( ST_GeomFromText('MULTICURVE((0 0,
      5 5),CIRCULARSTRING(4 0, 4 4, 8 4))', -1), 6);
```

An example MapServer layer might look like:

```
LAYER
  NAME "curves_poly"
  STATUS DEFAULT
  TYPE POLYGON
  CONNECTIONTYPE postgis
  CONNECTION "user=postgres password=postgres dbname=curves host=localhost port=5432"
  DATA "g from test using SRID=-1 using unique id"
  CLASS
    STYLE
      COLOR 128 128 128
      ANTIALIAS true
    END
  END
END
```

And testing with *shp2img* should produce a map image of:



Example#5: MultiSurface in MapServer

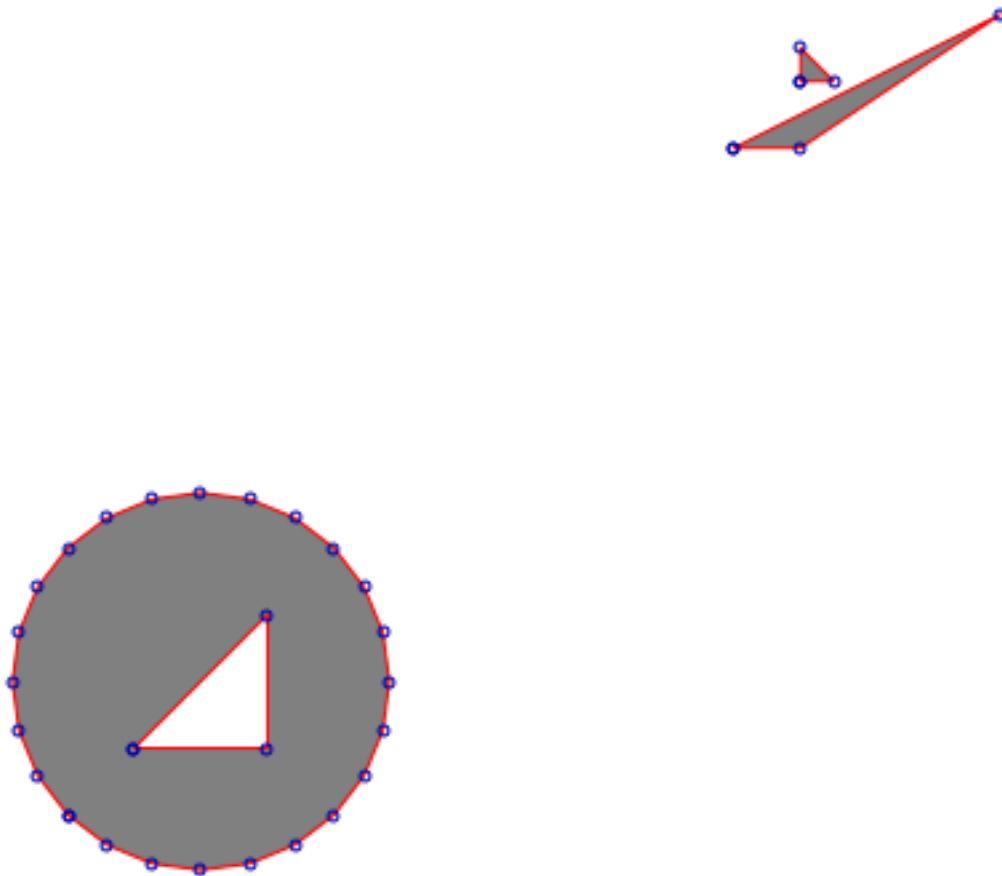
The following is the Well Known Text of the feature loading into PostGIS:

```
INSERT INTO test ( g, id ) VALUES ( ST_GeomFromText('MULTISURFACE(
    CURVEPOLYGON(CIRCULARSTRING(0 0, 4 0, 4 4, 0 4,
    0 0),(1 1, 3 3, 3 1, 1 1)),((10 10, 14 12, 11 10,
    10 10),(11 11, 11.5 11, 11 11.5, 11 11)))', -1), 7);
```

An example MapServer layer might look like:

```
LAYER
  NAME "curves_poly"
  STATUS DEFAULT
  TYPE POLYGON
  CONNECTIONTYPE postgis
  CONNECTION "user=postgres password=postgres dbname=curves host=localhost port=5432"
  DATA "g from test using SRID=-1 using unique id"
  CLASS
    STYLE
      COLOR 128 128 128
      ANTIALIAS true
    END
  END
END
```

And testing with *shp2img* should produce a map image of:



Using MapServer < 6.0

If you cannot upgrade to MapServer 6.0, then you can use the PostGIS function *ST_CurveToLine()* in your MapServer LAYER to draw the curves (note that this is much slower however):

```
LAYER
  NAME "curves_poly"
  STATUS DEFAULT
  TYPE POLYGON
  CONNECTIONTYPE postgis
  CONNECTION "user=postgres password=postgres dbname=curves host=localhost port=5432"
  DATA "wkb_geometry from (select c.id, ST_CurveToLine(c.g) as
    wkb_geometry from c) as subquery using
    unique id using SRID=-1"
  CLASS
    STYLE
      COLOR 128 128 128
      ANTIALIAS true
    END
  END
END
```

8.1.19 SDTS

This is a United States Geological Survey (USGS) format. SDTS has a raster and a vector format. The raster format is not supported in MapServer. Only the vector formats are supported, including VTP and DLG files.

File listing

- SDTS files are often organized into state-sized pieces. For example, all of the state of Maryland (MD), U.S.A.
- Files are also available for multiple types of features including hydrography, transportation and administrative boundaries.

This example uses transportation data, which consists of 35 separate files, each with the suffix DDF:

```
MDTRAHDR.DDF MDTRARRF.DDF MDTRCATS.DDF
MDTRDQCG.DDF MDTRFF01.DDF MDTRL02.DDF
MDTRNA03.DDF MDTRNO03.DDF MDTRSPDM.DDF
MDTRAMTF.DDF MDTRBFPS.DDF MDTRCATX.DDF
MDTRDQHL.DDF MDTRIDEN.DDF MDTRLE03.DDF
MDTRNE03.DDF MDTRPC01.DDF MDTRSTAT.DDF
MDTRARDF.DDF MDTRBMTA.DDF MDTRDDSH.DDF
MDRDQLC.DDF MDTRIREF.DDF MDTRNA01.DDF
MDTRNO01.DDF MDTRPC02.DDF MDTRXREF.DDF
MDTRARDM.DDF MDTRCATD.DDF MDTRDQAA.DDF
MDTRDQPA.DDF MDTRLE01.DDF MDTRNA02.DDF
MDTRNO02.DDF MDTRPC03.DDF
```

Data Access / Connection Method

- SDTS access is available in MapServer through OGR.
- The CONNECTIONTYPE OGR parameter must be used.
- The path (which can be relative) to the catalog file (????CATD.DDF) is required, including file extension.
- There are multiple layers in the SDTS catalog, some of which are only attributes and have no geometries.
- The layer name is specified with the DATA parameter

OGRINFO Examples

Using ogrinfo on a catalog file (note that the first 7 layers do not have geometries):

```
> ogrinfo /data/sdts/MD/MDTRCATD.DDF
Had to open data source read-only.
INFO: Open of 'MDTRCATD.DDF'
using driver 'SDTS' successful.
1: ARDF (None)
2: ARRF (None)
3: AMTF (None)
4: ARDM (None)
5: BFPS (None)
6: BMTA (None)
7: AHDR (None)
8: NE03 (Point)
9: NA01 (Point)
10: NA02 (Point)
```

```
11: NA03 (Point)
12: NO01 (Point)
13: NO02 (Point)
14: NO03 (Point)
15: LE01 (Line String)
16: LE02 (Line String)
17: LE03 (Line String)
18: PC01 (Polygon)
19: PC02 (Polygon)
20: PC03 (Polygon)
```

Using ogrinfo to examine the structure of the file/layer:

```
> ogrinfo /data/sdts/MD/MDTRCATD.DDF LE01 -summary
Had to open data source read-only.
INFO: Open of 'MDTRCATD.DDF'
using driver 'SDTS' successful.

Layer name: LE01
Geometry: Line String
Feature Count: 780
Extent: (-80.000289, 36.999774) - (-74.999711, 40.000225)
Layer SRS WKT:
  GEOGCS["NAD27",
    DATUM["North_American_Datum_1927",
      SPHEROID["Clarke 1866",6378206.4,294.978698213901]],
    PRIMEM["Greenwich",0],
    UNIT["degree",0.0174532925199433]]
  RCID: Integer (0.0)
  SNID: Integer (0.0)
  ENID: Integer (0.0)
  ENTITY_LABEL: String (7.0)
  ARBITRARY_EXT: String (1.0)
  RELATION_TO_GROUND: String (1.0)
  VERTICAL_RELATION: String (1.0)
  OPERATIONAL_STATUS: String (1.0)
  ACCESS_RESTRICTION: String (1.0)
  OLD_RAILROAD_GRADE: String (1.0)
  WITH_RAILROAD: String (1.0)
  COVERED: String (1.0)
  HISTORICAL: String (1.0)
  LIMITED_ACCESS: String (1.0)
  PHOTOREVISED: String (1.0)
  LANES: Integer (2.0)
  ROAD_WIDTH: Integer (3.0)
  BEST_ESTIMATE: String (1.0)
  ROUTE_NUMBER: String (7.0)
  ROUTE_TYPE: String (9.0)
```

Map File Example:

```
LAYER
  NAME sdts_maryland
  TYPE LINE
  CONNECTIONTYPE OGR
  CONNECTION "data/sdts/MD/MDTRCATD.DDF"
  DATA "LE01"
  STATUS DEFAULT
  CLASS
```

```

STYLE
  COLOR 0 0 0
END
END
END

```

8.1.20 S57

Also known as S57. The IHO S-57 format is a vector interchange format used for maritime charts. It was developed by the International Hydrographic Organisation (IHO). For more information about the IHO see: <http://www.ihoshom.fr/>

File listing

Individual S57 data files have an extension of *.000. For example:

US1BS02M.000

Data Access / Connection Method

- S57 access in MapServer occurs through OGR, CONNECTIONTYPE OGR must be used.
- Specify a full path or a relative path from the SHAPEPATH to the .000 file for the CONNECTION
- Use the DATA parameter to specify the s57 layer name

Special Notes

The underlying OGR code requires two files from your GDAL/OGR installation when reading S57 data in MapServer : s57objectclasses.csv and s57attributes.csv. These files can be found in the /GDAL/data/ folder (unix: /usr/local/share/gdal windows: /ms4w/gdaldatal). If you receive an error in MapServer such as:

```
msDrawMap(): Image handling error. Failed to draw layer named 's57'.
msOGRFileOpen(): OGR error. xxx failed for OGR connection
```

you may have to point MapServer to these files using the CONFIG parameter in the main section of your map file:

```
CONFIG GDAL_DATA "C:\ms4w\gdaldatal"
```

OGRINFO Examples

Using ogrinfo on an S57 file to get the layer name:

```
> ogrinfo us1bs02m.000
ERROR 4: S57 Driver doesn't support update.
Had to open data source read-only.
INFO: Open of 'us1bs02m.000'
using driver 'IHO S-57 (ENC)' successful.
1: ADMARE (Polygon)
2: CBLSUB (Line String)
3: CTNARE
4: COALNE (Line String)
5: DEPARE
6: DEPCNT (Line String)
```

```
7: LNDARE
8: LNDELV
9: LNDRGN
10: LNDMRK
11: LIGHTS (Point)
12: OBSTRN
13: RDOSTA (Point)
14: SEAARE
15: SBDARE
16: SLCONS
17: SOUNDG (Multi Point)
18: UWTROC (Point)
19: WATTUR
20: WRECKS
21: M_COVR (Polygon)
22: M_NPUB (Polygon)
23: M_NSYS (Polygon)
24: M_QUAL (Polygon)
25: C_ASSO (None)
```

Using ogrinfo to examine the structure of an S57 layer:

```
> ogrinfo us1bs02m.000 DEPARE -summary
ERROR 4: S57 Driver doesn't support update.
Had to open data source read-only.
INFO: Open of 'us1bs02m.000'
using driver 'IHO S-57 (ENC)' successful.

Layer name: DEPARE
Geometry: Unknown (any)
Feature Count: 297
Extent: (165.666667, 48.500000) - (180.000000, 60.750000)
Layer SRS WKT:
  GEOGCS["WGS 84",
    DATUM["WGS_1984",
      SPHEROID["WGS 84", 6378137, 298.257223563]],
    PRIMEM["Greenwich", 0],
    UNIT["degree", 0.0174532925199433]]
  GRUP: Integer (3.0)
  OBJL: Integer (5.0)
  RVER: Integer (3.0)
  AGEN: Integer (2.0)
  FIDN: Integer (10.0)
  FIDS: Integer (5.0)
  LNAM: String (16.0)
  LNAM_REF: StringList (16.0)
  DRVAL1: Real (0.0)
  DRVAL2: Real (0.0)
  QUASOU: String (0.0)
  SOUACC: Real (0.0)
  VERDAT: Integer (0.0)
  INFORM: String (0.0)
  NINFOM: String (0.0)
  NTXTDS: String (0.0)
  SCAMAX: Integer (0.0)
  SCAMIN: Integer (0.0)
  TXTDSC: String (0.0)
  RECDAT: String (0.0)
  RECIND: String (0.0)
```

...

Map File Example:

```
LAYER
  NAME s57
  TYPE POLYGON
  STATUS DEFAULT
  CONNECTIONTYPE OGR
  CONNECTION "./s57/us1bs02m.000"
  DATA "DEPARE"
  CLASS
    STYLE
      COLOR 247 237 219
      OUTLINECOLOR 120 120 120
    END
  END
END # Layer
```

8.1.21 SpatiaLite

SpatiaLite spatially enables the file-based SQLite database. For more information see the [SpatiaLite description page](#).

File listing

Similar to other database formats, the .sqlite file consists of several tables. The geometry is held in a BLOB table column.

Data Access / Connection Method

Spatialite access is available through OGR. See the [OGR driver page](#) for specific driver information. The driver is available in GDAL/OGR version 1.7.0 or later.

OGR uses the names of spatial tables within the SpatiaLite database (tables with a geometry column that are registered in the `geometry_columns` table) as layers.

The CONNECTION parameter must include the sqlite extension, and the DATA parameter should be the name of the spatial table (or OGR layer).

```
CONNECTIONTYPE OGR
CONNECTION "spatialite_db.sqlite"
DATA "layername"
```

OGRINFO Examples

First you should make sure that your GDAL/OGR build contains the spatialite “SQLite” driver, by using the ‘–formats’ command:

```
>ogrinfo --formats
Loaded OGR Format Drivers:
...
-> "GMT" (read/write)
-> "SQLite" (read/write)
-> "ODBC" (read/write)
...
```

If you don't have the driver, you might want to try the [MS4W](#) or [OSGeo4W](#) packages, which include the driver.

Once you have confirmed that you have the SQLite driver you are ready to try an ogrinfo command on your database to get a list of spatial tables:

```
>ogrinfo counties.sqlite
INFO: Open of 'counties.sqlite'
using driver 'SQLite' successful.
1: mn_counties (Polygon)
```

Now use ogrinfo to get information on the structure of the spatial table:

```
>ogrinfo counties.sqlite county -summary
INFO: Open of 'counties.sqlite'
using driver 'SQLite' successful.

Layer name: mn_counties
Geometry: Polygon
Feature Count: 87
Extent: (189783.560000, 4816309.330000) - (761653.524114, 5472346.500000)
Layer SRS WKT:
PROJCS["NAD83 / UTM zone 15N",
    GEOGCS["NAD83",
        DATUM["North_American_Datum_1983",
            SPHEROID["GRS 1980", 6378137, 298.257222101,
                AUTHORITY["EPSG", "7019"]],
            TOWGS84[0, 0, 0, 0, 0, 0, 0],
                AUTHORITY["EPSG", "6269"]],
        PRIMEM["Greenwich", 0,
            AUTHORITY["EPSG", "8901"]],
        UNIT["degree", 0.0174532925199433,
            AUTHORITY["EPSG", "9122"]],
            AUTHORITY["EPSG", "4269"]],
        UNIT["metre", 1,
            AUTHORITY["EPSG", "9001"]],
        PROJECTION["Transverse_Mercator"],
        PARAMETER["latitude_of_origin", 0],
        PARAMETER["central_meridian", -93],
        PARAMETER["scale_factor", 0.9996],
        PARAMETER["false_easting", 500000],
        PARAMETER["false_northing", 0],
        AUTHORITY["EPSG", "26915"],
        AXIS["Easting", EAST],
        AXIS["Northing", NORTH]]
FID Column = PK_UID
Geometry Column = Geometry
AREA: Real (0.0)
PERIMETER: Real (0.0)
COUNTY_ID: Integer (0.0)
FIPS: String (0.0)
...
...
```

Mapfile Example

Standard connection

```
LAYER
  NAME my_counties_layer
  TYPE POLYGON
  CONNECTIONTYPE ogr
  CONNECTION "counties.sqlite"
  DATA "mn_counties"
  STATUS ON
  CLASS
    NAME "mncounties"
    STYLE
      COLOR 255 255 120
    END
  END
END
```

Connection utilizing SQL syntax

```
LAYER
  NAME my_counties_layer
  TYPE POLYGON
  CONNECTIONTYPE OGR
  CONNECTION "counties.sqlite"
  DATA "select geometry from mn_counties"
  STATUS ON
  CLASS
    NAME "mncounties"
    STYLE
      COLOR 255 255 120
    END
  END
END
```

Connection utilizing joined table for additional attributes

```
LAYER
  NAME my_counties_layer
  TYPE POLYGON
  CONNECTIONTYPE OGR
  CONNECTION "counties.sqlite"
  DATA "SELECT mn.geometry, c.fips FROM mn_counties mn inner
        join county_data c on mn.county_id = c.county_id"
  STATUS ON
  CLASS
    NAME "mncounties"
    STYLE
      COLOR 255 255 120
    END
  END
END
```

Standard Connection with a filter

```
LAYER
  NAME my_counties_layer
  TYPE POLYGON
  CONNECTIONTYPE OGR
  CONNECTION "counties.sqlite"
  DATA "mn_counties"
  FILTER ('[fips]' = '27031')
  STATUS ON
  CLASS
    NAME "mncounties"
    STYLE
      COLOR 255 255 120
    END
  END
END
```

Filter utilizing SQL syntax

```
LAYER
  NAME my_counties_layer
  TYPE POLYGON
  CONNECTIONTYPE OGR
  CONNECTION "counties.sqlite"
  DATA "select geometry from mn_counties where fips = '27031'"
  STATUS ON
  CLASS
    NAME "mncounties"
    STYLE
      COLOR 255 255 120
    END
  END
END
```

8.1.22 USGS TIGER

TIGER/Line files are created by the US Census Bureau and cover the entire US. They are often referred simply as TIGER files. For more information see: <http://www.census.gov/geo/www/tiger/>.

File listing

TIGER/Line files are text files and directory-based data sources. For example, one county folder TGR06059 contains several associated files:

```
TGR06059.RT1 TGR06059.RT2 TGR06059.RT4 TGR06059.RT5
TGR06059.RT6 TGR06059.RT7 TGR06059.RT8 TGR06059.RTA
TGR06059.RTC TGR06059.RTH TGR06059.RTI TGR06059.RTP
TGR06059.RTR TGR06059.RTS TGR06059.RTT TGR06059.RTZ
```

Data Access / Connection Method

- TIGER/Line access occurs through an OGR CONNECTION

- The full path to the directory containing the associated files is required in the CONNECTION string.
- The feature type is specified in the DATA parameter

OGRINFO Examples

Using ogrinfo on a TIGER directory to retrieve feature types:

```
> ogrinfo TGR06059 (NOTE that this is a directory)
ERROR 4: Tiger Driver doesn't support update.
Had to open data source read-only.
INFO: Open of 'TGR06059'
using driver 'TIGER' successful.
1: CompleteChain (Line String)
2: AltName (None)
3: FeatureIds (None)
4: ZipCodes (None)
5: Landmarks (Point)
6: AreaLandmarks (None)
7: Polygon (None)
8: PolygonCorrections (None)
9: EntityNames (Point)
10: PolygonEconomic (None)
11: IDHistory (None)
12: PolyChainLink (None)
13: PIP (Point)
14: TLIDRange (None)
15: ZeroCellID (None)
16: OverUnder (None)
17: ZipPlus4 (None)
```

Using ogrinfo to examine the structure of the TIGER feature type CompleteChain:

```
> ogrinfo TGR06059 CompleteChain -summary
ERROR 4: Tiger Driver doesn't support update.
Had to open data source read-only.
INFO: Open of 'TGR06059'
using driver 'TIGER' successful.

Layer name: CompleteChain
Geometry: Line String
Feature Count: 123700
Extent: (-118.125898, 33.333992) - (-117.412987, 33.947512)
Layer SRS WKT:
GEOGCS["NAD83",
DATUM["North_American_Datum_1983",
    SPHEROID["GRS 1980", 6378137, 298.257222101]],
PRIMEM["Greenwich", 0],
UNIT["degree", 0.0174532925199433]]
MODULE: String (8.0)
TLID: Integer (10.0)
SIDE1: Integer (1.0)
SOURCE: String (1.0)
FEDIRP: String (2.0)
FENAME: String (30.0)
FETYPE: String (4.0)
FEDIRS: String (2.0)
CFCC: String (3.0)
```

```
FRADDL: String (11.0)
TOADDL: String (11.0)
FRADDR: String (11.0)
TOADDR: String (11.0)
FRIADDL: String (1.0)
TOIADDL: String (1.0)
FRIADDR: String (1.0)
TOIADDR: String (1.0)
ZIPL: Integer (5.0)
```

Map File Example:

```
LAYER
  NAME Complete_Chain
  TYPE LINE
  STATUS DEFAULT
  CONNECTIONTYPE OGR
  CONNECTION "/path/to/data/tiger/TGR06059"
  DATA "CompleteChain"
  CLASS
    STYLE
      COLOR 153 102 0
    END
  END
END # Layer
```

8.1.23 Vector field rendering - UVraster

Vector fields are used for instance in meteorology to store/display wind direction and magnitude.

The source is two bands of raster data, the first band represents the U component of the vector, and the second band the V component. Using the u,v values at a given location we can compute a rotation and magnitude and use that to draw an arrow of a size proportional to the magnitude and pointing in the direction of the phenomenon (wind, current, etc.)

For more details about vector fields, refer to: [Vector field](#)

A vector field [LAYER](#) is a hybrid layer, which has a raster data source as input and vector features as output. The output features are represented as points. Queries are not supported.

Since the data source is a raster, all raster processing options can be used (e.g. RESAMPLE). RESAMPLE=AVERAGE generally gives a good result, and the default. This can be overridden by explicitly specifying the type of resampling.

Vector field layers are of *TYPE point*, and have *CONNECTIONTYPE uvraster*. The raster data set is specified in *DATA*. The two bands that define the vector field are specified using *PROCESSING BANDS* (U first, V second).

The UVraster connection type offers the following attributes:

- [u]: the raw u value
- [v]: the raw v value
- [uv_angle]: the vector angle
- [uv_minus_angle]: the vector angle - opposite direction
- [uv_length]: the vector length (scaled with the *UV_SIZE_SCALE* optional value)
- [uv_length_2]: half the vector length

Optional *PROCESSING* settings:

- *UV_SPACING*: The spacing is simply the distance, in pixels, between arrows to be displayed in the vector field. Default is 32.
- *UV_SIZE_SCALE*: The uv size scale is used to convert the vector lengths (magnitude) of the raster to pixels for a better rendering. Default is 1.

Example of a layer definition:

```

SYMBOL
  NAME "horizline"
  TYPE VECTOR
  POINTS
    0 0
    1 0
  END # points
END # symbol
SYMBOL
  NAME "arrowhead"
  TYPE vector
  FILLED true
  #ANCHORPOINT 0 0.5
  POINTS
    0 2
    4 1
    0 0
  END # points
END # symbol
SYMBOL
  NAME "arrowtail"
  TYPE vector
  FILLED true
  ANCHORPOINT 1 0.5 # to shift the arrowtail
  POINTS
    0 2
    4 1
    0 0
    -99 -99
    0 1
    4 1
  END # points
END # symbol
LAYER
  NAME "my_uv_test"
  TYPE POINT
  STATUS DEFAULT
  CONNECTIONTYPE uvraster
  DATA /path/window.grab2
  PROCESSING "BANDS=1,2"
  PROCESSING "UV_SPACING=40"
  PROCESSING "UV_SIZE_SCALE=0.2"
  CLASS
    STYLE
      SYMBOL "horizline"
      ANGLE [uv_angle]
      SIZE [uv_length]
      WIDTH 3
      COLOR 100 255 0
    END # style

```

```
STYLE
  SYMBOL "arrowhead"
  ANGLE [uv_angle]
  SIZE 10
  COLOR 255 0 0
  POLAROFFSET [uv_length_2] [uv_angle]
END # style
STYLE
  SYMBOL "arrowtail"
  ANGLE [uv_angle]
  SIZE 10
  COLOR 255 0 0
  POLAROFFSET [uv_length_2] [uv_minus_angle]
END # style
END # class
END # layer
```

New in version 6.2: ([MS RFC 78: Vector Field Rendering \(CONNECTIONTYPE UVRASTER\)](#))

8.1.24 Virtual Spatial Data

Table of Contents

- Virtual Spatial Data
 - Types of Databases
 - Types of Flat Files
 - Steps for Display

This is an OGR extension to MapServer. It allows you to connect to databases that do not explicitly hold spatial data, as well as flat text files. Your data must have an X and a Y column, and the data may be accessed through an ODBC connection or a direct pointer to a text file.

The original [VirtualSpatialData](#) wiki page may contain additional information.

Types of Databases

The VirtualSpatialData OGR extension has been tested with the following databases and should, in theory, support all ODBC data sources.

- Oracle
- MySQL
- SQL Server
- Access
- PostgreSQL

Types of Flat Files

Comma, tab or custom delimited text/flat files work with VirtualSpatialData.

Steps for Display

1. Create the Datasource Name (DSN)

- Specific notes about creating a DSN on Windows and Linux can be found by searching the MapServer reference documents site
- On some Windows systems you must create a SYSTEM DSN.

2. Test your Connection

Test your connection with ogrinfo. The syntax for this command is:

```
> ogrinfo ODBC:user/pass@DSN table
```

Windows users may not be required to specify a user/password, so the syntax would be:

```
> ogrinfo ODBC:@DSN table
```

Example: Accessing a comma separated text file through ODBC using ogrinfo

The following is a snippet of the flat text file coal_dep.txt containing lat/long points:

```
unknown,na,id,id2,mark,coalkey,coalkey2,long,lat
0.000,0.000,1,1,7,87,87,76.90238,51.07161
0.000,0.000,2,2,7,110,110,78.53851,50.69403
0.000,0.000,3,3,3,112,112,83.22586,71.24420
0.000,0.000,4,4,6,114,114,80.79896,73.41175
```

If the DSN name is Data_txt, the ogrinfo command to see a list of applicable files in the directory is:

```
> ogrinfo ODBC:jeff/test@Data_txt
INFO: Open of 'ODBC:jeff/test@Data_txt'
using driver 'ODBC' successful.
1: coal_dep.csv
2: coal_dep.txt
3: coal_dep_nf.txt
4: coal_dep_trim.txt
5: Copy of coal_dep.txt
6: deposit.csv
7: maruia.asc
8: oahuGISbathy.csv
9: oahuGISbathy.txt
10: on_pts.txt
11: on_pts_utm.txt
12: test.txt
13: utm_test.txt
```

Username and password may be optional, so the following may also be valid:

```
> ogrinfo ODBC:@Data_txt
```

Therefore, the command to see more information about one of the specific layers is:

```
> ogrinfo ODBC:@Data_txt coal_dep.txt
INFO: Open of 'ODBC:@Data_txt'
using driver 'ODBC' successful.
```

Layer name: coal_dep.txt

```
Geometry: Unknown (any)
Feature Count: 266
Layer SRS WKT:
(unknown)
UNKNOWN: String (255.0)
NA: String (255.0)
ID: String (255.0)
ID2: String (255.0)
MARK: String (255.0)
COALKEY: String (255.0)
COALKEY2: String (255.0)
LONG: String (255.0)
LAT: String (255.0)
OGRFeature(coal_dep.txt):0
UNKNOWN (String) = 0.000
....
```

3. Create a Virtual Data File

This is a file with an ovf extension and looks like the following:

```
<OGRVRTDataSource>
  <OGRVRTLayer name="mylayer">
    <SrcDataSource>ODBC:user/pass@DSN</SrcDataSource>
    <SrcLayer>tablename</SrcLayer>
    <GeometryType>wkbPoint</GeometryType>
    <LayerSRS>WGS84</LayerSRS>
    <GeometryField encoding="PointFromColumns" x="x" y="y"/>
  </OGRVRTLayer>
</OGRVRTDataSource>
```

More information on ovf files can be found at: http://www.gdal.org/ogr/drv_vrt.html

Example ovf file for coal_dep.txt:

```
<OGRVRTDataSource>
  <OGRVRTLayer name="coal-test">
    <SrcDataSource>ODBC:Data_txt</SrcDataSource>
    <SrcLayer>coal_dep.txt</SrcLayer>
    <GeometryField encoding="PointFromColumns" x="Long" y="Lat"/>
    <GeometryType>wkbPoint</GeometryType>
  </OGRVRTLayer>
</OGRVRTDataSource>
```

4. Test Virtual Data File with ogrinfo

Use ogrinfo to test your new ovf file, such as:

```
> ogrinfo coal.ovf coal-test
ERROR 4: Update access not supported for VRT datasources.
Had to open data source read-only.
INFO: Open of 'myfile.ovf'
using driver 'VRT' successful.
```

```
Layer name: coal_dep.txt
Geometry: Unknown (any)
```

```

Feature Count: 266
Layer SRS WKT:
(unknown)
UNKNOWN: String (255.0)
NA: String (255.0)
ID: String (255.0)
ID2: String (255.0)
MARK: String (255.0)
...

```

5. Mapfile Layer

Using an ovf file your layer may look like:

```

LAYER
  CONNECTION "coal.ovf"
  CONNECTIONTYPE OGR
  DATA "coal-test"
  METADATA
    "wms_srs"      "4326"
    "wms_title"    "coal-test"
  END
  NAME "coal-test"
  SIZEUNITS PIXELS
  STATUS ON
  TOLERANCE 0
  TOLERANCEUNITS PIXELS
  TYPE POINT
  UNITS METERS
  CLASS
    STYLE
      COLOR 255 0 0
      MAXSIZE 100
      MINSIZE 1
      SIZE 6
      SYMBOL "star"
    END
  END
END

```

Or you may specify the ovf contents inline such as:

```

LAYER
  CONNECTION "<OGRVRTDataSource>
<OGRVRTLayer name='coal-test'>
<SrcDataSource>ODBC:@Data_txt</SrcDataSource>
<SrcLayer>coal_dep.txt</SrcLayer>
<GeometryField encoding='PointFromColumns' x='Long' y='Lat' />
<GeometryType>wkbPoint</GeometryType>
</OGRVRTLayer>
</OGRVRTDataSource>"
  CONNECTIONTYPE OGR
  DATA "coal-test"
  METADATA
    "wms_srs"      "4326"
    "wms_title"    "coal-test"
  END

```

```
NAME "coal-test"
SIZEUNITS PIXELS
STATUS ON
TOLERANCE 0
TOLERANCEUNITS PIXELS
TYPE POINT
UNITS METERS
CLASS
    STYLE
        COLOR 255 0 0
        MAXSIZE 100
        MINSIZE 1
        SIZE 6
        SYMBOL "star"
    END
END
END
```

6. Test your Mapfile

The first thing you should try is to use the [shp2img](#) utility:

```
shp2img -m mymapfile.map -o test.png
```

Once you successfully created a map image, then try your application. Note Windows users may come across a problem where shp2img works but their application throws an error similar to this:

```
Warning: [MapServer Error]: msOGRFileOpen(): Open failed for OGR connection 'coal.ovf'.
Unable to initialize ODBC connection to DSN for jeff/test@Data_txt,
[Microsoft] [ODBC Driver Manager] Data source name not found
and no default driver specified in D:\ms4w\Apache\htdocs\quickmap.php on line 40
```

If that happens you should make sure you have created a System DSN.

8.1.25 WFS

WFS is an Open Geospatial Consortium (OGC) specification. For more information about the format itself, see: <http://www.opengeospatial.org/standards/wfs>

WFS allows a client to retrieve geospatial data encoded in Geography Markup Language (GML) from multiple Web Feature Services. GML is built on the standard web language XML.

WFS differs from the popular Web Map Service (WMS) specification in that WFS returns a subset of the data in valid GML format, not just a graphic image of data.

Capabilities

Requesting the capabilities using the GetCapabilities request to a WFS server returns an XML document showing what layers and projections are available, etc. Example of a WFS GetCapabilities URL:

```
http://demo.mapserver.org/cgi-bin/wfs?SERVICE=WFS&VERSION=1.0.0&REQUEST=GetCapabilities
```

Example of the Resulting XML from GetCapabilties:

```

...
<FeatureTypeList>
  <Operations>
    <Query/>
  </Operations>
  <FeatureType>
    <Name>continents</Name>
    <Title>World continents</Title>
    <SRS>EPSG:4326</SRS>
    <LatLongBoundingBox minx="-180" miny="-90" maxx="180" maxy="83.6274"/>
  </FeatureType>
  <FeatureType>
    <Name>cities</Name>
    <Title>World cities</Title>
    <SRS>EPSG:4326</SRS>
    <LatLongBoundingBox minx="-178.167" miny="-54.8" maxx="179.383" maxy="78.9333"/>
  </FeatureType>
</FeatureTypeList>
...

```

Data Access / Connection Method

- WFS access is a core MapServer feature. MapServer currently supports WFS version 1.0.0
- The CONNECTIONTYPE WFS parameter must be used.
- WFS layers can be requested through a layer in a map file, or you can request the GML directly through the browser with a GetFeature request. You can specify a specific layer with the TypeName request. In a map file the name/value pairs should be put into a METADATA object.
- You can limit the number of features returned in the GML by using the MaxFeatures option (e.g. &MAXFEATURES=100).

Example of a WFS Request Directly Through the Browser:

The following URL requests the GML for the layer continents. (see the GetCapabilities above for the possible layers available on this test server) . The URL is all one line, broken up here for readability (click [here](#) for a working link).

```

http://demo.mapserver.org/cgi-bin/wfs?
SERVICE=WFS&
VERSION=1.0.0&
REQUEST=getfeature&
TYPENAME=continents&
MAXFEATURES=100

```

Map File Example

```

LAYER
  NAME "continents"
  TYPE POLYGON
  STATUS ON
  CONNECTION "http://demo.mapserver.org/cgi-bin/wfs?"
  CONNECTIONTYPE WFS
  METADATA
    "wfs_typename"      "continents"
    "wfs_version"       "1.0.0"
    "wfs_connectiontimeout" "60"
    "wfs_maxfeatures"   "10"

```

```
END
PROJECTION
    "init=epsg:4326"
END
CLASS
    NAME "Continents"
    STYLE
        COLOR 255 128 128
        OUTLINECOLOR 96 96 96
    END
END
END # Layer
```

8.2 Raster Data

Author Frank Warmerdam

Contact warmerdam at pobox.com

Revision \$Revision\$

Date \$Date\$

Last Updated 2007/12/09

Table of Contents

- Raster Data
 - Introduction
 - How are rasters added to a Map file?
 - Supported Formats
 - Rasters and Tile Indexing
 - Raster Warping
 - 24bit RGB Rendering
 - Special Processing Directives
 - Raster Query
 - Raster Display Performance Tips
 - Preprocessing Rasters
 - Georeference with World Files

8.2.1 Introduction

MapServer supports rendering a variety of raster file formats in maps. The following describes some of the supported formats, and what capabilities are supported with what formats.

This document assumes that you are already familiar with setting up MapServer *Mapfile*, but does explain the raster specific aspects of mapfiles.

8.2.2 How are rasters added to a Map file?

A simple raster layer declaration looks like this. The *DATA* file is interpreted relative to the *SHAPEPATH*, much like shapefiles.

```
LAYER
  NAME "JacksonvilleNC_CIB"
  DATA "Jacksonville.tif"
  TYPE RASTER
  STATUS ON
END
```

Though not shown rasters can have *PROJECTION*, *METADATA*, *PROCESSING*, *MINSCALE*, and *MAXSCALE* information. It cannot have labels, *CONNECTION*, *CONNECTIONTYPE*, or *FEATURE* information.

Classifying Rasters

Rasters can be classified in a manner similar to vectors, with a few exceptions.

There is no need to specify a *CLASSITEM*. The raw pixel value itself (“[pixel]”) and, for palettes images, the red, green and blue color associated with that pixel value (“[red]”, “[green]” and “[blue]”) are available for use in classifications. When used in an evaluated expression the pixel, red, green and blue keywords must be in lower case.

```
LAYER
  NAME "JacksonvilleNC_CIB"
  DATA "Jacksonville.tif"
  TYPE RASTER
  STATUS ON
  CLASSITEM "[pixel]"
    # class using simple string comparison, equivalent to ([pixel] = 0)
    CLASS
      EXPRESSION "0"
      STYLE
        COLOR 0 0 0
      END
    END
    # class using an EXPRESSION using only [pixel].
    CLASS
      EXPRESSION ([pixel] >= 64 AND [pixel] < 128)
      STYLE
        COLOR 255 0 0
      END
    END
    # class using the red/green/blue values from the palette
    CLASS
      NAME "near white"
      EXPRESSION ([red] > 200 AND [green] > 200 AND [blue] > 200)
      STYLE
        COLOR 0 255 0
      END
    END
    # Class using a regular expression to capture only pixel values ending in 1
    CLASS
      EXPRESSION /*1/
      STYLE
        COLOR 0 0 255
      END
    END
  END
```

As usual, *CLASS* definitions are evaluated in order from first to last, and the first to match is used. If a *CLASS* has a *NAME* attribute it may appear in a *LEGEND*. Only the *COLOR*, *EXPRESSION* and *NAME* parameters within a *CLASS* definition are utilized for raster classifications. The other styling or control information is ignored.

Raster classifications always take place on only one raster band. It defaults to the first band in the referenced file, but this can be altered with the *BANDS PROCESSING* directive. In particular this means that including even a single CLASS declaration in a raster layer will result in the raster layer being rendered using the one band classification rules instead of other rules that might have applied (such as 3 band RGB rendering).

Classifying Non-8bit Rasters

As of MapServer 4.4 support has been added for classifying non-8bit raster inputs. That is input rasters with values outside the range 0-255. Mostly this works transparently but there are a few caveats and options to provide explicit control.

Classifying raster data in MapServer is accomplished by pre-classifying all expected input values and using that table of classification results to lookup each pixel as it is rendered. This is done because evaluating a pixel value against a series of CLASS definitions is relatively expensive to do for the hundreds of thousands of pixels in a typical rendered image.

For simple 8bit inputs, only 256 input values need to be pre-classified. But for non-8bit inputs more values need to be classified. For 16bit integer inputs all 65536 possible input values are pre-classified. For floating point and other input data types, up to 65536 values are pre-classified based on the maximum expected range of input values.

The *PROCESSING* directive can be used to override the range of values to be pre-classified, or the number of values (aka Buckets) in that range to classify. The *SCALE=min,max* *PROCESSING* directive controls the range. The *SCALE_BUCKETS* *PROCESSING* directive controls the number of buckets. In some cases rendering can be accelerated considerable by selecting a restricted range of input values and a reduced number of scaling values (buckets).

The following example classifies a floating raster, but only 4 values over the range -10 to 10 are classified. In particular, the values classified would be -7.5, -2.5, 2.5, and 7.5 (the middle of each “quarter” of the range). So those four value are classified, and one of the classification results is selected based on which value is closest to the pixel value being classified.

```
LAYER
  NAME grid1
  TYPE raster
  STATUS default
  DATA data/float.tif
  PROCESSING "SCALE=-10,10"
  PROCESSING "SCALE_BUCKETS=4"
  CLASS
    NAME "red"
    EXPRESSION ([pixel] < -3)
    STYLE
      COLOR 255 0 0
    END
  END
  CLASS
    NAME "green"
    EXPRESSION ([pixel] >= -3 and [pixel] < 3)
    STYLE
      COLOR 0 255 0
    END
  END
  CLASS
    NAME "blue"
    EXPRESSION ([pixel] >= 3)
    STYLE
      COLOR 0 0 255
    END
```

```
END
END
```

8.2.3 Supported Formats

What raster formats are supported by MapServer is largely controlled by configuration time options. Some formats are considered to be built-in while the remainder are handled by the optional GDAL raster library.

More information on GDAL can be found at <http://www.gdal.org>, including the [supported formats list](#). Some of the advanced MapServer raster features, such as resampling, RGB color cube generation and automatic projection capture only work with raster formats used through GDAL. GDAL is normally built and installed separately from MapServer, and then enabled during the build of MapServer using the `-with-gdal` configuration switch.

To find out what is built into a particular MapServer executable, use the `-v` flags to discover what build options are enabled. To find out what GDAL formats are available, the “`gdalinfo --formats`” command may be used. For example:

```
warmerda@gdal2200[124]% mapserv -v
MapServer version 4.4.0-beta2 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP
SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER SUPPORTS=WMS_CLIENT
SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER SUPPORTS=FASTCGI
INPUT=EPPL7 INPUT=POSTGIS INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE DEBUG=MSDEBUG
warmerda@gdal2200[18]% gdalinfo --formats
Supported Formats:
  GRASS (ro): GRASS Database Rasters (5.7+)
  GTiff (rw+): Geotiff
  NITF (rw+): National Imagery Transmission Format
  HFA (rw+): Erdas Imagine Images (.img)
  SAR_CEOS (ro): CEOS SAR Image
  ...
  ...
```

The following formats are potential builtins:

TIFF/GeoTIFF If built with `INPUT=TIFF` MapServer will have builtin support for reading TIFF or GeoTIFF files.

The builtin TIFF support has some limitations with regard to the organization of files that can be read (no tiled, 16bit, RGB, or odd color models). This driver supports world files, or simple builtin GeoTIFF coordinates for georeferencing.

Full featured TIFF/GeoTIFF support is available through GDAL. Note that only GDAL supports tiled TIFF files and TIFF files with overviews. Tiled TIFF files with overviews pre-built are one of the highest performance ways of serving large raster images.

GIF If GD is configured with `GIF (OUTPUT=GIF)` support, then MapServer will also be able to read GIF files for raster layers. The only way to georeference GIF files is with a world file.

If GD is not configured with GIF support, it may still be available in GDAL.

PNG If GD is configured with `PNG (OUTPUT=PNG)` support, then MapServer will also be able to read PNG files for raster layers. The only way to georeference PNG files is with a world file.

If GD is not configured with PNG support, it may still be available in GDAL.

JPEG If MapServer is built with `JPEG (INPUT=JPEG)` support then greyscale JPEG files may be rendered in raster layers. RGB files (the more common kind) will not be able to be displayed. Georeferencing is via world files.

If MapServer is not built with native JPEG support, GDAL may still support the format. In this case RGB files are also supported (via the RGB color cube mechanism). Georeferencing is still via world file.

Erdas .LAN/.GIS If configured with `INPUT=EPPL7` (the default) MapServer will support one band eight bit Erdas LAN/GIS files. The `.trl` file is read for a colormap, and if not found the layer is treated as greyscale. Georeferencing is read from the file.

If MapServer is built with GDAL it is generally better to access all possible formats through GDAL rather than via the built-in drivers. The built-in drivers are less featureful, and not as well maintained.

8.2.4 Rasters and Tile Indexing

When handling very large raster layers it is often convenient, and higher performance to split the raster image into a number of smaller images. Each file is a tile of the larger raster mosaic available for display. The list of files forming a layer can be stored in a shapefile with polygons representing the footprint of each file, and the name of the files. This is called a ‘TILEINDEX’ and works similarly to the same feature in vector layers. The result can be represented in the Mapfile as one layer, but MapServer will first scan the tile index, and ensure that only raster files overlapping the current display request will be opened.

The following example shows a simple example. No *DATA* statement is required because MapServer will fetch the filename of the raster files from the *Location* attribute column in the *hp2.dbf* file for records associated with polygons in *hp2.shp* that intersect the current display region. The polygons in *hp2.shp* should be rectangles representing the footprint of the corresponding file. Note that the files do not have to be all the same size, the formats can vary and they can even overlap (later files will be drawn over earlier ones); however, they must all be in the same coordinate system (projection) as the layer.

```
LAYER
  NAME "hpool"
  STATUS ON
  TILEINDEX "hp2.shp"
  TILEITEM "Location"
  TYPE RASTER
END
```

The filenames in the tileindex are searched for relative to the *SHAPEPATH* or map file, not relative to the tileindex. Great care should be taken when establishing the paths put into the tileindex to ensure they will evaluate properly in use. Often it is easiest to place the tileindex in the *SHAPEPATH* directory, and to create the tileindex with a path relative to the *SHAPEPATH* directory. When all else fails, absolute paths can be used in tileindex, but then they cannot be so easily moved from system to system.

While there are many ways to produce *TILEINDEX* shapefiles for use with this command, one option is the [gdaltindex](#) program, part of the GDAL utility suite. The *gdaltindex* program will automatically generate a tile index shapefile from a list of GDAL supported raster files passed on the command line.

```
Usage: gdaltindex [-tileindex field_name] index_file [gdal_file]*
% gdaltindex doq_index.shp doq/*.tif
```

Tile Index Notes

- The shapefile (*index_file*) will be created if it doesn’t already exist.
- The default tile index field is ‘location’.
- Simple rectangular polygons are generated in the same coordinate system as the rasters.
- Raster filenames will be put in the file exactly as they are specified on the commandline.
- Many problems with tile indexes relate to how relative paths in the tile index are evaluated. They should be evaluated relative to the *SHAPEPATH* if one is set, otherwise relative to the tileindex file. When in doubt absolute paths may avoid path construction problems.

The *gdaltindex* program is built as part of GDAL. Prebuilt binaries for GDAL including the *gdaltindex* program can be downloaded as part of the [OSGeo4W](#), [FWTools](#) and [MS4W](#) distributions.

See Also:*Tile Indexes*

8.2.5 Raster Warping

MapServer is able to resample GDAL rasters on the fly into new projections. Non-GDAL rasters may only be up or down sampled without any rotation or warping.

Raster warping kicks in if the projection appears to be different for a raster layer than for the map being generated. Warped raster layers are significantly more expensive to render than normal raster layers with rendering time being perhaps 2-4 times long than a normal layer. The projection and datum shifting transformation is computed only at selected points, and generally linearly interpolated along the scanlines (as long as the error appears to be less than 0.333 pixels).

In addition to reprojecting rasters, the raster warping ability can also apply rotation to GDAL rasters with rotational coefficients in their georeferencing information. Currently rotational coefficients won't trigger raster warping unless the map and layer have valid (though matching is fine) projection definitions.

8.2.6 24bit RGB Rendering

Traditionally MapServer has been used to produce 8 bit pseudo-colored map displays generated from 8bit greyscale or pseudocolored raster data. However, if the raster file to be rendered is actually 24bit (a red, green and blue band) then additional considerations come into play. Currently rendering of 24bit imagery is only supported via the GDAL renderer. The built-in PNG, JPEG and other drivers do not support 24bit input images.

If the output is still 8bit pseudo-colored (the *IMAGEMODE* is PC256 in the associated *OUTPUTFORMAT* declaration) then the full 24bit RGB colors for input pixels will be converted to a color in the colormap of the output image. By default a color cube is used. That is a fixed set of 175 colors providing 5 levels of red, 7 levels of green and 5 levels of blue is used, plus an additional 32 greyscale color entries. Colors in the input raster are mapped to the closest color in this color cube on the fly. This substantially degrades color quality, especially for smoothly changing images. It also fills up the colors table, limited to 256 colors, quite quickly.

A variation on this approach is to dither the image during rendering. Dithering selects a color for a pixel in a manner that "diffuses error" over pixels. In an area all one color in the source image, a variety of output pixel colors would be selected such that the average of the pixels would more closely approximate the desired color. Dithering also takes advantage of all currently allocated colors, not just those in the color cube. Dithering requires GDAL 1.1.9 or later, and is enabled by providing the *PROCESSING* "DITHER=YES" option in the mapfile. Dithering is more CPU intensive than using a simple color cube, and should be avoided if possible in performance sensitive situations.

The other new possibility for handling 24bit input imagery in MapServer 4.0 or later, is to produce 24bit output images. The default "IMAGETYPE png24" or "IMAGETYPE jpeg" declaration may be used to produce a 24bit PNG output file, instead of the more common 8bit pseudo-colored PNG file. The *OUTPUTFORMAT* declaration provides for detailed control of the output format. The *IMAGEMODE* RGB and *IMAGEMODE* RGBA options produce 24bit and 32bit (24bit plus 8bit alpha/transparency) for supported formats.

8.2.7 Special Processing Directives

As of MapServer 4.0, the *PROCESSING* parameter was added to the *LAYER* of the *Mapfile*. It is primarily used to pass specialized raster processing options to the GDAL based raster renderer. The following processing options are supported in MapServer 4.0 and newer.

BANDS=red_or_grey[,green,blue[,alpha]] This directive allows a specific band or bands to be selected from a raster file. If one band is selected, it is treated as greyscale. If 3 are selected, they are treated as red, green and blue. If 4 are selected they are treated as red, green, blue and alpha (opacity).

Example:

```
PROCESSING "BANDS=4,2,1"
```

COLOR_MATCH_THRESHOLD=n Alter the precision with which colors need to match an entry in the color table to use it when producing 8bit colormapped output (IMAGEMODE PC256). Normally colors from a raster colormap (or greyscale values) need to match exactly. This relaxes the requirement to being within the specified color distance. So a COLOR_MATCH_THRESHOLD of 3 would mean that an existing color entry within 3 (sum of difference in red, green and blue) would be used instead of creating a new colormap entry. Especially with greyscale raster layers, which would normally use all 256 color entries if available, this can be a good way to avoid “stealing” your whole colormap for a raster layer. Normally values in the range 2-6 will give good results.

Example:

```
PROCESSING "COLOR_MATCH_THRESHOLD=3"
```

DITHER=YES This turns on error diffusion mode, used to convert 24bit images to 8bit with error diffusion to get better color results.

Example:

```
PROCESSING "DITHER=YES"
```

EXTENT_PRIORITY=WORLD Override GDAL with a world file.

Example:

```
PROCESSING "EXTENT_PRIORITY=WORLD"
```

LOAD_FULL_RES_IMAGE=YES/NO This option affects how image data is loaded for the resampler when reprojecting or otherwise going through complex resampling (as opposed to the fast default image decimation code path). This forces the source image to be loaded at full resolution if turned on (default is NO). This helps work around problems with default image resolution selection in when radical warping is being done. It can result in very slow processing if the source image is large.

LOAD_WHOLE_IMAGE=YES/NO This option affects how image data is loaded for the resampler (as above). This option, if turned on, will cause the whole source image to be loaded and helps make up for problem identifying the area required, usually due to radical image reprojection near a dateline or projection “horizon”. The default is NO. Turning this on can dramatically affect rendering performance and memory requirements.

LUT[_n]=<lut_spec> This directive (MapServer 4.9+) instructs the GDAL reader to apply a custom LUT (lookup table) to one or all color bands as a form of on the fly color correction. If LUT is used, the LUT is applied to all color bands. If LUT_n is used it is applied to one color band (n is 1 for red, 2 for green, 3 for blue, 4 for alpha).

The LUT can be specified inline in the form:

```
<lut_spec> = <in_value>:<out_value>[,<in_value>:<out_value>]*
```

This essentially establish particular input values which are mapped to particular output values. The list implicitly begins with 0:0, and 255:255. An actual 256 entry lookup table is created from this specification, linearly interpolating between the values. The in values must be in increasing order. The LUT specification may also be in a text file with the <lut_spec> being the filename. The file contents should be in the same syntax, and the file is searched relative to the mapfile.

Example:

```
PROCESSING "LUT_1=red.lut"
PROCESSING "LUT_2=green.lut"
PROCESSING "LUT_3=blue.lut"
```

```
    or
PROCESSING "LUT=100:30,160:128,210:200"
```

As a special case there is also support for GIMP format curve files. That is the text files written out by the Tools->Color->Curves tool. If this is specified as the filename then it will be internally converted into linear segments based on the curve control points. Note that this will not produce exactly the same results as the GIMP because linear interpolation is used between control points instead of curves as used in the GIMP. For a reasonable number of control points the results should be similar. Also note that GIMP color curve files include an overall “value” curve, and curves for red, green, blue and alpha. The value curve and the appropriate color curve will be composed internally to produce the final LUT.

Example:

```
PROCESSING "LUT=munich.crv"
```

OVERSAMPLE_RATIO=double Default is 2.5. Rendering time will increase with increasing OVERSAMPLE_RATIO.

Example:

```
PROCESSING "OVERSAMPLE_RATIO=1.0"
```

RESAMPLE=NEAREST/AVERAGE/BILINEAR This option can be used to control the resampling kernel used sampling raster images. The default (and fastest) is NEAREST. AVERAGE will perform compute the average pixel value of all pixels in the region of the disk file being mapped to the output pixel (or possibly just a sampling of them). BILINEAR will compute a linear interpolation of the four pixels around the target location. This topic is discussed in more detail in [MS RFC 4: MapServer Raster Resampling](#).

Resampling options other than NEAREST result in use of the generalized warper and can dramatically slow down raster processing. Generally AVERAGE can be desirable for reducing noise in dramatically downsampled data, and can give something approximating antialiasing for black and white linework. BILINEAR can be helpful when oversampling data to give a smooth appearance.

Example (choose one):

```
PROCESSING "RESAMPLE=NEAREST"
PROCESSING "RESAMPLE=AVERAGE"
PROCESSING "RESAMPLE=BILINEAR"
```

SCALE[_n]=AUTO or min,max This directive instructs the GDAL reader to pre-scale the incoming raster data. It is primarily used to scale 16bit or floating point data to the range 0-255, but can also be used to contrast stretch 8bit data. If an explicit min/max are provided then the input data is stretch (or squished) such that the minimum value maps to zero, and the maximum to 255. If AUTO is used instead, a min/max is automatically computed. To control the scaling of individual input bands, use the SCALE_1, SCALE_2 and SCALE_3 keywords (for red, green and blue) instead of SCALE which applies to all bands.

Example:

```
PROCESSING "SCALE=AUTO"
or
PROCESSING "SCALE_1=409,1203"
PROCESSING "SCALE_2=203,296"
PROCESSING "SCALE_3=339,1004"
```

WORLDFILE=<file> Specifies an alternative world file (for georeferencing). If a path only is specified, the base name of the dataset will be appended. The suffix (.wld / .tfw / ...) can be omitted.

Example:

```
PROCESSING "WORLDFILE=/path/"
or
PROCESSING "WORLDFILE=/path/file.wld"
or
PROCESSING "WORLDFILE=/path/file"
```

8.2.8 Raster Query

A new feature added in MapServer 4.4 is the ability to perform queries on rasters in a manner similar to queries against vector layers. Raster queries on raster layers return one point feature for each pixel matching the query. The point features will have attributes indicating the value of different bands at that pixel, the final rendering color and the class name. The resulting feature can be directly access in MapScript, or processed through templates much like normal vector query results. Only raster layers with a query TEMPLATE associated can be queried, even for the query methods that don't actually use the query template (much like vector data).

Raster query supports QueryByPoint, QueryByRect, and QueryByShape. QueryByPoint supports single and multiple result queries. Other query operations such as QueryByIndex, QueryByIndexAdd, QueryByAttributes and QueryByFeature are not supported for raster layers.

Raster layers do **not** support saving queries to disk, nor **query maps**.

Raster queries return point features with some or all of the following attributes:

- x** georeferenced X location of pixel.
- y** georeferenced Y location of pixel.
- value_list** a comma separated list of the values of all selected bands at the target pixel.
- value_n** the value for the n'th band in the selected list at this pixel (zero based). There is one value_n entry for each selected band.
- class** Name of the class this pixel is a member of (classified layers only).
- red** red component of the display color for this pixel.
- green** green component of the display color for this pixel.
- blue** blue component of the display color for this pixel.

The red, green and blue attribute are intended to be the final color the pixel would be rendered with, but in some subtle cases it can be wrong (ie. classified floating point results). The selected bands are normally the band that would be used to render the layer. For a pure query-only layer BANDS *PROCESSING* directive can be used to select more bands than could normally be used in a render operation. For instance for a 7 band landsat scene a *PROCESSING* "BANDS=1,2,3,4,5,6,7" directive could be used to get query results for all seven bands in results to a query operation.

Care should be taken to avoid providing a large query area (selecting alot of pixels) as each selected pixel requires over 100 bytes of memory for temporary caching. The RASTER_QUERY_MAX_RESULT *PROCESSING* item can be used to restrict the maximum number of query results that will be returned. The default is one million which would take on the order of 100MB of RAM.

Query results can be returned as HTML via the normal substitution into query template HTML. Query results are also accessible via WMS GetFeatureInfo calls, and from MapScript. The following example shows executing a feature query from Python MapScript and fetching back the results:

```
map = mapscript.Map('rquery.map')
layer = map.getLayer(0)

pnt = mapscript.Point()
pnt.x = 440780
```

```

pnt.y = 3751260

layer.queryByPoint( map, pnt, mapscript.MS_MULTIPLE, 180.0 )

layer.open()
for i in range(1000):
    result = layer.getResult( i )
    if result is None:
        break

    s = layer.getShape( result )
    for i in range(layer.numitems):
        print '%s: %s' % (layer.getItem(i), s.getValue(i))

layer.close()

```

This following is a simple example query [TEMPLATE](#) file. The raster pixel attributes will be substituted in before the query result is returned to the user as HTML.

```

Pixel:<br>
values=[value_list]<br>

value_0=[value_0]<br>
value_1=[value_1]<br>
value_2=[value_2]<br>
RGB = [red],[green],[blue]<p>
Class = [class]<br>

```

Internally raster query results are essentially treated as a set of temporary features cached in RAM. Issuing a new query operation clears the existing query cache on the layer. The transitory in-memory representation of raster query results is also responsible for the inability to save raster query results since saved query results normally only contain the feature ids, not the entire features. Some addition information is available in the [RasterQuery](#) Wiki topic.

8.2.9 Raster Display Performance Tips

- Build overview levels for large rasters to ensure only a reasonable amount of data needs to be touched to display an overview of a large layer. Overviews can be implemented as a group of raster layers at different resolutions, using *MINSCALEDENOM*, and *MAXSCALEDENOM* to control which layers are displayed at different resolutions. Another, perhaps easier way, is to build overviews for GDAL supported formats using the [gdaladdo](#) utility.
- When using tileindexes to manage many raster files as a single file, it is especially important to have an overview layer that kicks in at high scales to avoid having to open a large number of raster files to fulfill the map request.
- Preprocess RGB images to eightbit with a colormap to reduce the amount of data that has to be read, and the amount of computation to do on the fly.
- For large images use tiling to reduce the overhead for loading a view of a small area. This can be accomplished using the *TILEINDEX* mechanism of the mapfile, or by creating a tiled format file (ie. TIFF with GDAL).
- Ensure that the image is kept on disk in the most commonly requested projection to avoid on-the-fly image warping which is fairly expensive.
- If you are getting debug output from MapServer in your web server log file, check to see if the message *msResampleGDALToMap* in effect appears. If so, the raster layer is being resampled. If you don't think it should be resampled carefully review your map file to ensure that the layer projection exactly matches the map projection or that the layer has no projection definition.

8.2.10 Preprocessing Rasters

The following operations use GDAL commandline utilities, some of which are python scripts. They are generally available on any GDAL installation with python support.

Producing Tiled Datasets

The TIFF and Erdas Imagine formats support internal tiling within files, and will generally give better display speed for local map requests from large images. To produce a GeoTIFF file in internally tiled format using the TILED=YES creation option with the `gdal_translate` utility:

```
gdal_translate -co TILED=YES original.tif tiled.tif
```

Erdas Imagine (HFA) files are always tiled, and can be larger than 4GB (the GeoTIFF limit). Use a command like the following to translate a raster to Imagine format:

```
gdal_translate -of HFA original.tif tiled.img
```

Reducing RGB to 8bit

Rendering and returning 24bit images (especially as PNG) can be quite expensive in render/compress time and bandwidth. Pre-reducing raster data to 8bit can save disk space, processing time, and bandwidth. However, such a color reduction also implicitly reduces the quality of the resulting map. The color reduction can be done on the fly by MapServer but this requires even more processing. A faster approach is to pre-reduce the colors of 24bit imagery to 8bit. This can be accomplished with the GDAL `rgb2pct.py` script like this:

```
rgb2pct.py original.tif 8bit.tif
```

By default images will be reduced to 256 colors but this can mean there are not enough colors to render other colors in the map. So it may be desired to reduce to even less colors:

```
rgb2pct.py -n 200 original.tif 8bit.tif
```

Downsampling to 8bit should be done before internal tiling and overview building. The `rgb2pct.py` script tries to compute an optimal color table for a given image, and then uses error diffusion during the 24bit to 8bit reduction. Other packages (such as ImageMagick or Photoshop) may have alternative color reduction algorithms that are more appropriate for some uses.

Building Internal Overviews

Most GDAL supported raster formats can have overviews pre-built using the `gdaladdo` utility. However, a few formats, such as JPEG2000, MrSID, and ECW already contain implicit overviews in the format themselves and will not generally benefit from external overviews. For other formats (such as GeoTIFF, and Erdas Imagine format) use a command like the following to build overviews:

```
gdaladdo tile.tif 2 4 8 16 32 64 128
```

The above would build overviews at x2 through x128 decimation levels. By default it uses “nearest neighbour” downsampling. That is one of the pixels in the input downsampled area is selected for each output pixel. For some kinds of data averaging can give much smoother overview results, as might be generated with this command:

```
gdaladdo -r average tiled.tif 2 4 8 16 32 64 128
```

Note that overview building should be done after translating to a final format. Overviews are lost in format conversions using `gdal_translate`. Also, nothing special needs to be done to make MapServer use GDAL generated overviews. They are automatically picked up by GDAL when mapserver requests a reduced resolution map.

Building External Overviews

When working with large collections of raster files using a MapServer tileindex, it is desirable to build reduced resolution overview layers that kick in at high scales (using `MINSCALEDENOM / MAXSCALEDENOM` to control which layer activates). Preparing the overviews can be a somewhat complex process. One approach is to use the `gdal_merge.py` script to downsample and mosaic all the images. For instance if we want to produce an overview of many 1meter ortho photos with 250 meter pixels we might do something like:

```
gdal_merge.py -o overview.tif -ps 250 250 ortho_*.tif
```

The `gdal_merge.py` utility suffers from a variety of issues, including no support for different resampling kernels. With GDAL 1.3.2 or later it should be able to accomplish something similar with the more flexible `gdalwarp` utility:

```
gdalwarp -rc -tr 250 250 ortho_*.tif overview.tif
```

In some cases the easiest way of generating an overview is to let MapServer do it using the `shp2img` utility. For instance if the tileindex layer is called “orthos” we could do something like:

```
shp2img -m ortho.map -l orthos -o overview.png
```

Note that the overview will be generated with the extents and size in the .map file, so it may be necessary to temporarily adjust the map extents and size values to match the raster extents and the desired output size. Also, if using this method, don’t leave large files in PNG (or GIF or JPEG) format as they are slow formats to extract subareas from.

8.2.11 Georeference with World Files

World files are a simple mechanism for associating georeferencing (world coordinates) information with raster files. ESRI was the first company to propagate the use of world files, and they often used with TIFF instead of embedding georeferencing information in the file itself.

The world file contents look like the following. The first coefficient is the X pixel size. The second and third are rotational/shear coefficients (and should normally be 0.0). The fourth is the Y pixel size, normally negative indicating that Y decreases as you move down from the top left origin. The final two values are the X and Y location of the center of the top left pixel. This example is for an image with a 2m x 2m pixel size, and a top left origin at (356800E, 5767999N):

```
2
0.0000000000
0.0000000000
-2
356800.00
5767999.00
```

The name of the world file is based on the file it relates to. For instance, the world file for `aerial.tif` might be `aerial.tf.w`. Conventions vary for appropriate endings, but with MapServer the extension `.wld` is always OK for world files.

Since the GDAL/OGR library is used for vector and raster access in MapServer, many more formats are supported, so please see the [OGR](#) (vector) and [GDAL](#) (raster) formats pages.

Output Generation

9.1 AGG Rendering Specifics

Author Thomas Bonfort

Contact thomas.bonfort at gmail

Revision \$Revision\$

Date \$Date\$

Last Updated 2008/11/24

Table of Contents

- AGG Rendering Specifics
 - Introduction
 - Setting the OutputFormat
 - New Features
 - Modified Behavior

9.1.1 Introduction

MapServer 5.0 released with a new rendering backend. This howto details the changes and new functionality that this adds to map creation. This howto assumes you already know the basics of mapfile syntax. If not, you should probably be reading *the mapfile syntax*.

9.1.2 Setting the OutputFormat

24 bit png (high quality, large file size):

```
OUTPUTFORMAT
  NAME 'AGG'
  DRIVER AGG/PNG
  IMAGEMODE RGB
END
```

24 bit png, transparent background:

```
OUTPUTFORMAT
  NAME 'AGGA'
  DRIVER AGG/PNG
  IMAGEMODE RGBA
END
```

24 bit jpeg (jpeg compression artifacts may appear, but smaller file size):

```
OUTPUTFORMAT
  NAME 'AGG_JPEG'
  DRIVER AGG/JPEG
  IMAGEMODE RGB
END
```

png output, with number of colors reduced with quantization.

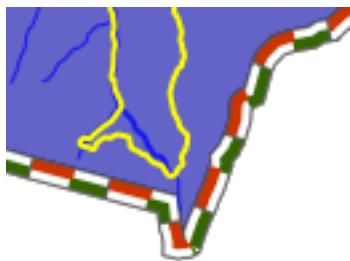
```
OUTPUTFORMAT
  NAME 'AGG_Q'
  DRIVER AGG/PNG
  IMAGEMODE RGB
  FORMATOPTION "QUANTIZE_FORCE=ON"
  FORMATOPTION "QUANTIZE_DITHER=OFF"
  FORMATOPTION "QUANTIZE_COLORS=256"
END
```

9.1.3 New Features

- All rendering is now done antialiased by default. All ANTIALIAS keywords are now ignored, as well as TRANSPARENCY ALPHA. Pixmaps and fonts are now all drawn respecting the image's internal alpha channel (unless a backgroundcolor is specified).
- As with GD in ver. 4.10, using a SYMBOL of type ELLIPSE to draw thick lines isn't mandatory anymore. To draw a thick line just use:

```
STYLE
  WIDTH 5
  COLOR 0 0 255
END
```

- A line symbolizer has been added, that works with vector or pixmap symbols, to draw textured lines. This happens by default if a line's style is given a symbol of type vector or pixmap. To enable "shield" symbolization, i.e. a marker placed only on some points of the line, you must add a GAP parameter to your symbol definition. This GAP value is scaled w.r.t the style's SIZE parameter. Specify a positive gap value for symbols always facing north (optionally rotated by the ANGLE of the current style), or a negative value for symbols that should follow the line orientation



- This happens by default if a line's style is given a symbol of type vector or pixmap. To enable “shield” symbolization, i.e. a marker placed only on some points of the line, you must add a GAP parameter to your symbol definition. This GAP value is scaled w.r.t the style's SIZE parameter - specify a positive gap value for symbols always facing north (optionally rotated by the ANGLE of the current style), or a negative value for symbols that should follow the line orientation
- Pixmap and font symbols can now be rotated without loosing their transparency
- For POLYGON layers with no specific SYMBOL, the WIDTH keyword specifies the width of the outline, if an OUTLINECOLOR was specified. This is a shorthand that avoids having to create multiple styles for basic rendering, and will provide a marginal performance gain. Note that in this case, the width of the outline is /not/ scale dependent.

9.1.4 Modified Behavior

- When specifying a SYMBOL for a polygon shape, the GAP parameter of the symbol is used as a separation between each rendered symbol. This works for symbols of type vector, pixmap and ellipse. For example a symbol defined by

```
SYMBOL
  NAME 'triangle'
  TYPE VECTOR
  FILLED TRUE
  POINTS
    0 1
    .5 0
    1 1
    0 1
  END
  GAP 1
END
```

that is rendered in a class where SIZE is 15 will be rendered like



- layers of type CIRCLE support hatch type symbol filling
- the ENCODING keyword for labels is now enforced. If unset, MapServer will treat your label text byte-by-byte (resulting in corrupt special characters).

9.2 AntiAliasing with MapServer

Author Pericles Nacionales

Contact naci0002 at umn.edu

Revision \$Revision\$

Date \$Date\$

Last Updated 2009/01/17

Note: For quality antialiased output from mapserver, it is **highly** recommended to use the *AGG* rendering. This document applies only if you wish to stick to the GD rendering, or if you are using a version predating the 5.0 release of mapserver.

Table of Contents

- AntiAliasing with MapServer
 - What needs to be done

9.2.1 What needs to be done

1. Change (or add) IMAGETYPE keyword in MAP object to PNG24 (24-bit PNG output) or JPEG

MAP

```
...  
IMAGETYPE [P N G]24  
...
```

END

2. Add TRANSPARENCY to the LAYER object and set value to ALPHA

MAP

```
...  
IMAGETYPE [P N G]24  
...
```

LAYER

```
...  
TRANSPARENCY ALPHA  
...
```

END**END**

3. Add ANTIALIAS keyword to the STYLE object within the *CLASS* object within the *LAYER* and set value to TRUE

MAP

```
...  
IMAGETYPE [P N G]24  
...
```

LAYER

```
...  
TRANSPARENCY ALPHA  
...
```

CLASS

```
...  
STYLE  
...
```

```
ANTIALIAS TRUE  
...
```

END

```
\ \ . \ \ . \ \ .
```

```
END # end class
```

```

END # end layer
END # end map

```

Note: Don't use the SYMBOL or the SIZE keywords within the CLASS object, instead use WIDTH to specify width of line or polygon outline. Don't use WIDTH unless you have to. If you must define a SYMBOL, use symbol of type ELLIPSE—it supports antialiasing.

Here's an example of a real-world mapfile:

Note: From MapServer 6, symbol type CARTOLINE is no longer supported. You have to use AGG rendering and STYLE PATTERN to achieve dashed lines. Therefore, the following example does not work anymore.

```

1 MAP
2   NAME 'ms101'
3   EXTENT -2198022.00 -2444920.25 2707932.00 1234545.25 # CONUS LAEA (US)
4   SIZE 640 480
5   SHAPEPATH 'data'
6   SYMBOLSET 'symbols/symbols.txt'
7
8   IMAGETYPE P N G 24
9
10  PROJECTION
11    "init=epsg:2163"
12  END
13
14  # The layer below will be rendered as 1-pixel wide, antialiased line
15  # If you'd like to change the line thickness add the WIDTH keyword
16  # in the STYLE object with a value of 3 or greater.
17  LAYER # begin antialiased country boundary (line) layer
18    NAME 'country_line'
19    DATA 'shapefile/WorldCountryBorders'
20    TYPE LINE
21    STATUS ON
22    TRANSPARENCY ALPHA
23
24    PROJECTION
25      "init=epsg:4326"
26  END
27
28  CLASS
29    NAME 'Country Boundary'
30    STYLE
31      COLOR 96 96 96
32      ANTIALIAS TRUE
33    END
34  END
35  END # end country boundary layer
36
37  # The layer below shows one way to draw a polygon with antialiased outline
38  LAYER # begin antialiased country boundary (polygon) layer
39    NAME 'country_line'
40    DATA 'shapefile/Countries_area'
41    TYPE POLYGON
42    STATUS ON
43    TRANSPARENCY ALPHA

```

```
44
45     PROJECTION
46         "init=epsg:4326"
47     END
48
49     CLASS
50         NAME 'Country Boundary'
51         STYLE
52             COLOR 212 212 212
53             OUTLINECOLOR 96 96 96
54             WIDTH 3
55             ANTIALIAS TRUE
56         END
57     END
58 END # end country boundary polygon layer
59
60 # The layer below shows one way to draw a polygon with antialiased outline
61 LAYER # begin antialiased state boundary (line) layer
62     NAME 'state_line'
63     DATA 'shapefile/us_states'
64     TYPE LINE
65     STATUS ON
66     TRANSPARENCY ALPHA
67
68     PROJECTION
69         "init=epsg:4326"
70     END
71
72     CLASS
73         NAME 'State Boundary'
74         STYLE
75             COLOR 144 144 144
76             SYMBOL 'cartoline'
77             ANTIALIAS TRUE
78         END
79     END
80 END # end state line layer
81 END # end of map file
```

Here's how the 'cartoline' symbol is defined:

Note: From MapServer 6, symbol type CARTOLINE is not available. You have to use AGG rendering and STYLE PATTERN to achieve dashed lines. Therefore, the following symbol can not be used anymore.

```
SYMBOL
    NAME 'cartoline'
    TYPE CARTOLINE
    LINECAP "round"
    LINEJOIN "round"
    LINEJOINMAXSIZE 3
END
```

Note: The examples provided here are for illustrative purposes only—keep your map file definitions simple. Antialiasing adds computing overhead on the server and could slow/degrade its performance. Don't use it unless you must and certainly don't use symbols with it unless you really have to.

.**index::** single: Dynamic charting

9.3 Dynamic Charting

Author Thomas Bonfort

Contact thomas.bonfort at gmail.com

Last Updated 2012/05/24

Table of Contents

- Dynamic Charting
 - Setup
 - Adding a Chart Layer to a Mapfile
 - Pie Charts
 - Bar Graphs

Starting with version 5.0, MapServer included the ability to automatically draw pie or bar graphs whose values are taken and adjusted from attributes of a datasource.

This document assumes that you are already familiar with MapServer application development and especially setting up *Mapfile*s. You can also check out the *Vector Data Access Guide*, which has lots of examples of how to access specific data sources.

9.3.1 Setup

Supported Renderers

Dynamic charts are supported solely with the GD and [AGG](#) renderers.

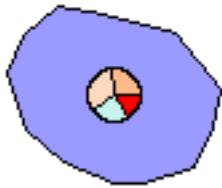
Attempting to add a chart layer with any other renderer (e.g. PDF or SVG) will result in undefined behavior. Rendering quality with the GD renderer is less than optimal, especially with small graphs, due to the lack of subpixel rendering functions.

Output from AGG and GD Renderers

MapServer AGG Rendering



MapServer GD Rendering



9.3.2 Adding a Chart Layer to a Mapfile

Layer Type

A new type of layer has been added to the mapfile syntax. To specify a chart layer, use

```
LAYER
...
  TYPE CHART
  ...
END
```

No other specific keywords have been added in order to keep the number of different keywords to a minimum in the mapfile syntax, therefore all the chart specific configuration is determined by PROCESSING directives.

Specifying the Size of each Chart

.**index:** triple: PROCESSING; CHART_SIZE; LAYER

The size of each chart is specified by the CHART_SIZE directive. If two values are given for this parameter, this will specify the width and height of each chart (this only applies for bar graphs). By default, the charts are 20x20 pixels.

```
LAYER
  TYPE CHART
  PROCESSING "CHART_SIZE=21" # specify size of the chart for pie or bar graphs
  #PROCESSING "CHART_SIZE=20 10" # specify width and height for bar graphs
  ...
END
```

.**index:** triple: PROCESSING; CHART_SIZE_RANGE; LAYER

The diameter of a pie chart can be bound to an attribute, using the CHART_SIZE_RANGE PROCESSING attribute:

```
PROCESSING "CHART_SIZE_RANGE = itemname minsize maxsize minval maxval exponent"
```

or just

```
PROCESSING "CHART_SIZE_RANGE = itemname"
```

where:

- itemname is the name of the attribute that drives the chart size (e.g. total_sales)
- minsize and maxsize are the minimum and maximum chart size values in pixels (e.g. “10 100”)
- minval and maxval are the minimum values of the attribute that correspond to chart sizes of minsize and maxsize (e.g. 10000 1000000).
- exponent (optional) applies an exponential factor to the diameter, calculated with:

```
diameter=mindiameter +
    pow((attribute_value-minvalue)/(maxvalue-minvalue),1.0/exponent)*
    (maxdiameter-mindiameter);
```

If the attribute value is smaller than ‘minval’ then the chart size will be minsize pixels, and if the attribute value is larger than maxval, the chart size will be maxsize pixels.

Specifying the Values to be Plotted

Each value to be plotted (i.e. a slice in a pie chart, or a bar in a par graph) is specified in a CLASS of the chart layer. The value to be plotted is taken from the SIZE keyword from the first STYLE block of the class. This is semantically a bit awkward, but keeps the number of different keywords to a minimum in the mapfile syntax. The value given to the SIZE keyword could of course be given a static value, but dynamic charting really only makes sense with attribute binding.

```
LAYER
...
CLASS
    # include a NAME keyword if you want this class to be included
    # in the legend
    NAME "value 1"
    STYLE
        # specify which value from the data source will be used as the
        # value for the graph
        SIZE [attribute]
    ...
END
END
CLASS
...
END
...
END
```

At least 2 CLASS blocks must be specified before charting can occur (but you already knew this if you want your charts to convey at least *some* information ;)).

.index::: triple: PROCESSING; CHART_TYPE; LAYER

Specifying Style

The styling of each value in the charts is specified by the usual MapServer syntax. Only one style per class is supported, any other STYLE block will be silently ignored. Only a subset of the styling keywords are supported:

```
STYLE
    SIZE [attribute]
    # specify the fill color
    COLOR [r] [g] [b]

    # if present will draw an outline around the corresponding bar or slice
    OUTLINECOLOR [r] [g] [b]

    #specify the width of the outline if OUTLINECOLOR is present (defaults to 1)
    WIDTH [w]

    # only for pie charts. 'a' is the number of pixels the corresponding
```

```
# slice will be offset relative to the center of the pie. This is useful
# for emphasizing a specific value in each chart. 'b' is required by the
# mapfile parser but is ignored.
OFFSET [a | b]
END
```

.**index**:: single: Pie chart

9.3.3 Pie Charts

This is the default type of chart that is rendered. This can also be specifically set with a PROCESSING keyword in the layer attributes:

```
PROCESSING "CHART_TYPE=PIE"
```

For each shape in the layer's datasource, the STYLE SIZE is used to set the relative size (value) of each pie slice, with the angles of the slices that are automatically computed so as to form a full pie. For example:

```
1 LAYER
2   NAME "Ages"
3   TYPE CHART
4   CONNECTIONTYPE postgis
5   CONNECTION "blabla"
6   DATA "the_geom from demo"
7   PROCESSING "CHART_TYPE=pie"
8   PROCESSING "CHART_SIZE=30"
9   STATUS ON
10  CLASS
11    NAME "Population Age 0-19"
12    STYLE
13      SIZE [v1006]
14      COLOR 255 244 237
15    END
16  END
17  CLASS
18    NAME "Population Age 20-39"
19    STYLE
20      SIZE [v1007]
21      COLOR 255 217 191
22    END
23  END
24  CLASS
25    NAME "Population Age 40-59"
26    STYLE
27      SIZE [v1008]
28      COLOR 255 186 140
29    END
30  END
31 END
```

In the example above, if for a given shape we have v1006=1000, v1007=600 and v1008=400 then the actual pie slices for each class will be respectively 50%, 30% and 20% of the total pie size.

.**index**:: single: Bar graph

9.3.4 Bar Graphs

Bar graph drawing is set with a PROCESSING keyword in the layer attributes:

PROCESSING "CHART_TYPE=BAR"

For each shape in the layer's datasource, the STYLE SIZE is used to set the relative size (value) of each bar in the graph. By default, the vertical axis of each bar graph is scaled for the values of the corresponding shape, and will always include the origin (=0). For example

- a shape whose STYLE SIZES contains values {5,8,10,3} will be plotted on a graph whose vertical axis spans 0 to 10.
- a shape whose STYLE SIZES contains values {-5,-8,-10,-3} will be plotted on a graph whose vertical axis spans -10 to 0.
- a shape whose STYLE SIZES contains values {-5,-8,10,3} will be plotted on a graph whose vertical axis spans -8 to 10.

..index:: triple: PROCESSING; CHART_BAR_MINVAL; LAYER

..index:: triple: PROCESSING; CHART_BAR_MAXVAL; LAYER

Additional PROCESSING directives are used to optionally specify the bounds of vertical axes so that the graphs for all the shapes can be plotted with the same scale:

PROCESSING "CHART_BAR_MINVAL=val"

PROCESSING "CHART_BAR_MAXVAL=val"

Values in the datasource that are above CHART_BAR_MAXVAL or below CHART_BAR_MINVAL will be clipped respectively to these values. If only one of these directives is included, the other will be automatically adjusted for each shape to include at least the origin, i.e. the graphs for all the shapes will be in the same scale *only if* all the values are of the same sign (positive or negative).

..index:: single: Stacked bar graph

Stacked bar Graphs

Stacked bar graphs can be drawn using:

PROCESSING "CHART_TYPE=VBAR"

9.4 Flash Output

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Author Yewondwossen Assefa

Contact assefa at dmsolutions.ca

Revision \$Revision\$

Date \$Date\$

Last Updated 2008/07/15

Table of Contents

- Flash Output
 - Introduction
 - Installing MapServer with Flash Support
 - How to Output SWF Files from MapServer
 - What is Currently Supported and Not Supported

9.4.1 Introduction

Since MapServer 4.0, MapServer can output Flash files, in SWF format (or “Shockwave Flash Format”). The following document outlines how to enable Flash output in MapServer.

Note: SWF is no longer supported in version 6.0.

Links to Flash-Related Information

- Open Source Flash Viewer
- Flash maps demo

9.4.2 Installing MapServer with Flash Support

To check that your mapserv executable includes Flash support, use the “-v” command-line switch and look for “OUTPUT=SWF”.

```
$ ./mapserv -v
MapServer version 5.2.0-rc1 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP
OUTPUT=PDF OUTPUT=SWF OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=AGG
SUPPORTS=FREETYPE SUPPORTS=ICONV SUPPORTS=WMS_SERVER SUPPORTS=WMS_CLIENT
SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER
SUPPORTS=SOS_SERVER SUPPORTS=FASTCGI SUPPORTS=THREADS
SUPPORTS=GEOS SUPPORTS=RGBA_PNG INPUT=JPEG INPUT=POSTGIS
INPUT=ORACLESPATIAL INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE
```

Using Pre-compiled Binaries

Windows users can use [MS4W](#), which supports SWF output.

Compiling MapServer with Flash Support

The library chosen to output SWF files is the [Ming library](#). Ming is a C library for generating SWF (“Flash”) format movies, and it contains a set of wrappers for using the library from C++ and popular scripting languages like PHP, Python, and Ruby.

Building on Windows

- download the [Ming library](#) (the version currently supported is 0.2a)
- as of Ming 0.3 there was no makefile for Windows available in the distribution yet, but you can download a MS VC++ makefile (makefile.vc) from [here](#) (contains makefile and also libming.lib)
- copy makefile.vc under the src directory (ming-0.2/src)
- execute:

```
nmake /f makefile.vc
```
- at this point you should have a libming.lib that will be linked with MapServer
- edit the nmake.opt in your MapServer directory and uncomment the MING=-DUSE_MING_FLASH flag, and point MING_DIR to your Ming directory.
- build MapServer as usual

Building on Unix

Use the “–with-ming” configure flag to enable MING support on Unix. “–with-ming=dir” will try to find the include files and library in the indicated directory.

Note: compiling MapServer 4.4.2 with flash support (mingbeta version 0.3) requires the -DMING_VERSION_03 option otherwise the make fails. This option should be included in the configure.in after -DUSE_MING_FLASH as below:

```
MING_ENABLED= "--DUSE_MING_FLASH -DMING_VERSION_03"
```

9.4.3 How to Output SWF Files from MapServer

SWF output is specified by using the *OUTPUTFORMAT* object. There are 2 possible output types:

1. A single movie containing the raster output for all the layers. To enable this, declare the following in the map file:

```
OUTPUTFORMAT
  NAME swf
  MIMETYPE "application/x-shockwave-flash"
  DRIVER swf
  IMAGEMODE PC256
  FORMATOPTION "OUTPUT_MOVIE=SINGLE"
END
```

2. A movie for every layer (vector movies for vector layers and raster movies for raster layers). To enable this, declare the following in the map file:

```
OUTPUTFORMAT
  NAME swf
  MIMETYPE "application/x-shockwave-flash"
  DRIVER swf
  IMAGEMODE PC256
  FORMATOPTION "OUTPUT_MOVIE=MULTIPLE"
END
```

Other OutputFormat Options

- **FORMATOPTION “FULL_RESOLUTION=FALSE”**

The FULL_RESOLUTION applies only for vector layers. If set to FALSE, filtering will be applied to the vector elements. It results in a smaller SWF file. The default value is TRUE.

- **FORMATOPTION “LOAD_AUTOMATICALLY=OFF”**

Setting this option to OFF will not load the SWF files for each layer. The default value is ON.

Composition of the Resulting SWF Files

Several SWF Files will be produced from a single map file: there will be one SWF file for each layer defined in the map file and one ‘main’ SWF file containing critical information on the map file and the layers produced.

- The ‘main’ SWF File will contain Action Script (AS) code that gives critical information on the map file and the SWF layers produced. Basically there will be an object called mapObj containing the height, width, extent, scale, number of layers, etc. Here is an example (in AS) of the contents of this main movie:

```
mapObj = new Object ();
mapObj.name = "DEMO_SWF";
mapObj.width = 400;
mapObj.height = 300;
mapObj.extent = "-2594561.353333,3467361.353333,3467361.353333,3840000.000000"; ;
mapObj.numlayers = 4;
mapObj.layers = new Array ();
function LayerObj (name, type, fullname, relativename) {
this.name = name;
this.type = type;
this.fullname = fullname;
this.relativename = relativename;
}
mapObj.layers[0] = new LayerObj ("park", "2", "c:/tmp/ms_tmp/102389536132841_layer_0.swf", "102389536132841_layer_0");
mapObj.layers[1] = new LayerObj ("popplace", "4", "c:/tmp/ms_tmp/102389536132841_layer_1.swf", "102389536132841_layer_1");
mapObj.layers[2] = new LayerObj ("rail", "1", "c:/tmp/ms_tmp/102389536132841_layer_2.swf", "102389536132841_layer_2");
mapObj.layers[3] = new LayerObj ("road", "1", "c:/tmp/ms_tmp/102389536132841_layer_3.swf", "102389536132841_layer_3");
```

This example is produced based on a mapfile with two layers defined in it. We create a layer class object containing useful information on a layer. The parameters are:

- Name : the name found in the map file
- Type : the type of layer (0 = Point Layer; 1=Line; 2=Polygon; 3=Raster; 4=Annotation; 6=Circle)
- Fullname : Full name of the file with path included
- Relative name : Relative Name

For example you can use mapObj.layers[0].name to extract the name of the first layer.

Note: All map parameters from MapServer are not exported at this time. We should come up with a list of information of what we want to output. Note that this information can be used in a Flash application to load the SWF file, to build a legend, to build a scale bar, etc.

- SWF Files for each layer

Each layer defined in the mapfile will have an associated SWF file created. The names of these SWF files are based on the name of the main file with an addition of ‘layer_X’ at the end of the name (where X is the layer index).

These SWF files will contain vector and raster data as well as some Action Script depending on the layer and some configurations in the map file. We will see these configurations in detail in the following section.

Exporting Attributes

Exporting attributes works on a layer basis (it is only available for Vector Layers). To be able to export attributes to the SWF files, you have to define a metadata item called SWFDUMPATTRIBUTES in the layer section of the mapfile. Here is an example :

```
...
LAYER
NAME park
METADATA
  "DESCRIPTION""Parks"
  "RESULT_FIELDS" "NAME_E YEAR_EST AREA_KMSQ"
  "SWFDUMPATTRIBUTES" "NAME_E,AREA_KMSQ"
END
TYPE POLYGON
STATUS ON
DATA park
...
```

In the above example, the values for the attributes NAME_E and AREA_KMSQ will be exported for each element in the layer.

The resulting SWF File will have the values of these attributes (written in Action Script). Here is an example related to the above layer:

```
nAttributes= 2;
Attributes = new Array();
Attributes[0] = "NAME_E";
Attributes[1] = "AREA_KMSQ";
Element = new Array ();
Element[0] = new Array();
Element[0][0] = "Ellesmere Island National Park Reserve";
Element[0][1] = "1500";
Element[1][0] = " Aulavik National park";
Element[1][1] = "1500";
```

Events and Highlights

Here is what is currently implemented concerning events (events here refer to mouse events happening on an element. The available events are MOUSEUP, MOUSEDOWN, MOUSEOVER, MOUSEOUT):

- Events are only available for layers that have defined attributes exported (using SWFDUMPATTRIBUTES). This is like defining that a certain layer is queryable.
- When a mouse event happens on one of the elements, there is an Action Script call that is made: _root.ElementSelected(LayerId, ShapeId, Event) . The Flash application who wants to receive these events should define the function ElementSelected and use the information received to do actions like retrieving the attribute values from the specific SWF for the specified shape and display it.

In order to have highlighting, it has to be defined when the SWF is produced (basically highlighting means that the shape is redrawn using a different color).

As of MapServer 5.0, highlighting is available on queryable layers by using the QueryMap object in the map file to extract the color and do a highlight when on MOUSEOVER. The current implementation will highlight all objects that are in a layer that uses SWFDUMPATTRIBUTES, using the COLOR set in the QueryMap object in the mapfile.

Before MapServer 5.0, all objects that are in a layer that uses SWFDUMPATTRIBUTES are highlighted using a red color.

Fonts

Ming uses a special type of font called FDB files. It does not yet support Truetype fonts. Please refer to ming documentation on how to [produce FDB files](#).

Outputting Raster SWF for Vector Layers

One mechanism would be to use the metadata for layer objects to define a raster output for vector layers. We could use something like “SWFOUTPUT” “RASTER”. If this sounds desirable, please file an enhancement [ticket](#) with this request, specifying the “Output-SWF” component.

9.4.4 What is Currently Supported and Not Supported

1. Vector layers

- Layer Point (case MS_LAYER_POINT) : *done*
 - msDrawMarkerSymbol
 - msDrawLabel
- Layer line (case MS_LAYER_LINE) : *done*
 - msDrawLineSymbol
 - msDrawLabel
- Layer circle (case MS_LAYER_CIRCLE) : *not done* (should be done easily but missing data for testing)
 - omsCircleDrawLineSymbol
 - omsCircleDrawShadeSymbol
- Layer annotation (case MS_LAYER_ANNOTATION): *done*
 - omsDrawMarkerSymbol
 - omsDrawLabel
- Layer Polygon (MS_SHAPE_POLYGON): *done*
 - omsDrawShadeSymbol
 - omsDrawLineSymbol
 - omsDrawLabel
- Vector Low Level functions
 - omsDrawMarkerSymbol
 - * case(MS_SYMBOL_TRUETYPE) : *done*
 - * case(MS_SYMBOL_PIXMAP) : *done*
 - * case(MS_SYMBOL_ELLIPSE) : *done*
 - * case(MS_SYMBOL_VECTOR) : *done*
 - omsDrawLineSymbol

- * case : simple line : *done*
- drawing with the symbols : *not done*
 - omsDrawShadeSymbol
 - * case : solid fill polygon : *done*
 - * case : filled with symbols : cannot be implemented for now (tried to create a GD image to fill the shape but files created were huge)
 - omsCircleDrawLineSymbol : *not done*
 - omsCircleDrawShadeSymbol : *not done*
 - omsDrawLabel : *done*
 - omsDrawLabelCache : *done*
 - obillboard (shadow for texts) : *not done*
- 2. Raster Layer
 - msDrawRasterLayer: *done*
- 3. WMS Layer
 - msDrawWMSLayer: *done*
- 4. Surround components (Legend, scalebar) : *not supported*

9.5 HTML Legends with MapServer

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Last Updated 2012-03-23

Table of Contents

- HTML Legends with MapServer
 - Introduction
 - * Implementation
 - * Legend Object of Mapfile
 - * CGI [legend] tag
 - * HTML Legend Template File
 - Sample Site Using the HTML Legend

9.5.1 Introduction

The HTML legend is an alternative to the traditional GIF legend in MapServer. The following document describes the process for implementing an HTML legend in MapServer CGI applications (NOTE: MapServer version > 3.5 is required).

This document assumes that you are already familiar with certain aspects of MapServer:

- Setting up MapServer mapfiles and templates.

Implementation

Key components for generating HTML legends are 1) a template parameter in the legend object, 2) a CGI [legend] tag in the HTML file, and 3) an HTML legend template file. So that means that if the HTML page has the CGI [legend] parameter set, and the mapfile has a LEGEND object with its TEMPLATE set to a valid HTML legend file then an HTML legend will be returned. The following sections discuss these components.

Legend Object of Mapfile

The HTML legend is enabled by a new TEMPLATE parameter in the Legend Object of the mapfile. If TEMPLATE is set in the Legend Object, then the HTML legend template file is read and used to generate an HTML legend which will be inserted at the location of the [legend] tag in the main HTML template. Similar to other MapServer templates, the HTML legend template filename MUST end with an ".html" extension.

Example 1. Sample Legend Object with the new TEMPLATE parameter

```
...
# LEGEND object
LEGEND
  STATUS ON
  KEYSIZE 18 12
  # LABEL object
  LABEL
    TYPE BITMAP
    SIZE MEDIUM
    COLOR 0 0 89
  END
  TEMPLATE "legend.html"  ### HTML template file
END
...
```

If TEMPLATE is not set, then the [legend] tag produces a regular image in a GIF/PNG image (the traditional behaviour).

CGI [legend] tag

The traditional CGI [legend] tag returns the URL of an image, so it is usually used inside an tag in the HTML file. The new HTML [legend] tag returns a block of HTML, so when converting an existing application template from using a traditional image legend to the new HTML legend, you have to remove the IMG tag in the main application template. Also note that if legend mode is specified in the URL, then MapServer will return a gif containing the whole legend if no template is specified.

See the [CGI Reference doc](#) for more information on CGI parameters.

Example 2. [legend] tag in the main HTML template (with TEMPLATE set)

```
...
<FONT SIZE=+1><B>Legend</B></FONT><BR><HR>[legend]<HR>
...
```

Example 3. [legend] tag in the main HTML template (with TEMPLATE not set)

```
...
<FONT SIZE=+1><B>Legend</B></FONT><BR><HR><IMG SRC=" [legend] "><HR>
...
```

HTML Legend Template File

The HTML legend template file is a separate file that contains 0 or 1 of each of the following tags that define blocks of HTML to use in building the legend:

```
[leg_group_html] ... [/leg_group_html]
[leg_layer_html <OPTIONAL PARAMS>] ... [/leg_layer_html]
[leg_class_html <OPTIONAL PARAMS>] ... [/leg_class_html]
```

Note

Any text or HTML tags outside the [leg_*_html] tag pairs in the legend template file are ignored by the template parser.

The following example shows what an HTML legend TEMPLATE file could look like:

Example 4. An HTML legend TEMPLATE file

```
[leg_group_html]
<tr>
  <td colspan=3 bgcolor=#cccccc><b>[leg_group_name]</b></td>
</tr>
[/leg_group_html]

[leg_layer_html order_metadata=legend_order opt_flag=5]
<tr>
  <td>
    <input type=checkbox name="map_[leg_layer_name]_status"
      value=1 [if name=layer_status oper=eq value=2]CHECKED[/if]>
  </td>
  <td colspan=2>
    <a href="[metadata name=href]">[metadata name=layer_title]</a>
  </td>
</tr >
[/leg_layer_html]

[leg_class_html]
<tr>
  <td width=15> </td>
  <td>
    
  </td>
  <td>
    [leg_class_name]
  </td>
</tr>
[/leg_class_html]
```

Supported Tags for the TEMPLATE file:

HEADER block

Tag [leg_header_html]...[/leg_header_html]

Description HTML block to use as the header of the legend.

FOOTER block

Tag [leg_footer_html]...[/leg_footer_html]

Description HTML block to use as the footer of the legend.

Example 5. HTML Legend File Using Header/Footer Blocks

```
[leg_header_html]
<p><b>my header</b></p>
[/leg_header_html]

[leg_layer_html]
...
[/leg_layer_html]

[leg_footer_html]
<p><b>my footer</b></p>
[/leg_footer_html]
```

GROUP block

Tag [leg_group_html <OPTIONAL PARAMS>]...[/leg_group_html]

Description HTML block to use for layer group headers if layers should be grouped in the legend. If not set then layers are not grouped in the legend.

When the [leg_group_html] tag is used, then layers that don't belong to any group (i.e. LAYER GROUP not set in the mapfile) and their classes will not show up at all in the legend. The group list is decided by the order_metadata parameter, which is explained later.

SUPPORTED PARAMETERS:

Parameter opt_flag=<bit_mask>

Description Control the group's display, by adding the following values (default is 15). The opt_flag is applied on all layers in the group. If at least one layer matches the flag, the group will show up in the legend.

- 1 If set, show group even if all layers in group are out of scale (default: hide groups out of scale).
- 2 If set, show group even if all layers in group have status OFF (default: hide groups with STATUS OFF).
- 4 If set, show group even if all layers in group are of type QUERY (default: hide group of TYPE QUERY)
- 8 If set, show group even if all layers in group are of type ANNOTATION (default: hide groups of TYPE ANNOTATION) Deprecated since version 6.2.

e.g. opt_flag=12 (shown below) means show all layer types, including QUERY and ANNOTATION layers (4 + 8)

```
[leg_group_html opt_flag=12]
...
[/leg_group_html]
```

SUPPORTED TAGS:

Tag [leg_group_name]

Description Returns the group's name.

Tag [layer_status]

Description Returns the status of the first layer in the group.

Tag [leg_icon width=<optional_width> height=<optional_height>]

Description In the group context, the [leg_icon] tag returns the URL of a legend icon for the first class in the first layer that's part of this group.

Tag [metadata name=<metadata_field_to_display>]

Description Returns specified metadata value from web's metadata.

e.g. the group block below simply displays the name of the group in the legend:

```
[leg_group_html]
<tr><td colspan=2><b>[leg_group_name]</b></td></tr>
[/leg_group_html]
```

LAYER block

Tag [leg_layer_html <OPTIONAL PARAMS>] ... [/leg_layer_html]

Description HTML block to use for layer header. If not set then no layer headers are displayed (could allow a legend with only classes in it).

SUPPORTED PARAMETERS:

Parameter order_metadata=<field_to_order_by>

Description Specifies that the value of the layer metadata <field_to_order_by> controls the order and visibility of the layers in the legend.

- Layers with <field_to_order_by> ≥ 0 are sorted in order of this value, with multiple layers with same value being accepted, in which case the map layer order applies between those layers.
- Layers with <field_to_order_by> < 0 are always hidden in the legend.

Parameter opt_flag=<bit_mask>

Description Control the layer display process. Add the values below to acquire the desired options (default is 15):

- 1 If set, show layer even if out of scale (default: hide layers out of scale).
- 2 If set, show layer even if status is OFF (default: hide layers with STATUS OFF).
- 4 If set, show layer even if type is QUERY (default: hide layers of TYPE QUERY)
- 8 If set, show layer even if type is ANNOTATION (default: hide layers of TYPE ANNOTATION) Deprecated since version 6.2.

e.g. opt_flag=14 (shown below) means do not show layers in the legend that are out of scale.

```
[leg_layer_html opt_flag=14]
...
[/leg_layer_html]
```

SUPPORTED TAGS:

Tag [leg_layer_group]

Description Returns the group name of the layer. This was added to MapServer v4.8.

Tag [leg_layer_index]

Description Returns the mapfile index value of the layer, which is useful for ordering. This was added to MapServer v4.8.

Tag [leg_layer_maxscale]

Description Returns the maximum scale set for the layer. This was added to MapServer v4.8.

Tag [leg_layer_minscale]

Description Returns the minimum scale set for the layer. This was added to MapServer v4.8.

Tag [leg_layer_name]

Description Returns the current LAYER NAME value.

Tag [leg_icon width=<optional_width> height=<optional_height>]

Description In the layer context, the [leg_icon] tag returns the URL of a legend icon for the first class in this layer.

Tag [metadata name=<metadata_field_to_display>]

Description Returns specified metadata value from this layer's metadata and web's metadata.

e.g. the layer block below simply displays an icon of the layer's class and the layer name:

```
[leg_layer_html]
<tr><td><img src=[leg_icon width=15 height=15]><b>[leg_layer_name]</b></td></tr>
[/leg_layer_html]
```

CLASS block

Tag [leg_class_html <OPTIONAL PARAMS>] ... [/leg_class_html]

Description HTML block to use for classes. If not set then no classes are displayed (could allow a legend with only layer headers in it). Note that classes with NULL (i.e. empty) NAMES are not displayed.

SUPPORTED PARAMETERS:

Parameter opt_flag=<bit_mask>

Description Control the layer (i.e. class) display process. Add the values below to acquire the desired options (default is 15). Note that using this parameter for the CLASS block has the same effect as using the opt_flag parameter in the LAYER block.

- 1 If set, show layer even if out of scale (default: hide layers out of scale).
- 2 If set, show layer even if status is OFF (default: hide layers with STATUS OFF).
- 4 If set, show layer even if type is QUERY (default: hide layers of TYPE QUERY)
- 8 If set, show layer even if type is ANNOTATION (default: hide layers of TYPE ANNOTATION) Deprecated since version 6.2.

e.g. opt_flag=14 (shown below) means do not show classes in the legend that are out of scale.

```
[leg_class_html opt_flag=14]
...
[/leg_class_html]
```

SUPPORTED TAGS:**Tag** [leg_class_index]**Description** Returns the mapfile index value of the class, which is useful for ordering and legend icon creation. This was added to MapServer v4.8.**Tag** [leg_class_maxscale]**Description** Returns the maximum scale set for the class. This was added to MapServer v4.8.**Tag** [leg_class_minscale]**Description** Returns the minimum scale set for the class. This was added to MapServer v4.8.**Tag** [leg_class_name]**Description** Returns the CLASS NAME value.**Tag** [leg_class_title]**Description** Returns the CLASS TITLE value.**Tag** [leg_layer_name]**Description** Returns the parent layer name. This was added to MapServer v4.8.**Tag** [leg_icon width=<optional_width> height=<optional_height>]**Description** In the layer context, the [leg_icon] tag returns the URL of a legend icon for the first class in this layer.**Tag** [metadata name=<metadata_field_to_display>]**Description** Returns specified metadata value from the metadata of the layer to which this class belongs and web's metadata.

e.g. the class block below simply displays an icon of the layer's class and the class name:

```
[leg_class_html]
<tr><td><img src=[leg_icon width=15 height=15]><b>[leg_class_name]</b></td></tr>
[/leg_class_html]
```

CONDITIONAL text

[if] tags can be used in any of the [leg_*_html] tags above to place conditional text. The syntax is:

```
[if name=<field_to_check> oper=<eq|neq|isset|isnull> value=<to_compare_with_field>] ... [/if]
```

Note:

Nested IF's are supported. Parameter "oper" can be "eq" for equal, "neq" for not equal, "isset" (self-explanatory), or "isnull" (self-explanatory). The default value is equal.

Example 6. [if] tag can be used to maintain the state of a layer checkbox

```
[leg_layer_html order_metadata=legend_order opt_flag=5]
<tr>
  <td>
    <input type=checkbox name="map_[leg_layer_name]_status"
```

```
        value=1 [if name=layer_status oper=eq value=2]CHECKED[/if] >
    </td>
    <td colspan=2>
        <a href="[metadata name:href]">[metadata name=layer_title]</a>
    </td>
</tr >
[/leg_layer_html]
```

The possible values that can be tested in an [if] tag depend on the context in which the [if] tag is used. At the moment, the number of values that can be tested is limited, but new values may be added as needed.

Note that the order of the items in the following [if] contexts are listed by their order of precedence. The rule is always that special keywords have top priority (e.g. layer_status, etc.), followed by layer-level metadata, and ending with map-level metadata. The possible values that can be tested are as follows:

In a **[leg_group_html]** context:

- [if name=layer_status value=...] ... [/if]
value is the layer status of the first layer that belongs to the group in integer format: 0=OFF, 1=ON, 2=DEFAULT

- [if name=layer_visible value=...] ... [/if]
value is the visibility of the first layer in the group: 0=NOT VISIBLE, 1=VISIBLE

- [if name=group_name value=...] ... [/if]
- [if name=any_layer_metadata value=...] ... [/if]

Uses metadata value from the first layer in the mapfile that belongs to that group

- [if name=any_web_metadata value=...] ... [/if]
- [if name=layer_queryable value=...] ... [/if]

value is the queryability of the first layer in the group: 0=NOT QUERYABLE, 1=QUERYABLE New in version 5.6.

In a **[leg_layer_html]** context:

- [if name=layer_status value=...] ... [/if]
value is the layer's status in integer format: 0=OFF, 1=ON, 2=DEFAULT

- [if name=layer_type value=...] ... [/if]
value is the layer's type in integer format: 0=POINT, 1=LINE, 2=POLYGON, 3=RASTER, 4=AN-NOTATION (deprecated since 6.2), 5=QUERY, 6=CIRCLE

- [if name=layer_name value=...] ... [/if]
value is the layer's name in string format

- [if name=layer_group value=...] ... [/if]
value is the layer's group name in string format

- [if name=layer_visible value=...] ... [/if]
value is the visibility of the layer: 0=NOT VISIBLE, 1=VISIBLE

- [if name=any_layer_metadata value=...] ... [/if]
- [if name=any_web_metadata value=...] ... [/if]

- [if name=layer_queryable value=...] ... [/if]

value is the queryability of the layer: 0=NOT QUERYABLE, 1=QUERYABLE New in version 5.6.

In a [leg_class_html] context:

- [if name=layer_status value=...] ... [/if]

value is the status of the layer in which the class is located

- [if name=layer_type value=...] ... [/if]

value is the layer's type in integer format: 0=POINT, 1=LINE, 2=POLYGON, 3=RASTER, 4=AN-NOTATION (deprecated since 6.2), 5=QUERY, 6=CIRCLE

- [if name=layer_name value=...] ... [/if]

value is the layer's name in string format

- [if name=layer_group value=...] ... [/if]

value is the layer's group name in string format

- [if name=layer_visible value=...] ... [/if]

value is the visibility of the layer: 0=NOT VISIBLE, 1=VISIBLE

- [if name=class_name value=...] ... [/if]

- [if name=any_layer_metadata value=...] ... [/if]

- [if name=any_web_metadata value=...] ... [/if]

- [if name=layer_queryable value=...] ... [/if]

value is the queryability of the layer: 0=NOT QUERYABLE, 1=QUERYABLE New in version 5.6.

9.5.2 Sample Site Using the HTML Legend

http://demo.mapserver.org/itasca_legend/

This demo is based on the MapServer Itasca demo and contains several variations of HTML Legends, some of which are listed below:

- “HTML Legend 1” - displays classes only, similar to the traditional legends:

```
[leg_class_html opt_flag=15]
  <img src=[leg_icon]> [leg_class_name]<br>
[/leg_class_html]
```

- “HTML Legend 2” - displays layer titles with HREF links and classes:

```
[leg_layer_html order_metadata=WMS_ORDER visibility_flag=15]
  <a href="[leg_layer_name]">[metadata name=WMS_TITLE]</a><BR>
[/leg_layer_html]
```

```
[leg_class_html visibility_flag=15]
  <img src=[leg_icon]> [leg_class_name]<br>
[/leg_class_html]
```

- “HTML Legend 3” - displays layers by group, with checkboxes to turn layers on/off:

```
[leg_group_html]
  <tr><td colspan=2><b>[leg_group_name]</b></td></tr>
[/leg_group_html]
```

```
[leg_layer_html order_metadata=WMS_ORDER opt_flag=15]
<tr>
    <td><input type=checkbox name=layer value=[leg_layer_name]>
        [&if name=layer_status value=1]CHECKED[/if]>
        [&if name=layer_type value=4]
            <img src=[leg_icon width=22 height=18]>
        [/if]
        [&if name=layer_type oper=neq value=4]<img src=[leg_icon]>[/if]
    </td>
    <td>
        <a href="#" [leg_layer_name]">[metadata name=WMS_TITLE]</a>
    </td>
</tr>
[/leg_layer_html]
```

9.6 HTML Imagemaps

Author David Fawcett

Contact david.fawcett at gmail.com

Last Updated 2008-10-08

Contents

- [HTML Imagemaps](#)
 - [Introduction](#)
 - [Mapfile Layer Definition](#)
 - [Templates](#)
 - [Request URL](#)
 - [Additional Notes](#)
 - [More Information](#)

9.6.1 Introduction

The shpxy method of creating imagemaps uses MapServer query functionality to build a html imagemap. Just like a regular MapServer query, you send a query request and MapServer uses the templates to build a block of html that it sends back to the browser. The first example shows you how to build an imagemap based on a point layer. An example template for a polygon layer is also included.

Components

- MapServer mapfile
- query template file
- query header template
- query footer template

9.6.2 Mapfile Layer Definition

Here is a simple mapfile for our example

```

MAP
NAME "myMapFile"
STATUS ON
SIZE 200 200
EXTENT 178784 4804000 772653 5483346

UNITS METERS
STATUS ON
SHAPEPATH "/web/maps/data"
IMAGECOLOR 255 255 255

WEB
  IMAGEPATH "/web/maps/tmp/"
  IMAGEURL "/maps/tmp/"
END

QUERYMAP
  STATUS ON
  STYLE NORMAL
END

LAYER
  NAME "sites"
  STATUS DEFAULT
  TYPE point
  DATA 'aqiAreas'
    TEMPLATE "bodytemplate.html"
    HEADER "imapheader.html"
    FOOTER "imapfooter.html"
END
END

```

You can see that we have a mapfile with one point layer, and that it contains references to three query templates.

9.6.3 Templates

In MapServer, the query header and footers get processed only once. The main query template, ‘bodytemplate.html’ in this example, gets processed once for each record in the record set returned by the query.

Point Layers

Here is the query header, ‘imapheader.html’. It creates the opening tag for your html imagemap.

```
<map id="mymap" name="mymap">
```

Here is the query template, ‘bodytemplate.html’. It creates the body of the html imagemap.

```
<area shape="circle" coords="[shpxy precision=0 proj=image yf=",7" xf=","]" href="http://my.url/mypage.cfm?region=Northern" >
```

This template is used to create circular imagemap elements for a point layer. NAME is a fieldname in the data source, the value for NAME for each individual record gets substituted as the template is processed. The href specifies the URL link if the element is clicked. Title and alt will display the value when an element is moused over.

The resulting html element looks like

```
<area shape="circle" coords="80,103,7" href="http://my.url/mypage.cfm?region=Northern" >
```

The key part here is

```
coords="[shpxy precision=0 proj=image xf=, " yf=,7"]"
```

This is where MapServer will substitute the image coordinates for that query record. With Precision=0, the coordinates will be integers.

You also see shpxy template formatting options ‘xf’ and ‘yf’. ‘xf=,’ tells MapServer to place a comma after the x coordinate. ‘yf=,’7” after the y coordinate. This is done to specify a radius of 7 pixels for the circle. More options can be found in the [Template Reference](#).

The query footer template simply adds the closing tag for the html imagemap

```
</map>
```

Polygon Layers

Here is a query template for a polygon layer

```
<area shape="poly" coords="[shpxy precision=0 proj=image]" href="http://my.url/mypage.cfm?ID=[SITE_ID]
```

9.6.4 Request URL

To get the imagemap, you need to send a GET or POST request to MapServer with several URL variables defined. The below URL tells MapServer where the mapfile is located, what layer we are querying, and that we are using nquery mode to return multiple results.

```
http://myurl/cgi-bin/mapserv?map=/web/maps/demoimap.map&qlayer=sites&mode=nquery&searchmap=true
```

9.6.5 Additional Notes

If you use separate map files to generate your imagemap and your map image, make sure that the EXTENT and SIZE specified in both mapfiles are identical. If they are not, your features will not align properly.

9.6.6 More Information

[Steve Lime’s SHPYX Example](#)

9.7 OGR Output

Author Frank Warmerdam

Contact warmerdam at pobox.com

Last Updated 2011-11-15

Table of Contents

- OGR Output
 - Introduction
 - OUTPUTFORMAT Declarations
 - LAYER Metadata
 - MAP / WEB Metadata
 - Geometry Types Supported
 - Attribute Field Definitions
 - Return Packaging
 - Test Suite Example

9.7.1 Introduction

OGR output support was added to MapServer 6.0. It provides an output driver to produce feature style output suitable as a return result from WMS GetFeatureInfo or WFS GetFeature requests. OGR feature output depends on MapServer being built against the GDAL/OGR library. The OGR output driver should be enabled in MapServer 6.0 or newer when INPUT=OGR appears in the version string.

9.7.2 OUTPUTFORMAT Declarations

Details of OGR output formats allowed are controlled by an *OUTPUTFORMAT* declaration. The declarations define the OGR format driver to be used, creation options specific to that driver, and more general instructions to MapServer on how to package multi-file results and whether to try and build the result on disk or in memory.

Examples:

```
OUTPUTFORMAT
  NAME "CSV"
  DRIVER "OGR/CSV"
  MIMETYPE "text/csv"
  FORMATOPTION "LCO:GEOMETRY=AS_WKT"
  FORMATOPTION "STORAGE=memory"
  FORMATOPTION "FORM=simple"
  FORMATOPTION "FILENAME=result.csv"
END
```

```
OUTPUTFORMAT
  NAME "OGRGML"
  DRIVER "OGR/GML"
  FORMATOPTION "STORAGE=filesystem"
  FORMATOPTION "FORM=multipart"
  FORMATOPTION "FILENAME=result.gml"
END
```

```
OUTPUTFORMAT
  NAME "SHAPEZIP"
  DRIVER "OGR/ESRI Shapefile"
  FORMATOPTION "STORAGE=memory"
  FORMATOPTION "FORM=zip"
  FORMATOPTION "FILENAME=result.zip"
END
```

The OGR format driver to be used is determined by the name appearing after “OGR/” in the DRIVER argument. This name should match one of the formats listed as supported for the “-f” argument to ogr2ogr in the ogr2ogr usage message.

The IMAGEMODE for OGR output is FEATURE, but this is implicit and does not need to be explicitly stated for OGR output driver declarations.

The OGR renderer will support the following FORMATOPTION declarations:

DSCO:* Anything prefixed by DSCO: is used as a dataset creation option with the OGR driver. See the OGR web page for the particular format driver to see layer creation options available.

LCO:* Anything prefixed by LCO: is used as a layer creation option. See the OGR web page for the particular format driver to see layer creation options available.w

FORM=simple/zip/multipart Indicates whether the result should be a simple single file (single), a mime multipart attachment (multipart) or a zip file (zip). “zip” is the default.

STORAGE=memory/filesystem/stream Indicates where the datasource should be stored while being written. “file” is the default.

If “memory” then it will be created in /vsimem/ - but this is only suitable for drivers supporting VSI*L which we can’t easily determine automatically.

If “filesystem”, then a directory for temporary files (specified using *WEB TEMPPATH* or *MS_TEMPPATH*) will be used for writing and reading back the file(s) to stream to the client.

If “stream” then the datasource will be created with a name “/vsistdout” as an attempt to write directly to stdout. Only a few OGR drivers will work properly in this mode (ie. CSV, perhaps kml, gml).

FILENAME=name Provides a name for the datasource created, default is “result.dat”.

9.7.3 LAYER Metadata

The OGR output driver utilizes several items from the LAYER level METADATA object. Some of these were originally intended for GML output or are primarily intended to support WFS.

wfs_getfeature_formatlist (Optional) A comma delimited list of formats supported for WFS GetFeature responses. The OUTPUTFORMAT NAME values should be listed.

```
"wfs_getfeature_formatlist" "OGRGML,SHAPEZIP,CSV"
```

gml_include_items (Optional) A comma delimited list of items to include, or keyword “all”. You can enable full exposure by using the keyword “all”.

```
"gml_include_items" "all"
```

You can specify a list of attributes (fields) for partial exposure, such as:

```
"gml_include_items" "Name, ID"
```

The new default behaviour is to expose no attributes at all.

gml_[item name]_alias (Optional) An alias for an attribute’s name. The resulting file will refer to this attribute by the alias. Here is an example:

```
"gml_province_alias" "prov"
```

gml_[item name]_type (Optional) Specifies the type of the attribute. Valid values are Integer|Real|Character|Date|Boolean.

gml_[item name]_width (Optional) Specifies the width of the indicated field for formats where this is significant, such as Shapefiles.

gml_[item name]_precision (Optional) Specifies the precision of the indicated field for formats where this is significant, such as Shapefiles. Precision is the number of decimal places, and is only needed for “Real” fields.

gml_types (Optional) If this field is “auto” then some input feature drivers (ie. OGR, and native shapefiles) will automatically populate the type, width and precision metadata for the layer based on the source file.

```
"gml_types"    "auto"
```

ows/wfs_geomtype (Optional) Set the geometry type of OGR layers created from this MapServer LAYER. One of “Point”, “LineString”, “Polygon”, “MultiPoint”, “MultiLineString”, “MultiPolygon”, “GeometryCollection”, “Geometry”, or “None”. Most are fairly obvious, but “Geometry” can be used to represent a mix of geometry types, and “None” is sometimes suitable for layers without geometry. Note that layers which are a mix of polygon and multipolygon would normally have to be described as “Geometry”. To produce 2.5D output append “25D” to the geometry type (ie. “Polygon25D”). Note that Z values are only carried by MapServer if built with USE_POINT_Z_M support.

```
"ows_geomtype"  "Polygon"
```

9.7.4 MAP / WEB Metadata

wms_feature_info_mime_type In order for WMS GetFeatureInfo to allow selection of OGR output formats, the mime type associated with the OUTPUTFORMAT must be listed in this metadata item.

```
"wms_feature_info_mime_type" "text/csv"
```

9.7.5 Geometry Types Supported

In MapServer we have POINT, LINE and POLYGON layers which also allow for features with multiple points, lines or polygons. However, in the OGC Simple Feature geometry model used by OGR a point and multipoint layer are quite distinct. Likewise for a LineString and MultiLineString and Polygon an MultiPolygon layer type.

To work around the mismatches between the MapServer and OGR geometry models, there is a mechanism to specify the geometry type to be used when exporting through OGR. This is the “wfs/ows_geomtype” metadata item on the layer. It may be one of one of “Point”, “LineString”, “Polygon”, “MultiPoint”, “MultiLineString”, “MultiPolygon”, “GeometryCollection”, “Geometry”, or “None”.

If this item is not specified, then “Point”, “LineString” or “Polygon” will be used depending on the TYPE of the LAYER. In cases of mixed geometry types (ie. polygons and multipolygons) the geometry type should be set to “Geometry” which means any geometry type.

```
"ows_geomtype"  "Geometry"
```

9.7.6 Attribute Field Definitions

For OGR output it is highly desirable to be able to create the output fields with the appropriate datatype, width and precision to reflect the source feature definition.

It is possible to set the gml_[item]_type, gml_[item]_width and gml_[item]_precision metadata on the layer to provide detailed field definitions:

```
METADATA
  "gml_ID_type"          "Integer"
  "gml_ID_width"         "8"
  "gml_AREA_type"        "Real"
  "gml_AREA_width"       "15"
  "gml_AREA_precision"   "6"
  "gml_NAME_type"        "Character"
  "gml_NAME_width"       "64"
  ...
  
```

However, doing this manually is tedious and error prone. For that reason some feature sources (at least OGR, Shapefiles, POSTGIS and ORACLESPATIAL) support a mechanism to automatically populate this information from the source datastore. To accomplish this specify:

```
"gml_types"           "auto"
```

If no effort is made to set type, width and precision information for attribute fields, they will all be treated as variable length character fields when writing through OGR.

9.7.7 Return Packaging

One of the challenges returning generalized feature formats is that many such formats consists of multiple files which must be returned in the result. There are three approaches taken to this based on the FORM FORMATOPTION in the OUTPUTFORMAT declaration.

simple In this case a single result is returned. This is suitable for format drivers that produce a single file. The return result will have the mimetype listed in the OUTPUTFORMAT declaration. Note that if the OGR driver actually returns multiple files, only the primary one (the one with a name matching the filename passed into the OGR CreateDataSource call) will be returned. The return result will have a suggested filename based on the FILENAME FORMATOPTION.

multipart In this case all the files produced are returned as a multipart mime result. In this case the MIMETYPE of the OUTPUTFORMAT is ignored. All component files are returned with a mime type of “application/binary” and the whole package is “multipart/mixed”.

zip In this case all the files produced are bundled into one .zip file and this zip file is returned with a mimetype of “application/zip”. The OUTPUTFORMAT MIMETYPE is ignored.

One caveat with “zip” results is that this option is only available if the GDAL/OGR version is 1.8 or newer (or a 1.8 development later than approximately Oct 15, 2010). Earlier versions of GDAL/OGR lacked the zipping capability needed.

9.7.8 Test Suite Example

The MSAutoTest test suite contains a test case for use of OGR Output from WFS. The mapfile is at:

https://github.com/mapserver/msautotest/blob/master/wxs/wfs_ogr.map

The comments at the start of the file have a variety of sample requests that can be run against the map, as long as [MAPFILE] is replaced with the mapfile name. These requests should be run against mapserv sitting in the msautotest/wxs directory.

9.8 PDF Output

Author Yewondwossen Assefa

Contact yassefa at dmsolutions.ca

Revision \$Revision\$

Date \$Date\$

Last Updated 2006/01/12

Table of Contents

- [PDF Output](#)
 - [Introduction](#)
 - [What is currently supported and not supported](#)
 - [Implementing PDF Output](#)
 - [PHP/MapScript and PDF Output](#)

9.8.1 Introduction

PDF output support was added to MapServer 3.7. Previous versions of MapServer had support for pdf output using a utility program (`shp2pdf`) to output a pdf file given a MapServer mapfile.

The difference in this new version is that the output to PDF can now be directly specified in the mapfile using the `IMAGETYPE` or the `OUTPUTFORMAT` parameters in the mapfile. Additionally, raster layers are now supported for pdf output.

Note: From version 6.0, PDF output is supported through Cairo. This is not reflected in the current documentation.

9.8.2 What is currently supported and not supported

1. Vector Layers

- Layer Point: supported
- Layer Line: supported
- Layer Polygon: supported
- Layer Circle : not supported

Note: Note: Dashed lines are supported with PDFlib version 6 or greater.

Note: Polygons filled with symbols are not supported.

2. Raster Layers

Raster layers are supported. Note that at this point all raster layers are transformed to jpeg format before being written to the PDF file.

3. WMS Layers

Not yet supported

4. Surround components

Legend, scalebar are not supported.

5. Fonts

Standard PostScript fonts are supported. For use of other fonts (such as truetype), see the pdflib documentation for use of UPR description files (some notes on it are [here](#)).

9.8.3 Implementing PDF Output

Note that the following instructions were developed for MapServer 3.7 and pdflib 4.0.3, but the general steps should be similar for recent versions of both.

Build the PDF Library

In order to have access to the PDF support in MapServer, you should download and build the PDF library from <http://www.pdflib.com/products/pdflib/>. Please follow the instructions on the PDFLib site to build on your specific platforms.

Here are some quick notes on how to build on windows:

- download and extract the source code from <http://www.pdflib.com/products/pdflib/>
- open the project PDFlib.dsw in MS Visual C++
- build the project pdflib_dll
- after a sucessful build, you should have a pdflib.lib and pdplib.dll under the pdflib directory
- copy the pdplib.dll under your system directory (ex : c:/winnt/system32)
- the pdflib.lib will be used while building mapserver with the PDF support

Build MapServer with PDF support

Windows platform

Edit the makefile.vc and uncomment the following lines (make sure that the paths are adapted to your installation):

```
PDF_LIB=../pdflib-4.0.3/pdflib/pdflib.lib  
PDF_INC=-I../pdflib-4.0.3/pdflib  
PDF=-DUSE_PDF
```

See the *Windows Compilation* document for general MapServer compile instructions.

Unix platforms

Add *with-pdf* to your configure command line before compiling.

See the *Unix Compilation* document for general MapServer compile instructions.

Mapfile definition

The IMAGETYPE parameter in the *Mapfile* should be set to pdf in order to output to PDF:

```
NAME pdf-test  
STATUS ON  
...  
IMAGETYPE pdf
```

```
...
WEB
...
END

LAYER
...
END

END
```

You can also specify the output using the *OUTPUTFORMAT* tag (this tag was introduced in mapserver 3.7) :

```
OUTPUTFORMAT
  NAME pdf
  MIMETYPE "application/x-pdf"
  DRIVER pdf
  FORMATOPTION "OUTPUT_TYPE=RASTER" ##not mandatory
END
```

If the OUTPUT_TYPE=RASTER all the layers will be rendered as rasters. Note that when WMS layers are included in the mapfile, this option should be set since there is a problem with transparency and wms layers. See the *OUTPUTFORMAT* object in the *Mapfile* reference for parameter explanations.

Testing

The easiest way to test your pdf output mapfile is with the MapServer *shp2img utility*. Windows users can find this utility in [MS4W](#), as well as [FWTools](#).

You simply pass a mapfile to the executable and a name for the output pdf, and a pdf file is generated:

```
shp2img -m gmap_pdf.map -o test.pdf
```

Possible Errors

```
PDFlib I/O error: Resource configuration file 'pdflib.upr' not found
```

This is related to fonts. If you remove the LABEL object from your mapfile you will see this error go away. The pdf error is described [here](#). Basically, until this issue is ‘fixed’, if you want to use a font other than the included standard PostScript fonts in pdf output (such as truetype fonts), consult the PDFlib documentation.

9.8.4 PHP/MapScript and PDF Output

MapServer can render to PDF directly, another option is to render to a PNG and insert that into a PDF document. This is not the only way to create a PDF document of course. You will need to have support for [PDFLib](#) compiled into your PHP install.

This example shows the key parts of the process, you will need to furnish parts of the script yourself (depending on your app) and repeat the process for each map element that you want to include.

Refer to the [PHP/MapScript Reference](#) wherever necessary.

How does it work?

In brief, we will pass parameters required to render a map to a PHP script that will:

- create a PDF document
- render a PNG view at a suitably higher resolution
- insert the PNG
- buffer it and send it to the user

Create the PDF document

Here is an example similar to the one given on the [PHP website](#) to create a new PDF document:

```
$my_pdf = pdf_new();  
...
```

Get this stage and section 4.5 working before you try inserting MapServer elements.

Render PNG views at a suitable resolution

Work back from the assumption that you will need no more than 300 dpi on your page for your map to look presentable. For an A4 map, I am using 150 dpi for an 8' x 8' main map, which is 1200 x 1200 pixels.

```
$map->set(width,1200);  
$map->set(height,1200);
```

Of course, our map will not be very useful unless it is zoomed in to the extent our user requested, and the layers they selected are switched on. Maintain arrays in your application that record:

- The current extent (say \$ext[])
- Layer status (say \$layer[])

Open your map file and pass these back through to set the map file into the state the user is expecting, something like:

```
$map->setextent($ext[0], $ext[1], $ext[2], $ext[3]);  
  
while($layer[]) {  
    $layer=$map->getLayer($n);  
    if($layer[$n]==1) {  
        $layer->set(status,1);  
    } else {  
        $layer->set(status,0);  
    }  
}
```

Now you will need to save a rendered view to a PNG file.

```
$img = $map->draw();  
$url = $img->saveWebImage(MS_PNG, 0, 0, 0);
```

Use the same method for all your map elements, such as drawReferenceMap?(), drawScaleBar?() and drawLegend().

Insert the PNG elements into your PDF document

This is really easy, use the `pdf_open_image_file()` function to import the map elements into your PDF document:

```
$element = pdf_open_image_file($my_pdf, "png", "$webroot/$url");
pdf_place_image($my_pdf, $element, $xpos, $ypos);
pdf_close_image($my_pdf, $element);
```

Repeat as needed for any map elements you created.

Buffer the PDF and send it to the user

Assuming we have been creating the document `$my_pdf`, when we are done, we merely buffer it and send it to the user using `echo()`:

```
<?php

.....
pdf_close($my_pdf);

$data = pdf_get_buffer($my_pdf);

header('Content-type: application/pdf');
header('Content-disposition: inline; filename=map.pdf');
header('Content-length: ' . strlen($data) );

echo $data;

?>
```

Gotcha: remember that you cannot send headers if you have at any stage outputted text to the browser.

Additional stuff to try

Rendering everything as PNG can look ugly, so I step through the key and extract labels so I can render them using PDF's text functions.

This can be done for other map element, such as map titles, layer descriptions, or anything else that can be read from the mapfile.

9.9 SVG

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Revision \$Revision\$

Date \$Date\$

Last Updated 2005/12/13

Table of Contents

- [SVG](#)
 - [Introduction](#)
 - [Feature Types and SVG Support Status](#)
 - [Testing your SVG Output](#)
 - [goSVG](#)

9.9.1 Introduction

SVG (or Scalable Vector Graphics) is a standardized XML language for describing 2D graphics via vector graphics, text and raster graphics. As of version 4.5, MapServer can output SVG v1.1 maps. The following documentation is based on the [World Wide Web Consortium's \(W3C\) Scalable Vector Graphics \(SVG\) 1.1 Specification](#).

This document assumes that you are already familiar with certain aspects of MapServer:

- MapServer application development and setting up map files.

Note: From version 6.0, SVG output is supported through Cairo. This is not reflected in the current documentation.

Links to SVG-Related Information

- [SVG 1.1 specification](#)
- [SVG Discussion Paper](#)
- [G-XML Project Page](#)
- [SVG Tiny Profile](#)
- [*MapFile Reference Doc*](#)

9.9.2 Feature Types and SVG Support Status

Circle Layers

Circle layers are not yet supported.

Line Layers

The following items describe how line layers are handled by MapServer for SVG output:

- Lines are converted to SVG [polyline](#) elements.
- The STYLE object's WIDTH parameter is used for SYMBOL 0 for line thickness.
- The STYLE object's SIZE parameter is used for other symbols for line thickness.
- All lines are drawn without symbols - only line thickness changes.
- If a style uses a symbol and this symbol has a dashed style, it will be transformed into an SVG stroke-dasharray element.

Point Layers

The following items describe how point layers are handled by MapServer for SVG output:

- VECTOR, ELLIPSE, and TRUETYPE symbols are supported.
- PIXMAP symbols are not currently supported.
- Labels attached with the symbols are supported (see the *Text Features* section below for details).

Polygon Layers

The following items describe how polygon layers are handled by MapServer for SVG output:

- Polygons are converted to SVG `polygon` elements.
- The STYLE's COLOR is used for the fill.
- The STYLE's OUTLINECOLOR is used for the stroke.
- SVG `patterns` are not currently supported.

Raster Layers

The following items describe how raster layers are handled by MapServer for SVG output:

- Temporary image is created through the GD library, and GD functions are used to draw the layer.
- You must have at least PNG or JPEG support compiled in MapServer.
- You must have the WEB object's IMAGEPATH and IMAGEURL set properly in your mapfile.

Text Features

The following items describe how text features are handled by MapServer for SVG output:

- Text is converted to SVG `text` element.
- Only TRUETYPE fonts are supported.
- Supports labels with ENCODING (output as UTF-8 hexadecimal values).
- The FONT name used in MapServer is parsed to form the SVG `font-family`, `font-style`, and `font-weight`.

WMS Layers

WMS layers are not yet supported.

Setting up a Mapfile for SVG Output

- You must have valid IMAGEPATH and IMAGEURL parameters set in the WEB object of the mapfile.
- To be able to output a valid SVG file, the user needs to define an OUTPUTFORMAT object in the map file and set the IMAGETYPE parameter to svg. Here is an example:

```
MAP
...
IMAGETYPE svg
...
OUTPUTFORMAT
```

```
NAME svg
MIMETYPE "image/svg+xml"
DRIVER svg
FORMATOPTION "COMPRESSED_OUTPUT=TRUE"
FORMATOPTION "FULL_RESOLUTION=TRUE"
END
...
WEB
  IMAGEPATH "/tmp/ms_tmp/"
  IMAGEURL  "/ms_tmp/"
END
...
LAYER
...
END
END
```

Note:

If FORMATOPTION “COMPRESSED_OUTPUT=TRUE” is set MapServer will produce a compressed SVG file (svgz). By default this option is FALSE. Note that to be able to create compressed output, MapServer must be built with the compile flag USE_ZLIB.

If FORMATOPTION “FULL_RESOLUTION=TRUE” is set MapServer will not eliminate duplicate points and collinear lines when outputting SVG. By default this option is set to FALSE.

9.9.3 Testing your SVG Output

- The easiest way to test your SVG mapfile is to use *MapServer CGI*. For example, you might enter the following URL in a browser:

```
http://127.0.0.1/cgi-bin/mapserv.exe?map=my/path/to/my-svg.map&mode=map&layers=layer1 layer2
```

- You can also use *PHP/MapScript* to test your SVG mapfile. Your php file might look like the following:

```
<?php
  dl("php_mapscript_45.dll");

  $oMap = ms_newmapObj("my/path/to/my-svg.map");

  $img = $oMap->draw();

  header("Content-type: image/svg+xml");

  $url = $img->saveImage("");
?>
```

An SVG file should be created in your IMAGEPATH directory. If you open the SVG file in a text editor you can see that it is an XML file. Below is a sample SVG file of a point layer with labels:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN" "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11-flat.dtd">
<svg version="1.1" width="400" height="300" xmlns="http://www.w3.org/2000/svg" xmlns:xlink="http://www.w3.org/1999/xlink">

  <!-- START LAYER popplace -->
  <ellipse cx="252" cy="130" rx="3" ry="3" fill="#000000" />
```

```

<ellipse cx="37" cy="227" rx="3" ry="3" fill="#000000" />
<ellipse cx="127" cy="239" rx="3" ry="3" fill="#000000" />
<ellipse cx="255" cy="282" rx="3" ry="3" fill="#000000" />
<polygon fill="#000000" stroke-width="1" points=" 267,263 270,263 271,260 272,263 275,263 273,265
<ellipse cx="288" cy="247" rx="3" ry="3" fill="#000000" />
<ellipse cx="313" cy="243" rx="3" ry="3" fill="#000000" />
<ellipse cx="328" cy="233" rx="3" ry="3" fill="#000000" />
<ellipse cx="331" cy="245" rx="3" ry="3" fill="#000000" />
<ellipse cx="366" cy="196" rx="3" ry="3" fill="#000000" />
<ellipse cx="161" cy="246" rx="3" ry="3" fill="#000000" />
<ellipse cx="92" cy="208" rx="3" ry="3" fill="#000000" />
<ellipse cx="40" cy="125" rx="3" ry="3" fill="#000000" />
<ellipse cx="108" cy="146" rx="3" ry="3" fill="#000000" />
<text x="40" y="143" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="43" y="121" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="34" y="205" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="164" y="258" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="316" y="190" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="334" y="258" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="249" y="230" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="241" y="242" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="223" y="260" font-family="fritqat-italic" font-size="8pt" fill="#ff0000" stroke="#ffffffff" stroke-width="1" />
<text x="210" y="279" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="82" y="234" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="40" y="223" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
<text x="214" y="125" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffffff" stroke-width="1" />
</svg>
```

You can now view the SVG file in a supported browser (see the official [list of SVG implementations](#) for possible SVG viewers). The [Adobe Viewer plugin](#) is very popular.

9.9.4 goSVG

goSVG is now supported as a vector output format in MapServer 4.5 (and later).

Definition

This definition of goSVG was obtained from [here](#).

goSVG is short for “G-XML over SVG” and “g-contents over SVG”. This is a subset for mobiles specified within the [G-XML](#) (a Japanese Spatial Information Format which is an XML based protocol with the ability to describe, communicate and exchange Spatial Information and Electric Maps), and is a Spatial Information Exchanging format that determines the method to expand spatial information and connect to the backend system(G-XML standard mark format). goSVG is an expanded [SVG Tiny profile](#) (a Mobile profile of [SVG 1.1](#). suited for cellular phones) that adds functions that are useful for Spatial Information Services (SVG Map Service).

Support for Specific goSVG Elements

- Name space extension: supported
- Content Area Definition (bounding box): supported
- Geographic Coordinate System: supported
- Map Request Protocol: supported

Setting up a Mapfile for goSVG Output

Requirements

- A valid MapServer *Mapfile*.
- Valid IMAGEPATH and IMAGEURL parameters set in the WEB object of the mapfile.
- A PROJECTION object defined beneath the MAP object, using an EPSG code. For example:

```
MAP
...
WEB
    IMAGEPATH  "/tmp/ms_tmp/"
    IMAGEURL   "/ms_tmp/"
END
...
PROJECTION
    "init=epsg:42304"
END
...
LAYER
...
END
END
```

Setting the OUTPUTFORMAT

To be able to output a valid goSVG file, you must define an *OUTPUTFORMAT* object in the mapfile and set the IMAGETYPE to svg. Here is an example:

```
MAP
...
IMAGETYPE svg
...
OUTPUTFORMAT
    NAME svg
    MIMETYPE "image/svg+xml"
    DRIVER svg
    FORMATOPTION "GOSVG=TRUE"
    FORMATOPTION "GOSVG_ZoomInTH=20"
    FORMATOPTION "GOSVG_ZoomOutTH=40"
    FORMATOPTION "GOSVG_ScrollTH=60"
END
...
WEB
    IMAGEPATH  "/tmp/ms_tmp/"
    IMAGEURL   "/ms_tmp/"
END
...
PROJECTION
    "init=epsg:42304"
END
...
LAYER
...
END
END
```

Specific FORMATOPTIONS Related to goSVG

GOSVG should be set to TRUE. The default is false.

GOSVG_ZoomInTH controls the zoomin threshold when outputting the Map Request Protocol. If it is not defined the default value is set to 70.

GOSVG_ZoomOutTH controls the zoomout threshold when outputting the Map Request Protocol. If it is not defined the default value is set to 100.

GOSVG_ScrollTH controls the scrolling threshold when outputting the Map Request Protocol. If it is not defined the default value is set to 10.

Testing your goSVG Output

Refer to the section [Testing your SVG Output](#) to generate and test your goSVG output. goSVG can be read by regular SVG viewers (they will just ignore the goSVG headers).

Sample goSVG File Produced by MapServer

Below is a sample goSVG file of a point layer with labels:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN" "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11-flat.dtd">
<svg version="1.1" width="400" height="300" xmlns="http://www.w3.org/2000/svg" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:au="http://www.mapserver.org/au" xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:crs="http://www.opengis.net/def/crs/OGC/1.3/CRS_OGC" xmlns:maprequest="http://www.mapserver.org/au/maprequest">
<title>DEMO</title>
<metadata>
<rdf:RDF xmlns:rdf = "http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:crs = "http://www.opengis.net/def/crs/OGC/1.3/CRS_OGC" xmlns:svg="http://www.w3.org/2000/svg">
<rdf:Description>
<crs:CoordinateReferenceSystem svg:transform="matrix(0.000066,0.000000,0.000000,-0.000066,171.243002,0)" rdf:resource="http://www.opengis.net/gml/srs/epsg.xml#42304"/>
</rdf:Description>
</rdf:RDF>
<au:lbs protocol="maprequest">
<au:zoomin th="20" xlink:href="#" />
<au:zoomout th="40" xlink:href="#" />
<au:scroll th="60" xlink:href="#" />
</au:lbs>
</metadata>

<!-- START LAYER popplace -->
<ellipse cx="252" cy="130" rx="3" ry="3" fill="#000000" />
<ellipse cx="37" cy="227" rx="3" ry="3" fill="#000000" />
<ellipse cx="127" cy="239" rx="3" ry="3" fill="#000000" />
<ellipse cx="255" cy="282" rx="3" ry="3" fill="#000000" />
<polygon fill="#000000" stroke-width="1" points=" 267,263 270,263 271,260 272,263 275,263 273,265 288,247 313,243 328,233 331,245 366,196 161,246 92,208 40,125 108,146" />
<text x="40" y="143" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#ffffff" stroke-width="1" />
```

```
<text x="43" y="121" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
<text x="34" y="205" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
<text x="164" y="258" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
<text x="316" y="190" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
<text x="334" y="258" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
<text x="249" y="230" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
<text x="241" y="242" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
<text x="223" y="260" font-family="fritqat-italic" font-size="8pt" fill="#ff0000" stroke="#fffffff" stroke-width="1px"/>
<text x="210" y="279" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
<text x="82" y="234" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
<text x="40" y="223" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
<text x="214" y="125" font-family="fritqat" font-size="8pt" fill="#000000" stroke="#fffffff" stroke-width="1px"/>
</svg>
```

9.10 Tile Mode

Author Paul Ramsey

Contact pramsey at cleverelephant.ca

Revision \$Revision\$

Date \$Date\$

Last Updated 2008/04/30

Table of Contents

- [Tile Mode](#)
 - [Introduction](#)
 - [Configuration](#)
 - [Utilization](#)

9.10.1 Introduction

MapServer can feed tile-based map clients directly using the CGI “tile mode”. Tile-based map clients work by dividing the map of the world up into a discrete number of zoom levels, each partitioned into a number of identically sized “tiles”. Instead of accessing a map by requesting a bounding box, a tile client builds a map by accessing individual tiles.

9.10.2 Configuration

Tile requests are handled by the ‘mapserv’ CGI program. In order to return tiles in the correct projection, MapServer must be built with the –use-proj option turned on. You can check if your version of ‘mapserv’ has projection support by running it with the ‘-v’ option and looking for ‘SUPPORTS=PROJ’.

Example 1. On Unix:

```
$ ./mapserv -v
MapServer version 4.6.1 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP OUTPUT=PDF
OUTPUT=SWF OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER
SUPPORTS=WMS_CLIENT SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER
INPUT=JPEG INPUT=POSTGIS INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE DEBUG=MSDEBUG
```

Example 2. On Windows:

```
C:\apache\cgi-bin> mapserv -v
MapServer version 4.6.1 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP OUTPUT=PDF
OUTPUT=SWF OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER
SUPPORTS=WMS_CLIENT SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER
INPUT=JPEG INPUT=POSTGIS INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE DEBUG=MSDEBUG
```

MapServer requires that each LAYER in your map file have a valid PROJECTION block to support reprojection. Because the tile mode uses reprojection, you will have to ensure each LAYER has a valid PROJECTION block.

Configuration checklist:

- MapServer compiled with PROJ support
- Map file with a *PROJECTION* defined for every *LAYER*

As of MapServer 6.0, there are two extra parameters available for configuring tile mode.

- *tile_map_edge_buffer* renders the tile into a buffered rendering frame, then clips out the final tile. This will reduce edge effects when large symbols or wide lines are drawn. Recommended value: the size of the largest symbol or line width in your map file.
- *tile_metatile_level* renders the into into a fixed metatile, then clips out the final tile. This will reduce label repetition, at the expense of much higher rendering cost. Recommended value: 1 if you are doing labelling of large features in your layer. 0 otherwise.

If you use both *tile_map_edge_buffer* and *tile_metatile_level* at the same time, the buffer will be applied at the meta-tile level.

9.10.3 Utilization

The MapServer tile support adds three new directives to the CGI interface:

- *mode=tile* tells the server to generate tiles based on the other tile mode parameters
- *tilemode=gmap* tells the server use the Google Maps tile scheme for the tiles
- *tile=x+y+z* tells the server what tile you want to retrieve, using the Google Maps tile addressing system
- *tilemode=ve* tells the server use the Virtual Earth tile naming scheme for the tiles
- *tile=10231* tells the server what tile you want to retrieve, using the Virtual Earth tile addressing system

About Spherical Mercator

Spherical Mercator (also called “web mercator” by some) is a world projection. All the major tile-based map interfaces (Google Maps, Microsoft Virtual Earth, Yahoo Maps, OpenLayers) use the spherical mercator system to address tiles.

A spherical mercator set of tiles has the following properties:

- The map has been reprojected to mercator using a spherical mercator algorithm
- There is one tile in the top zoom level, zoom level zero
- Each successive zoom level (z) has 2^z tiles along each axis
- Tiles are 256x256 in size

Google Maps and Virtual Earth both use spherical mercator as their underlying tile projection, but use different formats to address the individual tiles.

Google Maps uses an “x”, “y”, “zoom” format. The zoom indicates which level to pull tiles from, and the “x” and “y” indicate while tile in that zoom level to pull.

Virtual Earth uses a single string to address each tile. The top zoom level in Virtual Earth has four tiles (equivalent to Google’s zoom level 1). The top left tile in the Virtual Earth top zoom level is addressed as “0”, top right as “1”, bottom left as “2” and bottom right as “3”. Each tile the next level is addressed by first referencing the top level tile that contains it, then its address relative to that tile. So the top left tile in the second zoom level is “00” and the bottom right one is “33”. See the Virtual Earth site for more details: <http://msdn.microsoft.com/en-us/library/bb545006.aspx>

Using Google Maps

The Google Maps API includes support for using alternative tile sets as overlays, or as alternate base maps. Here is an example of an GTileLayerOverlay

```
1  <!DOCTYPE html
2      PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3      "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4  <html xmlns="http://www.w3.org/1999/xhtml">
5  <head>
6      <meta http-equiv="content-type" content="text/html; charset=utf-8"/>
7      <title>Google/MapServer Tile Example</title>
8      <script src="http://maps.google.com/maps?file=api&v=2&key=[YOUR KEY HERE]"
9          type="text/javascript"></script>
10     <script type="text/javascript">
11
12     function load() {
13         if (GBrowserIsCompatible()) {
14             var urlTemplate = 'http://localhost/cgi-bin/mapserv?' ;
15             urlTemplate += 'map=/var/map.map&';
16             urlTemplate += 'layers=layer1 layer2&';
17             urlTemplate += 'mode=tile&';
18             urlTemplate += 'tilemode=gmap&';
19             urlTemplate += 'tile={X}+{Y}+{Z}' ;
20             var myLayer = new GTileLayer(null,0,18,{
21                 tileUrlTemplate:urlTemplate,
22                 isPng:true,
23                 opacity:1.0 });
24             var map = new GMap2(document.getElementById("map"));
25             map.addControl(new GLargeMapControl());
26             map.addControl(new GMapTypeControl());
27             map.setCenter(new GLatLng(35.35, -80.55), 15);
28             map.addOverlay(new GTileLayerOverlay(myLayer));
29         }
30     }
31
32     </script>
33     </head>
34     <body onload="load()" onunload="GUnload()">
35         <div id="map" style="width: 500px; height: 500px"></div>
36     </body>
37     </html>
```

Note the format of the tileUrlTemplate: a valid URL, with {X}, {Y} and {Z} substitution tokens that Google Maps will replace with the tile coordinates and zoom level on the fly to retrieve tiles from your server.

You can also use a MapServer tile layer as an alternate base map:

```

1  <!DOCTYPE html
2   PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3   "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4  <html xmlns="http://www.w3.org/1999/xhtml">
5  <head>
6  <meta http-equiv="content-type" content="text/html; charset=utf-8"/>
7  <title>Google/MapServer Tile Example</title>
8  <script src="http://maps.google.com/maps?file=api&v=2&key=[YOUR KEY HERE]"
9   type="text/javascript"></script>
10 <script type="text/javascript">
11
12 function load() {
13     if (GBrowserIsCompatible()) {
14         var urlTemplate = 'http://localhost/cgi-bin/mapserv?';
15         urlTemplate += 'map=/var/map.map&';
16         urlTemplate += 'layers=layer1 layer2&';
17         urlTemplate += 'mode=tile&';
18         urlTemplate += 'tilemode=gmap&';
19         urlTemplate += 'tile={X}+{Y}+{Z}';
20         var myLayer = new GTileLayer(null, 0, 18, {
21             tileUrlTemplate:urlTemplate,
22             isPng:true,
23             opacity:0.3 });
24         var map = new GMap2(document.getElementById("map"));
25         map.addControl(new GLargeMapControl());
26         map.addControl(new GMapTypeControl());
27         map.setCenter(new GLatLng(35.35, -80.55), 15);
28         var myMapType = new GMapType([myLayer], new GMercatorProjection(18), 'MapServer');
29         map.addMapType(myMapType);
30     }
31 }
32
33 </script>
34 </head>
35 <body onload="load()" onunload="GUnload()">
36   <div id="map" style="width: 500px; height: 500px"></div>
37 </body>
38 </html>

```

The only change from the previous example is that we don't create a GTileLayerOverlay, we create a GMapType, and use addMapType(), instead of addOverlay().

Using Virtual Earth

The [Virtual Earth API](#) also includes support for using alternative tile sets as overlays, or as alternate base maps. Here is an example:

```

1  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
2  <html xmlns="http://www.w3.org/1999/xhtml">
3  <head>
4  <meta http-equiv="content-type" content="text/html; charset=utf-8"/>
5  <title>Virtual Earth Example</title>
6  <script type="text/javascript" src="http://dev.virtualearth.net/mapcontrol/mapcontrol.ashx?v=6.1">
7  <script type="text/javascript">
8
9      var map = null;
10

```

```
11     function OnLoadMap () {
12         map = new VEMap("myMap");
13         map.LoadMap();
14
15         var url = "http://localhost/cgi-bin/mapserv?";
16         url += "map=/var/map.map&";
17         url += "mode=tile&";
18         url += "layers=layer1 layer2&";
19         url += "tilemode=ve&";
20         url += "tile=%4";
21
22         var tileSourceSpec = new VETileSourceSpecification( "myLayer", url );
23         tileSourceSpec.Opacity = 0.3;
24         map.AddTileLayer(tileSourceSpec, true);
25     }
26
27 </script>
28 </head>
29 <body onload="OnLoadMap();">
30     <div id="myMap" style="position:relative; width:500px; height:500px;"></div>
31 </body>
32 </html>
```

9.11 Template-Driven Output

Author Chris Hodgson

Contact chodgson at refractions.net

Last Updated 2011-04-13

Table of Contents

- Template-Driven Output
 - Introduction
 - OUTPUTFORMAT Declarations
 - Template Substitution Tags
 - Examples

9.11.1 Introduction

RFC 36 added support for defining template-driven OUTPUTFORMATs for use with feature queries, including WMS GetFeatureInfo and WFS GetFeature. This allows for custom text-oriented output such as GeoJSON, KML, or XML. The templates are essentially the same as with the standard MapServer query *Templating*, however there are some additional tags to allow for template definition in a single file instead of the standard header/template/footer.

Note: There are other, simpler, ways to output some of these formats using MapServer. However, template-driven output provides maximal flexibility and customization of the output, at the cost of additional complexity and configuration.

9.11.2 OUTPUTFORMAT Declarations

Details of template-driven output formats are controlled by an `OUTPUTFORMAT` declaration. The declarations define the template file to be used, as well as other standard OUTPUTFORMAT options.

Examples:

```
OUTPUTFORMAT
  NAME "kayml"
  DRIVER "TEMPLATE"
  MIMETYPE "application/vnd.google-earth.kml+xml"
  FORMATOPTION "FILE=myTemplate.kml"
  FORMATOPTION "ATTACHMENT=queryResults.kml"
END

OUTPUTFORMAT
  NAME "geojson"
  DRIVER "TEMPLATE"
  FORMATOPTION "FILE=myTemplate.json"
END

OUTPUTFORMAT
  NAME "customxml"
  DRIVER "TEMPLATE"
  FORMATOPTION "FILE=myTemplate.xml"
END
```

The template file to be used is determined by the “FILE=...” FORMATOPTION. The template filename is relative to the mapfile’s path. As is standard with MapServer template files, the file must contain the magic string ‘mapserver template’ in the first line of the file, usually within a comment, but this line is not output to the client.

Note that both the MIMETYPE and FORMATOPTION “ATTACHMENT=...” parameters are very useful for controlling how a web browser handles the output file.

9.11.3 Template Substitution Tags

These tags only work in query result templates, and their purpose is primarily to simplify the templating to a single file for custom output formats.

[include src="otherTemplate.txt"] Includes another template file; the path to the template file is relative to the mapfile path.

Attributes:

- src: The file to be included.

[resultset layer=layername]...[/resultset] Defines the location of the results for a given layer.

Attributes:

- layer: The layer to be used
- nodata: (optional) A string to return if no results are returned.

[feature]...[/feature] Defines the loop around the features returned for a given layer.

Attributes:

- limit: (optional) Specifies the maximum number of features to output for this layer.
- trimlast: (optional) Specifies a string to be trimmed off of the end of the final feature that is output. This is intended to allow for trailing record delimiters to be removed. See the examples below.

[join name=join1]...[/join] defines the loop around the features join from another layer.

See Also:

Templating

9.11.4 Examples

This example shows how to emulate the old 3-file system using the new system, to compare the usage:

```
<!-- mapserver template -->
[include src="templates/header.html"]
[resultset layer=lakes]
    ... old layer HEADER stuff goes here, if a layer has no results
        this block disappears...
    [feature]
        ...repeat this block for each feature in the result set...
        [join name=join1]
            ...repeat this block for each joined row...
        [/join]
    [/feature]
    ...old layer FOOTER stuff goes here...
[/resultset]
[resultset layer=streams]
    ... old layer HEADER stuff goes here, if a layer has no results
        this block disappears...
    [feature]
        ...repeat this block for each feature in the result set...
    [/feature]
    ...old layer FOOTER stuff goes here...
[/resultset]
[include src="templates/footer.html"]
```

A specific GML3 example:

```
<!-- mapserver template -->
<?xml version="1.0" encoding="ISO-8859-1"?>
[resultset layer=mums]
<MapServerUserMeetings xmlns="http://localhost/ms_ogc_workshop"
    xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:gml="http://www.opengis.net/gml"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://localhost/ms_ogc_workshop ./mums.xsd">
    <gml:description>This is a GML document which provides locations of
        all MapServer User Meeting that have taken place</gml:description>
    <gml:name>MapServer User Meetings</gml:name>
    <gml:boundedBy>
        <gml:Envelope>
            <gml:coordinates>-93.093055556,44.944444444 -75.7,45.4166667</gml:coordinates>
        </gml:Envelope>
    </gml:boundedBy>
    [feature]
        <gml:featureMember>
            <Meeting>
                <gml:description>[desc]</gml:description>
                <gml:name>[name]</gml:name>
                <gml:location>
                    <gml:Point srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
                        <gml:pos>[x] [y]</gml:pos>
                    </gml:Point>
                </gml:location>
            </Meeting>
        </gml:featureMember>
    </feature>
</MapServerUserMeetings>
```

```
</gml:location>
<year>[year]</year>
<venue>[venue]</venue>
<website>[url]</website>
</Meeting>
</gml:featureMember>
[/feature]
<dateCreated>2007-08-13T17:17:32Z</dateCreated>
</MapServerUserMeetings>
[resultset]
```

A GeoJSON example:

```
// mapserver template
[resultset layer=mums]
{
    "type": "FeatureCollection",
    "features": [
        [feature trimlast=", "]
        {
            "type": "Feature",
            "id": "[id]",
            "geometry": {
                "type": "PointLineString",
                "coordinates": [
                    {
                        "type": "Point",
                        "coordinates": [[x], [y]]
                    }
                ]
            },
            "properties": {
                "description": "[description]",
                "venue": "[venue]",
                "year": "[year]"
            }
        },
        [/feature]
    ]
}
[/resultset]
```

A more complicated KML example. Note the use of [shpxy] to support multipolygons with holes, and also that a point placemark is included with each feature using [shplabel]:

```
<!--MapServer Template-->
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2"
      xmlns:gx="http://www.google.com/kml/ext/2.2"
      xmlns:kml="http://www.opengis.net/kml/2.2"
      xmlns:atom="http://www.w3.org/2005/Atom">
<Document>
  <Style id="parks_highlight">
    <IconStyle>
      <scale>1.4</scale>
      <Icon>
        <href>http://maps.google.com/mapfiles/kml/shapes/parks.png</href>
      </Icon>
      <hotSpot x="0.5" y="0" xunits="fraction" yunits="fraction"/>
```

```
</IconStyle>
<LineStyle>
  <color>fffff5500</color>
  <width>4.2</width>
</LineStyle>
<PolyStyle>
  <color>aaaaaaaa</color>
</PolyStyle>
<BalloonStyle>
  <text>
    <![CDATA[
      <p ALIGN="center"><b>$[name]</b></p>
      $[description]
    ]]>
  </text>
</BalloonStyle>
</Style>
<Style id="parks_normal">
  <IconStyle>
    <scale>1.2</scale>
    <Icon>
      <href>http://maps.google.com/mapfiles/kml/shapes/parks.png</href>
    </Icon>
    <hotSpot x="0.5" y="0" xunits="fraction" yunits="fraction"/>
  </IconStyle>
  <LineStyle>
    <color>fffff5500</color>
    <width>4.2</width>
  </LineStyle>
  <PolyStyle>
    <color>ff7fff55</color>
  </PolyStyle>
  <BalloonStyle>
    <text>
      <![CDATA[
        <p ALIGN="center"><b>$[name]</b></p>
        $[description]
      ]]>
    </text>
  </BalloonStyle>
</Style>
<StyleMap id="parks_map">
  <Pair>
    <key>normal</key>
    <styleUrl>#parks_normal</styleUrl>
  </Pair>
  <Pair>
    <key>highlight</key>
    <styleUrl>#parks_highlight</styleUrl>
  </Pair>
</StyleMap>
[resultset layer=parks]
<Folder>
  <name>Parks</name>
[feature trimlast="," limit=1]
  <Placemark>
    <name>[NAME]</name>
    <Snippet/>
```

```

<description>
  <![CDATA[
    <p>Year Established: [YEAR_ESTABLISHED]</p>
    <p>Area: [AREA_KILOMETERS_SQUARED] sq km</p>
  ]]>
</description>
<styleUrl>#parks_map</styleUrl>
<ExtendedData>
  <Data name="Year Established">[YEAR_ESTABLISHED]</Data>
  <Data name="Area">[AREA_KILOMETERS_SQUARED]</Data>
</ExtendedData>
<MultiGeometry>
  <Point>
    <coordinates>[shplabel proj=epsg:4326 precision=10],0</coordinates>
  </Point>
[shpxy      ph="<Polygon><tessellate>1</tessellate>" pf="</Polygon>"
  xf=", " xh=" " yh=" " yf=", 0 "
  orh="<outerBoundaryIs><LinearRing><coordinates>"
  orf="</coordinates></LinearRing></outerBoundaryIs>"
  irh="<innerBoundaryIs><LinearRing><coordinates>"
  irf="</coordinates></LinearRing></innerBoundaryIs>"
  proj=epsg:4326 precision=10]
  </MultiGeometry>
</Placemark>
[/feature]
</Folder>
[/resultset]
</Document>
</kml>

```

9.12 Kml Output

Last Updated 2010/11/26

Authors Dvaid Kana (david.kana at gmail.com)

Authors Thomas.Bonfort (thomas.bonfort at gmail.com)

Authors Yewondwossen Assefa (yassefa at dmsolutions.ca)

Authors Michael Smith (michael.smith at usace.army.mil)

Version MapServer 6.0

Id \$

9.12.1 Introduction

This purpose of this document is to describe the KML/KMZ output support in MapServer 6.0.

The main goal of the KML driver is to generate KML output used mainly by Google Earth application.

9.12.2 General Functionality

Kml support is provided by using a kml or kmz image type in the map file. Output can then be generated using MapServer cgi (example mode=map) or through a WMS request.

9.12.3 Output format

The default name of the output format is kml or kmz, and this name can be used to set the imagetype parameter in the map file.

The format can also be defined in the map file:

```
OUTPUTFORMAT
  NAME kml
  DRIVER "KML"
  MIMETYPE "application/vnd.google-earth.kml+xml"
  IMAGEMODE RGB
  EXTENSION "kml"
  FORMATOPTION 'ATTACHMENT=gmap75.kml' #name of kml file returned
  FORMATOPTION "maxfeaturestodraw=100"
END

OUTPUTFORMAT
  NAME kmz
  DRIVER "KMZ"
  MIMETYPE "application/vnd.google-earth.kmz"
  IMAGEMODE RGB
  EXTENSION "kmz"
  FORMATOPTION 'ATTACHMENT=gmap75.kmz' #name of kmz file returned
END
```

9.12.4 Build

- On windows: there is a flag KML in nmake.opt
- On Linux: –with-kml
- AGG driver is necessary for the kml driver
- To be able to get kmz support, MapServer needs to be build against GDAL 1.8

9.12.5 Limiting the number of features

The number of vector features drawn by default is set to 1000 per layer. To control the number of features, users can set:

- layer level metadata that only applies to the layer: “maxfeaturestodraw” “100”
- map level metadata that applies to all layers: “maxfeaturestodraw” “100”
- output format option that applies to all layers: FORMATOPTION “maxfeaturestodraw=100”

9.12.6 Map

In terms for Kml object, the MapServer KML output will produce a <Document> element to include all the layers that are part of the MapServer map file. Features supported for the Document are:

Docu- ment element	Sup- ported	MapServer equivalence/Notes
name	Yes	Name in the map file
visibility	No	Can be supported if needed. Default is 1
open	No	Can be supported if needed. Default is 0
address	No	Could be supported for example using ows_address if available
AddressDe- tails	No	
pho- neNumber	No	Could be supported using ows_contactvoicetelephone is available
Snippet	No	
description	No	
Ab- stractView	No	
TimePrim- itive	No	
styleURL	No	
StyleSe- lector	Yes	Style element will be supported. All different styles from the layers will be stored here and referenced from the folders using a styleUrl. In addition to the Styles related to features, there is a ListStyle element added at the document level. This allows to control the way folders are presented. See Layers section (styleUrl) setting for more details.
Region	No	
Metadata	No	
Extended- Data	No	

9.12.7 Layers

Each layer of the MapServer map file will be inside a Kml <Folder> element. Supported Folder elements are:

Folder element	Sup- ported	MapServer equivalence/Notes
name	Yes	Name of the layer. If not available the name will be Layer concatenated with the layer's index (Layer1)
visibility	Yes	Always set to 1
open	No	Default is 0
atom:authoratom:linkaddressAdressDetailsphoneNumberSnippet	No	
description	No	Could be supported using ows_description
AbstarctView	No	
TimePrimitive	No	
styleUrl	Yes	The user can use the kml_folder_display layer or map level metedata to choose a setting. Possible values are 'check' (default), 'radioFolder', 'checkOffOnly', 'checkHideChildren'.
RegionMetadataExtended- Data	No	

Each element in the Layer will be inside a Kml <Placemark> element. As described in the Kml reference : « A Placemark is a Feature with associated Geometry. In Google Earth, a Placemark appears as a list item in the Places panel. A Placemark with a Point has an icon associated with it that marks a point on the Earth in the 3D viewer. (In the Google Earth 3D viewer, a Point Placemark is the only object you can click or roll over. Other Geometry objects do not have an icon in the 3D viewer. To give the user something to click in the 3D viewer, you would need to create a MultiGeometry object that contains both a Point and the other Geometry object.) »

For Polygon and Line layers, when a feature is associated with a label, a MultiGeometry element containing a point geometry and the geometry of the feature is created. The point feature will be located in the middle of the polygon or line

```
<Folder>
  <name>park</name>
  <visibility>1</visibility>
  <styleUrl>#LayerFolder_check</styleUrl>
  <Placemark>
    <name>Ellesmere Island National Park Reserve</name>
    <styleUrl>#style_line_ff787878_w4.0_polygon_ff00ffcc_label_ff0000ff</styleUrl>
    <MultiGeometry>
      <Polygon>
        <outerBoundaryIs>
          <LinearRing>
            <coordinates>
              ...
              <Point>
                <coordinates>
-70.86810858,82.12291871
                </coordinates>
              </Point>
            </coordinates>
          </LinearRing>
        </outerBoundaryIs>
      </Polygon>
    </MultiGeometry>
  </Placemark>
</Folder>
```

Supported Features in the Placemark element are:

Place-mark element	Supported	MapServer equivalence/Notes
name	Yes	Label attached with the feature. If there is no label a default name is assigned using the layer name and the shape id (ex. park.1)
visibility	No	Is by default set to true
open	No	
address	No	
Address-Details	No	
phoneNumber	No	
Snippet	No	This is a short description the feature. If needed It could be supported.
description	Yes	This information is what appears in the description balloon when the user clicks on the feature. The <description> element supports plain text as well as a subset of HTML formatting elements. Used when KML/OWS_DESCRIPTION is defined
AbstractView	No	
TimePrimitive	No	
styleUrl	Yes	Refers to a Style defined in the Document
StyleSelector	No	
Region	No	
Metadata	No	
Extended-Data	Yes	Used when KML/OWS_INCLUDE_ITEMS is defined
Geometry	Yes	Depends on the layer type

General notes on layers

- Labelcache is turned off on each layer
- Projection block should be set. If not set It will be assumed that the data is in lat/lon projection (a debug message will be sent to the user: Debug Message 1)
- Possible to output vector layers as raster using metadata: “KML_OUTPUTASRASTER” “true”
- The user can use the KML_FOLDER_DISPLAY layer or map level metedata to choose a setting. Possible values are ‘check’ (default), ‘radioFolder’, ‘checkOffOnly’, ‘checkHideChildren’.
- The user can use metadata KML/OWS_DESCRIPTION or KML/OWS_INCLUDE_ITEMS to define the description attached to each feature. If KML/OWS_DESCRIPTION are defined, the <description> tag of the Placemark will be used. If KML/OWS_INCLUDE_ITEMS, the <ExtendedData> tag will be used.
- The user can use the metadata KML_NAME_ITEM to indicate the field name to be used a a name tag for each feature.
- The user can use metadata KML_ALTITUDEMODE to specify how altitude components in the <coordinates> element are interpreted. Possible values are: absolute, relativeToGround, clampToGround. <http://code.google.com/apis/kml/documentation/kmlreference.html#altitudemode>
- The user can use metadata KML_EXTRUDE to specify whether to connect the LinearRing to the ground. <http://code.google.com/apis/kml/documentation/kmlreference.html#tessellate>

- The user can use metedata KML_TESSELLATE to specify whether to allow the LinearRing to follow the terrain.
<http://code.google.com/apis/kml/documentation/kmlreference.html#extrude>
- The user can specify an attribute to be used as the elevation value using a layer level metedata: 'kml_elevation_attribute' '<Name of attribute>'. The value will be used as the z value when the coordinates are written.

Point Layers

- Each layer will be inside a Folder element.
- Each feature will be represented by a Placemark.
- The Geometry element for a Point layer would be represented as a Point geometry element in Kml. Supported elements are:

Line Layers

- Each layer will be inside a Folder element.
- Each feature in the layer would be represented by a Placemark.
- If a label is attached to the line, the Geometry element would be represented as a MultiGeometry that includes a LineString element and a Point element representing the position of the label. If no label is attached to a feature, the Geometry element will be a LineString.

Polygon Layers

- Each layer will be inside a Folder element.
- Each feature will be represented by a Placemark.
- If a label is attached to the polygon, the Geometry element would be represented as a MultiGeometry that includes a Polygon element and a Point element representing the position of the label.

Raster Layers

- Each layer will be inside a Folder element.
- A GroundOverlay feature is created for the layer, that includes an href link to the raster image generated and LatLongBox for the extents (map extents).
- The href is generated using the imagepath and imageurl settings in the map file.

9.12.8 Styling

As described in Section 4, all different styles from the layers will be stored at the Document level and referenced from the folders using a styleUrl.

Point Layers

Point layers will be styled using the IconStyle styling element of kml. An image representing the symbol will be created and referenced from the IconStyle object. If a label is attached to the point, a LabelStyle element will also be used. The LabelStyle will have the color parameter set.

```
<Style id="style_label_ff0000ff_symbol_star_13.0_ff000000">
  <IconStyle>
    <Icon>
      <href>http://localhost/ms_tmp/4beab862_19bc_0.png</href>
    </Icon>
  </IconStyle>
  <LabelStyle>
    <color>ff0000ff</color>
  </LabelStyle>
</Style>
```

Line Layers

Line layers will be styled using the LineStyle styling element of kml. Color and width parameters of the LineStyle will be used. If a label is attached to the layer, a LabelStyle element will also be used.

Polygon Layers

Polygon layers will be styled using the PolyStyle styling element of kml. Color parameter of the PolyStyle will be used. If an outline is defined in the map file, an addition LineStyle will be used. If a label is attached to the layer, a LabelStyle element will also be used.

9.12.9 Attributes

As described in section on Layers, two ways of defining the description:

- kml/ows_description
- kml/ows_include_items

9.12.10 Coordinate system

The map level projection should be set to epsg:4326. If not set, the driver will automatically set it. Layers are expected to have projection block if their projection is different from epsg:4326.

9.12.11 Warning and Error Messages

- When the projection of the map file is not set or is different from a lat/lion projection, the driver automatically sets the projection to espdg:4326. If the map is in debug mode, the following message is sent: « "KmlRenderer::checkProjection: Mapfile projection set to epsg:4326" »
- If imagepath and imageurl are not set in the web object, the following message is sent in debug mode: « KmlRenderer::startNewLayer: imagepath and imageurl should be set in the web object »

OGC Support and Configuration

Interoperability is increasingly becoming a focus point for organizations that distribute and share data over the Internet. The [Open Geospatial Consortium](#) (OGC) focuses on the development of publicly available geospatial web standards. MapServer supports numerous OGC standards, allowing users to publish and consume data and services in an application neutral implementation manner.

10.1 MapServer OGC Specification support

- Web Map Service (OGC:WMS)
 - Server: 1.0.0, 1.0.7, 1.1.0, 1.1.1, 1.3.0
 - Client: 1.0.0, 1.0.7, 1.1.0, 1.1.1
- Web Feature Service (OGC:WFS) 1.0.0, 1.1.0
- Web Coverage Service (OGC:WCS) 1.0.0, 1.1.0, 2.0.0, 2.0.1
- Geography Markup Language (OGC:GML) 2.1.2, 3.1.0 Level 0 Profile, 3.2.1
- GML Application Schema - Coverages (OGC:GMLCOV) 1.0.0, 1.0.1
- Web Map Context Documents (OGC:WMC) 1.0.0, 1.1.0
- Styled Layer Descriptor (OGC:SLD) 1.0.0
- Filter Encoding Specification (OGC:FES) 1.0.0
- Sensor Observation Service (OGC:SOS) 1.0.0
- Observations and Measurements (OGC:OM) 1.0.0
- SWE Common (OGC:SWE) 1.0.1
- OWS Common (OGC:OWS) 1.0.0, 1.1.0, 2.0.0

10.2 WMS Server

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Last Updated 2011-10-06

Table of Contents

- WMS Server
 - Introduction
 - Setting Up a WMS Server Using MapServer
 - Changing the Online Resource URL
 - WMS 1.3.0 Support
 - Reference Section
 - FAQ / Common Problems

10.2.1 Introduction

A WMS (or Web Map Server) allows for use of data from several different servers, and enables for the creation of a network of Map Servers from which clients can build customized maps. The following documentation is based on the Open Geospatial Consortium's (OGC) [Web Map Server Interfaces Implementation Specification v1.1.1](#).

MapServer v3.5 or more recent is required to implement WMS features. At the time this document was written, MapServer supports the following WMS versions: 1.0.0, 1.0.7, 1.1.0 (a.k.a. 1.0.8), 1.1.1 and 1.3.0

This document assumes that you are already familiar with certain aspects of MapServer:

- MapServer application development and setting up .map files.
- Familiarity with the WMS spec would be an asset. A link to the WMS specification document is included in the “WMS-Related Information” section below.

Links to WMS-Related Information

- [*MapServer WMS Client Howto*](#)
- [*WMS 1.1.1 specification*](#)
- [*WMS 1.3.0 specification*](#)
- [*Open Geospatial Consortium \(OGC\) home page*](#)
- [*WMS-Dev mailing list and archive*](#)
- [*WMS Cookbook*](#)
- [*MapServer OGC Web Services Workshop package*](#)
- [*MapServer Styled Layer Descriptor \(SLD\) Howto*](#)
- [*MapServer WMS Time Support Howto*](#)

How does a WMS Work

WMS servers interact with their clients via the HTTP protocol. In most cases, a WMS server is a CGI program. This is also the case with MapServer.

The WMS specification defines a number of request types, and for each of them a set of query parameters and associated behaviors. A WMS-compliant server MUST be able to handle at least the following 2 types of WMS requests:

1. **GetCapabilities:** return an XML document with metadata of the Web Map Server's information

2. **GetMap:** return an image of a map according to the user's needs.

And support for the following types is optional:

1. **GetFeatureInfo:** return info about feature(s) at a query (mouse click) location. MapServer supports 3 types of responses to this request:

- text/plain output with attribute info.
- text/html output using MapServer query templates (see [Templating](#)) specified in the `CLASS TEMPLATE` parameter (the filename has to have an .html extension). The MIME type returned by the Class templates defaults to text/html and can be controlled using the metadata "wms_feature_info_mime_type".
- application/vnd.ogc.gml, GML.1 or GML for GML features.

2. **DescribeLayer:** return an XML description of one or more map layers. To execute this:

- for vector layers: to have a valid return the user needs to setup wfs_onlineresource (or ows_onlineresource) metadata either at the map level or at the layer level (the layer level metadata is the one which is used if both are defined) - for raster layers: the metadata is wcs_onlineresource with the same logic as above.

3. **GetLegendGraphic:** returns a legend image (icon) for the requested layer, with label(s). More information on this request can be found in the GetLegendGraphic section later in this doc.

With respect to MapServer specifically, it is the "mapserv" CGI program that knows how to handle WMS requests. So setting up a WMS server with MapServer involves installing the `mapserv` CGI program and a setting up a mapfile with appropriate metadata in it. This is covered in the rest of this document.

10.2.2 Setting Up a WMS Server Using MapServer

Install the Required Software

WMS requests are handled by the `mapserv CGI` program. Not all versions of the mapserv program do include WMS support (it is included by default when you compile together with the PROJ library), so the first step is to check that your mapserv executable includes WMS support. One way to verify this is to use the "-v" command-line switch and look for "SUPPORTS=WMS_SERVER".

(Unix users should refer to the [Compiling on Unix](#) document for any compiling instructions, and Windows users might want to use `MS4W`, which comes ready with WMS/WFS support)

Example 1. On Unix:

```
$ ./mapserv -v
MapServer version 4.6.1 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP OUTPUT=PDF
OUTPUT=SWF OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER
SUPPORTS=WMS_CLIENT SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER
INPUT=JPEG INPUT=POSTGIS INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE DEBUG=MSDEBUG
```

Example 2. On Windows:

```
C:\apache\cgi-bin> mapserv -v
MapServer version 4.6.1 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP OUTPUT=PDF
OUTPUT=SWF OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER
SUPPORTS=WMS_CLIENT SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER
INPUT=JPEG INPUT=POSTGIS INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE DEBUG=MSDEBUG
```

Setup a Mapfile For Your WMS

Each instance of WMS server that you setup needs to have its own mapfile. It is just a regular MapServer mapfile in which some parameters and some metadata entries are mandatory. Most of the metadata is required in order to produce a valid GetCapabilites output.

Here is the list of parameters and metadata items that usually optional with MapServer, but are **required (or strongly recommended) for a WMS configuration:**

At the MAP level:

- Map NAME
- Map PROJECTION
- Map Metadata (in the WEB Object):
 - wms_title
 - wms_onlineresource
 - wms_srs (unless PROJECTION object is defined using “init=epsg:...”)
 - wms_enable_request

And for each LAYER:

- Layer NAME
- Layer PROJECTION
- Layer METADATA
 - wms_title
 - wms_srs (optional since the layers inherit the map’s SRS value)
- Layer STATUS
 - Layers set to STATUS DEFAULT will always be sent to the client.
 - Layers set to STATUS ON or STATUS OFF can be requested by the client.
- Layer TEMPLATE (required for GetFeatureInfo requests - see *Templating*)

Let's go through each of these parameters in more detail:

• Map Name and wms_title:

WMS Capabilities requires a Name and a Title tag for every layer. The Map’s NAME and wms_title metadata will be used to set the root layer’s name and title in the GetCapabilities XML output. The root layer in the WMS context corresponds to the whole mapfile.

• Layer Name and wms_title metadata:

Every individual layer needs its own unique name and title. Layer names are also used in GetMap and GetFeatureInfo requests to refer to layers that should be included in the map output and in the query. Layer names must start with a letter when setting up a WMS server (layer names should not start with a digit or have spaces in them).

• Map PROJECTION and wms_srs metadata:

WMS servers have to advertise the projection in which they are able to serve data using EPSG projection codes (see [The EPSG web page](#) for more background on EPSG codes). Recent versions of the PROJ4 library come with a table of EPSG initialization codes and allow users to define a projection like this:

```
PROJECTION
  "init=epsg:4269"
END
```

(Note that “epsg” has to be in lowercase when used in the PROJ4 ‘init’ directive.)

If the **MAP PROJECTION** block is provided in the format “init=epsg:xxxx” then MapServer will also use this information to generate a <BoundingBox> tag for the top-level layer in the WMS capabilities document. BoundingBox is a mandatory element of WMS capabilities for WMS 1.3.0 (for WMS 1.1.0 it is optional, but it is good practice to allow MapServer to include it when possible).

The above is sufficient for MapServer to recognize the EPSG code and include it in SRS tags in the capabilities output (wms_srs metadata is not required in this case). However, it is often impossible to find an EPSG code to match the projection of your data. In those cases, the “wms_srs” metadata is used to list one or more EPSG codes that the data can be served in, and the PROJECTION object contains the real PROJ4 definition of the data’s projection.

Here is an example of a server whose data is in an Lambert Conformal Conic projection (42304). It’s capabilities output will advertise EPSG:4269 and EPSG:4326 projections (lat/lon), but the PROJECTION object is set to the real projection that the data is in:

```
NAME "DEMO"
...
WEB
...
METADATA
  "wms_title"          "WMS Demo Server"
  "wms_onlineresource" "http://my.host.com/cgi-bin/mapserv?map=wms.map&"
  "wms_srs"             "EPSG:4269 EPSG:4326"
END
END

PROJECTION
  "init=epsg:42304"
END
...
END
```

In addition to EPSG:xxxx projections, a WMS server can advertise projections in the AUTO:xxxx namespace. AUTO projections 42001 to 42005 are internally supported by MapServer. However, AUTO projections are useful only with smart WMS clients, since the client needs to define the projection parameters in the WMS requests to the server. For more information see Annex E of the [WMS 1.1.1 specification](#) and section 6.5.5.2 of the same document. See also the FAQ on AUTO projections at the end of this document.

- **Layer PROJECTION and wms_srs metadata:**

By default layers inherit the SRS of their parent layer (the map’s PROJECTION in the MapServer case). For this reason it is not necessary (but still strongly recommended) to provide PROJECTION and wms_srs for every layer. If a layer PROJECTION is not provided then the top-level map projection will be assumed.

Layer PROJECTION and wms_srs metadata are defined exactly the same way as the map’s PROJECTION and wms_srs metadata.

For vector layers, if a PROJECTION block is provided in the format “init=epsg:xxxx” then MapServer will also use this information to generate a <BoundingBox> tag for this layer in the WMS capabilities document. BoundingBox is a mandatory element of WMS capabilities for WMS 1.3.0 (for WMS 1.1.0 it is optional, but it is good practice to allow MapServer to include it when possible).

- **“wms_onlineresource” metadata:**

The wms_onlineresource metadata is set in the map's web object metadata and specifies the URL that should be used to access your server. This is required for the GetCapabilities output. If wms_onlineresource is not provided then MapServer will try to provide a default one using the script name and hostname, but you shouldn't count on that too much. It is strongly recommended that you provide the wms_onlineresource metadata.

See section 6.2.2 of the [WMS 1.1.1 specification](#) for the whole story about the online resource URL. Basically, what you need is a complete HTTP URL including the `http://` prefix, hostname, script name, potentially a "map=" parameter, and terminated by "?" or "&".

Here is a valid online resource URL:

```
http://my.host.com/cgi-bin/mapserv?map=mywms.map&
```

By creating a wrapper script on the server it is possible to hide the "map=" parameter from the URL and then your server's online resource URL could be something like:

```
http://my.host.com/cgi-bin/mywms?
```

This is covered in more detail in the section "More About the Online Resource URL" below.

- **"wms_enable_request" metadata:**

Specify which requests to enable. If not specified, no requests will be enabled! See the explanation below.

- **Configuring for GetFeatureInfo Requests:**

You must set the layer TEMPLATE parameter for the layer to be queryable by GetFeatureInfo requests (see [Templating](#)). For requests of type "text/html" you should also set the layer HEADER and FOOTER parameters.

As of MapServer 4.6 you must set the `gml_*` metadata for the layer attributes to be served (see the Layer Object metadata in the Reference Section later in this document). To include geometry, gml_geometries and `gml_[geometry name]_type` has to be specified.

Here are working examples of GetFeatureInfo requests: `text/plain` / `text/html` / `gml` (for gml, your browser might ask you to save the file, if so save it locally as a .gml file and view it in a text editor)

Test Your WMS Server

Validate the Capabilities Metadata

OK, now that we've got a mapfile, we have to check the XML capabilities returned by our server to make sure nothing is missing.

Using a web browser, access your server's online resource URL to which you add the parameters "SERVICE=WMS&VERSION=1.1.1&REQUEST=GetCapabilities" to the end, e.g.

```
http://my.host.com/cgi-bin/mapserv?map=mywms.map&SERVICE=WMS&VERSION=1.1.1  
&REQUEST=GetCapabilities
```

Here is a working GetCapabilities request (note that the SERVICE parameter is required for all GetCapabilities requests):

```
http://demo.mapserver.org/cgi-bin/wms?SERVICE=WMS&VERSION=1.1.1&REQUEST=GetCapabilities
```

This should return a document of MIME type application/vnd.ogc.wms_xml, so your browser is likely going to prompt you to save the file. Save it and open it in a text editor (Emacs, Notepad, etc.), and you will see the returned XML from the WMS server.

If you get an error message in the XML output then take necessary actions. Common problems and solutions are listed in the FAQ at the end of this document.

If everything went well, you should have a complete XML capabilities document. Search it for the word “WARNING”... MapServer inserts XML comments starting with “`<!--WARNING:` ” in the XML output if it detects missing mapfile parameters or metadata items. If you notice any warning in your XML output then you have to fix all of them before you can register your server with a WMS client, otherwise things are likely not going to work.

Note that when a request happens, it is passed through WMS, WFS, and WCS in MapServer (in that order) until one of the services respond to it.

Test With a GetMap Request

OK, now that we know that our server can produce a valid XML GetCapabilities response we should test the GetMap request. MapServer only checks for a few of the required GetMap parameters, so both of the minimum MapServer parameters and a valid GetMap request will be explained below.

The following is a list of the required GetMap parameters according to the WMS spec:

VERSION=version: Request version

REQUEST=GetMap: Request name

LAYERS=layer_list: Comma-separated list of one or more map layers. Optional if SLD parameter is present.

STYLES=style_list: Comma-separated list of one rendering style per requested layer. Optional if SLD parameter is present. Set “`STYLES=`” with an empty value to use default style(s). Named styles are also supported and are controlled by CLASS GROUP names in the mapfile.

SRS=namespace:identifier: Spatial Reference System.

BBOX=minx,miny,maxx,maxy: Bounding box corners (lower left, upper right) in SRS units.

WIDTH=output_width: Width in pixels of map picture.

HEIGHT=output_height: Height in pixels of map picture.

FORMAT=output_format: Output format of map.

Note: WMS Servers only advertise supported formats that are part of the gd / gdal libraries.

A valid example would therefore be:

```
http://my.host.com/cgi-bin/mapserv?map=mywms.map&SERVICE=WMS&VERSION=1.1.1
&REQUEST=GetMap&LAYERS=prov_bound&STYLES=&SRS=EPSG:4326
&BBOX=-173.537,35.8775,-11.9603,83.8009&WIDTH=400&HEIGHT=300
&FORMAT=image/png
```

Here is a working [valid request](#).

Test with a Real Client

If you have access to a WMS client, then register your new server’s online resource with it and you should be off and running.

If you don’t have your own WMS client installed already, here are a few pointers:

- MapServer itself can be used as a WMS client, see the [MapServer WMS Client Howto](#).
- [Quantum GIS](#) is a full GIS package which includes WMS client support. (recommended)
- [OpenJUMP](#) is a desktop GIS package which includes WMS client support.

- [uDig](#) is a desktop package that allows users to add WMS layers.
- [Deegree](#) provides a WMS client.
- [owsview](#) Viewer Client Generator is an online application that allows users to add WMS layers.

This list is not exhaustive, there are several Open Source or proprietary packages that offer WMS support and could be used to interact with your new MapServer WMS server instance.

GetLegendGraphic Request

This request returns a legend image (icon) for the specified layer. The request will draw an icon and a label for all classes defined on the layer. If the requested layername is a GROUP-name, all included layers will be returned in the legend-icon.

Requirements

The following are required in the WMS server mapfile to enable this request:

- a LEGEND object.
- a CLASS object for each layer.
- a NAME in the CLASS object.
- the STATUS of each LAYER must be set to ON.

Parameters

The following are valid parameters for this request:

- **LAYER** - (Required) Name of the WMS layer to return the legend image of. Note that this is the <Name> parameter of the Layer in the GetCapabilities.
- **FORMAT** - (Required) Format of the legend image (e.g. “image/png”).
- **WIDTH** - (Optional) Width of the legend image. Note that the Width parameter is only used when the Rule parameter is also used in the request.
- **HEIGHT** - (Optional) Height of the legend image. Note that the Height parameter is only used when the Rule parameter is also used in the request.
- **SLD** - (Optional) The URL to the SLD. Applies the SLD on the layer and the legend is drawn after the SLD is applied (using the classes specified by the SLD). Note here that you need to put a <Name>class1</Name> inside the Rule element so that a class name is created from the SLD and therefore a correct legend image.
- **SLD_BODY** - (Optional) The body (code) of the SLD, instead of specifying a URL (as in the ‘SLD’ parameter).
- **SLD_VERSION** - (Optional) The SLD version.
- **SCALE** - (Optional) Specify a scale so that only layers that fall into that scale will have a legend.
- **STYLE** - (Optional) The style.
- **RULE** - (Optional) Specify the name of the CLASS to generate the legend image for (as opposed to generating an icon and label for ALL classes for the layer).

Note: All rules that are used to draw the legend in normal CGI mode apply here. See the [CGI Reference doc](#) if necessary.

The *CLASS* object's KEYIMAGE parameter can also be used to specify a legend image for a CLASS. See the *MapFile Reference doc* if necessary. Example Request

An example request might look like:

```
http://127.0.0.1/cgi-bin/mapserv.exe?SERVICE=WMS&VERSION=1.1.1&layer=park&
REQUEST=getlegendgraphic&FORMAT=image/png
```

10.2.3 Changing the Online Resource URL

As mentioned in the section “Setup a Mapfile / wms_onlineresource metadata” above, the following Online Resource URL is perfectly valid for a MapServer WMS according to section 6.2.2 or the WMS 1.1.1 specification:

```
http://my.host.com/cgi-bin/mapserv?map=mywms.map&
```

However, some people will argue that the above URL contains mandatory vendor-specific parameters and that this is illegal. First we would like to point that “map=...” is not considered a vendor-specific parameter in this case since it is part of the Online Resource URL which is defined as an opaque string terminated by “?” or “&” (See [WMS 1.1.1 section 6.2.2](#)).

But anyway, even if it's valid, the above URL is still ugly. And you might want to use a nicer URL for your WMS Online Resource URL. Here are some suggestions:

Apache ReWrite rules (using Apache mod_rewrite)

One can use Apache's mod_rewrite to avoid specifying the map, or any other default parameter in the mapserver URL. This task consist of three steps, specifying the mod_rewrite module to be loaded, enabling the mod_rewrite module for the selected directories and at last to write a .htaccess file to do the rewriting.

In the httpd.conf file, the mod_rewrite module is per default disabled. To enable it, remove the opening # in the line

```
#LoadModule rewrite_module modules/mod_rewrite.so
```

To be able to use the module, it must be enabled, using the directive AllowOverride. This can be done per server or per directory. If you just have one server, add an “AllowOverride All” line in the httpd.conf file (see the Apache documentation to be sure about the security implications of this). Per directory is the easiest way to make it work on virtual hosts. Within the <virtualHost> section of the httpd.conf insert:

```
<Directory myhtdocsdir>
    AllowOverride All
</Directory>
```

Where myhtdocsdir is the directory defined as documentroot for the actual virtual server.

When the directives are set to load and enable the mod_rewrite module, Apache has to be restarted.

In a web-accessible directory make a .htaccess file like the following:

```
RewriteEngine on
RewriteRule wmsmap?(.*) /cgi-bin/mapserv?map=/home/www/mapserverstuff/mymapfile.map&$1
```

The rewriteRule says: given a webpage starting with wmsmap, pick out the query parameters, make a new page request starting with /cgi-bin/mapserv?map=(...)? and add on whatever was the query parameters in the original page request.

e.g, the URL wmsmap?mode=map will be rewritten as

```
:: /cgi-bin/mapserv?map=/home/www/mapserverstuff/mymapfile.map&mode=map
```

If just the URL wmsmap is given (without any parameters) a page not found error will show up as that does not match the wmsmap? expression.

Apache environment variables - MS_MAPFILE

A default mapfile can be specified using the MS_MAPFILE environment variable:

```
Alias /mywms /usr/lib/cgi-bin/mapserver
<Location /mywms>
  SetHandler cgi-script
  Options ExecCGI
  SetEnv MS_MAPFILE /path/to/mymapfile.map
</Location>
```

Apache SetEnvIf

Another option is to use the “setenvif” feature of Apache: use symbolic links that all point to a same mapserv binary, and then for each symbolic link test the URL, and set the MAP environment accordingly.

For Windows and Apache users the steps are as follows (this requires Apache 1.3 or newer):

- Copy mapserv.exe to a new name for your WMS, such as “mywms.exe”.
- In httpd.conf, add:

```
SetEnvIf Request_URI "/cgi-bin/mywms" MS_MAPFILE=/path/to/mymap.map
```

ASP script (IIS - Microsoft Windows)

On IIS servers (Windows), you can use the following ASP script:

Note: The script below, while functional, is intended only as an example of using ASP to filter MapServer requests. Using ASP in a production WMS server will likely require additional ASP especially in the area of error handling and setting timeouts.*

```
<%
  Server.ScriptTimeout = 360

  Select Case Request.ServerVariables("REQUEST_METHOD")
    Case "GET"  strRequest = Request.QueryString
    Case "POST" strRequest = Request.Form
  End Select

  strURL = "http://myserver/cgi-bin/mapserv.exe?
            map=C:\Inetpub\wwwroot\workshop\itasca.map&" & strRequest

  Dim objHTTP
  Set objHTTP = Server.CreateObject("MSXML2.ServerXMLHTTP")
  objHTTP.open "GET", strURL, false
  objHTTP.send ""

  Response.ContentType = objHTTP.getResponseHeader("content-type")
  Response.BinaryWrite objHTTP.responseBody

  Set objHTTP = Nothing
%>
```

Mapscript wrapper

Some OGC services (WFS, SOS) support both GET and POST requests. Here, you can use a minimal MapScript WxS wrapper. Here's a Python example:

```
#!/usr/bin/python

import mapscript

req = mapscript.OWSRequest()
req.loadParams()
map = mapscript.mapObj('/path/to/config.map')
map.OWSDispatch(req)
```

Wrapper script (Unix)

On Unix servers, you can setup a wrapper shell script that sets the MS_MAPFILE environment variable and then passes control to the mapserv executable... that results on a cleaner OnlineResource URL:

```
#!/bin/sh
MS_MAPFILE=/path/to/demo.map
export MS_MAPFILE
/path/to/mapserv
```

Note: Using a /bin/sh wrapper script causes an overhead on system resources as two processes have to be spawned instead of one, and is therefore not recommended.

10.2.4 WMS 1.3.0 Support

MapServer 5.4 adds support for WMS 1.3.0. Although the general mechanism in MapServer to support this new specification are the same, there are some notable upgrades.

Major features related to the WMS 1.3.0 support

- Support WMS 1.3.0 basic operations: GetCapabilities, GetMap and GetFeatureInfo.
- Implement the [Styled Layer Descriptor profile of the Web Map Service Implementation Specification](#). This specification extends the WMS 1.3.0 and allows to advertise styling capabilities (Styled Layer Descriptor (SLD) support). It also defines two addition operations GetLegendGraphic and DescribeLayer
- Implement the [Symbology Encoding Implementation Specification](#), which is the new version of the SLD. Read support was added for Point, Line, Polygon, Raster symbolizers
- Upgrade the generation of SLD to version 1.1.0 (SLD generated through the GetStyles operation or through MapScript)

Coordinate Systems and Axis Orientation

The most notable changes introduced in WMS 1.3.0 are the:

- the axis changes
- the introduction of new coordinate reference systems

- the use of CRS parameter (instead of SRS)

The axis order in previous versions of the WMS specifications was to always use easting (x or lon) and northing (y or lat). WMS 1.3.0 specifies that, depending on the particular CRS, the x axis may or may not be oriented West-to-East, and the y axis may or may not be oriented South-to-North. The WMS portrayal operation shall account for axis order. This affects some of the EPSG codes that were commonly used such as EPSG:4326. MapServer 5.x makes sure that coordinates passed to the server (as part of the GetMap BBOX parameter) as well as those advertised in the capabilities document reflect the inverse axis orders for EPSG codes between 4000 and 5000.

MapServer 6.0 and up holds a list of epsg codes with inverted axis order. It is currently based on EPSG database version 7.6. It is also possible to define the axis order at build time for a specific ESPG code(see #3582). This allows for example to use the “normal” axis order for some of EPSG codes between 4000 and 5000.

In addition, the WMS 1.3.0 defines a series of new coordinate system. These are the ones that are currently supported in MapServer:

- CRS:84 (WGS 84 longitude-latitude)
- CRS:83 (NAD83 longitude-latitude)
- CRS:27 (NAD27 longitude-latitude)
- AUTO2:420001 (WGS 84 / Auto UTM)
- AUTO2:420002 (WGS 84 / Auto Tr. Mercator)
- AUTO2:420003 (WGS 84 / Auto Orthographic)
- AUTO2:420004 (WGS 84 / Auto Equirectangular)
- AUTO2:420005 (WGS 84 / Auto Mollweide)

Example of requests

Users can use the CRS:84 coordinate system and order the BBOX coordinates as long/lat:

- ...&CRS=CRS:84&BBOX=-180.0,-90.0,180.0,90.0&... ([example request](#))

Users can also use the EPSG:4326 coordinates and use the axis ordering of lat/long:

- ...&EPSG:4326&BBOX=-90.0,-180.0,90,180.0&... ([example request](#))

Other notable changes

- valid values for the EXCEPTIONS parameter in a GetMap request are XML, INIMAGE, BLANK
- valid value for the EXCEPTIONS parameter in a GetFeatureInfo request is XML
- LayerLimit is introduced, allowing a server to advertise and limit the number of layers a client is allowed to include in a GetMap request

Some Missing features

- WMS 1.3.0 Post request should be an XML document containing the different operations and parameters.
- SLD documents containing elements from the Feature Encoding 1.1 specification could potentially use EPSG projections with some filters. It is not yet clear nor implemented if the axis ordering should be taken into account in these specific cases.

OCG compliance tests

As of version 5.4, MapServer passes all the basic and query tests of the OGC CITE test suite for WMS 1.3.0.

10.2.5 Reference Section

The following metadata are available in the setup of the mapfile:

(Note that each of the metadata below can also be referred to as ‘ows_*’ instead of ‘wms_*’. MapServer tries the ‘wms_*’ metadata first, and if not found it tries the corresponding ‘ows_*’ name. Using this reduces the amount of duplication in mapfiles that support multiple OGC interfaces since “ows_*” metadata can be used almost everywhere for common metadata items shared by multiple OGC interfaces.)

Web Object Metadata

ows_http_max_age

- *Description:* (Optional) an integer (in seconds) to specify how long a given map response should be considered new. Setting this directive allows for aware WMS clients to use this resulting HTTP header value as a means to optimize (and minimize) requests to a WMS Server. More info is available at http://www.mnot.net/cache_docs/#CACHE-CONTROL

ows_schemas_location

- *Description:* (Optional) (Note the name ows_schemas_location and not wms_... this is because all OGC Web Services (OWS) use the same metadata) Root of the web tree where the family of OGC WMS XMLSchema files are located. This must be a valid URL where the actual .xsd files are located if you want your WMS output to validate in a validating XML parser. Default is <http://schemas.opengis.net>. See <http://ogc.dmsolutions.ca> for an example of a valid schema tree.

ows_sld_enabled

- *Description:* (Optional) A value (true or false) which, when set to “false”, will ignore SLD and SLD_BODY parameters in order to disable remote styling of WMS layers. Also, SLD is not advertised in WMS Capabilities as a result

ows_updatesequence

- *Description:* (Optional) The updateSequence parameter can be used for maintaining the consistency of a client cache of the contents of a service metadata document. The parameter value can be an integer, a timestamp in [ISO 8601:2000] format, or any other number or string.

wms_abstract

- *WMS TAG Name:* Abstract (WMS1.1.1, sect. 7.1.4.2)
- *Description:* (Optional) A blurb of text providing more information about the WMS server.

wms_accessconstraints

- *WMS TAG Name:* AccessConstraints (WMS1.1.1, sect. 7.1.4.2)
- *Description:* (Optional) Access constraints information. Use the reserved word “none” if there are no access constraints.

wms_addressstype, wms_address, wms_city, wms_stateorprovince, wms_postcode, wms_country

- *WMS TAG Name:* ContactAddress and family (WMS1.1.1, sect. 7.1.4.2)
- *Description:* Optional contact address information. If provided then all six metadata items are required.

wms_attribution_logourl_format

- *Description:* (Optional) The MIME type of the logo image. (e.g. “image/png”). Note that the other wms_attribution_logourl_* metadata must also be specified.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_attribution_logourl_height

- *Description:* (Optional) Height of the logo image in pixels. Note that the other wms_attribution_logourl_* metadata must also be specified.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_attribution_logourl_href

- *Description:* (Optional) URL of the logo image. Note that the other wms_attribution_logourl_* metadata must also be specified.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_attribution_logourl_width

- *Description:* (Optional) Width of the logo image in pixels. Note that the other wms_attribution_logourl_* metadata must also be specified.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_attribution_onlineresource

- *Description:* (Optional) The data provider’s URL.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_attribution_title

- ***Description:* (Optional) Human-readable string naming the data provider.**
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_bbox_extended:

- *Description:* (Optional) “true” or “false”. If true, bounding boxes are reported for all supported SRS / CRS in the capabilities document. If false, only the bounding box of the first SRS / CRS is reported.
- Introduced in 6.0.

wms_contactelectronicmailaddress

- **WMS TAG Name:** ContactElectronicMailAddress (WMS1.1.1, sect. 7.1.4.2)
- *Description:* Optional contact Email address.

wms_contactfacsimiletelephone

- **WMS TAG Name:** ContactFacsimileTelephone (WMS1.1.1, sect. 7.1.4.2)
- *Description:* Optional contact facsimile telephone number.

wms_contactperson, wms_contactorganization, wms_contactposition

- **WMS TAG Name:** ContactInformation, ContactPerson, ContactOrganization, ContactPosition (WMS1.1.1, sect. 7.1.4.2)
- *Description:* Optional contact information. If provided then all three metadata items are required.

wms_contactvoicetelephone

- **WMS TAG Name:** ContactVoiceTelephone (WMS1.1.1, sect. 7.1.4.2)

- *Description:* Optional contact voice telephone number.

wms_enable_request (or ows_enable_request)

- *Description:* Space separated list of requests to enable. The default is none. The following requests can be enabled: *GetCapabilities*, *GetMap*, *GetFeatureInfo* and *GetLegendGraphic*. A “!” in front of a request will disable the request. “*” enables all requests.

- *Examples:*

To enable only *GetMap* and *GetFeatureInfo*:

```
"wms_enable_request" "GetMap GetFeatureInfo"
```

To enable all requests except *GetFeatureInfo*

```
"wms_enable_request" "* !GetFeatureInfo"
```

wms_encoding

- *WMS TAG Name:* Encoding
- *Description:* Optional XML capabilities encoding type. The default is ISO-8859-1.

wms_feature_info_mime_type

- *WMS TAG Name:* Feature_info_mime_type
- *Description:*

- Used to specify an additional MIME type that can be used when responding to the GetFeature request.

For example if you want to use the layer’s HTML template as a base for its response, you need to add “WMS_FEATURE_INFO_MIME_TYPE” “text/html”. Setting this will have the effect of advertising text/html as one of the MIME types supported for a GetFeature request. You also need to make sure that the layer points to a valid html template (see [Templating](#)). The client can then call the server with INFO_FORMAT=text/html.

- If not specified, MapServer by default has text/plain and GML implemented.

wms_fees

- *WMS TAG Name:* Fees (WMS1.1.1, sect. 7.1.4.2)
- *Description:* (Optional) Fees information. Use the reserved word “none” if there are no fees.

wms_getcapabilities_version

- *Description:* (Optional) Default version to use for GetCapabilities requests that do not have a version parameter. If not set, the latest supported version will be returned.

wms_getlegendgraphic_formatlist

- *Description:* (Optional) A comma-separated list of valid formats for a WMS GetLegendGraphic request.

wms_getmap_formatlist

- *Description:* (Optional) A comma-separated list of valid formats for a WMS GetMap request.

wms_keywordlist

- *WMS TAG Name:* KeywordList (WMS1.1.1, sect. 7.1.4.2)
- *Description:* (Optional) A comma-separated list of keywords or keyword phrases to help catalog searching. As of WMS 1.1.0 no controlled vocabulary has been defined.

wms_keywordlist_vocabulary

- *WMS Attribute Name:* vocabulary of KeywordList -> Keyword
- *Description:* (Optional) Name of vocabulary used in **wms_keywordlist_[vocabulary's name]_items** as described below.

wms_keywordlist_[vocabulary's name]_items

- *WMS TAG Name:* KeywordList -> Keyword
- *Description:* (Optional) A comma-separated list of keywords or keyword phrases to help catalog searching for given vocabulary.

wms_languages

- *Description:* (Optional) A comma-separated list of supported languages. For details please refer to the section *Multi-language support for certain capabilities fields* in the INSPIRE View Service documentation.

wms_layerlimit

- *WMS TAG Name:* LayerLimit (WMS1.3.0, sect. 7.2.4.3)
- *Description:* (Optional) The maximum number of layers a WMS client can specify in a GetMap request. If not set, then no limit is imposed.

wms_onlineresource

- *WMS TAG Name:* OnlineResource (WMS1.1.1, sect. 6.2.2)
- *Description:* (Recommended) The URL that will be used to access this WMS server. This value is used in the GetCapabilities response.

See Also:

Sections “Setup a Mapfile / wms_onlineresource metadata” and “More About the Online Resource URL” above.

wms_resx, wms_resy

- *WMS TAG Name:* BoundingBox (WMS1.1.1, sect. 6.5.6)
- *Description:* (Optional) Used in the BoundingBox tag to provide info about spatial resolution of the data, values are in map projection units.

wms_rootlayer_abstract

- *WMS TAG Name:* Abstract (WMS1.1.1, sect. 7.1.4.2)
- *Description:* (Optional) Same as wms_abstract, applied to the root Layer element. If not set, then wms_abstract will be used.

wms_rootlayer_keywordlist

- *WMS TAG Name:* KeywordList (WMS1.1.1, sect. 7.1.4.2)
- *Description:* (Optional) Same as wms_keywordlist, applied to the root Layer element. If not set, then wms_keywordlist will be used.

wms_rootlayer_title

- *WMS TAG Name:* Title (WMS1.1.1, sect. 7.1.4.1)
- *Description:* (Optional) Same as wms_title, applied to the root Layer element. If not set, then wms_title will be used.

wms_service_onlineresource

- *Description:* (Optional) Top-level onlineresource URL. MapServer uses the onlineresource metadata (if provided) in the following order:

1. wms_service_onlineresource
2. ows_service_onlineresource
3. wms_onlineresource (or automatically generated URL, see the onlineresource section of this document)

wms_srs

- *WMS TAG Name:* SRS (WMS1.1.1, sect. 6.5.5)
- *Description:* (Recommended) Contains a list of EPSG projection codes that should be advertized as being available for all layers in this server. The value can contain one or more EPSG:<code> pairs separated by spaces (e.g. “EPSG:4269 EPSG:4326”) This value should be upper case (EPSG:42304.....not epsg:42304) to avoid problems with case sensitive platforms.
- See Also: section “Setup a Mapfile / Map PROJECTION and wms_srs metadata” above.

wms_timeformat

- *Description:* The time format to be used when a request is sent. (e.g. “wms_timeformat” “%Y-%m-%d %H, %Y-%m-%d %H:%M”). Please see the [WMS Time Support Howto](#) for more information.

wms_title

- *WMS TAG Name:* Title (WMS1.1.1, sect. 7.1.4.1)
- *Description:* (Required) A human-readable name for this Layer.

Layer Object Metadata**gml_exclude_items**

- *Description:* (Optional, applies only to GetFeatureInfo GML requests) A comma delimited list of items to exclude. As of MapServer 4.6, you can control how many attributes (fields) you expose for your data layer with metadata. The previous behaviour was simply to expose all attributes all of the time. The default is to expose no attributes at all. An example excluding a specific field would be:

```
"gml_include_items" "all"
"gml_exclude_items" "Phonenum"
```

gml_geometries

- *Description:* (Optional, applies only to GetFeatureInfo GML requests) Provides a name for geometry elements. The value is specified as a string to be used for geometry element names. By default, GML geometries are not written in GML GetFeatureInfo output, unless gml_geometries and gml_[geometry name]_type are both set. By default, only the bounding box is written. If gml_geometries is set to “none”, neither the bounding box nor the geometry are written.

gml_groups

- *Description:* (Optional, applies only to GetFeatureInfo GML requests) A comma delimited list of group names for the layer.

gml_[group name]_group

- *Description:* (Optional, applies only to GetFeatureInfo GML requests) A comma delimited list of attributes in the group. Here is an example:

```
"gml_include_items" "all"
"gml_groups" "display"
"gml_display_group" "Name_e,Name_f"
```

gml_include_items

- *Description:* (Optional, applies only to GetFeatureInfo GML requests) A comma delimited list of items to include, or keyword “all”. As of MapServer 4.6, you can control how many attributes (fields) you expose for your data layer with this metadata. The previous behaviour was simply to expose all attributes all of the time. You can enable full exposure by using the keyword “all”, such as:

```
"gml_include_items" "all"
```

You can specify a list of attributes (fields) for partial exposure, such as:

```
"gml_include_items" "Name, ID"
```

The new default behaviour is to expose no attributes at all.

gml_[item name]_alias

- *Description:* (Optional, applies only to GetFeatureInfo GML requests) An alias for an attribute’s name. The served GML will refer to this attribute by the alias. Here is an example:

```
"gml_province_alias" "prov"
```

gml_[item name]_type

- *Description:* (Optional, applies only to GetFeatureInfo GML requests) Specifies the type of the attribute. Valid values are Integer|Real|Character|Date|Boolean.

gml_[geometry name]_type

- *Description:* (Optional, applies only to GetFeatureInfo GML requests) When employing gml_geometries, it is also necessary to specify the geometry type of the layer. This is accomplished by providing a value for gml_[geometry name]_type, where [geometry name] is the string value specified for gml_geometries, and a value which is one of:

- point
- multipoint
- line
- multiline
- polygon
- multipolygon

gml_xml_items

- *Description:* (Optional, applies only to GetFeatureInfo GML requests) A comma delimited list of items that should not be XML-encoded.

wms_abstract

- Same as wms_abstract in the Web Object.

wms_attribution_logourl_format

- *Description:* (Optional) The MIME type of the logo image. (e.g. “image/png”). Note that the other wms_attribution_logourl_* metadata must also be specified.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_attribution_logourl_height

- *Description:* (Optional) Height of the logo image in pixels. Note that the other wms_attribution_logourl_* metadata must also be specified.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_attribution_logourl_href

- *Description:* (Optional) URL of the logo image. Note that the other wms_attribution_logourl_* metadata must also be specified.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_attribution_logourl_width

- *Description:* (Optional) Width of the logo image in pixels. Note that the other wms_attribution_logourl_* metadata must also be specified.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_attribution_onlineresource

- *Description:* (Optional) The data provider's URL.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_attribution_title

- **Description:** (Optional) Human-readable string naming the data provider.
- refer to section 7.1.4.5.11 of the WMS 1.1.1 spec.

wms_authorityurl_name, wms_authorityurl_href

- *Description:* (Optional) AuthorityURL is used in tandem with Identifier values to provide a means of linking identifier information back to a web service. The wms_identifier_authority should provide a string that matches a declared wms_authorityurl_name. Both wms_authorityurl_name and wms_authorityurl_href must be present for an AuthorityURL tag to be written to the capabilities.
- refer to section 7.1.4.5.12 of the WMS 1.1.1 spec.

wms_bbox_extended:

- *Description:* (Optional) “true” or “false”. If true, bounding boxes are reported for all supported SRS / CRS in the capabilities document. If false, only the bounding box of the first SRS / CRS is reported.
- Introduced in 6.0.

wms_dataurl_format

- *Description:* (Optional) Non-standardized file format of the metadata. The layer metadata wms_dataurl_href must also be specified.
- refer to section 7.1.4.5.14 of the WMS 1.1.1 spec.

wms_dataurl_href

- *Description:* (Optional) The URL to the layer's metadata. The layer metadata wms_dataurl_format must also be specified.
- refer to section 7.1.4.5.14 of the WMS 1.1.1 spec.

wms_enable_request (or ows_enable_request)

- *Description:* Space separated list of requests to enable. The default is none. The following requests can be enabled: *GetCapabilities*, *GetMap*, *GetFeatureInfo* and *GetLegendGraphic*. A “!” in front of a request will disable the request. “*” enables all requests.
- *Examples:*

To enable only *GetMap* and *GetFeatureInfo*:

```
"wms_enable_request" "GetMap GetFeatureInfo"
```

To enable all requests except *GetFeatureInfo*

```
"wms_enable_request" "* !GetFeatureInfo"
```

wms_exclude_items

- *Description:* (Optional, applies only to GetFeatureInfo text/plain requests) A comma delimited list of items to exclude, or keyword “all”.

See *gml_exclude_items* above.

wms_extent

- *WMS TAG Name:* BoundingBox (WMS1.1.1, sect. 6.5.6)
- *Description:* (Optional) Used for the layer’s BoundingBox tag for cases where it is impossible (or very inefficient) for MapServer to probe the data source to figure its extents. The value for this metadata is “minx miny maxx maxy” separated by spaces, with the values in the layer’s projection units. If *wms_extent* is provided then it has priority and MapServer will NOT try to read the source file’s extents.

For Rasters served through WMS, MapServer can now use the *wms_extent* metadata parameter to register the image. If a .wld file cannot be found, MapServer will then look for the *wms_extent* metadata parameter and use the extents of the image and the size of the image for georegistration.

wms_getfeatureinfo_formatlist

- *Description:* (Optional) Comma-separated list of formats that could be valid for a GetFeatureInfo request. If defined, only these formats are advertised through in the Capabilities document.

wms_getlegendgraphic_formatlist

- *Description:* (Optional) Comma-separated list of image formats that could be valid for a GetLegendGraphic request. If defined, only these formats are advertised through in the Capabilities document.

wms_getmap_formatlist

- *Description:* (Optional) Comma-separated list of image formats that could be valid for a GetMap request. If defined, only these formats are advertised through in the Capabilities document.

wms_group_abstract

- *Description:* (Optional) A blurb of text providing more information about the group. Only one layer for the group needs to contain *wms_group_abstract*, MapServer will find and use the value. The value found for the first layer in the group is used. So if multiple layers have *wms_group_abstract* set then only the first value is used.

wms_group_title

- *WMS TAG Name:* Group_title (WMS1.1.1, sect. 7.1.4.1)
- *Description:* (Optional) A human-readable name for the group that this layer belongs to. Only one layer for the group needs to contain *wms_group_title*, MapServer will find and use the value. The value found for the first layer in the group is used. So if multiple layers have *wms_group_title* set then only the first value is used.

wms_identifier_authority, wms_identifier_value

- *Description:* (Optional) Identifier is used in tandem with AuthorityURL end points to provide a means of linking identifier information back to a web service. The *wms_identifier_authority* should provide a string that matches a declared *wms_authorityurl_name*. Both *wms_identifier_authority* and *wms_identifier_value* must be present for an Identifier tag to be written to the capabilities.
- refer to section 7.1.4.5.12 of the WMS 1.1.1 spec.

wms_include_items

- *Description:* (Optional, applies only to GetFeatureInfo text/plain requests) A comma delimited list of items to include, or keyword “all”.

See `gml_include_items` above.

wms_keywordlist

- Same as `wms_keywordlist` in the Web Object.

wms_keywordlist_vocabulary

- Same as `wms_keywordlist_vocabulary` in the Web Object.

wms_keywordlist_[vocabulary's name]_items

- Same as `wms_keywordlist_[vocabulary's name]_items` in the Web Object.

wms_layer_group

- *Description:* (Optional) Can be used to assign a layer to a number of hierarchically nested groups. This grouped hierarchy will be expressed in the capabilities.

`WMS_LAYER_GROUP` is different from the `GROUP` keyword in that it does not necessarily publish the name of the group in the capabilities, only the title is always published. If a layer with the same name as used in `WMS_LAYER_GROUP` is found it is treated as named group and if no layer with this name is found as unnamed group.

As a consequence the groups set with `WMS_LAYER_GROUP` can not always be requested with a `GetMap` or `GetFeatureInfo` request (see section 7.1.4.5.2 of the WMS implementation specification version 1.1.1. (OGC 01-068r2)). Another difference is that `GROUP` does not support nested groups. The purpose of this metadata setting is to enable making a WMS client aware of layer grouping.

All group names should be preceded by a forward slash (/). It is not allowed to use both the `WMS_LAYER_GROUP` setting and the `GROUP` keyword for a single layer.

```
LAYER
  NAME "mylayer"
  DATA "mylayer"
  TYPE LINE
  CLASS
    STYLE
      COLOR 100 100 255
    END
  END
  METADATA
    "WMS_LAYER_GROUP" "/rootgroup/subgroup"
  END
END
```

wms_metadataurl_format

- *Description:* (Optional) The file format MIME type of the metadata record (e.g. “text/plain”). The layer metadata `wms_metadataurl_type` and `wms_metadataurl_href` must also be specified.
- refer to section 7.1.4.5.10 of the WMS 1.1.1 spec.

wms_metadataurl_href

- *Description:* (Optional) The URL to the layer’s metadata. The layer metadata `wms_metadataurl_format` and `wms_metadataurl_type` must also be specified.
- refer to section 7.1.4.5.10 of the WMS 1.1.1 spec.

wms_metadataurl_type

- *Description:* (Optional) The standard to which the metadata complies. Currently only two types are valid: “TC211” which refers to [ISO 19115], and “FGDC” which refers to [FGDC-STD-001-1988]. The layer metadata wms_metadataurl_format and wms_metadataurl_href must also be specified.
- refer to section 7.1.4.5.10 of the WMS 1.1.1 spec.

wms_opaque

- *WMS TAG Name:* Opaque (WMS1.1.1, sect. 7.1.4.6.3)
- *Description:* (Optional) Set this metadata to “1” to indicate that the layer represents an area-filling coverage of space (e.g. a bathymetry and elevation layer). This should be taken by the client as a hint that this layer should be placed at the bottom of the stack of layers.

wms_srs

- Same as wms_srs in the Web Object .

wms_style

- *Description:* (Optional) The LegendURL style name. Requires the following metadata: wms_style_[style's_name]_width, wms_style_[style's_name]_legendurl_height, wms_style_[style's_name]_legendurl_format, wms_style_[style's_name]_legendurl_href
- refer to section 7.1.4.5.4 of the WMS 1.1.1 spec.

wms_style_[style's_name]_legendurl_format

- *Description:* (Optional) The file format MIME type of the legend image. Requires the following metadata: wms_style_[style's_name]_width, wms_style_[style's_name]_legendurl_height, wms_style, wms_style_[style's_name]_legendurl_href.
- refer to section 7.1.4.5.4 of the WMS 1.1.1 spec.

wms_style_[style's_name]_legendurl_height

- *Description:* (Optional) The height of the legend image in pixels. Requires the following metadata: wms_style_[style's_name]_width, wms_style, wms_style_[style's_name]_legendurl_format, wms_style_[style's_name]_legendurl_href.
- refer to section 7.1.4.5.4 of the WMS 1.1.1 spec.

wms_style_[style's_name]_legendurl_href

- *Description:* (Optional) The URL to the layer's legend. Requires the following metadata: wms_style_[style's_name]_width, wms_style_[style's_name]_legendurl_height, wms_style_[style's_name]_legendurl_format, wms_style.
- refer to section 7.1.4.5.4 of the WMS 1.1.1 spec.

wms_style_[style's_name]_legendurl_width

- *Description:* (Optional) The width of the legend image in pixels. Requires the following metadata: wms_style_[style's_name]_format, wms_style_[style's_name]_legendurl_height, wms_style, wms_style_[style's_name]_legendurl_href.
- refer to section 7.1.4.5.4 of the WMS 1.1.1 spec.

wms_timedefault

- *Description:* (Optional for Time Support) This value is used if it is defined and the Time value is missing in the request. Please see the [WMS Time Support Howto](#) for more information.

wms_timeextent

- *Description:* (Mandatory for Time Support) This is used in the capabilities to return the valid time values for the layer. The value defined here should be a valid time range. Please see the [WMS Time Support Howto](#) for more information.

wms_timeitem

- *Description:* (Mandatory for Time Support) This is the name of the field in the DB that contains the time values. Please see the [WMS Time Support Howto](#) for more information.

wms_title

- Same as wms_title in the Web Object.

Vendor specific WMS parameters

angle

- Angle (in degrees) to rotate the map.

Note: The angle value is in degrees clockwise.

radius

- This parameter accepts two types of input:
 - An integer that specifies the search radius in pixels.
 - The special value *bbox* that will change the query into a bbox query based on the bbox given in the request parameters.

Cascading WMS Requests

Currently, there are 3 requests that support WMS cascading:

- GetMap
- GetFeatureInfo
- GetLegendGraphic

Before MapServer 6.2, a GetLegendGraphic request was not cascaded. A legend was returned using the layer classes. To preserve that behavior, a GetLegendGraphic request will be cascaded only **if**:

1. The GetLegendGraphic request is enabled via the *_enable_request* metadata.
2. The layer does not contain any class with the name property set. ie:

```
CLASS
  NAME "Parks"
  STYLE
    COLOR 0 255 0
  END
END
```

This layer won't be cascaded because it contains at least a class with the property NAME set.

Note: If you know that the remote WMS server *does not* support a given WMS request, you should disable this request explicitly for your layer using the (ows/wms)*_enable_request* metadata. Otherwise, you will simply get the XML exception from the cascaded server.

Sample WMS Server Mapfile

The following is a very basic WMS Server mapfile:

```
1 MAP
2   NAME "WMS-test"
3   STATUS ON
4   SIZE 400 300
5   EXTENT -2200000 -712631 3072800 3840000
6   UNITS METERS
7   SHAPEPATH "../data"
8   IMAGECOLOR 255 255 255
9   FONTSET ../[e|t|c]/[f|o|n|t|s].[t|x|t]
10
11 WEB
12   IMAGEPATH "/ms4w/tmp/ms_tmp/"
13   IMAGEURL "/ms_tmp/"
14   METADATA
15     "wms_title"      "WMS Demo Server"    ##required
16     "wms_onlineresource" "http://yourpath/cgi-bin/mapserv.exe?"    ##required
17     "wms_srs"        "EPSG:42304 EPSG:42101 EPSG:4269 EPSG:4326"    ##recommended
18     "wms_enable_request" "*"      ##necessary
19 END
20 END # Web
21
22 PROJECTION
23   "init=epsg:42304"    ##required
24 END
25
26 SYMBOL
27   NAME "circle"
28   TYPE ellipse
29   POINTS 1 1 END
30 END # Symbol
31
32 #
33 # Start of layer definitions
34 #
35
36 LAYER
37   NAME "park"
38   METADATA
39     "wms_title"      "Parks"      ##required
40   END
41   TYPE POLYGON
42   STATUS OFF
43   DATA [p|a|r|k]
44   PROJECTION
45     "init=epsg:42304"    ##recommended
46   END
47   CLASS
48     NAME "Parks"
49     STYLE
50       COLOR 200 255 0
51       OUTLINECOLOR 120 120 120
52     END # Style
53   END # Class
54 END # Layer
55
```

```

56 LAYER
57   NAME p o p p l a c e
58   METADATA
59     "wms_title"      "Cities"    ##required
60   END
61   TYPE POINT
62   STATUS ON
63   DATA p o p p l a c e
64   PROJECTION
65     "init=epsg:42304"    ##recommended
66   END
67   CLASS
68     NAME "Cities"
69     STYLE
70       SYMBOL "circle"
71       SIZE 8
72       COLOR 0 0 0
73     END # Style
74   END # Class
75 END # Layer
76
77 END # Map File

```

10.2.6 FAQ / Common Problems

Q How can I find the EPSG code for my data's projection?

A If you know the parameters of your data's projection, then you can browse the “epsg” file that comes with PROJ4 and look for a projection definition that matches your data's projection. It's a simple text file and the EPSG code is inside brackets (<...>) at the beginning of every line.

The “epsg” file is usually located in /usr/local/share/proj/ on Unix systems and in C:/PROJ/ or C:/PROJ/NAD in Windows systems (depending on the installation). MS4W users will find the epsg file in /MS4W/proj/nad/.

Q My WMS server produces the error “msProcessProjection(): no system list, errno: ..”

A That's likely PROJ4 complaining that it cannot find the “epsg” projection definition file. Make sure you have installed PROJ 4.4.3 or more recent and that the “epsg” file is installed at the right location. On Unix it should be under /usr/local/share/proj/, and on Windows PROJ looks for it under C:/PROJ/ or C:/PROJ/NAD (depending on the installation). You should also check the *error documentation* to see if your exact error is discussed.

If you don't have the “epsg” file then you can get it as part of the PROJ4 distribution at <http://trac.osgeo.org/proj/> or you can download it at <http://www.maptools.org/dl/proj4-epsg.zip>.

Q How do AUTO projections work?

A When a WMS client calls a WMS server with an auto projection, it has to specify the SRS in the form: AUTO: proj_id,unit_id,lon0,lat0 where:

- proj_id is one of 42001, 42002, 42003, 42004, or 42005 (only five auto projections are currently defined).
- unit_id is always 9001 for meters. (It is uncertain whether anyone supports any other units.)

- lon0 and lat0 are the coordinates to use as the origin for the projection.

When using an AUTO projection in WMS GetCapabilities, you include only the “AUTO:42003” string in your wms_srs metadata, you do not include the projection parameters. Those are added by the application (client) at runtime depending on the map view. For example:

```
NAME "DEMO"
...
WEB
...
METADATA
    "wms_title"          "WMS Demo Server"
    "wms_onlineresource" "http://my.host.com/cgi-bin/mapserv?map=wms.map&"
    "wms_srs"             "AUTO:42001 AUTO:42002"
    "wms_enable_request" "*"   ##necessary
END # METADATA
END # WEB
```

The above server advertises the first two auto projections.

10.3 INSPIRE View Service

Author Stephan Meissl

Contact stephan.meissl at eox.at

Last Updated 2012-03-19

Table of Contents

- INSPIRE View Service
 - Introduction
 - Activation of INSPIRE support
 - Multi-language support for certain capabilities fields
 - Provision of INSPIRE specific metadata
 - Named group layers
 - Style section for root layer and possibly existing group layers

10.3.1 Introduction

INSPIRE is the name of an [European directive](#), establishing an infrastructure for spatial information in Europe to support Community environmental policies, and policies or activities which may have an impact on the environment.

The INSPIRE View Service is an implementation of the [INSPIRE Technical Guidance](#) document on top of the [WMS Server](#) implementation explained in the previous chapter.

In order to achieve INSPIRE View Service compliance, the following enhancements have been implemented in MapServer:

- Activation of INSPIRE support (two scenarios)
- Multi-language support for certain capabilities fields
- Provision of INSPIRE specific metadata

- Named group layers
- Style section for root layer and possibly existing group layers

10.3.2 Activation of INSPIRE support

INSPIRE specific metadata can either be referenced in an external INSPIRE service metadata document (scenario 1) or can be directly embedded in the capabilities document (scenario 2). MapServer supports both scenarios.

Activation of the corresponding scenario for INSPIRE support takes place in the WEB.METADATA section of the mapfile through `wms_inspire_capabilities`. If activated, the corresponding INSPIRE namespace as well as appropriate validation warnings are generated in the capabilities document.

Scenario 1 - activate INSPIRE support using a reference to external service metadata:

```
WEB
METADATA
  "wms_inspire_capabilities" "url"
  ...
END
END
```

Scenario 2 - activate INSPIRE support using embedded service metadata:

```
WEB
METADATA
  "wms_inspire_capabilities" "embed"
  ...
END
END
```

10.3.3 Multi-language support for certain capabilities fields

INSPIRE requires multi-language support and requests a list of all supported languages as well as the default language in the capabilities document. Based on the language parameter in the GetCapabilites request, certain specific metadata values, namely

- `wms_title`
- `wms_abstract`
- `wms_rootlayer_title`
- `wms_rootlayer_abstract`
- `wms_group_title`
- `wms_group_abstract`
- `wms_style_title`
- `wms_style_<name>_title`

as well as language dependent reference data like

- `DATA "road_eng"`
- `CONNECTION "db_ger"`

need to be provided in the requested language. If the language is not supported (or no language parameter is present), the default language has to be used.

All supported languages have to be specified as comma separated list (first language is default) through wms_languages in the WEB.METADATA section of the mapfile. This language parameter is also added to the OnlineResource in the GetCapabilites output:

```
WEB
METADATA
...
"wms_languages" "eng,ger"          #first default, values according ISO 639-2/B
...
END
END
```

For language specific metadata values, a key extension method is applied:

```
WEB
METADATA
...
"wms_title.eng" "myservicetitle"
"wms_title.ger" "myservicetitleger"
"wms_abstract" "mylayerabstract"      #fallback
"wms_abstract.ger" "mylayerabstractger"
...
END
END
```

For language dependent reference data, a similar approach like the *run-time substitution* feature of MapServer has been followed (only DATA and CONNECTION values with %language% are substituted):

```
...
LAYER
  NAME TN.RoadTransportNetwork.RoadLink
  DATA "road_%language%"
  ...
END
...
```

If the language is not supported (or no language parameter is present), the default language is substituted.

10.3.4 Provision of INSPIRE specific metadata

Depending on the scenario, additional metadata information is required to support the specification. The INSPIRE related fields are provided below.

Scenario 1 - INSPIRE related fields using referenced external service metadata:

```
WEB
METADATA
  "wms_inspire_capabilities" "url"
  "wms_languages" "eng,ger"          #first default, values according ISO 639-2/B
  "wms_inspire_metadataurl_href" "http://INSPIRE.service/metadata"
  "wms_inspire_metadataurl_format" "application/vnd.ogc.cs.wCapabilities.response_xml"
  "wms_keywordlist_ISO_items" "infoMapAccessService" #value according "classification of spatial data"
  "wms_keywordlist_vocabulary" "ISO"
  "wms_title" "myservicetitle"
  "wms_abstract" "myabstract"
  "wms_fees" "conditions unknown"    #value either "no conditions apply" | default "conditions un
  "wms_accessconstraints" "None"      #value according ISO 19115 (MD_RestrictionCode codelist) or
  "wms_contactorganization" "MapServer" #responsible organization
  "wms_contactposition" "owner"       #responsible organization, value according "INSPIRE Metadata
```

```
...
END
END
```

Scenario 2 - INSPIRE related fields using embedded service metadata:

```
WEB
METADATA
  "wms_inspire_capabilities" "embed"
  "wms_languages" "eng,ger"          #first default, values according ISO 639-2/B
  "wms_inspire_temporal_reference" "2011-09-19" #date of last revision, value according YYYY-MM-DD
  "wms_inspire_mpoc_name" "mympocname"      #point of contact
  "wms_inspire_mpoc_email" "mympoc@e.mail" #point of contact
  "wms_inspire_metadata_date" "2011-09-19" #value according YYYY-MM-DD
  "wms_inspire_resourcelocator" "http://myinspireresource" #URL for ResourceLocator
  "wms_inspire_keyword" "infoMapAccessService" #value according "classification of spatial data services"
  "wms_keywordlist_ISO_items" "infoMapAccessService"
  "wms_keywordlist_vocabulary" "ISO"
  "wms_title" "myservicetitle"
  "wms_abstract" "myabstract"
  "wms_fees" "conditions unknown"      #value either "no conditions apply" | default "conditions unknown"
  "wms_accessconstraints" "None"        #value according ISO 19115 (MD_RestrictionCode codelist) or
  "wms_contactorganization" "MapServer" #responsible organization
  "wms_contactposition" "owner"       #responsible organization, value according "INSPIRE Metadata"
...
END
END
```

Notes:

- several fields require certain values, these values are not validated by MapServer itself, instead a manual validation against the [INSPIRE schemas](#) and the [WMS INSPIRE tester](#) is recommended
- as suggested in this [document](#) regarding scenario 2, `<inspire_common:ResourceType>` is always set to service and `<inspire_common:SpatialDataServiceType>` is always set to view, both values can't be altered through the mapfile
- conformity is always set to not evaluated, based on the latest [INSPIRE Metadata Implementing Rules](#) (page 7), a specification document, the specification date and a specification URI or URL need to be provided for degree conformant/not conformant, which is currently not implemented

10.3.5 Named group layers

INSPIRE mandates usage of named group layers. Thus the functionality of `wms_layer_group` is extended to support named group layers. If a layer with the same name as used in `wms_layer_group` is found it is treated as named group and if no layer with this name is found as unnamed group as before.

Provided that ability, a hierarchy of any level can be achieved. See for example the grouping used in the `wms_inspire.map` mapfile in `msautotest`:

```
TN
+--- TN.CommonTransportElements
    +--- TN.CommonTransportElements.TransportArea
    +--- TN.CommonTransportElements.TransportLink
    +--- TN.CommonTransportElements.TransportNode
+--- TN.RoadTransportNetwork
    +--- TN.RoadTransportNetwork
    +--- TN.RoadTransportNetwork.VehicleTrafficArea
    +--- TN.RoadTransportNetwork.RoadServiceArea
```

```
+--- TN.RoadTransportNetwork.RoadArea
+--- TN.RailTransportNetwork
+--- TN.RailTransportNetwork.RailwayLink
+--- TN.RailTransportNetwork.RailwayStationArea
+--- TN.RailTransportNetwork.RailwayYardArea
+--- TN.RailTransportNetwork.RailwayArea
```

10.3.6 Style section for root layer and possibly existing group layers

For regular layers, the concept of GROUP and CLASSGROUP can be used to set the layer style name to the according value. Additionally the layer style titles can be overwritten through `wms_style_<stylename>_title` and the layer style legendURLs through `wms_style_<stylename>_legendurl_*` (width, height, format, and href need to be provided):

```
...
LAYER
  NAME TN.RoadTransportNetwork.RoadLink
  DATA "road"
  METADATA
    "wms_title.eng" "Transport networks: Road Link"
    "wms_title.ger" "Verkehrsnetze: Strassensegment"
    ...
    "wms_style_inspire_common:DEFAULT_title" "mylayerstyletitle"      #style title
    "wms_style_inspire_common:DEFAULT_legendurl_width" "85"          #override style legendurl (mandatory)
    "wms_style_inspire_common:DEFAULT_legendurl_height" "40"
    "wms_style_inspire_common:DEFAULT_legendurl_format" "image/png"
    "wms_style_inspire_common:DEFAULT_legendurl_href" "http://path/to/onlineresource...roadlink"
  END
  ...
END
  ...
CLASSGROUP "inspire_common:DEFAULT"
CLASSITEM "NAME_E"

CLASS
  NAME "myclass1"
  GROUP "inspire_common:DEFAULT"
  EXPRESSION "Trans-Canada Highway"
  COLOR 255 0 0
  END

CLASS
  NAME "myclass2"
  GROUP "inspire_common:DEFAULT"
  COLOR 0 255 0
  END
...

```

The following method is implemented to support (customizable) style sections in the root layer:

- use `wms_style_name` in the WEB.METADATA section to add a style section to the root layer
- use `wms_style_title` to override the style title (optional)
- use `wms_style_legendurl_*` to override width, height, format and href of the legendURL (optional)

and possibly existing group layers:

- use `wms_group_style_name` in the first corresponding LAYER.METADATA section to add a style section to the group layer
- use `wms_group_style_title` to override the style title (optional)
- use `wms_group_style_legendurl_*` to override width, height, format and href of the legendURL (optional)

```

...
WEB
METADATA
...
"wms_style_name" "inspire_common:DEFAULT"      #style name
"wms_style_title" "myroadarealayerstyletitle"   #style title
"wms_style_legendurl_width" "85"                 #override style legendurl (mandatory: width, height)
"wms_style_legendurl_height" "40"
"wms_style_legendurl_format" "image/png"
"wms_style_legendurl_href" "http://path/to/onlineresource...roadarea"
END
END

LAYER
NAME TN.RailTransportNetwork.RailwayLink
GROUP TN.CommonTransportElements.TransportLink
DATA "road"
METADATA
"wms_group_title.eng" "Transport networks: Generic Transport Link"
"wms_group_title.ger" "Verkehrsnetze: Generisches Verkehrssegment"
"wms_group_abstract" "mygenerictransportlinklayerabstract" #fallback
"wms_group_abstract.ger" "mygenerictransportlinklayerabstract"
"wms_group_style_name" "inspire_common:DEFAULT" #style name
"wms_group_style_title" "mygenerictransportlinklayerstyletitle" #style title
"wms_group_style_legendurl_width" "85"           #override style legendurl (mandatory: width, height)
"wms_group_style_legendurl_height" "40"
"wms_group_style_legendurl_format" "image/png"
"wms_group_style_legendurl_href" "http://path/to/onlineresource...generictransportlink"
"wms_title.eng" "Transport networks: Railway Link"
"wms_title.ger" "Verkehrsnetze: Eisenbahnverbindung"
"wms_abstract" "myrailwaylinklayerabstract" #fallback
"wms_abstract.ger" "myrailwaylinklayerabstractger"
...
END
...
END
...

```

Provided that ability, 3 levels of hierarchy can be achieved as done in the example mapfiles `wms_inspire_scenario1.map` and `wms_inspire_scenario2.map` in msautotest:

```

TN.RoadTransportNetwork.RoadArea
+--- TN.RoadTransportNetwork.RoadLink
+--- TN.CommonTransportElements.TransportLink
    +--- TN.RailTransportNetwork.RailwayLink
    +--- TN.AirTransportNetwork.AirLink

```

10.4 WMS Client

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Last Updated 2010-10-01

Table of Contents

- WMS Client
 - Introduction
 - Compilation / Installation
 - MapFile Configuration
 - Limitations/TODO

10.4.1 Introduction

A WMS (or Web Map Server) allows for use of data from several different servers, and enables for the creation of a network of Map Servers from which clients can build customized maps. The following document contains information about using MapServer's WMS connection type to include layers from remote WMS servers in MapServer applications.

MapServer supports the following WMS versions when acting as client: 1.0.0, 1.0.7, 1.1.0, 1.1.1 (see [MapServer OGC Specification support](#) for an updated list).

This document assumes that you are already familiar with certain aspects of MapServer:

- MapServer application development and setting up .map files.
- Familiarity with the WMS spec would be an asset. A link to the WMS specification document is included below.

WMS-Related Information

- [MapServer WMS Server HowTo](#)
- [WMS 1.1.1 specification](#)
- [MapServer OGC Web Services Workshop package](#)

10.4.2 Compilation / Installation

The WMS connection type is enabled by the `--with-wmsclient` configure switch. It requires PROJ4, GDAL and libcurl version 7.10.1 or more recent. Windows users who do not want to compile MapServer should use [MS4W](#) (which comes ready for WMS/WFS client and server use), or check for the availability of other [Windows binaries](#) with WMS support.

- For PROJ4 and GDAL installation, see the MapServer Compilation HowTo ([Compiling on Unix / Compiling on Win32](#))
- For [libcurl](#), make sure you have version 7.10.1 or more recent installed on your system. You can find out your libcurl version using `curl-config --version`. (if your system came with an older version of libcurl preinstalled then you MUST uninstall it prior to installing the new version)

Once the required libraries are installed, then configure MapServer using the `--with-wmsclient` switch (plus all the other switches you used to use) and recompile. This will give you a new set of executables (and possibly `php_mapscript.so` if you requested it). See the MapServer Compilation HowTo (links above) for installation details.

Check your MapServer executable

To check that your mapserv executable includes WMS support, use the “-v” command-line switch and look for “SUPPORTS=WMS_CLIENT”.

Example 1. Mapserv Version Info on Unix:

```
$ ./mapserv -v
MapServer version 5.2.0-rc1 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP
OUTPUT=PDF OUTPUT=SWF OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=AGG
SUPPORTS=FREETYPE SUPPORTS=ICONV SUPPORTS=WMS_SERVER SUPPORTS=WMS_CLIENT
SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER
SUPPORTS=SOS_SERVER SUPPORTS=FASTCGI SUPPORTS=THREADS
SUPPORTS=GEOS SUPPORTS=RGB_A_PNG INPUT=JPEG INPUT=POSTGIS
INPUT=ORACLESPATIAL INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE
```

Example 2. Mapserv Version Info on Windows:

```
C:\ms4w\apache\cgi-bin> mapserv -v
MapServer version 5.2.0-rc1 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP
OUTPUT=PDF OUTPUT=SWF OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=AGG
SUPPORTS=FREETYPE SUPPORTS=ICONV SUPPORTS=WMS_SERVER SUPPORTS=WMS_CLIENT
SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER
SUPPORTS=SOS_SERVER SUPPORTS=FASTCGI SUPPORTS=THREADS
SUPPORTS=GEOS SUPPORTS=RGB_A_PNG INPUT=JPEG INPUT=POSTGIS
INPUT=ORACLESPATIAL INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE
```

Install Optional PROJ4 EPSG Codes

(Note: installing these PROJ4 codes is optional, install only if you need them)

Some Canadian WMS servers will use some non-standard projection codes not included in the default distribution (e.g. EPSG:42304, etc.). If you are planning to use MapServer to connect to Canadian WMS servers then you might want to [download a custom Canadian epsg file](#) with those codes, and unzip it in the /usr/local/share/proj directory (or /ms4w/proj/nad/ for MS4W users).

Finally, ESRI WMS servers also come with their own series of non-standard codes. If you are planning to connect to ESRI WMS servers then you might want to get a custom epsg file that contains the canadian codes and the ESRI codes, allowing you to connect to any server. Download the [custom ESRI epsg file](#) and unzip it in /usr/local/share/proj (or /ms4w/proj/nad/ for MS4W users).

- Q** But why not always install and distribute the proj4-epsg-with-42xxx-and-esri.zip file then since it's more complete?
- A** You should install only the epsg projection codes that you need, the epsg file with all ESRI codes in it is 20% larger than the default one, so it comes with extra overhead that you may not need. Also note that when creating WMS servers, in order to be really interoperable, only EPSG codes that are part of the standard EPSG list should be used. i.e. it is a bad idea for interoperability to use the custom canadian codes or the custom ESRI codes and we do not want to promote their use too much.

10.4.3 MapFile Configuration

Note: A PROJECTION must be set in the mapfile for the MAP unless you are sure that all your WMS layers support only a single projection which is the same as the PROJECTION of the map. The MAP PROJECTION can be set using “init=epsg:xxxx” codes or using regular PROJ4 parameters. Failure to set a MAP PROJECTION may result in blank

maps coming from remote WMS servers (because of inconsistent BBOX+SRS combination being used in the WMS connection URL).

Storing Temporary Files

Before version 6.0, and in version 6.0 when wms_cache_to_disk metadata is turned on, you have to set the IMAGEPATH value in the WEB object of your mapfile to point to a valid and writable directory. MapServer will use this directory to store temporary files downloaded from the remote servers. The temporary files are automatically deleted by MapServer so you won't notice them.

Example 3. Setting IMAGEPATH Parameter in Mapfile

```
MAP
  ...
  WEB
    IMAGEPATH "/tmp/ms_tmp/"
    IMAGEURL ...
  END
  ...
END
```

If you want to keep this temporary file for debugging purposes, you should add the following statement to the LAYER object of your mapfile:

```
LAYER
  ...
  DEBUG ON
  ...
END
```

Adding a WMS Layer

WMS layers are accessed via the WMS connection type in the *Mapfile*. Here is an example of a layer using this connection type:

```
LAYER
  NAME "country_bounds"
  TYPE RASTER
  STATUS ON
  CONNECTION "http://demo.mapserver.org/cgi-bin/wms?"
  CONNECTIONTYPE WMS
  METADATA
    "wms_srs"           "EPSG:4326"
    "wms_name"          "country_bounds"
    "wms_server_version" "1.1.1"
    "wms_format"        "image/gif"
  END
END
```

Required Layer Parameters and Metadata

- **CONNECTIONTYPE WMS**
- **CONNECTION** - this is the remote server's online resource URL, just the base URL without any of the WMS parameters. The server version, image format, layer name, etc. will be provided via metadata, see below.

Note: Note that if the CONNECTION parameter value is not set the the value of the “wms_onlineresource” metadata will be used. If both CONNECTION and “wms_onlineresource” are set then the “wms_onlineresource” metadata takes precedence.

- “**wms_format**” **metadata** - the image format to use in GetMap requests.
-

Note: If wms_formatlist is provided then wms_format is optional and MapServer will pick the first supported format in wms_formatlist for use in GetMap requests. If both wms_format and wms_formatlist are provided then wms_format takes precedence. Also note that WMS Servers only advertize supported formats that are part of the GD/GDAL libraries.

- “**wms_name**” **metadata** - comma-separated list of layers to be fetched from the remote WMS server. This value is used to set the LAYERS and QUERY_LAYERS WMS URL parameters.
- “**wms_server_version**” **metadata** - the version of the WMS protocol supported by the remote WMS server and that will be used for issuing GetMap requests.
- “**wms_srs**” **metadata** - space-delimited list of EPSG projection codes supported by the remote server. You normally get this from the server’s capabilities output. This value should be upper case (EPSG:4236.....not epsg:4236) to avoid problems with case sensitive platforms. The value is used to set the SRS WMS URL parameter.

Optional Layer Parameters and Metadata

- **MINSCALE, MAXSCALE** - if the remote server’s capabilities contains a ScaleHint value for this layer then you might want to set the MINSCALE and MAXSCALE in the LAYER object in the mapfile. This will allow MapServer to request the layer only at scales where it makes sense
- **PROJECTION object** - it is optional at this point. MapServer will create one internally if needed. Including one may allow MapServer to avoid looking up a definition in the PROJ.4 init files.
- “**wms_auth_username**” **metadata** - msEncrypt-style authorization string. Empty strings are also accepted.

METADATA

```
"wms_auth_username" "foo"
"wms_auth_password" "{FF88CFDAAE1A5E33}"
END
```

- “**wms_auth_type**” **metadata** - Authorization type. Supported types include:

- basic
- digest
- ntlm
- any (the underlying http library picks the best among the options supported by the remote server)
- anysafe (the underlying http library picks only safe methods among the options supported by the remote server)

METADATA

```
"wms_auth_type" "ntlm"
END
```

- “**wms_connectiontimeout**” **metadata** - the maximum time to wait for a remote WMS layer to load, set in seconds (default is 30 seconds). This metadata can be added at the layer level so that it affects only that

layer, or it can be added at the map level (in the web object) so that it affects all of the layers. Note that wms_connectiontimeout at the layer level has priority over the map level.

METADATA

```
...
"wms_connectiontimeout" "60"
...
END
```

- “**wms_exceptions_format**” **metadata** - set the format for exceptions (as of MapServer 4.6). MapServer defaults to *application/vnd.ogc.se_inimage* (the exception will be in a picture format). You can check the GetCapabilities of the server to see what formats are available for exceptions. The *application/vnd.ogc.se_inimage* exception format is actually a non-required exception format in the WMS 1.1.1 spec, so there are servers out there which don’t support this format. In that case you would use:

LAYER

```
...
METADATA
  "wms_exceptions_format" "application/vnd.ogc.se_xml"
END
...
END
```

Which would return this xml exception in the MS_ERRORFILE:

```
Tue Jan 17 18:05:13 2006 - msDrawWMSLayerLow(): WMS server error.
WMS GetMap request got XML exception for layer 'prov_bound':
<?xml version='1.0' encoding="ISO-8859-1" standalone="no" ?>
<!DOCTYPE ServiceExceptionReport SYSTEM
"http://schemas.opengis.net/wms/1.1.1/exception_1_1_1.dtd">
<ServiceExceptionReport version="1.1.1"><ServiceException
code="LayerNotDefined">
msWMSLoadGetMapParams(): WMS server error. Invalid layer(s)
given in the LAYERS parameter.
</ServiceException>
</ServiceExceptionReport>
```

- “**wms_force_separate_request**” **metadata** - set this to “1” to force this WMS layer to be requested using its own separate GetMap request. By default MapServer will try to merge multiple adjacent WMS layers from the same server into a single multi-layer GetMap request to reduce the load on remote servers and improve response time. This metadata is used to bypass that behavior.
- “**wms_formatlist**” **metadata** - comma-separated list of image formats supported by the remote WMS server. Note that wms_formatlist is used only if wms_format is not set. If both wms_format and wms_formatlist are provided then wms_format takes precedence.
- “**wms_latlonboundingbox**” **metadata** - the bounding box of this layer in geographic coordinates in the format “lon_min lat_min lon_max lat_max”. If it is set then MapServer will request the layer only when the map view overlaps that bounding box. You normally get this from the server’s capabilities output.

METADATA

```
"wms_latlonboundingbox" "-124 48 -123 49"
END
```

- “**wms_proxy_auth_type**” **metadata** - the authorization type to use for a proxy connection. Supported types include:
 - basic
 - digest

- ntlm
- any (the underlying http library picks the best among the options supported by the remote server)
- anysafe (the underlying http library picks only safe methods among the options supported by the remote server)

METADATA

```
"wms_proxy_auth_type" "ntlm"
END
```

- “**wms_proxy_host**” **metadata** - the hostname of the proxy to use, in “dot-quad” format, with an optional port component (e.g. ‘192.168.2.10:8080’).

METADATA

```
"wms_proxy_host" "192.168.2.10"
END
```

- “**wms_proxy_port**” **metadata** - the port to use for a proxy connection.

METADATA

```
"wms_proxy_port" "8080"
END
```

- “**wms_proxy_type**” **metadata** - the type of the proxy connection. Valid values are ‘http’ and ‘socks5’, which are case sensitive.

METADATA

```
"wms_proxy_type" "http"
END
```

- “**wms_proxy_username**” **metadata** - msEncrypt-style string for a proxy connection. Empty strings are also accepted.

METADATA

```
"wms_proxy_username" "foo"
"wms_proxy_password" "{FF88CFDAAE1A5E33}"
END
```

- “**wms_sld_body**” **metadata** - can be used to specify an inline SLD document.
- “**wms_sld_url**” **metadata** - can be used to specify a link to an SLD document.
- “**wms_style**” **metadata** - name of style to use for the STYLES parameter in GetMap requests for this layer.
- “**wms_style_<stylename>_sld**” **metadata** URL of a SLD to use in GetMap requests. Replace <stylename> in the metadata name with the name of the style to which the SLD applies.

METADATA

```
...
"wms_style" "mystyle"
"wms_style_mystyle_sld" "http://my.host.com/mysld.xml"
...
END
```

For more information on SLDs in MapServer see the [SLD HowTo document](#).

- “**wms_time**” **metadata** - value to use for the TIME parameter in GetMap requests for this layer. Please see the [WMS Time HowTo](#) for more information.
- “**wms_bgcolor**” **metadata** - specifies the color to be used as the background of the map. The general format of BGCOLOR is a hexadecimal encoding of an RGB value where two hexadecimal characters are used for each of Red, Green, and Blue color values. The values can range between 00 and FF for each (0 and 255, base 10). The

format is 0xRRGGBB; either upper or lower case characters are allowed for RR, GG, and BB values. The “0x” prefix shall have a lower case “x”.

- **“wms_transparent” metadata** - specifies whether the map background is to be made transparent or not. TRANSPARENT can take on two values, “TRUE” or “FALSE”. If not specified, MapServer sets default to “TRUE”
- **“wms_cache_to_disk” metadata** - set this to “1” to force MapServer to write fetched images to disk. Writing to disk is necessary to take advantage of MapServer’s caching logic to avoid refetching WMS requests made previously. This feature is new to MapServer 6.0 - previously results were always written to disk.
- **“wms_nonsquare_ok” metadata** - set this to “0” to indicate that the remote WMS only supports requests for square pixels. In this case MapServer will be careful to only make square pixel requests even if it means oversampling in one dimension compared to the resolution of image data required. This feature is new to MapServer 6.0.
- **“wms_extent” metadata** - If there is exactly one SRS supported by this layer (as listed in the wms_srs metadata), and if the wms_extent metadata item (or an extent specified via the EXTENT keyword) is set then MapServer will take care to only making requests within this area. This can short circuit requests completely outside the layer, reduce processing for layers that only partially overlap the target map area and avoid poor behaviors with reprojection in some areas. The contents of this metadata item should be of the form “minx miny maxx maxy”. This feature is new to MapServer 6.0.

Note: Note that each of the above metadata can also be referred to as ‘ows_’ instead of ‘wms_’. MapServer tries the ‘wms_’ metadata first, and if not found it tries the corresponding ‘ows_’ name. Using this reduces the amount of duplication in mapfiles that support multiple OGC interfaces since “ows_” metadata can be used almost everywhere for common metadata items shared by multiple OGC interfaces.

Old CONNECTION parameter format from version 3.5 and 3.6 (deprecated)

In MapServer version 3.5 and 3.6, the CONNECTION parameter had to include at a minimum the VERSION, LAYERS, FORMAT and TRANSPARENT WMS parameters. This mode of operation is still supported but is deprecated and you are encouraged to use metadata items for those parameters as documented in the previous section above.

Here is an example of a layer definition using this deprecated CONNECTION parameter format:

```
LAYER
  NAME "bathymetry_elevation"
  TYPE RASTER
  STATUS ON
  CONNECTIONTYPE WMS
  CONNECTION "http://demo.org/cgi-bin/wms?VERSION=1.1.0&LAYERS=bm&FORMAT=image/png"
  PROJECTION
    "init=epsg:4326"
  END
END
```

10.4.4 Limitations/TODO

1. GetFeatureInfo is not fully supported since the output of getFeatureInfo is left to the discretion of the remote server. A method layer.getWMSFeatureInfoURL() has been added to MapScript for applications that want to access featureInfo results and handle them directly.
2. MapServer does not attempt to fetch the layer’s capabilities. Doing so at every map draw would be extremely inefficient. And caching that information does not belong in the core of MapServer. This is better done at

the application level, in a script, and only the necessary information is passed to the MapServer core via the CONNECTION string and metadata.

10.5 WMS Time

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Revision \$Revision\$

Date \$Date\$

Last Updated 2006/06/26

Table of Contents

- [WMS Time](#)
 - [Introduction](#)
 - [Enabling Time Support in MapServer](#)
 - [Future Additions](#)
 - [Limitations and Known Bugs](#)

10.5.1 Introduction

A WMS server can provide support to temporal requests. This is done by providing a TIME parameter with a time value in the request. MapServer 4.4 and above provides support to interpret the TIME parameter and transform the resulting values into appropriate requests.

Links to WMS-Related Information

- [MapServer WMS Server HowTo](#)
- [MapServer WMS Client HowTo](#)
- [WMS 1.1.1 specification](#)
- [MapServer OGC Web Services Workshop](#)

10.5.2 Enabling Time Support in MapServer

Time Patterns

WMS specifies that the basic format used for TIME requests is based on the ISO 8601:1988(E) “extended” format. MapServer supports a limited set of patterns that are defined in the ISO 8601 specifications, as well as few other patterns that are useful but not compliant to ISO 8601. Here is a list of patterns currently supported:

Table 1. Supported Time Patterns

Time Patterns	Examples
YYYYMMDD	20041012
YYYY-MM-DDTHH:MM:SSZ	2004-10-12T13:55:20Z
YYYY-MM-DDTHH:MM:SS	2004-10-12T13:55:20
YYYY-MM-DD HH:MM:SS	2004-10-12 13:55:20
YYYY-MM-DDTHH:MM	2004-10-12T13:55
YYYY-MM-DD HH:MM	2004-10-12 13:55
YYYY-MM-DDTHH	2004-10-12T13
YYYY-MM-DD HH	2004-10-12 13
YYYY-MM-DD	2004-10-12
YYYY-MM	2004-10
YYYY	2004
THH:MM:SSZ	T13:55:20Z
THH:MM:SS	T13:55:20

Setting Up a WMS Layer with Time Support

To have a valid WMS layer with time support, the user has to define the following metadata at the layer level:

- *wms_timeextent*: (*Mandatory*) this is used in the capabilities document to return the valid time values for the layer. The value defined here should be a valid time range. (more on this in ‘Specifying Time Extents’ below)
- *wms_timeitem*: (*Mandatory*) this is the name of the field in the DB that contains the time values.
- *wms_timedefault*: (*Optional*) this value is used if it is defined and the TIME value is missing in the request.

It is also recommended to set a *LAYER FILTER* for the time layer to provide a default time also for non-WMS requests. If the time item is *mytime*, and the time format is “YYYYMMDD” the following layer filter could be used:

```
FILTER ([mytime] = '2004-01-01 14:10:00')
```

Specifying Time Extents

Time Extents can be declared with the following syntax for the *wms_timeextent* metadata (see Annex C.3 in the [WMS 1.1.1 specification](#) document for a full description):

1. *value* - a single value. This is not directly supported in MapServer but there is an easy workwound by specifying the same value as min and max.
2. *value1,value2,value3,...* - a list of multiple values.
3. *min/max/resolution* - an interval defined by its lower and upper bounds and its resolution. This is supported in MapServer (note that the resolution is not supported however).
4. *min1/max1/res1,min2/max2/res2,...* - a list of multiple intervals.

Example WMS-Server Layer

```
LAYER
  NAME "earthquakes"
  METADATA
    "wms_title"      "Earthquakes"
    "wms_timeextent" "2004-01-01/2004-02-01"
    "wms_timeitem"   "TIME"
    "wms_timedefault" "2004-01-01 14:10:00"
```

```

    "wms_enable_request" "*"
END
TYPE POINT
STATUS ON
DATA "quakes"
FILTER ([T I M E])='2004-01-01 14:10:00'
CLASS
    ...
END
END

```

GetCapabilities Output

If your layer is set up properly, requesting the capabilities on the server outputs a Dimension element. Here is an example of a GetCapabilities result for a layer configured for time support:

```

<Layer queryable="0" opaque="0" cascaded="0">
    <Name>earthquakes</Name>
    <Title>Earthquakes</Title>
    <SRS>EPSG:4326</SRS>
    <LatLonBoundingBox minx="-131.02" miny="24.84" maxx="-66.59" maxy="48.39" />
    <BoundingBox SRS="EPSG:4326"
        minx="-131.02" miny="24.84" maxx="-66.59" maxy="48.39" />
    <Dimension name="time" units="ISO8601"/>
    <Extent name="time" default="2004-01-01 14:10:00" nearestValue="0">2004-01-01/2004-02-01</Extent>
</Layer>

```

Supported Time Requests

When sending a request with the TIME parameter, different types of time values can be specified. The following are supported by MapServer:

- *single value*: for example: ...&TIME=2004-10-12&...
- *multiple values*: for example: ...&TIME=2004-10-12, 2004-10-13, 2004-10-14&...
- *single range value*: for example: ...&TIME=2004-10-12/2004-10-13&...
- *multiple range values*: for example: ...&TIME=2004-10-12/2004-10-13, 2004-10-15/2004-10-16&...

Interpreting Time Values

When MapServer receives a request with a TIME parameter, it transforms the time requests into valid expressions that are assigned to the filter parameter on layers that are time-aware. Here are some examples of how different types of requests are treated (wms_timeitem is defined here as being “time_field”):

- single value (2004-10-12) *transforms to* ([time_field]‘ eq ‘2004-10-12‘)
- multiple values (2004-10-12, 2004-10-13) *transform to* ([time_field]‘ eq ‘2004-10-12‘ OR [time_field]‘ eq ‘2004-10-13‘)
- single range : 2004-10-12/2004-10-13 *transforms to* (([time_field]‘ ge ‘2004-10-12‘) AND ([time_field]‘ le ‘2004-10-13‘))
- multiple ranges (2004-10-12/2004-10-13, 2004-10-15/2004-10-16) *transform to* (([time_field]‘ ge ‘2004-10-12‘ AND [time_field]‘ le ‘2004-10-13‘) OR ([time_field]‘ ge ‘2004-10-15‘ AND [time_field]‘ le ‘2004-10-16‘))

As shown in the above examples, all fields and values are written inside back ticks (`) - this is the general way of specifying time expressions inside MapServer.

Exceptions to this rule:

1. When dealing with layers that are not Shapefiles nor through OGR, the expression built has slightly different syntax. For example, the expression set in the filter for the first example above would be ([time_field] = ‘2004-10-12’).
2. For *PostGIS/PostgreSQL* layers, the time expression built uses the *date_trunc* function available in PostgreSQL. For example, if the user passes a time value of ‘2004-10-12’, the expression set in the filter is *date_trunc*(‘day’, time_field) = ‘2004-10-12’. The use of the *date_trunc* function allows requests to use the concept of time resolution. In the example above, for a request of ‘2004-10-12’, MapServer determines that the resolution is “day” by parsing the time string and the result gives all records matching the date 2004-10-12 regardless of the values set for Hours/Minutes/Seconds in the database. For more information on the *date_trunc* function, please refer to the [PostgreSQL documentation](#).

Limits the Time Formats to Use

The user has the ability to define the time format(s) to be used when a request is sent, in metadata at the WEB level. For example, the user can define the following two formats:

```
"wms_timeformat" "YYYY-MM-DDTHH, YYYY-MM-DDTHH:MM"
```

Another example is for a WMS layer that is based on time data that contains precise time values taken every minute (e.g., 2004-10-12T13:55, 2004-10-12T13:56, 2004-10-12 T13:57, ...). Normally, a valid request on such a layer would require the time value to be as complete as the data underneath. By defining a set of patterns to use, MapServer introduces the notion of resolution to be used when doing a query. Using the example above, a request TIME= 2004-10-12T13:55 would be valid and a request TIME= 2004-10-12T13 would also be valid and would return all elements taken for that hour.

Note that this functionality is only available on layers based on Shapefiles and OGR.

Example of WMS-T with PostGIS Tile Index for Raster Imagery

This example currently requires latest 4.9 CVS build!

Here is an example mapfile snippet for a raster WMS-T instance using a PostGIS tileindex. This example shows US Nexrad Base Reflectivity running at Iowa State U at <http://mesonet.agron.iastate.edu/cgi-bin/wms/nexrad/n0rt.cgi?SERVICE=WMS&request=GetCapabilities>

```
1 # Tile Index
2 LAYER
3   STATUS ON
4   NAME "time_idx"
5   TYPE POLYGON
6   DATA "the_geom from nexrad_n0r_tindex"
7   METADATA
8     "wms_title" "TIME INDEX"
9     "wms_srs"    "EPSG:4326"
10    "wms_extent" "-126 24 -66 50"
11    "wms_timeextent" "2003-08-01/2006-12-31/PT5M"
12    "wms_timeitem" "datetime" #column in postgis table of type timestamp
13    "wms_timedefault" "2006-06-23T03:10:00Z"
14    "wms_enable_request" "*"
15  END
16  CONNECTION "dbname=postgis host=10.10.10.20"
```

```

17 CONNECTIONTYPE postgis
18 END
19
20 # raster layer
21 LAYER
22 NAME "nexrad-n0r-wmst"
23 TYPE RASTER
24 STATUS ON
25 DEBUG ON
26 PROJECTION
27 "init=epsg:4326"
28 END
29 METADATA
30 "wms_title" "NEXRAD BASE REF WMS-T"
31 "wms_srs" "EPSG:4326"
32 "wms_extent" "-126 24 -66 50"
33 "wms_timeextent" "2003-08-01/2006-12-31/PT5M"
34 "wms_timeitem" "datetime" #datetime is a column in postgis table of type timestamp
35 "wms_timedefault" "2006-06-23T03:10:00Z"
36 "wms_enable_request" "*"
37 END
38 OFFSITE 0 0 0
39 TILEITEM "filepath" #filepath is a column in postgis table with varchar of the filepath to each image
40 TILEINDEX "time_idx"
41 FILTER ([date] = "2006-06-23T03:10:00Z")
42 END

```

You can find more information on Time and tileindexes in the [WCS documentation](#).

10.5.3 Future Additions

- Support for a special time value: “current”.

10.5.4 Limitations and Known Bugs

- Pattern “YYYYMMDD” does not work on Windows. ([Bug#970](#))

10.6 WMS Dimension

Author Yewondwossen Assefa

Contact yassefa at dmsolutions.ca

Revision \$Revision: \$

Date \$Date: \$

Last Updated 2011/11/21

Table of Contents

- WMS Dimension
 - Introduction
 - Enabling Dimension Support in MapServer
 - GetCapabilities Output
 - Supported Dimension Requests
 - Processing Dimension Requests

10.6.1 Introduction

A WMS server can provide support for several type of dimensions such as time, elevation or other types of dimensions (for example, satellite images in different wavelength bands). For temporal dimension, please refer to [WMS Time Support](#). This document describes support for the elevation dimension and other type of dimensions

Links to WMS-Related Information

- [MapServer WMS Server HowTo](#)
- [WMS Time Support HowTo](#)

10.6.2 Enabling Dimension Support in MapServer

Setting Up a WMS Layer with dimension support

To have a valid WMS layer with dimension support, the user has to define the following metadata at the layer level:

- *wms_dimensionlist*: (*Mandatory*) comma separated list of dimension names available for the layer
- *wms_[dimensionname]_item*: (*Mandatory*) this is the name of the field in the DB that contains the dimension values.
- *wms_[dimensionname]_extent*: (*Mandatory*) defines a valid set of values for the dimension
- *wms_[dimensionname]_default*: (*Optional*) this value is used if it is defined and the dimension value is missing in the request.

Specifying Dimension Extents

Dimension Extents can be declared with the following syntax for the *wms_[dimensionname]_extent* metadata (see Annex C.3 in the [WMS 1.1.1 specification](#) document for a full description):

1. *value* - a single value.
2. *value1,value2,value3,...* - a list of multiple values.
3. *min/max/resolution* - an interval defined by its lower and upper bounds and its resolution. This is supported in MapServer (note that the resolution is not supported however).
4. *min1/max1/res1,min2/max2/res2,...* - a list of multiple intervals.

Example WMS-Server Layer

```

LAYER
  NAME "lakes_elev"
  METADATA
    "wms_title"          "Lakes"
    "wms_description"    "Lakes"
    "wms_dimensionlist" "elevation, text_dimension"
    "wms_elevation_item" "ELEV"
    "wms_elevation_extent" "500, 490, 480"
    "wms_elevation_units" "meters"
    "wms_elevation_default" "500"
    "wms_text_dimension_item" "text_dimen"
    "wms_text_dimension_extent" "first, second, third"
    "wms_text_dimension_units" "my_units"
    "wms_enable_request" "*"
  END
  TYPE POLYGON
  ..
END

```

10.6.3 GetCapabilities Output

If your layer is set up properly, requesting the capabilities on the server outputs one or several Dimension elements. Here is an example of a GetCapabilities result for a layer configured for two dimensions (wms 1.3.0):

```

<Layer queryable="0" opaque="0" cascaded="0">
  <Name>lakes_elev</Name>
  <Title>Lakes</Title>
  <CRS>EPSG:4326</CRS>
  <EX_GeographicBoundingBox>
    <westBoundLongitude>0.000178263</westBoundLongitude>
    <eastBoundLongitude>0.0034202</eastBoundLongitude>
    <southBoundLatitude>-0.002134</southBoundLatitude>
    <northBoundLatitude>0.000313775</northBoundLatitude>
    <BoundingBox CRS="EPSG:4326" minx="-0.002134" miny="0.000178263" maxx="0.000313775" maxy="0.0034202" />
    <Dimension name="elevation" units="meters" default="500" multipleValues="1" nearestValue="0">500</Dimension>
    <Dimension name="text_dimension" units="my_units" multipleValues="1" nearestValue="0">first, second, third</Dimension>
  </EX_GeographicBoundingBox>
</Layer>

```

10.6.4 Supported Dimension Requests

A request parameter name is constructed by concatenating the prefix “dim_” with the sample dimension Name (the value of the name attribute of the corresponding **<Dimension>** and **<Extent>** elements in the Capabilities XML). The resulting “dim_name” is case-insensitive. The use of the “dim_” prefix is to avoid clashes between server-defined dimension names and current or future OGC Web Service specifications. (Time and Elevation, being predefined, do not use the prefix.) (section C.4.2)

- *single value*: for example: ...&elevation=500&...
- *multiple values*: for example: ...&dim_text_dimension=first,second&...
- *single range value*: for example: ...&elevation=480/490&...
- *multiple range values*: for example: ...&elevation=480/490,490/500&...

10.6.5 Processing Dimension Requests

When MapServer process a valid dimension wms parameter, It will process it into expressions and set it on the *LAYER FILTER* object. If there was already a Logical “MapServer expressions”, It will be concatenated with it.

For example a request such as &elevation=490/500&... on a MapServer layer (with an empty FILTER) would give .. code-block:: mapfile

```
FILTER(([ELEV] >= 490 AND [ELEV] <= 500))
```

For example a request such as &elevation=600&... on a postgis layer with an existing FILTER would give .. code-block:: guess

- FILTER (elev > 500) #before request
- FILTER ((elev > 500) and ((ELEV = 600))) #after request

10.7 Map Context

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Last Updated 2010-10-07

Contents

- Map Context
 - Introduction
 - Implementing a Web Map Context

10.7.1 Introduction

The term ‘map context’ comes from the Open Geospatial Consortium’s (OGC) [Web Map Context Specification v1.0.0](#), which coincides with the OGC [Web Map Server Specification \(WMS\) v1.1.1](#). A map context is a XML document that describes the appearance of layers from one or more WMS servers, and can be transferred between clients while maintaining startup views, the state of the view (and its layers), and storing additional layer information.

Support for OGC Web Map Context was added to MapServer in version 3.7/4.0. This allows client applications to load and save a map configuration in a standard XML format. MapServer can read context documents of versions 0.1.2, 0.1.4, 0.1.7, 1.0.0, 1.1.0 and can export contents in versions 0.1.4, 0.1.7, 1.0.0, 1.1.0. Web Map Context 1.1.0 support was added to MapServer 4.10

This document assumes that you are already familiar with certain aspects of MapServer:

- MapServer application development and setting up *mapfiles*.
- Familiarity with the WMS spec would be an asset. Please see the following section for links to associated sources.

Links to WMS / Map Context Related Information

- [MapServer WMS Client HowTo](#)
- [Open Geospatial Consortium \(OGC\) home page](#)

- WMS 1.1.1 specification
- Map Context 1.0.0 specification
- MapServer OGC Web Services Workshop

10.7.2 Implementing a Web Map Context

Special Build Considerations

Map Context support requires PROJ4, GDAL/OGR and PHP support libraries.

Build/install the above libraries on your system and then build MapServer with the ‘*–with-wmsclient –with-proj –with-ogr –with-gdal –with-php*’ configure options. Also make sure that your build uses the *USE_WMS_LYR* and *USE_OGR* flags. For more details on MapServer compilation see the appropriate HowTo: [Unix / Windows](#)

Windows users can use [MS4W](#), which is ready for Map Context use.

Map Context Mapfile

A map context document can ONLY contain WMS layers (e.g. CONNECTIONTYPE WMS). Please refer to the [MapServer WMS Client HowTo](#) for more information on declaring WMS layers.

MapFile Metadata

The following mapfile metadata are used by MapServer to handle map context information:

(Note that some parameters have width, height, format, and href, and some only have format and href. This is because width and height are only used for images and parameters that do not have them are text or html. For consistency with the spec MapServer supports height and width for all parameters, but they should only be used for images)

Web Object Metadata

- *ows_schemas_location* : Location of XML schema document. Default is <http://schemas.opengis.net>. See <http://ogc.dmsolutions.ca> for an example of a valid schema tree.
- *wms_abstract* : A blurb of text providing more information about the WMS server.
- *wms_address* : If provided must also then provide *wms_addresses*, *wms_city*, *wms_stateorprovince*, *wms_postcode*, and *wms_country*)
- *wms_addresses* : If provided must also then provide *wms_address*, *wms_city*, *wms_stateorprovince*, *wms_postcode*, and *wms_country*)
- *wms_city* : If provided must also then provide *wms_address*, *wms_addresses*, *wms_stateorprovince*, *wms_postcode*, and *wms_country*)
- *wms_contactelectronicmailaddress* : contact Email address.
- *wms_contactfacsimiletelephone* : contact facsimile telephone number.
- *wms_contactorganization* :
- *wms_contactperson* :
- *wms_contactposition* :
- *wms_contactvoicetelephone* : contact voice telephone number.

- *wms_context_fid* : the feature id of the context. Set to 0 when saving if not specified.
- *wms_context_version* : the version of the map context specification.
- *wms_country* : If provided must also then provide wms_address, wms_city, wms_stateorprovince, wms_postcode, and wms_addressesype.
- *wms_descriptionurl_format* : Format of the webpage which contains relevant information to the view.
- *wms_descriptionurl_href* : Reference to a webpage which contains relevant information to the view.
- *wms_keywordlist* : A comma-separated list of keywords or keyword phrases to help catalog searching.
- *wms_logourl_width* : Width of the context logo.
- *wms_logourl_height* : Height of the context logo.
- *wms_logourl_format* : Format of the context logo.
- *wms_logourl_href* : Location of the context logo.
- *wms_postcode* : If provided must also then provide wms_address, wms_city, wms_stateorprovince, wms_addressesype, and wms_country.
- *wms_stateorprovince* : If provided must also then provide wms_address, wms_city, wms_addressesype, wms_postcode, and wms_country.
- *wms_title* : (**Required**) A human-readable name for this Layer (this metadata does not exist beyond version 0.1.4)

Layer Object Metadata

- *wms_abstract* : A blurb of text providing more information about the WMS server.
- *wms_dataurl_href* : Link to an online resource where data corresponding to the layer can be found.
- *wms_dataurl_format* : Format of the online resource where data corresponding to the layer can be found.
- *wms_dimension* : Current dimension used. New in version 4.10.
- *wms_dimensionlist* : List of available dimensions. New in version 4.10.
- *wms_dimension_%s_default* : Default dimension value. MapServer will check for wms_time and wms_timedefault metadata when this is not specified. %s = the name of the dimension. New in version 4.10.
- *wms_dimension_%s_multiplevalues* : Multiple dimension values. %s = the name of the dimension. New in version 4.10.
- *wms_dimension_%s_nearestvalue* : Nearest dimension value. The default value is 0. %s = the name of the dimension. New in version 4.10.
- *wms_dimension_%s_units* : Units for the dimension values. The default value is ISO8601. %s = the name of the dimension. New in version 4.10.
- *wms_dimension_%s_unitsymbol* : Symbol for dimension units. The default value is t. %s = the name of the dimension. New in version 4.10.
- *wms_dimension_%s_uservalue* : User dimension value. MapServer will check for wms_time and wms_timedefault metadata when this is not specified. %s = the name of the dimension. New in version 4.10.
- *wms_format* : Current format used.
- *wms_formatlist* : List of available formats for this layer.

- *wms_metadataurl_href* : Link to an online resource where descriptive metadata of the corresponding layer can be found.
- *wms_metadataurl_format* : Format of the online resource where descriptive metadata of the corresponding layer can be found.
- *wms_name* : Name of the WMS layer on the server.
- *wms_onlineresource* : **Required** URL to access the server.
- *wms_server_version* : The version of the web map server specification.
- *wms_server_title* : The title of the web map server.
- *wms_stylelist* : Current style used.
- *wms_style_%s_legendurl_width* : Width of an image describing the style. %s = the name of the style.
- *wms_style_%s_legendurl_height* : Height of an image describing the style. %s = the name of the style.
- *wms_style_%s_legendurl_format* : Format of an image describing the style. %s = the name of the style.
- *wms_style_%s_legendurl_href* : Location of an image describing the style. %s = the name of the style.
- *wms_style_%s_sld* : URL to the SLD document of this style. %s = the name of the style.
- *wms_style_%s_sld_body* : SLD_BODY document of this style. %s = the name of the style.
- *wms_style_%s_title* : Title of the layer. %s = the name of the style.
- *wms_title* : **(Required)** A human-readable name for this Layer.

Sample Map Context Mapfile

```

1   MAP
2
3     NAME "mapcontext"
4     STATUS ON
5     SIZE 400 300
6     SYMBOLSET "../etc/symbols.txt"
7     EXTENT -180 -90 180 90
8     UNITS DD
9     SHAPEPATH "../data"
10    IMAGECOLOR 255 255 255
11    FONTSET "../etc/fonts.txt"
12
13
14  #
15  # Start of web interface definition
16  #
17  WEB
18    IMAGEPATH "/ms4w/tmp/ms_tmp/"
19    IMAGEURL "/ms_tmp/"
20    METADATA
21      "wms_abstract" "Demo for map context document. Blah blah..."
22      "wms_title" "Map Context demo"    ##### REQUIRED
23    END
24  END
25
26  PROJECTION
27    "init=epsg:4326"
28  END

```

```
29
30      #
31      # Start of layer definitions
32      #
33
34      LAYER
35          NAME "country_bounds"
36          TYPE RASTER
37          STATUS ON
38          CONNECTION "http://demo.mapserver.org/cgi-bin/wms?"
39          CONNECTIONTYPE WMS
40          METADATA
41              "wms_title"                      "World Country Boundaries"    ##### REQUIRED
42              "wms_onlineresource"            "http://demo.mapserver.org/cgi-bin/wms?"   ##### REQUIRED
43              "wms_srs"                       "EPSG:4326"
44              "wms_name"                      "country_bounds"
45              "wms_server_version"           "1.1.1"
46              "wms_format"                   "image/gif"
47              "wms_dimensionlist"            "time,width"
48              "wms_dimension"                "time"
49              "wms_dimension_time_unitsymbol" "t"
50              "wms_dimension_time_units"     "ISO8601"
51              "wms_dimension_time_uservalue" "1310"
52              "wms_dimension_time_default"   "1310"
53              "wms_dimension_time_multiplevalues" "1310,1410"
54              "wms_dimension_time_nearestvalue" "0"
55          END
56      END
57
58  END # Map File
```

Testing Map Context Support

1. The first thing to do is to save your mapfile using the `saveMapContext` function available from the *PHP/MapScript* library. An example script is shown below:

```
<?php
    if (!extension_loaded("MapScript")) dl(MODULE);
    $oMap = ms_newMapObj("mapcontext.map");
    $oMap->saveMapContext("mapcontext_output.xml");
?>
```

2. Scan the XML output to look for `<!-- WARNING: ... -->` comments. Then make the necessary changes to fix every warning that you encounter. At the end of this you should have a mapfile compatible with the Map Context specification.
3. Now you can load your new Map Context document into an application using the `loadMapContext` function from the PHP/MapScript library.

Sample Map Context Document

The following is a sample Map Context document:

```
1  <?xml version='1.0' encoding="ISO-8859-1" standalone="no" ?>
2  <ViewContext version="1.1.0" id="mapcontext" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
3      <General>
```

```

4   <Window width="400" height="300"/>
5   <!-- Bounding box corners and spatial reference system -->
6   <BoundingBox SRS="EPSG:4326" minx="-180.000000" miny="-90.000000" maxx="180.000000" maxy="90
7   <!-- Title of Context -->
8   <Title>Map Context demo</Title>
9   <Abstract>Demo for map context document. Blah blah...</Abstract>
10  <ContactInformation>
11  </ContactInformation>
12  </General>
13  <LayerList>
14  <Layer queryable="0" hidden="0">
15    <Server service="OGC:WMS" version="1.1.1" title="World Country Boundaries">
16      <OnlineResource xlink:type="simple" xlink:href="http://demo.mapserver.org/cgi-bin/wms?"/>
17    </Server>
18    <Name>country_bounds</Name>
19    <Title>World Country Boundaries</Title>
20    <SRS>EPSG:4326</SRS>
21    <FormatList>
22      <Format current="1">image/gif</Format>
23    </FormatList>
24    <DimensionList>
25      <Dimension name="time" units="ISO8601" unitSymbol="t" userValue="1310" default="1310" mu
26    </DimensionList>
27  </Layer>
28 </LayerList>
29 </ViewContext>

```

Map Context Support Through CGI

MapServer CGI allows you to load a map context through the use of a CONTEXT parameter, and you can point this parameter to a locally stored context file or a context file accessible through a URL. For more information on MapServer CGI see the [CGI Reference](#).

Support for Local Map Context Files

There is a new cgi parameter called *CONTEXT* that is used to specify a local context file. The user can then use MapServer to request a map using the following syntax:

```
http://localhost/mapserver.cgi?MODE=map&MAP=/path/to/mapfile.map&CONTEXT=
    /path/to/contextfile.xml&LAYERS=layer_name1 layer_name2
```

Note: All layers created from a context file have their status set to ON. To be able to display layers, the user needs to add the LAYERS argument in the URL.

Support for Context Files Accessed Through a URL

The syntax of using a web accessible context file would be similar to accessing a local context file:

```
http://localhost/mapserver.cgi?MODE=map&MAP=/path/to/mapfile.map&CONTEXT=
    http://URL/path/to/contextfile.xml&LAYERS=layer_name1 layer_name2
```

Due to security concerns loading a file from a URL is disabled by default. To enable this functionality, the user needs to set a CONFIG parameter called *CGI_CONTEXT_URL* in the default mapfile that will allow this functionality. Here is an example of a map file with the CONFIG parameter:

```
# Start of map file
NAME "map-context"
STATUS ON
SIZE 400 300
EXTENT -2200000 -712631 3072800 3840000
UNITS METERS
IMAGECOLOR 255 255 255
IMAGETYPE png
CONFIG "CGI_CONTEXT_URL" "1"
...
WEB
...
END
LAYER
...
END

END
```

Default Mapfile

To smoothly run a MapServer CGI application with a Map Context, the application administrator needs to provide a default mapfile with at least the basic required parameters that will be used with the Context file. This default mapfile can contain as little information as the imagepath and imageurl or contain a list of layers. Information coming from the context (e.g.: layers, width, height, ...) would either be appended or will replace values found in the mapfile.

Here is an example of a default map file containing the minimum required parameters:

```
1 NAME "CGI-CONTEXT-DEMO"
2 STATUS ON
3 SIZE 400 300
4 EXTENT -2200000 -712631 3072800 3840000
5 UNITS METERS
6 IMAGECOLOR 255 255 255
7 IMAGETYPE png
8 #
9 # Start of web interface definition
10 #
11 WEB
12   MINSCALE 2000000
13   MAXSCALE 50000000
14 #
15 # On Windows systems, /tmp and /tmp/ms_tmp/ should be created at the root
16 # of the drive where the .MAP file resides.
17 #
18   IMAGEPATH "/ms4w/tmp/ms_tmp/"
19   IMAGEURL "/ms_tmp/"
20 END
21 END # Map File
```

Map Context Support Through WMS

MapServer can also output your WMS layers as a Context document. MapServer extends the WMS standard by adding a request=GetContext operation that allows you to retrieve a context for a WMS-based mapfile with a call like:

```
http://localhost/mapserver.cgi?map=/path/to/mapfile.map&service=WMS&
request=GetContext&version=1.1.0
```

The VERSION parameter controls the version of context document to return.

GetContext is disabled by default because it could be considered a security issue: it could publicly expose the URLs of WMS layers used (cascaded) by a mapfile.

To enable it, set the “wms_getcontext_enabled” web metadata to “1” in your WMS server’s mapfile.

10.8 WFS Server

Author Jean-François Doyon

Contact jdoyon at nrcan.gc.ca

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Revision \$Revision\$

Date \$Date\$

Contents

- **WFS Server**
 - Introduction
 - Configuring your MapFile to Serve WFS layers
 - Reference Section
 - To-do Items and Known Limitations

10.8.1 Introduction

A WFS (Web Feature Service) publishes feature-level geospatial data to the web. This means that instead of returning an image, as MapServer has traditionally done, the client now obtains fine-grained information about specific geospatial features of the underlying data, at both the geometry AND attribute levels. As with other OGC specifications, this interface uses XML over HTTP as it’s delivery mechanism, and, more precisely, GML (Geography Markup Language), which is a subset of XML.

WFS-Related Information

Here are some WFS related links (including a newly added OGC services workshop with MapServer). Since these are highly detailed technical specifications, there is no need to read through them in their entirety to get a MapServer WFS up and running. It is still recommended however to read them over and get familiar with the basics of each of them, in order to understand how it all works:

- The [OGC Web Feature Service Implementation Specification](#).
- The [Geography Markup Language Implementation Specification](#).

- MapServer OGC Web Services Workshop package.

Working knowledge of MapServer is of course also required.

Software Requirements

In order to enable MapServer to serve WFS, it MUST be compiled against certain libraries:

- PROJ.4: The reprojection library. Version 4.4.3 or greater is required.
- GDAL/OGR: I/O support libraries. Version 1.1.8 or greater is required.

Please see the MapServer [UNIX Compilation and Installation HowTo](#) for detailed instructions on compiling mapserver with support for these libraries and features. For Windows users, the [MS4W](#) installer comes ready to serve both WFS and WMS.

Versions of GML Supported

MapServer can output both GML2 and GML3. By default MapServer serves GML2. You can test this by adding an ‘OUTPUTFORMAT’ parameter to a GetFeature request, such as:

- [GML2 request output](#)
- [GML3 request output](#)

For a detailed discussion on the versions supported, see [bug#884](#).

10.8.2 Configuring your MapFile to Serve WFS layers

Much as in the WMS support, WFS publishing is enabled by adding certain magic METADATA keyword/value pairs to a MapFile.

MapServer will serve and include in its WFS capabilities only the layers that meet the following conditions:

- Data source is of vector type (Shapefile, OGR, PostGIS, SDE, SDO, ...)
- LAYER NAME must be set. Layer names must start with a letter when setting up a WFS server (layer names should not start with a digit or have spaces in them).
- LAYER TYPE is one of: LINE, POINT, POLYGON
- The “wfs_onlineresource” metadata:

The wfs_onlineresource metadata is set in the map’s web object metadata and specifies the URL that should be used to access your server. This is required for the GetCapabilities output. If wfs_onlineresource is not provided then MapServer will try to provide a default one using the script name and hostname, but you shouldn’t count on that too much. It is strongly recommended that you provide the wfs_onlineresource metadata.

See section 12.3.3 of the [WFS 1.0.0 specification](#) for the whole story about the online resource URL. Basically, what you need is a complete HTTP URL including the <http://> prefix, hostname, script name, potentially a “map=” parameter, and terminated by “?” or “&”.

Here is a valid online resource URL:

```
http://my.host.com/cgi-bin/mapserv?map=mywfs.map&
```

By creating a wrapper script on the server it is possible to hide the “map=” parameter from the URL and then your server’s online resource URL could be something like:

`http://my.host.com/cgi-bin/mywfs?`

This is covered in more detail in the “More About the Online Resource URL” section of the [WMS Server](#) document.

- The “wfs_enable_request” metadata (see below).

Example WFS Server Mapfile

The following is an example of a bare minimum WFS Server mapfile. Note the comments for the required parameters.

```

MAP
  NAME "WFS_server"
  STATUS ON
  SIZE 400 300
  SYMBOLSET ".../etc/symbols.txt"
  EXTENT -180 -90 180 90
  UNITS DD
  SHAPEPATH ".../data"
  IMAGECOLOR 255 255 255
  FONTSET ".../etc/fonts.txt"

  #
  # Start of web interface definition
  #

WEB
  IMAGEPATH "/ms4w/tmp/ms_tmp/"
  IMAGEURL "/ms_tmp/"
METADATA
  "wfs_title"           "WFS Demo Server for MapServer" ## REQUIRED
  "wfs_onlineresource"  "http://demo.mapserver.org/cgi-bin/wfs?" ## Recommended
  "wfs_srs"              "EPSG:4326 EPSG:4269 EPSG:3978 EPSG:3857" ## Recommended
  "wfs_abstract"         "This text describes my WFS service." ## Recommended
  "wfs_enable_request"   "*" # necessary
END
END

PROJECTION
  "init=epsg:4326"
END

  #
  # Start of layer definitions
  #

#####
# World Continents
#####
LAYER
  NAME "continents"
  METADATA
    "wfs_title"           "World continents" ## REQUIRED
    "wfs_srs"              "EPSG:4326" ## REQUIRED
    "gml_include_items"  "all" ## Optional (serves all attributes for layer)
    "gml_featureid"       "ID" ## REQUIRED
    "wfs_enable_request"   "*"
END

```

```
TYPE POLYGON
STATUS ON
DATA 'shapefile/countries_area'
PROJECTION
    "init=epsg:4326"
END
CLASS
    NAME 'World Continents'
    STYLE
        COLOR 255 128 128
        OUTLINECOLOR 96 96 96
    END
END
END #layer

END #mapfile
```

Rules for Handling SRS in MapServer WFS

The OGC WFS 1.0 specification doesn't allow a layer (feature type) to be advertised in more than one SRS. Also, there is no default SRS that applies to all layers by default. However, it is possible to have every layer in a WFS server advertised in a different SRS.

The OGC WFS 1.1 specification allows more than one SRS to be advertised, and one of the SRSs will be advertised as the default SRS (the default SRS will be the first in the list specified in the *METADATA wfs_srs / ows_srs*).

Here is how MapServer decides the SRS to advertise and use for each layer in your WFS:

- If a top-level map SRS is defined then this SRS is used and applies to all layers (feature types) in this WFS. In this case the SRS of individual layers is simply ignored even if it is set.
- If no top-level map SRS is defined, then each layer is advertised in its own SRS in the capabilities.

Note: By “SRS is defined”, we mean either the presence of a PROJECTION object defined using an EPSG code, or of a *wfs_srs / ows_srs* metadata at this level.

Note: At the map top-level the *wfs_srs / ows_srs* metadata value takes precedence over the contents of the *PROJECTION* block.

At the layer level, if both the *wfs_srs / ows_srs* metadata and the PROJECTION object are set to different values, then the *wfs_srs / ows_srs* metadata defines the projection to use in advertising this layer (assuming there is no top-level map SRS), and the PROJECTION value is assumed to be the projection of the data. So this means that the data would be reprojected from the PROJECTION SRS to the one defined in the *wfs_srs / ows_srs* metadata before being served to WFS clients.

Confusing? As a rule of thumb, simply set the *wfs_srs / ows_srs* at the map level (in web metadata) and never set the *wfs_srs / ows_srs* metadata at the layer level and things will work fine for most cases.

Axis Orientation in WFS 1.1

The axis order in previous versions of the WFS specifications was to always use easting (x or lon) and northing (y or lat). WMS 1.1 specifies that, depending on the particular SRS, the x axis may or may not be oriented West-to-East, and the y axis may or may not be oriented South-to-North. The WFS portrayal operation shall account for axis order. This affects some of the EPSG codes that were commonly used such as ESPG:4326. The current implementation makes

sure that coordinates returned to the server for the GetFeature request reflect the inverse axis orders for EPSG codes between 4000 and 5000.

Test Your WFS Server

Validate the Capabilities Metadata

OK, now that we've got a mapfile, we have to check the XML capabilities returned by our server to make sure nothing is missing.

Using a web browser, access your server's online resource URL to which you add the parameter "REQUEST=GetCapabilities" to the end, e.g.

```
http://demo.mapserver.org/cgi-bin/wfs?SERVICE=WFS&VERSION=1.0.0&REQUEST=GetCapabilities
```

If everything went well, you should have a complete XML capabilities document. Search it for the word "WARNING"... MapServer inserts XML comments starting with "<!--WARNING: " in the XML output if it detects missing mapfile parameters or metadata items. If you notice any warning in your XML output then you have to fix all of them before you can register your server with a WFS client, otherwise things are likely not going to work.

Note: The SERVICE parameter is required for all WFS requests. When a request happens, it is passed through WMS, WFS, and WCS in MapServer (in that order) until one of the services respond to it.

Test With a GetFeature Request

OK, now that we know that our server can produce a valid XML GetCapabilities response we should test the GetFeature request. Simply adding "SERVICE=WFS&VERSION=1.0.0&REQUEST=GetFeature&TYPENAME=yourlayername1,yourlayername2" to your server's URL should return the GML associated with those layers.

```
http://demo.mapserver.org/cgi-bin/wfs?SERVICE=WFS&VERSION=1.0.0&REQUEST=getfeature&TYPENAME=continents&MAXI
```

Test with a Real Client

If you have access to a WFS client, then register your new server's online resource with it and you should be off and running.

If you don't have your own WFS client installed already, here are a few pointers:

- MapServer itself can be used as a WFS client, see the [WFS Client HowTo](#).
- [Quantum GIS](#) is a full GIS package which includes WFS client support. (recommended)
- [Deegree](#) provides a WFS client.
- [uDig](#) can add layers from WMS/WFS servers.
- The [owsview](#) Viewer Client Generator is an online application that allows users to validate WFS Capabilities XML (it does not allow you to view WFS data).

Support for GET and POST Requests

Starting from version 4.2 MapServer supports XML-encoded POST requests and GET requests. The default in MapServer is POST.

Support for Filter Encoding

Starting from version 4.2 MapServer supports Filter Encoding (FE) in WFS GetFeature requests. For more information on the server side of Filter Encoding see the [Filter Encoding HowTo](#).

MapServer WFS Extensions

STARTINDEX In addition to the MAXFEATURES=n keyword, MapServer also supports a STARTINDEX=n keyword in WFS GetFeature requests. This can be used to skip some features in the result set and in combination with MAXFEATURES provides for the ability to use WFS GetFeature to page through results. Note that STARTINDEX=1 means start with the first feature, skipping none.

OUTPUTFORMAT Normally OUTPUTFORMAT should be GML2 for WFS 1.0 and either “text/xml; subtype=gml/2.1.2” or “text/xml; subtype=gml/3.1.1” for WFS 1.1. However as an extension to the specification, it is also possible to configure MapServer for a variety of other feature output formats. This is discussed in some detail in the [OGR Output](#) document.

10.8.3 Reference Section

The following metadata are available in the setup of the WFS Server mapfile:

Note: Each of the metadata below can also be referred to as ‘ows_*’ instead of ‘wfs_*’. MapServer tries the ‘wfs_*’ metadata first, and if not found it tries the corresponding ‘ows_*’ name. Using this reduces the amount of duplication in mapfiles that support multiple OGC interfaces since “ows_**” metadata can be used almost everywhere for common metadata items shared by multiple OGC interfaces.

Web Object Metadata

ows_schemas_location (Optional) (Note the name ows_schemas_location and not wfs/_... this is because all OGC Web Services (OWS) use the same metadata) Root of the web tree where the family of OGC WFS XML Schema files are located. This must be a valid URL where the actual .xsd files are located if you want your WFS output to validate in a validating XML parser. Default is <http://schemas.opengis.net>. See <http://ogc.dmsolutions.ca> for an example of a valid schema tree.

ows_updatesequence (Optional) The updateSequence parameter can be used for maintaining the consistency of a client cache of the contents of a service metadata document. The parameter value can be an integer, a timestamp in [ISO 8601:2000] format, or any other number or string.

wfs_abstract (Optional) Descriptive narrative for more information about the server.

WFS TAG Name: Abstract (WFS 1.0.0, sect. 12.3.3)

wfs_accessconstraints (Optional) Text describing any access constraints imposed by the service provider on the WFS or data retrieved from this service.

WFS TAG Name: Accessconstraints (WFS 1.0.0, sect. 12.3.3)

wfs_enable_request (or ows_enable_request) Space separated list of requests to enable. The default is none. The following requests can be enabled: *GetCapabilities*, *GetFeature* and *DescribeFeatureType*. A “!” in front of a request will disable the request. “*” enables all requests.

Examples:

To enable only *GetCapabilities* and *GetFeature*:

```
"wfs_enable_request" "GetCapabilities GetFeature"
```

To enable all requests except *GetCapabilities*

```
"wfs_enable_request" "* !GetCapabilities"
```

wfs_encoding (Optional) XML encoding for all XML documents returned by the server. The default is ISO-8859-1.

wfs_feature_collection Replaces the default name of the feature-containing element (<msFeatureCollection>) with a user-defined value.

wfs_fees (Optional) Any fees imposed by the service provider for usage of this service or for data retrieved from the WFS.

WFS TAG Name: Fees (WFS 1.0.0, sect. 12.3.3)

wfs_getcapabilities_version (Optional) Default version to use for GetCapabilities requests that do not have a version parameter. If not set, the latest supported version will be returned.

wfs_keywordlist (Optional) List of words to aid catalog searching.

WFS TAG Name: Keyword (WFS 1.0.0, sect. 12.3.3)

wfs_maxfeatures (Optional) The number of elements to be returned by the WFS server. This has priority over the ‘maxfeatures’ parameter passed by the user. If not set the current behaviour is not changed. Sensible values are integers greater than 0. If 0 is specified, no features will be returned.

wfs_namespace_prefix (Optional) User defined namespace prefix to be used in the response of a WFS GetFeature request. E.g. “wfs_namespace_prefix” “someprefix”.

wfs_namespace_uri (Optional) User defined namespace URI to be used in the response of a WFS GetFeature request. e.g. “wfs_namespace_uri” “<http://somehost/someurl>”.

wfs_onlineresource (Recommended) The URL prefix for HTTP GET requests.

WFS TAG Name: Onlineresource (WFS 1.0.0, sect. 12.3.3)

wfs_service_onlineresource (Optional) Top-level onlineresource URL. MapServer uses the onlineresource metadata (if provided) in the following order:

1. wfs_service_onlineresource
2. ows_service_onlineresource
3. wfs_onlineresource (or automatically generated URL, see the onlineresource section of this document)

wfs_srs (Recommended) The SRS to use for all layers in this server. (e.g. EPSG:4326) See the note about the SRS rules in WFS.

wfs_title (Required) Human readable title to identify server.

WFS TAG Name: Title (WFS 1.0.0, sect. 12.3.3)

Layer Object

gml_constants (Optional) A comma delimited list of constants. This option allows you to define data that are not part of the underlying dataset and add them to the GML output. Many application schemas require constants of one form or another. To specify the value and type of the constants use gml_[item name]_value and gml_[item name]_type.

```
"gml_constants" "const1,const2"
"gml_const1_type" "Character"
"gml_const1_value" "abc"
"gml_const2_type" "Integer"
"gml_const2_value" "999"
```

gml_exclude_items (Optional) A comma delimited list of items to exclude. As of MapServer 4.6, you can control how many attributes (fields) you expose for your data layer with metadata. The previous behaviour was simply to expose all attributes all of the time. The default is to expose no attributes at all. An example excluding a specific field would be:

```
"gml_include_items" "all"
"gml_exclude_items" "Phonenum"
```

gml_featureid (Required for MapServer 4.10) Field to be used for the ID of the feature in the output GML. wfs_featureid or ows_featureid can be specified instead.

gml_geometries Provides a name other than the default “msGeometry” for geometry elements. The value is specified as a string to be used for geometry element names.

gml_[geometry name]_occurrences MapServer applies default values of 0 and 1, respectively, to the “minOccurs” and “maxOccurs” attributes of geometry elements, as can be seen in the preceding examples. To override these defaults, a value is assigned to a gml_[geometry name]_occurrences layer metadata item, where again [geometry name] is the string value specified for gml_geometries, and the value is a comma-delimited pair containing the respective lower and upper bounds.

gml_[geometry name]_type When employing gml_geometries, it is also necessary to specify the geometry type of the layer. This is accomplished by providing a value for gml_[geometry name]_type, where [geometry name] is the string value specified for gml_geometries, and a value which is one of:

- point
- multipoint
- line
- multiline
- polygon
- multipolygon

gml_groups (Optional) A comma delimited list of group names for the layer.

gml_[group name]_group (Optional) A comma delimited list of attributes in the group. Here is an example:

```
"gml_include_items" "all"
"gml_groups" "display"
"gml_display_group" "Name_e,Name_f"
```

gml_include_items (Optional) A comma delimited list of items to include, or keyword “all”. As of MapServer 4.6, you can control how many attributes (fields) you expose for your data layer with this metadata. The previous behaviour was simply to expose all attributes all of the time. You can enable full exposure by using the keyword “all”, such as:

```
"gml_include_items" "all"
```

You can specify a list of attributes (fields) for partial exposure, such as:

```
"gml_include_items" "Name, ID"
```

The new default behaviour is to expose no attributes at all.

gml_[item name]_alias (Optional) An alias for an attribute's name. The served GML will refer to this attribute by the alias. Here is an example:

```
"gml_province_alias" "prov"
```

gml_[item name]_precision (Optional) Specifies the precision of the indicated field for formats where this is significant, such as Shapefiles. Precision is the number of decimal places, and is only needed for “Real” fields. Currently this is only used for OGR based output formats, not the WFS GML2/GML3 output.

gml_[item name]_type (Optional) Specifies the type of the attribute. Valid values are Integer|Real|Character|Date|Boolean.

gml_[item name]_value Used to specify values for gml_constants.

gml_[item name]_width (Optional) Specifies the width of the indicated field for formats where this is significant, such as Shapefiles.

gml_types (Optional) If this field is “auto” then some input feature drivers (ie. OGR, POSTGIS, ORACLESPATIAL and native shapefiles) will automatically populate the type, width and precision metadata for the layer based on the source file. Currently this is only used for OGR based output formats, not the WFS GML2/GML3 output.

```
"gml_types" "auto"
```

gml_xml_items (Optional) A comma delimited list of items that should not be XML-encoded.

wfs_abstract Same as wfs_abstract in the Web Object.

wfs_enable_request (or ows_enable_request) Space separated list of requests to enable. The default is none. The following requests can be enabled: *GetCapabilities*, *GetFeature* and *DescribeFeatureType*. A “!” in front of a request will disable the request. “*” enables all requests.

Examples:

To enable only *GetCapabilities* and *GetFeature*:

```
"wfs_enable_request" "GetCapabilities GetFeature"
```

To enable all requests except *GetCapabilities*

```
"wfs_enable_request" "* !GetCapabilities"
```

wfs_extent (Optional) Used for the layer’s BoundingBox tag for cases where it is impossible (or very inefficient) for MapServer to probe the data source to figure its extents. The value for this metadata is “minx miny maxx maxy” separated by spaces, with the values in the layer’s projection units. If wfs_extent is provided then it has priority and MapServer will NOT try to read the source file’s extents.

wfs_featureid (Required for MapServer 4.10) Field to be used for the ID of the feature in the output GML. gml_featureid or ows_featureid can be specified instead.

wfs_getfeature_formatlist (Optional) Comma-separated list of formats that could be valid for a GetFeature request. If defined, only these formats are advertised through in the Capabilities document.

wfs_keywordlist Same as wfs_keywordlist in the Web Object.

wfs_metadataurl_format (Optional) The file format of the metadata record. Valid values are “XML”, “SGML”, or “HTML”. The layer metadata wfs_metadataurl_type and wfs_metadataurl_href must also be specified. Refer to section 12.3.5 of the [WFS 1.0.0 spec](#).

wfs_metadataurl_href (Optional) The URL to the layer’s metadata. The layer metadata wfs_metadataurl_type and wfs_metadataurl_format must also be specified. Refer to section 12.3.5 of the [WFS 1.0.0 spec](#).

wfs_metadataurl_type (Optional) The standard to which the metadata complies. Currently only two types are valid: “TC211” which refers to [ISO 19115], and “FGDC” which refers to [FGDC CSDGM]. The layer metadata

wfs_metadataurl_format and wfs_metadataurl_href must also be specified. Refer to section 12.3.5 of the [WFS 1.0.0 spec](#).

wfs_srs If there is no SRS defined at the top-level in the mapfile then this SRS will be used to advertize this feature type (layer) in the capabilities. See the note about the SRS rules in WFS.

wfs_title Same as wfs_title in the Web Object.

10.8.4 To-do Items and Known Limitations

- This is just a basic WFS (read-only): transaction requests are not supported and probably never will given the nature of MapServer. [GeoServer](#) or [TinyOWS](#) is recommended for those needing WFS-T support.
- WFS spec. seems to require that features of a given feature type must all be of the same geometry type (point, line, polygon). This works fine for shapefiles, but some data source formats supported by MapServer allow mixed geometry types in a single layer and this goes against the WFS spec. Suggestions on how to handle this are welcome (send suggestions to the [mapserver-dev mailing list](#)).

10.9 WFS Client

Author Jean-François Doyon

Contact jdoyon at nrcan.gc.ca

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Last Updated 2010-11-07

Contents

- [WFS Client](#)
 - [Introduction](#)
 - [Setting up a WFS-client Mapfile](#)
 - [TODO / Known Limitations](#)

10.9.1 Introduction

MapServer can retrieve and display data from a WFS server. The following document explains how to display data from a WFS server using MapServer.

A WFS (Web Feature Service) publishes feature-level geospatial data to the web. This means that it is possible to use this data as a data source to render a map. In effect, this is not unlike having a shapefile accessible over the web, only it's not a shapefile, it's XML-Encoded geospatial data (GML to be exact), including both geometry AND attribute information.

WFS-Related Information

Although in-depth understanding of WFS and GML is neither necessary nor required in order to implement a MapServer application that reads remote WFS data, it is recommended to at least get acquainted with the concepts and basic functionality of both. Here are the official references (including a newly added OGC workshop with MapServer):

- OGC Web Feature Service Implementation Specification.
- Geography Markup Language Implementation Specification.
- MapServer OGC Web Services Workshop package.

Software Requirements

In order to enable MapServer to serve WFS, it MUST be compiled against certain libraries:

- PROJ.4: The reprojection library. Version 4.4.3 or greater is required.
- GDAL/OGR: I/O support libraries. Version 1.1.8 or greater is required.
- LibCURL: Used to help MapServer act as an HTTP client. Version 7.10 or greater is required.

Please see the MapServer UNIX Compilation and Installation HOWTO for detailed instructions on compiling mapserver with support for these libraries and features. For Windows users, look on the MapServer website to see if there are any binaries available that meet these requirements.

10.9.2 Setting up a WFS-client Mapfile

Storing Temporary Files

You must set the `IMAGEPATH` parameter in your mapfile since MapServer uses this directory to store temporary files downloaded from the remote WFS server. **Windows** users must specify a full path for `IMAGEPATH`, such as: `IMAGEPATH "C:/tmp/ms_tmp/"`

```
MAP
...
WEB
  IMAGEPATH "/tmp/ms_tmp/"
  IMAGEURL ...
END
...
END
```

WFS Layer

A WFS layer is a regular mapfile layer, which can use CLASS objects, with expressions, etc.

As of MapServer 4.4, the suggested method to define a WFS Client layer is through the `CONNECTION` parameter and the layer's `METADATA`. The necessary mapfile parameters are defined below:

- `CONNECTIONTYPE`: must be “wfs”
- `CONNECTION`: The URL to the WFS Server. e.g. `http://demo.mapserver.org/cgi-bin/wfs?` The path to the mapfile on the WFS server is required if it was required in the GetCapabilities request e.g. you would have to specify the `MAP` parameter in the `CONNECTION` for the following server: `http://map.ns.ec.gc.ca/MapServer/mapserv.exe?MAP=/mapserver/services/envdat/config.map &SERVICE=WFS&VERSION=1.0.0&REQUEST=GetCapabilities`
- `METADATA`: The LAYER's must contain a `METADATA` object with the following parameters:
 - `wfs_connectiontimeout` (optional): The maximum time to wait for a remote WFS layer to load, set in seconds (default is 30 seconds). This metadata can be added at the layer level so that it affects only that layer, or it can be added at the map level (in the web object) so that it affects all of the layers. Note that `wfs_connectiontimeout` at the layer level has priority over the map level.

- *wfs_filter*: This can be included to include a filter encoding parameter in the getFeature request (see the [Filter Encoding Howto](#) for more information on filtering). The content of the wfs_filter is a valid filter encoding element.

```
...
METADATA
  "wfs_filter"    "<PropertyIsGreaterThanOrEqualTo><PropertyName>POP_RANGE</PropertyName>
                  <Literal>4</Literal></PropertyIsGreaterThanOrEqualTo>
END
..."
```

- *wfs_geometryname* (optional): The name of the geometry column used for spatial filtering in the filter parameter (Geometry by default). This parameter is used for ArcGIS or GeoServer WFS services as several geometry column can be choosed (or with a different default name to Geometry).
- *wfs_latlongboundingbox* (optional): The bounding box of this layer in geographic coordinates in the format “lon_min lat_min lon_max lat_max”. If it is set then MapServer will request the layer only when the map view overlaps that bounding box. You normally get this from the server’s capabilities output.
- *wfs_maxfeatures* (optional): Limit the number of GML features to return. Sensible values are integers greater than 0. If 0 is specified, no features will be returned.
- *wfs_request_method* (optional): Can be set to “GET” to do a Get request to WFS servers that do not support Post requests. The default method in MapServer is Post.

```
...
METADATA
  "wfs_request_method"  "GET"
END
..."
```

- *wfs_typename* (required): the <Name> of the layer found in the GetCapabilities. An example GetCapabilities request is: <http://demo.mapserver.org/cgi-bin/wfs?SERVICE=WFS&VERSION=1.0.0&REQUEST=GetCapabilities>
- *wfs_version* (required): WFS version, currently “1.0.0”

Note: Each of the above metadata can also be referred to as ‘ows_’ instead of ‘wfs_’. MapServer tries the ‘wfs_’ metadata first, and if not found it tries the corresponding ‘ows_’ name. Using this reduces the amount of duplication in mapfiles that support multiple OGC interfaces since “ows_” metadata can be used almost everywhere for common metadata items shared by multiple OGC interfaces.

Example WFS Layer

```
LAYER
  NAME "continents"
  TYPE POLYGON
  STATUS ON
  CONNECTION "http://demo.mapserver.org/cgi-bin/wfs?"
  CONNECTIONTYPE WFS
  METADATA
    "wfs_typename"      "continents"
    "wfs_version"       "1.0.0"
    "wfs_connectiontimeout" "60"
    "wfs_maxfeatures"   "10"
  END
  PROJECTION
    "init=epsg:4326"
```

```

END
CLASS
  NAME "Continents"
  STYLE
    COLOR 255 128 128
    OUTLINECOLOR 96 96 96
  END
END
END # Layer

```

Connection - deprecated

As of MapServer v4.4 the method of specifying all of the connection information in the CONNECTION parameter has been deprecated. The preferred method is mentioned above. If the metadata is not provided, VERSION, SERVICE, and TYPENAME will be fetched from the CONNECTION, as shown below

```
CONNECTION      "http://demo.mapserver.org/cgi-bin/wfs?SERVICE=WFS&VERSION=1.0.0&TYPENAME=continents"
```

10.9.3 TODO / Known Limitations

1. Temporary WFS (gml) files are written to the IMAGEPATH directory, but this could become a security concern since it makes the raw GML data downloadable by someone who could guess the gml filename. We should consider having a “wfs_cache_dir” metadata that, if it is set will define a directory where temp files should be written. The default would still be to use the value of IMAGEPATH if “wfs_tmpdir” is not set.

10.10 WFS-T Server

Contents

- WFS-T Server
 - WFS-T

10.10.1 WFS-T

MapServer does not support the WFS-T specification. A companion program, *TinyOWS*, is a fast implementation of WFS-T. TinyOWS and MapServer share the same Mapfile format, and you can use the same Mapfile and datasources for a dual installation of MapServer and TinyOWS on your server.

10.11 WFS Filter Encoding

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Author Yewondwossen Assefa

Contact assefa at dmsolutions.ca

Last Updated 2010-10-07

Date \$Date\$

Table of Contents

- [WFS Filter Encoding](#)
 - [Introduction](#)
 - [Currently Supported Features](#)
 - [Get and Post Requests](#)
 - [Use of Filter Encoding in MapServer](#)
 - [Limitations](#)
 - [Tests](#)

10.11.1 Introduction

This document describes the procedures for taking advantage of the Filter Encoding (FE) support in WFS GetFeature requests, which was added to MapServer in version 4.2.

This document assumes that you are already familiar with the following aspects of MapServer:

- MapServer application development and setting up .map files.
- Familiarity with the WFS specification would be an asset. Links to the MapServer WFS documents are included in the next section.

Links to SLD-related Information

- [Filter Encoding Implementation Specification](#).
- [*MapServer WFS Client Howto*](#).
- [*MapServer WFS Server Howto*](#).
- [MapServer OGC Web Services Workshop](#).
- [Open GIS Consortium \(OGC\) home page](#).

10.11.2 Currently Supported Features

The following table lists the currently supported features for FE.

Table 1. Currently Supported Features

Feature Set	Feature
Spatial Capabilities	Equals Disjoint Touches Within Overlaps Crosses Intersects Contains DWithin BBOX
Scalar Capabilities	
Logical Operators	And Or Not
Comparison Operators	PropertyIsEqualTo (=) PropertyIsNotEqualTo (<>) PropertyIsLessThan (<) PropertyIsGreaterThan (>) PropertyIsLessThanOrEqualTo (<=) PropertyIsGreaterThanOrEqualTo (>=) PropertyIsLike PropertyIsBetween (range)

Units of measure

The following units of measure are supported:

m or meters	meters
km or kilometers	kilometers
NM	nauticalmiles
mi or miles	miles
in or inches	inches
ft or feet	feet
deg or dd	degree
px	pixels

10.11.3 Get and Post Requests

MapServer already has the capability to receive and parse Get requests and URL-encoded Post requests. The ability for MapServer to be able to receive Post requests with XML-encoded information sent in the body of the request has been added. Also, the ability to generate XML-encoded Post requests for WFS layers has been added.

Both Get and Post request are now supported for all WFS requests:

- GetCapabilities
- GetFeatures
- DescribeFeatureType

Supporting these WFS requests in Post was implemented to keep consistency between all supported WFS requests.

When sending requests, the default request method used is Post. To change this behavior, we have introduced a layer level meta data, wfs_request_method, which can be set to “GET”.

10.11.4 Use of Filter Encoding in MapServer

This section describes how to use FE on both the server and client sides.

Server Side

To be able to use Filter Encoding, you need to create a valid WFS server using MapServer. Please refer to the [WFS Server HOWTO](#) for specifics.

There is nothing special that should be added to a WFS server for Filter Encoding, but you should note that, when requesting the capabilities of your WFS server, the document returned should contain the supported filters. Here is part of a Capabilities document (note the “Filter_Capabilities” section):

```
1 <?xml version="1.0" encoding="ISO-8859-1"?>
2 <WFS_Capabilities version="1.0.0" updateSequence="0"
3   xmlns="http://www.opengis.net/wfs" xmlns:ogc="http://www.opengis.net/ogc"
4   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
5   xsi:schemaLocation="http://www.opengis.net/wfs
6   http://schemas.opengis.net/wfs/1.0.0/WFS-capabilities.xsd">
7
8   <!-- MapServer version 5.6.5 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP
9     OUTPUT=SWF OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=AGG SUPPORTS=FREETYPE
10    SUPPORTS=ICONV SUPPORTS=WMS_SERVER SUPPORTS=WMS_CLIENT
11    SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=WCS_SERVER
12    SUPPORTS=GEOS SUPPORTS=RGBA_PNG INPUT=EPPL7 INPUT=POSTGIS INPUT=OGR
13    INPUT=GDAL INPUT=SHAPEFILE -->
14
15 <Service>
16   <Name>MapServer WFS</Name>
17   <Title>WMS Demo Server for MapServer</Title>
18   <Abstract>This demonstration server showcases MapServer (www.mapserver.org)
19     and its OGC support</Abstract>
20   <OnlineResource>http://demo.mapserver.org/cgi-bin/wfs?</OnlineResource>
21 </Service>
22
23 <Capability>
24   <Request>
25     <GetCapabilities>
26       <DCPType>
27         <HTTP>
28           <Get onlineResource="http://demo.mapserver.org/cgi-bin/wfs?" />
29         </HTTP>
30       </DCPType>
31       <DCPType>
32         <HTTP>
33           <Post onlineResource="http://demo.mapserver.org/cgi-bin/wfs?" />
34         </HTTP>
35       </DCPType>
36     </GetCapabilities>
37     ...
38   </Request>
39 </Capability>
```

```

40 ...
41 <ogc:Filter_Capabilities>
42   <ogc:Spatial_Capabilities>
43     <ogc:Spatial_Operators>
44       <ogc:Equals/>
45       <ogc:Disjoint/>
46       <ogc:Touches/>
47       <ogc:Within/>
48       <ogc:Overlaps/>
49       <ogc:Crosses/>
50       <ogc:Intersects/>
51       <ogc:Contains/>
52       <ogc:DWithin/>
53       <ogc:BBOX/>
54     </ogc:Spatial_Operators>
55   </ogc:Spatial_Capabilities>
56   <ogc:Scalar_Capabilities>
57     <ogc:Logical_Operators/>
58     <ogc:Comparison_Operators>
59       <ogc:Simple_Comparisons/>
60       <ogc:Like/>
61       <ogc:Between/>
62     </ogc:Comparison_Operators>
63   </ogc:Scalar_Capabilities>
64 </ogc:Filter_Capabilities>
65
66 </WFS_Capabilities>

```

Client Side

To be able to generate a Filter to a WFS server, a layer level metadata called *wfs_filter* has been added, which should contain the filter to be sent to the server. Following is an example of a valid WFS client layer with a filter:

```

LAYER
  NAME "cities"
  TYPE POINT
  STATUS ON
  CONNECTION "http://demo.mapserver.org/cgi-bin/wfs?"
  CONNECTIONTYPE WFS
  METADATA
    "wfs_typename" "cities"
    "wfs_version" "1.0.0"
    "wfs_connectiontimeout" "60"
    "wfs_maxfeatures" "100"
    "wfs_filter" "<PropertyIsGreater Than><PropertyName>POPULATION</PropertyName>
                  <Literal>10000000</Literal></PropertyIsGreater Than>"
  END
  PROJECTION
    "init=epsg:4326"
  END
  LABELITEM 'NAME'
  CLASS
    NAME 'World Cities'
    STYLE
      COLOR 255 128 128
      OUTLINECOLOR 128 0 0
      SYMBOL 'circle'

```

```
SIZE      9
END
LABEL
  COLOR    0 0 0
  OUTLINECOLOR 255 255 255
  TYPE      TRUETYPE
  FONT      sans
  SIZE      7
  POSITION   UC
  PARTIALS  FALSE
END
END
END
```

Note:

- The filter given as a value of the wfs_filter metadata should not contain <Filter> start and end tags.
- The CONNECTION points to a valid WFS server supporting filters
- The returned shapes will be drawn using the class defined in the layer.

10.11.5 Limitations

- A limited set of spatial operators are supported.

10.11.6 Tests

Here are some test URLs for the different supported filters:

- `PropertyIsEqualTo`

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPENAME=cities&Filter=<Filter>
<PropertyIsEqualTo><PropertyName>NAME</PropertyName>
<Literal>Halifax</Literal></PropertyIsEqualTo></Filter>
```

- `PropertyIsNotEqualTo`

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPENAME=cities&Filter=<Filter>
<PropertyIsNotEqualTo><PropertyName>NAME</PropertyName>
<Literal>Halifax</Literal></PropertyIsNotEqualTo></Filter>
```

- `PropertyIsLessThan`

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPENAME=cities&Filter=<Filter>
<PropertyIsLessThan><PropertyName>POPULATION</PropertyName>
<Literal>1000</Literal></PropertyIsLessThan></Filter>
```

- `PropertyIsGreater Than`

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPENAME=cities&Filter=<Filter>
<PropertyIsGreater Than><PropertyName>POPULATION</PropertyName>
<Literal>10000000</Literal></PropertyIsGreater Than></Filter>
```

- `PropertyIsLessThanOrEqual To`

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPE_NAME=cities&Filter=<Filter>
<PropertyIsLessThanOrEqualTo><PropertyName>POPULATION</PropertyName>
<Literal>499</Literal></PropertyIsLessThanOrEqualTo></Filter>
```

- **PropertyIsGreaterThanOrEqualTo**

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPE_NAME=cities&Filter=<Filter>
<PropertyIsGreaterThanOrEqualTo><PropertyName>POPULATION</PropertyName>
<Literal>10194978</Literal></PropertyIsGreaterThanOrEqualTo></Filter>
```

- **PropertyIsBetween**

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPE_NAME=cities&Filter=<Filter>
<PropertyIsBetween><PropertyName>POPULATION</PropertyName>
<LowerBoundary>10194978</LowerBoundary>
<UpperBoundary>12116379</UpperBoundary></PropertyIsBetween></Filter>
```

- **PropertyIsLike**

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPE_NAME=cities&Filter=<Filter>
<PropertyIsLike wildcard='*' singleChar='.' escape='!'>
<PropertyName>NAME</PropertyName><Literal>Syd*</Literal></PropertyIsLike>
</Filter>
```

- **Logical operator OR**

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPE_NAME=cities&Filter=<Filter>
<OR><PropertyIsEqualTo><PropertyName>NAME</PropertyName>
<Literal>Sydney</Literal></PropertyIsEqualTo><PropertyIsEqualTo>
<PropertyName>NAME</PropertyName><Literal>Halifax</Literal>
</PropertyIsEqualTo></OR></Filter>
```

- **Logical operator AND**

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPE_NAME=cities&Filter=<Filter>
<AND><PropertyIsLike wildcard='*' singleChar='.' escape='!'>
<PropertyName>NAME</PropertyName><Literal>Syd*</Literal></PropertyIsLike>
<PropertyIsEqualTo><PropertyName>POPULATION</PropertyName>
<Literal>4250065</Literal></PropertyIsEqualTo></AND></Filter>
```

- **Logical operator NOT**

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPE_NAME=cities&Filter=<Filter>
<AND><NOT><PropertyIsEqualTo><PropertyName>POPULATION</PropertyName>
<Literal>0</Literal></PropertyIsEqualTo></NOT><NOT><PropertyIsEqualTo>
<PropertyName>POPULATION</PropertyName><Literal>12116379</Literal>
</PropertyIsEqualTo></NOT></AND></Filter>
```

- **Spatial operator BBOX**

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPE_NAME=cities&Filter=<Filter>
<BBOX><PropertyName>NAME</PropertyName><Box%20srsName='EPSG:42304'>
```

```
<coordinates>135.2239,34.4879 135.8578,34.8471</coordinates></Box></BBOX>
</Filter>
```

- Spatial operator Dwithin

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPENAME=cities&Filter=<Filter>
<DWithin><PropertyName>Geometry</PropertyName><gml:Point>
<gml:coordinates>135.500000,34.666667</gml:coordinates>
</gml:Point><Distance units='m'>10000</Distance></DWithin></Filter>
```

- Spatial operator Intersects

```
http://demo.mapserver.org/cgi-bin/wfs?&VERSION=1.0.0&SERVICE=WFS
&REQUEST=GetFeature&TYPENAME=cities&Filter=<Filter>
<Intersects><PropertyName>Geometry</PropertyName>
<gml:Polygon><gml:outerBoundaryIs><gml:LinearRing>
<gml:coordinates>135.5329,34.6624 135.4921,34.8153 135.3673,34.7815
135.3800,34.6216 135.5361,34.6210 135.5329,34.6624</gml:coordinates>
</gml:LinearRing></gml:outerBoundaryIs></gml:Polygon></Intersects></Filter>
```

- The OGC conformance tests (http://cite.opengeospatial.org/test_engine) have been run on the FE support. The following table and notes reflect the current status.

Table 2. WFS OGC test suite (over the HTTP Get and Post method)

Test #	Description	# of Tests	# of Failed Tests
1	Basic WFS tests over the HTTP Get and Post method	402	281
1.1	GetCapabilities	16	0
1.2	DescribeFeatureType	18	0
1.3	GetFeature	368	281
1.3.1	Basic WFS tests	20	1
1.3.2	Complex WFS tests	18	18
1.3.3	Arithmetic filter WFS tests	8	8
1.3.4	Comparison WFS tests	50	26
1.3.4.1	GetFeature PropertyIsGreaterThanOrEqualTo filter	2	0
1.3.4.2	GetFeature PropertyIsBetween filter	6	2
1.3.4.3	GetFeature PropertyIsEqualTo filter	4	0
1.3.4.4	GetFeature PropertyIsGreaterThan filter	4	2
1.3.4.5	GetFeature PropertyIsGreaterThanOrEqualTo filter	6	6
1.3.4.6	GetFeature PropertyIsLessThan filter	6	4
1.3.4.7	GetFeature PropertyIsLessThanOrEqualTo filter	6	4
1.3.4.8	GetFeature PropertyIsLike filter	2	0
1.3.4.9	GetFeature PropertyIsNotEqualTo filter	6	0
1.3.4.10	GetFeature PropertyIsNull filter	8	8
1.3.5	Logical WFS test	20	0
1.3.5.1	GetFeature AND PropertyIsEqualTo PropertyIsEqualTo filter	8	0
1.3.5.2	GetFeature OR PropertyIsEqualTo PropertyIsEqualTo filter	8	0
1.3.5.3	GetFeature NOT PropertyIsNotEqualTo filter	4	0
1.3.6	Spatial operator WFS test	252	228
1.3.6.1	GetFeature BBOX filter	36	12
1.3.6.2	GetFeature with other filter types	216	216
2	Transactional WFS test	69	69

The OGC Cite WFS test suite can be found on the [OGC Cite portal](#).

Following are some MapServer specific notes on this test suite:

1. *Test number 1.3.1:*

- There is a contradiction between the wfs/1.0.0/basic/getfeature/post/3 assertion and the XPath expected value of the test. The assertion says: “Test that a GetFeature request with no output format defined returns a wfs:FeatureCollection with GML data.” and the expected XPath value for this request: “boolean(/ogc:ServiceExceptionReport)” is supposed to be true. So, the assertion means that when a WFS server receives a request which contains an undefined output format or no output format at all, the WFS server must return a WFS collection containing GML data. The XPath expected value means that when a WFS server receives a request with an undefined output format or no output format at all, the WFS server must return a service exception report.

2. *Tests number 1.3.2 and 1.3.3:*

- Not supported.

3. *Tests number 1.3.4.2, 1.3.4.4 to 1.3.4.7:*

- The string comparison is not supported using >, <, >=, <=.
- The date comparison is not supported.

See Also:

[bug 461](#)

4. *Test number 1.3.4.10:*

- This property is not supported in MapServer.

5. *Test number 1.3.6.1:*

- The returned feature xml won’t validate because the validation is done against a specific xsd (geomatry.xsd).
- The data conversion on multipoints and multilayers are not supported within GDAL.

See Also:

[bug 461](#)

6. *Test number 2:*

- The transaction requests are not supported.

10.12 SLD

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Author Yewondwossen Assefa

Contact assefa at dmsolutions.ca

Last Updated 2011-01-14

Contents

- SLD
 - Introduction
 - Server Side Support
 - Client Side Support
 - Named Styles support
 - Other Items Implemented
 - Issues Found During Implementation

10.12.1 Introduction

This document describes the procedures for taking advantage of the Styled Layer Descriptor (SLD) support in WMS GetMap requests with MapServer. SLD support exists for the server side (ability to read an SLD and apply it with a GetMap request) and for the client side (includes sending SLD requests to server and generate SLD files on the fly from MapServer map file). SLD support was added to MapServer in version 4.2.

This document assumes that you are already familiar with the following aspects of MapServer:

- MapServer application development and setting up *.map* files.
- Familiarity with the WMS specification would be an asset. Links to the MapServer WMS documents are included in the next section.

Links to SLD-related Information

- Styled Layer Descriptor Implementation Specification.
- *MapServer WMS Client HowTo*.
- *MapServer WMS Server HowTo*.
- MapServer OGC Web Services Workshop.
- Open GIS Consortium (OGC) home page.

10.12.2 Server Side Support

General Information

There are two ways a WMS request can pass an SLD document with a GetMap request to MapServer:

- SLD parameter pointing to remote SLD (SLD=http://URL_TO_SLD).
- SLD_BODY parameter to send the SLD definition in the URL.

These two methods are both available through MapServer. An example of a request would be:

```
http://demo.mapserver.org/cgi-bin/wms?SERVICE=wms&VERSION=1.1.1&REQUEST=GetMap
&LAYERS=country_bound
s&SLD=http://demo.mapserver.org/ogc-demos/map/sld/sld_line_simple.xml
```

Test the [remote SLD request](#).

The SLD in the above request follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<StyledLayerDescriptor version="1.0.0"
    xmlns="http://www.opengis.net/sld"
    xmlns:ogc="http://www.opengis.net/ogc"
    xmlns:xlink="http://www.w3.org/1999/xlink"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.opengis.net/sld
    http://schemas.opengis.net/sld/1.0.0/StyledLayerDescriptor.xsd">
    <NamedLayer>
        <Name>country_bounds</Name>
        <UserStyle>
            <Title>xxx</Title>
            <FeatureTypeStyle>
                <Rule>
                    <LineSymbolizer>
                        <Geometry>
                            <ogc:PropertyName>center-line</ogc:PropertyName>
                        </Geometry>
                        <Stroke>
                            <CssParameter name="stroke">#0000ff</CssParameter>
                        </Stroke>
                    </LineSymbolizer>
                </Rule>
            </FeatureTypeStyle>
        </UserStyle>
    </NamedLayer>
</StyledLayerDescriptor>
```

Version 1.1.0 of the same SLD

```
<?xml version="1.0" encoding="UTF-8"?>
<StyledLayerDescriptor version="1.1.0"
    xmlns="http://www.opengis.net/sld"
    xmlns:se="http://www.opengis.net/se"
    xmlns:ogc="http://www.opengis.net/ogc"
    xmlns:xlink="http://www.w3.org/1999/xlink"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.opengis.net/sld
    http://schemas.opengis.net/sld/1.1.0/StyledLayerDescriptor.xsd">
    <NamedLayer>
        <se:Name>country_bounds</se:Name>
        <UserStyle>
            <se:Name>xxx</se:Name>
            <se:FeatureTypeStyle>
                <se:Rule>
                    <se:LineSymbolizer>
                        <se:Geometry>
                            <ogc:PropertyName>center-line</ogc:PropertyName>
                        </se:Geometry>
                        <se:Stroke>
                            <se:SvgParameter name="stroke">#0000ff</se:SvgParameter>
                        </se:Stroke>
                    </se:LineSymbolizer>
                </se:Rule>
            </se:FeatureTypeStyle>
        </UserStyle>
    </NamedLayer>
</StyledLayerDescriptor>
```

When MapServer gets a valid SLD through a request, it parses this SLD to extract all the styles attached to the NamedLayers, and then it applies these styles to the map before it is returned to the client. When applying the SLD, MapServer compares the <Name> parameter of the NamedLayers in the SLD document to the WMS layer names (WMS layer names are available in a [GetCapabilities](#) request).

Note: All the examples given in this document are live uses of valid SLDs and a MapServer installation with SLD support.

Additional WMS features related to SLDs have also been developed:

Table1. Additional WMS Features

Features	Supported	Notes
Method GET : SLD URL	Yes	
Method GET : SLD_BODY	Yes	Additional item
Describer Layer	Yes	
GetLegendGraphic	Yes	
GetStyles	Yes	Uses MapScript to get the SLD

Note: As of MapServer version 4.2.3, the GetLegendGraphic request (see section 12 of the [Styled Layer Descriptor Implementation Specification](#)) works as follows: if the RULE keyword is absent from the request, an image containing the entire legend for the specified layer will be returned. This image consists of the layer name and a symbolization graphic and label for each class.

Specific SLD Elements Supported

The following tables give a lot of additional details about SLD support in MapServer.

Table2. Named Layers and User Layers

Features	Supported	Notes
Named Layers	Yes	
User Layers	No	

Table3. Named Styles and User Styles

Features	Supported	Notes
Named Styles	Yes	
User Styles	Yes	

Table 4. User Styles

Features	Sup-ported	Notes
Name	No	This was removed at implementation time, since it does not fit with MapServer
Title	No	No use in the MapServer environment
Abstract	No	No use in the MapServer environment
IsDefault	No	Only one style is available per layer
FeatureType-Style	Yes	MapServer has a concept of one feature type style per layer (either point, line, polygon, or raster)

Table 5. FeatureTypeStyle

Features	Supported	Notes
Name	No	No use in the MapServer environment
Title	No	No use in the MapServer environment
Abstract	No	No use in the MapServer environment
FeatureTypeName	No	No use in the MapServer environment
SemanticTypeIdentifier	No	Still an experimental element in the SLD specifications
Rule	Yes	

Table 6. Rule

Features	Supported	Notes
Name	Yes	
Title	Yes	
Abstract	No	No use in the MapServer environment
LegendGraphic	Yes	
Filter	Yes	
ElseFilter	Yes	
MinScaleDenominator	Yes	
MaxScaleDenominator	Yes	
LineSymbolizer	Yes	
PolygonSymbolizer	Yes	
PointSymbolizer	Yes	
TextSymbolizer	Yes	
RasterSymbolizer	Yes	Applies for 8-bit rasters

- Filter and ElseFilter

For each rule containing a filter, there is a class created with the class expression set to reflect that filter. Available filters that can be used are Comparison Filters and Logical Filters (see the [Filter Encoding HowTo](#)). The ElseFilter parameters are converted into a class in MapServer and placed at the end of the class list with no expression set. They are used to render elements that did not fit into any other classes.

- MinScaleDenominator and MaxScaleDenominator are translated in minscale and maxscale in MapServer.

The following are examples of valid requests using the Filters:

- line with one filter: [sld 6a](#) / full request 6a
- line with multiple filters: [sld 6b](#) / full request 6b
- line with one filter and an else filter: [sld 6c](#) / full request 6c
- spatial filter using BBOX: [sld 6d](#) / full request 6d

This example enables spatial filtering using the BBOX parameter as a Filter for a selected area (Africa).

Note that an ElseFilter will not work with a spatial filter.

Table 7. LineSymbolizer

Features	Supported	Notes
Geometry	No	MapServer uses the data geometry for the rendering
Stroke: GraphicFill	No	Solid color is used
Stroke: GraphicStroke	Yes	Draws the symbol along the line
Stroke (CssParameter): stroke	Yes	RGB colors are supported
Stroke (CssParameter): width	Yes	
Stroke (CssParameter): opacity	Yes	Only for AGG driver and mapserver version >=5.2
Stroke (CssParameter): linejoin and linecap	No	Not supported in MapServer
Stroke (CssParameter): dasharray	Yes	
Stroke (CssParameter): dashoffset	No	
PerpendicularOffset (only in SLD 1.1.0)	Yes	Offset values of the style object will be set
InitialGap(GraphicStroke SLD 1.1.0)	No	
Gap (GraphicStroke parameter SLD 1.1.0)	No	

Note: SvgParameter instead of CssParameter are required for SLD 1.1.0.

The following are examples of valid requests using the LineSymbolizer:

- simple line: [sld 7a](#) / full request [7a](#)
- line with width: [sld 7b](#) / full request [7b](#)
- dashed line: [sld 7c](#) / full request [7c](#)

Table 8. PolygonSymbolizer

Features	Supported	Notes
Geometry	No	
Stroke	Yes	Strokes are the same as for the LineSymbolizer
Fill	Yes	Was developed to support symbol fill polygons in addition to solid fill
Fill-opacity	Yes	Only available for AGG driver and mapserver version >=5.2
PerpendicularOffset	No	SLD 1.1.0 parameter
Displacement	Yes	SLD 1.1.0 parameter. Sets offsetx/y in MapServer

A Fill can be a solid fill or be a Graphic Fill, which is either a well-known Mark symbol (e.g., square, circle, triangle, star, cross, x) or an ExternalGraphic element (e.g., gif, png) available through a URL. When a Mark symbol is used in an SLD, MapServer creates a corresponding symbol in the map file and uses it to render the symbols. When a ExternalGraphic is used, the file is saved locally and a pixmap symbol is created in the mapfile referring to the this file.

Note: The Web object IMAGEPATH is used to save the file.

The following are examples of valid requests using the PolygonSymbolizer:

- simple solid fill: [sld 8a](#) / full request [8a](#)
- solid fill with outline: [sld 8b](#) / full request [8b](#)
- fill with mark symbol: [sld 8c](#) / full request [8c](#)
- fill with external symbol: [sld 8d](#) / full request [8d](#)

Table 9. PointSymbolizer

Features	Supported	Notes
Geometry	No	
Graphic: Mark symbol	Yes	Well-known names (square, circle, triangle, star, cross, X) are supported
Graphic: ExternalGraphic	Yes	Was developed to support symbol fill polygons in addition to solid fill
Opacity	Yes	Support added in MapServer 5.4
Size	Yes	
Rotation	Yes	Support added in MapServer 5.4
Displacement	Yes	SLD 1.1.0 Parameter. Support added in MapServer 5.4
AnchorPoint	No	

Note: Refer to the PolygonSymbolizer notes for how the Mark and ExternalGraphic symbols are applied in MapServer.

The following are examples of valid requests using the PointSymbolizer:

- filled mark symbol: [sld 9a](#) / full request [9a](#)
- default settings (square, size 6, color 128/128/128): [sld 9b](#) / full request [9b](#)
- external symbol: [sld 9c](#) / full request [9c](#)

Table 10. TextSymbolizer

Features	Sup-ported	Notes
Geometry	No	
Label	Yes	
Font(font-family)	Yes	Font names used are those available in MapServer font file. If no fonts are available there, default bitmap fonts are used
Font-style (Italic, ...)	Yes	
Font-weight	Yes	
Font-size	Yes	If true-type fonts are not used, default bitmap sizes are given
LabelPlace-ment	Yes	PointPlacement is supported. LinePlacement is supported for versions >=5.2.1. Only PerpendicularOffset and IsAligned are supported for LinePlacement.
Halo	Yes	Supported (fill converted to outlinecolor, and radius is converted to linewidth. Note that linewidth is only available for AGG in >=5.2)
Fill	Yes	Only solid color is available

Notes on the TextSymbolizer:

- *Font names*: when converting Font parameters to MapServer, the following rule is applied to get the font name: `FontFamily-FontStyle-FontWeight`. For example, if there is an SLD with a Font Family of arial, a Font Style of italic, and a Font weight equal to bold, the resulting MapServer font name is arial-bold-italic. Font Style and Weight are not mandatory and, if not available, they are not used in building the font name. When a Font Style or a Font Weight is set to normal in an SLD, it is also ignored in building the name. For example, if there is an SLD with a Font Family of arial, a Font Style of normal and a Font weight equals to bold, the resulting MapServer font name is arial-bold.
- A TextSymbolizer can be used in MapServer on a Point, Line, or Polygon layer - in addition to other symbolizers used for these layers.
- PointPlacement: a point placement includes AnchorPoint (which is translated to Position in MapServer) Displacement (which is translated to Offset) and Angle (which is translated to Angle).
- Angle setting (MapServer version >=5.4): by default the angle parameter is set to AUTO. For point features, users can use the PointPlacement to alter the value. For line features, the user can add a LinePlacement: If

an ‘empty’ LinePlacement is part of the SLD, the angle will be set to FOLLOW. If a LinePlacement contains the PerpendicularOffset parameter, the angle will be set to 0 and the PerpendicularOffset will be used to set the offset values in the label object. SLD 1.1.0 introduces the IsAligned parameter for LinePlacement: if this parameter is set to false, the angle will be set to 0.

The following are examples of valid requests using the TextSymbolizer:

- point layer : test for label, font, point placement, color, angle: [sld 10a / full request 10a](#)
- point layer with text and symbols using 2 symbolizers: [sld 10b / full request 10b](#)
- line layer with text using 2 symbolizers: [sld 10c / full request 10c](#)

Table 11. RasterSymbolizer

Features	Supported	Notes
Geometry	No	
Opacity	Yes	
ChannelSelection	No	
OverlapBehaviour	No	
ColorMap	Yes	
ContrastEnhancement	No	
ShadedRelief	No	
ImageOutline	No	

The current support in MapServer includes only ColorMap parameter support. It can be used to classify 8-bit rasters. Inside the ColorMap parameters, the color and quantity parameters are extracted and used to do the classification.

Table 12. ColorMap

The following Features are available in SLD 1.0

Features	Supported	Notes
Color	Yes	
Opacity	No	
Quantity	Yes	
Label	No	

The following is an example of ColorMap usage for SLD 1.0.

If we have following ColorMap in an SLD:

```
<ColorMap>
  <ColorMapEntry color="#00ff00" quantity="22"/>
  <ColorMapEntry color="#00bf3f" quantity="30"/>
  <ColorMapEntry color="#007f7f" quantity="37"/>
  <ColorMapEntry color="#003fbf" quantity="45"/>
  <ColorMapEntry color="#0000ff" quantity="52"/>
  <ColorMapEntry color="#000000" quantity="60"/>
</ColorMap>
```

The six classes that are created are:

```
class 1: [pixel] >= 22 AND [pixel] < 30 with color 00ff00
class 2: [pixel] >= 30 AND [pixel] < 37 with color 00bf3f
class 3: [pixel] >= 37 AND [pixel] < 45 with color 007f7f
class 4: [pixel] >= 45 AND [pixel] < 52 with color 003fbf
class 5: [pixel] >= 52 AND [pixel] < 60 with color 0000ff
class 6: [pixel] = 60 with color 000000
```

Note: The ColorMapEntry quantity parameters should be in increasing order.

The following Features are available in SLD 1.1

Features	Supported	Notes
Categorize	Yes	

The following is an example of and SLD 1.1.0 with a raster symbolizer

```
<StyledLayerDescriptor version="1.1.0" xsi:schemaLocation="http://www.opengis.net/sld
http://schemas.opengis.net/sld/1.1.0/StyledLayerDescriptor.xsd"
xmlns="http://www.opengis.net/sld" xmlns:ogc="http://www.opengis.net/ogc"
xmlns:se="http://www.opengis.net/se" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<NamedLayer>
<se:Name>landsat</se:Name>
<UserStyle>
<se:Name>xxx</se:Name>
<se:FeatureTypeStyle>
<se:Rule>
<se:RasterSymbolizer>
<se:Opacity>0.7</se:Opacity>
<se:ColorMap>
<se:Categorize fallbackValue="#78c818">
<se:LookupValue>Rasterdata</se:LookupValue>
<se:Value>#ffffff</se:Value>
<se:Threshold>22</se:Threshold>
<se:Value>#00ff00</se:Value>
<se:Threshold>30</se:Threshold>
<se:Value>#00bf3f</se:Value>
<se:Threshold>37</se:Threshold>
<se:Value>#007f7f</se:Value>
<se:Threshold>45</se:Threshold>
<se:Value>#003fbf</se:Value>
<se:Threshold>52</se:Threshold>
<se:Value>#0000ff</se:Value>
<se:Threshold>60</se:Threshold>
<se:Value>#000000</se:Value>
</se:Categorize>
</se:ColorMap>
</se:RasterSymbolizer>
</se:Rule>
</se:FeatureTypeStyle>
</UserStyle>
</NamedLayer>
</StyledLayerDescriptor>
```

The classes that are created are:

```
class 1: [pixel] < 22 with color ffffff
class 2: [pixel] >= 22 AND [pixel] < 30 with color 00ff00
class 3: [pixel] >= 30 AND [pixel] < 37 with color 00bf3f
class 4: [pixel] >= 37 AND [pixel] < 45 with color 007f7f
class 5: [pixel] >= 45 AND [pixel] < 52 with color 003fbf
class 6: [pixel] >= 52 AND [pixel] < 60 with color 0000ff
class 7: [pixel] >= 60 with color 000000
```

Examples using 8 bits and 16 bits rasters can be seen at:

- [example 1](#)

- example 2

10.12.3 Client Side Support

Client side support of the SLD consists of two parts:

- The first part is using MapServer as a WMS client to send a GetMap request with an SLD. This is done using two metadata that can be placed at a layer level in a MapServer mapfile. These two metadata are:
 - wms_sld_url, which takes a valid URL as a value and appends SLD=xxx to the GetMap request.
 - wms_sld_body, which takes a valid SLD string and appends SLD_BODY=xxx to the GetMap request.
If the value of wms_sld_body is set to AUTO, MapServer generates an SLD based on the classes found in the layer and send this SLD as the value of the SLD_BODY parameter in the GetMap request.
- The other major item is the generation of an SLD document from MapServer classes. These functions are currently available through MapServer/MapScript interface. Here are the functions available:
 - on a map object: generatesld
 - on a layer object: generatesld

Additional MapScript functions have been added or will be added to complement these functions:

- on a map object: applysld
- on a layer object: applysld

Note: When generating an SLD from MapServer classes, if there is a pixmap symbol you need to have this symbol available through a URL so it can be converted as an ExternalGraphic symbol in the SLD. To do this, you need to define the URL through a web object level metadata called WMS_SLD_SYMBOL_URL in your map file. The SLD generated uses this URL and concatenates the name of the pixmap symbol file to get the value that is generated as the ExternalGraphic URL.

PHP/MapScript Example that Generates an SLD from a Mapfile

The following is a small script that calls the generateSLD() function to create an SLD for a specific layer in a mapfile:

```
1 <?php
2
3 // define variables
4 define( "MAPFILE", "D:/ms4w/apps/cadastra/map/cadastra.map" );
5 define( "MODULE", "php_mapscript.dll" );
6
7 // load the mapscript module
8 if (!extension_loaded("MapScript")) dl(MODULE);
9
10 // open map
11 $oMap = ms_newMapObj( MAPFILE );
12
13 // get the parcel layer
14 $oLayer = $oMap->getLayerByName("parcel");
15
16 // force visibility of the layer
17 $oLayer->set('status', MS_ON);
18
19 // generate the sld for that layer
20 $SLD = $oLayer->generateSLD();
```

```

21
22 // save sld to a file
23 $fp = fopen("parcel-sld.xml", "a");
24 fputs( $fp, $SLD );
25 fclose($fp);
26
27 ?>

```

10.12.4 Named Styles support

Named styles support are introduced in MapServer 5.2. The support is base on *MS RFC 39: Support of WMS/SLD Named Styles*.

MapServer 5.2 introduces the possibility to assign a group to a series of classes defined on a layer object using two new non-mandatory keywords CLASSGROUP (at the layer level) and GROUP at the class level:

```

LAYER
  ...
    CLASSGROUP "group1"
  ...
    CLASS
      NAME "name1"
      GROUP "group1"
    ...
  END
  CLASS
    NAME "name2"
    GROUP "group2"
  ...
  END
  CLASS
    NAME "name3"
    GROUP "group1"
  ...
END
...

```

At rendering time, if the CLASSGROUP is defined, only classes that have the same group name would be used. Based on this concept, WMS/SLD support uses the class groups as named styles. Each group of classes is considered equivalent to a named style:

- The GetCapbilities request will output all the styles that are available
- The GetMap request can use the STYLES parameter to specify a named style
- The GetLegendGraphic can use the STYLES parameter to specify a named style

10.12.5 Other Items Implemented

- Support of filled polygons with Mark and ExternalGraphic symbols.
- MapScript functions to parse and apply SLD.
- SLD_BODY request support on client and server side.

10.12.6 Issues Found During Implementation

- Limitation of the FilterEncoding to comparison and logical filters. The spatial filters were not made available since it required major changes in MapServer WMS support.

10.13 WCS Server

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Author Stephan Meissl

Contact stephan.meissl at eox.at

Author Fabian Schindler

Contact fabian.schindler at eox.at

Last Updated 2012-08-30

Table of Contents

- WCS Server
 - Introduction
 - Configuring Your Mapfile to Serve WCS Layers
 - Test Your WCS 1.0 Server
 - WCS 1.1.0+ Issues
 - WCS 2.0
 - HTTP-POST support
 - Reference Section
 - Rules for handling SRS in a MapServer WCS
 - Spatio/Temporal Indexes
 - WCS 2.0 Application Profile - Earth Observation (EO-WCS)
 - To-do Items and Known Limitations

10.13.1 Introduction

A WCS (or Web Coverage Service) allows for the publication of “coverages”- digital geospatial information representing space-varying phenomena. In the MapServer world it allows for unfiltered access to raster data. Conceptually it is easy think of WCS as a raster equivalent of WFS. The following documentation is based on the Open Geospatial Consortium’s (OGC) Web Coverage Service Interfaces Implementation Specification version 1.0.0.

Links to WCS-Related Information

- OGC’s WCS Standard page
- WCS 1.0.0 specification
- WCS 1.1.1c1 specification
- WCS 2.0
 - GML 3.2.1 Application Schema Coverages

- WCS 2.0 Specification - Core
- WCS 2.0 Specification - KVP Protocol Binding Extension
- WCS 2.0 Specification - XML/POST Protocol Binding Extension
- *WMS Server HowTo*

Software Requirements

In order to enable MapServer to serve WCS data, it MUST be compiled against certain libraries:

- PROJ.4: The reprojection library. Version 4.4.3 or greater is required.
- GDAL: raster support library.
- MapServer: version ≥ 4.4 (tested with 5.0.2 while updating this document)

For WCS 1.1.x (MapServer 5.2) and WCS 2.0 (MapServer 6.0) support there is an additional requirement:

- libxml2: An xml parser and generation library.

Please see the *MapServer UNIX Compilation and Installation HowTo* for detailed instructions on compiling MapServer with support for these libraries and features. For Windows users, *MapServer for Windows (MS4W)* comes with WCS Server support.

10.13.2 Configuring Your Mapfile to Serve WCS Layers

Much as in the WMS and WFS support, WCS publishing is enabled by adding certain magic METADATA keyword/value pairs to a .map file.

MapServer will serve and include in its WCS capabilities only the layers that meet the following conditions:

- Data source is a raster, which is processed using GDAL (e.g GeoTIFF, Erdas Imagine, ...)
- LAYER NAME must be set
- LAYER TYPE is set to RASTER
- WEB metadata or LAYER metadata “wcs_enable_request” must be set
- WEB metadata “wcs_label” must be set
- LAYER metadata “wcs_label” must be set
- LAYER metadata “wcs_rangeset_name” must be set
- LAYER metadata “wcs_rangeset_label” must be set
- LAYER is enabled to be served via WCS (see [MS RFC 67](#))
- LAYER PROJECTION must be set, even if PROJECTION is set at the MAP level (a bug?)

Example WCS Server Mapfile

The following is an example of a simple WCS Server mapfile. Note the comments for the required parameters.

```
MAP
NAME W C S - s e r v e r
STATUS ON
SIZE 400 300
SYMBOLSET ".../etc/symbols.txt"
```

```
EXTENT -2200000 -712631 3072800 3840000
UNITS METERS
SHAPEPATH "../data"
IMAGECOLOR 255 255 255
FONTSET "../etc/fonts.txt"

#
# Start of web interface definition
#
WEB
IMAGEPATH "/ms4w/tmp/ms_tmp/"
IMAGEURL "/ms_tmp/"
METADATA
"wcs_label" "GMap WCS Demo Server" ### required
"wcs_description" "Some text description of the service"
"wcs_onlineresource" "http://127.0.0.1/cgi-bin/mapserv.exe?" ### recommended
"wcs_fees" "none"
"wcs_accessconstraints" "none"
"wcs_keywordlist" "wcs,test"
"wcs_metadatalink_type" "TC211"
"wcs_metadatalink_format" "text/plain"
"wcs_metadatalink_href" "http://someurl.com"
"wcs_address" "124 Gilmour Street"
"wcs_city" "Ottawa"
"wcs_stateorprovince" "ON"
"wcs_postcode" "90210"
"wcs_country" "Canada"
"wcs_contactelectronicmailaddress" "blah@blah"
"wcs_contactperson" "me"
"wcs_contactorganization" "unemployed"
"wcs_contactposition" "manager"
"wcs_contactvoicetelephone" "613-555-1234"
"wcs_contactfacimiletelephone" "613-555-1235"
"wcs_service_onlineresource" "http://127.0.0.1/cgi-bin/mapserv.exe?"
"wcs_enable_request" "*"
END
END

PROJECTION
"init=epsg:42304"
END

LAYER
NAME bathymetry
METADATA
"wcs_label" "Elevation/Bathymetry" ### required
"wcs_rangeset_name" "Range 1" ### required to support DescribeCoverage request
"wcs_rangeset_label" "My Label" ### required to support DescribeCoverage request
END
TYPE RASTER ### required
STATUS ON
DATA bathymapservr.tif
PROJECTION
"init=epsg:42304"
END
END
```

```
END # Map File
```

Output Formats

The raster formats supported by MapServer WCS are determined by the wcs_formats metadata item on the LAYER. This should contain a space separated list of OUTPUTFORMAT driver names separated by spaces. If absent, all raster OUTPUTFORMATs are allowed.

WCS is a “raw data” oriented format. So it often most suitable to use it with format using the BYTE, INT16 and FLOAT32 IMAGEMODEs with GDAL related output formats rather than the built in “rendering oriented” output formats. By default the only GDAL format driver defined is the GTiff driver. The following are example output format declarations utilizing the raw image modes:

```
OUTPUTFORMAT
  NAME GEOTIFF_16
  DRIVER "GDAL/GTiff"
  MIMETYPE "image/tiff"
  IMAGEMODE FLOAT32
  EXTENSION "tif"
END

OUTPUTFORMAT
  NAME AAIGRID
  DRIVER "GDAL/AAIGRID"
  MIMETYPE "image/x-aaigrid"
  IMAGEMODE INT16
  EXTENSION "grd"
  FORMATOPTION "FILENAME=result.grd"
END
```

The FORMATOPTION FILENAME defines the preferred name of the result file when returned WCS GetCoverage results.

10.13.3 Test Your WCS 1.0 Server

Validate the Capabilities Metadata

OK, now that we’ve got a mapfile, we have to check the XML capabilities returned by our server to make sure nothing is missing.

Using a web browser, access your server’s online resource URL to which you add the parameters “SERVICE=WCS&VERSION=1.0.0&REQUEST=GetCapabilities” to the end, e.g.

```
http://my.host.com/cgi-bin/mapserv?map=mywcs.map&SERVICE=WCS
&VERSION=1.0.0&REQUEST=GetCapabilities
```

If you get an error message in the XML output then take necessary actions. Common problems and solutions are listed in the FAQ at the end of this document.

If everything went well, you should have a complete XML capabilities document. Search it for the word “WARNING”... MapServer inserts XML comments starting with “<!--WARNING: ” in the XML output if it detects missing mapfile parameters or metadata items.</p>

Note that when a request happens, it is passed through WMS, WFS, and WCS in MapServer (in that order) until one of the services respond to it.

Here is a working example of a GetCapabilities request:

[WCS GetCapabilities live example](#)

Test With a DescribeCoverage Request

OK, now that we know that our server can produce a valid XML GetCapabilities response we should test the DescribeCoverage request. The DescribeCoverage request lists more information about specific coverage offerings.

Using a web browser, access your server's online resource URL to which you add the parameters "SERVICE=WCS&VERSION=1.0.0&REQUEST=DescribeCoverage&COVERAGE=layername" to the end, e.g.

```
http://my.host.com/cgi-bin/mapserv?map=mywcs.map&SERVICE=WCS
&VERSION=1.0.0&REQUEST=DescribeCoverage&COVERAGE=bathymetry
```

Here is a working example of a DescribeCoverage request:

[WCS DescribeCoverage live example](#)

Test With a GetCoverage Request

The GetCoverage request allows for the retrieval of coverages in a specified output format to the client.

The following is a list of the required GetCoverage parameters according to the WCS spec:

VERSION=version: Request version

REQUEST=GetCoverage: Request name

COVERAGE=coverage_name: Name of an available coverage, as stated in the GetCapabilities

CRS=epsg_code: Coordinate Reference System in which the request is expressed.

BBOX=minx,miny,maxx,maxy: Bounding box corners (lower left, upper right) in CRS units. One of BBOX or TIME is required.

TIME=time1,time2: Request a subset corresponding to a time. One of BBOX or TIME is required..

WIDTH=output_width: Width in pixels of map picture. One of WIDTH/HEIGHT or RESX/Y is required.

HEIGHT=output_height: Height in pixels of map picture. One of WIDTH/HEIGHT or RESX/Y is required.

RESX=x: When requesting a georectified grid coverage, this requests a subset with a specific spatial resolution. One of WIDTH/HEIGHT or RESX/Y is required.

RESY=y: When requesting a georectified grid coverage, this requests a subset with a specific spatial resolution. One of WIDTH/HEIGHT or RESX/Y is required.

FORMAT=output_format: Output format of map, as stated in the DescribeCoverage response.

The following are optional GetCoverage parameters according to the WCS spec:

RESPONSE_CRS=epsg_code: Coordinate Reference System in which to express coverage responses.

So to follow our above examples, a valid DescribeCoverage request would look like:

```
http://my.host.com/cgi-bin/mapserv?map=mywcs.map&SERVICE=wcs
&VERSION=1.0.0&REQUEST=GetCoverage&coverage=bathymetry
&CRS=EPSG:42304&BBOX=-2200000,-712631,3072800,3840000&WIDTH=3199
&HEIGHT=2833&FORMAT=GTiff
```

Here is a working example of a GetCoverage request (note that a 350KB tif is being requested, so this may take a second):

[WCS GetCoverage live example](#)

10.13.4 WCS 1.1.0+ Issues

WCS 1.1.0 and later versions of the WCS protocol are supported by MapServer 5.2. For the most part the map file setup for WCS 1.1.0 is similar to WCS 1.0.0, but the actual protocol is substantially changed.

GetCapabilities

The GetCapabilities request is the same as WCS 1.0 but with a different VERSION value:

```
SERVICE=WCS&VERSION=1.1.0&REQUEST=GetCapabilities
```

The format of the returned capabilities document is substantially altered from WCS 1.0, and makes use of OWS Common for service descriptions.

DescribeCoverage

The DescribeCoverage request is similar to WCS 1.0, but the IDENTIFIER keyword is used instead of COVERAGE to name the coverage being requested:

```
SERVICE=WCS&VERSION=1.1.0&REQUEST=DescribeCoverage&IDENTIFIER=spaceimaging
```

GetCoverage

The format for GetCoverage is substantially changed from 1.0. The following is a list of GetCoverage required parameters:

VERSION=version: Request version

REQUEST=GetCoverage: Request name

IDENTIFIER=coverage_name: Name of an available coverage, as stated in the GetCapabilities

BOUNDINGBOX=minx,miny,maxx,maxy,crs: Bounding box corners (lower left, upper right), and the CRS they are in. The CRS is described using a URN.

FORMAT=output_format: Output format (mime type) of grid product, as stated in the GetCapabilities.

If an alternate spatial resolution is desired, then the following set of keywords must be used to specify the sample origin and step size of the output grid to be produced. The produced grid will be of a number of pixels and lines as can be fit in the BOUNDINGBOX starting at GridOrigin, at GridOffsets resolution.

GRIDBASECRS=crs: The grid base CRS (URN).

GRIDCRS=crs: The grid CRS (URN).

GridType=urn:ogc:def:method:WCS:1.1:2dGridIn2dCrs: This is the only supported value for MapServer.

GridOrigin=x_origin,y_origin: The sample point for the top left pixel.

GridOffsets=xstep,ystep: The x and y step size for grid sampling (resolution). Both are positive.

As well, the following optional parameters are available.

RangeSubset=selection: Selects a range subset, and interpolation method. Currently only subsetting on bands are allowed. Depending on rangeset names, this might take the form “BandsName[bands[1]]” to select band 1, or “BandsName:bilinear[bands[1]]” to select band 1 with bilinear interpolation.

So a simple GetCoverage might look like:

```
SERVICE=WCS&VERSION=1.1.0&REQUEST=GetCoverage&IDENTIFIER=dem&FORMAT=image/tiff  
&BOUNDINGBOX=43,33,44,34,urn:ogc:def:crs:EPSG::4326
```

A more complex request might look like:

```
SERVICE=WCS&VERSION=1.1.0&REQUEST=GetCoverage&IDENTIFIER=dem&FORMAT=image/tiff  
&BOUNDINGBOX=33,43,34,44,urn:ogc:def:crs:EPSG::4326  
&GridBaseCRS=urn:ogc:def:crs:EPSG::4326&GridCS=urn:ogc:def:crs:EPSG::4326  
&GridType=urn:ogc:def:method:WCS:1.1:2dGridIn2dCrs  
&GridOrigin=33,44&GridOffsets=0.01,0.01  
&RangeSubset=BandsName:bilinear[bands[1]]
```

It should also be noted that return results from WCS 1.1 GetCoverage requests are in multi-part mime format. Typically this consists of a first part with an xml document referencing the other parts of the message, and an image file part. However, for output formats that return multiple files, each will be a separate part. For instance, this means it is possible to return a jpeg file with a world file, the OUTPUTFORMAT is appropriately configured.

URNs

In WCS 1.1 protocol coordinate systems are referenced by URN. Some typical URNs are:

```
urn:ogc:def:crs:EPSG::4326  
urn:ogc:def:crs:EPSG:27700  
urn:ogc:def:crs:OGC::CRS84
```

The first two are roughly equivalent to EPSG:4326, and EPSG:27700 while the third is a CRS defined by OGC (essentially WGS84). One critical thing to note is that WCS 1.1 follows EPSG defined axis/tuple ordering for geographic coordinate systems. This means that coordinates reported, or provided in urn:ogc:def:EPSG::4326 (WGS84) are actually handled as lat, long, not long,lat. So, for instance the BOUNDINGBOX for an area in California might look like:

```
BOUNDINGBOX=34,-117,35,-116,urn:ogc:def:crs:EPSG::4326
```

And, likewise the bounds reported by GetCapabilities, and DescribeCoverage will be in this ordering as appropriate.

10.13.5 WCS 2.0

Overview

Version 6.0 introduces support for the new version 2.0 of the WCS specification. This section documents the usage of the new WCS version.

Web Coverage Service (WCS) 2.0 Interface Standard

This specification adopts the new OGC Core and Extension model and at the moment the following documents are available from the OGC's WCS Standard page:

- [GML 3.2.1 Application Schema Coverages](#)
- [WCS 2.0 Specification - Core](#)

- WCS 2.0 Specification - KVP Protocol Binding Extension
- WCS 2.0 Specification - XML/POST Protocol Binding Extension

Technical changes from WCS version 1.1.2 include entirely building on the [GML 3.2.1 Application Schema Coverages](#) and adoption of [OWS Common 2.0](#). Another major change is the introduction of trim and slice concepts which is explained in more detail below.

There are [WCS 2.0 Schemas](#) defined against which all requests and responses should validate.

WCS 2.0 KVP request parameters

The following KVP request parameters are available in WCS 2.0:

COVERAGEID=id: This parameter is technically the same as the **COVERAGE** parameter for WCS 1.0 or the **IDENTIFIER** parameter **for WCS 1.1**. In `DescribeCoverage` requests, multiple IDs can be requested by concatenating them with commas.

SUBSET=axis[*crs*](*low*,*high*): This parameter subsets the coverage on the given axis. This parameter can be given multiple times, but only once for each axis. The optional sub-parameter **crs** can either be an EPSG definition (like EPSG:4326), an URN or an URI or ‘imageCRS’ (which is the default). All **crs** sub-parameters from all **SUBSET** parameters must be equal. (e.g: you cannot subset one axis in imageCRS and another in EPSG:4326).

Note: The syntax of the **crs** sub-parameter is likely to need to be changed when new specification documents become available (see [To-do Items and Known Limitations](#)).

SIZE=axis(*value*): This parameter sets the size of the desired axis to the desired value (pixels).

RESOLUTION=axis(*value*): This parameter sets the resolution of the desired axis to the desired value (pixels/unit).

Note: The **SIZE** and **RESOLUTION** are mutually exclusive on one axis, but can be mixed on different axes (e.g: SIZE on x-axis and RESOLUTION on y-axis). Also axis names in **SUBSET**, **SIZE** and **RESOLUTION** parameters cannot be mixed. E.g: ...&`SUBSET=x(0,100)&SIZE=lon(200)&...` is not legal although the axis names logically refer to the same axis.

Note: Recognized values for the axis sub-parameter are: “x”, “xaxis”, “x-axis”, “x_axis”, “long”, “long_axis”, “long-axis”, “lon”, “lon_axis”, “lon-axis”, “y”, “yaxis”, “y-axis”, “y_axis”, “lat”, “lat_axis” and “lat-axis”.

OUTPUTCRS=*crs*: This parameter defines in which crs the output image should be expressed in.

MEDIATYPE=mediatype: This parameter is relevant to `GetCoverage` requests, when multipart XML/image output is desired. It should be set to ‘multipart/related’ (which is currently the only possible value for this parameter).

INTERPOLATION=intperpolation_method: This defines the interpolation method used, for rescaled images. Possible values are “NEAREST”, “BILINEAR” and “AVERAGE”.

RANGESUBSET=band1[,band2[,...]]: With this parameter, a selection of bands can be made. Also the bands can be reordered. The bands can be referred to either by name (which can be retrieved using the `DescribeCoverage` request) or by index (starting with ‘1’ for the first band).

Note: The parameter names **SIZE**, **RESOLUTION**, **OUTPUTCRS=crs:**, **INTERPOLATION**, and **RANGESUBSET** might need to be changed when new specification documents become available (see [To-do Items and Known Limitations](#)).

Unchanged KVP parameters The following parameters have not (or just slightly) changed since the last version of the WCS standard.

VERSION=version: For WCS 2.0, this should be set to ‘2.0.1’.

SERVICE=service

REQUEST=request

ACCEPTVERSIONS=versions

SECTIONS=sections

UPDATESEQUENCE=updatesequence

ACCEPTFORMATS=formats: This parameter is currently ignored.

ACCEPTLANGUAGES=languages: This parameter is currently ignored.

FORMAT=format: The desired format can now also be set with the name of the outputformat object defined in the mapfile. In contrast to previous versions of WCS this parameter is optional when the native format is either specified or can be determined via GDAL.

MAP=mapfile

KVP request examples The below sample request outline the new KVP request syntax:

```
# GetCapabilities
http://www.yourserver.com/wcs?SERVICE=wcs&VERSION=2.0.1
    &REQUEST=GetCapabilities
# DescribeCoverage 2.0
http://www.yourserver.com/wcs?SERVICE=wcs&VERSION=2.0.1
    &REQUEST=DescribeCoverage&COVERAGEID=grey
# GetCoverage 2.0 image/tiff full
http://www.yourserver.com/wcs?SERVICE=wcs&VERSION=2.0.1
    &REQUEST=GetCoverage&COVERAGEID=grey&FORMAT=image/tiff
# GetCoverage 2.0 multipart/related (GML header & image/tiff) full
http://www.yourserver.com/wcs?SERVICE=wcs&VERSION=2.0.1
    &REQUEST=GetCoverage&COVERAGEID=grey&FORMAT=image/tiff
    &MEDIATYPE=multipart/related
# GetCoverage 2.0 image/tiff trim x y both
http://www.yourserver.com/wcs?SERVICE=wcs&VERSION=2.0.1
    &REQUEST=GetCoverage&COVERAGEID=grey&FORMAT=image/tiff
    &SUBSET=x(10,200)&SUBSET=y(10,200)
# GetCoverage 2.0 reproject to EPSG 4326
http://www.yourserver.com/wcs?SERVICE=wcs&VERSION=2.0.1
    &REQUEST=GetCoverage&COVERAGEID=grey&FORMAT=image/tiff
    &SUBSET=x,http://www.opengis.net/def/crs/EPSG/0/4326(-121.488744,-121.485169)
```

Please refer to the [WCS 2.0 tests in msautotest](#) for further sample requests.

Changes to previous versions

The layer name must be a valid NCName, i.e: must not start with a number and can only contain alphanumerical characters. This constraint derives of the gml:id property which has to be a NCName, that relates to the coverage ID

which is itself taken from the layers name.

Specifying coverage specific metadata

For WCS enabled layers in MapServer, there are different possibilities for declaring coverage metadata for WCS 2.0. In the simplest case, all of the required metadata can be retrieved from the source image.

For some reason this may not be desireable, maybe because the source image does not provide these metadata. Not every input image format has geospatial metadata attached. In this case, the layer metadata can be used to provide this information.

The convention is that once (wcslows)_extent and one of (wcslows)_size and (wcslows)_resolution is set in the layer metadata, all the coverage specific metadata will be retrieved from there. Otherwise the source image is queried via GDAL, if possible.

The relevant layer metadata fields are (wcslows)_bandcount, (wcslows)_imagemode, (wcslows)_native_format, and all New band related metadata entries.

New band related metadata entries

In this section new WCS 2.0 specific layer metadata entries are discussed.

The following layer metadata fields can be used to return a more detailed description for the range type of a “virtual dataset” coverage. A coverage is considered as a “virtual dataset” if the (wcslows)_extent metadata entry and one of the (wcslows)_size or (wcslows)_resolution metadata entries are set.

First of all, the used version of metadata has to be identified. To identify the bands of a coverage, one of the following fields must be present:

- (wcslows)_band_names (corresponding to WCS 2.0)
- (wcslows)_rangeset_axes (corresponding to WCS 1.1)

The type of these fields is a space delimited list of names, whereas the count of the names has to match the “bandcount” metadata field. These names are then used as a prefix for other metadata fields only concerning this band. The possible metadata keys are the following:

- WCS 2.0:
 - {band_name}_band_interpretation
 - {band_name}_band_uom
 - {band_name}_band_definition
 - {band_name}_band_description
 - {band_name}_interval
- WCS 1.1
 - {band_name}_semantic
 - {band_name}_values_types
 - {band_name}_values_semantic
 - {band_name}_description
 - {band_name}_interval

All values are interpreted as strings, only “interval” is interpreted as 2 double precision float values separated with a space.

Also default values can be configured for every key. These have the same suffix as the band specific keys but start with (wcslows) instead of the bands name:

- WCS 2.0:
 - (wcslows)_band_interpretation
 - (wcslows)_band_uom
 - (wcslows)_band_definition
 - (wcslows)_band_description
 - (wcslows)_interval
- WCS 1.1
 - (wcslows)_semantic
 - (wcslows)_values_types
 - (wcslows)_values_semantic
 - (wcslows)_description
 - (wcslows)_interval

If no specific or default value is given, the output is dependant on the metadata key. The UOM, for example will be set to ‘W.m-2.Sr-1’, interval and significant figures will be determined according to the image type and definition, description, and interpretation will not be visible in the output at all.

This example demonstrates the use of the band-specific metadata fields with their default values:

METADATA

```
"ows_srs" "EPSG:4326"
"wcs_extent" "47.5070762077246 16.038578977182 49.0103258976982 17.2500586851354"

"wcs_size" "1200 1100"
"wcs_imagemode" "BYTE"

"wcs_bandcount" "3"
"wcs_band_names" "BandA BandB BandC"

#default values
"wcs_band_interpretation" "This is default interpretation"
"wcs_band_uom" "DefaultUOM"
"wcs_band_definition" "DefaultDefinition"
"wcs_band_description" "This is default description"
"wcs_interval" "0 125"
"wcs_significant_figures" "3"

#specific band values
"BandA_band_interpretation" "This is a specific interpretation"
"BandA_band_uom" "SpecificUOM"
"BandA_band_definition" "SpecificDefinition"
"BandA_band_description" "This is a specific description"
"BandA_interval" "0 255"
```

END

The above example would result in having BandA a more specific description, and BandB and BandC having the default description. It would also be possible to only use some of the specific values for BandA and others from the default.

If no default and specific values are given for the interval or significant figures metadata field, the a default is generated from the “imagemode” field, which itself defaults to FLOAT32.

The new metadata fields also contain the *(wcsows)_nilvalues* and *(wcsows)_nilvalues_reasons*

- *(wcsows)_nilvalues*

With this field, specific nilvalues can be set. The values have to be delimited by a space.

- *(wcsows)_nilvalues_reasons*

This field defines the reasons for the specific nilvalues. The reasons are also space delimited and reference the nilvalue with the same index. The values for the reasons should be URIs or URNs.

The following example demonstrates the use of both metadata fields:

```
METADATA
  "ows_srs" "EPSG:4326"
  "wcs_extent" "47.5070762077246 16.038578977182 49.0103258976982 17.2500586851354"

  "wcs_size" "1200 1100"
  "wcs_imagemode" "BYTE"
  "wcs_bandcount" "3"

  "wcs_nilvalues" "0 255"
  "wcs_nilvalues_reasons"
    "urn:ogc:def:nil:OGC::BelowDetectionLimit urn:ogc:def:nil:OGC::AboveDetectionLimit"
END
```

10.13.6 HTTP-POST support

Since version 6.0 MapServer also supports HTTP-POST XML requests. All requests possible via HTTP GET can also be sent via POST. POST requests are possible for WCS 1.1 or WCS 2.0 which adhere to the according standard.

This is an example GetCapabilities request:

```
<?xml version="1.0" encoding="UTF-8"?>
<wcs:GetCapabilities
  xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
  xsi:schemaLocation="http://www.opengis.net/wcs/2.0
    http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"
  xmlns="http://www.opengis.net/wcs/2.0"
  xmlns:wcs='http://www.opengis.net/wcs/2.0'
  xmlns:ows="http://www.opengis.net/ows/2.0"
  service="WCS">
  <ows:AcceptVersions>
    <ows:Version>2.0.1</ows:Version>
  </ows:AcceptVersions>
  <ows:Sections>
    <ows:Section>OperationsMetadata</ows:Section>
    <ows:Section>ServiceIdentification</ows:Section>
  </ows:Sections>
</wcs:GetCapabilities>
```

This is an example DescribeCoverage request, which is only valid for WCS 2.0:

```
<?xml version="1.0" encoding="UTF-8"?>
<wcs:DescribeCoverage
    xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
    xsi:schemaLocation="http://www.opengis.net/wcs/2.0
        http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"
    xmlns="http://www.opengis.net/wcs/2.0"
    xmlns:wcs="http://www.opengis.net/wcs/2.0"
    service="WCS"
    version="2.0.1">
    <wcs:CoverageId>SOME_ID</wcs:CoverageId>
</wcs:DescribeCoverage>
```

This example demonstrates the usage of a WCS 2.0 POST-XML GetCoverage request:

```
<?xml version="1.0" encoding="UTF-8"?>
<wcs:GetCoverage
    xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
    xsi:schemaLocation="http://www.opengis.net/wcs/2.0
        http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"
    xmlns="http://www.opengis.net/wcs/2.0"
    xmlns:wcs="http://www.opengis.net/wcs/2.0"
    service="WCS"
    version="2.0.1">
    <wcs:CoverageId>SOME_ID</wcs:CoverageId>
    <wcs:DimensionTrim>
        <wcs:Dimension crs="http://www.opengis.net/def/crs/EPSG/0/4326">x
        </wcs:Dimension>
        <wcs:TrimLow>16.5</wcs:TrimLow>
        <wcs:TrimHigh>17.25</wcs:TrimHigh>
    </wcs:DimensionTrim>
    <wcs:DimensionTrim>
        <wcs:Dimension crs="http://www.opengis.net/def/crs/EPSG/0/4326">y
        </wcs:Dimension>
        <wcs:TrimLow>47.9</wcs:TrimLow>
    </wcs:DimensionTrim>
    <wcs:format>image/tiff</wcs:format>
    <wcs:mediaType>multipart/related</wcs:mediaType>
    <wcs:Resolution dimension="x">0.01</wcs:Resolution>
    <wcs:Size dimension="y">50</wcs:Size>
</wcs:GetCoverage>
```

Please refer to the [WCS 2.0 Specification - XML/POST Protocol Binding Extension](#) and the [WCS 2.0 Schemas](#) for further information on POST request in WCS 2.0.

10.13.7 Reference Section

To avoid confusion only “wcs_” and “ows_” prefixed metadata entries are evaluated in OGC WCS services. Previous versions used “wms_” prefixed entries as fallback which is dropped in version 6.0 in favor of forcing explicit decisions. The module will look for the “wcs_” and “ows_” metadata prefixes in this order.

The following metadata are available in the setup of the mapfile:

Web Object Metadata

wcs_abstract

- *Description:* (Optional) A brief description of the service, maps to ows:Abstract (WCS 1.1+ only).

wcs_accessconstraints

- *Description:* (Optional) A list of codes describing any access constraints imposed by the service provider. The keyword NONE is reserved to mean no access constraints are imposed.

wcs_address, **wcs_city**, **wcs_contactelectronicmailaddress**, **wcs_contactfacimiletelephone**,
wcs_contactorganization, **wcs_contactperson**, **wcs_contactposition**, **wcs_contactvoicetelephone**, **wcs_country**,
wcs_postcode, **wcs_stateorprovince**

- *Description:* (Optional) Contact address information. If provided then all twelve metadata items are required. You can also use the *responsibleparty* metadata instead.

wcs_description

- *Description:* (Optional) A description of the server.

wcs_enable_request (or **ows_enable_request**)

- *Description:* Space separated list of requests to enable. The default is none. The following requests can be enabled: *GetCapabilities*, *GetCoverage* and *DescribeCoverage*. A “!” in front of a request will disable the request. “*” enables all requests.

- *Examples:*

To enable only *GetCapabilities* and *GetCoverage*:

```
"wcs_enable_request" "GetCapabilities GetCoverage"
```

To enable all requests except *GetCapabilities*

```
"wcs_enable_request" "* !GetCapabilities"
```

wcs_fees

- *Description:* (Optional) A text string indicating any fees imposed by the service provider.

wcs_keywords

- *Description:* (Optional) Short words for catalog searching.

wcs_label

- *Description:* (Required) A human-readable label for the server.

wcs_metadatalink_format

- *Description:* (Optional) The file format MIME type of the metadata record (e.g. “text/plain”). The web metadata *wcs_metadatalink_type* and *wcs_metadatalink_href* must also be specified.

wcs_metadatalink_href

- *Description:* (Optional) The URL to the server’s metadata. The web metadata *wcs_metadatalink_format* and *wcs_metadatalink_type* must also be specified.

wcs_metadatalink_type

- *Description:* (Optional) The standard to which the metadata complies. Currently only two types are valid: “TC211” which refers to [ISO 19115], and “FGDC” which refers to [FGDC-STD-001-1988]. The web metadata *wcs_metadatalink_format* and *wcs_metadatalink_href* must also be specified.

wcs_name

- *Description:* (Optional) A name for the server.

wcs_responsibleparty_address_administrativearea,
wcs_responsibleparty_address_country,
wcs_responsibleparty_address_electronicmailaddress,

wcs_responsibleparty_address_city,
wcs_responsibleparty_address_deliverypoint,
wcs_responsibleparty_address_postalcode,

wcs_responsibleparty_individualname, wcs_responsibleparty_onlineresource, wcs_responsibleparty_organizationname, wcs_responsibleparty_phone_facsimile, wcs_responsibleparty_phone_voice, wcs_responsibleparty_postionname

- *Description:* (Optional) Contact address information. If provided then all twelve metadata items are required. You can also use the address* metadata instead.

wcs_service_onlineresource

- *Description:* (Optional) Top-level onlineresource URL. MapServer uses the onlineresource metadata (if provided) in the following order:
 1. wcs_service_onlineresource
 2. ows_service_onlineresource
 3. wcs_onlineresource (or automatically generated URL, see the onlineresource section of this document)

Layer Object Metadata

wcs_abstract

- *Description:* (Optional) A brief description of the service, maps to ows:Abstract (WCS 1.1+ only).

wcs_description

- *Description:* (Optional) A description of the layer.

wcs_enable_request (or ows_enable_request)

- *Description:* Space separated list of requests to enable. The default is none. The following requests can be enabled: *GetCapabilities*, *GetCoverage* and *DescribeCoverage*. A “!” in front of a request will disable the request. “*” enables all requests.
- *Examples:*

To enable only *GetCapabilities* and *GetCoverage*:

```
"wcs_enable_request" "GetCapabilities GetCoverage"
```

To enable all requests except *GetCapabilities*

```
"wcs_enable_request" "* !GetCapabilities"
```

wcs_extent

- *Description:* (Optional) Bounding box of layer, which must be provided for tiled data. Comma-delimited, in the format of: minx,miny,maxx,maxy

wcs_formats

- *Description:* (Optional) The formats which may be requested for this layer, separated by a space. (e.g. “GTiff MrSID”)

wcs_keywords

- *Description:* (Optional) Short words for catalog searching.

wcs_label

- *Description:* (Required) A human-readable label for the layer.

wcs_metadatalink_format

- *Description:* (Optional) The file format MIME type of the metadata record (e.g. “text/plain”). The web metadata *wcs_metadatalink_type* and *wcs_metadatalink_href* must also be specified.

wcs_metadatalink_href

- *Description:* (Optional) The URL to the layer's metadata. The web metadata `wcs_metadatalink_format` and `wcs_metadatalink_type` must also be specified.

wcs_metadatalink_type

- *Description:* (Optional) The standard to which the metadata complies. Currently only two types are valid: “TC211” which refers to [ISO 19115], and “FGDC” which refers to [FGDC-STD-001-1988]. The web metadata `wcs_metadatalink_format` and `wcs_metadatalink_href` must also be specified.

wcs_name

- *Description:* (Optional) A name for the layer.

wcs_nativeformat

- ***Description:* (Optional) The current format of the served raster** layer. (e.g. “GTiff”) (used for WCS 1.0)

wcs_native_format

- ***Description:* (Optional) The mime-type of the current format of the** served raster layer (e.g. “image/tiff”). This field is used when coverage metadata is provided by the layer metadata only (when `wcs_extent` and `wcs_size/wcs_resolution` are set). When set, WCS 2.0 GetCoverage requests will use this format when no other format is specified (the format parameter is optional then).

Axes Descriptions

MapServer allows you define a number of these for a layer. Individual axis are identified by name when defining specific metadata (e.g. `description`). All defined axes must be listed in the `rangeset_axes` metadata tag so MapServer knows in advance what to expect. A special rangeset for multiband date is automatically generated by adding the name “bands” to the `rangeset_axes` list. If found MapServer will automatically generate metadata for the image bands. You may of course extend that basic support using the naming conventions below.

wcs_rangeset_axes

- *Description:* (Optional) Delimited list of defined range sets. If defined, you can also use the following nine metadata items, where `rangeset axis` matches the axis name provided in this `wcs_rangeset_axes` metadata:

```
{rangeset axis}_semantic
{rangeset axis}_refsys
{rangeset axis}_refsyslabel
{rangeset axis}_description
{rangeset axis}_label
{rangeset axis}_values
{rangeset axis}_values_semantic
{rangeset axis}_values_type
{rangeset axis}_interval
```

wcs_rangeset_label

- *Description:* (Required for `DescribeCoverage` request)

wcs_rangeset_name

- *Description:* (Required for `DescribeCoverage` request)

wcs_srs

- *Description:* (Optional) Spatial reference system of the layer, in the form of: EPSG:code (e.g. EPSG:42304)

wcs_timeitem

- *Description:* (Optional) The attribute in the spatio/temporal index that contains time values.

wcs_timeposition

- *Description:* (Optional) A list of the start and end time of a given coverage (i.e. “2000-11-11T11:11:11Z,2001-11-11T11:11:11Z”), used when advertising GetCapabilities.

10.13.8 Rules for handling SRS in a MapServer WCS

TODO!

10.13.9 Spatio/Temporal Indexes

MapServer has long supported a method of breaking a dataset into smaller, more manageable pieces or tiles. In this case a shapefile is used to store the boundary of each tile, and an attribute holds the location of the actual data. Within a MapServer mapfile the layer keywords TILEINDEX and TILEITEM are used to activate tiling.

Consider the example where an organization wants to serve hundreds or even thousands of MODIS scenes. Five images cover the spatial extent and each group of five varies by date of acquisition. This turns out to be a fairly common scenario for organizations interested in WCS, one that the existing tiling support does not adequately address. In previous versions of MapServer a developer would have to create one tile index and one layer definition for each group of five images. This could result in configuration files that are prohibitively long and difficult to manage.

In order to more efficiently support the WCS specification a new tiling scheme has been implemented within MapServer. One that supports spatial sub-setting, but also ad hoc sub-setting based on any attributes found within tile index. In many cases a temporal attribute could be used, but sub-setting is not limited to that case. The new scheme introduces the concept of tile index layers, that is, a separate layer definition is used to describe the tile index dataset. With this we get all the benefits of any MapServer layer, most importantly we can apply MapServer filters to the data. Filters can be defined at runtime using MapServer CGI, MapScript or via the WCS server interface. The syntax for the layer using the index remains unchanged except that the value for *Tile Indexes* refers to the index layer instead of an external shapefile.

So, looking at the example above again we can reduce our MapServer configuration to two layer definitions, one for the tile index and one for the imagery itself. Extracting a single dates worth of imagery is now a matter of setting the appropriate filter within the tile index layer.

Building Spatio-Temporal Tile Indexes

Developing these tile indexes is more difficult than basic indexes simply because there are no ready-made tools to do so. Fortunately we can leverage existing tool available within MapServer or supporting libraries such as GDAL by post processing their output.

Taking the above example, building an index is relatively simple task if you are willing to roll up your sleeves and write a bit of code. First, the basic spatial index needs to be built. The GDAL utility gdaltindex already does this. Simply point gdaltindex at the directory containing the collection of MODIS images and it will build a shapefile index suitable for use with MapServer. The next step would be to add the temporal information. The pseudo code would look something like:

- open the index .dbf file for reading
- create a new column to hold the image acquisition date
- for each image; 1) extract the image acquisition date and 2) insert it into the new column
- close the index .dbf file

This general approach could be used for many cases. A scripting language such as Perl, PHP or Python works well since they all have readily available modules for manipulating .dbf files. A worst case would involve hand editing the resulting .dbf file using a desktop tool such as Microsoft Access or ESRI Arcview.

10.13.10 WCS 2.0 Application Profile - Earth Observation (EO-WCS)

OGC is currently discussing the adoption of an Earth Observation (EO) Application Profile for WCS 2.0 (EO-WCS) (see [public RFC on EO-WCS](#)). For an implementation please refer to the Open Source project [EOxServer](#) which already implements this proposed EO-WCS based on MapServer.

10.13.11 To-do Items and Known Limitations

- MapServer does not derive all of the metadata it could from a given dataset. For example, you must explicitly list time periods covered by a layer. This should get better with time.
- Only spatial, simple temporal and radiometric band subsetting is possible with the current implementation. Future enhancements should allow for arbitrary subsets based on pixel values or tile/image attributes.
- The available set of WCS 2.0 specification documents is not yet complete. Thus, for some implementation details, the content of some forthcoming extensions had to be anticipated based on the approaches taken for WCS 1.1 and 1.0. The implementation will be adjusted as soon as new specification documents become available.
- If you want to use libxml2 or its derived tools (like xmllint) for validation be aware that there is a currently bug in libxml2 that breaks the validation of GML 3.2.1.

10.14 WCS Use Cases

Author Norman Barker

Contact nbarker at ittvis.com

Author Gail Millin

Contact nbarker at ittvis.com

Revision \$Revision\$

Date \$Date\$

Last Updated 2005/12/12

Contents

- [WCS Use Cases](#)
 - Landsat
 - SPOT
 - DEM
 - NetCDF

This document explains how to use MapServer to deliver Landsat, SPOT, DEM, and NetCDF temporal/banded data through the MapServer WCS interface. Thanks go to Steve Lime and Frank Warmerdam for their assistance with these projects

10.14.1 Landsat

To serve Landsat imagery through the MapServer Web Coverage Service specify the **OUTPUTFORMAT** object. For format support install the GDAL library and from the command prompt and cd to where GDAL is installed and use the command, gdalinfo –formats. A list of all supported formats will appear and will specify if the format is read only <ro> or read and write <rwd> for WCS the format needs to be supported for read and write (except for GDAL's own WCS format, however).

For the example below the Landsat 7 15m resolution mosaic is in a Enhanced Compressed Wavelets format (ECW). By running the gdalinfo.exe program I could verify that the ECW format has write permissions, therefore the format can be specified in the MapFile and requested using the GetCoverage request.

```
OUTPUTFORMAT
  NAME "ECW"
  DRIVER "GDAL/ECW"
  MIMETYPE "image/ecw"
  IMAGEMODE "BYTE"
  EXTENSION "ecw"
END

LAYER
  NAME "Landsat7"
  STATUS OFF
  TYPE RASTER
  PROCESSING "SCALE=AUTO"
  UNITS Meters
  TILEINDEX "MapServer/wcs/landsat7/17mosaic15m.shp"
  TILEITEM "Location"
  METADATA
    "wcs_description" "Landsat 7 15m resolution mosaic"
    "wcs_name" "Landsat7"
    "wcs_label" "Landsat 7 15m resolution mosaic"
    "ows_srs" "EPSG:27700"
    "ows_extent" "0 0 700005 1050000"
    "wcs_resolution" "75 75"
    "wcs_bandcount" "3"
    "wcs_formats" "ECW"
    "wcs_enable_request" "*"
  END
END
```

A GetCoverage request can then be requested (using the parameters set in the MapFile) by creating a URL with the elements: - Your Server, MapServer Program, Location of MapFile, Type of Service (WCS), Request (GetCoverage), Coverage (Landsat7), BBOX (0,0,700005,1050000), CRS (EPSG:27700), ResX (75) ResY (75), Format (ECW).

10.14.2 SPOT

SPOT imagery can be delivered through MapServer Web Coverage Service similarly to the Landsat example above. The main difference is that as SPOT is a greyscale image the wcs_bandcount = 1 rather than a Landsat image which consists of 3 bands. For this example the well known GeoTiff format will be used to demonstrate what to specify in a MapFile for SPOT data.

```
OUTPUTFORMAT
  NAME "GEOTIFF"
  DRIVER "GDAL/GTiff"
  MIMETYPE "image/tiff"
  IMAGEMODE "BYTE"
```

```

EXTENSION "tif"
END
LAYER
  NAME "SPOT"
  STATUS OFF
  TYPE RASTER
  PROCESSING "SCALE=AUTO"
  UNITS Meters
  TILEINDEX "MapServer/wcs/orthospot/spot.shp"
  TILEITEM "Location"
  METADATA
    "wcs_description" "Orthospot mosaic"
    "wcs_name" "SPOT"
    "wcs_label" "Orthospot mosaic"
    "ows_srs" "EPSG:27700"
    "ows_extent" "375960 64480 497410 200590"
    "wcs_resolution" "100 100"
    "wcs_bandcount" "1"
    "wcs_formats" "GEOTIFF"
    "wcs_nativeformat" "8-bit GeoTIF"
    "wcs_enable_request" "*"
  END
END

```

The key parameters to specify in the WCS MapFile for any data layer and format are:

- Layer Name = Create a short name for the data
- Layer Type = Raster

The following examples further demonstrate how WCS can be implemented and also how to create WCS containing layers with a temporal dimension (see NetCDF example).

10.14.3 DEM

It is possible to deliver 16 bit DEM data through the MapServer Web Coverage Service.

Firstly it is necessary to specify the output format in the map file

```

OUTPUTFORMAT
  NAME "GEOTIFFINT16"
  DRIVER "GDAL/GTiff"
  MIMETYPE "image/tiff"
  IMAGEMODE "INT16"
  EXTENSION "tif"
END

```

and the corresponding layer

```

LAYER
  NAME "srtm"
  STATUS OFF
  TYPE RASTER
  DATA "srtm.tif"
  PROJECTION
    "init=epsg:4326"
  END
  METADATA
    "wcs_label" "SRTM WCS TIF Server"

```

```
"ows_extent" "-180 -90 180 90"
"wcs_resolution" "0.00083 -0.00083"
"ows_srs" "EPSG:4326"
"wcs_formats" "GEOTIFFINT16"
"wcs_nativeformat" "geotiff"
"wcs_enable_request" "*"
END
END
```

Performance gains can be made by using the gdaladdo utility described at http://www.gdal.org/gdal_utilities.html#gdaladdo

10.14.4 NetCDF

Firstly GDAL doesn't support all versions of netCDF (there are a lot, it is a generic format), so for stability it may be necessary to convert the files into GeoTiff format first. This can be achieved using the netCDF libraries here <http://my.unidata.ucar.edu/content/software/netcdf/index.html>. Denis Nadeau and Frank Warmerdam have added netCDF CF as a read only format within GDAL, so it now possible to read the CF convention netCDF files directly from disk.

We placed the Z-levels in the bands of the GDAL data file (either GeoTiff or netCDF), and created a shape index for the time levels. GDAL data is a 2-D format (x,y) and bands. netCDF is an N-D file format, supporting time, x,y,z, and experiment parameters. By using a set of GDAL netCDF / geoTiff files it is possible to represent this, and to store the z-level (height) as bands within the data file. Although a hack, it is possible for a custom client to receive important metadata from the describeCoverage operation of a WCS about the which z-level a band of a geotiff represents by encoding this in the returned axes description tag.

To create the shape file for the temporal dimension we had to do some hacking with Java code, but we also got it to work with Steve Lime's perl script in the MODIS MapServer demo download (which doesn't seem to be available now).

The perl script used in Modis demo by Steve Lime is as follows, and I have placed inline comments below. The script assumes that gdaltindex has already been run in this directory to create a tile index shape and dbf file. It assumes that the filenames of your data files have the date in the filename, for example myfileYYYYMMDDHH.tif

```
1  #!/usr/bin/perl
2  use XBase;
3  opendir(DIR, '.'); # open the current directory
4  foreach $file (readdir(DIR)) {
5      next if !($file =~ /\.dbf$/); # read the dbf file in this directory created by gdaltindex
6      print "Working on $file...\n";
7      $tfile = 'temporary.dbf';
8      system("mv $file $tfile");
9      $oldtable = new XBase $tfile or die XBase->errstr;
10     print join("\t", $oldtable->field_names) ."\n";
11     print join("\t", $oldtable->field_types) ."\n";
12     print join("\t", $oldtable->field_lengths) ."\n";
13     print join("\t", $oldtable->field_decimals) ."\n";
14     $newtable = XBase->create("name" => $file,
15                                "field_names" => [$oldtable->field_names, "IMDATE"], # this is the FILTERITEM in
16                                "field_types" => [$oldtable->field_types, "C"], # character column type
17                                "field_lengths" => [$oldtable->field_lengths, 13], # length of the date string
18                                "field_decimals" => [$oldtable->field_decimals, undef]) or die "Error creating new
19     foreach (0 .. $oldtable->last_record) {
20         ($deleted, @data) = $oldtable->get_record($_);
21         print "...record $data[0]\n";
22         # extract the date
```

```

23     $year = substr $data[0], 8, 4; # year is at position 8 in the filename string
24     $month = substr $data[0], 12, 2; # month is at position 12 in the filename string
25     $day = substr $data[0], 14, 2; # day is at position 14 in the filename string
26     $hour = substr $data[0], 16, 2; # hour is at position 16 in the filename string
27     $date = "$year-$month-$day" . "T" . "$hour\n"; # format is YYYY-MM-DDTHH, or any ISO format
28     print "$date";
29     push @data, "$date";
30     $newtable->set_record($_, @data);
31 }
32 $newtable->close();
33 $oldtable->close();
34 unlink($tfile);
35 }
```

If have used the perl script then skip to the layer definitions below, if you wish to code your own the description is here.

The DBF file has to have the column ‘location’ that indicates the location of the data file (either absolute path or relative to the map file location, and the second column that can be called whatever you want but indexes time. In our case we called it ‘time’ :-)

The corresponding shapefile then has to contain Polygons with the bounding boxes of the tif file for each time. So OGRInfo timeIndex.shp looks something like:

```

OGRFeature(timeIndex):116
  location(String) = mytime.tif
  time(String) = 2001-01-31T18:00:00
  POLYGON ((xxxx,xxxx,.....))
```

Define your output format as

```

OUTPUTFORMAT
  NAME "GEOTIFF_FLOAT"
  DRIVER 'GDAL/GTiff'
  MIMETYPE 'image/tiff'
  IMAGEMODE FLOAT32
  EXTENSION 'tif'
END
```

Then you need to define your tile index within the map file

```

LAYER
  NAME 'time_idx'
  TYPE TILEINDEX
  DATA 'timeIndex'
  FILTERITEM 'time'
  FILTER '%time%'
END
```

and the actual layer

```

LAYER
  NAME 'TempData'
  STATUS OFF
  TYPE RASTER
  TILEINDEX 'time_idx'
  PROJECTION
    "init=epsg:4326"
  END
  METADATA
```

```
"wcs_label" 'Temperature data'
"ows_extent" '-180 -90 180 90'
"wcs_resolution" '1.125 -1.125'
"ows_srs" 'EPSG:4326'
"wcs_formats" 'GEOTIFF_FLOAT'
"wcs_nativeformat" 'netCDF'
"wcs_bandcount" '27'
"wcs_rangeset_axes" 'bands'
"wcs_rangeset_label" 'Pressure (hPa units) Levels'
"wcs_rangeset_name" 'bands'
"wcs_rangeset_description" 'Z levels'
"wcs_timeposition" '2001-01-01T06:00:00,2001-01-01T12:00:00,2001-01-01T18:00:00,2001-01-02T00:00'
"wcs_timeitem" 'time'
"wcs_enable_request" "*"
END
END
```

The TempData coverage layer will now let you subset with the &bands=... &time=... subset parameters!

To do a coordinate reprojection specify in the request &Response_CRS=EPSG:xxxx

When you start doing temporal subsetting with WCS and MapServer you can see the need for an automatic way of generating map files such as using an XSL stylesheet!

For a tile-index layer you need to provide the following extra metadata in order to use it for WCS:

```
"OWS_EXTENT" "10050 299950 280050 619650"
"WCS_RESOLUTION" "100 100"
"WCS_SIZE" "2700 3197"
"WCS_BANDCOUNT" "3"
```

If your image has a colortable and only one band, it will come out greyscale unless you set the IMAGEMODE to PC256 instead of BYTE.

10.15 SOS Server

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Revision \$Revision\$

Date \$Date\$

Last Updated 2007/12/06

Table of Contents

- SOS Server
 - Introduction
 - Setting Up an SOS Server Using MapServer
 - Limitations / TODO
 - Reference Section
 - Use of sos_procedure and sos_procedure_item

10.15.1 Introduction

SOS (Sensor Observation Service), currently an OGC discussion paper, is part of the OGC's SensorWeb Enablement (SWE) group of specifications. These specifications describe how applications and services will be able to access sensors of all types over the Web. Specifically, SOS provides an API for managing deployed sensors and retrieving sensor data.

SOS support is available in MapServer 4.10.0 or more recent. Note that no client tools currently exist in MapServer for SOS. More SWE based software is available at <http://www.52north.org/>

SOS support was implemented in MapServer to the guidelines of MapServer *MS RFC 13: Support of Sensor Observation Service in MapServer*.

This document assumes that you are already familiar with certain aspects of MapServer:

- MapServer application development and setting up .map files.

Links to SOS-Related Information

- SOS discussion paper
- Sensor Web Enablement and OpenGIS SensorWeb

Relevant Definitions

The following is taken from the SOS discussion paper:

Observation An observation is an event with a result which has a value describing some phenomenon.

Observation Offering An observation offering is a logical grouping of observations offered by a service that are related in some way.

Observed Value A value describing a natural phenomenon, which may use one of a variety of scales including nominal, ordinal, ratio and interval.

Sensor An entity capable of observing a phenomenon and returning an observed value. A sensor can be an instrument or a living organism (e.g. a person).

10.15.2 Setting Up an SOS Server Using MapServer

Install the Required Software

SOS requests are handled by the “*mapserv*” CGI program. The first step is to check that your mapserv executable includes SOS support. One way to verify this is to use the “-v” command-line switch and look for “SUPPORTS=SOS_SERVER”.

Example 1. On Unix:

```
$ ./mapserv -v
MapServer version 4.9 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP
OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER
SUPPORTS=WMS_CLIENT SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT
SUPPORTS=WCS_SERVER SUPPORTS=SOS_SERVER SUPPORTS=THREADS INPUT=JPEG
INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE DEBUG=MSDEBUG
```

Example 2. On Windows:

```
C:\Apache\cgi-bin> mapserv -v
MapServer version 4.9 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP
OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER
SUPPORTS=WMS_CLIENT SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT
SUPPORTS=WCS_SERVER SUPPORTS=SOS_SERVER SUPPORTS=THREADS INPUT=JPEG
INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE DEBUG=MSDEBUG
```

If you don't have SOS support in your MapServer build, then you must compile MapServer with the following in mind:

- flag *-DUSE_SOS_SVR* is required
- requires either *-DUSE_WMS_SVR* or *-DUSE_WFS_SVR* flags to be enabled
- requires libxml2 and proj libraries
- requires ICONV support (*-DUSE_ICONV*) on Windows

For more help with MapServer compilation see the appropriate HowTo: [Unix](#) / [Windows](#)

Configure a Mapfile For SOS

Each instance of SOS server that you setup needs to have its own mapfile. It is just a regular MapServer mapfile in which some parameters and some metadata entries are mandatory. Most of the metadata is required in order to produce a valid GetCapabilites output.

Here is the list of parameters and metadata items that usually optional with MapServer, but are **required (or strongly recommended) for a SOS configuration**:

MAP level:

- Map NAME
- Map PROJECTION
- Map Metadata (in the WEB Object):
 - *sos_title*
 - *sos_onlineresource*
 - *sos_srs*
 - *sos_enable_request*
 - see the [Reference Section](#) of this document for a full list of metadata and descriptions

LAYER level:

- Layer NAME
- Layer PROJECTION
- Layer METADATA
 - *sos_offering_id*
 - *sos_observedproperty_id*
 - *sos_describesensor_url*
 - see the [Reference Section](#) of this document for a full list of metadata and descriptions

Onlinerelource URL

The `sos_onlinerelource` metadata is set in the map's web object metadata and specifies the URL that should be used to access your server. This is required for the GetCapabilities output. If `sos_onlinerelource` is not provided then MapServer will try to provide a default one using the script name and hostname, but you shouldn't count on that too much. It is strongly recommended that you provide the `sos_onlinerelource` metadata.

Here is a valid online resource URL:

```
http://my.host.com/cgi-bin/mapserv?map=mysos.map&
```

By creating a wrapper script on the server it is possible to hide the “`map=`” parameter from the URL and then your server's online resource URL could be something like:

```
http://my.host.com/cgi-bin/mapserv?
```

This is covered in more detail in the “More About the Online Resource URL” section of the [WMS Server](#) document.

Example SOS Server Mapfile

The following is an example of a bare minimum SOS Server mapfile. Note the comments for the required parameters.

```
MAP
  NAME "SOS_DEMO"
  STATUS ON
  SIZE 300 300
  EXTENT -66 44 -62 45
  UNITS METERS
  SHAPEPATH "./data/"
  IMAGECOLOR 255 255 0
  SYMBOLSET "./etc/symbols.sym"

  IMAGETYPE png

WEB
  IMAGEPATH "/ms4w/tmp/ms_tmp/"
  IMAGEURL "/ms_tmp/"

METADATA
  "sos_onlinerelource" "http://127.0.0.1/mapserv?map=/sos/sos_test.map" ## REQUIRED
  "sos_title" "My SOS Demo Server" ## Recommended
  "sos_srs" "EPSG:4326" ## REQUIRED
  "sos_enable_request" "*" # Necessary
END
END

PROJECTION
  "init=epsg:4326"
END

LAYER
  NAME "test_sos_layer"
  METADATA
    "sos_procedure" "NS01EE0014" ## REQUIRED
    "sos_offering_id" "WQ1289" ## REQUIRED
    "sos_observedproperty_id" "Water Quality" ## REQUIRED
    "sos_describesensor_url" "http://some/url/NS01EE0014.xml" ## REQUIRED
END
```

```
TYPE POINT
STATUS ON
DATA "sos_test"

PROJECTION
    "init=epsg:4326"
END

CLASS
    NAME "water quality"
    STYLE
        COLOR 255 0 0
        SYMBOL "circle"
        SIZE 8
    END
END
END

END #map
```

Test Your SOS Server

GetCapabilities Request

The GetCapabilities request allows the clients to retrieve service metadata about a specific service instance. For an SOS service, it allows to identify such things as offerings and observed property available, as well as information on sensors that are used.

Using a web browser, access your server's online resource URL to which you add the parameters “SERVICE=SOS&REQUEST=GetCapabilities” to the end, e.g.

```
http://my.host.com/cgi-bin/mapserv?MAP=mysos.map&SERVICE=SOS&REQUEST=GetCapabilities
```

If everything went well, you should have a complete XML capabilities document. Search it for the word “WARNING”... MapServer inserts XML comments starting with “<!--WARNING: ” in the XML output if it detects missing mapfile parameters or metadata items. If you notice any warning in your XML output then you have to fix all of them before you can try your server with an SOS client, otherwise things are likely not going to work.</p>

Note: The SERVICE parameter is required for all SOS requests.

GetObservation Request

The GetObservation request is designed to query sensor systems to retrieve observation data in the form defined in the Observation and Measurement specification (O&M), and more information on this O&M spec can be found at <http://www.opengeospatial.org/functional/?page=swe>. Upon receiving a GetObservation request, a SOS shall either satisfy the request or return an exception report.

The following is a list of the possible parameters for a GetObservation request:

request: (Required) value must be “GetObservation”.

service: (Required) value must be “SOS”.

version: (Required) value must be “1.0.0”.

offering: (Required) The Offering identified in the capabilities document.

observedProperty: (Required) The property identified in the capabilities document.

responseFormat: (Required) The format / encoding to be returned by the response.

eventTime (Optional) Specifies the time period for which observations are requested.

procedure: (Optional) The procedure specifies the sensor system used. In this implementation, the procedure is equivalent to be the sensor id that will be used when doing a DescribeSensor request.

featureOfInterest: (Optional) In this implementation, this will be represented by a gml envelope defining the lower and upper corners.

Result: (Optional) The Result parameter provides a place to put OGC filter expressions based on property values.

resultModel: (Optional) Identifier of the result model to be used for the requested data. The resultModel values supported by a SOS server are listed in the contents section of the service metadata (GetCapabilities). MapServer currently supports om:Observation and om:Measurement. om:Measurement provides a flat model of the geometry and attributes, similar to WFS GetFeature output. om:Observations provides a more compact definition which includes an XML header of the field names and definitions, followed by a “DataBlock” of delimited records (default is CSV delimited output). The default output is om:Measurement.

srsName: (Optional) srs (EPSG code) of the output response.

Here are some valid examples:

Example 1:

```
http://127.0.0.1/cgi-bin/mapserv.exe?map=D:/ms4w/apps/sos/sos_test.map&
Request=GetObservation&service=SOS&Offering=WQ1289&
observedproperty=Water Quality&version=1.0.0&
responseFormat=text/xml; subtype="om/1.0.0"
```

Example 2:

```
http://127.0.0.1/cgi-bin/mapserv.exe?map=D:/ms4w/apps/sos/sos_test.map&
Request=GetObservation&service=SOS&Offering=WQ1289&
observedproperty=Water Quality&eventtime=<ogc:TM_Equals><gml:TimePeriod>
<gml:beginPosition>1991-05-01</gml:beginPosition><gml:endPosition>
1993-02-02</gml:endPosition></gml:TimePeriod></ogc:TM_Equals>
&result=<Filter><Or><PropertyIsEqualTo><PropertyName>COLOUR
</PropertyName><Literal>180</Literal></PropertyIsEqualTo>
<PropertyIsEqualTo><PropertyName>COLOUR</PropertyName><Literal>200
</Literal></PropertyIsEqualTo></or></Filter>&version=1.0.0
&responseFormat=text/xml; subtype="om/1.0.0"
```

Example 3:

```
http://127.0.0.1/cgi-bin/mapserv.exe?map=D:/ms4w/apps/sos/sos_test.map&
Request=GetObservation&service=SOS&Offering=WQ1289&
observedproperty=Water Quality&featureofinterest=<gml:Envelope>
<gml:lowerCorner srsName='EPSG:4326'>-66 43</gml:lowerCorner>
<gml:upperCorner srsName='EPSG:4326'>-64 45</gml:upperCorner>
</gml:Envelope>&version=1.0.0&
responseFormat=text/xml; subtype="om/1.0.0"
```

Example 4:

```
http://127.0.0.1/cgi-bin/mapserv.exe?map=D:/ms4w/apps/sos/sos_test.map&
Request=GetObservation&service=SOS&Offering=WQ1289&
observedproperty=Water Quality&version=1.0.0&
responseFormat=text/xml; subtype="om/1.0.0"&resultModel=om:Observation
```

DescribeSensor Request

The DescribeSensor request gives the client the ability to retrieve the characteristics of a particular sensor and return the information in a SensorML xml document. In this implementation, MapServer does not generate the SensorML document but only redirect the request to an existing SensorML document.

The following is a list of the possible parameters for a DescribeSensor request:

- request:** (Required) value must be “DescribeSensor”
- service:** (Required) value must be “SOS”.
- version:** (Required) value must be “1.0.0”.
- procedure:** (Required) This is the sensor id, which was specified in the “sos_procedure” metadata.
- outputFormat:** (Required) The format encoding to be returned by the response.

Here is a valid example:

```
http://127.0.0.1/cgi-bin/mapserv.exe?map=D:/ms4w/apps/sos/sos_test.map&
Request=DescribeSensor&procedure=urn:ogc:def:procedure:NS01EE0014&
service=SOS&version=1.0.0&outputFormat=text/xml; subtype="sensorML/1.0.0"
```

10.15.3 Limitations / TODO

1. Have MapServer generate the SensorML document, instead of redirecting the request to an existing SensorML document.

10.15.4 Reference Section

The following metadata are available in the setup of the SOS Server mapfile:

Note: Each of the metadata below can also be referred to as ‘ows_’ instead of ‘sos_’. MapServer tries the ‘sos_’ metadata first, and if not found it tries the corresponding ‘ows_’ name. Using this reduces the amount of duplication in mapfiles that support multiple OGC interfaces since “ows_” metadata can be used almost everywhere for common metadata items shared by multiple OGC interfaces.

Web Object Metadata

ows_language

- *Description:* (Optional) Descriptive narrative for more information about the server. Identifier of the language used by all included exception text values. These language identifiers shall be as specified in IETF RFC 1766. When this attribute is omitted, the language used is not identified. Examples: “en-CA”, “fr-CA”, “en-US”. Default is “en-US”.

ows_schemas_location

- *Description:* (Optional) (Note the name ows_schemas_location and not sos/_... this is because all OGC Web Services (OWS) use the same metadata) Root of the web tree where the family of OGC SOS XMLSchema files are located. This must be a valid URL where the actual .xsd files are located if you want your SOS output to validate in a validating XML parser. Default is <http://www.opengeospatial.net/sos>. See <http://ogc.dmsolutions.ca> for an example of a valid schema tree.

ows_updatesequence

- *Description:* (Optional) The updateSequence parameter can be used for maintaining the consistency of a client cache of the contents of a service metadata document. The parameter value can be an integer, a timestamp in [ISO 8601:2000] format, or any other number or string.

sos_abstract

- *Description:* (Optional) Descriptive narrative for more information about the server.

sos_accessconstraints

- *Description:* (Optional) Text describing any access constraints imposed by the service provider on the SOS or data retrieved from this service.

sos_addressstype, sos_address, sos_city, sos_country, sos_postcode, sos_stateorprovince

- *Description:* Optional contact address information. If provided then all six metadata items are required.

sos_contactelectronicmailaddress

- *Description:* Optional contact Email address.

sos_contactfacsimiletelephone

- *Description:* Optional contact facsimile telephone number.

sos_contactinstructions

- *Description:* (Optional) Supplemental instructions on how or when to contact the individual or organization.

sos_contactorganization, sos_contactperson, sos_contactposition

- *Description:* Optional contact information. If provided then all three metadata items are required.

sos_contactvoicetelephone

- *Description:* Optional contact voice telephone number.

sos_enable_request (or ows_enable_request)

- *Description:* Space separated list of requests to enable. The default is none. The following requests can be enabled: *GetCapabilities*, *GetObservation* and *DescribeSensor*. A “!” in front of a request will disable the request. “*” enables all requests.

- *Examples:*

To enable only *GetCapabilities* and *GetObservation*:

```
"sos_enable_request" "GetCapabilities GetObservation"
```

To enable all requests except *GetCapabilities*

```
"sos_enable_request" "* !GetCapabilities"
```

sos_encoding_blockSeparator

- *Description:* (Optional) For GetObservation requests using resultModel=om:Observation (SWE DataBlock encoding). Record separator to be used. Default is ‘\n’

sos_encoding_tokenSeparator

- *Description:* (Optional) For GetObservation requests using resultModel=om:Observation (SWE DataBlock encoding). Token (field) separator to be used. Default is ‘,’

sos_fees

- *Description:* (Optional) Fees information. Use the reserved word “none” if there are no fees.

sos_hours of service

- *Description:* (Optional) Time period (including time zone) when individuals can contact the organization or individual.

sos_keywordlist

- *Description:* (Optional) A comma-separated list of keywords or keyword phrases to help catalog searching.

sos_maxfeatures

- *Description:* (Optional) The number of elements to be returned by the SOS server. If not set all observations are returned

sos_onlineresource

- *Description:* (Required) The URL that will be used to access this OGC server. This value is used in the GetCapabilities response.
- See the section “Onlineresource URL” above for more information.

sos_role

- *Description:* (Optional) Function performed by the responsible party. Possible values of this Role shall include the values and the meanings listed in Subclause B.5.5 of ISO 19115:2003.

sos_service_onlineresource

- *Description:* (Optional) Top-level onlineresource URL.

sos_srs

- *Description:* (Required) Contains a list of EPSG projection codes that should be advertised as being available for all layers in this server. The value can contain one or more EPSG:<code> pairs separated by spaces (e.g. “EPSG:4269 EPSG:4326”) This value should be upper case (EPSG:42304.....not epsg:42304) to avoid problems with case sensitive platforms.

sos_title

- *Description:* (Recommended) A human-readable name for this Layer.

Layer Object Metadata

sos_describesensor_url

- *Description:* (Required) This metadata item is only a temporary measure until the describe sensor is generated from MapServer. Right now when a DescribeSensor request is sent with a procedure (sensorid), it will redirect it to the url defined by this metadata item.
- In MapServer 5.0, it is possible to use variable substitution on the url. For example “sos_describesensor_url” “<http://foo/foo?mysensor=%procedure%>” will substitute the %procedure% in the metadata with the procedure value coming from the request.

```
"sos_describesensor_url" "http://some/url/NS01EE0014.xml"
```

sos_enable_request (or ows_enable_request)

- *Description:* Space separated list of requests to enable. The default is none. The following requests can be enabled: *GetCapabilities*, *GetObservation* and *DescribeSensor*. A “!” in front of a request will disable the request. “*” enables all requests.

- *Examples:*

To enable only *GetCapabilities* and *GetObservation*:

```
"sos_enable_request" "GetCapabilities GetObservation"
```

To enable all requests except *GetCapabilities*

```
"sos_enable_request" "* !GetCapabilities"
```

sos_[item name]_alias

- *Description:* (Optional) An alias for an attribute’s name that will be returned when executing a *GetObservation* request.

sos_[item name]_definition

- *Description:* (Optional) An associated definition (usually a URN) for a component, that will be returned when executing a *GetObservation* request. Default is “urn:ogc:object:definition”

sos_[item name]_uom

- *Description:* (Optional) An associated unit of measure URN) for a component, that will be returned when executing a *GetObservation* request. Default is “urn:ogc:object:uom”

sos_observedproperty_authority

- *Description:* (Optional) An associated authority for a given component of an observed property

sos_observedproperty_id

- *Description:* (Required) ID of observed property, possibly in number format.

sos_observedproperty_name

- *Description:* (Optional) Name of observed property, possibly in string format.

sos_observedproperty_version

- *Description:* (Optional) An associated version for a given component of an observed property

sos_offering_description

- *Description:* (Optional) Description of offering.

sos_offering_extent

- *Description:* (Optional) Spatial extents of offering, in *minx*, *miny*, *maxx*, *maxy* format:

```
"sos_offering_extent" "-66, 43, -62, 45"
```

The logic for the bounding box returned as part of the offering is the following:

- note that it is a mandatory element that needs an espg code and lower/upper corner coordinates
- looks for the espg parameter in the first layer of the offering (this could be an ows/sos_srs or a projection object with the espg code (mandatory)
- looks for *sos_offering_extent*. If the metadata is not available, the extents of all layers in the offering will be used to compute it.

Here is an example result from a *GetCapabilities* request:

```
<gml:boundedBy>
  <gml:Envelope>
    <gml:lowerCorner srsName="EPSG:4326">-66 43</gml:lowerCorner>
    <gml:upperCorner srsName="EPSG:4326">-62 45</gml:upperCorner>
  </gml:Envelope>
</gml:boundedBy>
```

sos_offering_id

- *Description:* (Required) ID of offering, possibly in number format.

sos_offering_intendedapplication

- *Description:* (Optional) The intended category of use for this offering.

sos_offering_name

- *Description:* (Optional) Name of offering, possibly in string format.

sos_offering_timeextent

- *Description:* (Optional) Time extent of offering, in the format of “begin/end”. Here is an example:

```
"sos_offering_timeextent" "1990/2006"
```

If end is not specified it will be set to now. Here is an example result from a GetCapabilities request:

```
<sos:eventTime>
  <gml:TimePeriod>
    <gml:beginPosition>1990</gml:beginPosition>
    <gml:endPosition>2006</gml:endPosition>
  </gml:TimePeriod>
</sos:eventTime>
```

sos_procedure

- *Description:* (Required) Normally a sensor unique id. One per layer:

```
"sos_procedure" "NS01EE0014"
```

Note: sos_procedure can also be a list, separated by spaces, i.e.:

```
"sos_procedure" "35 2147 604"
```

All *sos_procedure* links from layers in the offerings will be outputted together, such as the following taken from a GetCapabilities response:

```
<procedure xlink:href="urn:ogc:object:feature:Sensor:3eTI:csci-sensor-1"/>
<procedure xlink:href="urn:ogc:object:feature:Sensor:3eTI:csci-sensor-2"/>
```

sos_procedure_item

- *Description:* (Required if sos_procedure is not present): See section 5 for more details

```
"sos_procedure_item" "attribute_field_name"
```

sos_timeitem

- *Description:* (Optional) Name of the time field. It will be used for queries when a GetObservation request is called with an EVENTTIME parameter. It is layer specific and should be set on all layers.

```
"sos_timeitem" "TIME"
```

10.15.5 Use of sos_procedure and sos_procedure_item

In MapServer 5.0 SOS support has been upgraded to use a new metadata called sos_procedure_item. The value for sos_procedure_item is the field/attribute name containing the procedure values. The use of this metadata as well as the sos_procedure is described here per type of request (refer to <http://trac.osgeo.org/mapserver/ticket/2050> for more description):

It should be noted that, for very large datasets defined only with sos_procedure_item, this may result in costly processing, because MapServer has to process attribute data. It is advised to setup and manage datasets accordingly if dealing with large observation collections.

GetCapabilities

- if sos_procedure is defined, use it
- if not look for sos_procedure_item : procedure values are extracted from the layer's attribute specified by this metadata. Note that this can be time consuming for layers with a large number of features.
- if none is defined return an exception

DescribeSensor

- if sos_procedure is defined, use it
- if not look for sos_procedure_item : procedure values are extracted from the layer's attribute specified by this metadata
- if none is defined return an exception

GetObservation

Both sos_procedure and sos_procedure_item can be define. Here are the cases:

- **case 1** [only sos_procedure is defined.]
 - Use this metadata to match the layer with the procedure value sent in the request
 - When outputting the <member/procedure> output the value of the metadata

Note: If more than one procedure is defined per LAYER object, output observations will have incorrect sos:procedure values, because there is no way to map procedures to observations. This is where sos_procedure_item should be used (i.e. when more than one procedure makes up a LAYER object).

-
- **case 2: only procedure_item is defined.**
 - Use the sos_procedure_item and do a query on the layer to match the procedure with the layer.
 - When outputting the <member/procedure> use the procedure_item as a way to only output the attribute value corresponding to the feature.
 - **case 3: both are defined.**
 - check in sos_procedure to match the procedure with the layer.

- When outputting the <member/procedure> use the procedure_item as a way to only output the attribute value corresponding to the feature.

10.16 How to set up MapServer as a client to access a service over https

Revision \$Revision: 12521 \$

Date \$Date: 2011-09-06 19:48:20 +0200 (Tue, 06 Sep 2011) \$

Table of Contents

- How to set up MapServer as a client to access a service over https
 - Introduction
 - Requirements
 - Default Installation (with apt-get install, rpm, manual, etc)
 - Non-Standard Installation (common with ms4w and fgs)
 - Remote Server with a Self-Signed SSL Certificate

10.16.1 Introduction

The following documentation explains how to set up MapServer as a client to access a WMS/WFS server through a secure SSL connection using the HTTPS protocol. It describes the common problems a user could encounter and how to solve them.

10.16.2 Requirements

MapServer 5.4.1 and up, compiled with Curl. Curl must be built with SSL support.

10.16.3 Default Installation (with apt-get install, rpm, manual, etc)

The Curl CA bundle file should be located in the default directory.

Verify your connection with the Curl command line:

```
curl https://targethostname:port/gmap-demo/gmap75.phtml
```

Edit your map file to add the WMS connection URL. For example:

```
CONNECTION "https://domainname:port/cgi-bin/mapserv?map=/path/to/wms.map"
CONNECTIONTYPE WMS
```

If the layer is displayed correctly you do not need to read on.

10.16.4 Non-Standard Installation (common with ms4w and fgs)

If you get the following error, it means that your CA bundle is not found.

```
curl https://localhost:port/gmap-demo/gmap75.phtml
curl: (77) error setting certificate verify locations:
  CAfile: /home/nsavard/fgsfull/share/curl/cacert.pem
  CApth: none
```

It may be caused by the CURL_CA_BUNDLE environment variable pointing to the wrong location or the CA bundle file not being present. Follow the steps below to correct either case.

Set the CURL_CA_BUNDLE environment variable to point to the bundle file (e.g. export CURL_CA_BUNDLE=/path/to/my-ca-bundle.ext where my-ca-bundle.ext could be cacert.pem or ca-bundle.crt).

Download the CA bundle file “cacert.pem” found at <http://curl.haxx.se/docs/caextract.html> or if you have the Curl source you could create the CA bundle by executing “make ca-bundle” or “make ca-firefox” (if you have Firefox and the certutil tool installed). If you used the second choice, the bundle file will be named ca-bundle.crt and will be found in the lib directory under the Curl root directory. See <http://curl.haxx.se/docs/caextract.html> for more details. Store this file in the location pointed to by the URL_CA_BUNDLE environment variable.

Verify your connection using the Curl command line:

```
curl https://targethostname:port/gmap-demo/gmap75.phtml
```

Note: If you use ms4w, osgeo4w or fgs installation, these installers should take care of this problem for you.

10.16.5 Remote Server with a Self-Signed SSL Certificate

If you get the following error, it means that your remote server probably uses a self-signed SSL certificate and the server certificate is not included in your CA bundle file.

```
curl: (60) SSL certificate problem, verify that the CA cert is OK. Details:
error:14090086:SSL routines:SSL3_GET_SERVER_CERTIFICATE:certificate verify failed
More details here: http://curl.haxx.se/docs/sslcerts.html
```

curl performs SSL certificate verification by default, using a "bundle" of Certificate Authority (CA) public keys (CA certs). If the default bundle file isn't adequate, you can specify an alternate file using the --cacert option.

If this HTTPS server uses a certificate signed by a CA represented in the bundle, the certificate verification probably failed due to a problem with the certificate (it might be expired, or the name might not match the domain name in the URL).

If you'd like to turn off curl's verification of the certificate, use the -k (or --insecure) option.

To get the remote server certificate you have to execute this command:

```
openssl s_client -connect domainname:port
```

Copy everything from the “—BEGIN CERTIFICATE—” tag to “—END CERTIFICATE—” tag. Paste it at the end of the my-ca-bundle.ext file.

Verify your connection with the Curl command line:

```
curl https://targethostname:port/gmap-demo/gmap75.phtml
```

Note: If you get the following error, it means that the domain name in the URL request is not corresponding to the one that was declared when creating the remote server certificate.

```
curl: (51) SSL: certificate subject name 'domainname' does not match target host name 'domainname'
```

You have to use the exact same domain name as the one appearing in the “Common Name” prompt used when generating the remote server certificate. You cannot use the remote server ip for instance. It means that the following URL is not acceptable.

```
CONNECTION "https://xxx.xxx.xxx.xxx:port/cgi-bin/mapserv?map=/path/to/wms.map"
CONNECTIONTYPE WMS
```

10.17 MapScript Wrappers for WxS Services

Author Frank Warmerdam

Contact warmerdam at pobox.com

Revision \$Revision\$

Date \$Date\$

Contents

- MapScript Wrappers for WxS Services
 - Introduction
 - Python Examples
 - Perl Example
 - Java Example
 - PHP Example
 - Use in Non-CGI Environments (mod_php, etc)
 - Post Processing Capabilities

10.17.1 Introduction

With the implementation of MapServer [MS RFC 16: MapScript WxS Services](#) in MapServer 4.9, MapScript now has the ability to invoke MapServer’s ability to execute OGC Web Service requests such as WMS, WCS, and WFS as well as capturing the results of processing the requests.

This makes it possible to dynamically configure a map object based on information in the original request, and to capture the output of processing requests for further post-processing.

10.17.2 Python Examples

The following trivial example, in Python, demonstrates a script that internally provides the map name, but otherwise uses normal mapserver processing.

```
import mapscript

req = mapscript.OWSRequest()
req.loadParams()

map = mapscript.mapObj( '/u/www/maps/ukpoly/ukpoly.map' )
map.OWSDispatch( req )
```

The OWSRequest object is used to manage a parsed list of OWS processing options. In the above example they are loaded from the environment using the loadParams() call which fetches and parses them from QUERY_STRING in the same way the `mapserv` executable would.

Then we load a map, and invoke OWSDispatch with the given arguments on that map. By default the results of the dispatched request are written to stdout which returns them back to the client.

The following example ignores all passed in arguments, and manually constructs a request argument by argument. It is likely more useful for testing purposes than for deploying WxS services, but demonstrates direct manipulation of the request object.

```
import mapscript

req = mapscript.OWSRequest()
req.setParameter( 'SERVICE', 'WMS' )
req.setParameter( 'VERSION', '1.1.0' )
req.setParameter( 'REQUEST', 'GetCapabilities' )

map = mapscript.mapObj( '/u/www/maps/ukpoly/ukpoly.map' )
map.OWSDispatch( req )
```

The previous example have all let results be returned directly to the client. But in some cases we want to be able to capture, and perhaps modify the results of our requests in some custom way. In the following example we force the hated OGC required mime type for errors to simple text/xml (warning - non-standard!)

```
import mapscript

req = mapscript.OWSRequest()
req.loadParams()

map = mapscript.mapObj( '/u/www/maps/ukpoly/ukpoly.map' )

mapscript.msIO_installStdoutToBuffer()
map.OWSDispatch( req )

content_type = mapscript.msIO_stripStdoutBufferContentType()
content = mapscript.msIO_getStdoutBufferBytes()

if content_type == 'vnd.ogc.se_xml':
    content_type = 'text/xml'

print 'Content-type: ' + content_type
print
print content
```

This example demonstrates capture capturing output of OWSRequest to a buffer, capturing the “Content-type:” header value, and capturing the actual content as binary data. The msIO_getStdoutBufferBytes() function returns the stdout buffer as a byte array. If the result was known to be text, the msIO_getStdoutBufferString() function could have been used to fetch it as a string instead, for easier text manipulation.

10.17.3 Perl Example

Most of the same capabilities are accessible in all SWIG based mapscript languages. In perl, we could script creation of a request like this:

```
#!/usr/bin/perl

use mapscript;
```

```
$req = new mapscript::OWSRequest();
$req->setParameter( "SERVICE", "WMS" );
$req->setParameter( "VERSION", "1.1.0" );
$req->setParameter( "REQUEST", "GetCapabilities" );

$map = new mapscript::mapObj( "/u/www/maps/ukpoly/ukpoly.map" );

mapscript::msIO_installStdoutToBuffer();

$dispatch_out = $map->OWSDispatch( $req );

printf "%s\n", mapscript::msIO_getStdoutBufferString();
```

One issue in Perl is that there is currently no wrapping for binary buffers so you cannot call msIO_getStdoutBufferBytes(), and so cannot manipulate binary results.

More Perl example code

```
#!/usr/bin/perl
#####
#
# Name:      wxs.pl
# Project:   MapServer
# Purpose:   MapScript WxS example
#
# Author:    Tom Kralidis
#
#####
#
# Copyright (c) 2007, Tom Kralidis
#
# Permission is hereby granted, free of charge, to any person obtaining a
# copy of this software and associated documentation files (the "Software"),
# to deal in the Software without restriction, including without limitation
# the rights to use, copy, modify, merge, publish, distribute, sublicense,
# and/or sell copies of the Software, and to permit persons to whom the
# Software is furnished to do so, subject to the following conditions:
#
# The above copyright notice and this permission notice shall be included in
# all copies of this Software or works derived from this Software.
#
# THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS
# OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY,
# FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL
# THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER
# LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING
# FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER
# DEALINGS IN THE SOFTWARE.
#####

use CGI::Carp qw(fatalsToBrowser);
use mapscript;
use strict;
use warnings;
use XML::LibXSLT;
use XML::LibXML;
```

```

my $dispatch;

# uber-trivial XSLT document, as a file
my $xsltfile = "/tmp/foo.xslt";

# here's the actual document inline for
# testing save and alter $xsltFile above

=comment
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet version="1.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:wfs="http://www.opengis.net/wfs">
  <xsl:output method="xml" indent="yes"/>
  <xsl:template match="/">
    <WFSLayers>
      <xsl:for-each select="//wfs:FeatureType">
        <wfs_layer>
          <name><xsl:value-of select="wfs:Name"/></name>
          <title><xsl:value-of select="wfs:Title"/></title>
        </wfs_layer>
      </xsl:for-each>
    </WFSLayers>
  </xsl:template>
</xsl:stylesheet>
=cut

my $mapfile = "/tmp/config.map";
# init OWSRequest object
my $req = new mapscript::OWSRequest();

# pick up CGI paramters passed
$req->loadParams();

# init mapfile
my $map = new mapscript::mapObj($mapfile);

# if this is a WFS GetCapabilities request, then intercept
# what is normally returned, process with an XSLT document
# and then return that to the client
if ($req->getValueByName('REQUEST') eq "GetCapabilities" && $req->getValueByName('SERVICE') eq "WFS")

  # push STDOUT to a buffer and run the incoming request
  my $io = mapscript::msIO_installStdoutToBuffer();
  $dispatch = $map->OWSDispatch($req);

  # at this point, the client's request is sent

  # pull out the HTTP headers
  my $ct = mapscript::msIO_stripStdoutBufferContentType();

  # and then pick up the actual content of the response
  my $content = mapscript::msIO_getStdoutBufferString();

  my $xml = XML::LibXML->new();
  my $xslt = XML::LibXSLT->new();

  # load XML content

```

```
my $source = $xml->parse_string($content);

# load XSLT document
my $style_doc = $xml->parse_file($xsltfile);
my $stylesheet = $xslt->parse_stylesheet($style_doc);

# invoke the XSLT transformation
my $results = $stylesheet->transform($source);
# print out the result (header + content)
print "Content-type: $ct\n\n";
print $stylesheet->output_string($results);
}

# else process as normal
else {
    $dispatch = $map->OWSDispatch($req);
}
```

10.17.4 Java Example

One benefit of redirection of output to a buffer is that it is thread-safe. Several threads in the same process can be actively processing requests and writing their results to distinct output buffers. This Java example, used to test multi-threaded access demonstrates that.

```
import edu.umn.gis.mapscript.mapObj;
import edu.umn.gis.mapscript.OWSRequest;
import edu.umn.gis.mapscript.mapscript;

class WxSTest_thread extends Thread {

    public String      mapName;
    public byte[]      resultBytes;

    public void run() {
        mapObj map = new mapObj(mapName);

        map.setMetaData( "ows_onlineresource", "http://dummy.org/" );

        OWSRequest req = new OWSRequest();

        req.setParameter( "SERVICE", "WMS" );
        req.setParameter( "VERSION", "1.1.0" );
        req.setParameter( "REQUEST", "GetCapabilities" );

        mapscript.msIO_installStdoutToBuffer();

        int owsResult = map.OWSDispatch( req );

        if( owsResult != 0 )
            System.out.println( "OWSDispatch Result (expect 0): " + owsResult );

        resultBytes = mapscript.msIO_getStdoutBufferBytes();
    }
}

public class WxSTest {
    public static void main(String[] args) {
```

```
try {
    WxSTest_thread tt[] = new WxSTest_thread[100];
    int i;
    int expectedLength=0, success = 0, failure=0;

    for( i = 0; i < tt.length; i++ )
    {
        tt[i] = new WxSTest_thread();
        tt[i].mapName = args[0];
    }

    for( i = 0; i < tt.length; i++ )
        tt[i].start();

    for( i = 0; i < tt.length; i++ )
    {
        tt[i].join();
        if( i == 0 )
        {
            expectedLength = tt[i].resultBytes.length;
            System.out.println( "Document Length: " + expectedLength + ", expecting somewhere around " );
        }
        else if( expectedLength != tt[i].resultBytes.length )
        {
            System.out.println( "Document Length:" + tt[i].resultBytes.length + " Expected:" + expectedLength );
            failure++;
        }
        else
            success++;
    }

    System.out.println( "Successes: " + success );
    System.out.println( "Failures: " + failure );

} catch( Exception e ) {
    e.printStackTrace();
}
}
```

10.17.5 PHP Example

Most of the same capabilities are accessible in php mapscript. Here is an example displaying a *wms capabilities*.

Example1 : get the capabilities

This is for example what a url could look like :

<http://.../php/ows.php?service=WMS&version=1.1.1&Request=GetCapabilities>

```
<?php  
  
dl ("php_mapscript_4.10.0.dll");  
  
$request = ms_newowsrequestobj();  
  
$request->loadparams();
```

```
/*example on how to modify the parameters :
 forcing the version from 1.1.1 to 1.1.0 */
$request->setParameter("VeRsIoN","1.1.0");

ms_ioinstallstdouttobuffer();

$oMap = ms_newMapobj("../service/wms.map");

$oMap->owsdispatch($request);

$contenttype = ms_iostripstdoutbuffercontenttype();

$buffer = ms_iogetstdoutbufferstring();

header('Content-type: application/xml');
echo $buffer;

ms_ioresethandlers();

?>
```

Example2 : get the map
This is for example what a url could look like :

```
http://.../php/ows.php?SERVICE=WMS&VeRsIoN=1.1.1&Request=GetMap&
LAYERS=WorldGen_Outline
```

```
<?php

dl("php_mapscript_4.10.0.dll");

$request = ms_newowsrequestobj();

$request->loadparams();

ms_ioinstallstdouttobuffer();

$oMap = ms_newMapobj("../service/wms.map");

$oMap->owsdispatch($request);

$contenttype = ms_iostripstdoutbuffercontenttype();

if ($contenttype == 'image/png')
    header('Content-type: image/png');

ms_iogetStdoutBufferBytes();

ms_ioresethandlers();

?>
```

10.17.6 Use in Non-CGI Environments (mod_php, etc)

The `loadParams()` call establish parses the cgi environment varabiables (`QUERY_STRING`, and `REQUEST_METHOD`) into parameters in the `OWSRequest` object. In non-cgi environments, such as when php, python and perl are used as “loaded modules” in Apache, or Java with Tomcat, the `loadParams()` call will not work - in fact in 4.10.x it will terminate the web server instance.

It is necessary in these circumstances for the calling script/application to parse the request url into keyword/value pairs and assign to the `OWSRequest` object by other means, as shown in some of the above examples explicitly setting the request parameters.

10.17.7 Post Processing Capabilities

In the following python example, we process any incoming WxS request, but if it is a `GetCapabilities` request we replace the Service section in the capabilities with a section read from a file, that is carefully tailored the way we want.

```
#!/usr/bin/env python

import sys
import elementtree.ElementTree as ET

import mapscript

req = mapscript.OWSRequest()
req.loadParams()

map = mapscript.mapObj( '/u/www/maps/ukpoly/ukpoly.map' )

#
# Handle anything but a GetCapabilities call normally.
#
if req.getValueByName('REQUEST') <> 'GetCapabilities':

    map.OWSDispatch( req )

#
# Do special processing for GetCapabilities
#
else:
    mapscript.msIO_installStdoutToBuffer()

    map.OWSDispatch( req )

    ct = mapscript.msIO_stripStdoutBufferContentType()
    content = mapscript.msIO_getStdoutBufferString()
    mapscript.msIO_resetHandlers()

    # Parse the capabilities.

    tree = ET.fromstring(content)

    # Strip out ordinary Service section, and replace from custom file.

    tree.remove(tree.find('Service'))
    tree.insert(0,ET.parse('./Service.xml').getroot())

    # Stream out adjusted capabilities.
```

```
print 'Content-type: ' + ct
print
print ET.tostring(tree)
```

TinyOWS

Author Olivier Courtin

Contact olivier dot courtin at oslandia.com

TinyOWS is a lightweight and fast implementation of the OGC WFS-T specification. Web Feature Service (WFS) allows to query and to retrieve features. The transactional profile (WFS-T) allows then to insert, update or delete such features.

From a technical point of view WFS-T is a Web Service API in front of a spatial database. TinyOWS is so deeply tighed to PostgreSQL/PostGIS.

TinyOWS is already safely used in quite big GIS infrastructure arch, for instance, to allow European farmers to report the locations and crops on their fields (and then to be paid by EEC accordingly). <http://foss4g-cee.org/wp-content/uploads/2012/04/IPA-Online.pdf>

TinyOWS implement strictly OGC standards and pass successfully all WFS OGC CITE tests (and even beta ones).

TinyOWS is part of MapServer Suite, but provided as a distinct module (i.e you could use it in conjonction with MapServer and MapCache, or as a standalone app) But both MapServer and TinyOWS could use the same configuration file, if you want to (or native TinyOWS XML config file).

11.1 TinyOWS Installation

11.1.1 Requires

TinyOWS need following libraries/applications:

- LibXML2 (2.8 version or later)
- PostGIS (1.5.x version or later)
- PostgreSQL (with libpq headers)
- A working Web Server with cgi-bin support
- Fast-CGI is recommended

Installing from a stable source release

An example of a typical download, configure, make, make install:

```
$ wget http://download.osgeo.org/mapserver/tinyows-1.1.0.tar.bz2
$ tar xvjf tinyows-1.1.0.tar.bz2
$ cd mapserver-tinyows
$ ./configure
$ make
$ sudo make install
$ sudo make install-demo
```

Then copy the `tinyows` binary to your `cgi-bin` directory.

Installing the Current Trunk from GIT

To build from [GitHub](#), you must first install the `autoconf` utility, and `git` application .

```
$ git clone git://github.com/mapserver/tinyows.git
$ cd tinyows
$ autoconf
$ ./configure
$ make
$ sudo make install
$ sudo make install-demo
```

Then copy the `tinyows` binary to your `cgi-bin` directory.

Installing from source on Windows (oldies so dunno if still up to date)

- From GIT with Visual C++ for Win32 (written by Alexander Bruy)

11.2 Configuring TinyOWS with an XML File

The simplest way to configure TinyOWS is with a single XML file called `tinyows.xml`.

The default path is `/etc/tinyows.xml`. You can also use `TINYOWS_CONFIG_FILE` environment variable to set your own path.

11.2.1 Configuration file simple Example

An example `config.xml` file is in the `demo` directory:

```
<tinyows online_resource="http://127.0.0.1/cgi-bin/tinyows"
          schema_dir="/usr/local/tinyows/schema/">

<pg host="127.0.0.1" user="postgres" password="postgres" dbname="tinyows_demo" port="5432"/>

<metadata name="TinyOWS Server"
           title="TinyOWS Server - Demo Service" />

<layer retrievable="1"
        writable="1"
        ns_prefix="tows"
```

```

ns_uri="http://www.tinyows.org/"
name="world"
title="World Administrative Boundaries" />

<layer retrievable="1"
writable="1"
ns_prefix="tows"
ns_uri="http://www.tinyows.org/"
name="france"
title="French Administrative Sub Boundaries (IGN - GeoFLA Departements)" />

</tinyows>

```

11.2.2 Testing your config.xml file

Once you have a config.xml file related to your service, launch TinyOWS with the –check option to validate your configuration file, test your database connection, and list the layers to be used:

```

./tinyows --check
TinyOWS version: 1.1.0
FCGI support: Yes
Config File Path: /etc/tinyows.xml (TinyOWS XML)
PostGIS Version: 2.1.0
PostGIS dsn: host=127.0.0.1 user=postgres password=postgres dbname=foo port=5432
Output Encoding: UTF-8
Database Encoding: UTF8
Schema dir: /usr/local/share/tinyows/schema/
Display bbox: Yes
Estimated extent: No
Check schema: Yes
Check valid geoms: No
Available layers:
- public.commune (2154) -> tows.commune [RW]
- public.world (4326) -> tows.world [RW]

```

11.2.3 Structure of the config.xml file

TinyOWS Element

TinyOWS is the root element. He is mandatory, and must contains some system informations about the service itself. Some global service options could also be switched on or off at this level.

At-tribute	Re-required?	De-fault	Description
on-line_resourcetory	mandatory		URL where the service is located, e.g: http://127.0.0.1/cgi-bin/tinyows
schema_dir	mandatory		Path where TinyOWS schema dir is located e.g: /usr/local/tinyows/schema/
log	optional		Path where TinyOWS logs input requests. e.g: /var/log/tinyows.log. This file must be writable by the user that owns the TinyOWS process.
log_level	optional	0	Bit field value to indicate what to log: 1: ERROR, 2: EVENT, 4: HTTP QUERY, 8: SQL. e.g: 15 to log all.
de-gree_precision	optional	6	Indicate how many digits of decimal precision when coordinates are express in latitude/longitude.
me-ter_precision	optional	0	Indicate how many digits of decimal precision to use when coordinates are projected (so meter unit).
dis-play_bbox	optional	1	Flag to indicate if bounding box should be computed for WFS GML GetFeature output. It's mandatory in WFS specification. But as it's time consuming it could be interesting to be able to deactivate it.
esti-mated_extent	optional	0	Flag to indicate if TinyOWS should use estimated_extent (faster but slightly less accurate).
check_schema	optional	1	Flag to indicate if input data must be checked against schema before to be executed. Caution, schema validation is an important part of security. Disable this attribute at your peril.
check_valid	optional	1	Flag to indicate if OGC SFS 1.1 geometry validation should be done prior to execute a transaction.
encoding	optional	UTF-8	Output encoding. Other values could be ISO-8859-1 for instance. No encoding conversion is done on data; this attribute is declarative.
ex-pose_pk	optional	0	Flag to indicate if TinyOWS should expose PK in schema (and so require them in Transaction query).
wfs_default_version	optional		String version to indicate WFS default version, 1.0.0 or 1.1.0 for instance.

Limits Element

Limits Element provides a maximum for the server output. It could help to prevent a denial of service attack, or an abnormally large user query, from crashing your server. This element is optional.

Limits attributes

At-tribute	Re-required?	De-fault	Description
features	optional		Use to set maximum number of features returned to WFS client, on GetFeature request
geobbox	optional		Geographic bounding bbox, used to indicate maximum extent: East,West,North,South

```
<tinyows>
...
<limits features="10000" />
...
</tinyows>
```

PostgreSQL Connection

PostgreSQL connection element. This element is mandatory.

At-tribute	Re-required?	De-fault	Description
host	optional	local-host	Name (or IP) to PostgreSQL server (default is localhost)
user	optional		PostgreSQL user to connect (default is the system user used to run the server)
pass-word	optional		PostgreSQL password connection
db-name	optional		PostGIS database (by default, same as the system user used to run the server)
port	optional	5432	PostgreSQL port number
encod-ing	optional	UTF-8	PostgreSQL DB encoding, as specified in http://www.postgresql.org/docs/9.0/static/multibyte.html#CHARSET-TABLE

```
<tinyows>
...
<pg host="127.0.0.1"
    user="postgres"
    password="postgres"
    dbname="gis_data"
    port="5432" />
...
</tinyows>
```

Metadata and Contact Elements

Used to provide information about the service itself. These two elements are mandatory.

Metadata attributes

Attribute	Required?	Default	Description
name	mandatory		Web Service Name
title	mandatory		Web Service Title
keywords	optional		Web Service Keywords list (comma separated list)
fees	optional		Web Service Fees
access_constraints	optional		Web Service Access Constraints

Abstract Element

The Abstract element is an optional child element of Metadata. It is a place for a free-formatted text description of the service.

Contact attributes

Attribute	Required?	Default	Description
name	mandatory		Web Service Contact Name
site	mandatory		Web Service Contact URL
email	mandatory		Web Service Contact Email
individual_name	optional		Web Service Contact Individual Name
position	optional		Web Service Contact Position
phone	optional		Web Service Contact Phone
fax	optional		Web Service Contact Fax
online_resource	optional		Web Service Contact URL (e.g additional Metadatas)
address	optional		Web Service Contact Postal Address
postcode	optional		Web Service Contact Postcode
city	optional		Web Service Contact City
administrative_area	optional		Web Service Contact Administrative Area
country	optional		Web Service Contact Country
hours_of_service	optional		Web Service Contact Hours of Services
contact_instructions	optional		Web Service Contact Instructions

Contact and Metadata example with only mandatory attributes:

```
<metadata name="TinyOWS Server"
           title="TinyOWS Server - Demo Service" />

<contact name="TinyOWS Server"
          site="http://www.tinyows.org/"
          email="tinyows-users@lists.maptools.org" />
```

Layer Element

Layer element is used to set all layers provided by the service. Although this element is technically optional, omitting it will cause no layer at all to be provided.

At-tribute	Re-required?	De-fault	Inher-its?	Description
ns_prefix	mandatory		Yes	Layer's Namespace Prefix used in WFS
ns_uri	mandatory		Yes	Layer's Namespace URI used in WFS
name	mandatory		No	Layer's Name
title	optional		No	Layer's Title
retriev-able	optional	false	Yes	If true, layer is retrievable on WFS GetFeature request
writable	optional	false	Yes	If true, layer is editable with WFS Transaction request
schema	optional	'pub-lic'	Yes	PostgreSQL Schema name.
table	optional		No	PostgreSQL table name (default is to use layer's name).
abstract	optional		No	Abstract text
keywords	optional		Yes	Keywords (comma separated list)
srid	optional		Yes	Comma separated list of output SRID
geobbox	optional		Yes	WGS-84 bbox of max extent: East,West,North,South
in-clude_items	optional		Yes	Comma separated list of columns to retrieve (only)
ex-clude_items	optional		Yes	Comma separated list of columns to not retrieve
pkey	optional		Yes	Column name to use as a Primary Key, when there's no PostgreSQL one (e.g useful to use with VIEW)

```
<tinyows>
...
<layer retrievable="1"
        writable="1"
        ns_prefix="tows"
        ns_uri="http://www.tinyows.org/"
        name="world"
        title="World Administrative Boundaries" />
...
</tinyows>
```

Nested Layers

Layer entities could be nested, properties in this case are inherited. A Layer without title is then considered as a ‘virtual’ layer.

```
<tinyows>
...
<layer name="root"
        retrievable="1" writable="1"
        ns_prefix="tows"
        ns_uri="http://www.tinyows.org/"
        schema="my_db_schema">

    <layer name="foo" title="foo" />
    <layer name="bar" title="bar" />

</layer>
```

```
...
</tinyows>
```

11.3 Configuring TinyOWS with a standard Mapfile

11.3.1 Mapfile Config File support for TinyOWS

TinyOWS supports as a configuration file a standard MapServer Mapfile. This allow a single file to configure both MapServer and TinyOWS. (e.g could be usefull if you use them both, as one for WMS and the other as WFS-T)

TinyOWS does not handle all of the parameters in a Mapfile, but will ignore, without error, any extra parameters that are not implemented in TinyOWS.

If you prefer, you can configure TinyOWS using an XML file ([Configuring TinyOWS with an XML File](#)).

To indicate where your Mapfile is located, to TinyOWS binary, use the “TINYOWS_MAPFILE” environment variable.

Here an example of a single Mapfile:

```
MAP
  NAME "TinyOWS"

  WEB
    METADATA
      "tinyows_schema_dir" "/usr/local/share/tinyows/schema/"
      "tinyows_onlineresource" "127.0.0.1/cgi-bin/tinyows.fcgi"
      "wfs_title" "TinyOWS service provided by a MapFile"
      "wfs_contact" "foo@bar.net"
    END
  END

  LAYER
    NAME 'France'
    CONNECTIONTYPE postgis
    CONNECTION "host=127.0.0.1 user=postgres password=postgres dbname=tinyows_demo port=5432"
    METADATA
      'wfs_title' 'France'
      'wfs_namespace_prefix' 'tows'
      'wfs_namespace_uri' 'http://www.tinyows.org/'
      'wfs_srs' 'EPSG:27582'
      'tinyows_table' 'france'
      'tinyows_writable' '1'
      'tinyows_retrievable' '1'
    END
    DUMP TRUE
  END
END
```

Current concepts and limitations:

- Only the PostGIS CONNECTIONTYPE is handled
- TinyOWS does not support all of the WFS parameters available in a Mapfile. But on the other hand, you *are* able to configure every part of TinyOWS with a Mapfile.
- The CONNECTION string value in each layer must be the same.
- Mapfile PROJECTION content is not parsed, so use explicit wfs_srs.

- Mapfile LAYER and FILTER are not parsed.
- Default values are TinyOWS ones, even for common properties shared by both TinyOWS and MapServer.
- TinyOWS does not use DATA element from Mapfile, so you have to use tinyows_table (and tinyows_schema if needed) in each layer.
- If DUMP is not set to TRUE on a layer, both read and write access are disabled for the layer.

11.3.2 Mapfile path of each TinyOWS config element

Original TinyOWS XML Config File	Mapfile counterpart
/tinyows@online_resource	/map/metadata@tinyows_onlineresource
/tinyows@schema_dir	/map/metadata@tinyows_schema_dir
/tinyows@log	/map/metadata@tinyows_log
/tinyows@log_level	/map/metadata@tinyows_log_level
/tinyows@degree_precision	/map/metadata@tinyows_degree_precision
/tinyows@meter_precision	/map/metadata@tinyows_meter_precision
/tinyows@display_bbox	/map/metadata@tinyows_display_bbox
/tinyows@estimated_extent	/map/metadata@tinyows_estimated_extent
/tinyows@check_schema	/map/metadata@tinyows_check_schema
/tinyows@check_valid_geom	/map/metadata@tinyows_check_valid_geom
/tinyows@encoding	/map/metadata@wfs_encoding
/tinyows@db_encoding	/map/metadata@tinyows_db_encoding
/tinyows@expose_pk	/map/metadata@tinyows_expose_pk
/tinyows/limits@features	/map/metadata@wfs_maxfeatures
/tinyows/limits@geobbox	/map/metadata@tinyows_geobbox
/tinyows/pg@host	/map/layer@connection
/tinyows/pg@user	/map/layer@connection
/tinyows/pg@password	/map/layer@connection
/tinyows/pg@dbname	/map/layer@connection
/tinyows/pg@port	/map/layer@connection
/tinyows/pg@encoding	/map/metadata@tinyows_db_encoding
/tinyows/metadata@name	/map@name
/tinyows/metadata@title	/map/metadata@wfs_title
/tinyows/metadata@keywords	/map/metadata@wfs_keywordlist
/tinyows/metadata@abstract	/map/metadata@wfs_abstract
/tinyows/metadata@fees	/map/metadata@wfs_fees
/tinyows/metadata@access_constraints	/map/metadata@wfs_accessconstraints
/tinyows/layer@ns_prefix	/map/layer/metadata@wfs_namespace_prefix or /map/metadata@wfs_namespace_prefix
/tinyows/layer@ns_uri	/map/layer/metadata@wfs_namespace_uri or /map/metadata@wfs_namespace_uri
/tinyows/layer@name	/map/layer@name
/tinyows/layer@title	/map/layer/metadata@wfs_title
/tinyows/layer@retrievable	/map/layer/metadata@tinyows_retrievable and /map/layer@dmp
/tinyows/layer@writable	/map/layer/metadata@tinyows_writable and /map/layer@dmp
/tinyows/layer@schema	/map/layer/metadata@tinyows_schema
/tinyows/layer@keywords	/map/layer/metadata@wfs_keywordlist
/tinyows/layer/abstract	/map/layer/metadata@wfs_abstract
/tinyows/layer@srid	/map/metadata@wfs_srs and /map/layer/metadata@wfs_srs
/tinyows/layer@geobbox	/map/layer/metadata@tinyows_geobbox
/tinyows/layer@include_items	/map/layer/metadata@include_items

Continued on next page

Table 11.1 – continued from previous page

Original TinyOWS XML Config File	Mapfile counterpart
/tinyows/layer@exclude_items	/map/layer/metadata@exclude_items
/tinyows/layer@pkey	/map/layer/metadata@pkey
/tinyows/contact@name	/map/metadata@ows_contactorganization
/tinyows/contact@site	
/tinyows/contact@email	/map/metadata@ows_contactelectronicmailaddress
/tinyows/contact@individual_name	/map/metadata@ows_contactperson
/tinyows/contact@position	/map/metadata@ows_contactposition
/tinyows/contact@phone	/map/metadata@ows_contactvoicetelephone
/tinyows/contact@fax	/map/metadata@ows_contactfacsimiletelephone
/tinyows/contact@online_resource	
/tinyows/contact@address	/map/metadata@ows_address
/tinyows/contact@city	/map/metadata@ows_city
/tinyows/contact@administrative_area	
/tinyows/contact@country	/map/metadata@ows_country
/tinyows/contact@hours_of_service	
/tinyows/contact@contact_instructions	

11.4 Sample: WFS-T with TinyOWS and OpenLayers

0. Install PostGIS and TinyOWS (*TinyOWS Installation*)

1. Within PostGIS, create a spatial database called ‘tinyows’

```
createdb -U postgres tinyows
psql -U postgres -d tinyows < `pg_config --sharedir`/contrib/postgis-2.0/postgis.sql
psql -U postgres -d tinyows < `pg_config --sharedir`/contrib/postgis-2.0/spatial_ref_sys.sql
```

2. Import Frida data (we will use the parks layer) into your PostGIS database

```
wget ftp://ftp.intevation.de/freegis/frida/frida-1.0.1-shp.tar.gz
tar xvzf frida-1.0.1-shp.tar.gz
cd frida-1.0.1-shp
shp2pgsql -g geom -s 31467 -W LATIN1 -I gruenflaechen.shp frida | psql -U postgres -d tinyows
```

3. Configure TinyOWS by editing /usr/local/tinyows/config.xml

```
<tinyows online_resource="http://127.0.0.1/cgi-bin/tinyows"
          schema_dir="/usr/local/share/tinyoss/schema/">

<pg host="127.0.0.1" user="postgres" password="postgres" dbname="tinyows" port="5432"/>

<metadata name="TinyOWS Server"
           title="TinyOWS Server - WFS-T Frida Service" />

<contact name="TinyOWS Server"
          site="http://www.tinyows.org/"
          email="tinyows-users@lists.maptools.org" />

<layer retrievable="1"
        writable="1"
        ns_prefix="tows"
        ns_uri="http://www.tinyows.org/"
        name="frida"
```

```
    title="Frida Parks" />
</tinyows>
```

4. Test your installations of TinyOWS and PostGIS

```
./YOUR_CGI-BIN_PATH/tinyows --check
TinyOWS version: 1.1.0
FCGI support: Yes
Config File Path: /etc/tinyows.xml (TinyOWS XML)
PostGIS Version: 2.0.1
PostGIS dsn: host=127.0.0.1 user=postgres password=postgres dbname=tinyows port=5432
Output Encoding: UTF-8
Database Encoding: UTF8
Schema dir: /usr/local/share/tinyows/schema/
Display bbox: Yes
Estimated extent: No
Check schema: Yes
Check valid geoms: Yes
Available layers:
- public.frida (31467) -> tows:frida [RW]
```

5. Install OpenLayers

```
wget http://openlayers.org/download/OpenLayers-2.12.tar.gz
tar xvzf OpenLayers-2.12.tar.gz
sudo mv OpenLayers-2.12 /YOUR/SERVER/HTDOCS/
```

6. Install the OpenLayers proxy (you need the Python interpreter to make it work)

```
sudo cp OpenLayers-2.12/examples/proxy.cgi /YOUR/SERVER/CGI-BIN/
```

7. Add your server IP to proxy allowedHosts in (/YOUR/SERVER/CGI-BIN/proxy.cgi)

```
allowedHosts = ['127.0.0.1', 'www.openlayers.org', 'openlayers.org', ... ]
```

8. Create a new file at OpenLayers-2.12/examples/tinyows.html

```
<html>
<head>
  <link rel="stylesheet" href="../theme/default/style.css" type="text/css" />
  <link rel="stylesheet" href="style.css" type="text/css" />
  <script src="../lib/OpenLayers.js"></script>
<style>
  #map {
    width: 800px;
    height: 500px;
    float: left;
    border: 1px solid #ccc;
  }
  #message {
    position: relative;
    left: 5px;
  }
  #docs {
    float: left;
  }
  .customEditingToolbar {
    float: right;
    right: 0px;
```

```
    height: 30px;
    width: 200px;
}
.customEditingToolbar div {
    float: right;
    margin: 5px;
    width: 24px;
    height: 24px;
}
.olControlNavigationItemActive {
    background-image: url("../theme/default/img/editing_tool_bar.png");
    background-repeat: no-repeat;
    background-position: -103px -23px;
}
.olControlNavigationItemInactive {
    background-image: url("../theme/default/img/editing_tool_bar.png");
    background-repeat: no-repeat;
    background-position: -103px -0px;
}
.olControlDrawFeaturePolygonItemInactive {
    background-image: url("../theme/default/img/editing_tool_bar.png");
    background-repeat: no-repeat;
    background-position: -26px 0px;
}
.olControlDrawFeaturePolygonItemActive {
    background-image: url("../theme/default/img/editing_tool_bar.png");
    background-repeat: no-repeat;
    background-position: -26px -23px ;
}
.olControlModifyFeatureItemActive {
    background-image: url(..theme/default/img/move_feature_on.png);
    background-repeat: no-repeat;
    background-position: 0px 1px;
}
.olControlModifyFeatureItemInactive {
    background-image: url(..theme/default/img/move_feature_off.png);
    background-repeat: no-repeat;
    background-position: 0px 1px;
}
.olControlDeleteFeatureItemActive {
    background-image: url(..theme/default/img/remove_point_on.png);
    background-repeat: no-repeat;
    background-position: 0px 1px;
}
.olControlDeleteFeatureItemInactive {
    background-image: url(..theme/default/img/remove_point_off.png);
    background-repeat: no-repeat;
    background-position: 0px 1px;
}

```

</style>

```
<script src="tinyows.js"></script>
</head>
<body onload="init()">
    <h1 id="title">WFS Transaction Example, (TinyOWS ans OpenLayers)</h1>
    <div id="tags"></div>
    <p id="shortdesc">
        Shows the use of the WFS Transactions (WFS-T).
        Parks of Osnabrück (Frida).
```

```

<br />
    Base layers is OpenStreetMap from Omniscale WMS Server.
</p>
<div id="map"></div>

<div id="message"></div>
<div id="docs">
    <p>
        The WFS protocol allows for creation of new features and
        reading, updating, or deleting of existing features.
    </p>
    <p>
        Use the tools to create, modify, and delete (in order from left
        to right) features. Use the save tool (picture of a disk) to
        save your changes. Use the navigation tool (hand) to stop
        editing and use the mouse for map navigation.
    </p>
    <p>
        See the <a href="tinyows.js" target="_blank">
        wfs-protocol-transactions.js source</a> to see how this is done.
    </p>
</div>
</body>
</html>

```

9. Create a new file at OpenLayers-2.12/examples/tinyows.js (and replace all 127.0.0.1 addresses by your IP server if necessary)

```

var map, wfs;
OpenLayers.ProxyHost = "/cgi-bin/proxy.cgi?url=";
var DeleteFeature = OpenLayers.Class(OpenLayers.Control, {
    initialize: function(layer, options) {
        OpenLayers.Control.prototype.initialize.apply(this, [options]);
        this.layer = layer;
        this.handler = new OpenLayers.Handler.Feature(
            this, layer, {click: this.clickFeature}
        );
    },
    clickFeature: function(feature) {
        // if feature doesn't have a fid, destroy it
        if(feature.fid == undefined) {
            this.layer.destroyFeatures([feature]);
        } else {
            feature.state = OpenLayers.State.DELETE;
            this.layer.events.triggerEvent("afterfeaturemodified",
                {feature: feature});
            feature.renderIntent = "select";
            this.layer.drawFeature(feature);
        }
    },
    setMap: function(map) {
        this.handler.setMap(map);
        OpenLayers.Control.prototype.setMap.apply(this, arguments);
    },
    CLASS_NAME: "OpenLayers.Control.DeleteFeature"
});
function showMsg(szMessage) {
    document.getElementById("message").innerHTML = szMessage;
}

```

```
setTimeout(
    "document.getElementById('message').innerHTML = ''",2000);
}
function showSuccessMsg(){
    showMsg("Transaction successfully completed");
};
function showFailureMsg(){
    showMsg("An error occurred while operating the transaction");
};
function init() {
    map = new OpenLayers.Map('map', {
        projection: new OpenLayers.Projection("EPSG:31467"),
        units: "m",
        maxResolution: "auto",
        maxExtent: new OpenLayers.Bounds(3427000,5788000,3444000,5800000),
        controls: [
            new OpenLayers.Control.PanZoom()
        ]
    });
    var osm = new OpenLayers.Layer.WMS(
        "OSM by Omniscale WMS",
        "http://osm.omniscale.net/proxy/service",
        {layers: 'osm', format: 'image/jpeg'},
        {projection:"EPSG:31467", units: "m", maxResolution: "auto", maxExtent: new OpenLayers.Bounds});
    var saveStrategy = new OpenLayers.Strategy.Save();
    saveStrategy.events.register("success", '', showSuccessMsg);
    saveStrategy.events.register("fail", '', showFailureMsg);
    wfs = new OpenLayers.Layer.Vector("Editable Features", {
        strategies: [new OpenLayers.Strategy.BBOX(), saveStrategy],
        projection: new OpenLayers.Projection("EPSG:31467"),
        protocol: new OpenLayers.Protocol.WFS({
            version: "1.1.0",
            srsName: "EPSG:31467",
            url: "http://127.0.0.1/cgi-bin/tinyows",
            featureNS : "http://www.tinyows.org/",
            featureType: "frida",
            geometryName: "geom",
            schema: "http://127.0.0.1/cgi-bin/tinyows?service=wfs&request=DescribeFeatureType&version=1"
        })
    });
    map.addLayers([osm, wfs]);
    var panel = new OpenLayers.Control.Panel(
        {'displayClass': 'customEditingToolbar'}
    );
    var navigate = new OpenLayers.Control.Navigation({
        title: "Pan Map"
    });
    var draw = new OpenLayers.Control.DrawFeature(
        wfs, OpenLayers.Handler.Polygon,
        {
            title: "Draw Feature",
            displayClass: "olControlDrawFeaturePolygon",
            multi: true
        }
    );
    var edit = new OpenLayers.Control.ModifyFeature(wfs, {
        title: "Modify Feature",
    });
}
```

```

        displayClass: "olControlModifyFeature"
    });
    var del = new DeleteFeature(wfs, {title: "Delete Feature"});
    var save = new OpenLayers.Control.Button({
        title: "Save Changes",
        trigger: function() {
            if(edit.feature) {
                edit.selectControl.unselectAll();
            }
            saveStrategy.save();
        },
        displayClass: "olControlSaveFeatures"
    });
    panel.addControls([navigate, save, del, edit, draw]);
    panel.defaultControl = navigate;
    map.addControl(panel);
    map.zoomToMaxExtent();
}

```

11.5 Server Tuning: How to speed up your TinyOWS server

11.5.1 Tips and Tricks for PostgreSQL / PostGIS databases

- Use Spatial Indexes on your geometry/geography columns PostGIS Spatial Indexes.
- Index any column that could be used frequently as a filter
- General PostGIS Performance tips
- General PostgreSQL Performance tips
- Even more tips on Tuning PostgreSQL

11.5.2 Tips and Tricks for Apache

11.5.3 Using Fast-CGI

- Check that your TinyOWS is compiled with FastCGI support:

```
[user@host mapserver]$ tinyows --check
TinyOWS version: 1.1.0
FCGI support: Yes
...
```

Fast-CGI in Apache

- In Apache, activate mod_fastcgi

```
$ sudo apt-get install -y libapache2-mod-fastcgi
$ sudo a2enmod fastcgi
```

- Apache fast-cgi configuration:

```
#in your cgi-bin directive, add the following to run all cgi-bin using FastCGI
SetHandler fastcgi-script

#in your FastCGI config file (typically something like /etc/apache2/mods-enabled/fastcgi.conf)
FastCgiServer /usr/lib/cgi-bin/tinyows.fcgi -processes 10
```

Fast-CGI in MS4W

- Please refer to the [fastcgi doc in ms4w](#)
- Add the following 2 lines:

```
DefaultInitEnv TINYOWS_CONFIG_FILE "/ms4w/apps/tinyows/config.xml"
DefaultInitEnv TINYOWS_SCHEMA_DIR "/ms4w/apps/tinyows/schema/"
```

11.5.4 HTTP GZip compression

- In Apache, activate [mod_deflate](#)
- Deflate basic configuration, (note we're including xml so gml and json):

```
AddOutputFilterByType DEFLATE text/html text/plain text/xml application/xml application/json
```

11.6 Working Around the LibXML2 XSD Schema GML Bug

11.6.1 Issue

TinyOWS makes use of GML, an XML-based language that encodes geometry. Frequently the input and the output of TinyOWS are in GML.

Even if LibXML2 is a great lib, older versions (i.e previous to 2.8) didn't handle correctly GML 3.1.1 XSD Schema (see https://bugzilla.gnome.org/show_bug.cgi?id=630130).

11.6.2 Workaround and options

For TinyOWS users, you have several options

- Take a recent libxml2 version (i.e 2.8 or later)
- Patch your oldest copy of LibXML2 release and link TinyOWS against your local copy:

```
--- xschemas.c.orig      2011-04-24 14:58:16.000000000 +0000
+++ xschemas.c          2011-04-24 15:47:50.000000000 +0000
@@ -15158,7 +15158,11 @@
 }
 if ( (WXS_IS_LIST(type) || WXS_IS_UNION(type)) &&
     (WXS_IS_RESTRICTION(type) == 0) &&
-    (! WXS_IS_ANY_SIMPLE_TYPE(baseType)) ) {
+    (
+        (! WXS_IS_ANY_SIMPLE_TYPE(baseType))
+        && (baseType->type != XML_SCHEMA_TYPE_SIMPLE)
+    )
+    ) {
```

```

xmlSchemaPCustomErr(ctxt,
    XML_SCHEMAP_ST_PROPS_CORRECT_1,
    WXS_BASIC_CAST type, NULL,
} } }

```

- Modify the XSD GML Schema itself (but you violate the OGC License if you do this!):

Index: schema/gml/3.1.1/base/valueObjects.xsd

```

=====
--- schema/gml/3.1.1/base/valueObjects.xsd (revision 550)
+++ schema/gml/3.1.1/base/valueObjects.xsd (revision 561)
@@ -200,11 +200,13 @@
    <group name="ValueExtent">
        <choice>
+<!--
            <element ref="gml:CategoryExtent"/>
            <element ref="gml:QuantityExtent"/>
+-->
            <element ref="gml:CountExtent"/>
        </choice>
    </group>
- <!-- =====
- <element name="QuantityExtent" type="gml:QuantityExtentType" substitutionGroup="gml:_Value">
+ <!-- =====
+ <element name="QuantityExtent" type="gml:QuantityExtentType" substitutionGroup="gml:_Value">
    <element name="QuantityExtent" type="gml:QuantityExtentType" substitutionGroup="gml:_Value">
        <annotation>
@@ -212,5 +214,4 @@
            </annotation>
        </element>
- <!-- -->
<complexType name="QuantityExtentType">
    <annotation>
@@ -223,6 +224,7 @@
        </simpleContent>
    </complexType>
+-->
- <!-- =====
- <element name="CategoryExtent" type="gml:CategoryExtentType" substitutionGroup="gml:_Value">
+ <element name="CategoryExtent" type="gml:CategoryExtentType" substitutionGroup="gml:_Value">
    <element name="CategoryExtent" type="gml:CategoryExtentType" substitutionGroup="gml:_Value">
        <annotation>
@@ -230,5 +232,4 @@
            </annotation>
        </element>
- <!-- -->
<complexType name="CategoryExtentType">
    <annotation>
@@ -241,4 +242,5 @@
        </simpleContent>
    </complexType>
+-->
- <!-- =====
<element name="CountExtent" type="gml:CountExtentType" substitutionGroup="gml:_Value"> -->

```

- Or choose to use only GML 2.1.2 in the meantime.

See Also:

Developer documentation

(French) Utiliser TinyOWS comme serveur WFS-T

Optimization

12.1 Debugging MapServer

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Last Updated 2010-05-07

Table of Contents

- Debugging MapServer
 - Introduction
 - * Links to Related Information
 - Steps to Enable MapServer Debugging
 - * Step 1: Set the MS_ERRORFILE Variable
 - * Step 2: Set the DEBUG Level
 - * Step 3: Turn on CPL_DEBUG (optional)
 - * Step 4: Turn on PROJ_DEBUG (optional)
 - * Step 5: Test your Mapfile
 - * Step 6: Check your Web Server Logs
 - * Step 7: Verify your Application Settings
 - Debugging MapServer using Compiler Debugging Tools
 - * Running MapServer in GDB (Linux/Unix)
 - Debugging Older Versions of MapServer (before 5.0)

12.1.1 Introduction

When developing an application for the Internet, you will inevitably across problems many problems in your environment. The goal of this guide is to assist you with locating the problem with your MapServer application.

Links to Related Information

- *RFC 28: Redesign of LOG/DEBUG output mechanisms*

- *MapServer Errors*

12.1.2 Steps to Enable MapServer Debugging

Starting with MapServer 5.0, you are able to control the levels of debugging/logging information returned to you by MapServer, and also control the location of the output log file.

In technical terms, there are `msDebug()` calls in various areas of the MapServer code that generate information that may be useful in tuning and troubleshooting applications.

Step 1: Set the `MS_ERRORFILE` Variable

The `MS_ERRORFILE` variable is used to specify the output of debug messages from MapServer. You can pass the following values to `MS_ERRORFILE`:

[filename] Full path and filename of a log file, to contain MapServer's debug messages. Any file extension can be used, but `.log` or `.txt` is recommended. The file will be created, if it does not already exist.

Starting with MapServer 6.0, a filename with relative path can be passed via the `CONFIG MS_ERRORFILE` directive, in which case the filename is relative to the mapfile location. Note that setting `MS_ERRORFILE` via an environment variable always requires an absolute path since there would be no mapfile to make the path relative to.

stderr Use this to send MapServer's debug messages to the Web server's log file (i.e. "standard error"). If you are using Apache, your debug messages will be placed in the Apache `error_log` file. If you are using Microsoft IIS, your debug messages will be sent to `stdout` (i.e. the browser), so its use is discouraged. With IIS it is recommended to direct output to a file instead.

stdout Use this to send MapServer's debug messages to the standard output (i.e. the browser), combined with the rest of MapServer's output.

windowsdebug Use this to send MapServer's debug messages to the Windows OutputDebugString API, allowing the use of external programs like SysInternals debugview to display the debug output.

Through the Mapfile

The recommended way to set the `MS_ERRORFILE` variable is in your mapfile, within the `MAP` object, such as:

```
MAP
...
  CONFIG "MS_ERRORFILE" "/ms4w/tmp/ms_error.txt"
...
LAYER
...
END
END
```

Through an Environment Variable

You can also set the `MS_ERRORFILE` variable as an environment variable on your system. Apache users can set the environment variable in Apache's `httpd.conf` file, such as:

```
SetEnv MS_ERRORFILE "/ms4w/tmp/ms_error.txt"
```

Windows users can alternatively set the environment variable through the Windows System Properties; but make sure to set a SYSTEM environment variable.

Note: If both the *MS_ERRORFILE* environment variable is set and a *CONFIG MS_ERRORFILE* is also set, then the *CONFIG* directive takes precedence.

Step 2: Set the DEBUG Level

You can retrieve varying types of debug messages by setting the *DEBUG* parameter in the *Mapfile*. You can place the *DEBUG* parameter in any *LAYER* in the mapfile, or instead, set it once in the *MAP* object so that it applies to each layer. Use the value of the *DEBUG* parameter to set the type of information returned, as follows:

DEBUG Levels

Level 0 Errors only (DEBUG OFF, or DEBUG 0)

In level 0, only *mssetError()* calls are logged to *MS_ERRORFILE*. No *msDebug()* output at all. This is the default and corresponds to the original behavior of *MS_ERRORFILE* in MapServer 4.x

Level 1 Errors and Notices (DEBUG ON, or DEBUG 1)

Level 1 includes all output from Level 0 plus *msDebug()* warnings about common pitfalls, failed assertions or non-fatal error situations (e.g. missing or invalid values for some parameters, missing shapefiles in tileindex, timeout error from remote WMS/WFS servers, etc.)

Level 2 Map Tuning (DEBUG 2)

Level 2 includes all output from Level 1 plus notices and timing information useful for tuning mapfiles and applications. *this is the recommended minimal debugging level*

Level 3 Verbose Debug (DEBUG 3)

All of Level 2 plus some debug output useful in troubleshooting problems such as WMS connection URLs being called, database connection calls, etc.

Level 4 Very Verbose Debug (DEBUG 4)

Level 3 plus even more details...

Level 5 Very Very Verbose Debug (DEBUG 5)

Level 4 plus any *msDebug()* output that might be more useful to developers than to users.

Mapfile Example

The following example is the recommended method to set the *DEBUG* parameter:

```
MAP
...
  CONFIG "MS_ERRORFILE" "/ms4w/tmp/ms_error.txt"
  DEBUG 5
...
  LAYER
  ...
END
END
```

The MS_DEBUGLEVEL Environment Variable

Instead of setting the *DEBUG* Debug level in each of your mapfiles, you can also be set the level globally by using the *MS_DEBUGLEVEL* environment variable.

When set, this value is used as the default debug level value for all map and layer objects as they are loaded by the mapfile parser. This option also sets the debug level for any msDebug() call located outside of the context of a map or layer object, for instance for debug statements relating to initialization before a map is loaded. If a *DEBUG* value is also specified in the mapfile in some map or layer objects then the local value (in the mapfile) takes precedence over the value of the environment variable.

Apache users can set the environment variable in Apache's *httpd.conf* file, such as:

```
SetEnv MS_DEBUGLEVEL 5
```

Windows users can alternatively set the environment variable through the Windows System Properties; but make sure to set a SYSTEM environment variable.

Step 3: Turn on CPL_DEBUG (optional)

MapServer relies on the *GDAL* library to access most data layers, so you may wish to turn on GDAL debugging, to hopefully get more information on how GDAL is accessing your data file. This could be very helpful for problems with accessing raster files and PostGIS tables. You can trigger this GDAL output by setting the *CPL_DEBUG* variable in your mapfile, within the *MAP* object, such as:

```
MAP
...
CONFIG "CPL_DEBUG" "ON"
...
LAYER
...
END
END
```

Step 4: Turn on PROJ_DEBUG (optional)

MapServer relies on the *PROJ.4* library to handle data projections, so you may wish to turn on PROJ debugging, to hopefully get more information back from the PROJ library. You can trigger this PROJ output by setting the *PROJ_DEBUG* variable in your mapfile, within the *MAP* object, such as:

```
MAP
...
CONFIG "PROJ_DEBUG" "ON"
...
LAYER
...
END
END
```

Step 5: Test your Mapfile

Once you have set the *MS_ERRORFILE* and *DEBUG* level in your mapfile, you should now test your mapfile and read your generated log file.

Using shp2img

The recommended way to test your mapfile is to use the MapServer commandline utility `shp2img`, to verify that your mapfile creates a valid map image. `shp2img` should be included in your MapServer installation ([MS4W](#) users need to execute `setenv.bat` before using the utility).

You can set the `DEBUG` level by passing the `shp2img` following parameters to your commandline call:

Note: If you have already set `MS_ERRORFILE` in your mapfile, you must comment this out in order to use these `shp2img` options

Note: When using `shp2img` to debug, your layer's STATUS should be set to ON or DEFAULT. If the layer's STATUS is set to OFF, you must additionally pass the layer name to `shp2img` by using the “`-l layername`” syntax

-all_debug Use this setting to set the debug level for the MAP object and all layers. *this is the recommended switch to use*

```
shp2img -m spain.map -o test.png -all_debug 5
```

```
msLoadMap(): 0.002s
msDrawMap(): Layer 0 (spain provinces), 0.012s
msDrawRasterLayerLow(orthophoto): entering.
msDrawGDAL(): src=0,0,3540,2430, dst=188,48,1,1
source raster PL (-793.394,-1712.627) for dst PL (188,48).
msDrawGDAL(): red,green,blue,alpha bands = 1,2,3,0
msDrawMap(): Layer 1 (orthophoto), 0.150s
msDrawMap(): Layer 2 (urban areas), 0.004s
msDrawMap(): Layer 3 (species at risk), 0.008s
msDrawMap(): Layer 4 (populated places), 1.319s
msDrawMap(): Drawing Label Cache, 0.014s
msDrawMap() total time: 1.513s
msSaveImage() total time: 0.039s
msFreeMap(): freeing map at 0218C1A8.
freeLayer(): freeing layer at 0218F5E0.
freeLayer(): freeing layer at 030C33A0.
freeLayer(): freeing layer at 030C3BC8.
freeLayer(): freeing layer at 030C4948.
freeLayer(): freeing layer at 030C7678.
shp2img total time: 1.567s
```

-map_debug Use this setting to set the debug level for the MAP object only.

```
shp2img -m spain.map -o test.png -map_debug 5
```

```
msDrawMap(): Layer 0 (spain provinces), 0.012s
msDrawRasterLayerLow(orthophoto): entering.
msDrawMap(): Layer 1 (orthophoto), 0.144s
msDrawMap(): Layer 2 (urban areas), 0.004s
msDrawMap(): Layer 3 (species at risk), 0.008s
msDrawMap(): Layer 4 (populated places), 1.323s
msDrawMap(): Drawing Label Cache, 0.013s
msDrawMap() total time: 1.511s
msSaveImage() total time: 0.039s
msFreeMap(): freeing map at 0205C1A8.
```

-layer_debug Use this setting to set the debug level for one layer object only.

```
shp2img -m spain.map -o test.png -layer_debug orthophoto 5
```

```
msDrawRasterLayerLow(orthophoto): entering.  
msDrawGDAL(): src=0,0,3540,2430, dst=188,48,1,1  
source raster PL (-793.394,-1712.627) for dst PL (188,48).  
msDrawGDAL(): red,green,blue,alpha bands = 1,2,3,0  
msDrawMap(): Layer 1 (orthophoto), 0.151s  
freeLayer(): freeing layer at 02F23390.
```

Set CPL_DEBUG At the commandline execute the following:

```
set CPL_DEBUG=ON
```

```
shp2img -m spain.map -o test.png -layer_debug orthophoto 5
```

```
msDrawRasterLayerLow(orthophoto): entering.  
GDAL: GDALOpen(D:\ms4w\apps\spain\map/.\\data/ov172068_200904_c100u50x75c24n.jpg, this=0  
4059840) succeeds as JPEG.  
msDrawGDAL(): src=0,0,3540,2430, dst=188,48,1,1  
source raster PL (-793.394,-1712.627) for dst PL (188,48).  
msDrawGDAL(): red,green,blue,alpha bands = 1,2,3,0  
GDAL: GDALDefaultOverviews::OverviewScan()  
msDrawMap(): Layer 1 (orthophoto), 0.155s  
freeLayer(): freeing layer at 03113390.  
GDAL: GDALDeregister_GTiff() called.
```

Reading Errors Returned by shp2img If there is a problem with your mapfile, *shp2img* should output the line number in your mapfile that is causing the trouble. The following tells us that there is a problem on line 85 of my mapfile:

```
getSymbol(): Symbol definition error. Parsing error near (truetype2):(line 85)
```

If you are using mapfile *INCLUDEs*, it may be tricky to track down this line number, but most of the time the line number is useful.

Using mapserv CGI

Another handy way to test your mapfile is to call the mapserv CGI executable at the *commandline*, such as the following:

```
mapserv -nh "QUERY_STRING=map=/ms4w/apps/spain/map/spain.map&mode=map"
```

ON_MISSING_DATA

If you are using tile indexes to access your data, you should also be aware of the configuration settings added in MapServer 5.4 that allow you to tell MapServer how to handle missing data in tile indexes. Please see the *CONFIG* parameter's *ON_MISSING_DATA* setting in the *MAP* object for more information.

Hint: You can check the attributes in the tileindex by executing “ogrinfo -al” on your data file

Step 6: Check your Web Server Logs

Once you have verified that there are no problems with your mapfile, next you should check your Web server log files, for any related information that may help you narrow down your problem.

Apache

Unix users will usually find Apache's *error_log* file in a path similar to:

```
/var/log/apache2/
```

Windows users will usually find Apache's log files in a path similar to:

```
C:\Program Files\Apache Group\Apache2\logs
```

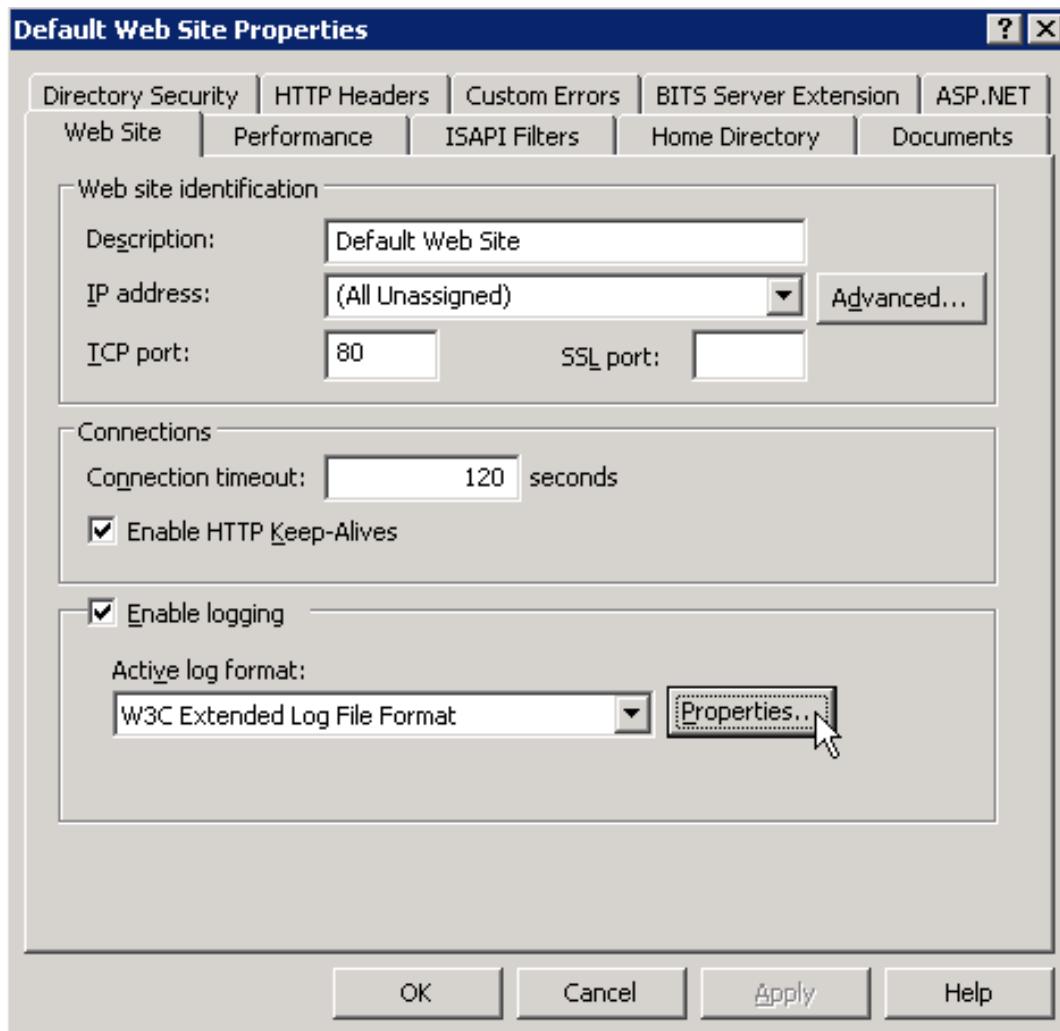
MapServer for Windows ([MS4W](#)) users will find Apache's log files at:

```
\ms4w\Apache\logs
```

Microsoft IIS

IIS log files can be located by:

1. Go to Start -> Control Panel -> Administrative Tools
2. Open the Internet Information Services (IIS) Manager.
3. Find your Web site under the tree on the left.
4. Right-click on it and choose Properties.
5. On the Web site tab, you will see an option near the bottom that says "Active Log Format." Click on the Properties button.



6. At the bottom of the General Properties tab, you will see a box that contains the log file directory and the log file name. The full log path is comprised of the log file directory plus the first part of the log file name, for example:

```
C:\WINDOWS\system32\LogFiles\W3SVC1\ex100507.log
```

You may also want to check the Windows Event Viewer logs, which is located at:

1. Go to Start -> Control Panel -> Administrative Tools
2. Computer Management
3. Event Viewer

Warning: As mentioned previously, in IIS the MapServer *stderr* debug output is returned to the client instead of routed to the Web Server logs, so be sure to log the output to a file, using:

```
CONFIG "MS_ERRORFILE" "/ms4w/tmp/ms_error.txt"
```

CGI Error - The specified CGI application misbehaved by not returning a complete set of HTTP headers

This error is often caused by missing DLL files. You should try to execute “`mapserv -v`” at the commandline, to make sure that MapServer loads properly.

Step 7: Verify your Application Settings

If you have verified that MapServer creates a valid map image through `shp2img`, you’ve checked your MapServer log files, and there are no problems noted in your Web server logs, then you should focus your attention on possible application configuration problems. “Application” here means how you are displaying your map images on the Web page, such as with [OpenLayers](#).

PHP MapScript

If you are using PHP MapScript in your application, here are some important notes for debugging:

1. Make sure your `php.ini` file is configured to show all errors, by setting:

```
display_errors = On
```

2. To enable debugging in PHP MapScript, if you are using MapServer 5.6.0 or more recent, make sure to define `ZEND_DEBUG` in the PHP source.

If you are using MapServer < 5.6.0, then:

- open the file `/mapscript/php3/php_mapscript.c`
- change the following:

```
#define ZEND_DEBUG 0  
  
to  
  
#define ZEND_DEBUG 1
```

12.1.3 Debugging MapServer using Compiler Debugging Tools

Running MapServer in GDB (Linux/Unix)

Section author: Frank Warmerdam

Building with Symbolic Debug Info

It is not strictly necessary to build MapServer with debugging enabled in order to use [GDB](#) on linux, but it does ensure that more meaningful information is reported within GDB. To enable full symbolic information use the `--enable-debug` configure switch. Note that use of this switch disables optimization and so it should not normally be used for production builds where performance is important.

```
./configure --enable-debug <other switches>  
make clean  
make
```

Running in the Debugger

To run either mapserv or shp2img, give the name of the executable as an argument to the “gdb” command. If it is not in the path, you will need to provide the full path to the executable.

```
gdb shp2img
GNU gdb (GDB) 7.0-ubuntu
Copyright (C) 2009 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law. Type "show copying"
and "show warranty" for details.
This GDB was configured as "x86_64-linux-gnu".
For bug reporting instructions, please see:
<http://www.gnu.org/software/gdb/bugs/>...
Reading symbols from /wrk/home/warmerda/mapserver/shp2img...done.
(gdb)
```

Once you are at the “(gdb)” prompt you can use the run command with the arguments you would normally have passed to the mapserv or shp2img executable.

```
(gdb) run -m test.map -o out.png
Starting program: /wrk/home/warmerda/mapserver/shp2img -m test.map -o out.png
[Thread debugging using libthread_db enabled]

Program received signal SIGSEGV, Segmentation fault.
0x00007ffff67594a2 in JP2KAKDataset::Identify (poOpenInfo=0x0)
  at jp2kakdataset.cpp:962
962          if( poOpenInfo->nHeaderBytes < (int) sizeof(jp2_header) )
Current language: auto
The current source language is "auto; currently c++".
(gdb)
```

If the program is crashing, you will generally get a report like the above indicating the function the crash occurred in, and some minimal information on why. It is often useful to request a traceback to see what functions led to the function that crashed. For this use the “where” command.

```
(gdb) where
#0 0x00007ffff67594a2 in JP2KAKDataset::Identify (poOpenInfo=0x0)
  at jp2kakdataset.cpp:962
#1 0x00007ffff67596d2 in JP2KAKDataset::Open (poOpenInfo=0x7fffffff6f6f0)
  at jp2kakdataset.cpp:1025
#2 0x00007ffff6913339 in GDALOpen (
  pszFilename=0x83aa60 "/home/warmerda/data/jpeg2000/spaceimaging_16bit_rgb.jp
2", eAccess=GA_ReadOnly) at gdaldataset.cpp:2170
#3 0x00007ffff69136bf in GDALOpenShared (
  pszFilename=0x83aa60 "/home/warmerda/data/jpeg2000/spaceimaging_16bit_rgb.jp
2", eAccess=GA_ReadOnly) at gdaldataset.cpp:2282
#4 0x0000000000563c2d in msDrawRasterLayerLow (map=0x81e450, layer=0x839140,
  image=0x83af90, rb=0x0) at mapraster.c:566
#5 0x000000000048928f in msDrawRasterLayer (map=0x81e450, layer=0x839140,
  image=0x83af90) at mapdraw.c:1390
#6 0x0000000000486a48 in msDrawLayer (map=0x81e450, layer=0x839140,
  image=0x83af90) at mapdraw.c:806
#7 0x00000000004858fd in msDrawMap (map=0x81e450, querymap=0) at mapdraw.c:459
#8 0x0000000000446410 in main (argc=5, argv=0x7fffffff6918) at shp2img.c:300
(gdb)
```

It may also be helpful to examine variables used in the line where the crash occurred. Use the print command for this.

```
(gdb) print poOpenInfo
$1 = (GDALOpenInfo *) 0x0
```

In this case we see that the program crashed because `poOpenInfo` was NULL (zero). Including a traceback like the above in bug report can help the developers narrow down a problem more quickly, especially if it is one that is difficult for the developers to reproduce themselves.

12.1.4 Debugging Older Versions of MapServer (before 5.0)

1. Make sure that MapServer is compiled in debug mode (on unix this is enabled through `./configure --enable-debug`).

You can verify that your build was compiled in debug mode, by executing the following at the commandline (look for “`DEBUG=MSDEBUG`”):

```
./mapserv -v
```

```
MapServer version 4.10.2 OUTPUT=GIF OUTPUT=PNG OUTPUT=WBMP
OUTPUT=SVG SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER
SUPPORTS=WMS_CLIENT SUPPORTS=WCS_SERVER SUPPORTS=THREADS SUPPORTS=GEOS
INPUT=EPPL7 INPUT=POSTGIS INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE
DEBUG=MSDEBUG
```

2. Set the `MS_ERRORFILE` variable is in your mapfile, within the `MAP` object, such as:

```
MAP
...
CONFIG "MS_ERRORFILE" "/ms4w/tmp/ms_error.txt"
...
LAYER
...
END
END
```

3. If you don't use the `MS_ERRORFILE` variable, you can use the `LOG` parameter in your `WEB` object of the mapfile, such as:

```
MAP
...
WEB
  LOG "mapserver.log"
END
...
LAYER
...
END
END
```

4. Specify `DEBUG ON` in your `MAP` object, or in your `LAYER` objects, such as:

```
MAP
...
WEB
  LOG "mapserver.log"
END
DEBUG ON
...
LAYER
...
```

```
END  
END
```

5. Note that only errors will be written to the log file; all DEBUG output goes to stderr, in the case of Apache that is Apache's *error_log* file. If you are using Microsoft IIS, debug output is routed to *stdout* (i.e. the browser), so be sure to remove *DEBUG ON* statements if using IIS on a production server.

12.2 FastCGI

Author Frank Warmerdam

Contact warmerdam at pobox.com

Author Howard Butler

Contact hobu.inc at gmail.com

Revision \$Revision\$

Date \$Date\$

Last Updated 2008/07/15

Table of Contents

- FastCGI
 - Introduction
 - Obtaining the necessary software
 - mod_fcgid Configuration
 - Deprecated mod_fcgid Configuration
 - Common mod_fcgid/mod_fcgid Configuration
 - Common Problems
 - FastCGI on Win32

12.2.1 Introduction

FastCGI is a protocol for keeping cgi-bin style web applications running as a daemon to take advantage of preserving memory caches, and amortizing other high startup costs (like heavy database connections) over many requests.

12.2.2 Obtaining the necessary software

1. There are three pieces to the MapServer FastCGI puzzle. First, you need the actual FastCGI library. This can be downloaded from <http://www.fastcgi.com/>. This library does the usual *configure, make, make install* dance. One added complication is that it installs by default in /usr/local, and you might give the *configure* command a *--prefix=/usr* to put it in a location that is already visible to ldconfig.
2. Assuming you are running [Apache](#), the next piece you need is the fastcgi module. There are two fastcgi implementations for apache:
 - *mod_fcgid*: mod_fcgid is the newer and recommended way to run fastcgi programs under recent apache versions. It can be downloaded from the [Apache fcgid homepage](#)

- **deprecated mod_fcgi:** Mod_fcgi depends on the version of Apache you are running, so make sure to download the correct fork (Apache 1.3 vs. Apache 2).
- The third and final piece is to compile MapServer with FastCGI support. This is pretty straightforward, and all you need to do is tell *configure* where the FastCGI library is installed. If you changed the prefix variable as described above, this would be:

```
./configure [other options] --with-fastcgi=/usr/local
```

With those pieces in place, the MapServer CGI (mapserv) should now be FastCGI-enabled. You can verify this by testing it on with the command line:

```
[hobu@kenyon mapserver-6.2.0]# ./mapserv -v
MapServer version 6.2.0 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP
SUPPORTS=PROJ SUPPORTS=FREETYPE SUPPORTS=WMS_SERVER SUPPORTS=WMS_CLIENT
SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT SUPPORTS=FASTCGI INPUT=EPPL7
INPUT=SDE INPUT=ORACLESPATIAL INPUT=OGR INPUT=GDAL
INPUT=SHAPEFILE DEBUG=MSDEBUG
```

12.2.3 mod_fcgid Configuration

1. Modify http.conf to load the FastCGI module.

```
LoadModule fcgid_module modules/mod_fcgid.so
```

2. Add an Apache handler for FastCGI applications.

```
AddHandler fcgid-script fcgi
```

3. Set FastCGI processing information

```
<IfModule mod_fcgid.c>
  FcgidMaxProcessesPerClass 30
  FcgidInitialEnv PROJ_LIB /usr/local/share/proj
  FcgidInitialEnv LD_LIBRARY_PATH "/usr/local/lib:/usr/local/pgsql/lib:/usr3/pkg3/oracle9/lib"
</IfModule>
```

12.2.4 Deprecated mod_fcgi Configuration

This section is left for reference. The recommended way to run fastcgi programs under apache is to use mod_fcgid, as detailed above.

1. Modify http.conf to load the FastCGI module.

```
LoadModule fastcgi_module /usr/lib/apache/1.3/mod_fastcgi.so
```

2. Add an Apache handler for FastCGI applications.

```
AddHandler fastcgi-script fcgi
```

3. Set FastCGI processing information

```
FastCgiConfig -initial-env PROJ_LIB=/usr/local/share/proj
-initial-env LD_LIBRARY_PATH=/usr/local/lib:/usr/local/pgsql/lib:/usr3/pkg3/oracle9/lib
-appConnTimeout 60 -idle-timeout 60 -init-start-delay 1
-minProcesses 2 -maxClassProcesses 20 -startDelay 5
```

12.2.5 Common mod_fcgid/mod_fcgi Configuration

1. Install a copy of the mapserv executable (originally **mapserv** or **mapserv.exe**) into the cgi-bin directory with the extension **.fcgi** (ie. **mapserv.fcgi**). Use this executable when you want to utilize fastcgi support.

For some platforms, the MapServer link would then have to changed from:

```
http://your.domain.name/cgi-bin/mapserv?MAP=/path/to/mapfile.map
```

To:

```
http://your.domain.name/cgi-bin/mapserv.fcgi?MAP=/path/to/mapfile.map
```

For other platforms, the MapServer link would then have to changed from:

```
http://your.domain.name/cgi-bin/mapserv.exe?MAP=/path/to/mapfile.map
```

To:

```
http://your.domain.name/cgi-bin/mapserv.fcgi?MAP=/path/to/mapfile.map
```

2. In your mapfile, set a **PROCESSING** directive to tell FastCGI to cache the connections and layer information on all layers for which connection caching is desired - ie. all slow layers.

```
PROCESSING "CLOSE_CONNECTION=DEFER"
```

12.2.6 Common Problems

File permissions

Fedora Core 3 doesn't allow FastCGI to write to the process logs (when you use RedHat's Apache 2 rather than your own). This is described [here](#).

Also, FastCGI needs to write its socket information somewhere. This can be directed with the *FastCgiIpcDir* directive.

12.2.7 FastCGI on Win32

MS4W Users

MS4W (MapServer for Windows) >= version 2.2.2 contains MapServer compiled with FastCGI support. MS4W version >= 2.2.8 also contains the required Apache module (mod_fcgid), and users must follow the [README](#) instructions to setup FastCGI with their application.

Building fcgi-2.4.0

I used libfcgi-2.4.0 for use with Apache2 from <http://www.fastcgi.com>.

Binary IO Patch

It is critical that stdio be in binary mode when PNG and other binary images are written to it. To accomplish this for stdio handled through the FastCGI library, I had to do the following hack to libfcgi/fcgi_stdio.c within the fcgi-2.4.0 distribution.

In FCGI_Accept() made he following change

```

if(isCGI) {
    FCGI_stdin->stdio_stream = stdin;
    FCGI_stdin->fcgx_stream = NULL;
    FCGI_stdout->stdio_stream = stdout;
    FCGI_stdout->fcgx_stream = NULL;
    FCGI_stderr->stdio_stream = stderr;
    FCGI_stderr->fcgx_stream = NULL;

    /* FrankWarmerdam: added so that returning PNG and other binary data
       will still work */
#ifdef _WIN32
    _setmode( _fileno(stdout), _O_BINARY);
    _setmode( _fileno(stdin), _O_BINARY);
#endif

} else {

```

Also, add the following just before the FCGI_Accept() function

```

#ifdef _WIN32
#include <fcntl.h>
#include <iio.h>
#endif

```

I'm sure there is a better way of accomplishing this. If you know how, please let me know!

Building libfcgi

The makefile.nt should be fine. Just ensure you have run VCVARS32.BAT (as is needed for building MapServer) and then issue the command:

```
nmake /f makefile.nt
```

Then the .lib and .dll will be in libfcgi/Debug?. Make sure you copy the DLL somewhere appropriate (such as your cgi-bin directory).

Other Issues

1) FastCGI's receive a very limited environment on win32, seemingly even more restricted than normal cgi's started by apache. Make sure that all DLLs required are either in the fastcgi directory or in windowssystem32. Any missing DLLs will result in very cryptic errors in the error_log, including stuff about Overlapping read requests failing or something like that.

2) Make sure you use a libfcgi.dll built against the same runtime library as your mapserv.exe (and possibly libmap_fcgi.dll) or you will suffer a world of pain! Different runtime libraries have different "environ" variables (as well as their own stdio and heaps). You can check that everything is using MSVCRT.DLL (or all using MSVCRTD.DLL) using the MS SDK Dependency Walker.

12.3 Mapfile

Author David Fawcett

Contact david.fawcett at gmail.com

Revision \$Revision\$

Date \$Date\$

Last Updated 2007/08/01

Table of Contents

- Mapfile
 - Introduction

12.3.1 Introduction

The contents of a Map File are used by MapServer for configuration, data access, projection, and more. Because the Map File is parsed every time a map image is requested, it is important to think about what you include in the file in order to optimize performance. The optimal Map File is one that doesn't include or reference anything that isn't needed.

1. Projections

There are two ways to define projections in a Map File. You can either use inline projection parameters or specify an EPSG code for that projection. If you use the *EPSG* code method, *Proj.4* looks up the projection parameters in the Proj4 database using the EPSG code as an ID. This database lookup takes significantly more resources than when the projection parameters are defined inline. This lookup takes place for each projection definition using EPSG codes in a Map File.

Projection defined using inline projection parameters

```
PROJECTION
  "proj=utm"
  "ellps=GRS80"
  "datum=NAD83"
  "zone=15"
  "units=m"
  "north"
  "no_defs"
END
```

Projection defined using EPSG Code

```
PROJECTION
  "init=epsg:26915"
END
```

Optimization Suggestions

- Use inline projection parameter definitions in place of EPSG codes.
- If you want to use EPSG codes, remove all unneeded projection definition records from the Proj.4 *EPSG* database.

2. Layers

For every layer in a Map File that has a status of ON or DEFAULT, MapServer will load that layer and prepare it for display, even if that layer never gets displayed.

Optimization Suggestions

- Build lean Map Files, only include layers that you plan to use.
- Turn off unnecessary layers; the more layers MapServer is displaying, the more time it takes. Have your opening map view show only the minimum necessary to orient the user, and allow them to turn on additional layers as needed. This is particularly true of remote WMS or very large rasters.
- Related to turning off layers, is turning them on but using MINSCALEDENOM and MAXSCALEDENOM to determine at what zoomlevels the layer is available. If a map's display is outside of the layer's MINSCALEDENOM and MAXSCALEDENOM range, then MapServer can skip processing that layer. It also makes for a really cool effect, that the national boundaries magically change to state boundaries.
- If you have a complex application, consider using multiple simple and specific Map Files in place of one large 'do everything' Map File.
- In a similar vein, each class also supports MINSCALEDENOM and MAXSCALEDENOM. If your dataset has data that are relevant at different zoomlevels, then you may find this a very handy trick. For example, give a MINSCALEDENOM of 1:1000000, county roads a MINSCALEDENOM of 1:100000, and streets a MAXSCALEDENOM of 1:50000. You get the cool effect of new data magically appearing, but you don't have MapServer trying to draw the nation's roads when the entire nation is in view!
- Classes are processed in order, and a feature is assigned to the first class that matches. So try placing the most commonly-used classes at the top of the class list, so MapServer doesn't have to try as many classes before finding a match. For example, if you wanted to highlight the single state of Wyoming, you would probably do this:

```
CLASS
  EXPRESSION ('[NAME]' eq 'WY')
  STYLE
    COLOR 255 0 0
  END
END
CLASS
  STYLE
    COLOR 128 128 128
  END
END
```

But it would be a lot more efficient to do this, since 98% of cases will be matched on the first try:

```
CLASS
  EXPRESSION ('[NAME]' ne 'WY')
  STYLE
    COLOR 128 128 128
  END
END
CLASS
  STYLE
    COLOR 255 0 0
  END
END
```

- Use *tile indexes* instead of multiple layers.

3. Symbols

When the Map File is loaded, each raster symbol listed in the symbols file is located on the filesystem and loaded.

Optimization Suggestions

- Only include raster symbols in your symbols file if you know that they will be used by your application.

4. Fonts

To load a font, MapServer opens up the fonts.list *FONTSET* file which contains an alias for the font and the path for that font file. If you have a fonts.list file with a long list of fonts, it will take more time for MapServer to locate and load the font that you need.

Optimization Suggestions

- Limit the entries in fonts.list to fonts that you actually use.

12.4 Raster

Author HostGIS

Revision \$Revision\$

Date \$Date\$

Last Updated 2008/08/08

Table of Contents

- Raster
 - Overviews
 - Tileindexes and Internal Tiling
 - Image formats
 - Remote WMS

12.4.1 Overviews

TIFF supports the creation of “overviews” within the file, which is basically a downsampled version of the raster data suitable for use at lower resolutions. Use the “gdaladdo” program to add overviews to a TIFF, and MapServer (via GDAL) will automatically choose which downsampled layer to use. Note that overviews significantly increase the disk space required by a TIFF, and in some cases the extra disk reading may offset the performance gained by MapServer not having to resample the image. You’ll just have to try it for yourself and see how it works.

12.4.2 Tileindexes and Internal Tiling

Tiling is mostly effective for cases where one commonly requests only a very small area of the image.

A tileindex is how one creates an on-the-fly mosaic from many rasters. This is described in the *Tile Indexes*. That document describes common cases where a tileindex makes sense. In particular, if you have a very large raster and most requests are for a very small spatial area within it, you may want to consider slicing it and tileindexing it.

As an alternative to slicing and mosaicing, TIFFs do support a concept of internal tiling. Like a tileindex, this is mostly effective when the requests are for a small portion of the raster. Internal tiling is done by adding “-co TILED=YES” to gdal_translate, e.g.:

```
gdal_translate -co TILED=YES original.tif tiled.tif
```

12.4.3 Image formats

The TIFF image format is the fastest to “decipher”, but once you get beyond a certain point, the disk reading (since TIFF is very large) may become slow enough to make it worthwhile to consider other image formats.

For TIFFs larger than 1 GB, ECW images tend to render faster than TIFFs, since decompressing the data (CPU and RAM) is faster than reading the uncompressed data (disk). The downside is that ECW is not open-source, and the licensing is often prohibitive.

JPEG2000 is a very slow image format, as is JPEG.

12.4.4 Remote WMS

Remote WMS servers are often slow, especially the public ones such as TerraServer or NASA’s Landsat server. There’s nothing you can do about that, except to reconsider when the remote WMS layer should be used.

For example, there may be a different WMS server (or a different set of imagery, or even vector outline maps) suitable for drawing the countries or states to orient the user. You could then have the WMS layer come on at a certain scale, or have the layer always available but turned off so the user can choose when to turn it on.

See Also:

Raster Data

12.5 Tile Indexes

Author HostGIS

Revision \$Revision\$

Date \$Date\$

Last Updated 2007/08/03

Table of Contents

- [Tile Indexes](#)
 - [Introduction](#)
 - [What is a tileindex and how do I make one?](#)
 - [Using the tileindex in your mapfile](#)
 - [Tileindexes may make your map faster](#)

12.5.1 Introduction

An introduction to tileindexes, MapServer’s method for doing on-the-fly mosaicing.

12.5.2 What is a tileindex and how do I make one?

A tileindex is a shapefile that ties together several datasets into a single layer. Therefore, you don’t need to create separate layers for each piece of imagery or each county’s road data; make a tileindex and let MapServer piece the mosaic together on the fly.

Making a tileindex is easy using ‘gdaltindex’ for GDAL data sources (rasters) and ‘ogrindex’ for OGR data sources (vectors). You just run them, specifying the index file to create and the list of data sources to add to the index.

For example, to make a mosaic of several TIFFs:

```
gdaltindex imagery.shp imagery/*.tif
```

And to make a mosaic of vectors:

```
ogrindex streets.shp tiger/CA/*.shp tiger/NV/*.shp
```

Note: ogrindex and gdaltindex **add** the specified files to the index. Sometimes you’ll have to delete the index file to avoid creating duplicate entries.

12.5.3 Using the tileindex in your mapfile

Using a tileindex as a layer is best explained by an example:

```
LAYER
  NAME "Roads"
  STATUS ON
  TYPE LINE
  TILEINDEX "tiger/index.shp"
  TILEITEM "LOCATION"
END
```

There are two items of note here: TILEINDEX and TILEITEM. TILEINDEX is simply the path to the index file, and TILEITEM specifies the field in the shapefile which contains the filenames referenced by the index. The TILEITEM will usually be “LOCATION” unless you specified the *-tileindex* option when running gdaltindex or ogrindex.

Two important notes about the pathnames:

- The path to TILEINDEX follows the same conventions as for any other data source, e.g. using the SHAPEPATH or else being relative to the location of the mapfile.
- The filenames specified on the command line to gdaltindex or ogrindex will be used with the same conventions as well, following the SHAPEPATH or else being relative to the mapfile’s location. I find it very useful to change into the SHAPEPATH directory and then run ogrindex/gdaltindex from there; this ensures that I specify the correct pathnames.

12.5.4 Tileindexes may make your map faster

A tileindex is often a performance boost for two reasons:

- It’s more efficient than having several separate layers.
- MapServer will examine the tileindex to determine which datasets fall into the map’s view, and will open only those datasets. This can result in a great savings for a large dataset, especially for use cases where most of the time only a very small spatial region of the data is being used. (for example, citywide maps with nationwide street imagery)

A tileindex will not help in the case where all/most of the data sources will usually be opened anyway (e.g. street data by county, showing states or larger regions). In that case, it may even result in a decrease in performance, since it may be slower to open 100 files than to open one giant file.

The ideal case for a tileindex is when the most typically requested map areas fall into very few tiles. For example, if you're showing state and larger regions, try fitting your data into state-sized blocks instead of county-sized blocks; and if you're showing cities and counties, go for county-sized blocks.

You'll just have to experiment with it and see what works best for your use cases.

12.6 Vector

Author HostGIS

Revision \$Revision\$

Date \$Date\$

Last Updated 2008/08/08

Table of Contents

- [Vector](#)
 - [Splitting your data](#)
 - [Shapefiles](#)
 - [PostGIS](#)
 - [Databases in General \(PostGIS, Oracle, MySQL\)](#)

12.6.1 Splitting your data

If you find yourself making several layers, all of them using the same dataset but filtering to only use some of the records, you could probably do it better. If the criteria are static, one approach is to pre-split the data.

The *ogr2ogr* utility can select on certain features from a datasource, and save them to a new data source. Thus, you can split your dataset into several smaller ones that are already effectively filtered, and remove the FILTER statement.

12.6.2 Shapefiles

Use *shptree* to generate a spatial index on your shapefile. This is quick and easy (“shptree foo.shp”) and generates a .qix file. MapServer will automagically detect an index and use it.

MapServer also comes with the *sortshp* utility. This reorganizes a shapefile, sorting it according to the values in one of its columns. If you're commonly filtering by criteria and it's almost always by a specific column, this can make the process slightly more efficient.

Although shapefiles are a very fast data format, *PostGIS* is pretty speedy as well, especially if you use indexes well and have memory to throw at caching.

12.6.3 PostGIS

The single biggest boost to performance is indexing. Make sure that there's a GIST index on the geometry column, and each record should also have an indexed primary key. If you used shp2pgsql, then these statements should create the necessary indexes:

```
ALTER TABLE table ADD PRIMARY KEY (gid);
CREATE INDEX table_the_geom ON table (the_geom) USING GIST;
```

PostgreSQL also supports reorganizing the data in a table, such that it's physically sorted by the index. This allows PostgreSQL to be much more efficient in reading the indexed data. Use the CLUSTER command, e.g.

```
CLUSTER the_geom ON table;
```

Then there are numerous optimizations one can perform on the database server itself, aside from the geospatial component. The easiest is to increase *max_buffers* in the *postgresql.conf* file, which allows PostgreSQL to use more memory for caching. More information can be found at the [PostgreSQL website](#).

12.6.4 Databases in General (PostGIS, Oracle, MySQL)

By default, MapServer opens and closes a new database connection for each database-driven layer in the mapfile. If you have several layers reading from the same database, this doesn't make a lot of sense. And with some databases (Oracle) establishing connections takes enough time that it can become significant.

Try adding this line to your database layers:

```
PROCESSING "CLOSE_CONNECTION=DEFER"
```

This causes MapServer to not close the database connection for each layer until after it has finished processing the mapfile and this may shave a few seconds off of map generation times.

Utilities

13.1 legend

13.1.1 Purpose

Creates a legend from a mapfile. Output format depends on the graphics library used for rendering.

13.1.2 Syntax

```
legend [mapfile] [output image]
```

13.2 msencrypt

13.2.1 Purpose

Used to create an encryption key or to encrypt portions of connection strings for use in mapfiles (added in v4.10). Typically you might want to encrypt portions of the CONNECTION parameter for a database connection. The following CONNECTIONTYPES are supported for using this encryption method:

OGR
Oracle Spatial
PostGIS
SDE

13.2.2 Syntax

To create a new encryption key:

```
msencrypt -keygen [key_filename]
```

To encrypt a string:

```
msencrypt -key [key_filename] [string_to_encrypt]
```

13.2.3 Use in Mapfile

The location of the encryption key can be specified by two mechanisms, either by setting the environment variable `MS_ENCRYPTION_KEY` or using a `CONFIG` directive in the `MAP` object of your mapfile. For example:

```
CONFIG MS_ENCRYPTION_KEY "/path/to/mykey.txt"
```

Use the { and } characters as delimiters for encrypted strings inside database CONNECTIONs in your mapfile. For example:

```
CONNECTIONTYPE ORACLESPATIAL
CONNECTION "user/{MIIBugIBAAKBgQCP0Yj+Seh8==}@service"
```

Example

```
LAYER
  NAME "provinces"
  TYPE POLYGON
  CONNECTIONTYPE POSTGIS
  CONNECTION "host=127.0.0.1 dbname=gmap user=postgres password=iluvyou18 port=5432"
  DATA "the_geom FROM province using SRID=42304"
  STATUS DEFAULT
  CLASS
    NAME "Countries"
    COLOR 255 0 0
  END
END
```

Here are the steps to encrypt the password in the above connection:

1. Generate an encryption key (note that this key should not be stored anywhere within your web server's accessible directories):

```
msencrypt -keygen "E:\temp\mykey.txt"
```

And this generated key file might contain something like:

```
2137FEFDB5611448738D9FBB1DC59055
```

2. Encrypt the connection's password using that generated key:

```
msencrypt -key "E:\temp\mykey.txt" "iluvyou18"
```

Which returns the password encrypted, at the commandline (you'll use it in a second):

```
3656026A23DBAFC04C402EDFAB7CE714
```

3. Edit the mapfile to make sure the 'mykey.txt' can be found, using the "MS_ENCRYPTION_KEY" environment variable. The `CONFIG` parameter inside the `MAP` object can be used to set an environment variable inside a mapfile:

```
MAP
  ...
  CONFIG "MS_ENCRYPTION_KEY" "E:/temp/mykey.txt"
  ...
END #mapfile
```

4. Modify the layer's CONNECTION to use the generated password key, making sure to use the "{}" brackets around the key:

```
CONNECTION "host=127.0.0.1 dbname=gmap user=postgres
            password={3656026A23DBAFC04C402EDFAB7CE714} port=5432"
```

5. Done! Give your new encrypted mapfile a try with the *shp2img* utility!

13.3 scalebar

13.3.1 Purpose

Creates a scalebar from a mapfile. Output is either PNG or GIF depending on what version of the GD library used.

13.3.2 Syntax

```
scalebar [mapfile] [output image]
```

13.4 shp2img

13.4.1 Purpose

Creates a map image from a mapfile. Output is either PNG or GIF depending on what version of the GD library is used. This is a useful utility to test your mapfile. You can simply provide the path to your mapfile and the name of an output image, and an image should be returned. If an image cannot be created an error will be displayed at the command line that should refer to a line number in the mapfile.

13.4.2 Syntax

```
shp2img -m mapfile [-o image] [-e minx miny maxx maxy] [-s sizex sizey]
                  [-l "layer1 [layers2...]" ] [-i format]
                  [-all_debug n] [-map_debug n] [-layer_debug n] [-p n] [-c n] [-d
                  layername datavalue]
-m mapfile: Map file to operate on - required
-i format: Override the IMAGETYPE value to pick output format
-o image: output filename (stdout if not provided)
-e minx miny maxx maxy: extents to render
-s sizex sizey: output image size
-l layers: layers to enable - make sure they are quoted and space separated
           if more than one listed
-all_debug n: Set debug level for map and all layers
-map_debug n: Set map debug level
-layer_debug layer_name n: Set layer debug level
-c n: draw map n number of times
-p n: pause for n seconds after reading the map
-d layername datavalue: change DATA value for layer
```

Example #1

```
shp2img -m vector_blank.map -o test.png
```

Result A file named ‘test.png’ is created, that you can drag into your browser to view.

Example #2

```
shp2img -m gmap75.map -o test2.png -map_debug 3
```

Result A file named ‘test2.png’ is created, and layer draw speeds are returned such as:

```
msDrawRasterLayerLow(bathymetry): entering
msDrawMap(): Layer 0 (bathymetry), 0.601s
msDrawMap(): Layer 3 (drain_fn), 0.200s
msDrawMap(): Layer 4 (drainage), 0.300s
msDrawMap(): Layer 5 (prov_bound), 0.191s
msDrawMap(): Layer 6 (fedlimit), 0.030s
msDrawMap(): Layer 9 (popplace), 0.080s
msDrawMap(): Drawing Label Cache, 0.300s
msDrawMap() total time: 1.702s
msSaveImage() total time: 0.040s
```

Example #3

```
shp2img -m gmap75.map -o test3.png -all_debug 3
```

Result A file named ‘test3.png’ is created, layer draw speeds are returned, and some warnings that index qix files are not found, such as:

```
msLoadMap(): 0.671s
msDrawRasterLayerLow(bathymetry): entering.
msDrawGDAL(): src=72,417,3077,2308, dst=0,0,400,300
msDrawGDAL(): red,green,blue,alpha bands = 1,0,0,0
msDrawMap(): Layer 0 (bathymetry), 0.090s
msSearchDiskTree(): Search returned no results. Unable to open spatial index
for D:\ms4w\apps\gmap\htdocs/.\..\data/drain_fn.qix. In most cases you can
safely ignore this message, otherwise check file names and permissions.
msDrawMap(): Layer 3 (drain_fn), 0.010s
msDrawMap(): Layer 4 (drainage), 0.050s
msSearchDiskTree(): Search returned no results. Unable to open spatial index
for D:\ms4w\apps\gmap\htdocs/.\..\data/province.qix. In most cases you can
safely ignore this message, otherwise check file names and permissions.
msDrawMap(): Layer 5 (prov_bound), 0.030s
msSearchDiskTree(): Search returned no results. Unable to open spatial index
for D:\ms4w\apps\gmap\htdocs/.\..\data/fedlimit.qix. In most cases you can
safely ignore this message, otherwise check file names and permissions.
msDrawMap(): Layer 6 (fedlimit), 0.010s
msDrawMap(): Layer 9 (popplace), 0.010s
msDrawMap(): Drawing Label Cache, 0.201s
msDrawMap() total time: 0.401s
msSaveImage() total time: 0.010s
shp2img total time: 1.082s
```

13.5 shptree

13.5.1 Purpose

Creates a quadtree-based spatial index for a Shape data set. The default tree depth is calculated so that each tree node (quadtree cell) contains 8 shapes. Do not use the default with point files, a value between 6 and 10 seems to work ok. Your mileage may vary and you'll need to do some experimenting.

The shptree wiki page may also contain information on this utility.

13.5.2 Description

This utility is a must for any MapServer application that uses Shape data sets. Shptree creates a spatial index of your Shape data set, using a quadtree method. This means that MapServer will use this index to quickly find the appropriate shapes to draw. It creates a file of the same name as your Shape data set, with a .qix file extension. The quadtree method breaks the file into 4 quadrants, recursively until only a few shapes are contained in each quadrant. This minimum number can be set with the <depth> parameter of the command.

13.5.3 Syntax

```
shptree <shpfile> [<depth>] [<index_format>]
Where:
<shpfile> is the name of the .shp file to index.
<depth> (optional) is the maximum depth of the index
        to create, default is 0 meaning that shptree
        will calculate a reasonable default depth.
<index_format> (optional) is one of:
    NL: LSB byte order, using new index format
    NM: MSB byte order, using new index format
The following old format options are deprecated
    N: Native byte order
    L: LSB (intel) byte order
    M: MSB byte order
The default index_format on this system is: NL
```

Example

```
shptree us_states.shp
creating index of new  LSB format
```

Result A file named ‘us_states.qix’ is created in the same location. (note that you can use the shptreevis utility, described next, to view the actual quadtree quadrants that are used by MapServer in this qix file)

13.5.4 Mapfile Notes

Shape data sets are native to MapServer, and therefore do not require the .shp extension in the DATA path of the LAYER. In fact, in order for MapServer to use the .qix extension you MUST NOT specify the extension, for example:

```
LAYER
...
DATA "us_states"      #MapServer will search for us_states.qix and will use it
...
END
```

LAYER

```
...
DATA "us_states.shp" #MapServer will search for us_states.shp.qix and won't find it
...
END
```

Note: As of MapServer 5.2 the qix will be used even when the .shp extension is specified

13.6 shptreetst

13.6.1 Purpose

Executes a spatial query on an existing spatial index (.qix), that was created by the *shptree* utility. This utility is useful to understand how a search of a Shape data set and its *qix* index works.

13.6.2 Syntax

```
shptreetst shapefile {minx miny maxx maxy}
```

Example

```
shptreetst esp 879827.480246 4317203.699447 884286.289767 4321662.508967
```

```
This new LSB index supports a shapefile with 48 shapes, 4 depth
shapes 6, node 4, -13702.315770,3973784.599548,1127752.921471,4859616.714055
shapes 5, node 3, -13702.315770,3973784.599548,614098.064712,4460992.262527
shapes 1, node 1, -13702.315770,3973784.599548,331587.893495,4241748.814186
shapes 1, node 0, 141678.278400,3973784.599548,331587.893495,4121164.917599
shapes 1, node 0, 268807.855447,4193028.047889,614098.064712,4460992.262527
shapes 1, node 0, 268807.855447,3973784.599548,614098.064712,4241748.814186
shapes 7, node 4, -13702.315770,4372409.051076,614098.064712,4859616.714055
shapes 1, node 0, -13702.315770,4372409.051076,331587.893495,4640373.265714
shapes 3, node 1, -13702.315770,4591652.499417,331587.893495,4859616.714055
shapes 1, node 0, -13702.315770,4712236.396004,176207.299326,4859616.714055
shapes 2, node 0, 268807.855447,4372409.051076,614098.064712,4640373.265714
shapes 3, node 2, 268807.855447,4591652.499417,614098.064712,4859616.714055
shapes 2, node 0, 424188.449617,4712236.396004,614098.064712,4859616.714055
shapes 1, node 0, 424188.449617,4591652.499417,614098.064712,4739032.817468
shapes 2, node 1, 499952.540988,3973784.599548,1127752.921471,4460992.262527
shapes 2, node 0, 499952.540988,4193028.047889,845242.750254,4460992.262527
shapes 5, node 3, 499952.540988,4372409.051076,1127752.921471,4859616.714055
shapes 1, node 1, 499952.540988,4372409.051076,845242.750254,4640373.265714
shapes 1, node 0, 655333.135158,4372409.051076,845242.750254,4519789.369127
shapes 1, node 0, 499952.540988,4591652.499417,845242.750254,4859616.714055
read entire file now at quad box rec 20 file pos 1084
result of rectangle search was
8, 10, 36, 37, 38, 39, 42, 46,
```

Result The above output from the shptreetst command tells us that the existing *.qix* index is for a Shape data set that contains 48 shapes; indeed the Shape data set used in this example, *esp.shp*, contains 48 polygons of Spain. The command also tells us that *qix* file has a quadtree depth of 4.

Most importantly, the resulting shape IDs (or feature IDs) that were contained in the bounding box that we passed in our example were returned at the bottom of the output: “8, 10, 36, 37, 38, 39, 42, 46”. You can use a tool such as QGIS to view those feature IDs and check what shapes MapServer is querying when a user clicks within that bounding box.

.index:: pair: Utility; shptreevis

13.7 shptreevis

13.7.1 Purpose

This utility can be used to view the quadtree quadrants that are part of a .qix file (that was created with the shptree utility).

13.7.2 Syntax

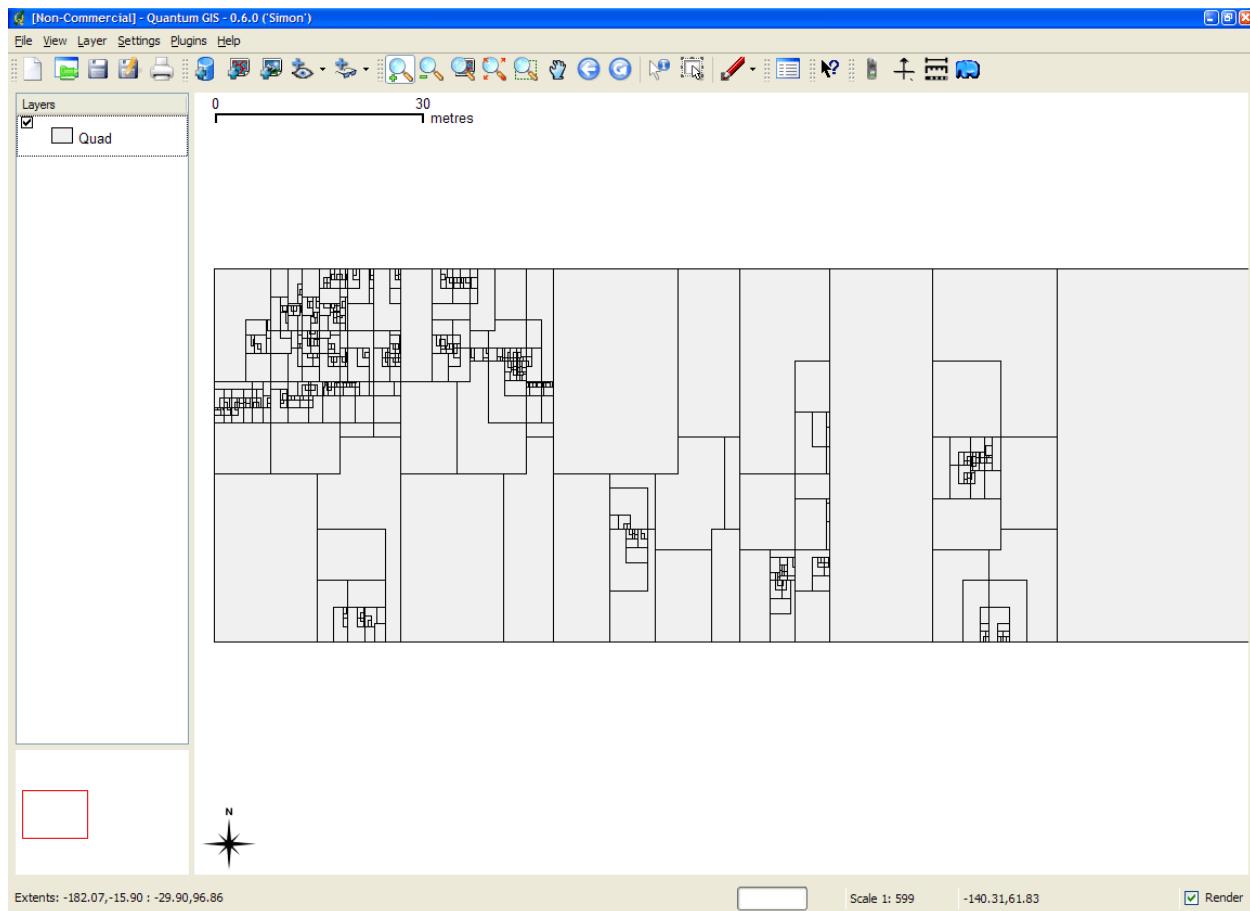
```
shptreevis shapefile new_shapefile
```

Example

```
shptreevis us_states.shp quad.shp
This new LSB index supports a shapefile with 2895 shapes, 10 depth
```

Result A Shape data set named ‘quad.shp’ is created. You can now view this Shape data set in a desktop GIS (such as [QGIS](#) for example) to see the quadtrees that were created with the shptree command, as shown below.

Figure: shptreevis result displayed in QGIS



13.8 sortshp

Purpose Sorts a Shape data set based on a single column in ascending or descending order. Supports INTEGER, DOUBLE and STRING column types. Useful for prioritizing shapes for rendering and/or labeling.

Description The idea here is that if you know that you need to display a certain attribute classed by a certain value, it will be faster for MapServer to access that value if it is at the beginning of the attribute file.

Syntax

```
sortshp [infile] [outfile] [item] [ascending|descending]
```

Example This example uses a roads file ('roads_ugl') that has a field with road classes in integer format ('class1').

```
sortshp roads_ugl roads-sort class1 ascending
```

Result A new Shape data set named 'roads-sort.shp' is created with shapes sorted in ascending order, according to the values in the 'class1' field, as shown below.

Figure1: Attributes Before sortshp

	median	class	class1	sign
1	2	Urban Principa	2	
2	0	Urban Principa	2	
3	2		4	42
4	2		4	42
5	2		4	
6	2	Urban Principa	3	28
7	2	Urban Principa	3	42
8	2		4	14
9	0	Urban Principa	2	
10	2		4	
11	2		4	
12	2	Urban Principa	2	51
13	2	Urban Principa	2	
14	2		2	169

Figure2: Attributes After sortshp

median	class	class1	sign
1	2 Urban Interstat	1	496
2	2 Urban Interstat	1	496
3	2 Urban Interstat	1	94
4	2 Urban Interstat	1	94
5	2 Urban Interstat	1	475
6	1 Rural Interstate	1	96
7	1 Rural Interstate	1	96
8	2 Urban Interstat	1	475
9	1 Urban Interstat	1	475
10	1 Urban Interstat	1	696
11	2 Urban Interstat	1	196
12	2 Urban Interstat	1	196
13	2 Urban Interstat	1 35E	
14	2 Urban Interstat	1 35E	

13.9 sym2img

13.9.1 Purpose

Creates a graphic dump of a symbol file. Output is either PNG or GIF depending on what version of the GD library used. (this utility is not currently included in pre-compiled packages, due to issues mentioned in [bug#506](#))

13.9.2 Syntax

```
sym2img [symbolfile] [outfile]
```

13.10 tile4ms

13.10.1 Purpose

Creates a tile index Shape data set for use with MapServer's TILEINDEX feature. The program creates a Shape data set of rectangles from extents of all the Shape data sets listed in [metafile] (one Shape data set name per line) and the associated DBF with the filename for each shape tile in a column called LOCATION as required by mapserv.

Note: Similar functionality can be found in the GDAL commandline utilities [ogrindex](#) (for vectors) and [gdaltindex](#) (for rasters).

13.10.2 Description

This utility creates a Shape data set containing the MBR (minimum bounding rectangle) of all shapes in the files provided, which can then be used in the LAYER object's TILEINDEX parameter of the mapfile. The new field created with this command is used by MapServer to only load the files associated with that extent (or tile).

13.10.3 Syntax

```
tile4ms <meta-file> <tile-file> [-tile-path-only]
<meta-file>      INPUT file containing list of Shape data set names
                  (complete paths 255 chars max, no extension)
<tile-file>      OUTPUT shape file of extent rectangles and names
                  of tiles in <tile-file>.dbf
-tile-path-only  Optional flag. If specified then only the path to the
                  shape files will be stored in the LOCATION field
                  instead of storing the full filename.
```

13.10.4 Short Example

Create tileindex.shp for all tiles under the /path/to/data directory:

```
<on Unix>

cd /path/to/data
find . -name "/*.shp" -print > metafile.txt
tile4ms metafile.txt tileindex

<on Windows>

dir /b /s *.shp > metafile.txt
tile4ms metafile.txt tileindex
```

13.10.5 Long Example

This example uses TIGER Census data, where the data contains files divided up by county (in fact there are over 3200 counties, a very large dataset indeed). In this example we will show how to display all lakes for the state of Minnesota. (note that here we have already converted the TIGER data into Shape format, but you could keep the data in TIGER format and use the ogrtindex utility instead) The TIGER Census data for Minnesota is made up of 87 different counties, each containing its own lakes file ('wp.shp').

1. We need to create the ‘meta-file’ for the tile4ms command. This is a text file of the paths to all ‘wp.shp’ files for the MN state. To create this file we can use a few simple commands:

```
DOS: dir wp.shp /b /s > wp_list.txt  
(this includes full paths to the data, you might want to edit the txt  
file to remove the full path)
```

```
UNIX: find -name *wp.shp -print > wp_list.txt
```

The newly created file might look like the following (after removing the full path):

```
001\wp.shp  
003\wp.shp  
005\wp.shp  
007\wp.shp  
009\wp.shp  
011\wp.shp  
013\wp.shp  
015\wp.shp  
017\wp.shp  
019\wp.shp  
...
```

2. Execute the tile4ms command with the newly created meta-file to create the index file:

```
tile4ms wp_list.txt index  
Processed 87 of 87 files
```

3. A new file named ‘index.shp’ is created. This is the index file with the MBRs of all ‘wp.shp’ files for the entire state, as shown in Figure1. The attribute table of this file contains a field named ‘LOCATION’, that contains the path to each ‘wp.shp’ file, as shown in Figure2.

Figure 1: Index file created by tile4ms utility

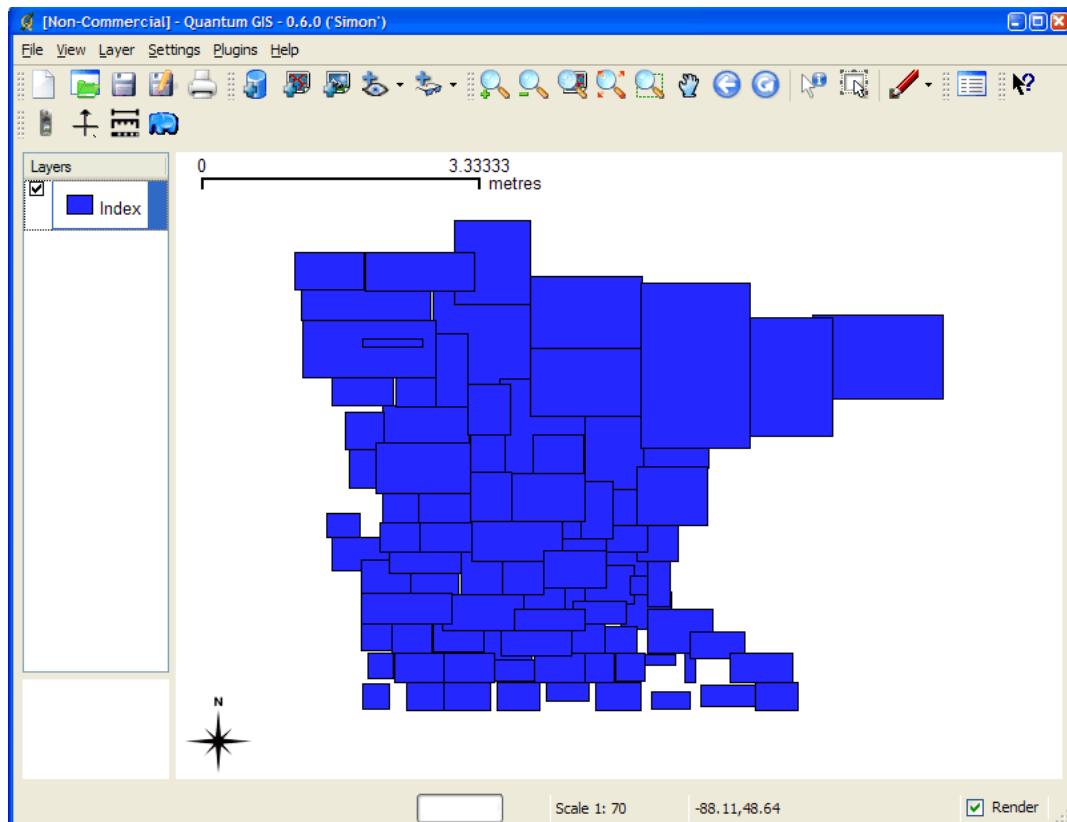


Figure 2: Attributes of index file created by tile4ms utility

id	location
1	0 001\wp
2	1 003\wp
3	2 005\wp
4	3 007\wp
5	4 009\wp
6	5 011\wp
7	6 013\wp
8	7 015\wp
9	8 017\wp
10	9 019\wp
11	10 021\wp
12	11 023\wp
13	12 025\wp
14	13 027\wp
15	14 029\wp

4. The final step is to use this in your mapfile.

- LAYER object's TILEINDEX - must point to the location of the index file
- LAYER object's TILEITEM - specify the name of the field in the index file containing the paths (default is 'location')
- do not need to use the LAYER's DATA parameter

For example:

```
LAYER
  NAME 'mn-lakes'
  STATUS ON
  TILEINDEX "index"
  TILEITEM "location"
  TYPE POLYGON
  CLASS
    NAME "mn-lakes"
    STYLE
      COLOR 0 0 255
    END
  END
END
```

When you view the layer in a MapServer application, you will notice that when you are zoomed into a small area of the state only those lakes layers are loaded, which speeds up the application.

13.11 Batch Scripting

If you need to run the utilities on multiple files/folders, here are some commands that will help you:

13.11.1 Windows

type the following at the command prompt:

```
for %f in (*.shp) do shptree %f
```

or to run recursively (throughout all subfolders):

```
for /R %f in (*.shp) do shptree %f
```

13.11.2 Linux

```
find /path/to/data -name "*.shp" -exec shptree {} \;
```

13.12 File Management

13.12.1 File Placement

MapServer requires a number of different files to execute. Except for graphics that are referenced in output templates (i.e. web pages) none of the data or configuration files need be accessible via a web server. File naming for MapServer follows two rules:

1. Files may be given using their full system path. *or*
2. Files may be given using a relative path where the path is relative to the location of the file they are being referenced from.

So, for files referenced in the Mapfile they can be given relative to the location of the Mapfile. Same holds true for symbol sets and font sets.

13.12.2 Temporary Files

MapServer also can produce a number of files (i.e. maps, legends, scalebars, etc...). These files **must** be accessible using a web server. To accomplish this MapServer creates these files in a scratch directory. The location of that directory is given using the IMAGEPATH and IMAGEURL parameters in the web section of a Mapfile. The scratch directory must be writable by the user that the web server runs under, usually *nobody*. It is recommended for security reasons that the web user own the scratch directory rather than making it world writable. The scratch area will need to be cleaned periodically. On busy sites this may need to happen several times an hour. Here's an example shell script that could be run using *cron*:

```
#!/bin/csh  
  
find /usr/local/www/docs/tmp -follow -name "*.gif" -exec rm {} \;
```

Windows

The following *.bat* file can be used in ‘Scheduled Tasks’ to remove these temporary images daily:

```
REM this script deletes the contents of the ms_tmp directory  
REM (i.e. the MapServer-created gifs)
```

```
cd D:\ms4w\tmp\ms_tmp  
echo Y | del *.*
```

CGI

Date 2008/09/09

Author Daniel Morissette

Contact dmorissette at mapgears.com

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Author Frank Koermann

14.1 MapServer CGI Introduction

14.1.1 Notes

- Variable names are not case sensitive.
- In cases where multiple values are associated with a variable (eg. mapext), the values must be separated by spaces (or their escaped equivalents for GET requests).
- Variable contents are checked for appropriate data types and magnitude as they are loaded.
- Any CGI Variable not listed below is simply stored and can be referenced within a template file.

14.1.2 Changes

From MapServer version 4.x to version 5.x

- Modifying map parameters through a URL has changed to allow for chunks of a mapfile to be modified at once. The syntax has changed accordingly, so please see the *Changing map file parameters via a form or a URL* section.

From MapServer version 3.x to version 4.x

- New way to perform attribute queries: No longer do you set a layer filter, but rather you pass a query string (and optionally a query item) to the query function. To do this two new CGI parameters were added to MapServer: *QSTRING* and *QITEM*.
- *SAVEMAP* is switched off: The SAVEMAP functionality is considered insecure, since the saved files are accessible by everyone.
- *TEMPLATE* has been removed, since the map_web_template syntax can be used to alter a template file. Simplifies security maintenance by only having to deal with this option in a single place. Note that the *TEMPLATEPATH* of the mapfile has to be used to enable this feature.

14.2 mapserv

The CGI interface can be tested at the commandline by using the “QUERY_STRING” switch, such as:

```
mapserv "QUERY_STRING=map=/ms4w/apps/gmap/htdocs/gmap75.map&mode=map"
```

To suppress the HTTP headers, you can use the “-nh” switch, such as:

```
mapserv -nh "QUERY_STRING=map=/ms4w/apps/gmap/htdocs/gmap75.map&mode=map"
```

To save the output into an image file, use the pipe command such as:

```
mapserv -nh "QUERY_STRING=map=/ms4w/apps/gmap/htdocs/gmap75.map&mode=map" > test.png
```

14.3 Map Context Files

14.3.1 Support for Local Map Context Files

There is a CGI parameter called CONTEXT that is used to specify a local context file. The user can then use MapServer to request a map using the following syntax:

```
http://localhost/mapserver.cgi?MODE=map&MAP=/path/to/mapfile.map&CONTEXT=
/path/to/contextfile.xml&LAYERS=layer_name1 layers_name2
```

Note: All layers created from a context file have their status set to ON. To be able to display layers, the user needs to add the LAYERS argument in the URL.

14.3.2 Support for Context Files Accessed Through a URL

The syntax of using a web accessible context file would be similar to accessing a local context file:

```
http://localhost/mapserver.cgi?MODE=map&MAP=/path/to/mapfile.map&CONTEXT=
http://URL/path/to/contextfile.xml&LAYERS=layers_name1 layer_name2
```

Due to security concerns loading a file from a URL is disabled by default. To enable this functionality, the user needs to set a CONFIG parameter called CGI_CONTEXT_URL in the default map file that will allow this functionality. Here is an example of a map file with the CONFIG parameter:

```
# Start of map file
NAME DEMO
STATUS ON
SIZE 400 300
EXTENT -2200000 -712631 3072800 3840000
UNITS METERS
IMAGECOLOR 255 255 255
IMAGETYPE png
CONFIG "CGI_CONTEXT_URL" "1"
...
```

14.3.3 Default Map File

To smoothly run a MapServer CGI application with a Map Context, the application administrator needs to provide a default map file with at least the basic required parameters that will be used with the Context file. This default map file can contain as little information as the imagepath and imageurl or contain a list of layers. Information coming from the context (e.g.: layers, width, height, etc) would either be appended or will replace values found in the map file.

Here is an example of a default map file containing the minimum required parameters:

```
NAME CGI-CONTEXT-DEMO
STATUS ON
SIZE 400 300
EXTENT -2200000 -712631 3072800 3840000
UNITS METERS
IMAGECOLOR 255 255 255
IMAGETYPE png
#
# Start of web interface definition
#
WEB
    MINSCALE 2000000
    MAXSCALE 50000000
#
# On Windows systems, /tmp and /tmp/ms_tmp/ should be created at the root
# of the drive where the .MAP file resides.
#
    IMAGEPATH "/ms4w/tmp/ms_tmp/"
    IMAGEURL "/ms_tmp/"
END
END # Map File
```

14.4 MapServer CGI Controls

14.4.1 Variables

BUFFER [distance] A distance, in the same coordinate system as the map file, used in conjunction with MAPXY to create an new map extent.

CLASSGROUP [name] The name of a *LAYER* CLASSGROUP. Set the *LAYER CLASSGROUP* to *name* for all layers that have at least one *CLASS* that is using the given CLASSGROUP *name*.

CONTEXT [filename] Path to a context file. Path is relative to the map file to be used, or can also be a URL path (See the section “Map Context Support Through CGI” below for more details).

ICON [layername],[classindex] Used in MODE=legendicon to generate a legend icon for a layer. The class index value is optional and defaults to 0.

ID [id-string] By default MapServer generates a uniq session id based on system time and process id. This parameter overwrites the default.

IMG The name associated with the inline map image used to record user clicks. What actually is passed are two variables, img.x and img.y.

For the CGI Applications this is an essential variable, see the examples for sample usage.

IMGBOX [x1] [y1] [x2] [y2] Coordinates (in pixels) of a box drag in the image. Most often used in conjunction with Java based front ends to the MapServer.

IMAGEEXT [minx] [miny] [maxx] [maxy] The spatial extent of the existing inline image, that is, the image the users can see in their browser.

IMGSHAPE [x1 y1 x2 y2 x3 y3 ...] | [WKT] An arbitrary polygon shape (specified using **image coordinates**) to be used for query purposes.

The polygon is specified by listing its coordinates (multiple instances simply add parts to the shape so it is possible to construct a shape with holes) or by specifying the WKT (Well Known Text) representation.

Used with the NQUERY mode.

IMGSIZE [cols] [rows] The size (in pixels) of the exiting inline image.

IMGXY [x] [y] Coordinates (in pixels) of a single mouse click. Used most often in conjunction with Java based front ends to the MapServer.

LAYER [name] The name of a layer as it appears in the map file. Sending mapserv a layer name sets that layer's STATUS to ON.

LAYERS [name name ...] The names of the layers to be turned on. Layer names must be seperated by spaces.

Version 4.4 and above: passing 'LAYERS=all' will automatically turn on all layers.

MAP [filename] Path, relative to the CGI directory, of the map file to be used.

MAPEXT [minx] [miny] [maxx] [maxy] , MAPEXT (shape) The spatial extent of the map to be created.

Can be set to shape as an alternative option. In this case mapextent is set to the extent of a selected shape. Used with queries.

MAPSHAPE [x1 y1 x2 y2 x3 y3 ...] | [WKT] An arbitrary polygon shape (specified using **map coordinates**) to be used for query purposes.

The polygon is specified by listing its coordinates (multiple instances simply add parts to the shape so it is possible to construct a shape with holes) or by specifying a WKT (Well Known Text) representation of the polygon.

Used with the NQUERY mode.

MAPSIZE [cols] [rows] The size (in pixels) of the image to be created. Useful for allowing users to change the resolution of the output map dynamically.

MAPXY [x] [y] , MAPXY (shape) A point, in the same coordinate system as the shapefiles, to be used in conjunction with a buffer or a scale to construct a map extent.

Can be set to shape as an alternative option. In this case mapextent is set to the extent of a selected shape. Used with queries.

MINX | MINY | MAXX | MAXY [number] Minimum/Maximum x/y coordinate of the spatial extent for a new map/query. This set of parameters are the pieces of MAPEXT.

MODE [value] Mode of operation. The following options are supported:

BROWSE Fully interactive interface where maps (and interactive pages) are created. This is the default mode.

FEATURENQUERY A spatial search that uses multiple features from SLAYER to query other layers.

FEATUREQUERY A spatial search that uses one feature from SLAYER to query other layers.

INDEXQUERY Looks up a feature based on the values of SHAPEINDEX and TILEINDEX parameters.
SHAPEINDEX is required, TILEINDEX is optional and is only used with tiled shapefile layers.

ITEMFEATURENQUERY A text search of attribute data is triggered using a QSTRING. Returns all matches.
Layer to be searched is defined using slayer parameter. The results of this search are applied to other searchable layers (which can be limited using the QLAYER parameter).

ITEMFEATUREQUERY A text search of attribute data is triggered using a QSTRING. Returns first match.
Layer to be searched is defined using slayer parameter. The results of this search are applied to other searchable layers (which can be limited using the QLAYER parameter).

ITEMNQUERY A text search of attribute data is triggered using a QSTRING. Returns all matches.

ITEMQUERY A text search of attribute data is triggered using a layer QSTRING. Returns 1st match.

LEGEND The created legend is returned. Used within an tag.

LEGENDICON A legend icon is returned. The ICON parameter must also be used to specify the layername and a class index. Class index value is optional and defaults to 0. For example:

```
mapserv.exe?map=/mapfiles/gmap75.map&MODE=legendicon&ICON=popplace,0
```

MAP The created map is returned. Used within an tag.

NQUERY A spatial search (finds all) is triggered by a click in a map or by user-defined selection box.

QUERY A spatial search (finds closest) is triggered by a click in a map.

REFERENCE The created reference map is returned. Used within an tag.

SCALEBAR The created scalebar is returned. Used within an tag.

ZOOMIN Switch to mode BROWSE with ZOOMDIR=1

ZOOMOUT Switch to mode BROWSE with ZOOMDIR=-1

COORDINATE To be clarified.

Note: The previously available map-only query modes, e.g. ITEMQUERYMAP, are no longer supported. The *QFORMAT* parameter is now used instead.

QFORMAT [outputformat | mime/type] (optional) The *OUTPUTFORMAT* name or mime/type to be used to process a set of query results (corresponds to the [WEB](#) object's *QUERYFORMAT* parameter). The parameter is optional and used in conjunction with query *MODEs*. The default is text/html.

Example (map output):

```
...&mode=nquery&qformat=png24...
```

QITEM [name] (optional) The name of an attribute in a layer attribute table to query on. The parameter is optional and used in conjunction with the QSTRING for attribute queries.

QLAYER [name] Query layer. The name of the layer to be queried as it appears in the map file.

QSTRING [expression] Attribute queries: Query string passed to the query function. Since 5.0, qstring will have to be specified in the *VALIDATION* parameter of the *LAYER* for qstring queries to work (*qstring_validation_pattern LAYER-level METADATA* for MapServer versions prior to 5.4).

QUERYFILE [filename] Used with BROWSE or NQUERY mode. This option identifies a query file to load before any regular processing. In BROWSE mode this result in a query map being produced instead of a regular map. This is useful when you want to hilite a feature while still in a pan/zoom mode. In NQUERY mode you'd gain access to any of the templates used in normally presenting the query, so you have access to query maps AND attribute information. See the SAVEQUERY option.

REF The name associated with the inline reference map image used to record user clicks. What actually is passed are two variables, ref.x and ref.y.

For the CGI Applications this is an essential variable when reference maps are used, see the examples for sample usage.

REFXY [x] [y] Coordinates (in pixels) of a single mouse click in the reference image. Used in conjunction with Java based front ends to the MapServer.

SAVEQUERY When used with any of the query modes this tells the MapServer to save the query results to a temporary file for use in subsequent operations (see QUERYFILE). Useful for making queries persistent.

SCALEDENOM [number] Scale to create a new map at. Used with mapxy. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000. Implemented in MapServer 5.0, to replace the deprecated SCALE parameter.

SCALE [number] - deprecated Since MapServer 5.0 the proper parameter to use is SCALEDENOM instead. The deprecated SCALE is the scale to create a new map at. Used with mapxy. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000.

SEARCHMAP It is possible to do pan/zoom interfaces using querymaps. In these cases you will likely want information about the contents of the new map rather than the previous map which is the normal way queries work. When searchmap is specified the new map is created and its extent is used to query layers. Useful with NQUERY mode only.

SHAPEINDEX [index] Used for index queries (in conjunction with INDEXQUERY).

SLAYER [name] Select layer. The name of the layer to be used for any of the feature (i.e. staged) query modes. The select layer must be a polygon layer. The selection feature(s) are available for presentation to the user.

TILEINDEX [index] Used for index queries (in conjunction with INDEXQUERY), used with tiled shapefile layers.

ZOOM [number] Zoom scaling to apply to the creation of the new map. Values greater than 0 resulting in zooming in, 0 is a pan, and values less than zero are for zooming out. A value of 2 means “zoom in twice”.

ZOOM can be used as a shortcut for the combination ZOOMDIR/ZOOMSIZE. The zoom is limited by the MINZOOM/MAXZOOM settings compiled into the MapServer (-25/25) by default.

ZOOMDIR [1 | 0 | -1] Direction to zoom. See above.

ZOOMSIZE [number] Absolute magnitude of a zoom. Used with ZOOMDIR.

ZOOMDIR is limited to MAXZOOM compiled into the MapServer (25 by default).

14.4.2 Changing map file parameters via a form or a URL

Beginning with version 3.3 it is possible to change virtually any map file value from a form or a URL. The syntax for this is fairly straightforward, and depends on what version of MapServer you are using. One potentially very powerful use of this ability to change mapfile parameters through a URL involves changing class expressions on-the-fly. *VALIDATION* can be used to control run-time substitution (see *Run-time Substitution*). Try it out.

Using MapServer version >= 5

Previous versions of the MapServer CGI program allowed certain parameters to be changed via a URL using a cumbersome syntax such as map_layer_0_class_0_color=255+0+0 which changes the color in one classObj. So, in the past you had to change parameters one-at-a-time. Now you can pass chunks of mapfiles (with security restrictions) to the CGI interface. The map_object notation is still necessary to identify which object you want to modify but you can change multiple properties at one time. Note that you can use either a ‘_’ or a ‘.’ to separate identifiers.

Example 1, changing a scalebar object:

```
...&map.scalebar=UNITS+MILES+COLOR+121+121+121+SIZE+300+2&...
```

Example 2, changing a presentation style:

```
...&map.layer[lakes].class[0].style[0]=SYMBOL+crosshatch+COLOR+151+51+151+SIZE+15&...
```

Example 3, creating a new feature:

```
...&map_layer[3]=FEATURE+POINTS+500000+1000000+END+TEXT+'A+test+point'+END&...
```

Example 4, set multiple web object parameters:

```
...&map_web=imagepath+/ms4w/tmp/ms_tmp/+imageurl+/ms_tmp/
```

Example 5, set the map size:

```
...&map_size=800+400
```

The variable identifies an object uniquely (by name or index in the case of layerObj’s and classObj’s). The value is a snippet of a mapfile. You cannot create new objects other than inline features at this point.

Using MapServer version < 5

For MapServer version < 5, any value can be expressed using the hierarchy used in a map file. A map contains a layer, which contains a class, which contains a label, which has a color. This hierarchy is expressed as a sequence of MapServer keywords separated by underscores. For example to change the color of a layer called “lakes” with only one class defined you would use a form variable named “map_lakes_class_color” and could assign it a color like “0 0 255”. Layers can be referenced by index (i.e. map_layer_0...) or by name as shown above. Layer classes are referenced by index value (i.e. map_layer_0_class_2). If there is only 1 class for a layer then the index should be omitted. These variables must always begin with the sequence “map_”. Values assigned must conform to the syntax of a map file.

It is also possible to define inline features using this mechanism. This is the only case where you can add on to the map file. You can edit/change layer parameters but you cannot create a new layer. With inline features you have to first create a feature and then build upon it, however, the layer the feature belongs to must exist. Here’s a snippet from a GET request that adds a feature to a webuser layer:

```
...&map_webuser_feature=new&map_webuser_feature_points=12345.6789+12345.6789
&map_webuser_feature_text=My+House!&...
```

The “map_webuser_feature=new” creates a new feature for the webuser layer. All subsequent calls to the feature object for that layer will modify the new feature. You can repeat the process to create additional features. This is really intended for very small (point, rectangle) amounts of data.

14.4.3 Specifying the location of mapfiles using an Apache variable

Apache variables can be used to specify the location of map files (instead of exposing full mapfile paths to the outside world).

1. Set the variable (in this example *MY_MAPFILE*) in Apache's httpd.conf:

```
SetEnv MY_MAPFILE "/opt/mapserver/map1/mymapfile.map"
```

2. Refer to the variable in the mapserver CGI URL:

```
http://localhost/cgi-bin/mapserv?map=MY_MAPFILE&mode=...
```

14.4.4 ROSA-Applet Controls

note: Active development and maintenance of the ROSA Applet has stopped

The ROSA Applet parameters were added to the CGI MapServer in version 3.6. This Java Applet provides a more intuitive user interface to MapServer. The MapTools site provides detailed information on the ROSA Applet.

The parameters can also be used by other interfaces/tools, if set to the right values. Please note that the two parameters have to be handed over to the CGI application in the order identified below.

INPUT_TYPE (auto_rect | auto_point) The INPUT_TYPE parameter is needed to identify if the coordinates handed over to the mapserver have to be interpreted as rectangular or point data.

INPUT_COORD [minx,miny;maxx,maxy] The ROSA-Applet always fills the pair of coordinates. In case of a point (input_type=auto_point) min and max coordinate are equal (MapServer uses the min value).

14.5 Run-time Substitution

Author Steve Lime

Contact steve.lime at DNR.STATE.MN.US

Revision \$Revision\$

Last Updated \$Date\$

Table of Contents

- Run-time Substitution
 - Introduction
 - Basic Example
 - Parameters Supported
 - Default values if not provided in the URL
 - VALIDATION
 - Magic values

14.5.1 Introduction

Run-time substitution for the MapServer CGI has been around since version 4.0 and its use has continued to expand. In short, it allows you to alter portions of a mapfile based on data passed via a CGI request. This functionality is only available via the standard CGI application. Within MapScript this is easy to do since the developer has complete control over how input is handled.

14.5.2 Basic Example

Let's say you'd like the user to dynamically set a portion of an expression so they could highlight a certain land cover class, and you have a form element (called ctype) that allows them to choose between: forest, water, wetland and developed. You could then set up a layer like so:

```
LAYER
  NAME 'covertypes'
  ...
  VALIDATION
    "ctype" "[a-z]+"
  END
  CLASSITEM 'type'
  CLASS # highlighted presentation
    EXPRESSION '%ctype%'
    ...
  END
  CLASS # default presentation
  ...
END
```

When a request is processed the value for ctype is substituted for the string %ctype% and the mapfile is processed as normal. If no ctype is passed in the EXPRESSION will never be true so it doesn't really hurt anything except for a slight performance hit. Often you would set a default class to draw features that don't match, but that is not required.

14.5.3 Parameters Supported

Not every mapfile parameter supports run-time substitution and care has been taken to try and support those that make the most sense. Remember, you also can do run-time configuration using the map_object_property type syntax detailed in [Changing map file parameters via a form or a URL](#). Below is a list of properties that do allow run-time substitution (todo- add MapServer version):

- CLASS: EXPRESSION
- CLASS: TEXT New in version 6.0.
- LAYER: CONNECTION
- LAYER: DATA (must validate against DATAPATTERN)
- LAYER: FILTER
- LAYER: TILEINDEX
- OUTPUTFORMAT: FORMATOPTION: FILENAME (must have a *MAP VALIDATION* pattern) New in version 6.2.

FILTERs

You can use runtime substitutions to change values within a FILTER as you go. For example your FILTER could be written like so:

```
FILTER ("multimedia='%multimedia%' and seats >= %nseats% and Sound= '%sound%'")
```

Then (assuming you're using the CGI interface) you could pass in variables named multimedia, nseats and sound with values defined by the user in an HTML form.

You should also define validation expressions on these variables to guard against unintentional SQL being submitted to postgis. Within the layer you'd do the following:

```
VALIDATION
  'multimedia' '^yes|no$'
  'sound' '^yes|no$'
  'nseats' '^[0-9]{1,2}$'
END
```

The validation strings are regular expressions that are applied against the appropriate variable value before being added to the FILTER. The first two limit the value of multimedia and sound to yes or no. The third limits the value for nseats to a 2 digit integer.

14.5.4 Default values if not provided in the URL

The runtime substitution mechanism will usually create syntactically incorrect, and almost always semantically incorrect mapfiles if the substitution parameter was not provided in the calling URL.

Since version 5.6, you can provide a default value for any substitution parameter, that will be applied if the parameter was not found in the url. You do this by providing special entries inside the layer metadata :

```
METADATA
  'default_sound' 'yes'
  'default_nseats' '5'
  'default_multimedia' 'yes'
END
```

In this example, the mapfile will be created as if the url contained “&sound=yes&nseats=5&multimedia=yes”

This behavior is also accessible in the shp2img utility, allowing you to test runtime substitution mapfiles without using a webserver.

14.5.5 VALIDATION

Because runtime substitution affects potentially sensitive areas of your mapfile such as database columns and filenames, it is mandatory that you use pattern validation (since version 6.0)

Pattern validation uses regular expressions, which are strings that describe how to compare strings to patterns. The exact functionality of your systems' regular expressions may vary, but you can find a lot of general information by a Google search for “regular expression tutorial”.

As of MapServer 5.4.0 the preferred mechanism is a *VALIDATION* block in the *LAYER* definition. This is only slightly different than the older *METADATA* mechanism. *VALIDATION* blocks can be with *CLASS*, *LAYER* and *WEB*.

```
VALIDATION
  # %firstname% substitutions can only have letters and hyphens
  'firstname'    '^*[a-zA-Z\-]+$'

  # %parcelid% must be numeric and between 5 and 8 characters
  'parcelid'     '^*[0-9]{5,8}$'

  # %taxid% must be two capital letters and six digits
  'taxid'        '^*[A-Z]{2}[0-9]{6}$'
END
```

14.5.6 Magic values

Some runtime substitutions have special caveats.

- **ID**

In addition to any defined *METADATA* or *VALIDATION*, the ‘id’ parameter will be subjected to a special check. It must be alphanumeric and cannot be longer than 63 characters.

14.6 A Simple CGI Wrapper Script

Author Steven Monai

Revision \$Revision\$

Date \$Date\$

Last Updated 2006/01/26

Table of Contents

- [A Simple CGI Wrapper Script](#)
 - [Introduction](#)
 - [Script Information](#)

14.6.1 Introduction

This document presents a simple shell script that can be used to “wrap” the MapServer CGI, in order to avoid having to specify the ‘map’ parameter (or any other chosen parameters) in your MapServer URLs.

14.6.2 Script Information

If you want to avoid having to specify the ‘map’ parameter in your MapServer URLs, one solution is to use a “wrapper”. Basically, a wrapper is a CGI program that receives an incoming CGI request, modifies the request parameters in some way, and then hands off the actual processing to another CGI program (e.g. MapServer).

The following shell scripts are wrappers for CGI GET requests that should be generic enough to run on any OS with /bin/sh.

Alternative 1

```
#!/bin/sh
MAPSERV="/path/to/my/mapserv"
MS_MAPFILE="/path/to/my/mapfile.map" exec ${MAPSERV}
```

You should set the MAPSERV and MS_MAPFILE variables as appropriate for your configuration. MAPSERV points to your MapServer executable, and MS_MAPFILE points to the mapfile you want MapServer to use. Both variables should be absolute file paths that your webserver has permission to access, although they need not (and probably should not) be in web-accessible locations. Put the script in your web server’s cgi-bin directory, and make it executable.

This solution should support both GET and POST requests.

Alternative 2

```
#!/bin/sh
MAPSERV="/path/to/my/mapserv"
MAPFILE="/path/to/my/mapfile.map"
if [ "${REQUEST_METHOD}" = "GET" ]; then
    if [ -z "${QUERY_STRING}" ]; then
        QUERY_STRING="map=${MAPFILE}"
    else
        QUERY_STRING="map=${MAPFILE}&${QUERY_STRING}"
    fi
    exec ${MAPSERV}
else
    echo "Sorry, I only understand GET requests."
fi
exit 1
# End of Script
```

You should set the MAPSERV and MAPFILE variables as appropriate for your configuration. MAPSERV points to your MapServer executable, and MAPFILE points to the mapfile you want MapServer to use. Both variables should be absolute file paths that your webserver has permission to access, although they need not (and probably should not) be in web-accessible locations. Then put the script in your web server's cgi-bin directory, and make it executable.

Although this script only sets the 'map' parameter, it is easily modified to set any number of other MapServer parameters as well. For example, if you want to force your MapServer to 'map' mode, you can simply add 'mode=map' to the front of the QUERY_STRING variable. Just remember to separate your parameters with ampersands ('&').

Finally, note that the script only works for GET requests.

14.7 MapServer OpenLayers Viewer

MapServer provides a simple, built-in method for testing a mapfile using OpenLayers. This feature is for testing/development purposes only, and not for production or deploying full-featured sites. You can preview, test, and navigate a mapfile by accessing a special url which will return a built-in OpenLayers template.

Note: This feature was discussed in [rfc 63](#) and in the ticket <http://trac.osgeo.org/mapserver/ticket/3549>

14.7.1 Using the OpenLayers viewer

Opening the OpenLayers viewer in your browser

Assuming you are running mapserver on your local machine, and you have the Itasca demo setup, a basic url would be (split into two lines for readability):

```
http://localhost/cgi-bin/mapserv?mode=browse&template=openlayers
&layer=lakespy2&layer=dlgstln2&map=/var/www/workshop/itasca.map
```

Here is a quick breakdown of that url:

- Basic Parameters for activating the OpenLayers browser:

```
template=openlayers
mode=browse
```

- Basic Map / Layer Parameters:

```
map=/var/www/workshop/itasca.map
layer=lakespy2
layer=dlgstln2
```

That's it!

Opening the OpenLayers viewer in the form of a WMS request

This feature is useful when debugging WMS requests. You can write one of these by hand, or copy the URL for a WMS tile. Running the following should give you a simple OpenLayers demo around the BBOX (split into several lines for readability):

```
http://localhost/cgi-bin/mapserv?map=/var/www/workshop/itasca.map
&LAYERS=lakespy2&VERSION=1.1.1&SERVICE=WMS&REQUEST=GetMap
&FORMAT=application/openlayers&WIDTH=512&HEIGHT=512&SRS=EPSG:26915
&BBOX=429956.19803725,5231780.0814818,444078.32296225,5245902.2064068
```

Here is a quick breakdown of the interesting parts of that URL:

- Special Parameter for activating the OpenLayers viewer:

```
FORMAT=application/openlayers
```

- Basic MapServer Parameters:

```
map=/var/www/workshop/itasca.map
```

- Basic WMS parameters:

```
#Layers, our bounding box and projection
LAYERS=lakespy2
BBOX=429956.19803725,5231780.0814818,444078.32296225,5245902.2064068
SRS=EPSG:26915
```

```
#Version and other WMS request params
SERVICE=WMS
VERSION=1.1.1
REQUEST=GetMap
WIDTH=512
HEIGHT=512
TRANSPARENT=true
```


Community Activities

15.1 IRC

Some of the development of MapServer is coordinated through IRC. This page describes how you log on to chat, ask questions, and hack around with the developers.

15.1.1 Server and Channel Information

```
Server: irc.freenode.net
Channel: #mapserver
Logs: http://logs.qgis.org/mapserver/
```

15.1.2 Why IRC?

IRC is a primary medium where Open Source GIS hackers congregate, collaborate, and hack. It makes it easy to communicate things like compilation issues, where immediate, iterative feedback allows folks to make a lot of progress. Something that might take days of heavily-quoted emails through a maillist might only take fifteen minutes on IRC.

IRC is a great way to coordinate on-line meetings. Much of the discussion about the development of the new MapServer website was coordinated through IRC.

Some folks find IRC distracting and do not normally participate except for on-line meetings.

15.1.3 How do I join?

[Chatzilla](#) is probably the easiest way to get going. Chatzilla works with Mozilla or Firefox, and once you have it installed, you can log on to the channel by pointing your browser at:

```
irc://irc.freenode.net/#mapserver
```

There are many other IRC clients available. [This page](#) provides a good listing for many different platforms.

15.2 Mailing Lists

15.2.1 mapserver-announce

The mapserver-announce listserv is used to announce MapServer software updates or security issues. It is a very low-traffic volume list.

- **Subscribing to mapserver-announce**

To subscribe to the mapserver-announce listserv visit <http://lists.osgeo.org/mailman/listinfo/mapserver-announce> and enter your subscription information. You can later change your subscription information or leave the list at this website.

Note: If you are subscribed to the mapserver-users listserv, you need not subscribe to mapserver-announce: all messages sent to mapserver-announce are also copied to mapserver-users.

- **Submitting Questions to mapserver-announce**

The mapserver-announce mailing list is “read only” - subscribers are not permitted to post to this list.

15.2.2 mapserver-users

The mapserver-users is the primary means for MapServer users and developers to exchange application ideas, discuss potential software improvements, and ask questions.

- **Subscribing to mapserver-users**

To subscribe to the mapserver-users listserv visit <http://lists.osgeo.org/mailman/listinfo/mapserver-users>. You can later change your subscription information or leave the list at this website.

- **Submitting Questions to mapserver-users**

To submit questions to the mapserver-users listserv, first join the list by following the subscription procedure above. Then post questions to the list by sending an email message to mapserver-users@lists.osgeo.org.

- **Searching the Archives**

All MapServer-Users archives are located in <http://lists.osgeo.org/pipermail/mapserver-users/>. Searching the archives is best done with [Nabble](#).

15.2.3 mapserver-dev

A separate listserv is available for MapServer developers. It is meant to be used by individuals working on MapServer source code and related libraries to discuss issues that would not be of interest to the entire mapserver-users listserv.

- **Subscribing to mapserver-dev**

To subscribe to the mapserver-dev listserv visit <http://lists.osgeo.org/mailman/listinfo/mapserver-dev>, enter your e-mail address, name, and create a password and click subscribe. You can later change your subscription information or leave the list at this website.

- **Submitting Questions to mapserver-dev**

To submit questions to the mapserver-dev listserv, first join the list by following the subscription procedure above. Then post questions to the list by sending an email message to mapserver-dev@lists.osgeo.org.

- **Searching the Archives**

All MapServer-Dev archives are located in <http://lists.osgeo.org/pipermail/mapserver-dev/>. Searching the archives is best done with [Nabble](#).

15.2.4 MapServer mailing lists in languages other than English

- MapServer-DE (German)

Note: Please send a note to the mapserver-dev list if you know of any other MapServer mailing lists in additional languages.

15.2.5 Downloading list archives

The MapServer-Users and MapServer-Dev mailing lists have been migrated to the new OSGeo list server. One of the benefits of this migration is that you no longer need an account to download or read the archives. To access the MapServer archives, simply point your browser to <http://lists.osgeo.org/pipermail/mapserver-users/> and download the gzipped file or click on the link. For MapServer-Dev archives, go to <http://lists.osgeo.org/pipermail/mapserver-dev/>.

15.3 MapServer Wiki Pages

- Conferences
- Hosting Providers
- User Groups
- Sites Using MapServer

15.4 MapServer Service Providers

- search for MapServer service providers with the [OSGeo Search Tool](#)

Development

16.1 Sponsors

DM Solutions

- OGC support (2001-2005)
- PHP-MapScript implementation and Support
- MapServer Release Management
- Windows Binaries
- MS4W and FGS installers
- Product Documentation

Environment Canada

- *RFC 13*: SOS Server support (2006-2007)

i-cubed

- OUTPUTFORMAT / 24-bit color raster support (2002)

RealGo

- SWIG mapscript improvements (2003-2004)

Refractions Research

- FastCGI implementation (2004).

TMC Technologies

- *RFC 5*: MapServer Horizon Reprojection Improvements (2005).

Tydac AG

- Rotated Maps (2004)
- *RFC 4*: MapServer Raster Resampling (2005)

Note: The MapServer project relies on its developers to keep this page up to date and accurate. If you feel that due credit is overlooked, please contact the developer that completed the work for your company or organization.

16.2 MapServer Release Plans

16.2.1 6.0 Release Plan

Authors Project Steering Committee

Last Updated 2011-03-17

Table of Contents

- 6.0 Release Plan
 - Background
 - New Features and Major Bug Fixes
 - * Core Changes in MapServer 6.0 Which Could Affect Existing Applications
 - * New Features and Enhancements in MapServer 6.0
 - * Other Notable Enhancements
 - * Deprecations / Removals
 - 6.2 Wishlist
 - Planned Dates
 - Release Manager
 - SVN Tags / Branches
 - Trac Conventions
 - Q/A

Background

The purpose of the following document is to outline the proposed changes for the upcoming MapServer 6.0 release. Users planning on upgrading to 6.0 are also recommended to review the - *MapServer Migration Guide*.

New Features and Major Bug Fixes

Core Changes in MapServer 6.0 Which Could Affect Existing Applications

- *MS RFC 54: Rendering Interface API*
 - Full pluggable renderer support (Thomas/Frank)
- *MS RFC 64 - MapServer Expression Parser Overhaul*
 - Expanded expression syntax support + OGC filter encoding -> MapServer filterObj support (Steve)
- *MS RFC 65 - Single-pass Query Changes for 6.0*

New Features and Enhancements in MapServer 6.0

- *MS RFC 50: OpenGL Rendering Support*
- *MS RFC 58: Kml Output*
- *MS RFC 60: Labeling enhancement: ability to skip ANGLE FOLLOW labels with too much character overlap*
- *MS RFC 61: Enhance MapServer Feature Style Support*
- *MS RFC 62: Support Additional WFS GetFeature Output Formats*

- *MS RFC 63: Built-in OpenLayers map viewer*
- *MS RFC 66: Better handling of temporary files*
- *MS RFC 67: Enable/Disable Layers in OGC Web Services*
- *MS RFC 68: Support for combining features from multiple layers*
- *MS RFC 69: Support for clustering of features in point layers*
- **Output formats:**
 - KML from Google SOC project (Assefa)
 - Any OGR Format (Frank)
 - GML3 (Steve - maybe during sprint?)
 - Cairo (PDF, SVG)
- **XML mapfile consumption:**
 - run-time compilation (XML/XSLT => .map)
- Labeling improvements (label precision and display of labels along curved lines)
- Label Styles
- Large Shapefile (dbf file >2Gb) Support
- WCS 2.0 + POST support in WCS 1.1
- Ability to escape single/double quotes inside a string and/or a logical expression

Other Notable Enhancements

- Additional query improvements (such as being able to do XOR on queries (ask Steve) - RFC 65?)
- Support for style objects within labels
- Use of classObj title for legend drawing
- PHP MapScript refactoring for PHP 5.2+ new object/API model
- Support for PostGIS curves

Deprecations / Removals

- Removal of GD non-PC256 support (replaced by AGG driver)
- Removal of native SVG support (use Cairo instead, or re-implement using plugin API)
- Removal of native PDF support (use Cairo instead)
- Removal of SWF/Flash output (no alternative)
- Deprecation of symbolObj GAP, LINECAP, LINEJOIN and PATTERN properties (now set in style instead)
- Deprecation of redundant template tags (e.g. [mapext_esc]) (see <http://trac.osgeo.org/mapserver/wiki/60RemoveTemplateTags>)
- Removal of native, non-GDAL, image drivers (EPPL7, TIFF, etc...)
- Removal of MyGIS driver (use OGR MySQL driver instead)

6.2 Wishlist

- SVG symbol support (not owned, RFC exists)
- Named styles / labels
- embedded XML mapfile parser
- Support for a filterObj (based on OGC filter specification) at the driver level (RFC - Steve)
- Projection AUTO support (RFC - Howard)
- Explore supporting SLD and/or GSS within a layerObj, inline, external file or URL (Assefa, RFC needed)
- Object string serialization (e.g. \$layer->toString()) (not owned)
- Reimplement Flash/SWF output with new rendering API (needs funding)
- Hatch rendering speed (use AGG hatches?)
- Small feature labels: use lead instead of skipping feature (Zak)
- mod_mapserver - multi-threaded loaded mapserver module for Apache
- Color ramping, dynamic statistics generation (SteveL/Frank)

Planned Dates

We will plan for 4 betas and 2 release candidate (RC) over a 6 week period after the code freeze (1 beta/RC per week each Wednesday). This will lead us to a final release sometime around 2011-04-20:

Release	Date
Feature freeze	Fri. March 4, 2011
6.0.0-beta1	Wed. March 9, 2011
6.0.0-beta2	Fri. March 18, 2011
6.0.0-beta3	Wed. March 23, 2011
6.0.0-beta4	Wed. March 30, 2011
6.0.0-rc1	Wed. April 6, 2011
6.0.0-rc2	Wed. April 13, 2011
6.0.0 (final)	Wed. April 20, 2011

Release Manager

Daniel Morissette will act as release Manager ([MS RFC 34: MapServer Release Manager and Release Process](#)). (“motion passed with +1 from DanielM, TomK, TamasS, SteveL, PericlesN, SteveW, FrankW, AssefaY, HowardB and ThomasB’’)

SVN Tags / Branches

- The main trunk SVN is currently the 5.7 development version that we plan to release as 6.0 (browse)
- The stable SVN branch for this release will be called “branch-6-0” (not created yet).
- Current proposed date for creating “branch-6-0” is the date of the 6.0.0 release
- If post-5.6 developments require earlier branching then please bring up your request for branching on the -dev list.

- The betas will be tagged in SVN as “rel-6-0-0-beta1”, “rel-6-0-0-beta2”, ... and the release candidates as “rel-6-0-rc1”, “rel-6-0-rc2”, etc...

Trac Conventions

In order to facilitate querying the Trac database for tickets that still need to be addressed for this release, we try to stick to the following conventions:

- Tickets to be addressed for this release must have their target milestone set to “6.0 release”
- Bugs/Enhancements that can’t make it in this release but that we may want to address at a later time should be marked with the “FUTURE” target milestone with a comment explaining that the bug is postponed and if possible a quick analysis
- The target milestone on a ticket should be set by the developers (bug owners) and not by the users (reporters).

Other good practices when dealing with tickets:

- Please file tickets for any non-trivial bugfix or change to the software. This is so that we keep a trace for future reference of all bugfixes and changes that were made (why and how).
- Please mark bugs ASSIGNED as soon as you start working on them
- Please when marking a bug fixed include a comment describing the fix, the version of the software in which it was done, the SVN changeset number (e.g. r1234) and any other relevant information. This will just make our lives easier in a few months/years when questions come up about this issue.
- When committing to SVN, please include the bug number in your SVN change log comment e.g. (#1234).
- Keep documentation in mind when fixing/changing things: if you cannot update the documentation yourself then please create a documentation bug describing the new feature/change and which document(s) should be updated.

The following query returns all currently open bugs that are tagged with the “6.0 release” target milestone:

<http://trac.osgeo.org/mapserver/query?status=new&status=assigned&status=reopened&milestone=6.0+release>

Q/A

Feedback and testing is welcome anytime during the 6.0 release process.

16.3 Release Announcements

16.3.1 6.2 Announcement

Authors Project Steering Committee

Released 2012-11-14

The MapServer Team is pleased to announce the long awaited release of MapServer 6.2.0 after an extensive beta phase.

After the 6.0 release that introduced important changes in key components under the hood of the MapServer core, this 6.2 release brings a large number of new features that are summarized in this document.

Table of Contents

- Major New Features in MapServer 6.2
 - MapServer Suite
 - INSPIRE View Services
 - Mask Layers
 - Precise Symbol Placement
 - Complex Multi Label/Symbol Symbology
 - Vector Fields
 - Label Leader Offsetting
 - SVG Symbology
 - Multiple Font Support
- Minor New Features in MapServer 6.2
- Noteworthy Changes Which Could Affect Existing Applications
- Migration Guide
- Source Code Download
- Binary Distributions
- Thanks

Major New Features in MapServer 6.2

MapServer Suite

This is the first joint release between MapServer 6.2, TinyOWS 1.1, and MapCache 1.0, and is the first step towards a fully-fledged MapServer “Suite” integrating these 3 components. A source code archive containing all 3 components can be found in the download links.

- **MapServer CGI and MapScript 6.2.0** The MapServer web mapping engine that has been at the core of the project since the beginning.

See Also:

MapServer Documentation

- **WFS-T: TinyOWS 1.1** TinyOWS is a lightweight and fast implementation of the OGC WFS-T specification. Web Feature Service (WFS) allows to query and to retrieve features, and the transactional profile (WFS-T) then allows to insert, update or delete such features.

From a technical point of view WFS-T is a Web Service API in front of a spatial database; TinyOWS is deeply tied to PostgreSQL/PostGIS.

See Also:

TinyOWS documentation

- **Tiling: MapCache 1.0**

MapCache is a high performance tiling server, that runs in native code either as a FastCGI, an Apache module, or an Nginx module. It supports a wide variety of protocols (WMTS, TMS, WMS, VirtualEarth, KML, ...) and storage backends (Disk, SQLite, Memcache, GeoTIFF files, BerkeleyDB, ...), and provides options for dynamically responding to client requests by assembling cached tiles.

See Also:

MapCache documentation

INSPIRE View Services

MapServer 6.2 is *INSPIRE View Service* compliant, i.e. supports the provision of an INSPIRE View Service compliant *WMS Server*.

See Also:

INSPIRE View Service documentation

Mask Layers

Mask layers are used to “mask out” part of a given layer, to only represent data that intersect features from another layer. This can be typically used on land parcels, to only display a base satellite image on the areas covered by the parcels of a specific owner/customer.

Two layers are used in combination to activate this feature. The first layer is used to render the features that will be used as a mask. It will typically use a FILTER to only render a select number of features:

```
layer
  name "countries"
  status off
  class
    expression ("[FIPS]" = "EZ")
    style
      color 0 0 0
    end
  end
end
```

Note two things:

- The layer is set to STATUS OFF, as we do not want it rendered on the final map itself. In some use cases this might be set to STATUS ON.
- We have setup an EXPRESSION to only render the country who's code is “EZ”. In a parcel scenario, this would typically be a list of parcels or the id of a parcel owner.

The second layer is the layer that will be masked:

```
layer
  status on
  name "naturalearth"
  mask "countries"
  type raster
end
```

With these two layers, our “naturalearth” raster layer will only be rendered on the pixels that intersect the “EZ” country from our countries layer.

This masking feature can be used on all the renderers that work on pixel data, i.e. not for the pdf or svg renderers. In the case where the masked layer contains labels, only the labels who's anchor falls inside the mask will be rendered. The actual label text may itself overlap outside of the masked area.

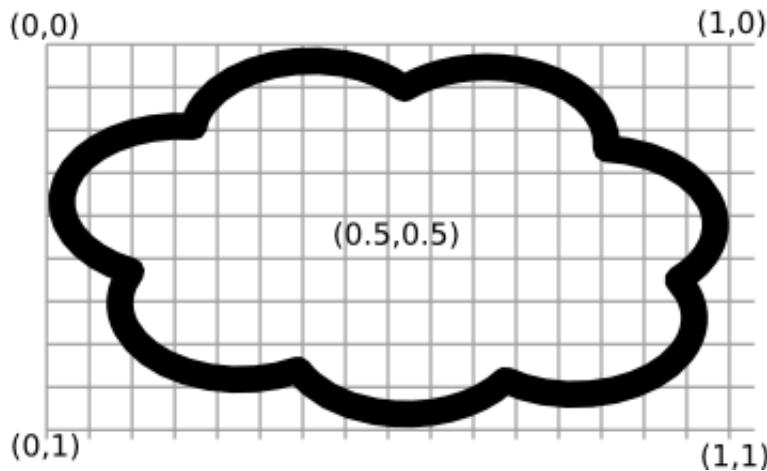
See Also:

[test mapfile and resulting image](#)

Precise Symbol Placement

Traditionally, MapServer centers a marker symbol on the point it should be rendered to. ANCHORPOINT is a new SYMBOL level keyword that describes where the given symbol should be anchored.

```
SYMBOL
  NAME "foo"
  TYPE TRUETYPE
  ANCHORPOINT 0 0 #will anchor the symbol on it's top-left
  ANCHORPOINT 0.5 0.5 #default, will center the symbol
  ANCHORPOINT 1 1 #will anchor the symbol on it's bottom right
  ...
END
```



See Also:

[test mapfile and resulting image](#)

Complex Multi Label/Symbol Symbology

Some cartographic representations require juxtaposing multiple symbols and/or labels in order to obtain a complex final symbol. Typically such needs can arise in the meteorological field when creating observation maps, resulting in this kind of symbology:

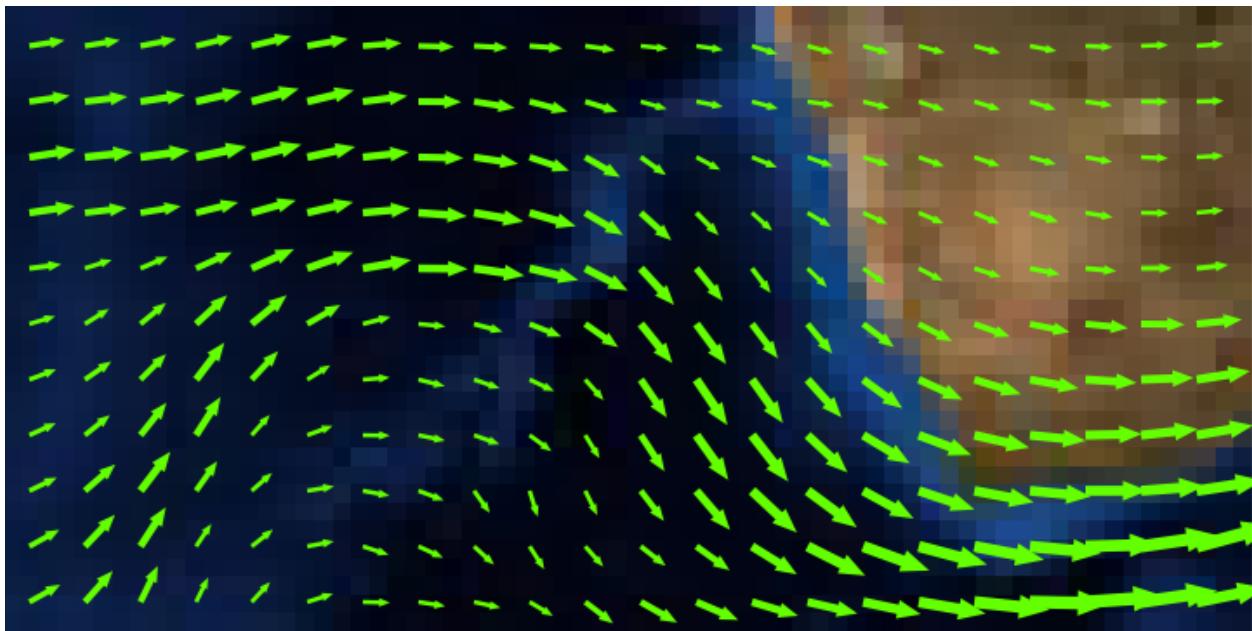
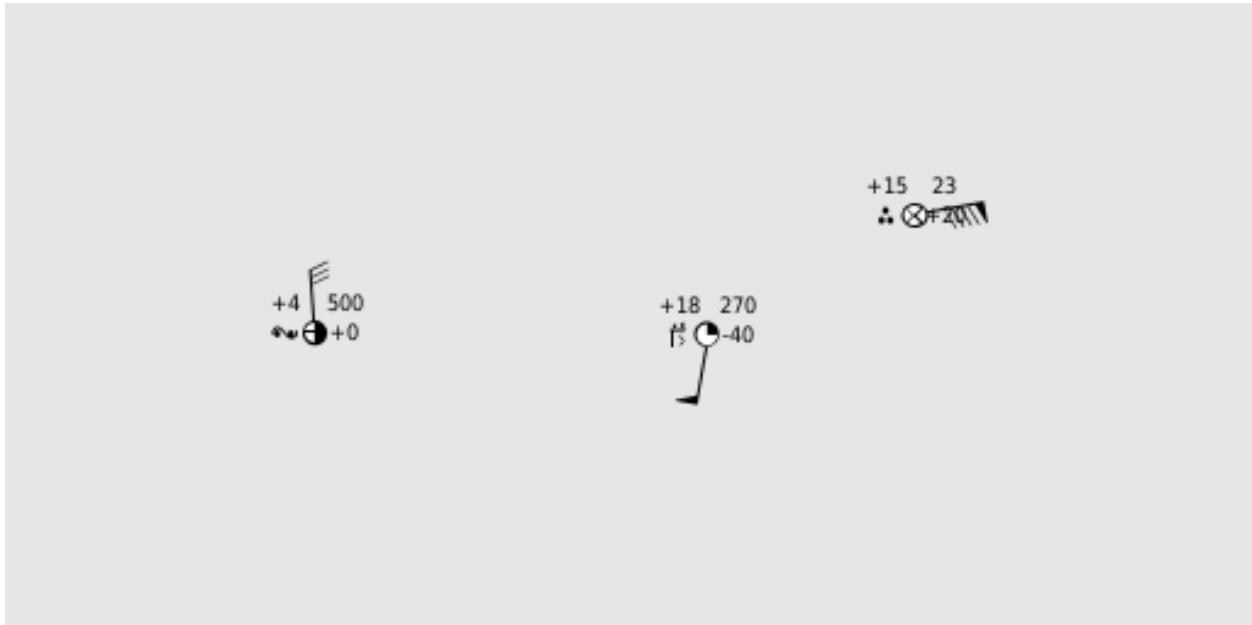
In order to render these kind of symbols while avoiding collisions with neighbouring symbols, MapServer *CLASS* elements now support multiple *LABEL* children, and the *LABEL* element supports an *EXPRESSION* filter determining whether the label should be displayed or not. Inside a *LABEL*, a new *FORCE GROUP* parameter determines if the current label is allowed to intersect other labels from the same feature or not, and multiple *STYLE* blocks can be used to render graphic symbols instead of or alongside the text. Note that this new feature will in practice make heavy use of attribute binding to control symbol sizes and orientations.

See Also:

[test mapfile](#)

Vector Fields

MapServer can render vector fields based off data from GDAL supported raster formats containing *u* and *v* bands.



In order to support rendering arrowheads, the *STYLE* object now supports a *POLAROFFSET r theta* entry, where the offset is given in polar coordinates (i.e distance and bearing) rather than cartesian coordinates as for plain *OFFSET*.

See Also:

the [UVRASTER RFC](#), the test uvraster mapfile and the resulting uvraster test image

Label Leader Offsetting

For densely labelled maps, MapServer now supports offsetting a label with respect to it's original anchorpoint if the original location resulted in a collision with an already present label. An optional line can also be rendered to link the rendered text to it's original feature location.



In order to be able to offset complex symbols as defined previously, *LABEL* leaders are defined at the *CLASS* level in their own *LEADER* block:

```
class
  ...
  leader
    maxdistance 30
    gridstep 5
    style
      color 0 0 0
```

```

    width 1
  end
end
label
...
end
end

```

The configuration sets what is the maximum distance a label can be offsetted from its original location, and the density of the grid where possible label positions are sampled when testing for collisions. The optional *STYLE* block is used to render the line drawn from the feature to the offsetted label position.

Note that computing the positions of offsetted labels is computationally heavy and may increase rendering times. To mitigate this, you can either apply this offsetting to a select class of features, and/or diminish the the leader maxdistance, and/or augment the leader gridstep.

See Also:

View a [test mapfile](#) or head to the [LEADER object documentation](#) to download sample data with mapfile

SVG Symbology

Along with the traditional ELLIPSE, VECTOR, PIXMAP and TRUETYPE symbols, MapServer 6.2 now supports SVG symbols directly, opening up new symbology usages with scalable and multicolor complex markers. SVG symbols are defined very classically by

```

SYMBOL
  NAME "my-svg-symbol"
  TYPE SVG
  IMAGE "/path/to/svgfile.svg"
END

```

Multiple Font Support

No single truetype font contains all the glyphs of all the scripts of the world. When rendering worldwide maps, it is thus needed to be able to specify multiple font files from which to extract glyphs from. You can now give the LABEL's FONT a comma separated list of fontset keys to try from, for each glyph to render MapServer will test each font in turn until the requested glyph is found.

```

LABEL
  TYPE TRUETYPE
  FONT "vera,arialuni,cjk,khmer"
  ...
END

```

See Also:

[test mapfile](#) and [resulting image](#)

Minor New Features in MapServer 6.2

- **WMS Dimension Support**

MapServer's WMS server now supports ELEVATION and DIM_* dimensions in addition to the already existing TIME support. Head over to the [WMS dimension documentation](#) for more info.

- **Stable Hatching**

MapServer's *HATCH* symbol will now create hatches that are contiguous across adjacent features and across different tiles.

- **XMP Metadata Support**

RFC and *documentation*

- **Support for Named Grouped Layers**

The functionality of `wms_layer_group` is extended to support named group layers as needed by the *INSPIRE View Service*. If a layer with the same name as used in `wms_layer_group` is found it is treated as named group and if no layer with this name is found as unnamed group as before.

See Also:

WMS Server documentation

- **Support for Generating Geospatial PDFs**

- **Initial Gap Support for Line Patterns**

The line pattern used to style lines can now be precisely offseted with respect to the start of the line feature, allowing stable combinations of dashed patterns

See Also:

test mapfile and resulting image

- **General Speedups and Memory Usage Optimizations**

- Queries sent to postgis backend have been optimized to exercise eventual indexes that might have been set on the time column.
- The Postgis driver cuts down on the dynamic memory allocations necessary for simple features.
- The labelcache rendering phase has been sped up and consumes less memory.
- If using proj version 4.8 or newer, MapServer will no longer use a thread lock before entering proj functions.

Noteworthy Changes Which Could Affect Existing Applications

- **Unix Build Procedure**

- The configure script now accepts the traditional `-prefix` argument to determine where the libraries and executables should be installed.
- Running `make install` as a privileged user is now **required** after a successful compilation, and the previous method of copying the `mapserv` binary from the source directory to the webserver's cgi-bin directory is highly discouraged. Instead, copy or symlink the installed binary from `$prefix/bin`.
- The `libmapserver` library is now built as a shared library by default, instead of being statically linked in the `mapserv`, `shp2img` or `mapscript` libraries.
- Installing multiple instances (with different capabilities for now, or for multiple versions in the future) can/must be done by specifying different `-prefix` entries for each instance, e.g.:

```
$ ./configure --without-gd --prefix=/opt/ms-62-nogd
$ make && sudo make install
$ ln -s /opt/ms-62-nogd/bin/mapserv /usr/lib/cgi-bin/mapserv
$ make clean
$ ./configure --with-gd --prefix=/opt/ms-62-gd
```

```
$ make && sudo make install
$ ln -s /opt/ms-62-gd/bin/mapserv /usr/lib/cgi-bin/mapserv-62-gd
```

- PHP Mapscript builds are now enabled by configuring with `-with-php[=/path/to/php-config]`
- Python Mapscript builds are now enabled by configuring with `-enable-python-mapscript` and eventually `-with-python=/path/to/bin/python` for non-standard python installs
- **GD support is now optional and disabled by default**

The GD library is now an optional dependency and isn't enabled by default. If `-with-gd` is not supplied to `./configure`, GD/* outputformats will fall back to native AGG rendering.

- **ANNOTATION Layers are deprecated**

Annotation layers are deprecated in 6.2 and will probably be removed in a future version. Identical functionality can be obtained by adding *LABEL* level *STYLE* blocks, and do not require loading the datasets twice in two different layers as was the case with ANNOTATION layers.

Note: MultiLabel Symbology and Offseted labels are not supported on ANNOTATION layers.

- **Support for GDAL older than 1.5.0 has been dropped**

Migration Guide

- **CGI:** Aside from the build procedure changes detailed above, there are no backwards compatibility issues we are aware of.
- **MapScript:** There is at least one incompatibility that has been encountered with MapScript vs the support for multiple label objects in a *class*. In 6.0 and older, *label* was an immutable member of the *class* object, and a single label was always allocated as part of the *classObj*. In 6.2, there is no label allocated in the class object by default and your MapScript code (python, etc.) has to create new label objects and add them to the class object. Three new methods were added to the *classObj* in MapScript to handle this: `getLabel`, `addLabel`, `removeLabel`. Existing scripts need to be updated or risk silent failures as SWIG MapScript (at least in python) does not complain on invalid access to the label member of the *classObj*.

Source Code Download

The source for this release can be downloaded at:

<http://mapserver.org/download.html>

or:

- for MapServer 6.2.0:
<http://download.osgeo.org/mapserver/mapserver-6.2.0.tar.gz>
- for TinyOWS 1.1.0:
<http://download.osgeo.org/mapserver/tinyows-1.1.0.tar.bz2>
- for MapCache 1.0.0:
<http://download.osgeo.org/mapserver/mapcache-1.0.0.tar.gz>
- for MapServer Suite 12.11 (all three components in a single archive):
<http://download.osgeo.org/mapserver/mapserver-suite-12.11.tar.gz>

Binary Distributions

Binary distributions will be available in the coming days:

- MS4W users will soon be able to upgrade to this MapServer 6.2.0 release: <http://www.maptools.org/ms4w/>
- Ubuntu binaries for lucid, precise and quantal are also built and available in the unstable PPA of UbuntuGIS. See details and instructions at: <http://trac.osgeo.org/ubuntugis/>
- RHEL and CentOS 5.6 TODO
- OpenSUSE rpm binaries are available from Open Build Service (Application:Geo) official repository. There is also a [One-Click Installer](#).

The other binary distributions listed in the download page should also be updated with binaries for the new release shortly.

Thanks

The MapServer team would like to thank [Météo-France](#) for funding a number of the new features present in this release.

Finally, thank you to all of the users, developers, and supporters of MapServer. Enjoy!

The MapServer Team

16.3.2 6.0 Announcement

Authors Project Steering Committee

Released 2011-05-12

Table of Contents

- [6.0 Announcement](#)
 - [Core Changes in MapServer 6.0 Which Could Affect Existing Applications](#)
 - [New Features and Notable Enhancements in MapServer 6.0](#)
 - [Migration Guide](#)
 - [Source Code Download](#)
 - [Binary Distributions](#)
 - [Documentation](#)

The MapServer Team is pleased to announce the long awaited release of MapServer 6.0.0.

The 6.0 release introduces important changes in key components of the MapServer core, as well as a large number of new features and enhancements. The complete list of changes and enhancements is too long to include here, so here is a quick list of RFCs related to this release:

[Core Changes in MapServer 6.0 Which Could Affect Existing Applications](#)

- [MS RFC 54](#): Rendering Interface API
- [MS RFC 64](#): MapServer Expression Parser Overhaul
- [MS RFC 65](#): Single-pass Query Changes for 6.0

New Features and Notable Enhancements in MapServer 6.0

- [MS RFC 50](#): OpenGL Rendering Support
- [MS RFC 58](#): Kml Output
- [MS RFC 60](#): Labeling enhancement: MAXOVERLAPANGLE
- [MS RFC 61](#): Enhance MapServer Feature Style Support
- [MS RFC 62](#): Support Additional WFS GetFeature Output Formats
- [MS RFC 63](#): Built-in OpenLayers map viewer
- [MS RFC 66](#): Better handling of temporary files
- [MS RFC 67](#): Enable/Disable Layers in OGC Web Services
- [MS RFC 68](#): Support for combining features from multiple layers
- [MS RFC 69](#): Support for clustering of features in point layers

More details are also available in the [6.0 Release Plan](#).

Migration Guide

Users upgrading to 6.0 from an older 5.x release are strongly encouraged to start by reviewing the [5.6 -> 6.0 Migration Guide](#). This document contains important notes on backwards incompatibilities or other changes required when upgrading to 6.0.

Source Code Download

The source for this release can be downloaded at:

<http://mapserver.org/download.html>

or

<http://download.osgeo.org/mapserver/mapserver-6.0.0.tar.gz>

Binary Distributions

- MS4W users can upgrade to this MapServer 6.0.0 release by following instructions at: http://www.maptools.org/ms4w/index.phtml?page=RELEASE_mapserver_ms4w3.x_dev-6.0.0.html
- Ubuntu binaries for hardy, lucid, maverick and natty are also built and available in the unstable PPA of UbuntuGIS. See details and instructions at: <http://trac.osgeo.org/ubuntugis/>
- RHEL and CentOS 5.6 packages can be downloaded from the <http://elgis.argeo.org/> testing repository. Scientific Linux need php53 packages in order to install php-mapserver6. Users who have mapserver6 beta and rc packages installed are advised to remove those before installing MapServer 6.0.0 packages.

The other binary distributions listed in the download page should also be updated with binaries for the new release shortly.

Documentation

The MapServer documentation team is continuing to update and maintain documents, and are happy to announce that MapServer documentation is now available in **English**, **German**, **French**, and **Spanish**. Volunteers are always needed to help translate documents and update the documentation. The documentation team asks those volunteers interested in translating documents to please introduce yourself on the mapserver-dev email list.

Finally, thank you to all of the users, developers, and supporters of MapServer. Enjoy!

The MapServer Team

16.4 MapServer Changelogs

16.4.1 MapServer 6.2.0 Changelog since RC1

- 2012-11-13 21:27:09 +0100 | szekerest | Fix indentation when writing PATTERN
- 2012-11-12 23:25:38 +0100 | szekerest | Fixed the mapfile writer to support GEOMTRANSFORM expressions (#2825)
- 2012-11-09 13:42:21 +0100 | Thomas Bonfort | avoid integer division on pixmap size calculation (#4409)
- 2012-10-21 22:13:39 +0200 | szekerest | loadSymbolSet doesn't reset lexer state (#4506)
- 2012-11-07 16:20:00 +0100 | szekerest | MSSQL: Fix problem using TAB in DATA section (#3914)
- 2012-11-07 15:58:06 +0100 | szekerest | MSSQL: Fix crash caused by lengthy DATA sections (#3911)
- 2012-11-07 15:17:04 +0100 | szekerest | Fix mssql driver to handle field names with spaces (#4519)
- 2012-11-06 17:16:00 +0100 | Umberto Nicoletti | Rolled back bc4ccf09b9450b30a2bfcd8f0fb4ec20cd53fc7c to fix pagination loop issue #4508 with oracle spatial layers
- 2012-11-05 22:10:04 +0100 | szekerest | Flushing stdout at process termination of mapserv.exe (#4505)
- 2012-11-05 15:10:05 +0100 | szekerest | Reset layer level item indexes in msLayerWhichItems (#4517)
- 2012-11-05 12:55:36 +0100 | szekerest | Fix OGR autostyle font mapping problem (#3893)
- 2012-11-02 23:13:06 +0100 | szekerest | Fix msDrawLabel to be aware of label->status when labelcache is not set (#932)
- 2012-11-02 22:46:07 +0100 | szekerest | Fix cleaning up label expressions in msLayerClose (#4127)
- 2012-11-02 22:41:19 +0100 | szekerest | Expose labelObj.text and labelObj.expression (#4310)
- 2012-10-30 15:34:04 +0000 | Alan Boudreault | Fix segfault in uvraster on missing data
- 2012-10-19 18:58:20 +0200 | Stephan Meissl | update msautotest submodule
- 2012-10-19 18:53:06 +0200 | Stephan Meissl | Adjusting version parameter (#4503).
- 2012-10-19 14:05:46 +0200 | Thomas Bonfort | module update
- 2012-10-19 13:51:20 +0200 | Thomas Bonfort | update tests for uvraster
- 2012-10-16 17:00:27 +0000 | Alan Boudreault | Fix UVRaster layer issue with reprojection (#4495)
- 2012-10-15 16:47:23 +0000 | Alan Boudreault | msWFSGetFeatureApplySRS() has to be called before FLTApplyFilterToLayer
- 2012-10-15 16:42:12 +0000 | Alan Boudreault | Modified the fix for the writing of wfs getfeature bounds (#4494)
- 2012-10-15 16:17:30 +0000 | Alan Boudreault | Revert small change related to (#4494)

- 2012-10-15 16:11:26 +0000 | Alan Boudreault | Fix WFS GetFeature result bounds are not written in requested projection (#4494)

16.4.2 MapServer 6.2.0 RC1 Changelog

2012-10-07 13:42:42 +0200 | Thomas Bonfort | add imgObj.getBytes() support for pdf/svg (#4145)
2012-10-02 16:12:12 +0200 | Thomas Bonfort | fix typo in version number
2012-09-30 17:43:27 +0200 | Thomas Bonfort | fix mapscript builds for recent swig versions (#4325)
2012-10-01 15:12:17 +0200 | Thomas Bonfort | fix segfault on SLD Getmap requests with empty LAYERS
2012-10-01 09:50:32 +0200 | Oliver Tonnhofer | fixed angle follow fallback to auto after auto2 fix (#4476)
2012-09-30 18:34:18 +0200 | Thomas Bonfort | add centroid geomtransform to writeStyle (#4480)
2012-09-30 17:01:01 +0200 | Thomas Bonfort | fix invalid call to gdFree (#3942)
2012-09-30 16:47:33 +0200 | Thomas Bonfort | fix typo in template date (#4034)
2012-09-30 11:51:23 +0200 | Thomas Bonfort | avoid spurious error messages in parser (#4479)
2012-09-29 12:19:39 +0200 | Thomas Bonfort | make sure x,y shape values are in map SRS (#4403)
2012-08-23 20:30:12 -0400 | Mark Phillips | fix issue when querying reprojected rasters (#4403)
2012-09-22 15:32:02 +0200 | Yves Jacolin | add XML namespace for WFS Client requests (#4467)
2012-09-04 20:47:34 +0200 | szekerest | SDE: Fix for the crash with NCLOB type (#3001)

16.4.3 MapServer 6.2.0 beta4 Changelog

2012-09-27 18:05:37 +0200 | Thomas Bonfort | avoid segfault when font file could not be loaded
2012-09-27 14:21:04 +0200 | Thomas Bonfort | fix ioGetStdoutBufferString() not binary-enabled (#3989)
2012-09-27 11:11:09 +0200 | Stephan Meissl | Harmonizing notation of Content-Type (not Content-type) header.
2012-09-27 00:05:29 +0200 | Stephan Meissl | Adjusting Content-type header in WCS 2.0.
2012-09-26 18:47:27 +0200 | Stephan Meissl | Correcting mapscript methods msIO_stripStdoutBufferContentType() and msIO_stripStdoutBufferContentHeaders() for new line endings (#4430).
2012-09-24 11:35:21 +0200 | Thomas Bonfort | fix typo leading to segfault in some multi-label conditions
2012-09-20 09:27:36 +0200 | Yves Jacolin | add configuration for geometry column in WFS filter for WFS CONNECTIONTYPE layer (#4466)
2012-09-23 18:43:37 +0200 | Thomas Bonfort | undo changes for fastcgi mapfile caching (#4018)
2012-09-23 18:18:39 +0200 | Thomas Bonfort | fix leaks on mask-skipped follow labels (#4460)
2012-09-23 11:25:11 +0200 | Thomas Bonfort | more explicit error message if swig missing
2012-09-21 17:32:02 +0200 | Thomas Bonfort | restore AUTO positioning of labels around points (#4402)
2012-09-21 11:04:33 +0200 | Thomas Bonfort | fix leaks in LIKE, RE, IRE filters/expressions (#4461)
2012-09-20 19:50:39 +0200 | Thomas Bonfort | add “make test” target, can be run with -j
2012-09-20 13:46:29 +0200 | Thomas Bonfort | fix failing postgis queries on times with no date (#4464)
2012-09-19 21:59:12 +0200 | szekerest | MSSQL: Fix spatial filter test condition (#4462)

2012-09-16 12:15:25 +0200 | Thomas Bonfort | add support for quotes in ogc filters, restore previous mapscript setFilter syntax #3983

2012-09-19 13:10:59 +0200 | Thomas Bonfort | fix leaks in drivers erroneously using LayerClose for LayerCloseConnection

2012-09-18 19:53:38 +0200 | Thomas Bonfort | avoid leak and unnecessary usage of onlineresource in template output

2012-09-18 10:50:51 +0200 | szekerest | MSSQL2008: Bypass spatial filtering in certain conditions (#4462)

2012-09-17 19:56:49 +0200 | Thomas Bonfort | numerous memory leak fixes (wms,wcs,wfs,sos ...)

2012-09-16 15:08:26 +0200 | Thomas Bonfort | use threadsafe time cleanup/teardown functions (#4458)

2012-09-16 14:12:23 +0200 | Thomas Bonfort | fix memory leaks and thread-unsafe usage of time parsing (#4458)

2012-09-17 13:48:43 +0200 | szekerest | SDE: Fix for the crash with CLOB type (#3001)

2012-09-13 11:08:25 +0200 | Thomas Bonfort | add support for svg symbols in version string

2012-09-12 15:36:32 +0200 | Stephan Meissl | Resolving compiler warning.

2012-07-20 15:51:43 +0200 | Thomas Bonfort | scale dependant resolution fixes (#4401)

2012-09-11 12:06:23 +0200 | Thomas Bonfort | add SCALE support for cascaded getlegendgraphic (#4452)

2012-09-10 14:38:05 +0000 | Alan Boudreault | Fix multiple classes in a inline layer

2012-09-10 14:36:42 +0200 | Thomas Bonfort | avoid integer roundings in clipping buffer calculation (#179, #4451)

2012-09-09 15:14:28 +0200 | szekerest | Fix MSSQL to parse 3D geometries (#4450)

2012-09-09 15:07:56 +0200 | szekerest | Fix OGR autostyle label rendering (#4449)

2012-09-09 14:48:59 +0200 | szekerest | Fix drawing legend icons for annotation layers when no marker symbol is given (#2917)

2012-09-07 14:04:36 +0200 | Stephan Meissl | Fixing attribute vocabulary not allowed in WMS 1.1.1 (#4447).

2012-09-07 12:00:17 +0200 | Stephan Meissl | Fixing wrong size in LegendURL of group layers (#4441) and improvements to fix of Style inheritance in WMS (#4442).

16.4.4 MapServer 6.2.0 beta3 Changelog

af90e5a 2012-09-06 19:10:49 +0200 (Stephan Meissl): Fixing Style inheritance in WMS (#4442)

c55668e 2012-09-06 15:48:04 +0200 (Thomas Bonfort): avoir writing default values to STYLE (#4446)

191d0c9 2012-09-06 15:32:36 +0200 (Thomas Bonfort): php-mapscript allow setting NULL template (#4443)

f8d8837 2012-09-06 14:23:01 +0200 (Thomas Bonfort): create python-mapscript install destination directory (#4445)

8b61e09 2012-09-06 12:39:30 +0200 (Thomas Bonfort): adjust clip buffer for polygons in image space (#179)

f5e1bec 2012-09-05 17:48:45 +0200 (Thomas Bonfort): adjust clipping buffer to avoid edge artifacts (#179)

9c9d999 2012-09-05 01:35:27 -0700 (Umberto Nicoletti): fix for #4417: Oracle and queryByAttributes doesn't run

d6be4e6 2012-09-05 14:27:22 +0200 (Stephan Meissl): Fixing wrong size in LegendURL of root layer (#4441)

40ad795 2012-09-05 14:22:12 +0200 (Thomas Bonfort): build and clean mapscriptvars utility file (#4440)

fadfc37a 2012-09-05 14:14:50 +0200 (Thomas Bonfort): fix ogc "equals" operator after rfc 64 (#3613)

ee0e42c 2012-09-05 14:11:57 +0200 (Thomas Bonfort): allow empty wms styles (#4355)

5e9c8a1 2012-09-05 13:32:02 +0200 (Thomas Bonfort): deactivate postgis getextent function (#4039)

9184876 2012-09-05 13:26:43 +0200 (Thomas Bonfort): avoid token collisions in parser when reading char by char (#4012)

9cb9e5e 2012-09-05 13:19:44 +0200 (Thomas Bonfort): adjust letterspacing on follow labels (#4404)

2d474ae 2012-09-04 20:47:34 +0200 (szekerest): SDE: Fix for the crash with NCLOB type (#3001)

73c9d9d 2012-09-03 18:55:09 +0200 (Stephan Meissl): Fixing wms_style_name in GetMap requests (#4439).

ca2cbad 2012-08-31 17:30:53 +0200 (Thomas Bonfort): add branch-6-2 to stable merge script (#4437)

155c827 2012-08-30 14:49:57 +0000 (Alan Boudreault): Fix queryByFilter segfault in SWIG...

6f293c3 2012-08-30 14:18:18 +0000 (Alan Boudreault): Fix in msQueryBy* functions to support the startindex from MapScript

75be13f 2012-08-30 13:30:24 +0000 (Alan Boudreault): Modified WFSGetFeature to support maxfeatures across layers rather than within (#4011)

5aff6da6 2012-08-30 10:39:12 +0200 (Stephan Meissl): Updating HISTORY.TXT

5ca7cf0 2012-08-29 16:40:20 +0000 (Alan Boudreault): Fix segfault in queryByFilter function in PHP/MapScript

6990f04 2012-08-29 15:27:01 +0000 (Alan Boudreault): Fix another issue in symbolObj.getImage related to internal renderer object

e1d9b33 2012-08-29 15:59:49 +0200 (Stephan Meissl): Adjusting to GMLCOV 1.0 corrigendum 1.0.1 (#4003).

5849069 2012-08-29 15:18:14 +0200 (Stephan Meissl): Adjusting to WCS 2.0 Core corrigendum 2.0.1 (#4003).

d36ca21 2012-08-29 13:47:31 +0200 (Stephan Meissl): Updating HISTORY.TXT

728faf8 2012-08-29 13:32:47 +0200 (Stephan Meissl): Adjusted support for the mediatype multipart/related in WCS 2.0. Related to issue #4003.

c64d1bb 2012-08-28 18:46:11 +0000 (Alan Boudreault): Fix symbolObj.getImage seg fault in PHP/MapScript

28592bf 2012-08-28 17:16:38 +0000 (Alan Boudreault): Added history note

3027d4f 2012-08-28 17:15:38 +0000 (Alan Boudreault): Fix bad handling of startindex with some drivers (#4011)

7a0361b 2012-08-28 18:37:32 +0200 (Stephan Meissl): Correcting HISTORY.TXT

5b21f45 2012-08-28 18:11:45 +0200 (Stephan Meissl): Small adjustment in fixing bugs with WCS 1.1/2.0 with VSIMEM (#4369)

4a34233 2012-08-28 17:42:46 +0200 (Stephan Meissl): Backporting: WCS: Set layer projection to map's one if not set (#4079).

7266535 2012-08-25 18:11:14 +0200 (Thomas Bonfort): fix header line terminations on multipart org output (#4430)

93e0c3b 2012-08-25 18:04:13 +0200 (Thomas Bonfort): fix rendering of cached pixmap symbols on lines (#4433)

5463c8f 2012-08-22 18:34:42 +0200 (Thomas Bonfort): fix double free on queryitem

d812b0a 2012-08-22 14:04:21 +0200 (Thomas Bonfort): mark errors as reported for inimage mode (#4142)

a148625 2012-08-21 14:22:43 +0000 (Alan Boudreault): Fix regression related to sld expression (#3929)

760d7b9 2012-08-22 12:42:55 +0200 (Thomas Bonfort): add erroneously removed statement (#4424)

a598fec 2012-08-22 12:36:42 +0200 (Thomas Bonfort): don't fail on shapefile with no items (#4424)

8e62696 2012-08-22 09:00:09 +0200 (Thomas Bonfort): last fix related to #4229

bbe7847 2012-08-21 17:27:17 +0200 (Thomas Bonfort): fixes related to #4429

16e2120 2012-08-21 17:17:53 +0200 (Thomas Bonfort): fix second occurrence of #4424

b326324 2012-08-21 17:09:34 +0200 (Thomas Bonfort): avoid segfault on dbf with less records than shp (#4424)

2dc5791 2012-08-21 14:53:09 +0200 (Thomas Bonfort): use rn as header lineendings instead of n (#4430)

968c285 2012-08-21 00:47:07 +0200 (szekerest): Fix SLD label rendering with mapserver 6.2 (#4429)

80494b3 2012-08-20 13:25:48 +0200 (Thomas Bonfort): WCS: Set layer projection to map's one if not set (#4079)

d33dc7e 2012-08-18 15:53:29 +0200 (szekerest): MSSQL: Fix for the crash if uniqueidentifier is specified as fid column (#4427)

d6c02b4 2012-08-14 18:26:43 +0000 (Jerome Villeneuve Larouche): Fix for issue 4225

c9821b7 2012-08-14 09:50:11 +0200 (szekerest): Fixed the OGR driver to use point or line spatial filter geometries in degenerated cases (#4420)

a8f89da 2012-08-13 11:48:59 +0200 (Fabian Schindler): Added support for the mediatype multipart/related in Get-Coverage requests. Related to issue #4003.

674fd84 2012-08-11 12:54:57 +0200 (Thomas Bonfort): avoid unchecked null metadata values (#4419)

0661fae 2012-08-10 12:48:40 +0200 (Thomas Bonfort): add perl mapscript ignores

9dbefe1 2012-08-10 11:07:07 +0200 (Thomas Bonfort): fix segfault on WFS 1.1 namespace prefix (#4419)

bad0ca4 2012-08-07 15:53:59 +0200 (Thomas Bonfort): fix buffer size for onlineresource with https and non-standard port (#4413)

75ec1d1 2012-08-07 13:47:04 +0200 (Thomas Bonfort): return exception only on failed wfs getfeature preamble

92c9ed0 2012-08-07 12:29:19 +0200 (Thomas Bonfort): fix segfault in msSLDApplySLD (#4112)

070d1c9 2012-08-06 21:07:15 -0500 (Stephen Lime): Initialize record.resultindex to -1 in msQueryByIndex()... #4416

502b59f 2012-07-23 12:14:16 +0200 (Thomas Bonfort): avoid segfault on failed reprojected point (#4403)

76a1251 2012-08-02 17:00:57 +0200 (szekerest): Fix msCopyClass causing memory corruption

10f6195 2012-07-04 15:19:11 +0200 (Fabian Schindler): Fixing bugs with WCS 1.1/2.0 with VSIMEM (#4369)

195610f 2012-06-29 20:24:50 +0000 (Jerome Villeneuve Larouche): Added labelleader and some minor modification to the test

0a19da6 2012-06-29 14:07:32 +0000 (Jerome Villeneuve Larouche): Updated XML support for 6.2

917ce92 2012-06-29 08:38:41 -0300 (Daniel Morissette): Add ref to MapScript fix for PHP 5.4 (#4309)

0d68cd5 2012-06-28 18:57:19 -0300 (Jeff McKenna): backport PHP 5.4 mapscript updates to branch-6-0

f51753f 2012-06-15 19:13:47 +0000 (Alan Boudreault): Fix msOGREscapeSQLParam could return random data (#4335)

3ef03d9 2012-06-05 16:20:29 +0200 (Håvard Tveite): Updated migration guide - removal of DUMP (#3830)

eaddf28 2012-05-30 16:21:27 +0200 (Fabian Schindler): Fixed bug in format enumeration. The map.web.metadata key wcs_formats is now also taken into account for each layer (in WCS 1.1).

4538f8e 2012-05-30 15:37:02 +0200 (Fabian Schindler): Removed advertising of supported formats in WCS 2.0 CoverageDescriptions as this is not included in the standard.

fb29d28 2012-05-30 15:35:34 +0200 (Fabian Schindler): Parse available formats from map.web.metadata field 'wcsformats' if given. Now for WCS 1.1. Not possible for WCS 1.0 since this Capabilities does not include a supported formats section.

0a0aace 2012-05-30 12:38:01 +0200 (Fabian Schindler): Parse available formats from map.web.metadata field 'wcsformats' if given.

16.4.5 MapServer 6.2.0 beta2 Changelog

27f1d6b (Thomas Bonfort): fix template access to non-existant classes (#4367)
cf9809d (Thomas Bonfort): reset style on empty ogr style strings (#4365)
4333826 (Thomas Bonfort): fix CGI extents in tile mode (#4410)
af4e02b (Thomas Bonfort): add ms_ioStripStdoutBufferContentHeaders() to php mapscript (#4319)
aa63ed2 (Thomas Bonfort): compiler warning: cast size_t to int
b9c8a40 (Thomas Bonfort): compiler warning: size_t is always positive
204b68b (Thomas Bonfort): fix various compiler warnings
02e56f7 (Thomas Bonfort): avoid memory corruption in inspire capabilities (#4387)
677ff45 (Thomas Bonfort): avoid going through internal resampling for degenerate rects (#4039)
42cc882 (Thomas Bonfort): add call to msComputeBounds after fastpath reprojection
3128a3c (Even Rouault): Unix configure: add -Wdeclaration-after-statement by default in CFLAGS to issue ‘warning: ISO C90 forbids mixed declarations and code’ with GCC, which means that compilation will fail with MSVC, so something that *MUST* be fixed
73761fd (szekerest): Fix build problems related to mixed code and variable declarations
bcd0449 (Thomas Bonfort): add -ldl to linker flags (#4342)
67f2784 (Thomas Bonfort): fix bug with uncached/cached shapes (#4371)
d8763a7 (Thomas Bonfort): fix gd transparent background (#4013)
607b729 (Thomas Bonfort): fix uninitialized text outline width in error image
479dc7c (Thomas Bonfort): fix memory leak with proj >= 4.8.0 (#4398)
bdefa75 (Thomas Bonfort): fix memory leak on WMS 1.3.0 bbox parsing (#4397)
220ef2d (Thomas Bonfort): fix bounds calculation on inline features (#4391)
af9f398 (Thomas Bonfort): Revert “make msLayerNextShape calculate shape bounds (#4391)”
7599b8c (Thomas Bonfort): fix sld stroke-opacity for PolygonSymbolizer (#4132)
64ef556 (Thomas Bonfort): ifdef out unused code without POINT_Z_M
bca7fd1 (Thomas Bonfort): don’t crash on offsetting degenerate lines (#4383)
d4579e6 (Thomas Bonfort): fix postgis compilation warnings (unused vars)
698246f (Thomas Bonfort): fix calls to msDrawShape (c.f. #4371)
b2a3611 (Thomas Bonfort): use drawmode for non-clipped labels (#4371)
3ae0407 (Thomas Bonfort): make msLayerNextShape calculate shape bounds (#4391)
9e17579 (Martin Kofahl): Fixing a couple of invalid calls to msSetError() in mapunion.c and mapcluster.c causing a segmentation fault.
8205992 (Thomas Bonfort): fix label poly calculation for multiline bitmap labels (#4390)
f3554df (Thomas Bonfort): make msLayerNextShape calculate shape bounds (#4391)
566da12 (Martin Kofahl): Fixing a couple of invalid calls to msSetError() in mapunion.c and mapcluster.c causing a segmentation fault.
aa42674 (Thomas Bonfort): fix label poly calculation for multiline bitmap labels (#4390)

24e2cf5 (Thomas Bonfort): use MS_DRAW_SINGLESTYLE instead of style==1
5c6c652 (Thomas Bonfort): fix label min/maxscale handling at layer level (#4371)
e353c17 (Stephen Lime): Updated migration guide for ticket #4368.
7dfb9e5 (Stephen Lime): Removed min/max scale override via URL (#4368).
d0a0a60 (Martin Kofahl): Use platform depended path delimiters in msStripPath (#4379)
9695eca (Martin Kofahl): #3443 reports a huge performance issue because of falling back to world bounds when reprojection of a map request rectangle into layer projection fails. This patch will abort drawing such a layer.
9bcec4f (faegi): Issue #3428 - correct wfs namespaces in GetCapabilities
50198ae (Thomas Bonfort): correct usage of ‘ instead of ” in strchr
88965b4 (Thomas Bonfort): don’t free any static memory
6ecb4fe (Martin Kofahl): support for alternative worldfile location for raster datasets by setting the processing directive to either “PROCESSING “WORLDFILE=/path/”” (will lookup basename.??? at this path) or “PROCESSING “WORLDFILE=/path/file.wld”” (will use the given file).
ca7243a (Thomas Bonfort): crash from msTiledSHPOpenFile (#4254)
dff71ec (Thomas Bonfort): don’t try to offset labels with no bounding poly computed (#4370)
20701b4 (Thomas Bonfort): add some styling parameters to CGI interface (#4157)
c79f8a2 (Thomas Bonfort): avoid segfaults on empty shapes (#4092)
56a154b (Thomas Bonfort): Ensure FILENAME for ogr output is not absolute (#4086)
3836039 (Thomas Bonfort): fix wms capabilities content-type (#4364)
fe2bb37 (Håvard Tveite): Updated the migration guide with some rendering changes between 6.0 and 6.2
8e4df01 (Umberto Nicoletti): (backported from master) Error in new refcounting locking code: restore project build also when thread support is disabled
0d6092e (Alan Boudreault): Removed unnessecary operations related to pagination

16.5 Bug Submission

Bugs/issues should be submitted through github (<https://github.com/mapserver/mapserver/issues>). You will first need to create a free personal account at github (<https://github.com/plans>).

Please keep the following issues in mind when submitting a bug/issue:

1. Please set the *Label* carefully. It will determine who the bug/issue is assigned to by default.

Note: All security/vulnerability bugs should use the label **Security/Vulnerability (Private)**. It is important to use that label for those bugs to be sure the security bugs maintainer is aware of the issue and that the right procedure is done.

2. Set a meaningful yet reasonably brief description.
3. In general you should not assign the issue to a specific user (the appropriate developers will be notified of your new issue through the ‘label’).
4. In your description please indicate whether you built from source or got it from an prepared binary build, and specify the MapServer version.

The most important thing when reporting a bug is to boil down a minimum example that is needed to reproduce the bug. That means a minimal mapfile + any data files it depends on. Remove everything from the map file that isn't needed to reproduce the bug.

The developers often dislike having to spend the first 30 minutes working on a bug, having to fix paths, remove unnecessary layers, removing references to external symbols or fonts that were not included or even needed and otherwise doctoring your test case to get it to a point when they can actually use it.

If the bug is easily demonstrated with “*shp2img*”, without the need to setup a proper web service and test it through http, then please show it that way. If a standalone *MapScript* script can demonstrate a problem without it having to be a web service, likewise submit it that way.

The chances of a bug being addressed in a timely manner is directly related to the speed with which the developer can reproduce the bug. If you make that hard for the developer, chances are the bug will be given up on or ignored for quite a while.

16.6 GitHub

16.6.1 Background

Since April 2012, MapServer’s source code and documentation are under GitHub control (<https://github.com/mapserver>). In the past, MapServer has also used Subversion and CVS for version control.

16.6.2 GitHub Sub-Projects

Several sub-projects are used on GitHub, to separate files for the MapServer source, or documentation, for example. Here are a list of the important sub-projects:

1. `/mapserver`: MapServer source
2. `/docs`: Documentation files, stored as restructured text files.
3. `/mapcache`: MapCache source, used for tile caching.
4. `/msautotest`: msautotest files, used for automatically verifying source changes.
5. `/basemaps`: basemaps files, used to generate mapfiles from OpenStreetMap data.

16.6.3 Code Developer’s GitHub Access

Github access is mostly intended for use by developers, but users can also access the MapServer source between releases as it is being developed. Github access is only recommended for those who need the absolute latest and greatest code, if they are not afraid of getting their hands dirty building the source. The Github repository does not contain **GD** or any of the support libraries, and it requires flex and bison to build it. Building MapScript will also require **SWIG** be installed on your machine. Here’s how to access the source:

1. Create a [free personal account](#) at GitHub
2. See GitHub’s [help guidelines](#) to install Git locally
3. Issue `git clone git@github.com:mapserver/mapserver.git` to check out a copy of the current source/master into your working directory.

16.6.4 Support Libraries

Information about supporting libraries and how to compile MapServer from source can be found in the [Compiling on Unix](#) or [Compiling on Win32](#).

16.6.5 How to Obtain Commit/Push Access

If you find yourself submitting a lot of push requests to GitHub, or you would like to be an active developer that picks up the maintenance of a portion of MapServer, contact Steve Lime, one of the other developers, or send a message to the MapServer-dev [Mailing Lists](#). To obtain GitHub commit/push access, an individual must:

- demonstrate expertise about a specific area
- be willing to put more time into the project than just the short term (dumping code into the project and providing no way to maintain it is almost as bad as having no code at all)
- be active instead of casual about the project.
- election of Subversion committers is covered in [MS RFC 7.1: MapServer SVN Commit Management](#)

16.6.6 Issue Trackers

- the main Issue Tracker for the MapServer source is found at: <https://github.com/mapserver/mapserver/issues>
- the Issue Tracker for documentation is found within the docs sub-project at: <https://github.com/mapserver/docs/issues>

16.7 Documentation Development Guide

Author Howard Butler

Contact hobu.inc at gmail.com

Author Jeff McKenna

Contact jmckenna at gatewaygeomatics.com

Last Updated 2013-01-02

Table of Contents

- Documentation Development Guide
 - Background
 - GitHub Notes
 - General Writing Guidelines
 - reStructuredText Reference Guides
 - reStructuredText Formatting
 - Installing and Using Sphinx for rst-html Generation
 - How translations are handled
 - Reference Labels

16.7.1 Background

The current structure of the MapServer documentation process is for developers to maintain their documents in reStructuredText format, and submit their changes through [GitHub](#) pull requests; you will first need to create a [free personal account](#) at GitHub. The [Sphinx](#) documentation generator is used to convert the reStructuredText files to html, and the live website is then automatically updated once every 2 hours, on the hour.

16.7.2 GitHub Notes

- Documentation files are stored in the /docs sub-project on GitHub at: <https://github.com/mapserver/docs>
- Always submit pull requests on the latest branch (such as branch-6-2), not on master
- See GitHub's [help guidelines](#) to install Git locally
- Useful git commands:

- clone branch locally:

```
git clone -b branch-6-2 git@github.com:mapserver/docs.git mapserver-docs-git-branch-6-2
```

- update local files:

```
git pull
```

- add file to repository (need to commit after this):

```
git add <file>
```

- commit file to repository:

```
git commit -m "my message" <files>
```

16.7.3 General Writing Guidelines

- MapServer instead of mapserver, map server, Map Server, mapServer or map Server.
- MapScript instead of mapscript, Mapscript, or map script.
- PostGIS instead of postgis.
- HowTo instead of howto or HOWTO.
- Email addresses should be manually spam protected:
`hobu.inc at gmail.com instead of hobu.inc@gmail.com`

16.7.4 reStructuredText Reference Guides

- Quick reStructuredText

16.7.5 reStructuredText Formatting

- All text should be hard breaks at or around the 80 column mark, just as the source code.
- No `.. sectnum::` in the contents directives

- All external links should live at the bottom of your document, under the heading:

```
.. ##### rST Link Section #####
```
- Always include the :Revision: and :Date: lines (as-is) at the top of your document, such as:

```
:Revision: $Revision$  
:Date: $Date$
```

16.7.6 Installing and Using Sphinx for rst-html Generation

Note: As of 2010-06-01 the MapServer site requires Sphinx 1.0. You can browse the versions of the Sphinx packages [here](#), and then install the exact version such as:

```
easy_install Sphinx==1.0.7
```

On Windows:

1. install [Python 2.X](#)
2. download [setuptools](#)
3. make sure that the ‘C:/Python2X/Scripts’ directory is your path
4. execute the following at commandline:

```
easy_install Sphinx
```

...you should see message: “Finished processing dependencies for Sphinx”

Note: Make sure you install Sphinx 1.0 or more recent. See note above.

5. inside the /docs directory, execute:

```
make html
```

or

```
make latex
```

the HTML output will be written to the _build/html sub-directory.

On Linux:

1. make sure you have the Python dev and setuptools packages installed. On Ubuntu:

```
sudo apt-get install python-dev  
sudo apt-get install python-setuptools
```

2. install sphinx using easy_install:

```
sudo easy_install Sphinx
```

Note: Make sure you install Sphinx 1.0 or more recent. See note above.

3. to process the docs, from the MapServer /docs directory, run:

```
make html
```

or

```
make latex
```

the HTML output will be written to the build/html sub-directory.

Note: If there are more than one translation, the above commands will automatically build all translations.

On OS X:

1. install sphinx using easy_install:

```
sudo easy_install Sphinx
```

Note: Make sure you install Sphinx 1.0 or more recent. See note above.

```
# install MacTex from http://www.tug.org/mactex/2009/ if you want to build pdfs
```

1. to process the docs, from the MapServer /docs directory, run:

```
make html
```

or

```
make latex
```

the HTML output will be written to the build/html sub-directory.

Note: If there are more than one translation, the above commands will automatically build all translations.

16.7.7 How translations are handled

- All translations are organized in subdirectories in MapServer /docs directory
 - The directories are named using ISO3166-1 alpha-2 country codes, which will also reference to the corresponding flag icon
 - Translations are based on the English docs
 - The directory structure and filenames must be kept, they are used to generate links between the different translations
-

Note: To start a new translation, copy the directories images and include from docs/en to docs/<lang>, where <lang> is one of the country codes. You also should copy the docs/en/documentation.txt and docs/en/index.txt files into your <lang> directory (the build process requires these files...you are free to edit them as you wish for your own language).

- Only translated files are kept in the <lang> directories and the repository.
- The build script (Makefile and make.bat) have an option (init) to preprocess the <lang> directories. That means that each not translated English file is copied to the target <lang> directory. You don't have to do this to build html files locally. If you do this, you have to clean up your directories afterwards.
- To keep the translations in sync with the English docs, the translators can monitor commits to the repository.

Note: One way to monitor changes is to subscribe the RSS feed through Github: in the docs repository, click on the “Commits” tab and look for a subscription link for these commit changes, for example: see “Commit History” at <https://github.com/mapserver/docs/commits/branch-6-2>

- You have to define which languages are available by setting TRANSLATIONS in the Makefile or make.bat:

```
TRANSLATIONS      = en de
```

The build script will then process the subdirectories *en* and *de*. If they are not accessible, an error message will be returned.

16.7.8 Reference Labels

Table 16.1: :ref: reference labels

Label	Title
about	<i>About</i>
agg	<i>AGG Rendering Specifics</i>
antialias	<i>AntiAliasing with MapServer</i>
arcinfo	<i>ArcInfo</i>
arcsde	<i>ArcSDE</i>
autotest	<i>Regression Testing</i>
background	<i>Tutorial Timeframe</i>
batch_utilities	<i>Batch Scripting</i>
bugs	<i>Bug Submission</i>
cgi	<i>CGI</i>
cgi_controls	<i>MapServer CGI Controls</i>
cgi_introduction	<i>MapServer CGI Introduction</i>
class	<i>CLASS</i>
community	<i>Community Activities</i>
development	<i>Development</i>
dgn	<i>DGN</i>
documentation	<i>MapServer 5.2.2 Documentation</i>
documentation_development	<i>Documentation Development Guide</i>
dotnet_compile	<i>.NET MapScript Compilation</i>
download	<i>Download</i>
dynamic_charting	<i>Dynamic Charting</i>
editing	<i>Mapfile Editing</i>
errors	<i>Errors</i>
example1-1	<i>Example 1.1</i>
example1-1-map	<i>Example1-1.map</i>
example1-2	<i>Example 1.2</i>
example1-2-map	<i>Example1-2.map</i>
example1-3	<i>Example 1.3</i>
example1-3-map	<i>Example1-3.map</i>
example1-4	<i>Example 1.4</i>
example1-4-map	<i>Example1-4.map</i>
example1-5	<i>Example 1.5</i>
example1-5-map	<i>Example1-5.map</i>

Continued on next page

Table 16.1 – continued from previous page

Label	Title
example1-6	<i>Example 1.6</i>
example1-6-map	<i>Example1-6.map</i>
example1-7	<i>Example 1.7</i>
example1-7-map	<i>Example1-7.map</i>
example1-8	<i>Example 1.8</i>
example1-8-map	<i>Example1-8.map</i>
expressions	<i>Expressions</i>
faq	<i>FAQ</i>
fastcgi	<i>FastCGI</i>
feature	<i>FEATURE</i>
filter_encoding	<i>WFS Filter Encoding</i>
flash	<i>Flash Output</i>
fontset	<i>FONTSET</i>
format_types	<i>Data Format Types</i>
genindex	<i>genindex</i>
git	<i>GitHub</i>
gloss	<i>Glossary</i>
gml	<i>GML</i>
gpx	<i>GPS Exchange Format (GPX)</i>
grid	<i>GRID</i>
html_legend	<i>HTML Legends with MapServer</i>
iis	<i>IIS Setup for MapServer</i>
imagemaps	<i>HTML Imagemaps</i>
include	<i>INCLUDE</i>
inline	<i>Inline</i>
input	<i>Data Input</i>
input_postgis	<i>PostGIS/PostgreSQL</i>
installation	<i>Installation</i>
introduction	<i>An Introduction to MapServer</i>
irc	<i>IRC</i>
join	<i>JOIN</i>
kml	<i>KML - Keyhole Markup Language</i>
label	<i>LABEL</i>
layer	<i>LAYER</i>
legend	<i>LEGEND</i>
legend_utility	<i>legend</i>
license	<i>License</i>
linux	<i>Linux</i>
lists	<i>Mailing Lists</i>
management	<i>File Management</i>
map	<i>MAP</i>
map_context	<i>Map Context</i>
mapcache_formats	<i>MapCache Image Formats</i>
mapcache_jpeg_format	<i>MapCache JPEG Format</i>
mapcache_png_format	<i>MapCache PNG Format</i>
mapcache_mixed_format	<i>MapCache Mixed PNG+JPEG Format</i>
mapcache_caches	<i>MapCache Cache Backends</i>
mapcache_grids	<i>MapCache Tile Grids</i>
mapcache_cache_sqlite	<i>MapCache Sqlite Caches</i>

Continued on next page

Table 16.1 – continued from previous page

Label	Title
mapcache_cache_disk	<i>MapCache Disk Caches</i>
mapcache_cache_memcache	<i>MapCache Memcache Caches</i>
mapcache_cache_tiff	<i>MapCache TIFF Caches</i>
mapcache_services	<i>MapCache Tile Services</i>
mapcache_ve	<i>MapCache VirtualEarth Quadkey Tile Service</i>
mapcache_tms	<i>MapCache Tile Map Service</i>
mapcache_kml	<i>MapCache Super-Overlay KML Services</i>
mapcache_wmts	<i>MapCache OGC WMTS Service</i>
mapcache_wms	<i>MapCache OGC WMS Service</i>
mapcache_gmaps	<i>MapCache GoogleMaps Tile Service</i>
mapcache_proxying	<i>MapCache Proxying Support</i>
mapcache_dimensions	<i>MapCache Tileset Dimensions</i>
mapcache_featureinfo	<i>MapCache FeatureInfo Requests</i>
mapcache_tile_assembling	<i>MapCache Tile Assembling</i>
mapcache_sources	<i>MapCache Input Sources</i>
mapcache_source_wms	<i>MapCache WMS Source</i>
mapcache_source_mapfile	<i>MapCache Native MapServer Sources</i>
mapcache_http	<i>MapCache HTTP Request</i>
mapcontext_cgi	<i>Map Context Files</i>
mapfile	<i>Mapfile</i>
mapfile_tuning	<i>Mapfile</i>
mapinfo	<i>MapInfo</i>
mapscript	<i>MapScript</i>
mapscript_introduction	<i>Introduction</i>
mapscript_ows	<i>MapScript Wrappers for WxS Services</i>
mapscript_tests	<i>MapScript Unit Testing</i>
mapserv	<i>mapserv</i>
modindex	<i>modindex</i>
msencrypt	<i>msencrypt</i>
mysql	<i>MySQL</i>
ntf	<i>NTF</i>
oci	<i>Oracle Spatial</i>
oci_install	<i>Oracle Installation</i>
ogc	<i>OGC Support and Configuration</i>
ogc_support	<i>OGC Support</i>
ogr	<i>OGR</i>
online_resource_wms	<i>More About the Online Resource URL</i>
optimization	<i>Optimization</i>
osx	<i>Mac OS X</i>
output	<i>Output Generation</i>
outputformat	<i>OUTPUTFORMAT</i>
pdf	<i>PDF Output</i>
pgeo	<i>ESRI Personal Geodatabase (MDB)</i>
php	<i>PHP MapScript</i>
php_example	<i>By Example</i>
php_install	<i>PHP MapScript Installation</i>
php_install_example_steps	<i>Example Steps of a Full Windows Installation</i>
projection	<i>PROJECTION</i>
python	<i>Python MapScript Appendix</i>

Continued on next page

Table 16.1 – continued from previous page

Label	Title
querying	<i>Querying</i>
querymap	<i>QUERYMAP</i>
raster	<i>Raster Data</i>
raster_optimization	<i>Raster</i>
reference	<i>REFERENCE</i>
rfc1	<i>MS RFC 1: Technical Steering Committee Guidelines</i>
rfc10	<i>MS RFC 10: Joining the Open Source Geospatial Foundation</i>
rfc11	<i>MS RFC 11: Support for Curved Labels</i>
rfc12	<i>MS RFC 12: C code Unit tests</i>
rfc13	<i>MS RFC 13: Support of Sensor Observation Service in MapServer</i>
rfc14	<i>MS RFC 14: Relative Coordinates for INLINE features</i>
rfc15	<i>MS RFC 15: Support for thread neutral operation of MapServer/MapScript</i>
rfc16	<i>MS RFC 16: MapScript WxS Services</i>
rfc17	<i>MS RFC 17: Dynamic Allocation of layers, styles, classes and symbols</i>
rfc18	<i>MS RFC 18: Encryption of passwords in mapfiles</i>
rfc19	<i>MS RFC 19: Style & Label attribute binding</i>
rfc2	<i>MS RFC 2: Creating line features and/or shapes using WKT</i>
rfc21	<i>MS RFC 21: MapServer Raster Color Correction</i>
rfc22a	<i>MS RFC 22a: Feature cache for long running processes and query processing</i>
rfc23	<i>MS RFC 23: Technical Steering Committee Guidelines</i>
rfc24	<i>MS RFC 24: Mapscript memory management</i>
rfc24first	<i>MS RFC 24: Mapscript memory management</i>
rfc25	<i>MS RFC 25: Align MapServer pixel and extent models with OGC models</i>
rfc26	<i>MS RFC 26: Version 5 Terminology Cleanup</i>
rfc27	<i>MS RFC 27: Label Priority</i>
rfc28	<i>MS RFC 28: Redesign of LOG/DEBUG output mechanisms</i>
rfc29	<i>MS RFC 29: Dynamic Charting Capability</i>
rfc3	<i>MS RFC 3: Feature Layer Plug-in Architecture</i>
rfc30	<i>MS RFC 30: Support for WMS 1.3.0</i>
rfc31	<i>MS RFC 31: Loading MapServer Objects from Strings</i>
rfc32	<i>MS RFC 32: Support for Anti-Grain Geometry (AGG) Rendering Engine</i>
rfc33	<i>MS RFC 33: Removing msLayerWhichItems() from maplayer.c</i>
rfc39	<i>MS RFC 39: Support of WMS/SLD Named Styles</i>
rfc4	<i>MS RFC 4: MapServer Raster Resampling</i>
rfc40	<i>MS RFC 40: Support Label Text Transformations</i>
rfc41	<i>MS RFC 41: Support of WCS 1.1.x Protocol</i>
rfc42	<i>MS RFC 42: Support of Cookies Forwarding</i>
rfc43	<i>MS RFC 43: Direct tile generation for Google Maps and Virtual Earth API</i>
rfc44	<i>MS RFC 44: Restore URL modification of mapfiles to pre-5.0 levels</i>
rfc45	<i>MS RFC 45: Symbology, Labeling, and Cartography Improvements</i>
rfc46	<i>MS RFC 46: Migrate Website to OSGeo</i>
rfc47	<i>MS RFC 47: Move IGNORE_MISSING_DATA to run-time configuration</i>
rfc48	<i>MS RFC 48: GEOTRANSFORM Geometry operations</i>
rfc49	<i>MS RFC 49: Symbology, Labeling, and Cartography Improvements</i>
rfc5	<i>MS RFC 5: MapServer Horizon Reprojection Improvements</i>
rfc50	<i>MS RFC 50: OpenGL Rendering Support</i>
rfc51	<i>MS RFC 51: XML Mapfile Format</i>
rfc53	<i>MS RFC 53: Guidelines for MapScript method return values</i>
rfc54	<i>MS RFC 54: Rendering Interface API</i>

Continued on next page

Table 16.1 – continued from previous page

Label	Title
rfc55	<i>MS RFC 55: Improve control of output resolution</i>
rfc56	<i>MS RFC 56: Tighten control of access to mapfiles and templates</i>
rfc6	<i>MS RFC 6: Color Range Mapping of Continuous Feature Values</i>
rfc7	<i>MS RFC 7: MapServer CVS Commit Management</i>
rfc7.1	<i>MS RFC 7.1: MapServer SVN Commit Management</i>
rfc8	<i>MS RFC 8: Pluggable External Feature Layer Providers</i>
rfc9	<i>MS RFC 9: Item tag for query templates</i>
rfcs	<i>Request for Comments</i>
runsub	<i>Run-time Substitution</i>
s57	<i>S57</i>
scalebar	<i>SCALEBAR</i>
scalebar_utility	<i>scalebar</i>
sdts	<i>SDTS</i>
search	<i>search</i>
section1	<i>Section 1: Static Maps and the MapFile</i>
section2	<i>Section 2: CGI variables and the User Interface</i>
shapefiles	<i>ESRI Shapefiles (SHP)</i>
shp2img	<i>shp2img</i>
shptree	<i>shptree</i>
shptreevis	<i>shptreevis</i>
sld	<i>SLD</i>
sortshp	<i>sortshp</i>
sos_server	<i>SOS Server</i>
source	<i>Source</i>
sponsors	<i>Sponsors</i>
style	<i>STYLE</i>
styleitemauto-label-styles	<i>Accessing OGR STYLEITEMAUTO Label Styles Through MapScript</i>
svg	<i>SVG</i>
svn	<i>Subversion</i>
swig	<i>SWIG MapScript API Reference</i>
sym2img	<i>sym2img</i>
sym_construction	<i>Cartographic Symbol Construction with MapServer</i>
sym_examples	<i>Symbology Examples</i>
symbol	<i>SYMBOL</i>
template	<i>Templating</i>
testing	<i>Testing</i>
tiger	<i>USGS TIGER</i>
tile4ms	<i>tile4ms</i>
tile_mode	<i>Tile Mode</i>
tileindex	<i>Tile Indexes</i>
tutorial	<i>MapServer Tutorial</i>
unix	<i>Compiling on Unix</i>
utilities	<i>Utilities</i>
variable_sub	<i>Variable Substitution</i>
vector	<i>Vector Data</i>
vector_optimization	<i>Vector</i>
vim	<i>VIM Syntax</i>
virtual_vector	<i>Virtual Spatial Data</i>
wcs_format	<i>WCS Use Cases</i>

Continued on next page

Table 16.1 – continued from previous page

Label	Title
wcs_server	<i>WCS Server</i>
web	<i>WEB</i>
wfs	<i>WFS</i>
wfs_client	<i>WFS Client</i>
wfs_server	<i>WFS Server</i>
win32	<i>Compiling on Win32</i>
windows	<i>Windows</i>
wms_capabilities	<i>Validate the Capabilities Metadata</i>
wms_client	<i>WMS Client</i>
wms_server	<i>WMS Server</i>
wms_time	<i>WMS Time</i>
wrapper	<i>A Simple CGI Wrapper Script</i>

Regenerating the reference labels

You can regenerate the reference labels by issuing:

```
make labels
```

from the docs directory like when you are building the html or latex versions

16.8 Testing

MapServer provides testing in multiple forms. The *Regression Testing* framework uses *CGI* and other tools to test the generation of images and *OGC* output. The *MapScript Unit Testing* framework tests the MapScript and its object hierarchy.

16.8.1 Regression Testing

Author Frank Warmerdam

Contact warmerdam at pobox.com

Revision \$Revision\$

Date \$Date\$

Last Updated 2011/3/20

Table of Contents

- Regression Testing
 - Getting msautotest
 - Running msautotest
 - Checking Failures
 - Background
 - Result Comparisons
 - REQUIRES - Handling Build Options
 - RUN_PARMS: Tests not using shp2img
 - Result File Preprocessing
 - What If A Test Fails?
 - TODO
 - Adding New Tests

The msautotest is a suite of test maps, data files, expected result images, and test scripts intended to make it easy to run a set of automated regression tests on MapServer.

Getting msautotest

The autotest is available from SVN. On Unix it could be fetched something like:

```
% svn checkout http://svn.osgeo.org/mapserver/trunk/msautotest
```

This would create an msautotest subdirectory wherever you are. I normally put the autotest within my MapServer directory.

Running msautotest

The autotest requires python (but not python MapScript), so if you don't have python on your system - get and install it. More information on python is available at <http://www.python.org>. Most Linux system have some version already installed.

The autotest also requires that the executables built with MapServer, notably *shp2img*, *legend*, *mapserv* and *scalebar*, are available in the path. I generally accomplish this by adding the MapServer build directory to my path.

csh:

```
% setenv PATH $HOME/mapserver:$PATH
```

bash/sh:

```
% PATH=$HOME/mapserver:$PATH
```

Verify that you can run stuff by typing ‘shp2img -v’ in the autotest directory:

```
warmerda@gdal2200[152]% shp2img -v
MapServer version 3.7 (development) OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP
SUPPORTS=PROJ SUPPORTS=TTF SUPPORTS=WMS_SERVER SUPPORTS=GD2_RGB
INPUT=TIFF INPUT=EPPL7 INPUT=JPEG INPUT=OGR INPUT=GDAL INPUT=SHAPEFILE
```

Now you are ready to run the tests. The tests are subdivided into categories, currently just “gdal”, “misc”, and “wxs” each as a subdirectory. To run the “gdal” tests cd into the gdal directory and run the run_test.py script.

Unix:

```
./run_test.py
```

Windows:

```
python.exe run_test.py
```

The results in the gdal directory might look something like this:

```
warmerda@gdal2200[164]% run_test.py
version = MapServer version 6.0.0-beta2 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG SUPPORTS=PROJ SUPPORTS=AGG

Processing: grayalpha.map
    results match.
Processing: class16.map
    result images match, though files differ.
Processing: nonsquare_multiraw.map
    results match.
Processing: bilinear_float.map
    results match.
Processing: processing_scale_auto.map
    results match.
Processing: grayalpha_plug.map
    result images match, though files differ.
Processing: processing_bands.map
    results match.
...
Processing: 256color_overdose_cmt.map
    results match.
Test done (100.00% success):
0 tested skipped
69 tests succeeded
0 tests failed
0 test results initialized
```

In general you are hoping to see that no tests failed.

Checking Failures

Because most msautotest tests are comparing generated images to expected images, the tests are very sensitive to subtle rounding differences on different systems, and subtle rendering changes in libraries like freetype gd, and agg. So it is quite common to see some failures.

These failures then need to be reviewed manually to see if the differences are acceptable and just indicating differences in rounding/rendering or whether they are “real” bugs. This is normally accomplished by visually comparing files in the “result” directory with the corresponding file in the “expected” directory. It is best if this can be done in an application that allows images to be layers, and toggled on and off to visually highlight what is changing. OpenEV can be used for this.

Background

The msautotest suite was initially developed by Frank Warmerdam (warmerdam at pobox.com), who can be contacted with questions it.

The msautotest suite is organized as a series of .map files. The python scripts basically scan the directory in which they are run for files ending in .map. They are then “run” with the result dumped into a file in the result directory. A binary comparison is then done to the corresponding file in the expected directory and differences are reported. The general principles for the test suite are that:

- The test data should be small so it can be easily stored and checked out of svn without big files needing to be downloaded.
- The test data should be completely contained within the test suite ... no dependencies on external datasets, or databases that require additional configuration. PostGIS and Oracle will require separate testing mechanisms.
- The tests should be able to run without a significant deal of user interaction. This is as distinct from the DNR test suite described in [FunctionalityDemo](#).
- The testing mechanism should be suitable to test many detailed functions in relative isolation.
- The test suite is not dependent on any of the MapScript environments, though I think it would be valuable to extend the testsuite with some mapscript dependent components in the future (there is a start on this in the mspython directory).

Result Comparisons

For shp2img tests The output files generated by processing a map is put in the file results/<mapfilebasename>.png (regardless of whether it is PNG or not). So when gdal/256_overlay_res.map is processed, the output file is written to gdal/results/256_overlay_res.png. This is compared to gdal/expected/256_overlay_res.png. If they differ the test fails, and the “wrong” result file is left behind for investigation. If they match the result file is deleted. If there is no corresponding expected file the results file is moved to the expected directory (and reported as an “initialized” test) ready to be committed to CVS.

For tests using RUN_PARMS, the output filename is specified in the RUN_PARMS statement, but otherwise the comparisons are done similarly.

The initial comparison of files is done as a binary file comparison. If that fails, for image files, there is an attempt to compare the image checksums using the GDAL Python bindings. If the GDAL Python bindings are not available this step is quietly skipped.

If you install the PerceptualDiff program (<http://pdiff.sourceforge.net/>) and it is in the path, then the autotest will attempt to use it as a last fallback when comparing images. If images are found to be “perceptually” the same the test will pass with the message “result images perceptually match, though files differ.” This can dramatically cut down the number of apparent failures that on close inspection are for all intents and purposes identical. Building PerceptualDiff is a bit of a hassle and it will miss some significant differences so its use is of mixed value.

For non-image results, such as xml and html output, the special image comparisons are skipped.

REQUIRES - Handling Build Options

Because MapServer can be built with many possible extensions, such as support for OGR, GDAL, and PROJ.4, it is desirable to have the testsuite automatically detect which tests should be run based on the configuration of MapServer. This is accomplished by capturing the version output of “shp2img -v” and using the various keys in that to decide which tests can be run. A directory can have a file called “all_require.txt” with a “REQUIRES:” line indicating components required for all tests in the directory. If any of these requirements are not met, no tests at all will be run in this directory. For instance, the gdal/all_require.txt lists:

```
REQUIRES: INPUT=GDAL OUTPUT=PNG
```

In addition, individual .map files can have additional requirements expressed as a REQUIRES: comment in the map-file. If the requirements are not met the map will be skipped (and listed in the summary as a skipped test). For example gdal/256_overlay_res.map has the following line to indicate it requires projection support (in addition to the INPUT=GDAL and OUTPUT=PNG required by all files in the directory):

```
# REQUIRES: SUPPORTS=PROJ
```

RUN_PARMS: Tests not using shp2img

There is also a RUN_PARMS keyword that may be placed in map files to override a bunch of behaviour. The default behaviour is to process map files with shp2img, but other programs such as mapserv or scalebar can be requested, and various commandline arguments altered as well as the name of the output file. For instance, the following line in misc/tr_scalebar.map indicates that the output file should be called tr_scalebar.png, the commandline should look like “[SCALEBAR] [MAPFILE] [RESULT]” instead of the default “[SHP2IMG] -m [MAPFILE] -o [RESULT]”.

```
RUN_PARMS: tr_scalebar.png [SCALEBAR] [MAPFILE] [RESULT]
```

For testing things as they would work from an HTTP request, use the RUN_PARMS with the program [MAPSERV] and the QUERY_STRING argument, with results redirected to a file.

```
# RUN_PARMS: wcs_cap.xml [MAPSERV] QUERY_STRING='map=[MAPFILE]&SERVICE=WCS&VERSION=1.0.0&REQUEST=Get...
```

For web services that generate images that would normally be prefixed with the Content-type header, use [RESULT_NOMIME] to instruct the test harness to script off any http headers before doing the comparison. This is particularly valuable for image results so the files can be compared using special image comparisons.

```
# Generate simple PNG.
# RUN_PARMS: wcs_simple.png [MAPSERV] QUERY_STRING='map=[MAPFILE]&SERVICE=WCS&VERSION=1.0.0&REQUEST=...
```

Result File Preprocessing

As mentioned above the [RESULT_DEMIME] directive can be used for image file output from web services (ie. WMS GetMap requests).

For text, XML and HTML output it can also be helpful to apply other pre-processing to the output file to make comparisons easier. The [RESULT_DEVERSION] directive in the RUN_PARMS will apply several translations to the output file including:

- stripping out the MapServer version string which changes depending on build options and version.
- manipulating the format of exponential numbers to be consistent across platforms (changes windows e+nn format to e+nn).
- strip the last decimal place off floating point numbers to avoid unnecessary sensitivity to platform specific number handling.
- blank out timestamps to avoid “current time” sensitivity.

In some cases it is also helpful to strip out lines matching a particular pattern. The [STRIP:xxx] directive drops all lines containing the indicated substring. Multiple [STRIP:xxx] directives may be included in the command string if desired. For instance, the error reports from the runtime substitution validation test (misc/runtime_sub.map) produces error messages with an absolute path in them which changes for each person. The following directive will drop any text lines in the result that contain the string ShapefileOpen, which will be error messages in this case:

```
# RUN_PARMS: runtime_sub_test001.txt [MAPSERV] QUERY_STRING='map=[MAPFILE]&mode=map&layer=layer1&name1=bdry_county2' > [RESULT_DEVERSION] [STRIP:ShapefileOpen]
```

What If A Test Fails?

When running the test suite, it is common for some tests to fail depending on vagaries of floating point on the platform, or harmless changes in MapServer. To identify these compare the results in result with the file in expected and determine what the differences are. If there is just a slight shift in text or other features it is likely due to floating point differences on different platforms. These can be ignored. If something has gone seriously wrong, then track down the problem!

It is also prudent to avoid using output image formats that are platform specific. For instance, if you produce TIFF it will generate big endian on big endian systems and therefore be different at the binary level from what was expected. PNG should be pretty safe.

TODO

- Add lots of tests for different stuff! Very little vector testing done yet.
- Add a high level script in the msautotest directory that runs the subscripts in all the subdirectories and produces a summary report.
- Add something to run tests on the server and report on changes.

Adding New Tests

- Pick an appropriate directory to put the test in. Feel free to start a new one for new families of testing functionality.
- Create a minimal map file to test a particular issue. I would discourage starting from a “real” mapfile and cutting down as it is hard to reduce this to the minimum.
- Give the new mapfile a name that hints at what it is testing without making the name too long. For instance “ogr_join.map” tests OGR joins. “rgb_overlay_res_to8bit.map” tests RGB overlay layers with resampling and converting to 8bit output.
- Put any MapServer functionality options in a # REQUIRES: item in the header as described in the internal functioning topic above.
- Write some comments at the top of the .map file on what this test is intended to check.
- Add any required datasets within the data directory beneath the test directory. These test datasets should be as small as possible! Reuse existing datasets if at all possible.
- run the “run_tests.py” script.
- verify that the newly created expected/<testname>.png file produces the results you expect. If not, revise the map and rerun the test, now checking the results/<testname>.png file. Move the results/<testname>.png file into the expected directory when you are happy with it.
- add the .map file, and the expected/<testname>.png file to SVN when you are happy with them. For example,

```
% svn add mynewtest.map expected/mynewtest.png  
% svn commit -m "new" mynewtest.map expected/mynewtest.png
```

You’re done!

16.8.2 MapScript Unit Testing

Date 2005/11/20

Author Sean Gillies

Test Driven Development

In 2003, I began to commit to test driven development of the mapscript module. TDD simply means development through repetition of two activities:

1. add a test, cause failure, and write code to pass the test

2. remove duplication

Test Driven Development is also a book by Kent Beck.

New features that I develop for MapServer begin as test expressions. There are a bazillion good reasons for working this way. The most obvious are

1. accumulation of automated unit tests
2. accumulation of excellent usage examples
3. that i'm prevented from starting work on flaky ideas that can't be tested

About the tests

Tests are committed to the MapServer CVS under mapscript/python/tests. They are written in Python using the JUnit inspired unittest module. A good introduction to unit testing with Python is found at http://diveintopython.org/unit_testing/index.html.

The test framework imports mapscript from python/tests/cases/testing.py. This allows us to test the module before installation

```
[sean@lenny python]$ python setup.py build
[sean@lenny python]$ python tests/runtests.py -v
```

Test cases are implemented as Python classes, and individual tests as class methods named beginning with test*. The special setUp() and tearDown() methods are for test fixtures and are called before and after every individual test.

Since version 4.2, MapServer includes a very lightweight testing dataset under mapserver/tests. The set consists of symbols, fonts, three single-feature shapefiles, and a test.map mapfile. This is the only data used by the unit tests.

Many tests that require a mapObj derive from testing.MapTestCase:

```
class MapTestCase(MapPrimitivesTestCase):
    """Base class for testing with a map fixture"""
    def setUp(self):
        self.map = mapscript.mapObj(TESTMAPFILE)
    def tearDown(self):
        self.map = None
```

One example is the MapSymbolSetTestCase, the test case I used for development of the expanded symbolset functionality present in the 4.2 release:

```
class MapSymbolSetTestCase(MapTestCase):
    def testGetNumSymbols(self):
        """expect getNumSymbols == 2 from test fixture test.map"""
        num = self.map.getNumSymbols()
        assert num == 2, num
    ...
```

Status

This unit testing framework only covers functionality that is exposed to the Python mapscript module. It can help to check on pieces of the core MapServer code, but is no guarantor of the *mapserv* program or of the *PHP MapScript* module. As of this writing, there are 159 tests in the suite. These are tests of features added since mid-2003. Much of MapServer's older stuff remains untested and it is doubtful that we'll make the time to go back and fill in.

16.9 Request for Comments

A MapServer RFC describes a major change in the technological underpinnings of MapServer, major additions to functionality, or changes in the direction of the project.

16.9.1 MS RFC 1: Technical Steering Committee Guidelines

Date 2005/06/24

Author Frank Warmerdam, Independent

Contact warmerdam at pobox.com

Last Edited \$Date\$

Status Superseded by [MS RFC 23: Technical Steering Committee Guidelines](#)

Id \$Id\$

Summary

This document describes how the MapServer Technical Steering Committee determines membership, and makes decisions on MapServer technical issues.

In brief the technical team votes on proposals on mapserver-dev. Proposals are available for review for at least two days, and a single veto is sufficient delay progress though ultimately a majority of members can pass a proposal.

Detailed Process

1. Proposals are written up and submitted on the mapserver-dev mailing list for discussion and voting, by any interested party, not just committee members.
2. Proposals need to be available for review for at least two business days before a final decision can be made.
3. Respondents may vote “+1” to indicate support for the proposal and a willingness to support implementation.
4. Respondents may vote “-1” to veto a proposal, but must provide clear reasoning and alternate approaches to resolving the problem within the two days.
5. A vote of -0 indicates mild disagreement, but has no effect. A 0 indicates no opinion. A +0 indicate mild support, but has no effect.
6. Anyone may comment on proposals on the list, but only members of the Technical Steering Committee’s votes will be counted.
7. A proposal will be accepted if it receives +2 (including the proposer) and no vetos (-1).
8. If a proposal is vetoed, and it cannot be revised to satisfy all parties, then it can be resubmitted for an override vote in which a majority of all eligible voters indicating +1 is sufficient to pass it. Note that this is a majority of all committee members, not just those who actively vote.
9. Upon completion of discussion and voting the proposer should announce whether they are proceeding (proposal accepted) or are withdrawing their proposal (vetoed).
10. The Chair gets a vote.
11. The Chair is responsible for keeping track of who is a member of the Technical Steering Committee (perhaps as part of a TSC file in CVS).

12. Addition and removal of members from the committee, as well as selection of a Chair should be handled as a proposal to the committee.
13. The Chair adjudicates in cases of disputes about voting.

When is Vote Required?

- Anything that could cause backward compatibility issues.
- Adding substantial amounts of new code.
- Changing inter-subsystem APIs, or objects.
- Issues of procedure.
- When releases should take place.
- Anything that might be controversial.

Boundaries of “Technical”

- If it relates to changes in the code, it is technical.
- If it relates to how the developers cooperate, it is technical.
- If it relates to legal issues around code ownership it is technical.
- If it relates to documentation, or the web site it is not technical.
- If it relates to events such as conferences, it is not technical.

Observations

- The Chair is the ultimate adjudicator if things break down.
- The absolute majority rule can be used to override an obstructionist veto, but it is intended that in normal circumstances vetoers need to be convinced to withdraw their veto. We are trying to reach consensus.
- It is anticipated that separate “committees” will exist to manage conferences, documentation and web sites.

Bootstrapping

Steve Lime is declared initial Chair of the Technical Steering Committee.

Steve Lime, Daniel Morissette, Frank Warmerdam, Sean Gilles, Assefa Yewondwossen, Howard Butler and Perry Nacionales are declared to be the founding Technical Steering Committee.

16.9.2 MS RFC 2: Creating line features and/or shapes using WKT

Date 2005/07/13

Author Steve Lime

Contact steve.lime at DNR.STATE.MN.US

Last Edited \$Date\$

Status Completed

Version MapServer 4.8

Id \$Id\$

Description: Developing inline features or shapes within MapScript can be a bit cumbersome. One alternative would be to allow users to define feature using the Well-Known Text format. The proposed solution would allow users to use this format:

1. within a mapfile
2. via URL
3. via MapScript
4. via MapServer query template

Instead of writing a new WKT parser we would provide access to underlying GEOS or OGR functionality to do this. Notes about the actual implementation are included below.

Files affected

- mapfile.h => new constant, WKT
- maplexer.l => recognize the new constant
- mapfile.c => process new mapfile parameter with FEATURE block (WKT), and update URL parsing in a similar manner
- mapgeos.cpp => wrap GEOS WKT reading/writing code
- mapogr.cpp => wrap OGR WKT reading/writing code
- mapprimitive.c => wrap the GEOS and OGR WKT writer/reading code, this would be the “public” interface
- maptemplate.c => update the shpxy tag with a “-wkt” option so it would output the WKT version of a shape. Placing here would allow us to take advantage of the projection support already in place, plus any future options (thining, buffers and so on).
- mapscript/swiginc/shape.i => update constructor to pass a WKT string and to define a “toString” method that would output a WKT string. Similar modifications would have to be made within PHP/MapScript, patterned after the SWIG-based interface.

Backwards compatability issues

N/A, new functionality

Implementation Details

- The C API will take the form:

```
shapeObj *msShapeFromWKT( const char * );
char *msShapeToWKT( shapeObj * );
```

These are contrary to some of the older code (e.g. msLayerNextShape()). However there are 2 places the WKT APIs will be used: 1) MapScript and 2) creating inline features via URL or MapFiles. In both cases the above functions would be prefered.

- In MapScript, creating a shape will take the form of an overloaded constructor, e.g.:

```
$shape = new shapeObj($mapscript::MS_SHAPE_LINE); OR $shape = new
shapeObj('LINESTRING(0 0,1 1,2 2)');
```

- In MapScript, a toWKT() method will be added to shapeObj object.
- WKT is geometry only. The attributes, index, tileindex, classindex, and text fields do not exist in WKT and will have to be set “elsewhere”.
- There is no widely supported, or standardized approach to “measure” values in WKT though Refractions does support it in “EWKT”. For now it is assumed that measure values will not be preserved from WKT.
- There is a well defined way of including Z coordinates and these should be carried through if MapServer is built with Z and M support enabled.
- Development will be accompanied by a set of tests. Sean Gillies has already created a test case or two.

Transformations shapeObj to WKT

- MS_SHAPE_POINT: If numlines and numpoints are one, then this is converted to a POINT object in WKT. If there are more points, this is converted to a MULTIPOLYPOINT object.
- MS_SHAPE_LINE: if numlines is 1 then this will be translated to a LINESTRING otherwise it will be translated to a MULTILINESTRING.
- MS_SHAPE_POLYGON: MapServer does not keep track of interior and exterior rings in a shape, since the scanline rasterization mechanism of GD does not require this information. However, when converting to WKT we need to know whether we have a single polygon with holes, or multiple polygons (more than one exterior ring). If numlines is 1, we can directly translate to POLYGON(), otherwise the rings will need to be analysed to identify outer rings, and to associate inner rings with their outer ring. If more than one outer ring exist, a MULTIPOLYYGON will be produced, otherwise a POLYGON will be produced.
- MS_SHAPE_NULL: This results in an empty WKT string.

Transformations WKT to shapeObj

- POINT: Translates to an MS_SHAPE_POINT object with one point and one line.
- LINESTRING: Translates to an MS_SHAPE_LINE object with one line.
- POLYGON: Translates to an MS_SHAPE_POLYGON object with one line for the outer ring and one line for each inner ring.
- MULTIPOINT: Translates to an MS_SHAPE_POINT object with one line, and one point for each line.
- MULTILINESTRING: Translates to an MS_SHAPE_LINE object with one line for each linestring in the container.
- MULTIPOLYYGON: Translates into an MS_SHAPE_POLYGON with each ring of each polygon being a line in the resulting polygon object.
- GEOMETRYCOLLECTION: Treat as MULTIPOINT, MULTILINESTRING or MULTIPOLYYGON if the contents are all compatible, otherwise throw an exception.

Bug ID

<http://trac.osgeo.org/mapserver/ticket/1466> (primary bug, addition entries for MapScript and OGR will follow)

Voting history

Vote proposed by Steve Lime on 9/4/2005, result was +4 (3 non-voting members).

Voting +1: Lime, Warmerdam, Morissette, Gillies

Proposal passes and will move forward.

16.9.3 MS RFC 3: Feature Layer Plug-in Architecture

Date 2005/08/22

Author Jani Averbach

Contact javerbach at extendthereach.com

Last Edited \$Date\$

Status Adopted

Version MapServer 4.8

Id \$Id\$

Abstract Solution

Implement a virtual table structure for `layerObj`. This structure will contain function pointers for all layer specific operations. This structure will be populated when the layer is opened or first time accessed. After that all back-end format specific layer operations will happen through this vtable which is cached in the `layerObj` struct.

Technical Solution

All file names and numbers are against released MapServer 4.6.0 source code.

1. Add new field to the `layerObj`. It will be pointer to the vtable, which will contain function pointers for this layer.
2. Add the virtual table architecture

The vtable will be initialized when the layer is accessed at the first time. The vtable will be populated with dummies when it is created and these dummies will implement feasible default actions if there is any (e.g. do nothing) or return error by default.

2.1. Standard functions which are found currently from `maplayer.c`

2.1.1. `InitItemInfo`

```
int (*LayerInitItemInfo)(layerObj *layer);
```

2.1.2. `FreeItemInfo`

```
void (*LayerFreeItemInfo)(layerObj *layer);
```

2.1.3. `Open`

```
int (*LayerOpen)(layerObj *layer);
```

Currently there are two layers which accept more than the generic layer arg for LayerOpen function:

```
int msOGRLayerOpen(layerObj *layer,
                    const char *pszOverrideConnection);
int msWFSLayerOpen(layerObj *lp,
                    const char *pszGMLFilename,
                    rectObj *defaultBBOX);
```

However, these are called from msLayerOpen with NULL args, so I think that proposed interface for this virtual table function should be fine.

2.1.4. IsOpen

```
int (*LayerIsOpen) (layerObj *layer);
```

2.1.5. WhichShapes

```
int (*LayerWhichShapes) (layerObj *layer,
                        rectObj rect);
```

2.1.6. NextShape

```
int (*LayerNextShape) (layerObj *layer, shapeObj *shape);
```

2.1.7. GetShape

```
int (*LayerGetShape) (layerObj *layer, shapeObj *shape,
                      int tile, long record);
```

2.1.8. LayerClose

```
int (*LayerClose) (layerObj *layer);
```

2.1.9. LayerGetItems

```
int (*LayerGetItems) (layerObj *layer);
```

2.1.10. GetExtent

```
int (*LayerGetExtent) (layerObj *layer,
                      rectObj *extent);
```

2.1.11. GetAutoStyle

```
int (*LayerGetAutoStyle) (mapObj *map, layerObj *layer,
                        classObj *c, int tile,
                        long record);
```

2.2. New functions and/or fields for vtable

2.2.1. CloseConnection

This function is used to actually close the connection, in case that layer implements some kind of connection pooling by its own. If layer doesn't use any connection pooling, this function should be implemented as no-op. Caller should first call layer's "close" function, and finally at the very end `CloseConnection`.

The signature of function is

```
int (*LayerCloseConnection) (layerObj *layer);
```

And the main place where this function will be called, is `mapfile.c`: 4822

```
void msCloseConnections (mapObj *map)
```

This function is needed because e.g. POSTGIS is implementing this usage pattern at the moment `maplayer.c`: 599

```
void msLayerClose (layerObj *layer)
...
/*
 * Due to connection sharing, we need to close the results
 * and free the cursor, but not close the connection.
 */
msPOSTGISLayerResultClose (layer);
```

2.2.2. SetTimeFilter

This function is used to create a time filter for layer. At the moment we have three special cases (`maplayer.c`: 1635):

- (a) POSTGIS with it's own function
- (b) Layers with backticks delimited expressions
- (c) Layers without backticks

The idea is provide a generic helper function,

```
int makeTimeFilter (layerObj *lp,
                    const char *timestring,
                    const char *timefield,
                    const bool bBackTicks)
```

And the actual layer's `SetTimeFilter` could use the above, or implement something totally different as POSTGIS is doing at the moment.

The signature for layer's vtable function is

```
int (*LayerSetTimeFilter) (layerObj *lp,
                           const char *timestring,
                           const char *timefield);
```

2.3. Extra functions to add to the vtable

2.3.1. FLTApplyFilterToLayer (`mapogcfILTER.c`: 1084)

This is the main filter interface for layers. We will provide two helper functions, one for "SQL" case and the another for "non-SQL" case, and set all layers, except POSTGIS, ORACLESPATIAL and OGR to call directly this "non-SQL" version of this helper function (else-branch of if).

ORACLESPATIAL, POSTGIS and OGR could use “SQL” version of the helper function (actual if-branch) if the conditions for this are met, otherwise they will use Non-SQL version of the function.

2.3.2. layerObj->items allocation

There will be vtable function for allocation `items` and initialization for `numitems`. If layer has some special needs for these objects it can override default function.

The signature for function will be:

```
int (*CreateItems) (layerObj *)
```

which does the allocation and set `numitems` to correct value.

2.3.3. msCheckConnection (mapfile.c: 4779)

This API is deprecated. It is called only from `msMYGISLayerOpen`. We will not provide this functionality through vtable.

2.4. Interface functions for internal layers

We have to add some new interface functions to access layers.

2.4.1 Function interface to initialize internal layer type

We need a per layer type a function which will be called when the layer’s vtable has to be initialized. These functions will be

```
int msXXXInitializeLayerVirtualTable (layerObj *)
```

where XXX will be name of the layer. This function is called anytime when the vtable isn’t initialized and the layer is accessed at the first time.

2.4.2 Function interface to change the connectiontype of layer

To change the connection type of layer, it has to be done by function interface. Accessing directly `connectiontype` field is not supported anymore.

To change the `connectiontype` and to connect to the new layer, there will be following interface function

```
int msConnectLayer (int connectiontype,
                   const char *library_str)
```

where `connectiontype` is the type of new layer, and `library_str` is the name of library which will provide functionality for this new layer. For internal layer types this second argument is ignored.

3. Remove unwanted interfaces

Frank Warmerdam proposed [FW1] that we remove all layer specific interface functions from `map.h`.

I see each “built-in” module such as `mapsde.c` providing a registration function such as “`msSDEInitializeLayerVirtualTable`” so that none of the layer type specific definitions need to appear in `map.h` any more.

Files and objects affected

This proposal will affect at least following files and objects:

- map.h
 - layerObj will contain new fields. There will be a new object vtableObj in the map.h.
- maplayer.c
 - Various changes, layer specific switch-statements will go away, vtable handling and layers vtable initialization will be added.
- mapfile.c
 - Cleaning of msCheckConnection
 - Vtable for msCloseConnection
- mapogcfilter.c
 - Remove layer-logic from FLTApplyFilterToLayer
- mapXXX.c, where XXX is the name of layer.
 - Add new initialization function
 - Add all new interface functions
 - Fix existing interface functions, if needed / add wrappers for msOGRLayerOpen and msWFSLayerOpen.

Backwards compatibility issues

This is binary and source code level backward incompatible change. The proposal will remove some previously public functions, and add new field(s) to the layerObj struct.

This proposal is not MapScript backward compatible, it will break scripts which change directly connectiontype field in layerObj.

The proposal is MAP-file backward compatible.

Implementation Issues

- Biggest problem is probably that the author has ignored or missed something by oversight which will show up during implementation. However, there is a prototype implementation of external plug-in architecture which works at the moment and is based on ideas presented in this proposal. So there is some real life experience that this architecture change is feasible thing to do.
- I also like to note that this proposal won't remove all layer specific code from MapServer e.g. WMF, WMS and GRATICULE are used as special cases from place to place.

Bug ID

Bug 1477

Voting history

Vote proposed by Jani Averbach on 9/19/2005, result was +4 (3 non-voting members).

Voting +1: Howard Butler, Frank Warmerdam, Yewondwossen Assefa, Daniel Morissette

Proposal passes and will move forward.

Open questions

- How do we like to expose layer's virtual table to the layers. We have at least two different routes to go:
 - expose it as a struct, layers will fill vtable pointers by accessing directly struct's field.
 - expose it as a complete opaque type, vtable pointers will be set by accessing functions setLayerOpenFP, setLayerCloseFP and so on.

The advance of second option is that this way we could easily add new functions to the struct if we refactor code more or found some logic which is ignored by oversight in this proposal.

- Are there any special issues with the raster query layer support which is handled via the layer API?

16.9.4 MS RFC 4: MapServer Raster Resampling

Date 2005/09/16

Author Frank Warmerdam

Contact warmerdam at pobox.com

Last Edited \$Date\$

Status adopted

Version MapServer 4.8

Id \$Id\$

Overview

Additional resampling kernels will be implemented in the MapServer GDAL raster resampler code including “averaging”, “bilinear” and “cubic”.

Technical Details

- The new resampling options will be implemented in mapresample.c and will only be accessible for datasets processing through that mechanism (ie. GDAL raster formats, requires coordinate system information defined).
- The resampling kernel to use will be selected with one of the following. The default will be RESAMPLE=NEAREST, the current behavior.

```
PROCESSING "RESAMPLE=NEAREST"
PROCESSING "RESAMPLE=AVERAGE"
PROCESSING "RESAMPLE=BILINEAR"
PROCESSING "RESAMPLE=BICUBIC"
```

- The mapraster.c code currently decides whether to invoke the “simple” GDAL renderer or the “resampling” GDAL renderer based on whether the projection seems to differ. It will also now check for the RESAMPLE processing option, and force use of mapresample.c if the resampling kernel select is other than NEAREST.

- Note that resampling kernels other than NEAREST can have a substantial effect on rendering performance. For this reason NEAREST will remain the default.

Mapfile Implications

All new options are selected via new PROCESSING options. There is no change in the mapfile syntax. There should be no compatibility problems with old mapfiles.

MapScript Implications

There are no additions or changes to the MapScript API. The new options are controlled via PROCESSING information on the layers which I believe is already manipulatable from MapScript.

Documentation Implications

The new processing options will need to be documented in the *Raster Data* (and possibly the *MAP* reference).

Test Plan

New test cases for each mode will be incorporated in msautotest/gdal.

Staffing / Timeline

The new feature will be implemented by Frank Warmerdam and completed by October 15th, 2005, in time for the MapServer 4.8 release. Implementation is generously funded by Tydac AG and managed by DM Solutions.

16.9.5 MS RFC 5: MapServer Horizon Reprojection Improvements

Date 2005/09/16

Author Frank Warmerdam

Contact warmerdam at pobox.com

Last Edited \$Date\$

Status Adopted

Version MapServer 4.8

Id \$Id\$

Purpose

To provide a practical solution to MapServer Bug 411 - Clipping Issue with Ortho Projection:

<http://trac.osgeo.org/mapserver/ticket/411>

Approach

The msProjectShape() function would be altered support reprojection of shapes where some, but not all, vertices fail to transform due to issues such as falling over the horizon. An iterative method would be used to preserve a reduced geometry approximating the portion that can be transformed.

Point Features

- Point features will be handled as they are now. They either transform successfully or not. Those that fail to transform are dropped.

Line Features

- Line strings would potentially be split into multiple line strings, if there were more than one discontinuous portion of a line string that transforms.
- Interpolated (horizon) points would be computed by transforming points along the line segment between the last successful point and the first unsuccessful point. A binary search algorithm will be used to find the closest point within our tolerance distance.
- Line strings where no vertices transform successfully will still be dropped.

Area Features

- Each ring will be treated distinctly, without regard to the other rings. This means no there is no assurance that an inner ring will remain completely within the outer ring after clipping. In particular, where the horizon passes through an area and a hole in the area, it is likely that the hole edge will touch over even overlap the outer area edge a bit. Generally this should not matter much in the MapServer context since a simple scanline rasterization (winding number based) technique is used. So polygon “correctness” is not paramount.
- A similar technique to that for lines is used to interpolate the edge vertices when clipping is to be applied.
- For polygons there will be two (or possibly 4, 6, 8...) interpolated horizon points. These will be connected with a straight line segment. For very large polygons spanning a significant portion of the horizon (ie. dozens of degrees of arc of the horizon) this will result in part of the circle of the horizon getting clipped off. Optionally an iterative method could be applied to address this curvature issue (not priced into this proposal).

Tolerances

MapServer will need make a decision on how detailed to get when doing the iterative horizon determination. The tolerance will be fixed as half the size of a pixel in the current map rendering. In normal map drawing this should mean that the final rendering is effectively exact.

However, communicating the tolerance into msProjectShape() will require substantial work as the msProjectShape() function does not normally know anything about the map or current rendering information. To communicate this information to msProjectShape(), I will add a transformation options structure with this information (and possibly other flags controlling transformation) which will be passed into msProjectShape(). If NULL particular defaults will be used.

All appropriate uses of msProjectShape() will need to be updated to reflect this change, and to setup the transformation options information ahead of time. layerObj level PROCESSING options will also be provided to control (override) the default transformation options.

Caveats

1. msProjectShape() may produce slightly invalid polygons from a GIS point of view, though it shouldn't matter much for rendering purposes.
2. The straight line segment for "area horizon edges" will result in visible "clipping" of the horizon for very large polygons (ie. the Soviet Union).
3. This change is too disruptive to back port to the stable 4.6.x release, so it would only be available as part of CVS based MapServer builds (aka 4.7) until such time as the 4.8 release is made, likely in December or January.

Mapfile Implications

There will be no changes to the mapfile.

MapScript Implications

There will be no changes to MapScript.

Backward Compatibility Issues

Some maps that previously dropped incompletely reprojected features will now produce clipped features. I don't foresee this causing obvious problems other than a slight change (improvement!) in appearance.

Staffing and Timeline

The new feature will be implemented by October 15th, 2005, in time for inclusion in MapServer 4.8. It will be implemented by Frank Warmerdam with generous funding from TMC Technologies.

16.9.6 MS RFC 6: Color Range Mapping of Continuous Feature Values

Date 2005/09/27

Author Bill Binko

Contact bill at binko.net

Last Edited \$Date\$

Status Proposed

Id \$Id\$

Description: This proposal addresses the need to be able to easily map continuous feature values to a continuous range of colors. This RFC is the result of (and my interpretation of) the discussion that surrounded Bug #1305.

A preliminary patch has already been applied to MapServer 4.6+ (before the RFC process was in place), however, there is little consensus on the format being used and there is no support for proper display of legends for classes using ColorRanges.

Background

This work started as a patch that I created to be able to quickly visualize data with a large range of values. In particular, I was wishing to map property values, and various ratios that could take on a large range of values. To me, the natural way to do this was to set a max value, a min value and what colors those mapped to. The patch I wrote had MapServer do a linear interpolation of the value for each feature on to that color range.

The initial syntax for this feature simply added 5 new keywords to the STYLE block and looked as follows:

```
STYLE
  COLOR 60 60 60
  MINCOLOR 0 0 0
  MAXCOLOR 255 255 0
  MINVALUE 0.0
  MAXVALUE 300000.0
  GRADIENTITEM "sale_price"
END
```

After some discussion, the term Gradient was shown to be problematic. Also, the number of new keywords seemed high. After some discussion, the syntax was changed to this format:

```
STYLE
  COLORRANGE 0 0 0 255 255 0 # black to yellow
  DATARANGE 0.0 100.0
  RANGEITEM "foobar"
END
```

While this is still just a set of keywords under a Style, it seemed simpler and is now working in the MapServer 4.6 branch.

Current Syntax Problems

Several people pointed out that the current syntax could be improved by:

1. Moving the new keywords into a block
2. Adding a METHOD keyword with the type of interpolation used ('linear' being the first defined type, 'logarithmic' being a potential second type, etc.)
3. Adding an INTERVALS keyword that would limit the number of colors actually used by rounding values before interpolation.
4. Moving all of the keywords out of the Style block.
5. Allowing the ColorRange to be defined separately so that it can be reused

Proposed New Syntax

To meet the above needs, I propose the following new Block Syntax:

```
COLORRANGE
  RANGEITEM 'itemname' #required
  MINCOLOR 0 0 0 #optional - default = Black
  MAXCOLOR 255 255 0 #optional - default = White
  MINVALUE 0.0 #optional - default = 0
  MAXVALUE 100.0 #optional - default = 1
  INTERVALS 10 #optional - default = 0 (unlimited)
  METHOD LINEAR #optional - default = 'LINEAR'
END
```

I propose that this block lives at the CLASS level. My reasons for putting it at the CLASS, rather than the LAYER (or above) level are as follows:

1. CLASS is the lowest level that can define a Legend entry (by using a named class)
2. Allows multiple COLORANGES to be applied to a single layer (i.e. Red->Yellow and Yellow->Green to make a contiguous Reg->Yellow->Green).
3. Allows “out of bounds” values to be highlighted separately (with a different CLASS).

(If we wish to provide this capability on the OUTLINECOLOR, then I would suggest we create a OUTLINECOLOR-RANGE block with identical format.)

Note: I am (and have always been) flexible on all of the keyword names and formats here. However, given the discussion that's gone on around (and around) this, I thought I'd put a straw man up and start here.

Proposed Legend Format

I have posted a mockup of how I believe legends should look at

<http://trac.osgeo.org/mapserver/ticket/324>

The format only changes the height of the legend (which is already dynamic) so it should not have major layout implications. (Nit-picking about how tall the colorbar should be can be worked out during implementation.)

I have not started the legend support, and would like some help in this area. However, I do believe it is straightforward, and I will do it on my own if there are no volunteers.

MapScript Issues

As Sean Gillies mentioned in the discussion, this should be encapsulated in MapScript as a class. While I disagree with his putting it on the LAYER (see above), the rest of his suggestions all seem right in line.

I Propose a class named ColorRamp with the following read/write attributes:

```
Color minColor
Color maxColor
double minValue
double maxValue
String rangeItem
String method
int intervals
```

and two methods

```
Color findColor(double value)
double findValue(Color color)
```

ColorRamps can be obtained through an appropriate constructor or through a new (read/write) attribute on the ClassObj object:

```
ColorRange colorRange
```

Note: I will need help in adding these to MapScript as I do not have the SWIG experience to do it well.

Files affected

I will update this list as the RFC evolves, but right now, these are what I see:

- mapfile.h => Change Keywords
- maplexer.l => Change Keywords
- mapfile.c => process new Keywords
- mapscript/swiginc/*.i => various interface modifications to fit the above requirements
- maplegend.c => Add new Legend support
- mapdraw.c => update existing ColorRange code to use new keywords & add intervals and LOGARITHMIC method

Backwards compatibility issues

Right now, certain code _requires_ that there is a COLOR attribute set on any layer that is going to be displayed. Either this will need to be changed, or we will have to decide what that means if both a COLOR and a COLORRANGE are defined. One option is to use the COLOR for any values that are outside of the range.

Multiple Mapping Methods

The system will allow new color mapping methods to be added with as little effort as possible. If a new color mapping method uses only the keywords defined by this RFC, it should be a simple as:

1. Implement a function with the signature

```
int mappingFn(colorRangeObj/* range, shapeObj/* shape, colorObj /*color)
```

This function should use the shape and range parameters to determine the shapes color, and modify the color parameter accordingly.

2. Choose a unique method name ('linear', 'logarithmic', 'discrete') modify the method msMapColorRamp() to call its method when its method name is found on a ColorRange definition.

Note: Whether the msMapColorRamp() method uses if/then logic or dispatches by function pointer can be determined later. For now, I believe the simplest approach would be to move all of the mapping logic + all current methods into a mapColorRange.c file.

Bug ID

Currently this is being tracked by <http://trac.osgeo.org/mapserver/ticket/1305>

Voting history

None

16.9.7 MS RFC 7: MapServer CVS Commit Management

Date 2005/09/22

Author Frank Warmerdam

Contact warmerdam at pobox.com

Last Edited \$Date\$

Status Adopted

Id \$Id\$

Note: This RFC is superseded by *RFC 7.1*

Purpose

To formalize CVS commit access, and specify some guidelines for CVS committers.

Election to CVS Commit Access

Permission for CVS commit access shall be provided to new developers only if accepted by the MapServer Technical Steering Committee. A proposal should be written to the TSC for new committers and voted on normally. It is not necessary to write an RFC document for these votes ... email to mapserver-dev is sufficient.

Removal of CVS commit access should be handled by the same process.

The new committer should have demonstrated commitment to MapServer and knowledge of the MapServer source code and processes to the committee's satisfaction, usually by reporting bugs, submitting patches, and/or actively participating in the various MapServer forums.

The new committer should also be prepared to support any new feature or changes that he/she commits to the MapServer source tree in future releases, or to find someone to which to delegate responsibility for them if he/she stops being available to support the portions of code that he/she is responsible for.

All committers should also be a member of mapserver-dev mailing list so they can stay informed on policies, technical developments and release preparation.

Committer Tracking

A list of all project committers will be kept in the main mapserver directory (called COMMITTERS) listing for each CVS committer:

- Userid: the id that will appear in the CVS logs for this person.
- Full name: the users actual name.
- Email address: A current email address at which the committer can be reached. It may be altered in normal ways to make it harder to auto-harvest.
- A brief indication of areas of responsibility.

CVS Administrator

One member of the Technical Steering Committee will be designated the CVS Administrator. That person will be responsible for giving CVS commit access to folks, updating the COMMITTERS file, and other CVS related management. That person will need login access on the CVS server of course.

Initially Steve Lime will be the CVS Adminstrator.

CVS Commit Practices

The following are considered good CVS commit practices for the MapServer project.

- Use meaningful descriptions for CVS commit log entries.
- Add a bug reference like “(bug 1232)” at the end of CVS commit log entries when committing changes related to a bug in bugzilla.
- Include an entry in the HISTORY file for any significant change or bug fix committed in the main MapServer source tree. Make sure it is placed under the correct version heading and include bug numbers in these messages too.
- Changes should not be committed in stable branches without a corresponding bug id and HISTORY entry. Any change worth pushing into the stable version is worth a bugzilla bug and good HISTORY notations.
- Never commit new features to a stable branch: only critical fixes. New features can only go in the main development trunk.
- Only bug fixes should be committed to the code during pre-release code freeze.
- Significant changes to the main development version should be discussed on the -dev list before you make them, and larger changes will require a RFC approved by the TSC.
- Do not create new branches without the approval of the TSC. Release managers are assumed to have permission to create a branch.
- All source code in CVS should be in Unix text format as opposed to DOS text mode.
- When committing new features or significant changes to existing source code, the committer should take reasonable measures to insure that the source code continues to build and work on the most commonly supported platforms (currently Linux and Windows), either by testing on those platforms directly, or by getting help from other developers working on those platforms. If new files or library dependencies are added, then the configure.in, Makefile.in, Makefile.vc and related documentations should be kept up to date.

16.9.8 MS RFC 7.1: MapServer SVN Commit Management

Date 2008/07/02

Author Frank Warmerdam and Tom Kralidis

Contact warmerdam at pobox.com and tomkralidis at hotmail.com

Last Edited \$Date\$

Status Adopted

Id \$Id\$

Note: This RFC obsoletes [MS RFC 7: MapServer CVS Commit Management](#).

Purpose

To formalize SVN commit access, and specify some guidelines for SVN committers.

Election to SVN Commit Access

Permission for SVN commit access shall be provided to new developers only if accepted by the MapServer Project Steering Committee. A proposal should be written to the PSC for new committers and voted on normally. It is not necessary to write an RFC document for these votes ... email to mapserver-dev is sufficient.

Removal of SVN commit access should be handled by the same process.

The new committer should have demonstrated commitment to MapServer and knowledge of the MapServer source code and processes to the committee's satisfaction, usually by reporting tickets, submitting patches, and/or actively participating in the various MapServer forums.

The new committer should also be prepared to support any new feature or changes that he/she commits to the MapServer source tree in future releases, or to find someone to which to delegate responsibility for them if he/she stops being available to support the portions of code that he/she is responsible for.

All committers should also be a member of mapserver-dev mailing list so they can stay informed on policies, technical developments and release preparation.

Committer Tracking

A list of all project committers will be kept in the main mapserver directory (called COMMITTERS) listing for each SVN committer:

- Userid: the id that will appear in the SVN logs for this person.
- Full name: the users actual name.
- Email address: A current email address at which the committer can be reached. It may be altered in normal ways to make it harder to auto-harvest.
- A brief indication of areas of responsibility.

SVN Administrator

One member of the Project Steering Committee will be designated the SVN Administrator. That person will be responsible for giving SVN commit access to folks, updating the COMMITTERS file, and other SVN related management. Initially Steve Lime will be the SVN Administrator.

SVN Commit Practices

The following are considered good SVN commit practices for the MapServer project.

- Use meaningful descriptions for SVN commit log entries.
- Add a ticket reference like “(#1232)” at the end of SVN commit log entries when committing changes related to a ticket in Trac.
- Include changeset revision numbers like “r7622” in tickets when discussing relevant changes to the codebase.
- Include an entry in the HISTORY file for any significant change or fix committed in the main MapServer source tree. Make sure it is placed under the correct version heading and include ticket numbers in these messages too.
- Changes should not be committed in stable branches without a corresponding ticket and HISTORY entry. Any change worth pushing into the stable version is worth a Trac ticket and good HISTORY notations.
- Never commit new features to a stable branch: only critical fixes. New features can only go in the main development trunk.

- Only ticket defects should be committed to the code during pre-release code freeze.
- Significant changes to the main development version should be discussed on the -dev list before you make them, and larger changes will require an RFC approved by the PSC.
- Do not create new branches without the approval of the PSC. Release managers are assumed to have permission to create a branch.
- All source code in SVN should be in Unix text format as opposed to DOS text mode.
- When committing new features or significant changes to existing source code, the committer should take reasonable measures to insure that the source code continues to build and work on the most commonly supported platforms (currently Linux and Windows), either by testing on those platforms directly, or by getting help from other developers working on those platforms. If new files or library dependencies are added, then the configure.in, Makefile.in, Makefile.vc and related documentations should be kept up to date.

Legal

Commiters are the front line gatekeepers to keep the code base clear of improperly contributed code. It is important to the MapServer users, developers and the OSGeo foundation to avoid contributing any code to the project without it being clearly licensed under the project license.

Generally speaking the key issues are that those providing code to be included in the repository understand that the code will be released under the MapServer License, and that the person providing the code has the right to contribute the code. For the committer themselves understanding about the license is hopefully clear. For other contributors, the committer should verify the understanding unless the committer is very comfortable that the contributor understands the license (for instance frequent contributors).

If the contribution was developed on behalf of an employer (on work time, as part of a work project, etc) then it is important that an appropriate representative of the employer understand that the code will be contributed under the MapServer License. The arrangement should be cleared with an authorized supervisor/manager, etc.

The code should be developed by the contributor, or the code should be from a source which can be rightfully contributed such as from the public domain, or from an open source project under a compatible license.

All unusual situations need to be discussed and/or documented.

Committers should adhere to the following guidelines, and may be personally legally liable for improperly contributing code to the source repository:

- Make sure the contributor (and possibly employer) is aware of the contribution terms.
- Code coming from a source other than the contributor (such as adapted from another project) should be clearly marked as to the original source, copyright holders, license terms and so forth. This information can be in the file headers, but should also be added to the project licensing file if not exactly matching normal project licensing (mapserver/LICENSE.txt).
- Existing copyright headers and license text should never be stripped from a file. If a copyright holder wishes to give up copyright they must do so in writing to the foundation before copyright messages are removed. If license terms are changed it has to be by agreement (written in email is ok) of the copyright holders.
- When substantial contributions are added to a file (such as substantial patches) the author/contributor should be added to the list of copyright holders for the file.
- If there is uncertainty about whether it is proper to contribute to the code base, please seek more information from the project steering committee, or the foundation legal counsel.

Voting History

Adopted on 2008/07/02 with +1 from PericlesN, DanielM, TamasS, JeffM, UmbertoN, SteveW, AssefaY, FrankW, TomK

16.9.9 MS RFC 7.2: MapServer Git Push Management

Date 2012/10/04

Author Frank Warmerdam, Tom Kralidis and Thomas Bonfort

Contact warmerdam at pobox.com

Contact tomkralidis at hotmail.com

Contact tbonfort at gmail.com

Last Edited 2012/10/04

Status Draft

Note: This RFC obsoletes [MS RFC 7.1: MapServer SVN Commit Management](#).

Purpose

To formalize Git push access, and specify guidelines for Git committers. More information on working with Git in MapServer can be found at <https://github.com/mapserver/mapserver/wiki/WorkingWithGit>.

Election to Git Push Access

Permission for Git push access shall be provided to new developers only if accepted by the MapServer Project Steering Committee. A proposal should be written to the PSC for new committers and voted on normally. It is not necessary to write an RFC document for these votes; email to mapserver-dev is sufficient.

Removal of Git commit access should be handled by the same process.

The new committer should have demonstrated commitment to MapServer and knowledge of the MapServer source code and processes to the committee's satisfaction, usually by reporting issues , submitting pull requests, and/or actively participating in the various MapServer forums.

The new committer should also be prepared to support any new feature or changes that he/she commits to the MapServer source tree in future releases, or to find someone to which to delegate responsibility for them if he/she stops being available to support the portions of code that he/she is responsible for.

All committers should also be a member of mapserver-dev mailing list so they can stay informed on policies, technical developments and release preparation.

Committer Tracking

A list of all project committers will be managed in <https://github.com/mapserver/mapserver/blob/master/COMMITERS> with the following format:

- Userid: the id that will appear in the Git commit logs for this person.
- Full name: the user's actual name.

- Email address: A current email address at which the committer can be reached. It may be altered in normal ways to make it harder to auto-harvest.
- A brief indication of areas of responsibility.

Git Administrator

One member of the Project Steering Committee will be designated the Git Administrator. That person will be responsible for giving Git commit access to folks, updating the COMMITTERS file, and other Git related management.

Thomas Bonfort, Steve Lime and Daniel Morissette will be the Git Administrators.

Git Commit Practices

The following are considered good Git commit practices for the MapServer project:

- Use meaningful descriptions for Git commit log entries. Commit messages should follow git commit conventions, i.e. a short one-line summary, followed eventually by a blank line and a paragraph giving more detail.
- Add a GitHub issue reference like “(#1232)” as part of the commit message when possible.
- Include an entry in HISTORY.txt for any new feature or backwards incompatible quirk implemented in the master branch. Make sure it is placed under the correct version heading and include issue numbers accordingly. Commits to stable branches should **not** include an update to HISTORY.txt, but instead contain a sufficiently descriptive commit message.
- **Never** commit new features to a stable branch; only critical fixes. New features can only go in the main development master. This also applies to pre-release stable branches once they have been branched off of master.
- Discuss significant changes on the -dev list before you make them. Larger changes require an RFC approved by the PSC.
- Ensure all source code in Git is in Unix text format as opposed to DOS text mode.
- Ensure that all commits do not break any existing tests (or that the test suite be updated with expected results if required).
- Ensure new features get msautotest tests added, exercising the functionality in both normal and exceptional conditions.
- When fixing subtle or non-trivially impacting bugs, add a relevant msautotest to ensure the fix remains in the long run.
- Ensure that the committed code is in accordance with MapServer’s coding conventions as per <https://github.com/mapserver/mapserver/wiki/CodingStyle>
- When committing new features or significant changes to existing source code, the committer should take reasonable measures to ensure that the source code continues to build and work on the most commonly supported platforms (currently Linux and Windows), either by testing on those platforms directly, or by getting help from other developers working on those platforms. If new files or library dependencies are added, then configure.in, Makefile.in, Makefile.vc and related documentation should be kept up to date.
- Use GitHub pull requests rather than directly committing to the branches as a practical way of testing proposed changes before inclusion, given MapServer’s setup for continuous integration.

Legal

Committers are the front line gatekeepers to keep the code base clear of improperly contributed code. It is important to the MapServer users, developers and the OSGeo foundation to avoid contributing any code to the project without it being clearly licensed under the project license.

Generally speaking the key issues are that those providing code to be included in the repository understand that the code will be released under the MapServer License, and that the person providing the code has the right to contribute the code. For the committer themselves understanding about the license is hopefully clear. For other contributors, the committer should verify the understanding unless the committer is very comfortable that the contributor understands the license (for instance frequent contributors).

If the contribution was developed on behalf of an employer (on work time, as part of a work project, etc) then it is important that an appropriate representative of the employer understand that the code will be contributed under the MapServer License. The arrangement should be cleared with an authorized supervisor/manager, etc.

The code should be developed by the contributor, or the code should be from a source which can be rightfully contributed such as from the public domain, or from an open source project under a compatible license.

All unusual situations need to be discussed and/or documented.

Committers should adhere to the following guidelines, and may be personally legally liable for improperly contributing code to the source repository:

- Make sure the contributor (and possibly employer) is aware of the contribution terms.
- Code coming from a source other than the contributor (such as adapted from another project) should be clearly marked as to the original source, copyright holders, license terms and so forth. This information can be in the file headers, but should also be added to the project licensing file if not exactly matching normal project licensing (mapserver/LICENSE.txt).
- Existing copyright headers and license text should never be stripped from a file. If a copyright holder wishes to give up copyright they must do so in writing to the foundation before copyright messages are removed. If license terms are changed it has to be by agreement (written in email is ok) of the copyright holders.
- When substantial contributions are added to a file (such as substantial pull requests) the author/contributor should be added to the list of copyright holders for the file.
- If there is uncertainty about whether a change is proper to contribute to the code base, please seek more information from the project steering committee, or the foundation legal counsel.

Voting History

TBD

16.9.10 MS RFC 8: Pluggable External Feature Layer Providers

Date 2005/10/26

Author Jani Averbach

Contact javerbach at extendthereach.com

Last Edited \$Date\$

Status adopted

Version MapServer 4.8

Id \$Id\$

Purpose

The purpose of this proposal is provide a way to user actually plug-in external third party feature layer providers to the MapServer at run time.

Abstract Solution

Provide a way to user to tell via map-file which library to load for layer, then load this library on demand and cache it for later use and bind it to the running MapServer by layer's virtual table.

Technical Solution

- New CONFIG option `MS_PLUGIN_DIR` which, if set, tells the base path for plugins
- New MAP-file keyword `PLUGIN` with string argument. This keyword tells which library dynamically to load for this layer.

The plugins are loaded based on the following algorithm:

- If plugin string is missing `.so` or `.dll` extension, append it to the plugin string
- If `MS_PLUGIN_DIR` is set and plugin string is not an absolute path, prefix plugin string with `MS_PLUGIN_DIR`
- otherwise use plugin string directly

In general, the dynamic library loader will use system paths to seek appropriate plugin to load, if the path is not absolute.

- New connection type `PLUGIN`
- New field `char* plugin_library` in `layerObj` structure, this is the name of library to load for this layer.
- Function to get virtual table for requested layer. If the library isn't already loaded, it will be loaded on demand.

```
static const layerVTableObj *
getCustomLayerVirtualTable(layerObj *layer)
```

where `layerVTableObj` is the virtual table and `layer` is a custom layer. In case of error, function will return `NULL`.

- Function to get a function pointer from dynamic loaded library. This function will also load the library.

```
msGetDynamicLibrarySymbol(const char *Library,
                           const char *SymbolName)
```

This is implemented by GDAL project, and I have planned to use their implementation of this (`CPLGetSymbol`).

- Cache structure for already loaded libraries. This cache structure will consist of a full name/path of the library (provided by user via mapfile), and a function pointer to the virtual table initialization function. The size of cache will be fixed and will be same as the maximum amount of layers (200 at the moment). This is the maximum number of different custom layers for MapServer which could be loaded at the same time. This cache implementation is internal, so if it has to be make dynamically allocated, it is possible to do later without breaking interface.
- New lock item (`TLOCK_LAYER_VTABLE`) to protect library cache structure.

Files and objects affected

This proposal will affect at least following files and objects:

- map.h
 - layerObj will contain a new field, `char *plugin_library`.
- New lock token `TLOCK_LAYER_VTABLE`
- New files and objects for custom layer handling.

Backwards compatibility issues

This change is binary incompatible, but mapfile backward compatible. It will add a new keyword which is unknown for old MapServers.

Implementation Issues

None

Bug ID

Bug 1477

Voting history

Vote proposed by Jani Averbach on 10/26/2005, the initial result was +3 and after amending RFC, got +4 (3 non-voting members).

Voting +1: Frank Warmerdam, Steve Lime, Yewondwossen Assefa, Daniel Morissette

Proposal passed and will move forward.

Open questions

None

Working Notes

Plugin library has to implement function `PluginInitializeVirtualTable`

```
int (*pfnPluginInitVTable)(layerVTableObj *,
                           layerObj *);
```

which is called during library loading. This function is responsible to populate `layerVTableObj * virtual table`. If this function leaves some function pointers to NULL in this virtual table, then default actions are used for these missing functions. The defaults are visible in function `maplayer.c: populateVirtualTable(...)`. The function must not populate directly `layerObj->vtable`, it have to use `layerVTableObj * argument` for this. The MapServer is holding `TLOCK_LAYER_VTABLE` lock during this function call.

16.9.11 MS RFC 9: Item tag for query templates

Date 2006/01/05

Author Steve Lime

Contact steve.lime at DNR.STATE.MN.US

Status Implemented

Version MapServer 4.10

Id \$Id\$

Description: At the moment processing of attributes exposed via query templates is limited to a couple forms of escaping. This is too limiting. It would be much nicer to be able to apply a format to an attribute (e.g. truncate decimals or add a prefix) or detect when it is NULL or empty and present an alternative representation. This RFC describes a simple scheme to allow for extended processing of attributes before sending to the users.

This would involve adding a new “item” tag to the template processor.

Files affected

- maptemplate.c => add tag processor, update query template processor to use tag processor.

Backwards compatibility issues

N/A, new functionality. Existing methods for exposing an attribute (e.g. [attribute name]) would continue to function, although we might mark that as deprecated at some point.

Implementation Details

The “item” tag would have the following properties.

- name: the name of the attribute to be exposed
- format: a simple string containing the token(s) \$value, default format is the result of any processing
- nullformat: string to return if value is NULL or empty (length=0)
- uc: convert string to upper case
- lc: convert string to lower case
- substr: perform a perl-like substring operation by providing offset, and optionally length (un-implemented as of 3/13/07)
- commify: add commas to a numeric string (12345 would become 12,345), note, supports only North American notation at the moment
- escape: what type of escaping to do (default is html), permissible values would be html, url, none
- precision: number of decimals to retain after the decimal point
- pattern: regular expression that must validate (against the column value) to process the tag

We could add simple case statement support at a later date but the above would more than meet my needs at the moment.

Examples

Display no decimal places, and commify:

```
[item name=foo community=true precision=0] - 12345.6789 output as 12,345
```

Conditional display an item if its value contains ‘bar’:

```
[item name=foo pattern=bar]
```

Escape a value for inclusion in a URL, and convert to upper case:

```
[item name=foo uc=true escape=url] - “hello world” output as “HELLO%20WORLD”
```

Apply a custom format to an item, and display a message if the item is empty:

```
[item name=foo format=”foo=$value” nullformat=”foo is not found”]
```

Notes

Item tags are processed after other column tags (e.g. [foo]) so you can include substitution strings within the item tag itself.

Bug ID

1636

Voting history

+1: Lime, Morissette, Butler +0: Gillies, Warmerdam

16.9.12 MS RFC 10: Joining the Open Source Geospatial Foundation

Date 2006/02/06

Author Howard Butler

Contact hobu.inc at gmail.com

Author Frank Warmerdam

Contact warmerdam at pobox.com

Author Steve Lime

Contact sdlime at comcast.net

Status passed

Id \$Id\$

Abstract

The Open Source Geospatial Foundation ([OSGeo](#)) presents a unique opportunity for MapServer in that it can provide an umbrella organization that can provide benefits and possibilities that a project by itself simply cannot provide. This RFC will outline what those benefits can be to the project, define MapServer’s role in participating, and describe the unique process of how we propose to decide to join.

MapServer's Participation in the Foundation

The OSGeo bootstrap meeting of February 4th, 2006 was attended by Steve Lime, Frank Warmerdam, Pericles Nacionales, Howard Butler, Tom Burk, Dave McIlhagga and others from the MapServer community. By their participation in this meeting, these individuals are part of the initial group of members in the OSGeo foundation. A thorough, thoughtful, and stimulating discussion about how the OSGeo foundation can help to alleviate issues that an individual project cannot overcome took place. Many projects that were represented at the meeting, including GDAL, OSSIM, MapGuide Open Source, MapBuilder, and GRASS decided immediately to participate in the foundation. The folks represented by MapServer at the meeting stated that they would also like to participate, contingent on approval by both the MTSC and the community at large.

In this RFC we are proposing that MapServer join the foundation as one of the founding projects as this is a unique opportunity for MapServer to influence the direction that the foundation will take, and in the end get a foundation that will better suit its specific needs.

Expected Benefits of OSGeo to the MapServer Project

OSGeo provides a unique and necessary structure for the MapServer project to solve some of the issues an Open Source project by itself cannot. One of the most important ones is the idea of an umbrella organization that can take on issues like infrastructure, branding and visibility, outreach, solicitation of sponsorship, and more formal project organization. While the MapServer project has done some of these things by itself in some form over the years, a formalized structure that has its mission to do so provides a more attractive solution. Here are some expected benefits, described by Schuyler Erle, who also attended the meeting:

The Open Source Geospatial Foundation, or OSGeo for short, will seek to provide roughly the same kind of function for the F/OSS GIS community that the Apache Software Foundation provides for the Apache development and user communities, with the primary difference being that, where Apache started as a single project and then branched out, the OSGeo Foundation is attempting to weld together the overlapping but sometimes disparate interests of different projects with different communities. The Foundation will hopefully serve as an outreach and advocacy organization for the community; a forum for improving cross-project collaboration; a unified professional front for large government and corporate users; a source of shared infrastructure, like code and documentation repositories; and as a legal entity to help protect developers and users of Open Source geospatial software against greedy patent lawsuits or unscrupulous license infringements. In general, the object of the Foundation will be, in the words of Mark Lucas of OSSIM, to “help us do what we love” – which, for most of us, is building useful tools for digital cartography and geospatial analysis, and solving interesting problems with them.

Deciding to Join

The MTSC's charter, specified in [MS RFC 1](#), clearly states that it is only to concern itself with technical matters in the project. In our opinion, deciding to join OSGeo presents a special case in that it affects both the technical and non-technical. In this case we propose that the MTSC go through its decision process, and if approved, the community will be solicited to provide their input via a non-anonymous website poll. If both groups are in agreement - via the normal approval process from the MTSC and a majority from the community - the motion to join OSGeo will be considered passed.

Considerations

As MapServer joins the foundation some changes are anticipated in the project. There will need to be a copyright review of the existing code base, ensuring that it is all legitimately contributed under the existing license. All MapServer committers will need to sign some sort of committer agreement providing assurance they are not adding encumbered code. MapServer may have to consider moving its project infrastructure (CVS, website, lists, etc.) to the foundation

at some point. We will also need to establish a MapServer Project Committee within the foundation. This may just be the MTSC or it may be broader, including other stakeholders.

For the time being the MTSC will continue to operate under [MS RFC 1: Technical Steering Committee Guidelines](#) if the motion to join OSGeo is passed. Additional RFC(s) will address any changes in process deemed necessary as a result of joining the foundation.

Voting history

Passed +7. February 6th, 2005.

16.9.13 MS RFC 11: Support for Curved Labels

Date 2006/02/09

Author Benj Carson

Contact benjcarson at digitaljunkies.ca

Author Stephen Lime

Contact sdlime at comcast.net

Status passed

Id \$Id\$

Overview

One of the features most frequently asked for are labels that follow along linear features. This RFC describes an initial implementation of this feature.

Technical Details

The proposed solution has a couple of primary goals:

- isolate virtually all computations and data storage into a minimum number of functions and structures.
- integrates easily into the existing labelCacheObj structure and label cache processing routines.

A single, new function- msPolylineLabelPath() serves as the sole computational function for this new functionality. Like the existing msPolylineLabelPoint() function it takes an input feature and annotation string and computes a labeling position. However, instead of computing a single point (and optionally, angle) it computes a label point and angle for each character in the annotation string. The computation results are returned in a new structure called a “labelPathObj” that looks like:

```
typedef struct {
    multipointObj path;
    shapeObj bounds;
    double *angles;
} labelPathObj;
```

The function will return NULL if a curved label is not appropriate for the feature in question so traditional labeling can take place (for example, if the feature has only 2 points a curved label is not necessary). The curved label’s bounding polygon will be calculated in this function as well and stored in the “bounds” member of the labelPathObj structure.

In order to get the labelPathObj into the label cache it will be necessary to do 2 things:

- extend labelCacheMemberObj to optionally reference a labelPathObj
- extend the function msAddLabel to take a labelPathObj in addition to the parameters it already accepts

Since each labelPathObj will contain the boundary for the curved label, it will be ready to use with the existing label cache rendering code.

The only addition to the label cache rendering is code to detect when a text path should be rendered instead of a traditional label. Driver specific code to render a text path will have to be written but in general this is trivial and just involves calling the normal text rendering code once for each character in the path.

Mapfile Implications

It is proposed that we simply extend the labelObj ANGLE parameter. Currently it takes an angle (given in degrees) or the keyword AUTO. We suggest adding support for the keyword FOLLOW. This would set a new labelObj member, anglefollow, to MS_TRUE (and also angleauto to MS_TRUE as ANGLE FOLLOW implies ANGLE AUTO if a curved label is not appropriate).

Support for Non-GD Renderers

Presently all MapServer output renders use the contents of the label cache, which is basically render agnostic. This will not be the case any more. The placement computations necessary to support curved labels do leverage font metrics derived from the GD/Freetype interface. It may well be possible for the SWF, PDF and SVG renders to leverage even the GD-based curved labels, however it is probably best to consider this a raster-only output feature in this implementation. If font metrics support for other renderers is developed in the future then this feature can be easily extended to support them.

Bug Tracking

Bug 1620 has been setup to track this feature addition.

Voting History

+1: Lime, Assefa, Nacionales, Warmerdam, Morissette

16.9.14 MS RFC 12: C code Unit tests

Date 2006/02/28

Author Umberto Nicoletti

Contact umberto.nicoletti at gmail.com

Status Draft

Id \$Id\$

Overview

Unit tests are a simple but effective way of checking progress and code correctness while programming. MapServer already has unit tests for python MapScript and a functional testing suite but lacks unit tests for the C code which represents the core of its functionality.

This rfc outlines how unit tests can be (gradually) added to the usual development cycle of MapServer, without pretending that developers switch to extreme programming or adopt test driven development.

Issue #1664 on bugzilla and mapserver-dev will be used to track code samples and discussion.

Example

A patch has been attached to issue #1664 on bugzilla which implements the basic infrastructure and some unit tests to demonstrate functionality. The patch was created in under 6 hours by a single person, who is not a frequent C programmer. This is meant to prove that unit tests do not take away much time from developers and that in general the benefit is worth the cost.

The example already supports all the usual preprocessor flags (USE_FLAGS like #ifdef PROJ) so only the relevant tests will be compiled and run. This is necessary to avoid test failures due to a missing feature (as happens with Python unit tests).

Unit testing software

This rfc recommends the use of the CUnit unit testing library for the C language, version 2.0.x. The configure script must be updated to reflect this new dependency and the following or a similar text will be displayed when cunit is not found: “cunit not found, C unit testing disabled.”.

When cunit is available unit tests could be run by default at the end of the compile phase: this will give users some more confidence in the software they just compiled (most of them are linux newbies and have no experience with programming) and could help in catching obvious bugs (like a typo while committing to cvs).

Unit tests are placed in the cunit subdirectory of the MapServer source and distributed with all future releases. Unit tests files should be named with respect to the original MapServer source file they test plus the addition of the _tests suffix: for instance unit tests for the mappool.c file should be placed in a file called mappool_tests.c. The files can have an alphanumeric code added to the suffix to keep them conveniently short (like mappool_tests_1.c, mappool_tests_1b.c or mappool_tests_umberto.c).

Usage recommendations

Developers are not required to write unit tests but when they do we suggest to follow this checklist.

Developer implementing a new feature

- she will try to reproduce the bug with a unit test; if this is not possible or seems difficult she should consider asking on mapserver-dev. The unit test must fail at this stage (if written)
- she fixes the bug and verifies that the test written at the previous item now passes (if written)
- she verifies that also all other tests pass and only after she commits

Developer adding functionality

- she writes a test that verifies the new functionality (this can also be done afterward, as we have relaxed requirements)
- she writes the code implementing the desired functionality
- she now verifies that the test passes
- she verifies that all other tests pass and only after she commits

General

She will also use the usual preprocessor flags to ensure only the relevant tests for the current configuration context will be compiled and run. The example attached to issue #1664 already implements this feature.

Testing specific functionalities

Some aspects of MapServer like database connections and gd rendering are inherently difficult to test. This section provides guidance on how to deal with them in unit tests and will be expanded as new or better solutions are devised.

Database connections

Database connections generally require a specific setup so that expected tables, data and possibly other structures are in place. While this should be a long term goal in the short term unit tests could be limited to comparing the sql query against the expected one.

This quite likely requires a refactoring of current PostGIS code.

In the future a minimal setup script should be provided to create and populate the database for the user (if she desires to do so).

GD (and others) rendering engines

Taking inspiration from the perl GD module a set of images must be produced and then compared against those produced by MapServer. This kind of operation is already performed by the msautotest suite, so effort should rather go toward improving that instead of implementing yet another gd test suite.

WFS/WMS support

Note: The author is not an expert here

In this case unit tests can be used to verify that for certain requests (possibly using the test data supplied with MapServer) the string returned by MapServer equals the expected one.

A refactoring of existing code could be necessary.

Mapscript

Unit tests should be developed by the MapScript mantainers by following the guidelines given here.

Running unit tests and functional tests (Continuos integration)

Not part of unit tests for now, but useful in perspective

Effort should be put toward developing a build system capable of

1. testing the overall build/test of MapServer and of the various MapServers with different configure options
2. and integrating those results with the msautotest suite.

16.9.15 MS RFC 13: Support of Sensor Observation Service in MapServer

Date 2006/02/21

Author Yewondwossen Assefa

Contact yassefa at dmsolutions.ca

Status passed

Id \$Id\$

Overview

This is the a first attempt to support part of the OGC Sensor Web Enablement (SWE) in MapServer. The different specifications developed around the SWE are :

- Sensor Observation Service (SOS) : provides an API for managing deployed sensors and retrieving sensor data.
- Observation & Measurement: Information model and encoding for observations and measurements.
- Sensor Alert Service : A service by which a client can register for and receive sensor alert messages. The service supports both pre-defined and custom alerts and covers the process of alert publication, subscription, and notification.
- Sensor Model Language : Information model and XML encoding for discovering, querying and controlling Web-resident sensors.
- Sensor Planning Service : A service by which a client can determine collection feasibility for a desired set of collection requests for one or more mobile sensors/platforms, or a client may submit collection requests directly to these sensors/platforms.
- Transducer markup Language (TML) : General characterizations of transducers (both receivers and transmitters)
- Web Notification Service : Executes and manages message dialogue between a client and Web service(s) for long duration asynchronous processes.

The intention here is to support the SOS mandatory operations. Please refer to the OGC site (<http://www.opengeospatial.org/functional/?page=swe>) for more details on the SWE initiatives.

User Interface

From the user perspective there will be an SOS interface will offer the three core operations (GetCapabilities, GetObservation and DescribeSensor). A full description of what could be available is presented in [Annexe A : Sensor Observation System \(SOS\) support in MapServer](#).

Changes in MapServer

- All the development will be localized into a mapogcsos.c file.
- There will be additions to the mapows.c/h file to integrate the dispatch of the requests.
- In mapgml.c (function msGMLWriteWFSQuery), extract the loop that writes features (gml:featureMember) into a separate function so the the GetObservation can also use it to output the results.
- The SOS capability will be available when MapServer is built using the flag USE_SOS.

Mapscript implications

The are no special implication for the MapScript module

Additional libraries

There will be an attempt to use the libxml2 (<http://xmlsoft.org/>) library when generating the GetCapabilities document. Decision to go ahead will be based on ease to use and speed of output.

Testing

It is proposed that automatic tests with map/data/expected results be added into the msautotest project to test the GetCapilities and GetObservation requests.

Bug Tracking

Bug 1710 : <http://trac.osgeo.org/mapserver/ticket/1710>

Voting History

- +1 : Assefa, Warmerdam, Nacionales
- +0 : Morissette
- -0 : Gillies

Note: discussions, concerns are available in the mapserver-dev list (Feb 2006 RFC 13 : SOS support)

Annexe A : Sensor Observation System (SOS) support in MapServer

This is a first attempt to define what will be supported in MapServer to be able to deploy a Sensor Observation System (SOS)

Specifications and useful links used :

- Sensor Observation Service (SOS) (OGC 05-088r1, Version 0.1.1)
- Observation and Measurement (OGC 05-087r1, toward Version 1.0)
- Sensor ML : Sensor Model Language(ML) OGC 04-019r2
- <http://www.opengeospatial.org/functional/?page=swe> svn link for members :
<https://svn.opengeospatial.org:8443/ogc-projects/ows-3/schema4demo/>

SOS provides several operations divided into core mandatory operations (GetCapabilities, DescribeSensor and GetObservation) and optional transactional and enhanced operations. The first implementation of SOS in MapServer will only address the core operations

1. GetCapabilities Request

The GetCapabilities request will use the following parameters :

- Request : fixed at GetCapabilities
- Service : fixed at SOS

2. GetCapabilities returned document

Attached at the end of the document examples of a GetCapabilities document. The following elements are SOS items included in the capabilities document, with an equivalent MapServer implementation

- ServiceIdentification (all elements are extracted from metadata at the web level)
 - Title : extracted from a metadata at web level ows/sos_title. Same concept as wms/wfs
 - Abstract : metadata ows/sos abstract
 - ServiceType : Fixed to SOS
 - ServiceType version : Fixed to 0.3
 - Fees : metadata Ows/sos_fees
 - Access Constraints : metadata : Ows/sos_constraint
- ServiceProvider (all elements are extracted from metadata at the web level, using an equivalent name as the SOS element)
 - ProviderName :
 - ProviderSite
 - IndividualName
 - PositionName
 - Voice
 - Facsimile
 - DeliveryPoint
 - City
 - AdministrativeArea
 - PostalCode
 - Country
 - ElectronicmailAdress
 - EndAddress
 - OnlineResource
 - HoursOfService
 - ContactInstructions
- Operation Metadata : This part of the capabilities defines the operations that will be supported which are GetCapabilities and GetObservation. For more information refer to <https://svn.opengeospatial.org:8443/ogc/projects/ows-3/schema4demo/ows/1.0.30/owsOperationsMetadata.xsd>
 - Operation : GetCapabilities
 - * Operation Name : Fixed at GetCapabilities
 - * HTTP : Connect point URL extracted. Only the Get request method is supported
 - * Parameter : includes name and version. We could use the parameters to propagate the name of the service SOS and the version. Other parameters may be added if needed.
 - Operation : GetObservation

- * Operation Name : Fixed GetObservation
- * DCP (HTTP) : extracted from a metadata
- * Parameter : We could use this to propagate the parameters needed when doing a GetObservation request (Offering, eventTime)
- Operation : DescribeSensor
- Filter Capabilities

The Filter Capabilities that will be supported are the same ones that are currently supported in MapServer (See [WFS Filter Encoding](#) for more info) : Spatial Capabilities, Logical Operators, Comparison Operators

There is a mention in the specifications of ogc filter temporal capabilities, but I could not locate the exact definition of it. In any case,

- SOS Contents (Observation Offerings)

As explained in SOS specifications (section 6.2) , “ ...An observation offering is also analogous to a layer in a Web Map Service because each offering is intended to be a non-overlapping group of related observations. Each Observation Offering is constrained by a number of parameters including sensor system that report observation, Time, phenomena, geographical region ... “

In MapServer an Offering will be represented by a group of layers using mapserver's group parameter. The metadata associated with a group (offering will be taken from the first layer of the group)

The following properties would be set at a group level.

- Standard Properties
 - * id : Unique Offering Identifier. Mandatory
 - * name : name used with the offering. Optional
 - * description : description of the offering. Optional
- Bounded By : used to define the geographical boundaries of the Offering. It should be extracted from a metadata. Mandatory
- EventTime : used to define a valid time range for the offering. It should be extracted from a metadata. Mandatory
- Procedures : series of URLs reference to one or more systems that supply observations in the offering. It should be extracted from a metadata. Mandatory
- Observed property : Observables/Phenomena that can be requested in this offering.

Two specializations are identified in the specifications:

- Constrained : modifies base phenomenon by adding a single constraint (ex surface water temperature add a constraint that depth is between 0, -0.3)
- Compound which is either a composite (a set of component phenomena that may or may not relate to each other) or a phenomenonSeries that applies one or more constraintsList to the base phenomenon)

There is no clear cut indication which representation would be the more natural for MapServer but if we consider the group/layer/attribute combination, we can see that a group of layers could represent an offering, a layer would be an observed property (or phenomenon) and the attributes would be the composite phenomenon defining the phenomenon.

The capabilities document will include CompositePhenomenonType element with a mandatory id element identifying the phenomenon and optional elements such as name and component.

- Feature Of Interest

The definition given in the specification is : This is a single feature or a collection of features that represents the object on which the sensor systems are making observations. In case of in-situ sensor this may be a station to which the sensor is attached or the atmosphere directly surrounding it. For remote sensors this may be the area or volume that is being sensor. It is represented by GML feature type and is expected to include bounding box extents.

In our case here, this would be equivalent to the “bounded by” element defined earlier.

Note that in the implementation of MapServer, It is assumed that geographical information used to represent the individual sensors represent the feature of interest of the sensor. This is a requirement to be able to do spatial queries.

- Result Format

MIME type of the result that will be returned to a GetObservation request. Fixed to text/xml;subtype=”om1.0.30”

3. GetObservation Request

The GetObservation request used to retrieve observation data will be supported using the Get method. Post method will not be supported in the first implementation.

Here are the parameters that will be supported and their definitions :

- Offering : Equivalent to the Offering Id identified in the capabilities (Mandatory)
- eventTime : single time or time period. This will be used as a Time filter to do the queries using an identified time attribute. (Optional)
- observedProperty : Identifies the layer in MapServer (Mandatory)
- featureOfInterest : Additional geographical filter using a bbox. (Optional)
- Result : Will be used to filter using the OGC Filter supported capabilities.

4. Get Observation Response

An observation response should contain the following information :

- Information describing the Offering
- Valid time (instances or period)
- Description of the phenomenon (like the offering name)
- location and feature of interest for the offering
- The result associated with the offering

In the case of MapServer implementation, what is proposed is to be returned an observation collection reflecting the query results. Here is the different elements returned :

- name : The offering unique identifier
- description : Description of the offering
- time : Valid time instance or period
- featureofinterest : Geographical extents covered of the offering
- Member : This is repeated for all the observations returned. The following are the parameters included for each member
 - observed property : the phenomenon observed
 - location : geographical coordinates

- procedure
- result : Result of the observation. In the first implementation It is proposed that the gml:feature member is returned. This gives the possibility to return one/more attribute values in an easily manipulated format. The will be equivalent to a gml:feature member returned in wfs.

5. Describe Sensor

The Describe sensor request uses two parameter that are SensorId (Mandatory) and an optional output-Format.

In this phase the DescribeSensor will use a metadata of URL type set on the layer and relay the request. There won't be any SensorML output generation done in MapServer in this implementation.

6. Examples

- <http://vast.uah.edu:8080/ows/weather?request=GetCapabilities>
- http://vast.uah.edu:8080/ows/weather?request=GetObservation&offering=WEATHER_DATA&time=2004-04-01T05:00:00Z/2004-04-01T06:00:00Z&format=application/com-xml

16.9.16 MS RFC 14: Relative Coordinates for INLINE features

Date 2006/04/10

Author Steve Lime

Contact steve.lime at DNR.STATE.MN.US

Status Complete

Version MapServer 4.10

Id \$Id\$

Description: Current it is possible to have features with pixel coordinates and to draw them by setting TRANSFORM FALSE in a layer definition. However the coordinates are relative to the upper lefthand corner of the image (0,0) which makes it impossible to anchor things like copyright statements to the other corners of the images if the image size can change (e.g. via WMS).

The proposed solution extends the behavior of the LAYER TRANSFORM parameter that would tell MapServer to use an alternative origin than the UL corner of the image.

C Structural Changes

None. Existing structure, members and constants would be utilized. The position enumeration should probably be given a different starting value to avoid conflict with variables like MS_TRUE and MS_FALSE.

Mapfile Changes

This functionality is really geared towards inline features. However, I'd like to keep the door open to support features from any datasource. The proposed change would extend the use of the LAYER TRANSFORM parameter. Currently it takes values TRUE or FALSE (default is TRUE). I propose extending to also take any of the standard explicit position values. So for the typical inline feature use you'd see a layer like:

```
LAYER
  NAME 'copyright'
  TYPE POINT
  TRANSFORM LL
```

```
FEATURE
  POINTS 10 -10 END
  TEXT 'Copyright &copy; MNDNR'
END
CLASS
  ...
END
END
```

Within MapScript the syntax would be similarly simple:

```
$layer->{transform} = $mapscript::MS_LL;
... draw as normal ...
```

Files affected

- map.h => change starting value of the positions enumeration
- mapfile.c => add detection of the additional TRANSFORM values
- mapprimitive.c => add a new offset shape function that would take the map height, width and shapeObj as input.
- mapdraw.c => update shape drawing code to use the new function (basically an else condition for all the if (layer->transform) checks).

Testing

- Python suite: none needed
- MsAutoTest suite: a mapfile testing all 9 positions would be developed

Backwards compatibility issues

N/A, new functionality. A value for TRANSFORM of FALSE implies UL... It should be noted that by changing the starting value for the position enumeration there is the possibility of breaking scripts that refer position by integer (poor programming practice). I would expect this to be a remote possibility and worth the risk.

Bug ID

1547

Voting history

Passed

16.9.17 MS RFC 15: Support for thread neutral operation of MapServer/MapScript

Date 2006/05/01

Author Tamas Szekeres

Contact szekerest at gmail.com

Last Edited \$Date\$

Status Draft

Version Not assigned yet

Id \$Id\$

1. Overview

By this time the core MapServer code has become widely used by many of the different application models. The extended usage of MapScript causes the possibility that the execution of the code is carried out by multiple threads, standing a fair chance portions of the code being called by the different threads simultaneously. The threading model of the application may fall beyond the control of the MapServer code, at the worst case even the host process of the application is beyond the programmer's scope. For example a web mapping application may be executed by a pre-existing host process ensuring to serve the user requests and calling the MapServer code by different threads from a pool of threads. The usage of process-wide global variables and resources within MapServer may require the need to serialize of the access to the variable by the multiple threads by using locks. The current approach uses process-wide locks to ensure the safe access to these variables causing performance degradation in multithreaded environments. Currently this behavior may be controlled by the USE_THREAD compilation switch.

2. Purpose

The purpose of this change is to get a significant performance boost by removing “big locks” from the code. It would add a significant improvement of the applications having high number of multiple threads executed simultaneously. This activity could bring in a more feasible support for some application models not really aimed at now like Microsoft ASP.NET. May result in higher clarity of the code by determining the code segments affected by multiple threads.

2. General principles of the solution

This RFC is in a special situation since wide area of the code is to be reviewed and extensive developer support is needed. The proposal will reach the proposed state only if all of the open issues are classified and properly handled.

Changing of the modules of MapServer should be in accordance of the primary maintainer. The maintainer may reserve the right to commit the changes proposed by this RFC during the implementation phase. Otherwise the primary author Tamas Szekeres will be responsible to make the changes.

The problems of the current implementation and the proposed changes will be enumerated later. To handle these issues the following options will be considered ordering by the expediency. The latter is the less expedient.

2.1 Not changing the code (Considering as safe without locks)

Some of the process-wide global variables store invariant data - like enumerations - having been initialized at compilation time. Since these variables can be simultaneously read by multiple threads there is nothing to be done and even the locks should be removed - if exist - ensuring the thread isolation to be realized. Might be redeclared as “static const”.

2.2 Retaining the variable, but reconsidering the initialization code

Some of the global variables store invariant data but the initial value is assigned at run time during the module initialization phase. In this situation we should ensure that the initialization will be done before the subsequent access is receivable to prevent from the possibility of race conditions. msSetup() is designated as a suitable place to make module level initialization of the variables. Mapscript language bindings are encouraged to provide calling msSetup automatically at module startup. The current locking strategy should be reviewed and the locks should be restricted to the initialization code.

2.3 Rewriting the code to eliminate the need of the global variable

If the global variable could be eliminated by changing the code structure we will consider to make these changes. The locks related to these variables should be removed.

2.4 Using thread local variable instead of the global one

When the usage of the global variable cannot be eliminated easily we will consider to use thread local variables instead. To implement thread local variables, theoretically we have at least 2 options to do:

1. By modifying the variable declaration we could use storage specifiers like Microsoft specific “`__declspec(thread)`” or “`__thread`” on the POSIX environments.
2. By implementing the allocation of the thread local memory utilizing the platform dependent TLS APIs like the Windows TLS or the unix Pthreads implementation.

The first one is not applicable for MapServer since the Microsoft implementation does not allow delay loading of the dll containing variables declared with `__declspec(thread)`.

The second approach is applicable, however rewriting the existing code may be more difficult. GDAL has a sample implementation for it might be taken over.

2.5 Not changing the code (Marking as safe with locks, will be reconsidered later)

Some of the MapServer code and/or the related external libraries may not be modified easily and will be protected by locks in this phase of the realization. These issues will be kept open and the solution for the thread isolation might be reconsidered later. The open issues will be enumerated and documented along with the MapServer source files and the thread safety FAQ

http://mapserver.gis.umn.edu/docs/faq/thread_safety

2.6 Not changing the code (Marking as unsafe, will be deprecated and unsupported)

Having lack of support of portions of the existing code may keep from changing the code easily. These portions of the code will not be modified in this phase of the realization. These issues will be kept open and might be reconsidered later. The open issues will be enumerated and documented along with the MapServer source files and the thread safety FAQ.

3. Issues of the MapServer /Mapscript code

This chapter will enumerate the sections of the existing code should be reconsidered according to the options mentioned previously. The line numbers may slightly change according to the developers work.

`epplib.c(47):static int REVERSE; /* set to 1 on bigendian machines */`

This variable is set in eppreset using the following code { union { long i; char c[4]; } u; u.i=1; REVERSE=(u.c[0]==0); } should be set during the initialization or by the makefile as a predefined constant. Also the MapServer configure script may include byte order detection. This constant might be used by other modules.

SDL: This constant is limited to epplib.c...

`mapcpl.c(57):static char szStaticResult[MS_PATH_BUF_SIZE];`

FrankW: In fact this code carried over from GDAL was later remodelled in GDAL. It looks like msGetBasename() is only used in a few places and we should remodel those to avoid using a static buffer.

```
maperror.c(110):static char *ms_errorCodes[MS_NUMERRORCODES] = {"",
maperror.c(154):    static errorObj ms_error = {MS_NOERR, "", "", NULL};
maperror.c(169):static te_info_t *error_list = NULL;
maperror.c(552):    static char version[1024];
maperror.c(651):    static char nonblocking_set = 0;
```

TODO

```
mapfile.c(184):static char *msUnits[8]={"INCHES", "FEET", "MILES", "METERS", "KILOMETERS", "DD", "P
mapfile.c(185):static char *msLayerTypes[8]={"POINT", "LINE", "POLYGON", "RASTER", "ANNOTATION", "QU
mapfile.c(186):char *msPositionsText[MS_POSITIONS_LENGTH] = {"UL", "LR", "UR", "LL", "CR", "CL", "UC
mapfile.c(187):static char *msBitmapFontSizes[5]={"TINY", "SMALL", "MEDIUM", "LARGE", "GIANT"};
mapfile.c(188):static char *msQueryMapStyles[4]={"NORMAL", "HILITE", "SELECTED", "INVERTED"};
mapfile.c(189):static char *msStatus[5]={"OFF", "ON", "DEFAULT", "EMBED"};
mapfile.c(191):static char *msTrueFalse[2]={"FALSE", "TRUE"};
mapfile.c(193):static char *msJoinType[2]={"ONE-TO-ONE", "ONE-TO-MANY"};
```

The above are all const static data, being handled as 2.1.

```
mapgd.c(239):static unsigned char PNGsig[8] = {137, 80, 78, 71, 13, 10, 26, 10}; /* 89 50 4E 47 0D 0A
mapgd.c(240):static unsigned char JPEGsig[3] = {255, 216, 255}; /* FF D8 FF hex */
mapgd.c(911): static gdPoint points[38];
mapgd.c(2428): static double last_style_size;
mapgd.c(2719): static int styleIndex, styleVis;
mapgd.c(2720): static double styleSize=0, styleCoef=0, last_style_size=-1;
mapgd.c(2721): static int last_style_c=-1, last_style_stylelength=-1, last_styleVis=0;
```

TODO

```
mapgdal.c(141):static int bGDALInitialized = 0;
```

Will be handled as 2.2. (Startup initialization)

```
mapgeos.cpp(98):GeometryFactory *gf=NULL;
```

Will be handled as 2.2. (Startup initialization)

```
maphttp.c(140):static int gbCurlInitialized = MS_FALSE;
```

Will be handled as 2.2. (Startup initialization)

```
mapimagemap.c(141):static char *layerlist=NULL;
mapimagemap.c(142):static int layersize=0;
mapimagemap.c(143):static pString imgStr, layerStr={ &layerlist, &layersize, 0 };
mapimagemap.c(146):static const char *polyHrefFmt, *polyMOverFmt, *polyMOutFmt;
mapimagemap.c(147):static const char *symbolHrefFmt, *symbolMOverFmt, *symbolMOutFmt;
mapimagemap.c(148):static const char *mapName;
mapimagemap.c(150):static int suppressEmpty=0;
mapimagemap.c(229):static int lastcolor=-1;
mapimagemap.c(273):static char* lname;
mapimagemap.c(274):static int dxf;
```

Imagemap support is not widely used, will be handled as 2.6 for now. Still waiting for comments.

```
mapio.c(67):static int is_msIO_initialized = MS_FALSE;
mapio.c(69):static msIOContext default_stdin_context;
mapio.c(70):static msIOContext default_stdout_context;
mapio.c(71):static msIOContext default_stderr_context;
mapio.c(73):static msIOContext current_stdin_context;
mapio.c(74):static msIOContext current_stdout_context;
mapio.c(75):static msIOContext current_stderr_context;
```

FrankW: Currently there is only one process wide set of “io handlers” for io. This will almost certainly need to change at some point to be thread local in some fashion. I hope to address this when I work on the redirectable OWS services accessable from MapScript this spring.

```
maplexer.c(220):static YY_BUFFER_STATE yy_current_buffer = 0;
maplexer.c(230):static char yy_hold_char;
maplexer.c(232):static int yy_n_chars;           /* number of characters read into yy_ch_buf */
maplexer.c(238):static char *yy_c_buf_p = (char *) 0;
maplexer.c(239):static int yy_init = 1;           /* whether we need to initialize */
maplexer.c(240):static int yy_start = 0;           /* start state number */
maplexer.c(245):static int yy_did_buffer_switch_on_eof;
maplexer.c(306):static yyconst short int yy_accept[2442] =
maplexer.c(579):static yyconst int yy_ec[256] =
maplexer.c(611):static yyconst int yy_meta[52] =
maplexer.c(621):static yyconst short int yy_base[2456] =
maplexer.c(895):static yyconst short int yy_def[2456] =
maplexer.c(1169):static yyconst short int yy_nxt[2776] =
maplexer.c(1478):static yyconst short int yy_chk[2776] =
maplexer.c(1787):static yy_state_type yy_last_accepting_state;
maplexer.c(1788):static char *yy_last_accepting_cpos;
maplexer.c(1886):static int yy_start_stack_ptr = 0;
maplexer.c(1887):static int yy_start_stack_depth = 0;
maplexer.c(1888):static int *yy_start_stack = 0;
```

According to Steve’s suggestions we will address this with newer versions flex and bison invoked appropriately.

```
mapmygis.c(245):static int gBYTE_ORDER = 0;
```

TODO

```
mapogcsos.c(1974): static char *request=NULL, *service=NULL;
```

TODO

```
mapogr.cpp(840):static int bOGRDriversRegistered = MS_FALSE;
```

Will be handled as 2.2. (Startup initialization)

```
mapows.c(1647): static char epsgCode[20] ="";
```

TODO

```
mapparser.c(282):static const unsigned char yytranslate[] =
mapparser.c(317):static const unsigned char yyprhs[] =
mapparser.c(328):static const yysigned_char yyrhs[] =
mapparser.c(354):static const unsigned short yyrline[] =
mapparser.c(368):static const char *const yytname[] =
mapparser.c(381):static const unsigned short yytoknum[] =
mapparser.c(391):static const unsigned char yyr1[] =
mapparser.c(402):static const unsigned char yyr2[] =
mapparser.c(415):static const unsigned char yydefact[] =
mapparser.c(431):static const yysigned_char yydefgoto[] =
mapparser.c(439):static const short yypact[] =
mapparser.c(455):static const yysigned_char yypgoto[] =
mapparser.c(465):static const unsigned char yytable[] =
mapparser.c(491):static const yysigned_char yycheck[] =
mapparser.c(519):static const unsigned char yystos[] =
```

According to Steve’s suggestions we will address this with newer versions flex and bison invoked appropriately.

```
mappluginlayer.c(46):static VTFactoryObj gVirtualTableFactory = {MS_MAXLAYERS, 0, {NULL}};
```

TODO

```
mappool.c(206):static int connectionCount = 0;
mappool.c(207):static int connectionMax = 0;
mappool.c(208):static connectionObj *connections = NULL;
```

TODO

```
mapproject.c(889):static char *ms_proj_lib = NULL;
mapproject.c(890):static char *last_filename = NULL;
mapproject.c(918): static int finder_installed = 0;
```

TODO

```
mapscale.c(68):static char *unitText[5]={"in", "ft", "mi", "m", "km"};
mapscale.c(69):double inchesPerUnit[6]={1, 12, 63360.0, 39.3701, 39370.1, 4374754};
```

const static data, being handled as 2.1.

```
mapsde.c(216):static int lcacheCount = 0;
mapsde.c(217):static int lcacheMax = 0;
mapsde.c(218):static layerId *lcache = NULL;
```

TODO

```
mapserv.c(1196): static int nRequestCounter = 1;
```

Considering safe without locks (2.1). The *mapserv* application does not involved in multiple threads.

```
mapshape.c(70):static int bBigEndian;
```

Should be handled as epplib.c(47):static int REVERSE;

```
mapsosg.c(164): static char epsgCode[20] ="";
mapsosg.c(165): static char *value;
```

TODO

```
mapsosg.c(97):static char gszFilename[128];
mapsosg.c(98):static char gszAction[256];
mapsosg.c(99):static char gszTmp[256];
```

TODO

```
mapsymbol.c(154):static char *msCapsJoinsCorners[7]={"NONE", "BEVEL", "BUTT", "MITER", "ROUND", "SQUA
```

const static data, being handled as 2.1.

```
mapthread.c(196):static int thread_debug = 0;
mapthread.c(198):static char *lock_names[] =
```

const static data, being handled as 2.1.

```
mapthread.c(213):static int mutexes_initialized = 0;
mapthread.c(214):static pthread_mutex_t mutex_locks[TLOCK_MAX];
mapthread.c(223): static pthread_mutex_t core_lock = PTHREAD_MUTEX_INITIALIZER;
mapthread.c(294):static int mutexes_initialized = 0;
mapthread.c(295):static HANDLE mutex_locks[TLOCK_MAX];
mapthread.c(305): static HANDLE core_lock = NULL;
```

Should be handled as 2.2. (Startup initialization). Initialized in msThreadInit();

```
maputil.c(1068):static int tmpCount = 0;  
maputil.c(1069):static char *ForcedTmpBase = NULL;
```

TODO

```
mapwms.c(252):static char *wms_exception_format=NULL;
```

TODO

```
md5c.c(58):static unsigned char PADDING[64] = {
```

const static data, being handled as 2.1.

```
strptime.c(43):static const char *abb_weekdays[] = {  
strptime.c(54):static const char *full_weekdays[] = {  
strptime.c(65):static const char *abb_month[] = {  
strptime.c(81):static const char *full_month[] = {  
strptime.c(97):static const char *ampm[] = {
```

const static data, being handled as 2.1.

```
gdft\gdkanji.c(103): static int whatcode;  
gdft\gdkanji.c(403): static unsigned char tmp[BUFSIZ];  
gdft\gdkanji.c(489): static unsigned char tmp_dest[BUFSIZ];
```

SDL: gdft and it's contents are not part of MapServer distributions.

```
gdft\gdttf.c(712): static gdCache_head_t *tweenColorCache=NULL; /****** set up tweenColorCache on first font load */  
gdft\gdttf.c(852): static gdCache_head_t *fontCache=NULL; /****** initialize font engine on first font load */  
gdft\gdttf.c(853): static TT_Engine engine;
```

SDL: gdft and it's contents are not part of MapServer distributions.

```
gdft\jisx0208.h(7):static unsigned short UnicodeTbl[][][94] = {
```

SDL: gdft and it's contents are not part of MapServer distributions.

```
mapsript\csharp\csmodule.i(32): static $moduleHelper()  
mapsript\csharp\csmodule.i(41): static $moduleHelper the$moduleHelper = new $moduleHelper();
```

Initialization startup code.

```
mapsript\php3\mapsript_i.c(223): static int i=0;  
mapsript\php3\mapsript_i.c(1137): static char pszFieldName[1000];
```

TODO

```
mapsript\php3\php_mapsript.c(789):static int le_msmap;  
mapsript\php3\php_mapsript.c(790):static int le_mslayer;  
mapsript\php3\php_mapsript.c(791):static int le_msimg;  
mapsript\php3\php_mapsript.c(792):static int le_msclass;  
mapsript\php3\php_mapsript.c(793):static int le_mslabel;  
mapsript\php3\php_mapsript.c(794):static int le_mscolor;  
mapsript\php3\php_mapsript.c(795):static int le_msrect_new;  
mapsript\php3\php_mapsript.c(796):static int le_msrect_ref;  
mapsript\php3\php_mapsript.c(797):static int le_mspoint_new;  
mapsript\php3\php_mapsript.c(798):static int le_mspoint_ref;  
mapsript\php3\php_mapsript.c(799):static int le_msline_new;  
mapsript\php3\php_mapsript.c(800):static int le_msline_ref;
```

```

mapscript\php3\php_mapscript.c(801):static int le_msshape_new;
mapscript\php3\php_mapscript.c(802):static int le_msshape_ref;
mapscript\php3\php_mapscript.c(803):static int le_msshapefile;
mapscript\php3\php_mapscript.c(804):static int le_msweb;
mapscript\php3\php_mapscript.c(805):static int le_msrefmap;
mapscript\php3\php_mapscript.c(806):static int le_msprojection_new;
mapscript\php3\php_mapscript.c(807):static int le_msprojection_ref;
mapscript\php3\php_mapscript.c(808):static int le_msscalebar;
mapscript\php3\php_mapscript.c(809):static int le_mslegend;
mapscript\php3\php_mapscript.c(810):static int le_msstyle;
mapscript\php3\php_mapscript.c(811):static int le_msoutputformat;
mapscript\php3\php_mapscript.c(812):static int le_msgrid;
mapscript\php3\php_mapscript.c(813):static int le_mserror_ref;
mapscript\php3\php_mapscript.c(814):static int le_mslabelcache;
mapscript\php3\php_mapscript.c(815):static int le_mssymbol;
mapscript\php3\php_mapscript.c(816):static int le_msquerymap;
mapscript\php3\php_mapscript.c(857):static zend_class_entry *map_class_entry_ptr;
mapscript\php3\php_mapscript.c(858):static zend_class_entry *img_class_entry_ptr;
mapscript\php3\php_mapscript.c(859):static zend_class_entry *rect_class_entry_ptr;
mapscript\php3\php_mapscript.c(860):static zend_class_entry *color_class_entry_ptr;
mapscript\php3\php_mapscript.c(861):static zend_class_entry *web_class_entry_ptr;
mapscript\php3\php_mapscript.c(862):static zend_class_entry *reference_class_entry_ptr;
mapscript\php3\php_mapscript.c(863):static zend_class_entry *layer_class_entry_ptr;
mapscript\php3\php_mapscript.c(864):static zend_class_entry *label_class_entry_ptr;
mapscript\php3\php_mapscript.c(865):static zend_class_entry *class_class_entry_ptr;
mapscript\php3\php_mapscript.c(866):static zend_class_entry *point_class_entry_ptr;
mapscript\php3\php_mapscript.c(867):static zend_class_entry *line_class_entry_ptr;
mapscript\php3\php_mapscript.c(868):static zend_class_entry *shape_class_entry_ptr;
mapscript\php3\php_mapscript.c(869):static zend_class_entry *shapefile_class_entry_ptr;
mapscript\php3\php_mapscript.c(870):static zend_class_entry *projection_class_entry_ptr;
mapscript\php3\php_mapscript.c(871):static zend_class_entry *scalebar_class_entry_ptr;
mapscript\php3\php_mapscript.c(872):static zend_class_entry *legend_class_entry_ptr;
mapscript\php3\php_mapscript.c(873):static zend_class_entry *style_class_entry_ptr;
mapscript\php3\php_mapscript.c(874):static zend_class_entry *outputformat_class_entry_ptr;
mapscript\php3\php_mapscript.c(875):static zend_class_entry *grid_class_entry_ptr;
mapscript\php3\php_mapscript.c(876):static zend_class_entry *error_class_entry_ptr;
mapscript\php3\php_mapscript.c(877):static zend_class_entry *labelcache_class_entry_ptr;
mapscript\php3\php_mapscript.c(878):static zend_class_entry *symbol_class_entry_ptr;
mapscript\php3\php_mapscript.c(879):static zend_class_entry *querymap_class_entry_ptr;
mapscript\php3\php_mapscript.c(891):static unsigned char one_arg_force_ref[] =
mapscript\php3\php_mapscript.c(893):static unsigned char two_args_first_arg_force_ref[] =

```

TODO

```

mapscript\php3\php_proj.c(196):static zend_class_entry *proj_class_entry_ptr;
mapscript\php3\php_proj.c(200):static int le_projobj;
mapscript\php3\php_proj.c(294):static long _php_proj_build_proj_object(PJ *pj,

```

TODO

```

mapscript\swiginc\dbfinfo.i(40):           static char pszFieldName[1000];

```

TODO

```

mapscript\swiginc\map.i(204):    static int i=0;

```

TODO

3. Issues of the related libraries

TODO

4. Considerations for the future development

Developers should keep in mind that their code may be called by multiple threads simultaneously. Using process-wide global variables modified at run time will be discouraged in the future. If the usage is inevitable the variables should be protected by using mutual exclusion properly depending on the USE_THREAD constant.

5. Backwards compatibility issues

This is binary and source code level backward incompatible change. The compatibility of the mapscript interface might be kept.

Bug ID

The following bug is added as a primary source for collecting the developer and user response. Nevertheless the MapServer users and developers list will also be monitored and the RFC will be updated accordingly by the primary author.

Bug [1764](#)

Voting history

Still not proposed for voting

16.9.18 MS RFC 16: MapScript WxS Services

Date 2006/05/10

Author Frank Warmerdam

Contact warmerdam at pobox.com

Last Edited May 22, 2006

Status adopted and implemented

Version MapServer 4.10

Id \$Id\$

Purpose

The general intention is that a WMS or WCS service should be able to be setup via MapScript. The web request would be turned over to a MapScript script (Python, Perl, Java, etc) which can then manipulate the request and a map as needed. Then it can invoke the low level MapServer request function (ie. GetMap, GetCapabilities), and if desired manipulate the returned information before returning to the client. This will provide a means to do customizations such as:

- Implement security policy.
- Use dynamically created maps from a database, etc.

- Flesh out capabilities documents with auxiliary information not settable via the .map METADATA tags.
- Adjust error behaviors.

Technical Solution

- GetCapabilities, GetFeatureInfo and GetMap calls for WMS callable from MapScript, and results capturable for processing.
- GetCapabilities, DescribeCoverage and GetCoverage calls for WCS callable from MapScript and results capturable for processing.
- GetCapabilities, DescribeFeatureType and GetFeature calls for WFS callable from MapScript and results capturable for processing.
- Any other OWS services dispatched through OWSDispatch (such as SOS) would also be accessible from MapScript.
- IO hooking to capture various output from MapServer services will be accomplished via mapio.c services, the same as is used to capture output for FastCGI services.
- All SWIG based MapScript languages will be supported (Perl, Python, Ruby, C#, Java). PHP (non SWIG) may be supported if the PHP MapScript maintainers do a similar implementation.
- A MapScript WxS HOWTO will be written, including simple examples of customized services.

WxS Functions

Add the following methods on the mapObj in mapscript/swiginc/map.i.

```
int OWSDispatch( OWSRequest *req );
```

We can't call the lower level functions, like msWMSGetCapabilities() directly very easily because these functions require some pre-processing done by msWMSDispatch().

- Note that the OWSDispatch() reconfigures the map it is invoked on to match the request.
- Note that the results of the OWSRequest are still written out via the normal stdout stream handling, so separate msIO hooking is needed to capture the results.

OWSRequest

This object is already defined to MapScript in mapscript/swiginc/owsrequest.i but it seems to lack a means of setting it from cgi arguments or directly by parsing a provided url. I propose to add the following method on the OWSRequest:

```
loadParams();
```

- Loads the parameters from the normal sources (QUERY_STRING env. variable for instance).

```
loadParams( const char * url );
```

- Loads the parameters from the given url portion as would have appeared in QUERY_STRING if REQUEST_METHOD was GET.

IO Hooking

Currently output from functions such as msWMSGetCapabilities() is directed through the msIO services (in mapio.c), such as msIO_printf(). In order to capture this output and make it available for further processing it will be necessary to provide a means for MapScript applications to insert their own IO handlers of some sort.

Additionally, currently the msIO layer has a concept of io handlers, but they are global to the application. For non-trivial use of WxS MapScript services in Java, c# and other multithreaded environments it is desirable for it to be possible to insert per-thread IO handlers.

- Need to make at least current_stdin/stdout/stderr_context variables thread local. Possibly using the same approach as maperror.c. A new mutex will be required for this.
- Consider thread safe output to shared stdin/stdout/stderr handles for all threads? ie. protect with a mutex.
- We need to provide a convenient way to install “to buffer” and “from buffer” io handlers.
- We need to always use msIO redirection. Currently in the default case of not using FastCGI, USE_MARIO is not defined in mapio.h and msIO_printf() and similar functions are actually just #define’ed to printf(). But if we want to be able to capture output all the time for MapScript, we will actually always need the msIO layer. So USE_MARIO will always have to be defined.

```
msIO_resetHandlers();
```

- Resets msIO handlers to defaults (using stdin, stdout, stderr).
- Clears buffer data if buffered handlers were installed.

```
msIO_installStdoutToBuffer();
```

- Install handler to send stdout to a buffer, clear buffer.

```
msIO_installStdinFromBuffer();
```

- Install handler to get stdin from a buffer, clear buffer.

```
msIO_setStdinBuffer( unsigned char *data, int length );
```

- Set data for stdin buffer.

```
gdBuffer msIO_getStdoutBufferBytes();
```

- Fetch stdout buffer pointer and length.
- gdBuffer already provides language specific bindings to get byte data.

```
const char *msIO_getStdoutBufferString();
```

- Fetch stdout buffer as a string. Appropriate for XML and HTML results for instance.

The installed “buffer” handlers will manage their own buffer and concept of current read/write position.

My objective is that folks should be able to do something like this in Python MapScript.

```
mapscript.msIO_installStdoutToBuffer()
if map.OWSDispatch( req ) == mapscript.MS_SUCCESS:
    result = mapscript.msIO_getStdoutBufferString()
    mapscript.msIO_resetHandlers()
```

Questions:

- 1) Should we be “pushing” handlers instead of installing them and losing track of the previous handler? Then we could just pop them off.

2) Should we make the whole msIOContext thing more visible to MapScript? It seems like it would be complicated.

gdBuffer

The msIO_getStdoutBufferBytes() returns a gdBuffer since most language bindings already have a way of using this as a “array of raw bytes” buffer. It is normally used for fetched gdImage buffers. But because the msIO function returns a gdBuffer referring to an internally memory array not “owned” by the gdBuffer we need to add a owns_data flag.

```
typedef struct {
    unsigned char *data;
    int size;
    int owns_data;
} gdBuffer;
```

Likewise, each of the language bindings needs to be modified to only call gdFree() on data if owns_data is true.

This:

```
%typemap(out) gdBuffer {
    $result = PyString_FromStringAndSize($1.data, $1.size);
    gdFree($1.data);
}
```

becomes this:

```
%typemap(out) gdBuffer {
    $result = PyString_FromStringAndSize($1.data, $1.size);
    if( $1.owns_data )
        gdFree($1.data);
}
```

And similarly for the other bindings.

Files and objects affected

```
mapio.c
mapio.h
mapscript/mapscript.i
mapscript/swiginc/owsrequest.i
mapscript/swiginc/image.i
mapscript/swiginc/msio.i (new)
mapscript/python/pymodule.i (gdBuffer)
```

Backwards compatibility issues

There are no apparent backward compatibility problems with existing MapScript scripts.

Implementation Issues

- the gdBuffer stuff likely ought to be generalized.
- some MapScript languages lack gdBuffer typemaps (ie. perl).

- some performance testing should be done to verify that USE_MARIO isn't going to slow down normal operations significantly. This is specially a concern once the mario.c statics are actually handled as thread local as each msIO call will need to search for the appropriate thread local context.
- the msIO "buffer" approach is predicated on streaming output results into a memory buffer. For very large return results this may use an unreasonable amount of memory. For instance a WFS request with a 250MB response document. But such results aren't necessarily reasonable in web services context anyways.
- The set of functions will need to be exposed separately in the PHP bindings.

Test suite

The msautotest/mspython and python unit tests will be extended with at least rudimentary testing of a few of these services.

As we have no automated tests for other MapScript languages, no automated tests will be added, but I will endeavour to prepare simple scripts to test things. Currently this has been done for Python and Perl MapScript.

Example

This shows a very simple Python MapScript script that invokes a passed in OWSRequest passed via normal cgi means, but adding a text/plain content type ahead of the regular content type so we can see the results. The script could easily have done extra manipulation on the URL parameters, and on the map object.

Example:

```
#!/usr/bin/env python

import sys
import mapscript

req = mapscript.OWSRequest()
req.loadParams()

mapscript.msIO_installStdoutToBuffer()

map.OWSDispatch( req )

print 'Content-type: text/plain'
print
print mapscript.msIO_getStdoutBufferString()
```

Bug ID

<http://trac.osgeo.org/mapserver/ticket/1788>

Voting history

+1: FrankW, SteveW.

Open questions

None

16.9.19 MS RFC 17: Dynamic Allocation of layers, styles, classes and symbols

Date 2006/05/12

Author Frank Warmerdam, with edits from Daniel Morissette and Umberto Nicoletti

Contact warmerdam at pobox.com, dmorissette at mapgears.com, umberto.nicoletti at gmail.com

Last Edited 2007/07/18

Status Adopted (2007/07/18) - Implementation completed (2007/07/23)

Version MapServer 5.0

Id \$Id\$

Purpose

Modify the MapServer core libraries so that lists of layers, classes and styles are dynamic, not fixed to compile limits MS_MAXCLASSES, MS_MAXSTYLES, MS_MAXLAYERS and MS_MAXSYMBOLS.

MS_MAXSYMBOLS

Change symbolSetObj so that this:

```
int numsymbols;
symbolObj symbol[MS_MAXSYMBOLS];
```

becomes:

```
int numsymbols;
int maxsymbols;
symbolObj **symbol;
```

Add the following function to ensure there is at least one free entry in the symbol array in the symbolSetObj. This function will only grow the allocated array of pointers if needed (if maxsymbols == numsymbols) and will then allocate a new symbolObj if symbol[numsymbols] == NULL. The new entries in the array will be set to NULL and the new symbolObj[numsymbols] will be all set to zero bytes.

```
symbolObj *msGrowSymbolSet( symbolSetObj * );
```

- Modify all places that add new symbols to call msGrowSymbolsSet() to ensure there is space. These locations can be fairly easily identified by greping on MS_MAXSYMBOLS.
- Modify all places that access symbols by index to use the proper way to reference symbols in the new array, possibly using a GET_SYMBOL() macro similar to the GET_LAYER() added in MS-RFC-24 for layers.
- mapsymbol.c: Modify msInitSymbolSet() to initially setup the symbol set with an array of just one symbol.
- There should be no swig MapScript changes required as it already uses msAppendSymbol().

MS_MAXLAYERS

- map.h: Since *rfc24* already converted the array of layers in a mapObj to an array of pointers, we only need to add “int maxlayers;” to mapObj to indicate the current allocation size of layers array. Note that this also determines the size of the mapObj layerorder array.
- mapdraw.c: Change msDrawMap() to use map->numlayers in place of current MS_MAXLAYERS for asOWS-ReqInfo array.

- mapobject.c: Add msGrowMapLayers(mapObj*) function to ensure there is room for at least one more layer on the map. This grows layers, and layerorder arrays.
- mapobject.c: modify msInsertLayer() and MapScript layer constructor code (see last item) to use msGrowMapLayers().
- mapfile.c: set maxlayers to MS_MAXLAYERS and allocate layers accordingly in initMap(). Use msGrowMapLayers() before calling loadLayer() and loadLayerValue() when parsing.
- mappluginlayer.c: make dynamic. I'm not exactly sure what there is a static factory with entries dimensioned by the number of layers.
- It looks like swig MapScript already has an mapObj.insertLayer() method using msInsertLayer() which should be safe. Do MapScript applications sometimes just update the layers and numlayers directly? Answer: all layer manipulation is done by the layer constructor (when a not null mapObj is passed as only argument) or by msInsertLayer. Must modify the layer constructor as well.

MS_MAXCLASSES

- map.h: Add maxclasses field in layerObj (RFC-24 already converted the array of classes in a layerObj to an array of pointers).
- layerobject.c: Modify msInsertClass() and MapScript constructor code (like for layers) to use msGrowLayerClasses().
- layerobject.c: Add msGrowLayerClasses() to ensure there is at least one extra class in the classes list.
- mapdraw.c: colorbuffer and mindistancebuffer in msDrawQueryLayer() will need to be dynamically sized and allocated on the heap.
- mapfile.c: initLayer() will need to initialize maxclasses to MS_MAXCLASSES, and allocate class list accordingly.
- mapogcsld.c: modify to use msGrowLayerClasses() instead of checking limit.

MS_MAXSTYLES

- map.h: add maxstyles field to classObj (RFC-24 already converted the array of styles in a classObj to an array of pointers).
- mapfile.c: set maxstyles to MS_MAXSTYLES and allocate accordingly in initClass(). Use msGrowClassStyles() as appropriate.
- classobject.c: Add msGrowClassStyles() to ensure there is an unused class.
- classobject.c: Use msGrowClassStyles() in msInsertStyle() and in the style constructor.

Files and objects affected

map.h
mapfile.c
mapsymbol.c
mapdraw.c
mapobject.c
mappluginlayer.c
layerobject.c
mapogcsld.c
classobject.c

mapscript/swiginc/layer.i
 mapscript/swiginc/class.i
 mapscript/swiginc/style.i

Backwards compatibility issues

None.

Test suite

Python unit test entries will be added to exceed the builtin maximums for all of layers, classes, styles and symbols. An msautotest entry with a large number of classes will also be added.

Bug ID

- 302: <https://trac.osgeo.org/mapserver/ticket/302>

Voting history

Vote completed on 2007-07-19:

+1 from DanielM, SteveL, FrankW, SteveW, UmbertoN, TamasS, AssefaY

Comments/Questions from the review period

- Has the following issue already been dealt with by RFC-24 since the code already allocates less than MS_MAX_LAYERS in initMap()? Did RFC-24 make it a formal requirement to use the proper insert/add methods to add layers, styles and classes?

Answer: the implementation adopted with *rfc24* tries to save memory by only allocating the number of layers that are effectively needed. A map with 5 layers will allocate exactly 5 layers, a map with 50 layers will allocate 50, and so on up to the hard-coded limit of MS_MAX_LAYERS. This is also true for classes and style.

The arrays of pointers are for obvious reasons always allocated to MS_MAX_LAYERS size, but memory usage is reduced anyway because arrays of pointers are much smaller than arrays of structs. This represents a substantial change from before, when MS_MAX_LAYERS blank layers were always allocated causing a sure waste of memory in small maps.

MS RFC 17: Dynamic Allocation of layers, styles, classes and symbols should then invoke the various msGrow*() methods to grow the arrays when numlayers == maxlayers-1. I'd suggest to grow the array to a sensible size (like half of the current size) as the impact on memory allocation is going to be mitigated by the dynamic allocation approach introduced by *rfc24*

rfc24 did not make a formal requirement to use the proper insert methods as those and the object constructors are the *only* way to add a layer, class or style to a map. I do not know if this is also true for symbols.

- “Because MapScript application often explicitly initialize “blank” layers, classes and styles directly, and then increment the count, we can’t depend on all access going through the proper insert/add methods. For this reason we preserve the old MS_MAX values to establish the initial allocation. This should mean that existing applications will continue to work at some cost in unused memory. But well behaved MapScript applications using insert methods to increase sizes will be able to grow beyond the initial allocation.”

I'm not aware of any MapScript way to bypass the insert or the constructors (i.e. with direct manipulation of the arrays). If there was such way (which I doubt) I suggest that we forbid it by explicitly changing the MS_MAX_* names and making required fields immutable in swig.

- Comment from Tamas: The mappluginlayer stuff should be concretized a bit. That static repository of the vtables would prevent from loading the same library twice. That array should also be allocated dynamically since I don't think we will ever have MS_MAXLAYERS number of different plugin layers.

16.9.20 MS RFC 18: Encryption of passwords in mapfiles

Date 2006/05/26

Author Daniel Morissette

Contact dmorissette at mapgears.com

Last Edited 2006/08/11

Status Completed (2006/08/11)

Version MapServer 4.10

Overview

This proposal provides a mechanism to protect database connection passwords used inside *mapfiles* by encrypting them instead of including them in plain text.

Technical Solution

MapServer will be extended to allow the use of encrypted passwords as part of the CONNECTION string for the following layer types:

- *Oracle Spatial*
- *PostGIS*
- *ESRI SDE*
- *OGR*

The Tiny Encryption Algorithm (TEA) at <http://www.simonsherpherd.supanet.com/tea.htm> will be used for the encryption/decryption functions.

The implementation details follow...

Encryption key

In order to safely protect the encrypted information, an encryption key will be required by this mechanism. The key will NOT be stored in the mapfile: it will be stored in a separate file on the server and should be kept in a safe area by the server administrator (especially outside of the web server's document directories).

The location of the encryption key can be specified by two mechanisms, either by setting the environment variable MS_ENCRYPTION_KEY or using a CONFIG directive:

```
CONFIG MS_ENCRYPTION_KEY "/path/to/mykey.txt"
```

New “msencrypt” command-line utility

A “msencrypt” command-line utility will be provided to create an encryption key and to encrypt passwords (or any string) for use in a mapfile.

To create an encryption key:

```
msencrypt -keygen /path/to/mykey.txt
```

To encrypt a password or any string:

```
msencrypt -key /path/to/mykey.txt <string_to_encrypt>
```

If the MS_ENCRYPTION_KEY environment variable is set then the -key argument does not need to be specified.

Encoding of encrypted strings

Since the result of encryption is binary data that is not suitable for inclusion directly in a MapServer mapfile, hex encoding will be used for the encrypted strings in the mapfile as well as for storing the encryption key to disk.

The { and } characters will be used as delimiters for encrypted strings inside database CONNECTIONs. This will allow the use of either plain text or encrypted passwords in mapfiles without any backwards compatibility issues.

e.g.

```
CONNECTIONTYPE ORACLESPATIAL
CONNECTION "user/{MIIBugIBAAKBgQCP0Yj+Seh8==}@service"
```

Any part of a CONNECTION string can be encrypted and not just the password. This will allow protecting other information such as login name, hostname or port numbers if necessary.

For reference, here are examples of typical connection strings for the layer types that will be affected:

```
CONNECTIONTYPE POSTGIS
CONNECTION "host=yourhostname dbname=yourdatabasename user=yourdbusername password=yourdbpassword port=5432"
```

```
CONNECTIONTYPE SDE
CONNECTION "sdemachine.iastate.edu, port:5151, sde, username, password"
```

```
CONNECTIONTYPE ORACLESPATIAL
CONNECTION "user/pwd@service"
```

```
CONNECTIONTYPE OGR
CONNECTION "OCI:user/pwd@service"
```

Modifications to the source code

A msDecryptString() function will be created, it will take a CONNECTION string as input and decrypt any encrypted component that it may find in it. This function will be called by the various msXXXLayerOpen() methods before opening the connection to the database.

```
char *msDecryptString(mapObj *map, const char *string)
```

The first time that msDecryptString() is called for a given mapfile, it will load the encryption key from the file and store the key in a new private member of the mapObj (char * encryption_key).

To reduce the chances of false matches in long CONNECTION strings such as OGR VRT data sources, msDecryptString() function will look for a pair of { + }, and then verify that all chars in the block are valid hex encoding chars (0-9,A-F) before proceeding with decryption.

Note that the decrypted string will never be stored in the layerObj, it will be kept local to the function that opens the connection and destroyed as soon as the function is done with it. This is to prevent exposing the decrypted information in error messages or in calls to msSaveMap().

Files affected

```
map.h  
mapfile.c  
maporaclespatial.c  
mappostgis.c  
mappostgresql.c  
mapsde.c  
mapogr.cpp
```

Backwards compatibility issues

None.

Bug ID

1792: <http://trac.osgeo.org/mapserver/ticket/1792>

Voting history

Adopted on 2006/06/01. +1: FrankW, DanielM, HowardB, YewondwossenA, SteveW

Comments from the review period

- There were concerns about the use of the {...} delimiter to indicate encrypted strings inside CONNECTIONS. Since there was not a better alternative we will stick to that.
- There was a suggestion to use an ENCRYPTION_KEY mapfile keyword instead of CONFIG MS_ENCRYPTION_KEY. Since there was no strong argument either way we decided to stick to CONFIG MS_ENCRYPTION_KEY.
- There was a suggestion to consider the Blowfish algorithm (<http://www.schneier.com/blowfish.html>) instead of TEA. The sample implementations of Blowfish would require much more work to integrate than TEA, and since TEA is public domain and so much simpler (simpler is better!), we'll stick to TEA for now and can always change the underlying algorithm at a later time if we find that TEA is too weak (which doesn't appear to be an issue).
- Will the encryption methods be made available to MapScript? No plan to do so at this time, but this could easily be added later on.
- Since the user running the web server (and MapServer) needs to have permissions to read the key, any web server process or user with permissions to read the key can decrypt the passwords using a trivial program. It should be made very clear in the documentation that this is just simple obfuscation and is by no means secure and that users should not place valuable passwords in mapfiles encrypted or not.

16.9.21 MS RFC 19: Style & Label attribute binding

Date 2006/06/07

Author Steve Lime

Contact steve.lime at DNR.STATE.MN.US

Status Passed (in process)

Version MapServer 5.0

Id \$Id\$

Description: Presently MapServer supports binding of label and style properties for a few select attributes (e.g. angle). However, it is cumbersome to add new bindings which leads to unnecessarily complex structures and code that is difficult to maintain. This RFC presents ideas to bring a bit of order to that chaos and make expansion of this capability easier to achieve.

C Structural Changes

A new structure called attributeBindingObj would be added:

```
typedef struct {
    char *item;
    char index;
} attributeBindingObj;
```

Several new enumerations would then define what properties could be bound:

```
#define MS_STYLE_BINDING_LENGTH ...
#define MS_STYLE_BINDING_ENUM { MS_STYLE_BINDING_SIZE, MS_STYLE_BINDING_ANGLE, ... };

#define MS_LABEL_BINDING_LENGTH ...
#define MS_LABEL_BINDING_ENUM { MS_LABEL_BINDING_SIZE, MS_LABEL_BINDING_ANGLE, ... };
```

Several elements would be removed from layerObj and styleObj. For example, angleitem, angleitemindex and similar members would be removed. styleObj's and labelObj's would each take on 2 new members:

```
char hasBindings;
attributeBindingObj bindings[MS_STYLE_BINDING_LENGTH];
```

Mapfile/MapScript Changes

Options like SIZEITEM and ANGLEITEM would go away. Instead a more logical syntax such as:

```
STYLE
  SIZE [mySizeItem]
  ANGLE [myAngleItem]
  COLOR 255 0 0
  SYMBOL 'square'
END
```

Square brackets have been used in MapServer templates and expressions to bind to attributes so they are a natural choice to denote attribute bindings in this case.

Similarly MapScript would lose the ability to set/get the xxxITEM properties. Instead the style and label objects would get setBinding and deleteBinding methods:

```
(in Perl)
$style->setBinding($mapscript::MS_STYLE_BINDING_SIZE, 'mySizeItem');
$style->deleteBinding($mapscript::MS_STYLE_BINDING_COLOR);
```

Files Affected

- map.h => structure changes, enum and define additions
- maputil.c => add msStyleBindAttributes();

```
void msStyleBindAttributes(shapeObj *shape, styleObj *style)
{
    if(style->bindings[MS_STYLE_BINDING_SIZE].item)
        style->size = atoi(shape->values[style->bindings[MS_STYLE_BINDING_SIZE].index]);
    if(style->bindings[MS_STYLE_BINDING_ANGLE].item)
        style->angle = atoi(shape->values[style->bindings[MS_STYLE_BINDING_ANGLE].index]);
    ...
}
```

- maplabel.c => add msLabelBindAttributes();
- maplayer.c => fix msWhichItems() to populate the binding indexes
- mapdraw.c => remove references to the xxxITEM properties, if a style or label has bindings then call msStyleBindAttributes or msLabelBindAttributes
- mapfile.c => fix parsing to handle strings in addition to numbers for all supported bindings (symbols already allow this), if a binding is defined flip the hasBindings flag, remove all references to xxxITEM properties, alter style and label writing code to honor bindings as part of output
- mapcopy.c => fix style and labeling copying
- maplexer.l/mapfile.h => remove xxxITEM defines and lexer references, and to define a new raw type (similar to MS_STRING) called MS_BINDING
- mapscript/swiginc/style.i => add setBinding and deleteBinding methods (similar for PHP/MapScript)

Testing

- Python suite: need tests to set and delete bindings
- MsAutoTest suite: a mapfile testing various bindings would be developed (DNR tests have one example for labels)

Backwards compatibility issues

This does affect a number of parameters, however they are lightly used so this is probably worth the risk. The primary risk is breaking mapfiles as opposed to scripts. Given that this will definitely break some stuff I think it is most appropriate as a 5.0 change.

Bug ID

2100

Voting history

+1 Lime, Morissette, Woodbridge

16.9.22 MS RFC 21: MapServer Raster Color Correction

Date 2006/10/13

Author Frank Warmerdam

Contact warmerdam at pobox.com

Status adopted

Version MapServer 5.0

Id \$Id\$

Overview

To add support to MapServer to apply color correction curves (aka lookup tables) to raster images on the fly.

Technical Details

MapServer's raster rendering engine (mapgdaldraw.c) will be extended to support a PROCESSING option indicating a color correction file to be applied on the fly when raster data is being read from disk. The PROCESSING option would take the form:

```
PROCESSING "LUT=<lut_specification>"
```

for a single LUT applied to all bands equally or:

```
PROCESSING "LUT_<color#>=<lut_specification>"
```

for a LUT applied only to one band. The <lut_specification> can be the name of a file containing a LUT, or an inline lut definition. The inline lut definition looks like:

```
<lut_specification>=<in_value>:<out_value>,<in_value>:<out_value>[,<in_value>:<out_value>]*
```

The text file takes the same form, except that it may be multiline (lines will be implicitly joined by commas). So some common forms would be:

```
PROCESSING "LUT=0:0,128:150,255:255"
```

```
PROCESSING "LUT_2=green_lut.txt"
```

Note that the LUT specification files will be searched for relative to the map file if a relative path is provided.

The LUT will be applied in LoadGDALImage(), after any scaling to 8bit. So currently only 8bit (0-255) input and output values are supported. Optionally we could consider non-8bit inputs, and allow the LUT to apply scaling to 8bit but this would be somewhat complicated to do in a computationally efficient manner.

A 256 entry LUT will be created by linear interpolation between the LUT control points. Note this is different than a true “curve” based approach where some form of curve fitting is done to the control points. For a significant number of control points the difference will be very slight, but it could be noticeable for LUTs with only a few control points (ie. 3). Optionally we could compute a proper curve fit, but this will require extra research and development.

If no control points exist for input values 0 and 255 a mapping of “0:0” and “255:255” will be assumed.

Other Curve Formats

The GIMP's ascii curve format will also be supported directly. Exact details of this are to be determined, and since a GIMP curve file contains several curves (for different bands) it may be necessary to select which is to be used in the PROCESSING statement. Perhaps something like:

```
PROCESSING "LUT_2=GIMP_red:gimp.crv"
```

Mapfile Implications

All new options are selected via new PROCESSING options. There is no change in the mapfile syntax. There should be no compatibility problems with old mapfiles.

MapScript Implications

There are no additions or changes to the MapScript API. The new options are controlled via PROCESSING information on the layers which I believe is already manipulatable from MapScript.

Documentation Implications

The new processing options will need to be documented in the Raster Access HOWTO (and possibly the mapfile reference).

Test Plan

New test cases for each mode will be incorporated in msautotest/gdal.

Staffing / Timeline

The new feature will be implemented by Frank Warmerdam and completed by November 30th, 2006, for inclusion in the MapServer 5.0 release. Funding provided by the Information Center of the Ministry of Agriculture and Forestry (Finland).

Tracking Bug

<http://trac.osgeo.org/mapserver/ticket/1943>

16.9.23 MS RFC 22a: Feature cache for long running processes and query processing

Date 2007/06/24

Author Tamas Szekeres

Contact szekerest at gmail.com

Last Edited 2007/06/24

Status Discussion Draft

Version MapServer 5.0

Id \$Id\$

1. Overview

Currently the various query operations involve multiple accesses to the data providers which may cause a significant performance impact depending on the providers. In the first phase all of the features in the given search area are retrieved and the index of the relevant shapes are stored in the result cache. In the second phase the features in the result cache are retrieved from the provider one by one. Retaining the shapes in the memory we could eliminate the need of the subsequent accesses to the providers and increase the overall performance of the query. Implementing the cache requires a transformation of the data between the data provider and the client. From this aspect it is desirable to provide a framework to implement this transformation in a higher level of abstraction.

2. Purpose

The main purpose of this RFC is to implement a feature cache and retain the shapes in the memory for the further retrievals during a query operation. However I would also want to create a mechanism so that a layer could use another layer as a data source. This outer layer could apply transformations on the shapes coming from the base layer or even retain the shapes in the memory for the subsequent fetches. Here are some other examples where this framework would provide a solution:

1. Constructing geometries based on feature attributes
2. Modifying the geometries or the feature attribute values
3. Geometry transformations (like GEOS operations)
4. Feature cache
5. Providing default layer style based on external style information, or attribute based styling
6. Providing custom data filters

Setting up a proper layer hierarchy one can solve pretty complex issues without the need of creating additional (eg. mapscript) code. Later on - as a live example - I'll show up the solution of the following scenario:

1. The user will select one or more shapes in one layer (by attribute selection in this case).
2. Cascaded transformations will be applied on the selected shapes (I'll use the GEOS convexhull and buffer operations)
3. In another layer the features will be selected based on the transformed shapes as the selection shapes.

In this proposal to ensure the better readability I'll avoid embedding much of the code inline. However most of the implementation patches are available at the tracking ticket of this RFC (see later).

3. General principles of the solution

This proposal involves writing additional data providers. These providers will use another layer as the source of the features. To set up this hierarchy of the layers, the CONNECTION parameter of these layers will contain the name of the source layer. In some cases the source layer doesn't participate in the renderings and should be kept internal to the original layer. Therefore we will establish the support for nesting the layers into each other. In this regard the CONNECTION parameter will contain the full path of the layer it refers to. The path contains the layer names in the hierarchy using the slash '/' as the separator between the names. We can specify the pathnames relative to the actual layer or relative to the map itself.

1. Specify a reference relative to the map:

```
LAYER
  NAME "roads"
  CONNECTIONTYPE OGR
  CONNECTION "roads.tab"
  ...
END
LAYER
  NAME "cache"
  CONNECTIONTYPE CACHE
  CONNECTION "/roads"
  ...
END
```

2. Specify a reference relative to the outer layer

```
LAYER
  NAME "cache"
  CONNECTIONTYPE CACHE
  CONNECTION "roads"
  ...
LAYER
  NAME "roads"
  CONNECTIONTYPE OGR
  CONNECTION "roads.tab"
  ...
END
END
```

The main difference between these 2 options is that in the first case the referred layer is contained by the layers collection of the map, so the layer will participate in the drawings. In the second case the referred layer is internal to the outer layer. It is supported that 2 or more layers connect to the same base layer so that the features will be served from the same cache repository. The base layer can reside in any place of the layer hierarchy.

In any case, the exension layer can also be implemented as a pluggable external layer. (CONNECTIONTYPE PLUG-IN)

To achieve the desired functionality the following 3 providers will be implemented:

3.1 Feature caching provider

The purpose of this provider is to retain the features from the source layer in the memory so the subsequent fetches on the feature caching provider will be served from the internal cache. With the current implementation I'm planning to retain the shapes of last extent. When the subsequent shape retrieval refers to the same extent (or within that extent) the features will be served from the cache. At the moment I will not address caching features from multiple non overlapping extents and implement more sophisticated cache management (like size limit/expiration handling) but it might be the object of an enhancement in the future. All of the provider specific data will be placed in the layerinfo structure of the provider. The shapes in the cache will be stored in a hashtable. This provider will be implemented in a separate file (mapcache.c).

3.1.1 Shape retrieval options

This provider will be capable to populate the cache with all of the shapes in the given extent or only with the shapes in the resultcache of the source layer. The first one is the default option and the latter can be selected by the following PROCESSING directive:

```
PROCESSING "fetch_mode=selection"
```

The cache will be populated upon the WhichShapes call of the caching provider when the given rect falls outside of the previous one. We can also specify that the provider will retrieve all the shapes of the current map extent regardless to the search area using the following setting:

```
PROCESSING "spatial_selection_mode=mapextent"
```

3.1.2 Items selection

The feature caching provider will store all of the items available regardless of which items have been selected externally (by using the WhichItems call). However the iteminfo will contain the indexes only of the requested items. The GetShape and the NextShape operations will copy only the requested subset of the items to the caller. This solution will provide the compatibility with any other existing provider so there's no need to alter the common mapserver code from this aspect.

3.1.3 Support for the STYLEITEM “AUTO” option

By using the STYLEITEM “AUTO” option the provider can retrieve the classObj of every shapeObj from the data source. So as to keep on supporting this option the caching provider will be capable to cache these classObj-s as well as the shapeObj-s in a separate hashtable. When the STYLEITEM “AUTO” option is set on the feature caching provider the style cache will also be populated by calling the GetAutoStyle function to the source layer. The subsequent GetAutoStyle calls on the feature caching provider will retrieve the classObj-s from the style cache and provide a copy to the caller.

3.1.4 Support for the attribute filter

The feature caching provider will be compatible with the existing query operations (implemented in the msQueryBy[] functions in mapquery.c). For supporting the msQueryByAttributes the NextShape will use msEvalExpression before returning the shapes to the caller.

3.2 Geometry transformation provider

The geometry transformation provider (implemented in mapgeomtrans.c) will support transparent access to the source layer. Every vtable operations will be dispatched to corresponding vtable operation of the source layer. In addition some of the other layer properties might require to copy between the connected layers.

3.2.1 Items selection

This provider will serve the same subset of the items as the source layer provides. Therefore the InitIteminfo will copy the items and the numitems of the external layer to the source layer, like:

```
int msGeomTransLayerInitItemInfo( layerObj *layer )
{
    /* copying the item array an call the subsequent InitItemInfo*/
    return msLayerSetItems(((GeomTransLayerInfo*)layer->layerinfo)->srclayer, layer->items, layer->n
```

And upon the GetItems call these values will be copied back to the external layer, like:

```
int msGeomTransLayerGetItems(layerObj *layer)
{
    /* copying the item array back */
    int result;
    GeomTransLayerInfo* layerinfo = (GeomTransLayerInfo*)layer->layerinfo;
    result = msLayerGetItems(layerinfo->srclayer);
    msLayerSetItems(layer, layerinfo->srclayer->items, layerinfo->srclayer->numitems);
    return result;
}
```

3.2.2 Applying the transformations

The proposed implementation will support most of the GEOS transformations supported by mapserver (buffer, convexhull, boundary, union, intersection, difference, symdifference). The transformations will be applied right before retrieving a shape to the caller. The desired transformation can be selected using a PROCESSING option, like:

```
PROCESSING "transformation=buffer"
```

Some of the transformations will accept further parameters:

```
PROCESSING "buffer_width=0.2"
```

Some of these operations will use 2 shapes to create the transformed shape. The reference shape of these transformations can be set externally using the WKT representation of a processing option:

```
PROCESSING "ref_shape=[WKT of the shape]"
```

I'm also planning to support retrieving this shape from the features collection of the layer and from an external layer as well.

3.3 Layer filter provider

The layer filter provider (implemented in mapfilter.c) will provide the shape retrieved from the source layer and will not apply any transformation on that. However some of the shapes will be skipped in the NextShape operations depending on the spatial and the attribute selection options. This provider ensures transparent access to the source layer (just as the previous one) but uses a cache for storing the selection shapes. The selection shapes will be retrieved from another layer which can be specified in the following processing option:

```
PROCESSING "selection_layer=[path to the layer]"
```

When populating the selection cache I'll support to retrieve all of the shapes or only the shapes in the result cache as for the caching provider mentioned before:

```
PROCESSING "fetch_mode=selection"
```

4. Putting the things together (example)

In this chapter I'll describe the solution of the scenario have been mentioned earlier. I'll start with a simple map file definition with 2 layers the counties and the citypoints of the country:

```
MAP
  NAME "Hungary"
  STATUS ON
  EXTENT 421543.362603 47885.103526 933973.563202 367180.479761
  SIZE 800 600
```

```

IMAGETYPE PNG
IMAGECOLOR 255 255 255

PROJECTION
    "proj=somerc"
    "lat_0=47.14439372222222"
    "lon_0=19.04857177777778"
    "x_0=650000"
    "y_0=200000"
    "ellps=GRS67"
    "units=m"
    "no_defs"
END

SYMBOL
    Name 'point'
    Type ELLIPSE
    POINTS
        1 1
    END
    FILLED TRUE
END

LAYER
    PROJECTION
        "AUTO"
    END
    NAME "Hun_Counties"
    CONNECTIONTYPE OGR
    CONNECTION "Hun_Megye.TAB"
    STATUS default
    TYPE POLYGON
    LABELITEM "name"
    CLASS
        TEMPLATE "query.html"
        LABEL
            SIZE medium
            COLOR 64 128 64
        END
        STYLE
            COLOR 208 255 208
            OUTLINECOLOR 64 64 64
        END
    END
    END
LAYER
    PROJECTION
        "AUTO"
    END
    NAME "Hun_CityPoints"
    CONNECTIONTYPE OGR
    CONNECTION "Hun_CityPoints.TAB"
    STATUS default
    TYPE POINT
    CLASS
        STYLE
            COLOR 255 0 0
            SYMBOL "point"

```

```
        SIZE 2
    END
END
END
END
```

This map will look like this:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample.png>

4.1 Adding the feature cache for the layers

Any of the layers might be cached by using the CACHE layer provider. The original provider might be nested inside the cache. The parameters related to the drawing should be specified for the outer layer, like:

```
LAYER
    PROJECTION
        "AUTO"
    END
    NAME "Hun_Counties_cache"
    CONNECTIONTYPE CACHE
    CONNECTION "Hun_Counties"
    STATUS default
    TYPE POLYGON
    LABELITEM "name"
    CLASS
        TEMPLATE "query.html"
        LABEL
            SIZE medium
            COLOR 64 128 64
        END
        STYLE
            COLOR 208 255 208
            OUTLINECOLOR 64 64 64
        END
    END
    LAYER
        PROJECTION
            "AUTO"
        END
        NAME "Hun_Counties"
        CONNECTIONTYPE OGR
        CONNECTION "Hun_Megye.TAB"
        TYPE POLYGON
    END
END
```

The Hun_Counties_cache layer is queryable and all of the existing methods are available to populate the resultcache. In my example I'll use the mapscript C# drawquery example (implemented in drawquery.cs) to execute an attribute query and use the drawquery afterwards. The following command will be used along with this sample:

```
drawquery sample.map "([Name]='Tolna')" sample.png
```

Which passes the ('[Name]'='Tolna') query string to the queryByAttributes of the first layer.

The result of the rendering will look like:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample1.png>

The corresponding mapfile can be found here:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample1.map>

4.2 Applying transformations on the counties

In the next step I'll apply a cascaded GEOS convexhull and buffer operations on the first layer. The results will be rendered in a separate layer using the following definition:

```
LAYER
    NAME "selectionshape"
    CONNECTIONTYPE GEOMTRANS
    CONNECTION "simplify"
    STATUS default
    TYPE POLYGON
    TRANSPARENCY 50
    CLASS
        STYLE
            COLOR 64 255 64
            OUTLINECOLOR 64 64 64
        END
    END
    PROCESSING "transformation=buffer"
    PROCESSING "buffer_width=0.2"
    LAYER
        NAME "simplify"
        TYPE POLYGON
        CONNECTIONTYPE GEOMTRANS
        CONNECTION "/Hun_Counties_cache"
        PROCESSING "transformation=convexhull"
    END
END
```

The result of the rendering will look like:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample2.png>

The corresponding mapfile:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample2.map>

Which is not the desired result since all of the polygons were transformed. So as to transform only the selected shape an additional cache should be specified by using the “fetch_mode=selection” processing option:

```
LAYER
    NAME "selectionshape"
    CONNECTIONTYPE GEOMTRANS
    CONNECTION "simplify"
    STATUS default
    TYPE POLYGON
    TRANSPARENCY 50
    CLASS
        STYLE
            COLOR 64 255 64
            OUTLINECOLOR 64 64 64
        END
    END
    PROCESSING "transformation=buffer"
    PROCESSING "buffer_width=0.2"
    LAYER
```

```
NAME "simplify"
TYPE POLYGON
CONNECTIONTYPE GEOMTRANS
CONNECTION "selectioncache"
PROCESSING "transformation=convexhull"
LAYER
    NAME "selectioncache"
    TYPE POLYGON
    CONNECTIONTYPE CACHE
    CONNECTION "/Hun_Counties_cache"
    PROCESSING "fetch_mode=selection"
END
END
END
```

And here is the result of the drawing:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample3.png>

The corresponding mapfile:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample3.map>

4.3 Using the transformed shape as the selection shape

My final goal is to select the features of the point layer using the transformed shape as the selection shape. Therefore I'll have to use the layer filter provider on the point layer and setting the selection_layer to the transformed layer:

```
LAYER
    TYPE POINT
    CONNECTIONTYPE LAYERFILTER
    CONNECTION "Hun_CityPoints"
    NAME "selectedpoints"
    STATUS default
    PROCESSING "selection_layer=/selectionshape"
    CLASS
        STYLE
            COLOR 255 0 0
            SYMBOL "point"
            SIZE 2
        END
    END
    LAYER
        PROJECTION
            "AUTO"
        END
        NAME "Hun_CityPoints"
        CONNECTIONTYPE OGR
        CONNECTION "Hun_CityPoints.TAB"
        TYPE POINT
    END
END
```

Here is the result:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample4.png>

The corresponding mapfile:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample4.map>

Note1: Without altering the map configuration I can modify the selection externally and the rendered image will reflect the changes automatically. For example I can select 2 counties using the query string: ('[Name]'='Tolna' or '[Name]'='Baranya')

The resulting image can be found here:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample4a.png>

Note2: If there's no need to render the selection layer I can specify that configuration inline:

```
LAYER
    TYPE POINT
    CONNECTIONTYPE LAYERFILTER
    CONNECTION "Hun_CityPoints"
    NAME "selectedpoints"
    STATUS default
    PROCESSING "selection_layer=selectionshape"
    CLASS
        STYLE
            COLOR 255 0 0
            SYMBOL "point"
            SIZE 2
        END
    END
    LAYER
        PROJECTION
            "AUTO"
        END
        NAME "Hun_CityPoints"
        CONNECTIONTYPE OGR
        CONNECTION "Hun_CityPoints.TAB"
        TYPE POINT
    END
    LAYER
        NAME "selectionshape"
        CONNECTIONTYPE GEOMTRANS
        CONNECTION "simplify"
        STATUS default
        TYPE POLYGON
        TRANSPARENCY 50
        CLASS
            STYLE
                COLOR 64 255 64
                OUTLINECOLOR 64 64 64
            END
        END
        PROCESSING "transformation=buffer"
        PROCESSING "buffer_width=0.2"
        LAYER
            NAME "simplify"
            TYPE POLYGON
            CONNECTIONTYPE GEOMTRANS
            CONNECTION "selectioncache"
            PROCESSING "transformation=convexhull"
            LAYER
                NAME "selectioncache"
                TYPE POLYGON
                CONNECTIONTYPE CACHE
                CONNECTION "/Hun_Counties_cache"
                PROCESSING "fetch_mode=selection"
```

```
    END
  END
END
END
```

Here is the result:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample5.png>

And the corresponding mapfile:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/sample5.map>

And recall that because I've used a cache on the counties layer all of these renderings require to retrieve the shapes only once from the original provider. That was the primary objective of this RFC.

5. Modifying the mapserver core

To achieve the desired functionality the following major steps should be done in the mapserver core. The details of the proposed changes can be found here:

<http://trac.osgeo.org/mapserver/attachment/ticket/2128/common.patch>

5.1 Hashtable implementation

The current hashtable implementation (in maphash.c) will be generalized to be capable to store objects as well as strings. Currently the hashtable can store only string values. In addition we will provide support for specifying the hashsize upon the construction of the hashtable. The objects will be stored in the hashtable by reference and the destroy function of the objects can also be specified externally. The following functions will be added to maphash.c

```
int initHashTableEx( hashTableObj *table, int hashSize );
void msClearHashItems( hashTableObj *table );
struct hashObj *msInsertHashTablePtr(hashTableObj *table, const char *key, const char *value);
struct hashObj *msFirstItemFromHashTable( hashTableObj *table);
struct hashObj *msNextItemFromHashTable( hashTableObj *table, struct hashObj *lastItem );
int msGetHashTableItemCount(hashTableObj *table);
```

initHashTableEx can be called to specify the hash size externally. Actually the original initHashTable will be implemented as calling initHashTableEx with MS_HASHSIZE. msClearHashItems will clear all of the elements of the hashtable but does not clear the items array. msInsertHashTablePtr provides the support for adding object by reference to the hashtable. msFirstItemFromHashTable and msNextItemFromHashTable will provide the iteration of the elements efficiently and will be called by the NextShape of the feature caching provider. msGetHashTableItemCount will retrieve the actual number of the hashtable items.

5.2 Extending the layerObj structure to support nesting the layers (map.h)

The sublayers in the layerObj structure will be stored as an array of layers.

```
typedef struct layer_obj {
  ...
#ifndef SWIG
  struct layer_obj **layers;
  int numlayers; /* number of sublayers in layer */
#endif /* SWIG */
  ...
} layerObj;
```

The parser will take care of loading the nested layers:

```
int loadLayer(layerObj *layer, mapObj *map)
{
    ...
    case (LAYER):
        if(layer->numlayers == 0)
            layer->layers = (layerObj**) malloc(sizeof(layerObj*));
        else
            layer->layers = (layerObj**) realloc(layer->layers, sizeof(layerObj*) * (layer->numlayers));
        layer->layers[layer->numlayers]=(layerObj*)malloc(sizeof(layerObj));
        if (layer->layers[layer->numlayers] == NULL) {
            msSetError(MS_MEMERR, "Malloc of a new layer failed.", "loadLayer()");
            return MS_FAILURE;
        }
        if(loadLayer(layer->layers[layer->numlayers], map) == -1) return MS_FAILURE;
        layer->layers[layer->numlayers]->index = layer->numlayers; /* save the index */
        ++layer->numlayers;
        break;
    ...
}
```

5.3 Adding a new built in data connection types (map.h)

A new data connection type is established for the new providers.

```
enum MS_CONNECTION_TYPE {MS_INLINE, MS_SHAPEFILE, MS_TILED_SHAPEFILE, MS_SDE, MS_OGR, MS_UNUSED_1, MS_UNUSED_2};
```

The lexer will be modified to interpret the new connection types.

5.4 Support for destroying the persistent data of the providers (map.h, maplayer.c)

The providers would keep persistent data between the various Connection/Close operations on that layer so we should establish a mechanism to destroy this provider specific data by adding a new method to the layervtbl:

```
void (*LayerDestroy)(layerObj *layer);
```

5.5 Vtable initialization for the new data providers (maplayer.c)

```
int
msInitializeVirtualTable(layerObj *layer)
{
    if (layer->baselayer)
        msInitializeVirtualTable(layer->baselayer);
    ...
    switch(layer->connectiontype) {
    ...
    case (MS_GEOMTRANS):
        return (msGeomTransLayerInitializeVirtualTable(layer));
        break;
    case (MS_LAYERFILTER):
        return (msFilterLayerInitializeVirtualTable(layer));
        break;
    case (MS_CACHE):
        return (msCacheLayerInitializeVirtualTable(layer));
    }
```

```
        break;  
    ...  
}  
..  
}
```

6. Files affected

The following files will be affected by this RFC:

```
maphash.c  
maphash.h  
maplayer.c  
maplexer.l  
mapfile.c  
map.h  
Makefile.vc  
Makefile.in  
mapcache.c (new)  
mapgeomtrans.c (new)  
mapfilter.c (new)
```

7. Backwards compatibility issues

These changes will retain mapfile and mapscript backward compatibility.

8. Bug ID

The ticket for RFC-22a can be found here.

Bug [2128](#)

9. Voting history

None

16.9.24 MS RFC 23: Technical Steering Committee Guidelines

Date 2006/05/12

Author Frank Warmerdam, Steve Lime

Contact warmerdam at pobox.com, sdlime at dnr.state.mn.us

Last Edited 2008/01/25

Status Adopted

Id \$Id\$

Summary

This document describes how the MapServer Project Steering Committee determines membership, and makes decisions on all aspects of the MapServer project - both technical and non-technical.

Examples of PSC management responsibilities:

- setting the overall development road map
- developing technical standards and policies (e.g. coding standards, file naming conventions, etc...)
- ensuring regular releases (major and maintenance) of MapServer software
- reviewing RFC for technical enhancements to the software
- project infrastructure (e.g. CVS/SVN, Bugzilla, hosting options, etc...)
- formalization of affiliation with external entities such as OSGeo
- setting project priorities, especially with respect to project sponsorship
- creation and oversight of specialized sub-committees (e.g. project infrastructure, training)

In brief the project team votes on proposals on mapserver-dev. Proposals are available for review for at least two days, and a single veto is sufficient delay progress though ultimately a majority of members can pass a proposal.

Detailed Process

- Proposals are written up and submitted on the mapserver-dev mailing list for discussion and voting, by any interested party, not just committee members.
- Proposals need to be available for review for at least two business days before a final decision can be made.
- Respondents may vote “+1” to indicate support for the proposal and a willingness to support implementation.
- Respondents may vote “-1” to veto a proposal, but must provide clear reasoning and alternate approaches to resolving the problem within the two days.
- A vote of -0 indicates mild disagreement, but has no effect. A 0 indicates no opinion. A +0 indicate mild support, but has no effect.
- Anyone may comment on proposals on the list, but only members of the Project Steering Committee’s votes will be counted.
- A proposal will be accepted if it receives +2 (including the author) and no vetoes (-1).
- If a proposal is vetoed, and it cannot be revised to satisfy all parties, then it can be resubmitted for an override vote in which a majority of all eligible voters indicating +1 is sufficient to pass it. Note that this is a majority of all committee members, not just those who actively vote.
- Upon completion of discussion and voting the author should announce whether they are proceeding (proposal accepted) or are withdrawing their proposal (vetoed).
- The Chair gets a vote.
- The Chair is responsible for keeping track of who is a member of the Project Steering Committee (perhaps as part of a PSC file in CVS).
- Addition and removal of members from the committee, as well as selection of a Chair should be handled as a proposal to the committee.
- The Chair adjudicates in cases of disputes about voting.

When is Vote Required?

- Any change to committee membership (new members, removing inactive members)
- Changes to project infrastructure (e.g. tool, location or substantive configuration)
- Anything that could cause backward compatibility issues.
- Adding substantial amounts of new code.
- Changing inter-subsystem APIs, or objects.
- Issues of procedure.
- When releases should take place.
- Anything dealing with relationships with external entities such as OSGeo
- Anything that might be controversial.

Observations

- The Chair is the ultimate adjudicator if things break down.
- The absolute majority rule can be used to override an obstructionist veto, but it is intended that in normal circumstances vetoers need to be convinced to withdraw their veto. We are trying to reach consensus.
- It is anticipated that separate “committees” will exist to manage conferences, documentation and web sites. That said, it is expected that the PSC will be the entity largely responsible for creating any such committees.

Committee Membership

The PSC is made up of individuals consisting of technical contributors (e.g. developers) and prominent members of the MapServer user community. There is no set number of members for the PSC although the initial desire is to set the membership at 9.

Adding Members

Any member of the mapserver-dev mailing list may nominate someone for committee membership at any time. Only existing PSC committee members may vote on new members. Nominees must receive a majority vote from existing members to be added to the PSC.

Stepping Down

If for any reason a PSC member is not able to fully participate then they certainly are free to step down. If a member is not active (e.g. no voting, no IRC or email participation) for a period of two months then the committee reserves the right to seek nominations to fill that position. Should that person become active again (hey, it happens) then they would certainly be welcome, but would require a nomination.

Membership Responsibilities

Guiding Development

Members should take an active role guiding the development of new features they feel passionate about. Once a change request has been accepted and given a green light to proceed does not mean the members are free of their obligation.

PSC members voting “+1” for a change request are expected to stay engaged and ensure the change is implemented and documented in a way that is most beneficial to users. Note that this applies not only to change requests that affect code, but also those that affect the web site, technical infrastructure, policies and standards.

IRC Meeting Attendance

PSC members are expected to participate in pre-scheduled IRC development meetings. If known in advance that a member cannot attend a meeting, the member should let the meeting organizer know via e-mail.

Mailing List Participation

PSC members are expected to be active on both the mapserver-users and mapserver-dev mailing lists, subject to open source mailing list etiquette. Non-developer members of the PSC are not expected to respond to coding level questions on the developer mailing list, however they are expected to provide their thoughts and opinions on user level requirements and compatibility issues when RFC discussions take place.

Bootstrapping

Prior to the TSC anointing itself the PSC this RFC must be distributed before the MapServer community via MapServer-Users for comment. Any and all substantive comments must be discussed (and hopefully, but not necessarily, addressed via MapServer-Dev).

All members of the existing Technical Steering Committee will form the initial Project Steering Committee. Steve Lime is declared initial Chair of the Project Steering Committee.

Initial members are:

- Steve Lime
- Daniel Morissette
- Frank Warmerdam
- Assefa Yewondwossen
- Howard Butler
- Steve Woodbridge
- Perry Nacionales

There are two open committee positions at the initial formation of the PSC.

Updates

29 May 2007

The following members were added to the PSC after discussion and consensus:

- Tom Kralidis
- Jeff McKenna
- Umberto Nicoletti
- Tamas Szekeres

30 March 2009

Thomas Bonfort was added to the PSC after discussion and consensus.

19 August 2011

Olivier Courtin was added to the PSC after RFC 70 was passed.

21 September 2011

Mike Smith was added to the PSC after a PSC vote.

16.9.25 MS RFC 25: Align MapServer pixel and extent models with OGC models

Date 2007/10/23

Author Steve Lime

Contact steve.lime at DNR.STATE.MN.US

Status Draft

Version

Id \$Id\$

Overview

At present MapServer uses different pixel and extent model than defined by OGC services such as WCS and WMS. MapServer uses the center of a pixel to represent its unique coordinate value. An extent is interpreted as the bounding box that runs from the center of the UL pixel in an image to the center of the LR pixel in an image. Why? Well, it goes back to companion software that existed along side MapServer to display satellite data stored in ERDAS that used the center to center extent model. The math is simple and there is a certain logic in having the extent actually represent pixel values - that is, if you render the extent as a polygon you get the exact edge of the image as one might expect.

On the other hand, OGC service specifications define an extent (BBOX) to refer to the dimensions of the outside edges of the image being requested. This appears to be a far more common means of expressing an area of interest.

I've not been able to ascertain where the coordinate of an individual pixel is located from various OGC specifications. MapServer "could" retain a center-based pixel model. That does add complexity to the map <=> image coordinate transformations since you have to offset things by one-half cellsize. Since that computation is done many times I would expect a performance hit. We could optimize things by computing and storing the one-half cellsize value once (as cellsize is now), but that complicates the C APIs and requires huge amounts of change. I propose moving to a upper-left-based pixel model to simplify these conversions.

Note: In looking at the code there were past efforts to go to the OGC extent in 4.8 and 4.10, but it was not universally applied. This RFC would ensure that the same extent and pixel model is in use throughout MapServer and that it is consistent with OGC.

model diagram: http://maps.dnr.state.mn.us/mapserver_docs/rfc25_extent.pdf

Technical Details

Affected files (relative to what is in main development trunk):

- map.h: change definition of MS_CELL_SIZE

```
#define MS_CELL_SIZE(min,max,d)      ((max - min)/d)
```

- map.h: change coordinate conversion macros (no change just add comments)

```
/*
** These macros work relative to the UL corner of the UL pixel of a map extent. Pixel
** model is (as of 5.0) the UL corner of a pixel. UL pixel = minx,maxy.
*/
#define MS_MAP2IMAGE_X(x,minx,cx) (MS_NINT((x - minx)/cx))
#define MS_MAP2IMAGE_Y(y,maxy,cy) (MS_NINT((maxy - y)/cy))
#define MS_IMAGE2MAP_X(x,minx,cx) (minx + cx*x)
#define MS_IMAGE2MAP_Y(y,maxy,cy) (maxy - cy*y)
```

- maputil.c: update msAdjustExtent()

```
ox = MS_MAX((width - (rect->maxx - rect->minx)/cellsize)/2,0);
oy = MS_MAX((height - (rect->maxy - rect->miny)/cellsize)/2,0);
```

- mapwcs.c: remove code to convert between MapServer extent and OWS extent
- mapwms.c: remove code to convert between MapServer extent and OWS extent
- mapwmsclient.c remove code to convert between MapServer extent and OWS extent
- various raster layer handlers: Need Frank's comments here.
- mapscript ...zoom functions: I don't believe these will need any change.

The affect of these changes on end-users should be minimal since it is unlikely they are aware of differences in extent interpretation. The larger impact may be on 3rd party applications like dBox, Chameleon and QGIS that manage extents and call MapServer. Efforts must be made to make those folks aware of the change.

Mapfile Implications

None, these are internal changes only.

MapScript Implications

None, these are internal changes only.

Documentation Implications

The models for a pixel and an extent need to documented in a couple of places: mapfile reference, the related OWS service how-to's and perhaps a new how-to pertaining to just this topic.

Test Plan

Need to develop some tests to somehow validate the math. The WCS interface or output drivers using GDAL are excellent candidates since they produce georeferenced output. Some testing has already been done to verify the existence of the issue (first discovered via WCS) and the proposed fix.

Mini-images (e.g. 7x7) can be used to verify rendering makes sense. For example, if you draw the extent as a polygon you would expect to see lines for the left and top edges, but not for the bottom and right. That is because the maxx,miny extent values won't represent a pixel in the output (rather the next tile to the right and/or below).

Staffing / Timeline

Changes to maputil.h, map.h, mapwcs.c and mapwms.c would be done by Steve Lime. Changes to other portions of MapServer would be coordinated with the various component owners. This RFC would be completed for the 5.0 release.

16.9.26 MS RFC 26: Version 5 Terminology Cleanup

Date 2007/04/21

Author Steve Lime, Havard Tveite

Contact steve.lime at dnr.state.mn.us, havard.tveite at umb.no

Last Edited \$Date\$

Status Implemented

Version MapServer 5.0

Id \$Id\$

MapServer terminology is mostly good and consistent, with a few exceptions. The two that generate the most confusion and TRANSPARENCY (layerObj) and various scale referencing parameters (e.g. MINSCALE).

Another change would be changing the symbolObj STYLE parameter to PATTERN instead. This would be simply to avoid confusion with the classObj STYLE.

The purpose of this proposal is to make MapServer even easier to use, removing confusion that can arise in cases of inconsistent terminology.

TRANSPARENCY

1. Overview

TRANSPARENCY is used in the MapServer mapfile layer object for what is in fact opacity (as is also pointed out in the current documentation).

2) Technical details To achieve more consistent terminology, the following should be done:

Changing the keyword TRANSPARENCY to OPACITY

The old mapfile layer keyword “TRANSPARENCY” will be deprecated, but shall be supported in future versions of MapServer as an alias for OPACITY.

The new mapfile layer keyword OPACITY should replace TRANSPARENCY. There will be no changes in type or semantics, only a change of keyword name.

The internal structure member name in the layerObj will change from transparency to opacity.

3. Mapfile Implications

The parser will have to support both OPACITY and TRANSPARENCY (for backward compatibility). The type will not change.

At debug level 1 a warning will be issued that the TRANSPARENCY parameter is deprecated and OPACITY should be used instead.

4. MapScript Implications

Since the layerObj will no longer contain a transparency member this will break old scripts. The fix will be evident.

5. Documentation Implications

Documentation should be updated, introducing OPACITY as a new layer keyword with documentation similar to the current transparency. The layer keyword TRANSPARENCY should be documented as deprecated. All other documentation that references TRANSPARENCY will have to be updated (simple search-replace with a manual check of all occurrences of the word transparency?)

SCALE

1. Overview

SCALE and MAXSCALE/MINSCALE is a case where MapServer terminology is not in line with mainstream map terminology.

In proper usage, scale is a representative fraction. The scale 1:50000 tells us that one meter on the map corresponds to 50000 meters in the “terrain”. 1:1000 (0.001) is a larger scale than 1:50000 (0.00002). The current use of MAXSCALE and MINSCALE is therefore not consistent with proper terminology.

2. Technical details

To achieve more consistent terminology, the following could be done with limited consequences:

Change all occurrences of “SCALE” in keywords to “ScaleDenom”.

MinScale 10000 Maxscale 1000000

will become:

MinScaleDenom 10000 MaxScaleDenom 1000000

This will apply to the following occurrences of SCALE in mapserver keywords:

Map object: SCALE -> ScaleDenom

Web object: MAXSCALE/MINSCALE

Layer object: MAXSCALE/MINSCALE LABELMAXSCALE/LABELMINSCALE SYMBOLSCALE

Class object: MAXSCALE/MINSCALE

3. Mapfile Implications

The parser would have to accept the new keywords. The old keywords will be unique prefixes of the new keywords, and could be accepted by the parser (in a transition period or for eternity).

At debug level 1 a warning will be issued that the ...SCALE parameter is deprecated and ...SCALEDENOM should be used instead.

4) MapScript Implications For all scale variables, scale should be changed to scaledenom (for consistency reasons). The type (double) will not change. Like opacity above this could break old scripts.

5. Template Implications

The [scale] substitution should be deprecated (but still supported) and [scaledenom] added.

6. CGI Implications

The scale CGI parameter would continue to be supported (e.g. users often define a map extent using a center point and a scale value). Scaledenom would also be supported.

7. Documentation Implications

All occurrences of scale keywords in the documentation will have to be changed to reflect the new names. The old style keywords could be included, but should be marked as deprecated.

PATTERN

1. Overview

Currently both the symbolObj and classObj contain STYLE parameters. The symbolObj style stores dash patterns used for line symbols. The name is derived from GD terminology. To avoid confusion with the classObj STYLE the symbolObj STYLE should be renamed to more concisely reflect it's purpose.

2. Technical details

In the symbolObj structure definition the member style will be renamed pattern. All references to the style in the code will also be updated.

3. Mapfile/symbol file Implications

The parser would have to accept the new keywords. The old keywords will be unique prefixes of the new keywords, and could be accepted by the parser (in a transition period or for eternity).

At debug level 1 a warning will be issued that the STYLE parameter is deprecated and PATTERN should be used instead.

4. MapScript Implications

As above the symbolObj structure would be altered and so MapScript scripts that set a symbol style programmaticaly would break. They would need to reference the patter parameter instead.

5. Template Implications

None

6. CGI Implications

None

7. Documentation Implications

The symbolObj reference guides would need to updated to reflect the name change.

16.9.27 MS RFC 27: Label Priority

Date 2007/05/22

Author Daniel Morissette

Contact dmorissette at mapgears.com

Last Edited 2007/06/29

Status Adopted (2007/05/25) - Implementation completed (2007/07/05)

Version MapServer 5.0

Id \$Id\$

Overview

MapServer 4.10 and older used a last in first out (LIFO) mechanism to plot labels on a map. This resulted in excessive use of ANNOTATION layers to make certain labels more prominent. This RFC introduces a new PRIORITY parameter on the LABEL object to control the order in which labels are rendered.

Technical Solution

PRIORITY is a new LABEL parameter that takes an integer value between 1 (lowest) and MS_MAX_LABEL_PRIORITY (highest). The default value is 1.

MS_MAX_LABEL_PRIORITY is defined and can be altered in map.h, its default value is 10.

The prioritization is handled by maintaining an array of MS_MAX_LABEL_PRIORITY cache lists in the label cache. When a label is added to the label cache, its priority index is used to decide in which cache list it should be added.

Then at rendering time, we loop through the cache lists, starting with the highest priority list.

Specifying an out of range PRIORITY value inside a map file will result in a parsing error. An out of range value set via MapScript or coming from a shape attribute will be clamped to the min/max values in msAddLabel().

There is no expected impact on performance for using label priorities.

Support for attribute binding

The PRIORITY parameter can also be bound to an attribute using the attribute bindings mechanism defined in RFC-19. This means two ways to set LABEL PRIORITY:

```
...
LABEL
  PRIORITY 5
...
END
...
or
...
LABEL
  PRIORITY [someattribute]
...
END
...
```

Modifications to the source code

- PRIORITY will be added to the LABEL object in map.h, in the mapfile parser/writer (mapfile.c) and in MapScript
- A MS_IS_VALID_LABEL_PRIORITY() macro will be defined to validate priority ranges in a consistent way everywhere.
- The label cache code (maplabel.c) will be modified to work with an array of MS_MAX_LABEL_PRIORITY cache lists instead of a single list
- The various msDrawLabelCacheXX() functions will be modified to replace the current loop on cache items with two nested loops: the outer loop will iterate on cache lists (from highest to lowest), and the inner loop will iterate on the cache items inside each list.
- msBindLayerToShape() will be updated to support binding PRIORITY to a shape attribute field.

MapScript Implications

The labelObj will have a new priority property of type integer.

Files affected

```
map.h
mapfile.c
maplabel.c
maputil.c
mapgd.c      (msDrawLabelCacheGD)
mapimagemap.c (msDrawLabelCacheIM)
mappdf.c     (msDrawLabelCachePDF)
mapsVG.c     (msDrawLabelCacheSVG)
mapsWF.c     (msDrawLabelCacheSWF)
mapagg.cpp    (msDrawLabelCacheAGG)
```

Backwards compatibility issues

None.

Bug ID

- 1619: <https://trac.osgeo.org/mapserver/ticket/1619>
- Bug 206 also made mention of label priority but has been closed as duplicate of 1619: <https://trac.osgeo.org/mapserver/ticket/206>

Voting history

Vote completed on 2007-05-25:

+1 from DanielM, SteveW, SteveL, YAssefa, UmbertoN and FrankW

Questions/Comments from the review period

- Q: Why use an array of cache lists instead of doing a quicksort on all cache entries?
A: Mainly for performance reason, but it was also pointed out that quicksort is not stable and could result in different orderings depending on the set of labels.

16.9.28 MS RFC 28: Redesign of LOG/DEBUG output mechanisms

Date 2007/06/14

Author Daniel Morissette

Contact dmorissette at mapgears.com

Last Edited 2007/08/24

Status Adopted (2007-06-29) - Implementation completed (2007/07/06)

Version MapServer 5.0

Id \$Id\$

Overview

MapServer 4.10 and older used to have multiple LOG/DEBUG output mechanisms that did not play well together. In order to improve the usability of the software this RFC proposes a new LOG/DEBUG output mechanism with more control on the output location (logfile or stderr) and that works under all supported web servers.

Inventory of existing mechanisms

MapServer 4.10 and older support the following LOG/DEBUG systems:

- LOG [filename] in the WEB object:

From the documentation: “File to log MapServer activity in. Must be writable by the user the web server is running as.”

More specifically, the function writeLog() in mapserv.c logs information about the mapserv CGI request results at the end of its execution. This option has no effect with MapScript.

- MS_ERRORFILE environment variable:

If set then all calls to msSetError() are logged to this file.

- msDebug() with DEBUG ON/OFF at the MAP and LAYER level:

There are msDebug() calls in various areas of the code that generate information that may be useful in tuning and troubleshooting apps. The DEBUG ON/OFF statements in the MAP and LAYER objects are used to enable/disable the msDebug() calls. The msDebug() mechanism is also disabled by default and enabled only by the -DENABLE_STDERR_DEBUG compile-time option. Users could benefit from easier access to this and more debug information.

The output of msDebug() is sent to stderr and cannot be redirected. In addition to not being very flexible, this is a problem under IIS where stderr output goes to stdout and the msDebug() output corrupt MapServer’s output.

Questions

- Q: Is the mapserv-specific LOG option really used by anyone? Do we need to maintain it, should we get rid of it, or perhaps extend it? At a minimum this option should be better documented to avoid confusion with the other mechanisms described in this RFC.

A: The LOG option will be left untouched by this RFC.

Technical Solution

We will essentially merge the MS_ERRORFILE and DEBUG/msDebug() mechanisms. The variable MS_ERRORFILE will specify the location of the output, with possible values being either a file path on disk, or one of “stderr” or “stdout”.

The current DEBUG ON/OFF mechanism that controls msDebug() output will also be extended to support multiple DEBUG levels.

In order to keep the implementation relatively simple and efficient, the output file handle will be kept open with a reference to it in a global variable in the context of the current request and will be closed only in msCleanup(). This means that if two mapfiles are loaded in the same request with different MS_ERRORFILE settings then errors/debug statements for both will go to the same file (and the output file will change when the second mapfile is read).

Note: the output file handle will be global in the context of the current request only and not global across threads, this will be done using the same mechanism currently used by msGetErrorObj() in maperror.c.

Setting MS_ERRORFILE

The variable MS_ERRORFILE will specify the location of the output, with possible values being either a file path on disk, or one of the following special values:

- “stderr” to send output to standard error. Under Apache stderr is the Apache error_log file. Under IIS stderr goes to stdout so its use is discouraged. With IIS it is recommended to direct output to a file on disk instead.
- “stdout” to send output to standard output, combined with the rest of MapServer’s output
- “windowsdebug” to send output to the Windows OutputDebugString API, allowing the use of external programs like SysInternals debugview to display the debug output.

It will be possible to specify MS_ERRORFILE either as an environment variable or via a CONFIG directive inside a mapfile:

```
CONFIG "MS_ERRORFILE" "/tmp/mapserver.log"
```

or

```
CONFIG "MS_ERRORFILE" "stderr"
```

If both the MS_ERRORFILE environment variable is set and a CONFIG MS_ERRORFILE is also set, then the CONFIG directive takes precedence.

If MS_ERRORFILE is not set then error/debug logging is disabled. During parsing of a mapfile, error/debug logging may become available only *after* the MS_ERRORFILE directive has been parsed.

DEBUG levels

The current DEBUG ON/OFF mechanism, at the layer and map level will be extended to support multiple debug levels as follows. The default is DEBUG OFF (Level 0):

- Level 0: Errors only (DEBUG OFF, or DEBUG 0)

In level 0, only mssetError() calls are logged to MS_ERRORFILE. No msDebug() output at all. This is the default and corresponds to the original behavior of MS_ERRORFILE in MapServer 4.x

- Level 1: Errors and Notices (DEBUG ON, or DEBUG 1)

Level 1 includes all output from Level 0 plus msDebug() warnings about common pitfalls, failed assertions or non-fatal error situations (e.g. missing or invalid values for some parameters, missing shapefiles in tileindex, timeout error from remote WMS/WFS servers, etc.)

- Level 2: Map Tuning (DEBUG 2)

Level 2 includes all output from Level 1 plus notices and timing information useful for tuning mapfiles and applications

- Level 3: Verbose Debug (DEBUG 3)

All of Level 2 plus some debug output useful in troubleshooting problems such as WMS connection URLs being called, database connection calls, etc.

- Level 4: Very Verbose Debug (DEBUG 4)

Level 3 plus even more details...

- Level 5: Very Very Verbose Debug (DEBUG 5)

Level 4 plus any msDebug() output that might be more useful to the developers than to the users.

The MS_DEBUGLEVEL environment variable

Debug level can also be set using the (optional) MS_DEBUGLEVEL environment variable.

When set, this value is used as the default debug level value for all map and layer objects as they are loaded by the mapfile parser. This option also sets the debug level for any msDebug() call located outside of the context of a map or layer object, for instance for debug statements relating to initialization before a map is loaded. If a DEBUG value is also specified in the mapfile in some map or layer objects then the local value (in the mapfile) takes precedence over the value of the environment variable.

This option is mostly useful when tuning applications by enabling timing/debug output before the map is loaded, to capture the full process initialization and map loading time, for instance.

MapScript Implications

No direct implication. Setting MS_ERRORFILE will enable debug output in MapScript as well.

Note that output to stderr or stdout may not work as expected in some scripting environments and we do not plan to make any special efforts to support those special cases as part of this RFC. However, logging to a file on disk will work with all MapScript flavours.

Files affected

```
map.h
mapfile.c
maperror.c
```

Several source files with msDebug() calls in them may also need to be edited to adjust the debug level at which the various msDebug() calls kick in.

Backwards compatibility issues

- The MapServer 4.x and older MS_ERRORFILE continues to work as before by default
- The DEBUG ON/OFF mechanism continues to work as before. However some msDebug() output from previous versions of MapServer may require a higher debug level in order to be enabled.

Bug ID

- 709: <https://trac.osgeo.org/mapserver/ticket/709>
- 1333: <https://trac.osgeo.org/mapserver/ticket/1333>
- 1783: <https://trac.osgeo.org/mapserver/ticket/1783>
- 2124: <http://trac.osgeo.org/mapserver/ticket/2124>

Voting history

Vote completed on 2007-06-29:

+1 from DanielM, TomK, FrankW, TamasS, JeffM, SteveL and AssefaY.

Questions/Comments from the review period

- Q: Can we catch the output of OGR/GDAL's CPLDebug calls, perhaps when the map-level debug level is ≥ 3 ?

A: Frank suggests that we keep this for a later phase.

16.9.29 MS RFC 29: Dynamic Charting Capability

Date 2007/06/15

Author Daniel Morissette

Contact dmorissette at mapgears.com

Last Edited 2007/07/31

Status Adopted (2007/07/05) - Completed (2007/07/09)

Version MapServer 5.0

Id \$Id\$

Overview

This RFC proposes the addition of simple dynamic charting capability in MapServer 5.0 by integrating the patch proposed by Thomas Bonfort in ticket #1800.

Note: this is already implemented and working (as a patch in ticket 1800). This RFC is to document the new feature and (hopefully) include it in the MapServer 5.0 release.

Technical Solution

A new CHART layer type is created and the initial implementation would support pie and bar charts.

PROCESSING directives are used to set the layer's CHART_TYPE (pie or bar) and CHART_SIZE,

Then we have one class for each pie slice or bar from the chart. Inside each class, the STYLE COLOR defines the color of the pie slice or bar, and the STYLE SIZE is used to set the relative size (value) of each pie slice or bar. This is mostly useful in combination with attribute binding of course. e.g.

Example:

```
LAYER
  NAME "Ages"
  TYPE CHART
  CONNECTIONTYPE postgis
  CONNECTION "blabla"
  DATA "the_geom from demo"
  PROCESSING "CHART_TYPE=pie"
  PROCESSING "CHART_SIZE=30"
  STATUS ON
  CLASS
    NAME "Population Age 0-19"
    STYLE
      SIZE [v1006]
      COLOR 255 244 237
    END
  END
  CLASS
```

```

NAME "Population Age 20-39"
STYLE
  SIZE [v1007]
  COLOR 255 217 191
END
END
CLASS
  NAME "Population Age 40-59"
  STYLE
    SIZE [v1008]
    COLOR 255 186 140
  END
END
END

```

In the example above, if for a given shape we have v1006=1000, v1007=600 and v1008=400 then the actual pie slices for each class will be respectively 50%, 30% and 20% of the total pie size. If we produced bar charts then the values would represent the relative height of the bars with the largest value (highest bar) being 100% of the chart height.

The following attachment to ticket 1800 contains a sample map produced by the layer definition above:

<https://trac.osgeo.org/mapserver/attachment/ticket/1800/chart-test.jpg>

The layer's legend behaves as usual and produces one color sample per class.

Issues and limitations

- The initial implementation supports only GD output formats. However Thomas Bonfort has offered to implement an AGG version once support for it is available. This is considered a future enhancement outside of the scope of this RFC. Update 2007/09/06: chart rendering is supported by the AGG renderer too.
- Should we use special keywords instead of PROCESSING parameters to specify the chart type and size?
- The values of each class are taken from the SIZE of the corresponding STYLE, which is semantically awkward (but that saves us from creating new keywords)

MapScript Implications

The new CHART type (constant) would be exposed via MapScript. There are no other MapScript implications.

Files affected

map.h	(new MS_LAYER_CHART constant)
mapfile.c	
maplexer.l	(new CHART keyword)
mapdraw.c	(hooks to call chart rendering code)
mapchart.c	(implementation of chart rendering)
maplegend.c	(add case for chart layer type)
Makefile.in	(addition of mapchart.o)
makefile.vc	(addition of mapchart.obj)

Note:

The patch from ticket 1800 also contains changes to mappostgis.c and mapmygis.c to treat layer type CHART the same way as POLYGON but I'm not exactly sure why or if the same needs to be done for other data sources. This will need further review before being released.

Backwards compatibility issues

None. This is a new feature.

Bug ID

- 1800: <https://trac.osgeo.org/mapserver/ticket/1800>

Future enhancements:

- 2136: <https://trac.osgeo.org/mapserver/ticket/2136>
- 2145: <https://trac.osgeo.org/mapserver/ticket/2145>

Documentation

- <http://mapserver.gis.umn.edu/docs/howto/dynamic-charting>

Voting history

Vote completed on 2007/07/05:

+1 from DanielM, SteveW, AssefaY

Questions/Comments from the review period

- Q: Does this assume a POLYGON data type input only? Can LINE and POINT data sources also be supported?

A: The current implementation works only for polygon data sources. I could extend it to work on point data sources as well fairly easily I think.

I'm not sure about line data sources though. I guess we could do like we do for ANNOTATION layers and use msPolylineLabelPoint() to determine the location of the chart.

Ticket #2145 has been opened to track this enhancement: <https://trac.osgeo.org/mapserver/ticket/2145>

- Q: Could we support attribute binding in CHART_SIZE = [size]? This would allow you to show the relative size of hits at a point and have the chart show the percentage contributions in the wedges.

A: While this would be a nice feature, we will keep it as a potential enhancement for a future release. See ticket #2136: <https://trac.osgeo.org/mapserver/ticket/2136>

16.9.30 MS RFC 30: Support for WMS 1.3.0

Date 2007/06/15

Author Daniel Morissette

Contact dmorissette at mapgears.com

Author Yewondwossen Assefa

Contact yassefa at dmsolutions.ca

Last Edited 2009/02/11

Status Draft

Version MapServer 5.4

Id \$Id\$

Overview

This RFC documents the changes required in order to upgrade MapServer's OGC WMS support to version 1.3.0 of the specification.

MapServer already includes mechanisms to support multiple WMS versions (and already supports WMS versions 1.0.0, 1.1.0 and 1.1.1) so in theory this upgrade should be straightforward and shouldn't require a RFC. Unfortunately, WMS 1.3.0 contains some tricky changes that while they are not exactly backwards incompatible are likely to make the life of users of WMS miserable.

This RFC is mostly to document those changes and the way MapServer deals with them.

Coordinate Systems and Axis Orientation

The main issue introduced by WMS 1.3.0 is the change in the way it handles axis order for several SRS. This has an impact on the way the BBOX is specified in WMS requests and in Capabilities documents and in how the CONNECTIONTYPE WMS code interacts with remote servers.

In previous versions of WMS, for any SRS the first axis was the easting (x or lon) and the second axis was the northing (y or lat). Starting with WMS 1.3.0, some SRS such as the very popular EPSG:4326 have their axis reversed and the axis order becomes lon, lat instead of lat, lon. This change in WMS 1.3.0 was done in order to align with the definitions from the EPSG database (a requirement to make WMS an ISO specification).

This change is sure to confuse simple clients that used to treat all SRS the same way. MapServer and PROJ will need to be extended to carry information about the axis order of all EPSG SRS codes and treat them using the correct axis order.

New CRS codes such as CRS:xxxx and AUTO2:xxxx have also been added by WMS 1.3.0 that will need to be supported by MapServer. Note the two types of Layer CRS identifiers are supported by the specification: "label" and "URL" identifiers. The intention is to support at this point the label types CRS.

List of CRS planned to be supported are:

- CRS:84 (WGS 84 longitude-latitude)
- CRS:83 (NAD83 longitude-latitude)
- CRS:27 (NAD27 longitude-latitude).
- AUTO2:42001 AUTO2:42002 AUTO2:42003 AUTO2:42004 AUTO2:42005

CRS:1 (pixel coordinates) would not be supported at this point (there is a ticket discussing this issue <http://trac.osgeo.org/mapserver/ticket/485>)

EPSG codes: when advertising (such as BoundingBox for a layer element) or using a CRS element in a request such as GetMap/GetFeatureInfo, elements using epsg code >=4000 and <5000 will be assumed to have a reverse axes.

All the above need to be done in a way that allows continued support for older versions of the WMS specification (1.0.0 to 1.1.1) and will have the least impact on existing WMS services.

Implementation for the reverse axis will follow closely to what was already done for WCS1.1 support (<http://mapserver.org/development/rfc/ms-rfc-41.html>)

WMS and SLD

All references to SLD support has been removed from the WMS 1.3.0 specifications. It has been replaced by two specifications:

- Styled Layer Descriptor profile of the Web Map Service
- Symbology Encoding Implementation Specification

The Styled Layer Descriptor profile allows:

- to extend the WMS to support additional operations (DescribeLayer, GetLegendGraphic)
- additional parameters related to the SLD for the GetMap support
- advertise SLD support.

This specification will be supported in the current implementation. Note that the GetStyles operation (available in WMS 1.1.1) might not be supported in the first phase

The Symbology Encoding Implementation represent basically the definitions for the different symbolizers. We need to upgrade the current SLD support to support this specification.

HTTP Post support

HTTP Post support is optional and currently supported by MapServer WMS 1.1.1. WMS 1.3.0 defines that if POST is supported, the the request message is formulated as an XML document. Although this is highly desirable, the first implemenation of the WMS 1.3.0 might not support the XML Post requests.

OCG compliance tests

The OGC Compliance and Interoperability Testing Initiative (CITE) http://cite.opengeospatial.org/test_engine/wms/1.3.0/ provides automatic tests to validate the implementation. The short term intention is to use this service as a first validation tool. The longer term goal is to have MapServer WMS 1.3.0 fully compliant.

Other Notes

- GetCapabilities advertises only the text/xml format. During a request we do not parse the optional Format paramater. It is always set to text/xml

MapScript Implications

None. This affects only the WMS server interface and WMS CONNECTION type.

Files affected

```
mapwms.c  
mapwmslayer.c  
mapfile.c  
mapows.c/h  
mapogcsld.c
```

Backwards compatibility issues

- The change in the way the axis order is handled is likely to cause lots of confusion.

Bug ID

- 473: <http://trac.osgeo.org/mapserver/ticket/473>

Voting history

Passed with +1 from: TomK, Woodbridge, Assefa, Morissette

Questions/Comments from the review period

- Q: Can libxml2 be used to generate XML responses to continue the work started in mapowscommon.c?
A: I'll keep libxml2 in mind during the implementation, but I do not plan to refactor and risk breaking any code to convert it to libxml2 as part of this upgrade.
Since WMS 1.3.0 doesn't implement OWS common, it won't benefit from any of the code that's already using libxml2. It will actually mostly reuse existing printf-based code that's already well tested and working. I think the right time to switch to libxml2 for WMS would be when it will support OWS common and then there will be real benefits by reusing functions from mapowscommon.c.

16.9.31 MS RFC 31: Loading MapServer Objects from Strings

Date 2007/06/19

Author Steve Lime

Contact Steve.Lime at DNR.State.MN.US

Version 5.0

Status Accepted (2007/06/22) Implemented

Id \$Id\$

Description: This RFC addresses the ability of the MapServer tokenizer (in maplexer.l and mapfile.c) to work from strings as well as files. A mapfile-wide ability was added to 5.0 source and this RFC looks at loading MapServer objects (layers, scalebars, etc...) via MapScript and via URLs.

Current State

Presently MapServer can load entire mapfile's from a text block using msLoadMapFromString. This is a new capability in 5.0. MapServer has long been able to load/modify individual values via URL using a map_object_property syntax (e.g. map_scalebar_units).

The problem with the URL support is that it is cumbersome for the user and results in a ton of duplicative code in mapfile.c making maintenance difficult. Developers will often add a parameter but forget to add a URL equivalent. This proposal removes that redundant code and relies on a single tokenizing function for each object.

C API Changes

All major objects would get a new ...LoadFromString function (e.g. msLoadLayerFromString and so on). These functions would be very simple and would take an existing reference to an object and a string snippet. They would:

1. establish lexer thread locks
2. set lexer state to MS_TOKENIZE_STRING
3. call loadObject (e.g. loadLayer)

In effect this would be a way to load an empty object or update a new one.

The loadObject functions would need minor changes:

1. Each function would need to remove restrictions for duplicate properties. That is setting a parameter twice should not generate an error as is does now.
2. Properties with allocated memory (e.g. char *) should be free'd if they already have values and are being updated.
3. the object main keyword (e.g. LAYER or CLASS) should be allowed as a token within that object loader. When parsing a file the object identifier (e.g. LAYER) is stripped off with the parent object. For example, a CLASS is recognized by loadLayer so that token never is encountered by loadClass. It makes the most sense to pass entire object definitions including the object identifier for ease of use.

MapScript

I'm open to suggestions but I think the easiest thing to do would be to add an updateFromString method to all major objects. It would simply take a string snippet and would wrap the ...LoadFromString methods mentioned above. They would return MS_SUCCESS or MS_FAILURE. Might consider adding a "clear" method to (freeObject then initObject) so that users could clean things out and reload from a string. I'm not sure about the effects on reference counting here.

URL

I propose removing all the loadObjectValue (e.g. loadLayerValue) functions in favor of entire object loading. So, instead of doing something like:

```
...map_scalebar_units=meters&map_scalebar_intervals=5&map_scalebar_size=300+2...
```

You would do:

```
...map_scalebar=UNITS+METERS+INTERVALS+5+SIZE+300+2...
```

The major objects would still be referenced by map_scalebar or map_legend or map_layername, but all other properties would be loaded through snippets.

The function msLoadMapParameter would become msUpdateMapFromURL and it would set the lexer state, acquire a thread lock and then call the appropriate loadObject function.

One issue is that the loadObject functions have traditionally worked just from files so there are no limitations on what can be altered. Obviously from a URL you can't allow just anything to be altered (e.g. CONNECTION, DUMP and so on). So, we would create a new lexer state, MS_TOKENIZE_URL, that would only recognize the parameters that we want. In that state the lexer would not return tokens like DUMP or CONNECTION so the loadObject functions would not handle those cases. This is a simple addition to the lexer. Any parameter exposed to URL modification will have the relevant loading block examined so that there are no memory leaks or buffer overflow possibilities.

In addition, it was pointed out that URL configuration should not be a default behavior but should be enabled explicitly. Enabling this feature would happen by way of a new parameter within the webObj- URLCONFIG [pattern], with a

default of NULL. The pattern would be a regular expression that would be applied against any map_* variables. So, one could limit changes to just the scalebar object with URLCONFIG ‘scalebar’ or allow more with URLCONFIG ‘’. The default would not to be allow any URL configuration.

Backwards Compatibility

The URL change will break backwards compatibility but I feel this is a relatively lightly used option and this change will be very beneficial.

Post Implementation Notes

Apparently a number of folks are having trouble with porting applications to use the new url configuration. Below are more examples and lists of supported keywords by object type. Rule of thumb one: when there is the opportunity for more than one of a particular object (e.g. layers, classes and styles) the syntax must uniquely identify the object in question in the variable name (e.g. map.layer[lakes]) and then the mapfile snippet to modify the object is given as the variable value. We have no way to modify 5 styles at once because the mapfile syntax is so freeform. Rule of thumb two: any parameters or objects that hang off the mapObj must be referenced in the variable name (e.g. map.imagetype).

Example 1, changing a scalebar object:

```
...&map.scalebar=UNITS+MILES+COLOR+121+121+121+SIZE+300+2&...
```

Example 2, changing a presentation style:

```
...&map.layer[lakes].class[0].style[0]=SYMBOL+crosshatch+COLOR+151+51+151+SIZE+15&...
```

Example 3, creating a new feature:

```
...&map_layer[3]=FEATURE+POINTS+500000+1000000+END+TEXT+'A+test+point'+END&...
```

Changeable objects/keywords by object type.

mapObj (example - ...&map.angle=50&map.imagecolor=255+0+0&...)

```
angle,config,extent,imagecolor,imagetype,layer,legend,projection,querymap,reference,resolution,
scalebar,size,shapepath,transparent,units,web
```

layerObj (example - ...&map.layer[lakes].data=myTempShapefile&...)

```
class,data (subject to DATAPATTERN validation),feature,footer (subject to TEMPLATEPATTERN
validation),header (subject to TEMPLATEPATTERN validation),labelitem,opacity,projection,status,
template (subject to TEMPLATEPATTERN validation),tolerance,units
```

classObj (example - ...&map.layer[lakes].class[0].style[1]=COLOR+255+0+0...)

```
color,label,outlinecolor,overlaycolor,overlayoutlinecolor,overlaysize,overlaysymbolsize,size,
status,style,symbol,text (note that setting of color etc... should really be done through
a styleObj and not the class shortcuts)
```

labelObj (example - ...&map.scalebar=LABEL+COLOR+255+0+0+SIZE+15+END)

```
angle,antialias,backgroundcolor,backgroundshadowcolor,backgroundshadowsize,color,font,
outlinecolor,position,shadowcolor,shadowsize,size
```

styleObj (example - ...&map.layer[lakes].class[0].style[0]=COLOR+255+0+0+ANGLE+50+SIZE+30...)

```
angle,backgroundcolor,color,outlinecolor,size,symbol,width  
featureObj(example - ...&map_layer[3]=FEATURE+POINTS+500000+1000000+END+TEXT+'A+test+point'+END&...)  
points,text,wkt  
More to come...
```

Bug IDs

<http://trac.osgeo.org/mapserver/ticket/2143>

Voting history

+1 from SteveL, SteveW, TomK, FrankW, AssefaY, PericlesN
+0 from JeffM

16.9.32 MS RFC 32: Support for Anti-Grain Geometry (AGG) Rendering Engine

Date 2007/07/09

Author Steve Lime, John Novak

Contact Steve.Lime at DNR.State.MN.US

Status Pending

Id \$Id\$

Overview

Presently MapServer supports GD (www.libgd.org) as its primary raster rendering backend. While GD is sufficient in many instances it is not capable of high quality output especially with regards to anti-aliased line work. MapServer does support pseudo anti-aliased wide lines using variable opacity “fuzzy” buffers, but the results are not as good as they could be.

AGG has emerged as one of the premier software-only rendering solutions and it holds the promise of superior output quality with little or no apparent loss in performance. In fact, AGG may well be faster than GD in some instances even with the higher quality output.

That said, we are still heavily vested in GD for many things. Text positioning and raster rendering in particular use GD functions directly. On the other hand, AGG does not have built in functions to read or write popular graphics formats such as GIF, JPEG or PNG. It makes sense then to consider a hybrid solution wherein we can take advantage of aspects of GD that make sense such as buffer management and I/O capabilities, and let AGG worry about rendering features. That’s exactly what is proposed- AGG rendering into a GD managed image buffer. A secondary benefit is that AGG functionality can be added incrementally as time and resources permit. For example, since an AGG imageObj is really just a gdImagePtr we can use current code that renders to a GD image along side any AGG routines.

Note: See [AGG Rendering Specifics](#) for more information.

Technical Solution

The goal of this initial implementation is to be able to render the symbol and style definitions the same way as GD does. That is, the AGG renderer should produce output similar to GD but of a higher quality. No attempts are made at this stage to introduce rendering capabilities specific to AGG unless otherwise noted. As a result no additions to the MapServer symbolObj or styleObj are necessary at this point.

For the most part, the AGG renderer can ingest processed shapeObj's, styleObj's and symbolObj's just as GD. That said, since AGG uses sub-pixel computations to render features it does not want feature coordinates rounded to integer values, so a special AGG-only map to image coordinate conversion function msTransformShapeAGG. Note, that it may be that GD could also make use of the non-rounded features and could just cast the doubles to ints when passing x's and y's to GD (in fact the code already does this), but further testing will be necessary.

C API Changes

In reality adding a new renderer has little or no effect on the MapServer core. The following files are to be modified to add AGG specific processing blocks that are basically straight copies of GD support:

- mapdraw.c
- mapdrawgdal.c
- maperror.c
- maplegend.c
- mapoutput.c
- mapraster.c
- mapresample.c
- maputil.c

No new functionality is added to these files, rather just else-if blocks.

The bulk of the AGG functionality can be found in a new source file, mapagg.cpp. For better or worse it mimics the rendering API found in mapgd.c. So, for example msDrawLineSymbolGD has a counter part in msDrawLineSymbolAGG. Various helper functions/methods can also be found in that file.

MapScript

No changes.

Mapfiles

An output block like this will trigger AGG rendering:

```
OUTPUTFORMAT
  NAME 'AGG_PNG24'
  DRIVER AGG/PNG
  IMAGEMODE RGB
END
```

Issues and Caveats

- The AGG driver only supports RGB output at this time. A fundamental difference in how GD and AGG interpret alpha channel values (GD is backwards) means that AGG cannot write to a GD alpha channel and have the output interpreted correctly. This really shouldn't be a deal breaker though since vector rendering in MapServer does not write to the alpha channel except when dealing with layer transparency, otherwise alpha blending occurs. In addition, GD is back under active development and there are plans to define a proper RGBA buffer.
- Text and raster layers are drawn using GD. While text placement could certainly benefit from sub-pixel placement there are not enough resources to complete that support at this time. Hopefully it can be addressed soon. Raster layer rendering doesn't appear to benefit from AGG and will remain a GD function at this time.
- The following symbol, style combinations do not work under AGG: TODO
- The AGG license was changed between versions 2.4 (BSD style) and 2.5 (GPL) (<http://www.antigrain.com/license/index.html>). MapServer should use version 2.4 of the library until all implications of this change are clarified.

Bug ID

None assigned

Voting history

None

16.9.33 MS RFC 33: Removing msLayerWhichItems() from maplayer.c

Date 2007/07/09

Author Steve Lime

Contact steve.lime at dnr.state.mn.us

Last Edited 2007/07/09

Status draft

Version MapServer 5.0

Id \$Id\$

Overview

The function msLayerWhichItems() is a function in maplayer.c that determines exactly which feature attributes need to be retrieved from a given data source. All item-based properties (e.g. CLASSITEM, bound properties, EXPRESSIONs, etc...) are checked and a master list (an array) is compiled. At the same time index references are made (e.g. classitemindex, labelitemindex, etc...). The item indexes are used instead of names to access attribute values at runtime.

The problem with this method is that a feature (a shapeObj) used for drawing or the first pass of a query is not the same as that used for presentation (the second pass of a query). The second pass of a query uses msLayerGetShape() which by default requests all attributes of a feature since we don't know ahead of time which attributes might be output.

By removing msLayerWhichItems() and always retrieving all attributes a feature is a feature whether drawing, querying or outputing via a template so caching features now becomes practical.

Technical Solution

As mentioned earlier msLayerWhichItems() does a couple of things. Some of these functions would need to be retained somehow and are described below.

1. Layer items array: this array normally would be populated by the msLayerWhichItems() call. Instead it should be populated as a layer is opened in msLayerOpen. (makes sense?)
2. Index references: linking a attribute name to an index value would have to happen during the course of rendering or querying instead of ahead of time. Basically code that uses attributes would have to first check if the parameter is not NULL, and then if the index reference is not set it would have to call a function like that shown below. While this affects a good number of places in the code base the change is relatively minor. The use of attribute binding isolates much of this code so this change is smaller for version 5.0 that it otherwise would have been.

```
int msGetItemIndex(char **itemlist, int numitems, char *item) {
    int i;

    if (!itemlist || numitems <= 0 || !item) return -1;

    for (i=0; i<numitems; i++)
        if(strcasecmp(itemlist[i], item)) return i;

    return -1; /* failure */
}
```

3. Logical expression handling: expressions maintain their own individual list of items to process so like 2 above this list would have to be created during processing. The code to do this exists as part of msLayerWhichItems() and would be retained under some other name.

Note: this RFC does not address single pass queries, but rather sets the stage for them. Subsequent drawing, query and template output processes would remain unaltered.

General C API Changes

maplayer.c - msLayerWhichItems() goes away. msLayerOpen() now sets the layer->items array.

maputil.c - Binding functions now must assign index references when executed. Same goes for the functions to assign a classObj to a feature.

mapdraw.c - Layeritemindex and classitemindex must now be dynamically assigned values.

Input Driver Changes

It is unclear how each driver made use of the output of msLayerWhichItems(). It may be as easy as calling msLayerGetItems() instead of using msLayerGetItemInfo() in msLayerOpen() in which case we'd loose the msLayerGetItemInfo() function for each driver too (and the main wrapper function). TODO...

mapshape.c - mapsde.c - mapogr.cpp - mappostgis.c - maporaclespatial.c - mapmygis.c -

MapScript

No changes.

Mapfiles

No changes anticipated.

Backwards Compatibility Issues

None. This is a new feature.

Bug ID

None assigned.

Voting History

None

16.9.34 MS RFC 34: MapServer Release Manager and Release Process

Date 2007/07/13

Author Daniel Morissette

Contact dmorissette at mapgears.com

Last Edited 2007/07/19

Status Adopted (2007/07/19)

Id \$Id\$

Overview

This RFC documents the MapServer Release Manager role and the phases of MapServer's Release Process.

The MapServer Release Manager Role

For every release of MapServer, the PSC elects a release manager (this is usually done with a motion and vote on the mapserver-dev list).

The overall role of the release manager is to coordinate the efforts of the developers, testers, documentation and other contributors to lead to a release of the best possible quality within the scheduled timeframe.

The PSC delegates to the release manager the responsibility and authority to make certain final decisions for a release, including:

- Approving or not the release of each beta, release candidate and final release
- Approving or rejecting non-trivial bug fixes or changes after the feature freeze
- Maintaining the release schedule (timeline) and making changes as required

When in doubt or for tough decisions (e.g. pushing the release date by several weeks) the release manager is free to ask the PSC to vote in support of some decisions, but this is not a requirement for the areas of responsibility above.

The release manager's role also includes the following tasks:

- Setup and maintain the Release Plan section of the website for this release
- Coordinate with the developers team
- Coordinate with the QA/testers team
- Coordinate with the docs/website team
- Keep track of progress via Trac (make use of Trac milestones and ensure tickets are properly targeted, push some tickets to a later release if required, etc.)
- Organize regular IRC meetings (including agenda and minutes)
- Tag source code in SVN for each beta, RC and release
- Branch source code in SVN after the final release (trunk becomes the next dev version)
- Update map.h and HISTORY.TXT for each beta/RC/release
- Package source code distribution for each beta/RC/release
- Update appropriate website/download page for each beta/RC/release
- Make announcements on mapserver-users and mapserver-announce for each release
- Produce/coordinate bugfix releases as needed during the 6 months period that follows the final release (i.e. until the next release)

Any of the above tasks can be delegated but they still remain the ultimate responsibility of the release manager.

The MapServer Release Process

(Credit: Inspired by the Plone release process at <http://plone.org/documentation/manual/plone-developer-reference/overview/release-process>)

MapServer uses a time-based release cycle, trying to aim for one release every 6 months.

The normal development process of a MapServer release consists of various phases.

- Development phase

The development phase usually lasts around 4 months. New features are proposed via RFCs voted by the MapServer PSC.

- RFC freeze date

For each release there is a certain date by which all new feature proposals (RFCs) must have been submitted for review. After this date no features will be accepted anymore for this particular release.

- Feature freeze date / Beta releases

By this date all features must have been completed and all code has to be integrated. Only non-invasive changes, user interface work and bug fixes are done now. We usually plan for 3-4 betas and a couple of release candidates over a 6 weeks period before the final release.

- Release Candidate

Ideally, the last beta that was bug free. No changes to the code. Should not require any migration steps apart from the ones required in the betas. If any problems are found and fixed, a new release candidate is issued.

- Final release / Expected release date

Normally the last release candidate that was issued without any show-stopper bugs.

- Bug fix releases

No software is perfect. Once a sufficient large or critical number of bugs have been found for a certain release, the release manager releases a new bug fix release a.k.a. third-dot release (for example 4.10.2).

MapServer Version Numbering

MapServer's version numbering scheme is very similar to Linux's. For example, a MapServer version number of 4.2.5 can be decoded as such:

- 4: Major version number.

We release a major version every two to three years. The major version number usually changes when significant new features are added or when major architectural changes or backwards incompatibilities are introduced.

- 2: Minor version number.

Increments in minor version number almost always relate to additions in functionality and correspond to the 6 months release process described in this RFC.

MapServer uses the same even/odd minor version number scheme as Linux. Even minor version numbers (0..2..4..6) relate to release versions, and odd minor versions (1..3..5..7) correspond to developmental versions. For instance development version 4.1 was released as version 4.2.0, there was never any formal release of 4.1.

- 5: Revision number.

Revisions are bug fixes only. No new functionality is provided in revisions.

Voting history

Vote completed on 2007/07/19.

+1 from DanielM, SteveL, SteveW, FrankW, TamasS, AssefaY, JeffM, PericlesN, UmbertoN and HowardB.

16.9.35 MS RFC 35: Standards Compliance Enforcement

Date 2007/10/16

Author Frank Warmerdam, Daniel Morissette

Contact warmerdam at pobox.com, dmorissette at mapgears.com

Last Edited 2007/12/07

Status Withdrawn (2007/12/07)

Id \$Id\$

Overview

This RFC introduces a mechanism to tell mapserver to enforce OGC standards compliance, or alternatively to be permissive. MapServer should continue to implement the standards as closely as possible, but it has been found that in some cases strict compliance reduces interoperability instead of increasing it.

One example of this is the requirement for the STYLES parameter in WMS GetMap requests which has been enforced in MapServer 5.0.0. Enforcing this requirement effectively prevented a number of WMS client implementations from connecting to MapServer because they did not include the required STYLES parameter in their GetMap request. This RFC also details short term adjustments to handling of the STYLE= required parameter in MapServer 5.

OWS_COMPLIANCE METADATA

This will be achieved by introducing a new MAP level metadata item named “ows_compliance” with the possible values “pedantic” and “permissive”, with the default being “permissive” if not specified. Variations for specific protocols will also be supported in the usual fashion for OWS metadata (ie. wms_compliance, wfs_compliance, wcs_compliance, sos_compliance).

If this keyword value is “permissive”, then when practical and unambiguous MapServer may attempt to be forgiving of missing or otherwise non-compliant requests and input in the interest of increasing MapServer’s usability in real life interoperability scenarios. This may include things such as allowing protocol parameters to be omitted in requests that are required by the OGC specifications, allowing services to operate even if metadata is missing from the mapfile to fill required fields in capabilities.

If this keyword value is “pedantic”, then to the extent practical MapServer will attempt to generate an error if it’s input (WxS protocol requests, mapfile incomplete, etc) is not in full compliance with the requirements of the OGC specifications.

It is foreseen that users wishing to encourage good standards compliance behavior in clients, and to ensure they don’t accidentally put up web services with incomplete metadata will use the “pedantic” mode. It is anticipated that “pedantic” mode will also be used when MapServer is run through OGC CITE and similar test suites.

It is foreseen that “permissive” mode will be used by those wishing to ensure their service is accessible by the broadest set of possible clients, even if they are not strictly operating to the standards.

Developers should keep in mind that adding more exceptions in the permissive mode should not be taken lightly as this encourages misuse of the specs and bloats the code with unnecessary exceptions.

msOWSLookupMetadata()

In actual code, the compliance keyword might be tested using msOWSLookupMetadata() in a manner similar to this:

```
if (stylesfound == 0 && sldfound == 0)
{
    if( strcasecmp(msOWSLookupMetadata(&(map->metadata), "MO", "compliance"),
                   "pedantic") == 0 ) {
        msSetError(MS_WMSERR, "Missing required parameter STYLES",
                   "msWMSLoadGetMapParams()");
        return msWMSException(map, nVersion, "MissingParameterValue");
    } else {
        msDebug( "WMS request missing STYLES parameter, permissively ignoring." );
    }
}
```

MapServer 5.0.1

For MapServer 5.0.1 the only change anticipated to be made in the code is the above example, requiring the STYLES parameter only in pedantic mode.

If other standards enforcement issues are discovered to be unnecessarily interfering with use of MapServer in real life interoperability they may also be changed in 5.0.x to be based off this keyword.

MapServer 5.1

In MapServer 5.1, and the future, if other standards enforcement issues are discovered to be unnecessarily interfering with use of MapServer in real life interoperability scenarios they may also be changed to be based off this keyword.

Once again, developers should keep in mind that adding more exceptions in the permissive mode should not be taken lightly as this encourages misuse of the specs and bloats the code with unnecessary exceptions.

As part of implementation of this RFC the authors will review all “WARNING:” entries emitted in capabilities documents in places like mapwms.c to see if they ought to be turned into fatal errors when operating in “pedantic” mode.

Documentation

The ows_compliance keyword will be added to the MapServer 5 reference documentation.

Implementation

The described changes will be made in MapServer 5.0 and MapServer 5.1 by Frank Warmerdam and/or Daniel Morissette with the MapServer 5.0 changes in time for a 5.0.1 release. It is hoped that all OWS service developers will apply the permissive/pedantic tests in OWS services in the future as required and as issues come up.

MapScript

No changes are anticipated in mapscript as it already has metadata setting methods.

Backwards Compatibility Issues

Implementation of this feature should restore backward compatible default behavior in MapServer 5 with MapServer 4.x. No other compatibility issues are anticipated.

Bug ID

<http://trac.osgeo.org/mapserver/ticket/2427>

Voting History

There was a first vote around 2007/11/08 which was veto'd... and after further discussion the RFC has been withdrawn in favor of simply restoring the behavior of MapServer 4.10 with respect to the STYLES= parameter (i.e. make it optional again). See ticket #2427 about this.

16.9.36 MS RFC 36: Simplified template support for query output

Date 2007/10/23

Author Steve Lime

Contact steve.lime at dnr.state.mn.us

Last Edited 2007/10/23

Status Development

Id \$Id\$

Overview

Problem:

1. Currently a driver like GML isn't available to the CGI as a means of presenting query results
2. The templating scheme (HEADER/TEMPLATE/FOOTER) for queries isn't user friendly nor is it ammenable to multple presentation formats. That is, one layer => one template set

Solution:

1. Use output format objects to define formats that can be used to output query results in addition to drawing images. For example:

```
OUTPUTFORMAT
  NAME 'gml3'
  DRIVER GML3
  MIMETYPE 'text/xml; subtype=gml/3.2.1'
END
```

Might need to extend that object to discriminate between map rendering and query formatters but that can happen in mapdraw.c and mapserv.c too. That is, drivers are explicitly referenced in those places so if someone tries to draw a map with a GML3 driver it would throw an error.

2. Use the webObj QUERYFORMAT property to reference formats: 'QUERYFORMAT gml3'. Right now that property carries a mime-type but it could be used to reference a format too.
3. Also allow applicable modes (i.e. WFS, WMS, SOS), to utilize DRIVER/TEMPLATE type formats (i.e. advertise in GetCapabilities responses, support through API [e.g. request=GetFeature&outputFormat=text/xml; subtype=gml/3.2.1]), mapped from OUTPUTFORMAT/MIMETYPE. Presently the WCS driver requires the developer to explicitly define supported output formats, other services could do the same and could reference templated output.
4. Define a TEMPLATE driver. Basically this would just invoke the normal query templating scheme. For example:

```
OUTPUTFORMAT
  NAME 'kml'
  DRIVER TEMPLATE
  MIMETYPE 'application/vnd.google-earth.kml+xml'
  TEMPLATE 'myTemplate.kml'
END
```

```
OUTPUTFORMAT
  NAME 'geojson'
  DRIVER TEMPLATE
  MIMETYPE 'application/json; subtype=geojson'
  TEMPLATE 'myTemplate.js'
END
```

5. Note that in the above examples we reference a file, so I'm thinking of supporting a single template system for queries in addition to the current mechanism. To do this I'd propose 4 new template tags: [resultset], [feature], [join] (for one-to-many joins), and [include] (to support code sharing between templates). All but the include tag would be blocks. An example might be:

```
[include src="templates/header.html"]
[resultset name=lakes]
  ... old layer HEADER stuff goes here, if a layer has no results this block disappears...
  [feature]
    ...repeat this block for each feature in the result set...
  [join name=join1]
    ...repeat this block for each joined row...
```

```
[/join]
[/feature]
...old layer FOOTER stuff goes here...
[/resultset]
[resulset name=streams]
... old layer HEADER stuff goes here, if a layer has no results this block disappears...
[feature]
    ...repeat this block for each feature in the result set...
[/feature]
...old layer FOOTER stuff goes here...
[/resultset]
[include src="templates/footer.html"]
```

A specific GML3 example might be:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
[resultSet layer=mums]
<MapServerUserMeetings xmlns="http://localhost/ms_ogc_workshop" xmlns:xlink="http://www.w3.org/1999/xlink"
<gml:description>This is a GML document which provides locations of all MapServer User Meeting that
<gml:name>MapServer User Meetings</gml:name>
<gml:boundedBy>
  <gml:Envelope>
    <gml:coordinates>-93.093055556,44.944444444 -75.7,45.4166667</gml:coordinates>
  </gml:Envelope>
</gml:boundedBy>
[feature]
<gml:featureMember>
<Meeting>
  <gml:description>[desc]</gml:description>
  <gml:name>[name]</gml:name>
  <gml:location>
    <gml:Point srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
      <gml:pos>[x] [y]</gml:pos>
    </gml:Point>
  </gml:location>
  <year>[year]</year>
  <venue>[venue]</venue>
  <website>[url]</website>
</Meeting>
</gml:featureMember>
[/feature]
<dateCreated>2007-08-13T17:17:32Z</dateCreated>
</MapServerUserMeetings>
[resultSet]
```

A GeoJSON example might be:

```
[resultset layer=foo] {
"type": "FeatureCollection",
"features": [
[feature trim=', ']
{
  "type": "Feature",
  "id": "[id]",
  "geometry": {
    "type": "PointLineString",
    "coordinates": [
      {
        "type": "Point",
        "coordinates": [
          [
            "type": "Point"
          ]
        ]
      }
    ]
  }
}
]
```

```

        "coordinates": [[x], [y]]
    }
]
},
"properties": {
    "description": "[description]",
    "venue": "[venue]",
    "year": "[year]"
}
},
[/feature]
]
}
[/resultset]

```

This would allow for relatively complex text files of any sort to be built from multiple layers. All the normal template tags would still be supported but those normally available for query results would only be valid inside a [feature]...[/feature]. These tags would work with existing system too but just wouldn't be as useful as with the 1 template idea.

Note: It is often a problem to have trailing record separator characters after the final record. For example, in the JSON template above the trailing comma in the [feature] block causes problems with Internet Explorer. So I propose supporting a “trim” attribute that tells the template processor to remove that string from the end of the output for the last feature processed.

Note: A resultset could be applied to multiple layers so the name attribute will take a comma delimited list of layers. The order listed is the order they results will be presented. It's possible that groups could be used as well but at this point that seems like a fairly rare use case.

Note: A resultset will also take a maxresults attribute so that the number of features processed can be limited.

Additional Mapfile Changes

By moving templates out of a layer we lose the ability mark layers as queryable. Dan proposed adding a QUERYABLE TRUE/FALSE option to layerObj's. That could be put in place as part of this RFC, although it is not required. We could continue to leverage dummy template values. Adding it would require the normal changes to support a new keyword, and a small change to function in mapquery.c that tests to see if a layer is queryable. Basically a layer would be queryable if: 1) it has a template or 2) QUERYABLE is TRUE (default would be FALSE).

Documentation

Documentation detailing the new templated output capabilities will be added to the mapfile reference guide (OUTPUTFORMAT and WEB objects) and to the template reference guide (new [resultset], [feature], [join] and [include] tags).

Implementation

mapoutput.c: No changes necessary (I think), no need to define a default format, nor do I think we need to extend the outputFormatObj structure.

mapfile.c/maplexer.l: Allow changing webObj QUERYFORMAT from a URL. (todo: add support for setting a layer as queryable)

maptemplate.c: Add processor functions for the new tags. Update process line to recognize the [resultset] and [join] tags (the [feature] tag would only be valid within a [resultset] block. Write a new single template processing function similar to msReturnQuery() in that same source file, something like msReturnSingleTemplateQuery().

mapserv.c: Add code at the end of the query processing switch statement to look at the value of web->queryformat. If it references an existing output format by name then use the file the format points to with msReturnSingleTemplateQuery(), otherwise process as currently done.

Caveats: to simplify tag parsing (at least initially) I propose requiring that start and end tags exist on their own lines in the template file (is this a requirement for legend templates?). Depending on the legend template block parsing this requirement could be removed once some implementation work is done.

MapScript

No changes are anticipated in MapScript at this time although we may choose to expose templated output as an option at a later date.

Backwards Compatibility Issues

No other compatibility issues are anticipated. The current templating mechanism would continue to function. In the event the QUERYFORMAT does not reference an outputFormatObj the current system would kick in. In fact, the current system can use several of the new proposed tags, specifically [join] and [include] tags.

Bug ID

None assigned.

Voting History

None

16.9.37 MS RFC 37: MapServer Spatial Reference Improvements and Additions

Author Howard Butler

Contact hobu.inc at gmail.com

Author Frank Warmerdam

Contact warmerdam at pobox.com

Revision \$Revision\$

Date \$Date\$

Status Draft

Id \$Id\$

Purpose

To provide MapServer with the ability to set its PROJECTION information from directly from the datasource itself, in an attempt to lessen the burden related to dealing with coordinate system information on users. These improvements will be optionally available and not interfere with previous PROJECTION definition methods.

The History of Spatial References in MapServer

MapServer's spatial reference support is quite anemic by many standards. While most of the data sources MapServer interacts with support describing the spatial reference of contained layers, MapServer has historically dropped the information on the floor or completely ignored it.

MapServer's reprojection machinery keys off the fact that a LAYER's PROJECTION is different than the MAP's. When this is the case, MapServer reprojects the LAYER's data to the MAP's spatial reference during a map draw.

Definition

MapServer has historically used two different approaches for defining the spatial reference of its data – EPSG/ESRI codes in the form:

```
PROJECTION
  "init=epsg:4326"
END
```

And proj4-formated definitions in the form:

```
PROJECTION
  "proj=cea"
  "lon_0=0"
  "lat_ts=45"
  "x_0=0"
  "y_0=0"
  "ellps=WGS84"
  "units=m"
  "no_defs"
END
```

OGR datasources also support a form of AUTO projection type, but it is not widely advertised or regularized:

```
LAYER
  CONNECTIONTYPE OGR
  PROJECTION
    "AUTO"
  END
END
```

Performance Observations

MapServer's current spatial reference story is focussed on two things – simple description and ensuring that unnecessary data reprojection doesn't happen. MapServer currently uses proj4 directly to do its data reprojection, and this is the impetus for defining coordinate systems in proj4 format. For people wanting the best performance but still requiring data reprojection, defining your spatial references in proj4 format is a must.

Alternatively, the EPSG/ESRI code definition of MapServer's spatial references allows MapServer to offload the lookup of proj4 descriptions to proj4 itself, with a simple file-based lookup table. This mechanism is currently a

bottleneck, however, as each lookup requires trolling through a file to match the given identifier and returning the proj4 definition.

Note: This penalty was lessened in early 2009 by the addition of a caching mechanism in proj4 that allows subsequent lookups to be fast.

Usability

The usability of these two mechanism can be a nightmare for users. First, most of the spatial reference descriptions that people work with are of the WKT variety – not proj4. While it is straightforward to set the PROJECTION information for data with a known EPSG value, custom projections or those not generally available in the EPSG database require the user to somehow translate their WKT into proj4 format and paste it into their mapfile.

Additionally, <http://spatialreference.org> exists to help ease this pain, but it is ultimately a stopgap, and not a permanent solution to the problem. It is not practical to be downloading the spatial reference for each and every layer in a mapfile on every map draw from a website. spatialreference.org does provide some conversion utilities to allow a user to paste in WKT and have it return MapServer PROJECTION blocks, but this approach still foists pain and misery on the users.

Specification Features

MapServer will continue to behave as before, and the user can opt-in for AUTO projection support by using the AUTO keyword in a projection object as so:

```
# Use the what the layer defines as the projection definition.  
# This may not be available for all data sources or layer types  
# (shapefile, SDE, OGR, etc.).  
PROJECTION  
    AUTO  
END
```

Implementation Details

It is important that MapServer's previous spatial reference definition behavior be preserved. First, drastically changing the PROJECTION definitions would mean a lot of unnecessary mapfile churn. Second, continuing to define spatial references in proj4 format as before will be the most performant.

Implementation of this RFC will encompass two items:

1. Addition of a method to the LAYER virtual table .
2. Additional methods will be added for drivers to be able to convert from their native projection description type (ESRI WKT, OGC WKT, proj.4, etc) into proj.4 for setting on the projectionObj.
3. PROJECTION will support an explicit AUTO keyword

Virtual Table Method

To support AUTO projection definitions, drivers need to have the ability to return spatial reference information. MapServer's layer plugin architecture provides mechanisms for interacting with MapServer layer providers, but there is currently no regularized method for returning the spatial reference information from providers. The following virtual table member is proposed:

```
int (*LayerGetAutoProjection) (layerObj *layer, projectionObj *projection)
```

Additional methods

The msOGCWKT2ProjectionObj method already exists, but a few more would be added to allow drivers that implement LayerGetAutoProjection to generate a projectionObj.

- msESRIWKT2ProjectionObj
- msOGCWKT2ProjectionObj

Driver-specific implementations

The following drivers will have implementations provided to support TYPE AUTO spatial reference definitions:

- Shapefile
- OGR
- GDAL Raster
- ArcSDE
- PostGIS

Files Affected

```
mapserver.h  
mapfile.c  
mapscript/swiginc/projection.i  
maplayer.c  
mapproject.h  
mapproject.c  
mapsde.c  
mapogr.cpp  
mapraster.c  
mappostgis.c  
. . .
```

Backward Compatibility Issues

All work described in this RFC will provide optional capabilities to MapServer and no backward compatibility issues are expected.

Documentation

This RFC will stand as primary documentation for the feature until such time as the methods and practices described in this document are integrated into the regular MapServer documentation framework.

16.9.38 MS RFC 38: Native Microsoft SQL Server 2008 Driver for MapServer

Author Howard Butler

Contact hobu.inc at gmail.com

Revision \$Revision\$

Date \$Date\$

Status Implemented

Version 5.2

Id \$Id\$

Purpose

To provide a read-only, native MapServer driver that connects to Microsoft SQL Server 2008 (henceforth called SQL Server) on Windows as a PLUGIN datasource driver.

Background

I.S. Consulting has donated a native driver modeled on the PostGIS driver to support SQL Server 2008's newly added spatial capabilities. This new driver will only be available on the Windows platform, and it will only be available as a PLUGIN datasource driver. No additional enumerations or conditional includes will be added to the MapServer codebase to support this driver.

Usage Details

The driver is a PLUGIN layer, and uses the PLUGIN syntax described in RFC 8 [1] to define relevant layer information:

```
LAYER
    NAME "Roads"
    CONNECTIONTYPE PLUGIN
    PLUGIN "C:\ms4w\plugins\msplugin_mssql2008.dll"

    CONNECTION "server=mysqlserver2008.com;uid=dbusername;pwd=dbpassword;database=Roads Database;Integ
    DATA "the_geom from roads"
    TYPE LINE

    STATUS ON

    PROJECTION
        "init=epsg:4326"
    END

    CLASS
        STYLE
            COLOR 0 0 255
            WIDTH 8
        END
    END

END
```

END

Files Affected

A single file, mapmssql2008.c will be added to subversion. It will only be compiled on windows using the ‘nmake /f makefile.vc plugins’ command when options describing the ODBC libraries are switched on.

Backward Compatibility Issues

All work described in this RFC will provide optional capabilities to MapServer and no backward compatibility issues are expected.

Documentation

This RFC will stand as primary documentation for the feature until such time as the methods and practices described in this document are integrated into the regular MapServer documentation framework.

Intellectual Property

This work will become a regular part of MapServer and will be released under MapServer’s open source license.

[1] <http://mapserver.gis.umn.edu/development/rfc/ms-rfc-8/>

16.9.39 MS RFC 39: Support of WMS/SLD Named Styles

Date 2008/06/25

Author Yewondwossen Assefa

Contact assefa at dmsolutions.ca

Status Adopted

Version MapServer 5.2

Id \$Id\$

Overview

When WMS and SLD support was added in MapServer few years back, one of features that was not integrated was the ability to specify named styles through WMS GetMap request using the STYLES parameter or through the <Named-Style> parameter in an SLD document.

Using named styles, the WMS client has the ability to render a specified layer using styles predefined by the WMS server.

Example of this would be:

`http://..../mapserv.cgi?Request=GetMap&....&LAYERS=Rivers,Roads,Houses&STYLES=CenterLine,CenterLine,0`

```
<StyledLayerDescriptor version="1.0.0">
  <NamedLayer><Name>Roads</Name>
    <NamedStyle>
      <Name>Casing</Name>
    </NamedStyle>
  <NamedStyle>
```

```
<Name>CenterLine</Name>
</NamedStyle>
</NamedLayer>
</StyledLayerDescriptor>
```

The main reason this functionality is not yet supported is that It is not currently possible to define in MapServer several mutually exclusive ‘styles’ on a layer. The intention of this RFC is to introduce a simple mechanism that would allow MapServer to define mutually exclusive ‘Styles’. This would then allow for MapServer to advertise and support named styles through the WMS interface.

Proposed Changes

The MapServer architecture (layer, class, styles) does not fit well the SLD model where it assumes that you can define mutually exclusive styles on a layer and be able to switch between them.

One possible solution which is reasonably non disruptive would be to introduce the concept of group names at the class object level and have at a layer level a parameter that can be used to specify the classes to use. Something like this is what is proposed:

```
LAYER
...
CLASSGROUP "group1"
...
CLASS
  NAME "name1"
  GROUP "group1"
...
END
CLASS
  NAME "name2"
  GROUP "group2"
...
END
CLASS
  NAME "name3"
  GROUP "group1"
...
END
...
```

- This introduces two new keywords, CLASSGROUP at the layer level and GROUP name in the class object.
- These parameters are optional
- If the CLASSGROUP parameter is set, only classes that have the same group name would be considered at rendering time. If it is not set, all classes (current behavior) would be used.
- Note that CLASSGROUP is acting as the default style if there are classes within the same LAYER with different GROUPs defined. The idea is that STYLES parameter through a wms request (or cgi URL variable) would override the value of the CLASSGROUP. In the example above, only classes “name1” and “name3” would be considered for rendering (if STYLES= or STYLES=default), unless the client overrides this value using STYLES=group2.

Affected/Added functionalities in MapServer

1. MapServer vector rendering (function msShapeGetClass) would use the setting of the classgroup if it is available
2. Raster rendering (function msGetClass) : would use the setting of the classgroup if it is available

3. Possibility to use the URL variables to modify the value of the classgroup (something like this would be valid : ...&map.layer[layername]=classgroup+group2. This would allow through the cgi to switch representation of a layer if needed

4. WMS related functionalities:

- Advertise STYLES through the GetCapabilities: styles would be based on the different group names of the classes defined in the layer. If all classes do not have the GROUP set, the current behavior (returning the STYLE element with the ‘default’ name) will be kept. If one or more classes have the GROUP set, It is proposed to output something like this for each “group”:

```
<Style>
  <Name>group1</Name>
  <Title>group1</Title>
  <LegendURL width="20" height="10">
    <Format>image/png</Format>
    <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink" xlink:type="simple" xlink:href="http://www.mapserver.org/group1.legend"></OnlineResource>
  </LegendURL>
</Style>
```

- Support Named Styles in SLD. This would have the effect of setting the layer level CLASSGROUP. We throw an exception if an invalid style is passed.
- Support style names in the STYLES parameter for the WMS GetMap request. We would still support the empty style names as well as the “default” keyword used for STYLES. We throw an exception if an invalid style is passed.
- GetLegendGraphic would be extended to support names in the STYLES parameter. The if STYLE parameter is present and the value is not empty, we would throw an exception if the style passes is not valid.
- GetStyles : the current behavior is to return all the classes as UserStyle elements. the sld 1.0 specification does not seem to be clear on how to deal when multiple styles are available : section 13.1 specifies "...All requested styles that can in fact be described by SLD will be returned as UserStyle elements, and styles that cannot be will returned as NamedStyle elements.". The proposed approach is to keep the current behaviour if the CLASSGROUP is not set and if set, to return UserStyle elements on specified classes only.

5. Legend drawing would need to use the setting of the classgroup if it is available

Other Considerations

- Does this apply to all types of layers such as chart layers ?

Files Affected

```
maplexer.l
mapserver.h
mapfile.h
mapfile.c
mapogcsld.c
mapwms.c
maplegend.c
mapcopy.c
php_mapscript.c
```

MapScript

Need to update set function (at least in the php MapScript) to set the two new parameters at the layer and class level.
Need to check if there is anything to be done for swig MapScript.

Backwards Compatibility

All work described in this RFC will provide optional capabilities to MapServer and no backward compatibility issues are expected.

Documentation

SLD, *WMS Server*, and *Mapfile* documents will be upgraded.

Testing

Addition of a test in msauto to validate the support of names STYLES parameter through a GetMap request

Bug ID

<http://trac.osgeo.org/mapserver/ticket/2431>

Voting History

+1: Assefa, TomK, FrankW +0, DanielM, SteveW

Discussions on mailing list

<http://www.nabble.com/Call-for-comments--RFC-39-td13774241.html> <http://www.nabble.com/call-for-vote-on-RFC-39-td14212600.html>

16.9.40 MS RFC 40: Support Label Text Transformations

Date 2007/12/03

Author Thomas Bonfort

Contact thomas.bonfort at gmail.com

Last Edited 2007/12/03

Status Implemented

Version MapServer 5.4

Id \$Id\$

Overview

MapServer 5.0 supports “hard” text wrapping, where the wrap character is unconditionally treated as a newline. This RFC proposes the addition of:

- conditional wrapping, i.e. newlines are only added when the current line length has met a user adjustable criteria
- line alignment, i.e. text aligned per user request, namely right, center and left

These two additions are independent from one another, i.e. can be activated together or not.

Line Wrapping

A new keyword, MAXLENGTH is added to the label object, and interacts with the label WRAP parameter as follows:

- the wrap character specifies what character can be replaced by a newline (no change w.r.t. the current meaning). Probably the most useful wrap character will become ‘ ‘ (i.e. the space character)
- the MAXLENGTH value specifies the maximum number of characters that can compose a line before a newline is inserted. A value of 0 specifies the current “hard” wrapping. A positive value triggers wrapping at the WRAP character for lines longer than MAXLENGTH. A negative value triggers wrapping that is allowed to break words, i.e. not necessarily at the WRAP character.

The WRAP / MAXLENGTH combinations are summarized here:

	maxlen =0	maxlen > 0	maxlen < 0
wrap = ‘char’	current way	conditional wrap if > maxlen	hard wrap
no wrap	no processing	skip label if > maxlen	hard wrap

Line Centering

A new keyword ALIGN is added to the label object. It supports 3 values: left, center and right, and controls how text lines should be aligned w.r.t. the label bounding box. Precise placement of text can only be done at the renderer level, by exactly defining the starting pixel of the current line. While this approach could be taken, it would considerably burden the renderer code.

I propose to use a more generic though less precise way of doing, by padding the text lines with space characters to approximate indentation. The initial implementation could only rely on the number of characters in each text line:

- loop through text lines to find the line with the most characters l_max
- pad all the other lines with $(l_{max} - l_{cur})/2$ space characters

A more advanced implementation will be to use the exact line lengths as returned by the renderers with the msGetLabelSize function:

- compute the size in pixels of the “ ” string (two spaces, accounts for kerning): l_2space
- loop through text lines to longest line of length pix_l_max
- pad all the other lines with $(pix_{l_max} - pix_{l_cur})/2 * 1/(2*l_{2space})$ space characters

“Limitations”: aligning text to the right will produce ugly results using this method, unless using a monospace font.

Modifications to the source code

- MAXLENGTH and ALIGN will be added to the LABEL object in map.h, in the mapfile parser/writer (mapfile.c) and in MapScript

- msTransformLabelText() in maplabel.c will be updated to support the modifications proposed. No other modifications should be required as the text itself is modified to fit the user's request (i.e. it is padded with spaces, and/or newlines are added to it)

MapScript Implications

The labelObj will have new maxlen property of type integer and align property (ms_align_*).

Files affected

```
map.h  
mapfile.c  
maplabel.c  
maplexer.l  
maplexer.c
```

Backwards compatibility issues

None.

Bug ID

- 2383: <https://trac.osgeo.org/mapserver/ticket/2383>

Voting history

- +1: SteveL, SteveW
- +0: FrankW, TomK

Questions/Comments from the review period

- SteveW: allow preciser computation of line offsets when padding with spaces: done. The precise size of each line is calculated in pixels, and the closest number of space characters required for alignment is computed accordingly
- DanielM: allow multiple characters to be used when wrapping lines: not addressed. Space characters can be *replaced* by a newline, while the hyphen character should generally be kept. Any idea how we can specify that some wrapping characters are to be kept while others are just markers for potential linebreaks?

16.9.41 MS RFC 41: Support of WCS 1.1.x Protocol

Date 2008/04/09

Author Frank Warmerdam

Contact warmerdam@pobox.com

Status Adopted

Version 5.2

Id \$Id\$

Overview

It is proposed to extend MapServer to support the WCS 1.1 protocol. MapServer already supports the WCS 1.0 protocol, but WCS 1.1 is significantly different.

Implementation Methodology

WCS 1.1 is based on OWS Common metadata (unlike WCS 1.0), and implementation of the WCS service will take advantage of the OWS metadata services in mapowscommon.c. However, mapowscommon.c is based on libxml for xml serialization (unlike the printf() based WCS 1.0 service). For this reason, WCS 1.1 GetCapabilities and DescribeCoverage implementations will be largely separate from WCS 1.0 implementations and will be implemented using libxml.

It should be noted that the format and organization of the WCS 1.1 capabilities and coverage description methods are so different that separate implementations would have been pretty much necessary anyways.

The key entry points in mapwcs.c for WCS services will be updated to “call out” to WCS 1.1 versions of the services in mapwcs11.c.

It is anticipated that the bulk of the WCS 1.0 GetCoverage implementation will be shared with WCS 1.1 with special WCS 1.1 implementations to handle specific issues in the request (RangeSet processing, and multi-part mime return results for instance).

WCS 1.1 Protocol Limitations

- Only one <Field> may be associated with the Range of Coverage when served through MapServer.
- Only two types of Axis will be supported, a “Bands” axis, and a “Time” axis.

Metadata Mapping

The current WCS metadata items are tightly related to the WCS 1.0 protocol, while the WCS 1.1 protocol used a substantially different form and conventions for service, and coverage descriptions as well as for the getcoverage request. The following table indicates which WCS metadata items are mapped to what coverage XML elements in WCS 1.0 and WCS 1.1:

MapServer	WCS 1.1	WCS 1.0
<x>_formats	SupportedFormat	formats
<x>_keywordlist	ows:Keywords	keywords
<x>_label	(unused)	label
<x>_description	ows:Title	description
<x>_abstract (new)	ows:Abstract	(unused)
<x>_metadatalink_href	(unused)	metadataLink
<x>_nativeformat	(unused)	nativeFormat
<x>_rangeset_name	Field.Identifier	RangeSet.name
<x>_rangeset_label	Field.Title	Rangeset.label
<x>_bands_name	Axis.identifier	AxisDescription.name

URNs / Coordinate Systems and Axis Orientation

WCS 1.1 uses URNs like “urn:ogc:def:crs:EPSG::4326” or “urn:ogc:def:crs:OGC::CRS84”. In addition the WCS protocol is required to honour EPSG axis conventions when using coordinate systems within the EPSG authority

space. This means, for instance, that any coordinates in the urn:ogc:def:crs:EPSG::4326 coordinate system must be provided in lat,long ordering instead of the conventional long,lat.

In order to implement these requirements, several changes are planned:

- msLoadProjectionString() will be updated to expand URNs in the EPSG and OGC name spaces.
- msLoadProjectionString() will add the “+epsgaxis=ne” parameter for URNs for GCS codes in the EPSG name space.
- New msAxisNormalizePoints() and msAxisDenormalizePoints() will be added for converting between normalized (easting,northing) axis orientation and EPSG preferred (denormalized) axis orientation (sometimes northing,easting). These functions will scan the p->args[] list for the +epsgaxis=ne to decide.
- msOWSCommonBoundingBox() will be modified to use these axis denormalization function to denormalize axis ordering for EPSG GCS URNs.
- the WCS 1.1 GetCoverage call will use msAxisNormalizePoints() to fix up orientation of request axes when needed.

MapScript

No changes to MapScript are anticipated.

Backwards Compatibility

No alterations to WCS 1.0 support are expected, and it is not expected that the mechanisms for specifying services metadata will be changed though it is possible a few metadata items used only in WCS 1.1 will be added.

Documentation

The [WCS Server](#) will be extended to discuss WCS 1.1 related issues.

Implementation Resources

Implementation will be done by Frank Warmerdam with financial support from Noetix Research Inc. and the Geoconnections program of the Canadian Government. Preliminary implementation is already operational in svn trunk, and work completion is anticipated by March 1st.

Testing

Tests will be added to msautotest/wxs for the WCS 1.1 protocol. Additional assistance with WCS 1.1 validation from other contributors would be welcome.

Bug ID

None Yet.

Voting History

FrankW(+1), AssefaY(+1), TomK(+1), DanielM(+1), PerryN(+1)

16.9.42 MS RFC 42: Support of Cookies Forwarding

Date 2008/03/26

Author Julien-Samuel Lacroix

Contact jlacroix at mapgears.com

Last Edited 2008/04/01

Status Adopted 2008/04/01 - Implementation completed

version MapServer 5.2

Id \$Id\$

Overview

This RFC propose to extend MapServer to forward HTTP Cookies when doing OWS requests.

One method of authentication in distributed server environment is the use of HTTP Cookies. HTTP cookies are used by Web servers to differentiate users and to maintain data related to the user during navigation, possibly across multiple visits and for state information. Technically, cookies are arbitrary pieces of data chosen by the Web server and sent to the browser. The browser returns them unchanged to the server. The enhancement to MapServer would allow the application to forward any HTTP cookie (either from a http or https request for get or post) received from a client to any other server or service that MapServer would request information from.

This would require MapServer to receive and forward any cookies to new services during requests for operations (cascades) such as (but not limited to) WMS requests for: getmaps, getfeatureinfo and WFS requests for GetFeature.

Implementation Methodology

A new metadata (`http_cookie_data`) will be added at the mapfile level to temporarily store HTTP cookie data. Another metadata (`ows_http_cookie`) will also be added at the layer and mapfile level to control the use of cookies. The later will be set to either “forward”, to forward the cookie stored in the `http_cookie_data` metadata, or to a hardcoded cookie value, to forward this hardcoded value only.

Example of `ows_http_cookie` in the metadata:

```
LAYER
...
METADATA
  "ows_http_cookie" "forward" # This will forward the cookie sent to MapServer
END
...
```

The user can also pass direct cookie values instead of the cookies being passed to MapServer. To pass multiple cookies, use the following syntax:

```
LAYER
...
METADATA
  "ows_http_cookie" "cookie1=my_value; cookie2=myvalue;" # This will forward the metadata value
END
...
```

By using the metadata configuration, a MapScript application will be able to forward a HTTP Cookie by setting the correct metadata.

Currently only WMS and WFS code will use this since they are the only places where MapServer request an outside webserver.

Implementation Issues

It was pointed out during the RFC review period that passing and storing the cookie data using an “http_cookie_data” metadata is a poor use of MapServer’s metadata mechanism.

Since MapServer currently lacks a mechanism to associate application state information to a mapObj, there is currently no better mechanism in place to store the cookie data received from the client and pass it to the rendering code that calls the remote WMS. Due to lack of a better solution, for the time being we will use the “http_cookie_data” metadata as proposed in this RFC, with the knowledge that this is a poor use of metadata and that we as soon as a better mechanism is in place to store and pass application state in a mapObj then this metadata will be deprecated and replaced by this new mechanism. Developers of MapScript applications setting this “http_cookie_data” metadata should be aware of this and be prepared to change their code in future revisions of MapServer.

Another issue is that no encoding currently is planned to be made with the http_cookie_data metadata. Poorly formatted metadata could break the HTTP header of a request. If it is found that Curl doesn’t encode the cookie value, only character with a value between 32 and 126 (printable ascii characters) will be allowed.

Modifications to the Source Code

The HTTP Cookie data will need to be stored in cgiRequestObj in a new member variable to be able to pass it to the mapfile. If HTTP Cookies are present the cookies will always be stored there. The mapserv.c main function will then be responsible of the HTTP Cookies in the mapfile just after the loadMap() function and before msOWSDispatch() if the ows_http_cookie metadata is set. The WMS and WFS code will set the newly created variable in the httpRequestObj when it prepares the URL for a server request.

The WMS/WFS msPrepareWMSLayerRequest function will check for the ows_http_cookie metadata in the layer and the map objects. If the value is set to forward, the content of the http_cookie_data metadata will be forwarded as HTTP Cookie to the WMS/WFS server.

Curl as an option in the curl_easy_setopt() function when doing a request called CURLOPT_COOKIE to send cookies with a request.

MapScript

By storing the HTTP Cookie data in a mapfile metadata MapScript will be able to use this new functionality. Here’s an example of a PHP/MapScript use of HTTP Cookie:

```
foreach($_COOKIE as $szKey => $szValue)
{
    $szHTTPCookies .= "$szKey=$szValue; ";
}
$oMap->setMetadata("http_cookie_data", $szHTTPCookies);
$oMap->setMetadata("ows_http_cookie", "forward");
$oMap->draw();
```

File Affected

cgiutil.h	(add http_cookies in cgiRequestObj)
cgiutil.c	(read and store the http cookies data in cgiRequestObj)
maphttp.c	(send cookies with the request via curl option)
mapows.h	(add http_cookies to httpRequestObj)

mapserv.c	(store cookies in mapfile metadata)
mapwmslayer.c	(set cookies in httpRequestObj)
mapwfslayer.c	(set cookies in httpRequestObj)

Backwards Compatibility

None.

Bug ID

<http://trac.osgeo.org/mapserver/ticket/2566>

Voting History

Adopted on 2008/04/01 with +1 from FrankW, DanielM, TomK and AssefaY, and +0 from JeffM and PericlesN.

16.9.43 MS RFC 43: Direct tile generation for Google Maps and Virtual Earth API

Date 2008/04/08

Author Paul Ramsey

Contact pramsey at cleverelephant.ca

Last Edited 2008/05/02

Status Adopted on 2008/04/29 - Completed

Version MapServer 5.2

Id \$Id\$

Overview

Providing a simple access API in the mapserv CGI can make using MapServer with the Google Maps and Virtual Earth user interfaces dramatically easier for new users.

Technical Solution

The GMaps API defines a GTileLayer which can be used as an overlay or base map. The GTileLayer supports a GTileLayerOption, tileUrlTemplate, which allows the TileLayer to be accessed using a simple URL pattern that substitutes Google's x/y/z coordinates into the request:

`http://host/tile?x={X}&y={Y}&z={Z}.png`

See <http://code.google.com/apis/maps/documentation/reference.html#GTileLayer>

For MapServer, the simple URL pattern will be:

`http://host/cgi-bin/mapserv?map=/the.map&layers=foo,bar&mode=tile&tilemode=gmap&tile={X}+{Y}+{Z}`

The change will add in new handling in the loadForm function for the mode, interface, version, x, y and z parameters. Like the WMS interface, GMaps API will require PROJ to be specified, and the existence of PROJECTION defines for all layers being accessed. Google X/Y/Z coordinates will be converted to “spherical mercator” coordinates and fed into the extent.

The result will make a Google-with-MapServer map as easy as:

```
var url = "http://host/cgi-bin/mapserv?";  
url += "map=/the.map&";  
url += "layers=parcels&";  
url += "mode=tile&";  
url += "tilemode=gmap&";  
url += "tile={X}+{Y}+{Z}";  
var myLayer = new GTileLayer(null,null,null,  
{  
    tileUrlTemplate:url,  
    isPng:true,  
    opacity:0.5  
});  
var map = new GMap2(document.getElementById("map"));  
map.addOverlay(new GTileLayerOverlay(myLayer));
```

A Virtual Earth with MapServer map would look like:

```
var url = "http://host/cgi-bin/mapserv?";  
url += "map=/the.map&";  
url += "layers=parcels&";  
url += "mode=tile&";  
url += "tilemode=ve&";  
url += "tile=%4";  
map = new VEMap("map");  
map.LoadMap();  
var tileSourceSpec = new VETileSourceSpecification( "myLayer", url );  
tileSourceSpec.Opacity = 0.3;  
map.AddTileLayer(tileSourceSpec, true);
```

A request with tilemode of “gmap” implies the following:

- The “tile” parameter will be of the form: x y zoom
- The output CRS will be set to “spherical mercator” (EPSG:900913)
- The service bounds be global in extent. The top “zoom” level (0) will have 1 tile.
- The “zoom” levels will run from 0 upwards
- The “y” axis of the tile coordinates will run from top to bottom
- The “x” axis of the tile coordinates will run from left to right
- The output tiles will be 256x256 in size
- Each zoom level will be related to parent and children by powers of two

A request with tilemode of “ve” implies the following:

- The “tile” parameter will use the VE tile numbering scheme, for example “0312”. See <http://msdn.microsoft.com/en-us/library/bb545006.aspx> for more details.
- The output CRS will be set to “spherical mercator” (EPSG:900913)
- The service bounds be global in extent. The top level will have 4 tiles (0, 1, 2, 3).

- The output tiles will be 256x256 in size
- Each zoom level will be related to parent and children by powers of two

The MapServer tile mode API will *not* explicitly attempt to address issues of meta-tiling or cross-tile labeling. However, the following steps will be taken to try to minimize these issues:

- Future phases will render into a target slightly larger than the tile and then clip off the extra border pixels.

MapScript Implications

None. This affects only the CGI interface and `mapserv` CGI.

Files Affected

```
mapserv.c  
maptile.c <new>  
maptile.h <new>
```

- Documentation will be updated to reflect the new feature
 - MapServer CGI Reference
 - MapServer Tile HOWTO <new>
- Test suite will be updated to exercise the new features
 - Frank Warmerdam has volunteered to do this

Backwards Compatibility Issues

None. This functionality is net new and requires no changes to existing behavior.

Bug ID

- <http://trac.osgeo.org/mapserver/ticket/2581>

Voting History

Adopted on 2008/04/29 with +1 from SteveL, DanielM, JeffM, SteveW, TomK, PericlesN and AssefaY.

References

- <http://msdn.microsoft.com/en-us/library/bb545006.aspx>
- <http://code.google.com/apis/maps/documentation/reference.html#GTileLayer>
- <http://www.worldwindcentral.com/wiki/TileService>

16.9.44 MS RFC 44: Restore URL modification of mapfiles to pre-5.0 levels

Date 2008/08/19

Author Steve Lime

Contact Steve.Lime at dnr.state.mn.us

Last Edited 2008/08/19

Status Draft

Version

Id \$Id\$

MS RFC 31: Loading MapServer Objects from Strings introduced a new syntax for modifying *mapfiles* via URL. Object parameters could be specified together in mapfile snippets making it easier to make changes with far fewer characters. At the same time access to a number of parameters, particularly those that mapfile parsing did no value checks on (mostly strings) were removed for security purposes. In hindsight I underestimated the degree to which that functionality was used by developers. This RFC aims to restore that functionality albeit with security in mind.

Proposed Changes

Presently a few widely modified (and risky) parameters (e.g. layer TEMPLATE and DATA) can be changed via URL if a regular expression (e.g. TEMPLATEPATTERN and DATAPATTERN) is set to validate the incoming value. I propose using the same approach for all un-checked mapfile input. Parameters that represent numbers, colors or have a value domain (e.g. ON/OFF/DEFAULT) are subject to the same checks as when a mapfile is read from disk and as a result should be ok. Those that don't would require specific validation values be set before input would be allowed. For example, the LAYER VALIDATION block below defines patterns that would be used to validate DATA or FILTER parameter changes. If the appropriate validation key doesn't exist the value cannot change.

Grouping all validation in a new VALIDATION block will ease use by simplifying key names to match MapServer token names. The block would be valid for *MAP*, *WEB*, *LAYER* and *CLASS* objects and its core type would be a hashTableObj. The MAP level VALIDATION block would be useful for applying a pattern for all LAYERS or CLASSES (since there is only 1 WEB object there is no need to rely on the MAP object). This would save lots of duplication in cases where a mapfile contains similar layers and the same data validation pattern applies to all. The logic would simply be: look for validation pattern in layer, if not found then look for validation pattern at map level, if not found then no modifications are allowed.

```
VALIDATION
data 'my pattern'
filter 'another pattern'
...
END
```

The validation would only be invoked if the token source is a URL. Mapfile file or string-based processing would be unaffected. An example of how this would work can be seen in mapfile.c near line 2683 with the DATA/DATAPATTERN parameters.

Files Affected

- *maplexer.l*: all parameters (a few will never be modifiable, like VALIDATION) will be changed to be recognized in the URL_VARIABLE lexer state; VALIDATION token needs to be added
- *mapfile.h*: add VALIDATION token
- *mapfile.c*: all non-value checked parameters will require regex validation before changes will be allowed via URL; recognize validation token; write validation hash with mapfile

- mapserv.c: update code for runtime substitution and qstring validation to check the validation hash as well

A complete list of parameters affected will be attached to this document in the post-implementation notes below.

Mapfile Changes

New VALIDATION token will be recognized.

MapScript Changes

None. MapScript already has a general class for hashTableObj management.

Backwards Compatibility Issues

The parameters DATAPATTERN and TEMPLATE pattern will become deprecated though. The objects in question (LAYER and CLASS) already contain validation blocks that can be used for this.

URL runtime substitution and qstring validation are currently supported through metadata. This would become deprecated as well. The runtime variables and the word “qstring” can be used as keys in the validation block instead.

Post-Implementation Notes

A HowTo will be developed that covers this topic and run-time substitutions.

Bug ID

<http://trac.osgeo.org/mapserver/ticket/2699>

Voting History

+1 Lime, Woodbridge, Morissette, Assefa

16.9.45 MS RFC 45: Symbology, Labeling, and Cartography Improvements

Date 2008/08/26

Authors Stephen Lime, Håvard Tveite, Thomas Bonfort

Contact Steve.Lime at DNR.State.MN.US

Status Draft

Version MapServer 5.4

Id \$Id\$

(*partially derived in part from a document prepared by Håvard and discussions with other developers working on cartographic output*)

Scale Dependent Rendering

- All symbols can be scaled. When SYMBOLSCALEDENOM is given for a layer, the layer and all of its symbols (height, width, line widths, line patterns, line dashes, ...) are scaled.
- CLASS->STYLE->SIZE gives the vertical dimension of the symbol's bounding box at the symbol scale (given by SYMBOLSCALEDENOM). For all other scales, the symbol is scaled proportionally to the mapscale.
- Symbol scaling can be limited by using CLASS->STYLE->MINSIZE and CLASS->STYLE->MAXSIZE. By using these MINSIZE/MAXSIZE, one can ensure that a symbol will never be rendered smaller/larger than the given sizes.

Precise Symbol Placement

Harmonize the placement of symbols relative to the feature (point or line) being drawn.

Fractional values for sizes

All symbols sizes and symbol geometries should be specified and represented as double - AGG supports fractional line widths so users should be able to set them explicitly. GD could either round or truncate/cast the double to an int.

- STYLE->SIZE/MINSIZE/MAXSIZE - styleObj.size/minsize/maxsize
- STYLE->WIDTH/MINWIDTH/MAXWITH - styleObj.width/minwidth/maxwidth
- STYLE->GAP - style.gap (replaces symbol->gap)
- STYLE->PATTERN (new feature) - styleObj.pattern
- STYLE-> CENTER/ORIGIN (new feature) - styleObj.centerx/centery and originx/originy
- STYLE->OFFSET - styleObj.offsetx and styleObj.offsety
- LABEL->SIZE/MINSIZE/MAXSIZE - labelObj.size/minsize/maxsize
- LABEL->OFFSET - labelObj.offsetx and labelObj.offsety

CENTER/ORIGIN [x y]

Defines the centre of the symbol using decimal pixels (x axis increasing to the right, y axis increasing downwards).

- Is used for placing a point symbol on the map or on a “decorated” line
- Defines the center of rotation if an ANGLE is specified for point symbols.
- Default value is the centre of the symbol's bounding box.
- Applies to TYPE ellipse, vector, pixmap, truetype.

Note: Implemented as *ANCHORPOINT*.

ANGLE [double|attribute] [DEFAULT|CLOCKWISE|COMPASS]

- STYLE-> ANGLE [double|attribute] [DEFAULT|CLOCKWISE|COMPASS]
- LABEL-> ANGLE [double|auto|follow|attribute] [DEFAULT|CLOCKWISE|COMPASS]

To specify rotation, you need a point of rotation, a reference direction, a direction of rotation and a unit of rotation. Currently, angles for labels have a reference direction to the right (east), and a counter-clockwise direction of rotation specified in degrees (0..360).

When specifying direction/rotation for symbols, compass direction is often used (reference direction north and clockwise rotation). A mechanism to specify mode of rotation/direction is needed.

The default would be reference direction east and counter-clockwise rotation. If possible, something like:

Modes of operation

- DEFAULT reference direction to the right (east), counter-clockwise direction of rotation.
- CLOCKWISE reference direction to the right (east), clockwise direction of rotation.
- COMPASS reference direction to the north, clockwise direction of rotation (compass directions).

Behavior

- For symbols of Type HATCH, this is the angle of the hatched lines.
- For points, this specifies the rotation of a symbol around its defined CENTER.
- For point symbols on lines, this specifies the rotation of the symbol relative to the direction of the line (0 - the symbol's x-axis is oriented along the line), or a fixed compass direction for the symbols orientation (COMPASS).
- For polygon fills this specifies the rotation of the pattern given by its defining symbol. For its use with hatched lines, see Example#8 in the SYMBOL examples.

Stable rendering for tile generation

how and with what keywords?

polygon fill symbols

give hatches and vector fills a stable geographical coordinate origin (0,0) to better support tiling and continuous rendering of neighbouring polygons

labeling

TODO

Keywords moved from SYMBOL to STYLE

FIXME GAP [double]+ END

Gap between point symbols when rendered on a linear geometry (used eg. for shields)

- Given in decimal pixels (at the symbol scale). Defines distances (centre to centre) between point symbols for line decoration at the layers symbol scale

- Default is 0.0. The first double gives the distance from the start of the line to the first point symbol, the rest of the doubles constitute a pattern of distances between the point symbols for the rest of the line.
- GAP distances are scaled. Applies to TYPES vector, ellipse, pixmap, truetype
- **FIXME** : When drawing the symbol along a line segment, a negative GAP will add 180 degrees to the angle.
- A GAP of 0 (the default value) will cause MapServer to use the symbol as a brush to draw the line. (AGG only)
- The defined centre (CENTER) of the symbol is used when placing the symbol on the line. When placing the symbol on the line, the symbol is oriented in such a way that the symbol's x-axis is directed along the line.

Note: *INITIALGAP* was introduced to address a part of this

DASHPATTERN ([double on] [double off])+ END

- renamed from STYLE
- the distances are scaled

Note: *PATTERN* was used instead of *DASHPATTERN*.

more to come?

add MINSCALEDENOM/MAXSCALEDENOM parameters to styleObj

this would allow doing things like removing outlines or the hollow portions of “tube” line work based on scale.

add LABELMETHOD to layerObj

(or perhaps just method to labelObj?)

- this would allow users to choose label placement algorithms that meet their needs. For example, in D2 below improving label placement will come with a reduction in performance. In some situations simply using a shapes bounding box center is perfectly adequate.
- The default would be the improved placement in D2.

add LABEL to layersObj

so that a default can be defined for all classes (sort of like templates). A class label would take precedent.

add OUTLINEWIDTH to styleObj

eg for drawing road lines with a cached outline

- It is currently impossible to have scale dependent road networks with a fixed width outline, this addition will remedy this.
- This would also be a shorthand to be able to specify an outline for linear networks, without having to specify two style blocks.

add TYPE to styleObj for line and polygon types

modifies how the current shape is interpreted. Applies to line and polygon layers (for now: any ideas for applying this to point layers?)

- TYPE BBOX : use the style to render the bounding box of the current shape
- TYPE CENTROID : render a single pointObj at the centroid of the feature
- TYPE VERTEXES : render a pointObj at each vertex of the shape. - how to specify angle (follows line direction, fixed,) - need to specify a way to ignore the start and/or end points of the feature
- TYPE START/END : render a pointObj at the start/end of the feature. would be used for example to add arrowheads to lines - default angle is direction of first/last segment

Note: *MS RFC 48: GEOTRANSFORM Geometry operations* addresses this (*GEOMTRANSFORM*).

Files Affected

- maplexer.l: C4, C5
- mapgd.c: B1, C2, C3, C4
- mapagg.cpp: B1, C2, C3, C4
- mapfile.c: B1, C1, C2, C3, C4, C5, C6, D1
- mapdraw.c: C1, C5, C6, D1
- mapprimitive.c: C5, D2

Bug IDs

Individual modifications will be tracked with their own tickets which will be listed here.

- B1: <http://trac.osgeo.org/mapserver/ticket/2766> (double)
- <http://trac.osgeo.org/mapserver/ticket/4066> (precise symbol placement - anchorpoint)
- <http://trac.osgeo.org/mapserver/ticket/3847> (stable rendering for tile generation)
- <http://trac.osgeo.org/mapserver/ticket/3797> (move from symbol to style)
- <http://trac.osgeo.org/mapserver/ticket/3752> (scalable gap and pattern)
- <http://trac.osgeo.org/mapserver/ticket/33879> (initialgap)

16.9.46 MS RFC 46: Migrate Website to OSGeo

Date 2008/11/5

Author Howard Butler

Contact hobu.inc at gmail.com

Last Edited \$Date\$

Status Proposed

Id \$Id\$

Purpose

Developers and users have expressed dissatisfaction with the current MapServer site, the site rather poorly serves the needs of the project in many instances, and its maintenance and upkeep is limited to a single system administrator (Howard Butler). This RFC will aspire to replace the current MapServer website with a hybrid setup that is similar to the infrastructure that the [OpenLayers](#) currently maintains.

Failures of the Current Website

The current MapServer website could be considered the 2.0 version of the MapServer project's web presence. The 1.0 version of the website was a completely static. The current version of the website looked to allow through-the-web editing to lessen the burden for documenters. Over three years into the effort, it is pretty clear that the website has not had the desired effect with respect to documentation, and it is getting in the way of the project doing other business.

Administrative Failures

Our uptime has been ok, but one effect of the current setup is that no one except Howard Butler takes responsibility for our web infrastructure. Part of the reason for this is there are no other Plone admins that have volunteered time in the MapServer community in the three plus years the site has existed, and part of the reason is that Howard bootstrapped the 2.0 version of the site and it was easy to leave it in his hands. Howard doesn't have the time to be able to keep things up at anything over a subsistence level, and administration of MapServer's web presence must be distributed if we are to achieve any progress.

Survey

A [survey](#) that hoped to determine if the community had any feelings about how the site is currently serving the community was rather inconclusive. While generally positive about the site, the self-selected sample size of eighteen dwarfs the nearly three thousand mailing list subscribers, and I am uncertain what was expressed captures the general sentiment.

Goals

Here are some goals that the 3.0 version of the MapServer website should achieve:

- Make it easy for folks to find the docs
- Stay out of developers' way
- Allow documenters to get their job done
- Allow limited user-contributed information in the form of wiki pages
- Have a gallery that works better
- Move off of UMN computing and integrate within OSGeo's infrastructure

Make it easy for folks to find the docs

Some people have complained that it is difficult to find documents on the website unless you know the exact place in the hierarchy. Because our mind-reading webpage finding software isn't quite up to snuff, the new website should make it easy enough for documenters to organize and reorganize information in logical and interlinked ways. It seems the strictly-enforced hierarchy causes more problems than it solves in this regard.

Stay the out of developers' way

The current website is quite slow. Slow to edit, slow to view, and slow to change. There's lots of pointing and clicking involved to do the simplest tasks. So much so, that folks will only update the website when they absolutely have to. Developers have subversion access by definition of being developers. They should be able to edit the website through text files in subversion and have the website be updated automatically.

Allow documenters to get their job done

The website fails documenters in a number of ways, but the most important failure is the inability to tie documents to specific MapServer versions. A new iteration of the MapServer website must allow this to happen. Luckily, we already have tools to version documents (our source code repository), so we should just leverage that to accomplish this goal.

Allow limited user-contributed information in the form of wiki pages

From time to time, users do contribute significant documentation describing how to accomplish a particular task with MapServer. Our new infrastructure must still allow this to happen without too much friction. MapServer's Trac instance already provides this capability (along with single-signon), and we can take advantage of it to accomplish this goal.

Have a gallery that works better

The OpenLayers Gallery works better than the current MapServer gallery, and it works much easier from a management/administrative standpoint. A benefit of using OpenLayers' gallery software is both projects can enjoy the benefits of improving it, which is not possible with the current MapServer gallery.

Move off of UMN computing and integrate within OSGeo's infrastructure

Just recently (Sept 15th – Sept 16th, 2008), the server that houses the site was having power supply unit issues (they have been resolved), but it is a fact that the site is running on a very old Solaris machine that could be decommissioned at any point without much of a head's up. MapServer no longer brings grant monies to the UMN, and while they have been gracious to continue hosting us, we need to move somewhere where we have more control over our destiny. Reasons like this are exactly why OSGeo exists, there are resources there for us to use, and we should move the website there at the same time.

Implementation

We are going to unabashedly rip off OpenLayers' web infrastructure. This includes the gallery, static website, and Trac integration. OpenLayers' web infrastructure meets a lot of the goals above, it stays out of the way of the developers and does a good job of serving the users' documentation needs. The mechanics of how this transition will take place are described below:

1. Migrate everything in <http://mapserver.gis.umn.edu/development> to Trac and add redirects of /development to a landing page on the Trac wiki.
2. Migrate everything in <http://mapserver.gis.umn.edu/community> to Trac and add redirects of /community to a landing page on the Trac wiki.
3. Migrate everything in <http://mapserver.gis.umn.edu/download> to Trac and add redirects of /download to a landing page on the Trac wiki.

4. Stand up an Apache instance for MapServer on OSGeo infrastructure. Howard will coordinate with OSGeo's System Administration Committee to get this done. Our new URL will be <http://mapserver.osgeo.org>
5. Stand up an instance of the [OpenLayers Gallery](http://mapserver.osgeo.org/gallery) at <http://mapserver.osgeo.org/gallery> and port over our existing gallery entries. Any culling of these entries must be done by some volunteer effort.
6. Migrate existing documents (notice of when to be given) in /docs to Subversion <http://svn.osgeo.org/mapserver/trunk/docs/> All subsequent editing on major MapServer documents from that point forward should happen in svn, and the documents on the Plone website will be considered frozen.
7. Stand up a cron process that takes the docs in Subversion and generates a static HTML website from them. This website will be what exists at <http://mapserver.osgeo.org>

16.9.47 MS RFC 47: Move IGNORE_MISSING_DATA to run-time configuration

Date 2008/10/09

Author Paul Ramsey

Contact pramsey at cleverelephant.ca

Last Edited 2008/10/15

Status Adopted on 2008-10-15 - Completed

Version MapServer 5.4

Id \$Id\$

Overview

Making the options for ignoring missing data in tile-indexed layers and WMS client layers more flexible, and configurable at run-time via the map file.

Technical Solution

Currently MapServer has only compile-time (`./configure --ignore-missing-data`) control of behavior when files referenced in tile indexes are missing, via the `IGNORE_MISSING_DATA` define, and that behavior is applied globally.

Under this RFC, the missing data behavior will be defined:

- at run time
- globally for a map file

As well, the option to “fail on a missing layer” will be added to the WMS client code, which currently defaults to “ignore on a missing layer”.

All changes will preserve the current default behavior in cases where new behavior is not requested by the user: missing data in tileindexes will continue to cause failure and missing WMS layers will continue to be ignored, unless MapServer is compiled with `--ignore-missing-data`.

A map-level configuration option will be added, `CONFIG "ON_MISSING_DATA" "[ACTION]"`, with the following valid actions: “`IGNORE`”, “`LOG`”, “`FAIL`”. The default map-level behavior will be “`FAIL`”, unless MapServer is compiled with `--ignore-missing-data`, in which case it will be “`LOG`”. This will preserve the current behavior for all legacy mapfiles and compile set-ups.

In the case of “`LOG`” behavior, the logging will only occur if the mapfile is set up for logging: `DEBUG` is set and `MS_ERRORFILE` is set. Documentation must note that `DEBUG` and `MS_ERRORFILE` need to be set.

At the same time, this ticket (#2722) can probably be tracked down and resolved.

Mapscript Implications

None.

Files Affected

mapshape.c
mapogr.c
mapraster.c
maprasterquery.c

- Documentation will be updated to reflect the new feature
 - MapServer Mapfile Reference

Backwards Compatibility Issues

None. Legacy mapfiles and compile setups should retain existing behavior in the presence of this new code.

Bug ID

- <http://trac.osgeo.org/mapserver/ticket/2785>

Voting History

N/A

References

N/A

16.9.48 MS RFC 48: GEOTRANSFORM Geometry operations

Date 2008/11/01

Authors Thomas Bonfort, Stephen Lime,

Contact thomas.bonfort at campocamp.com, Steve.Lime at DNR.State.MN.US

Status Implemented (2009/02)

Last Edited 2009/02

Version MapServer 5.4

Id \$Id\$

Summary

The purpose of this RFC is to add the ability to MapServer to interpret the geometries based on a user-defined GEOMETRYTRANSFORM keyword, and to render the interpreted geometry with the selected styling

An example usage would be:

```
GEOMETRYTRANSFORM "start([geom])"
```

to treat the underlying geometry as a point rendered on the first vertex current feature.

The directive to activate this behavior is the GEOMETRYTRANSFORM keyword, that initially belongs to the STYLE object. Further developments could be to enable the keyword at the LAYER level.

Usages of this parameter include drawing bounding boxes of underlying geometries, or adding arrowheads/tails to lines.

Further developments would allow complex expressions to be passed to the keyword, allowing nested transformations to the underlying geometry, eg:

```
GEOMETRYTRANSFORM "difference([geom],buffer([geom],10))"
```

and binding to attributes, eg:

```
GEOMETRYTRANSFORM "buffer([geom],[distance])"
```

Detailed functionality

The GEOMETRYTRANSFORM keyword initially accepts a shortcut version of these parameters :

- *bbox* : render a shapeObj representing the bounding box of the underlying geometry.
- *start/end* : render a point symbol at the first/last vertex of the underlying geometry. By default, the symbol is oriented to match the orientation of the corresponding geometry segment. This would be used to add arrowheads/tails to linestrings.
- *vertices* : render a point symbol at each vertex of the geometry. The default orientation matches the half angle of the corresponding segments. The start and end vertices are not included in the transformation.

These transforms are not initially implemented, but could be supported in the future:

- *buffer([geom],distance)* : render a shapeObj representing the buffered geometry. “distance” specifies the buffer distance, in layer units.
- *centroid([geom])* : render a pointObj at the location of the centroid of the geometry
- *labelpoint([geom])* : render a pointObj at the location of the at the point where the geometry will/would be labelled.
- *convexhull([geom])*
- *simplify([geom])*

Implementation Details

Apart from the parsing and internal storage of which type should be used, the modifications of this RFC only affect the high-level rendering functions in mapdraw.c .

There are three main modifications:

- AUTO is added to the ANGLE parser for the STYLE block. styleObj has an autoangle member added accordingly.
- inside msDrawVectorLayer, a copy of the shape before being clipped by the current extent must be kept, as the whole shape must be used for all but the VERTICES type. Then, when looping through the different styles that can be applied, we switch off to the type-specific function if a GEOMETRYTRANSFORM keyword is set.
- inside mapgeomtransform.c, the type-specific drawing function is added. Depending on the current style type, it either computes a new shape from the original shape (types bbox, convexhull or buffer) and passes it to the msDrawShadeSymbol, or calls msDrawMarkerSymbol for points of the original shape (types start, end, vertices, centroid) after having adjusted the orientation accordingly.

Affected Files

- mapdraw.c
- maplexer.c/l
- mapfile.c
- mapserver.h
- mapgeometrytransform.c is added, for the parsing of the transform expression, the transformation itself, and the calling of msDrawMarkerSymbol / msDrawShadeSymbol functions

Limitations

For line layers, the transformations do not fit in with the current cache mechanism that draws the first style of each class in a first pass for all shapes, and the remaining styles in a second pass.

MapScript implications

Getters and setters will have to be added to the different mapsheets.

A possible enhancement could also be to expose the transformation function to MapScript.

Documentation

completed

Backwards Incompatibility Issues

none expected.

Bug ID

<http://trac.osgeo.org/mapserver/ticket/2825>

Voting History

Vote completed on 2008/12/08:

- +1: Lime, Szekeres, Woodbridge, Nacionales, Morissette
- +0: Nicoletti

16.9.49 MS RFC 49: Symbology, Labeling, and Cartography Improvements

Date 2009/01/26

Authors Thomas Bonfort, Stephen Lime

Contact Thomas.Bonfort at campnocamp.com , Steve.Lime at DNR.State.MN.US

Status Passed and Implemented

Version MapServer 5.4

Id \$Id\$

Purpose

This RFC regroups a few minor additions or changes to the MapServer rendering or mapfile syntax.

These changes are/were all in RFC45, but were extracted to keep things moving on as some of the stuff in RFC45 lacks funding in the near future.

Fractional values for SIZE and WIDTH

AGG can deal with fractional widths and sizes but styleObj's define those properties as int's. Shouldn't be a big deal since both GD and AGG don't use those values directly, rather they use scaled values with are cast or rounded to an int if necessary.

<http://trac.osgeo.org/mapserver/ticket/2766>

MINSCALEDENOM / MAXSCALEDENOM for STYLEs and LABELS

These keywords can reduce mapfile size and maintainance, by avoiding creating multiple layers or classes.

<http://trac.osgeo.org/mapserver/ticket/2865>

OUTLINEWIDTH on line layers

It is currently impossible to draw a outlined line with a scale-dependant width. We propose to add the OUTLINEWIDTH keyword to the STYLE block, that indicates the width in pixels that should be rendered around the main line color.

The implementation of this lies in mapdraw.c. When a line's style block has an outlinewidth, the underlying shape is actually drawn twice: once with it's width adapted to account for the outlinewidth, and once normally. The current caching mechanism for lines is preserved.

example usage:

```
LAYER
  TYPE LINE
  SIZEUNITS meters
  CLASS
    STYLE
      COLOR 255 0 0
      OUTLINECOLOR 0 0 0
      OUTLINEWIDTH 1
      WIDTH 25 #this is in meters (ground units)
      MINWIDTH 1 #minimal width (in pixels) for far zoomed maps
      MAXWIDTH 20 #maximal width (in pixels) for close zoomed maps
    END
  END
END
```

whatever the map extent or scale, this line layer would always be rendered by a red line with a one pixel black outline.

<http://trac.osgeo.org/mapserver/ticket/2865>

add LABEL to layersObj

Note: This feature has not yet been implemented

so that a default can be defined for all classes (sort of like templates). A class label would take precedent.

<http://trac.osgeo.org/mapserver/ticket/XXX>

Affected Files

- mapfile.c
- mapdraw.c (outlinewidth on lines, scale on styleobj)
- mapserver.h
- maplabel.c (scale on labels)

Documentation

The documentation for the keywords will be added to the main mapfile syntax docs.

Mapscript

Getters and Setters for the keywords will be added for mapscript availability

Backwards Incompatibility

None Expected

Comments from Review period

- the LABELMETHOD proposal is withdrawn
- fractional values also for pattern,gap, offset: a good candidate for 6.0 (when pattern and gap would be moved to the styleObj?)
- there was concensus for adding parametered scaling, usefull for thematic mapping (eg size proportional to a feature attribute)
 - by allowing simple expressions, eg SIZE (18 + [poptotal] * ((43-18)/(5000-30000)))
 - or by adding pseudoitems at the layer level:

```
PSEUDOITEM
'mySize' (mrange([itemname], mininput, maxinput, minoutput,
maxoutput))
'myText' (commify(round([itemname], 2)) + ' ac')
END

LABELITEM 'myText'
CLASS
STYLE
COLOR 255 0 0
SIZE [mySize]
END
LABEL
...
END
END
```

this enhancement will be addressed in a specific rfc.

Voting History

+1 : SteveW, UmbertoN, TamasS, SteveL, DanielM (,AlanB)

16.9.50 MS RFC 50: OpenGL Rendering Support

Date 2008/12/23

Authors Toby Rahilly, Jonathan Bourke

Contact toby.rahilly at gmail.com. bourke.jf at gmail.com

Last Edited 2008/12/23

Version MapServer 5.4

Id

Overview

This RFC proposes the addition of an Opengl Rendering module to MapServer for faster rendering of images.

Presently MapServer supports AGG rendering for high quality anti-aliased images. Although AGG is capable of high quality images, and is significantly faster than GD rendering, it is still not fast enough to suit desirable use cases such as live on-demand rendering.

Opengl is seen as a solution that can provide high performance rendering by making use of hardware specially designed for real-time rendering. Current Opengl prototypes are capable of rendering maps an order of magnitude faster than AGG with similar image quality.

Technical Solution

The Opengl rendering module interface and path will be very similar to the current AGG rendering module. Like AGG, the Opengl module will make use of GD for I/O of the results. However due to the nature of Opengl there are a few key implementation differences that are worth noting.

Opengl can make use of pre-rendered textures. All symbols can be pre-rendered and stored as an Opengl texture, when they are used in rendering a map, the rendered texture is simply copied onto the image buffer with transformations. This can hugely increase the performance of complex and heavily repeated symbols, such as train tracks, because not only do they need to be only rendered once, Opengl also handles the repetition and transformations which it has been heavily optimised for.

Labels also benefit from this method greatly, as an entire alphabet can be pre-rendered and stored as textures. When a curved label is to be drawn, the Opengl module simply places the rotated textures of the characters.

Pre-rendered textures of symbols can also be shared between different map rendering instances. For this reason it is suggested that the rendering path be modified slightly, such that when a mapfile with opengl rendering is first loaded, all the symbols are pre-rendered and stored on the map object. This drastically increases the performance of batch rendering.

Another notable difference between AGG and Opengl is that Opengl is incapable of rendering into main memory, and instead renders into an inaccessible buffer in video memory. This means the image must be rendered into video memory in OpenGL, then copied to the GD image buffer before saving the result.

C API Changes

As the Opengl module follows very closely to the AGG implementation, very little change has to be made to the core of MapServer. Minor changes are made to the following files to add a rendering path for Opengl:

- mapdraw.c
- mapdrawgdal.c
- maperror.c
- maplegend.c
- mapoutput.c
- mapraster.c
- mapresample.c
- maputil.c

No new functionality is added to these files, rather just else-if blocks.

The bulk of Opengl functionality will be found in mapogl.cpp.

Mapfiles

An output block like this will trigger Opengl rendering:

```
OUTPUTFORMAT
  NAME 'OGL_PNG24'
  DRIVER OGL/PNG
  IMAGEMODE RGB
END
```

Issues

- The guts of opengl rendering occurs inside of opengl drivers. Opengl drivers vary from hardware and operating system, and the rendering techniques vary with them. What this means is that maps rendered on different computers can have different results, such as color shades, anti-aliasing quality and performance.
- Although Opengl is cross platform, each operating system has a different method of setting up an Opengl context to render into. Currently we have an implementation for pre-vista windows.

Documentation

TBD

Backwards Incompatibility

No issues expected.

Bug ID

Not assigned.

16.9.51 MS RFC 51: XML Mapfile Format

Date 2009/01/16

Authors Alan Boudreault

Contact aboudreault at mapgears.com

Last Edited 2009/03/09

Version MapServer 6.0

Id

Overview

Presently, MapServer supports only normal mapfiles that are parsed by Flex. The current mapfiles are parsed very fast by MapServer but can not be parsed by any other software due to the parser complexity. So, a client interface to build mapfiles is difficult to make.

The need we are trying to address is the ability to build MapFile Editors that would be facilitated by the existence of a XML mapfile format (since the current mapfile format makes it impossible to write a forward-compatible parser). XML is seen as a solution that can provide a strict syntax to mapfiles to have a strong validation with XML Schema.

This RFC proposes the addition of XML Mapfile support.

Technical Solution

It was decided that for the time being we should develop a XML schema and a XSLT to convert from XML to text mapfile. If the new XML format takes off then we may consider implementing support for it directly in MapServer in a future release.

Mapfiles

An example of XML mapfile layer definition (prototype):

```

<Layer>
  <name>popplace</name>
  <type>POINT</type>
  <debug>5</debug>
  <status>ON</status>
  <Metadata>
    <item name="DESCRIPTION">Cities</item>
    <item name="TEST">TESTING</item>
    <item name="RESULT_FIELDS">NAME</item>
  </Metadata>
  <data>popplace</data>
  <labelItem>Name</labelItem>
  <classItem>Capital</classItem>

  <Class>
    <name>Cities</name>
    <expression>1</expression>
    <template>ttt_query.html</template>
    <symbol>2</symbol>
    <size>8</size>
    <Label type="TRUETYPE">
      <colorAttribute>[COULEUR]</colorAttribute>
      <font>sans</font>
      <angle>0</angle>
      <size>8</size>
      <outlineColor red="255" green="255" blue="255"/>
    </Label>
    <color red="0" green="255" blue="0"/>
  </Class>

  <Class>
    <name>Cities</name>
    <expression>/2|3/</expression>
    <template>ttt_query.html</template>
    <tolerance>5</tolerance>
    <Label type="TRUETYPE">
      <colorAttribute>[COULEUR]</colorAttribute>
      <font>[FONT]</font>
      <angle>[ANGLE]</angle>
      <size>8</size>
      <outlineColor red="255" green="255" blue="255"/>
      <position>AUTO</position>
      <partials>FALSE</partials>
    </Label>
    <Style>
      <symbol>7</symbol>
      <size>6</size>

```

```
<colorAttribute>[COULEUR]</colorAttribute>
</Style>
</Class>
</Layer>
```

Future Enhancement

In the future, some enhancement could be good to added:

- Special tags for all WMS options (including styles)
- Reusable xml block with ID

Documentation

TBD

Backwards Incompatibility

No issues expected.

Bug ID

<http://trac.osgeo.org/mapserver/ticket/2872>

16.9.52 MS RFC 52: One-pass query processing

Date 2009/03/08

Authors Steve Lime

Contact sdlime at comcast.net

Last Edited 2009/06/03

Status Draft

Version MapServer 6.0

Id

Overview

This RFC proposes change(s) to the current of query (by point, by box, by shape, etc...) processing in MapServer.

Presently MapServer supports a very flexible query mechanism that utilizes two passes through the data. This works by caching a list of feature IDs (pass one) and then a second pass through the features for presentation: templated output, drawing, or retrieval via MapScript. The obvious problem is the performance hit incurred from the second pass. The real pain is that the msLayerGetShape() function, as implemented, provides random access to the data which can be very expensive for certain drivers.

Technical Solution

There are a number of potential solutions:

1. One could cache the returned shapes in memory. While this wouldn't result in a true single-pass, you wouldn't have to go back to the original driver twice. However, it could lead to large memory consumption with even moderately-sized datasets. Multiple clients accessing services at the same time would only compound the problems. Some testing has confirmed this method to be no faster and probably even a bit slower than option 3 below.
2. Another solution would be fold much of the query pre- and post-processing code into the msLayerWhichShapes() and msLayerNextShapes() functions so that the access paradigm used in drawing layers could be used. Subsequent research has let us to conclude that a true single pass is not possible in some cases. For example, GML requires a result set envelope be written out before writing individual features. There's no way to get that initial envelope without a pass through the features.
3. A final solution would be to change how the msLayerGetShape() function behaves. We propose changing the behavior of that function to provide random access to a result set (as defined by msLayerWhichShapes()) rather than the entire data set. This removes most of the overhead currently incurred by referencing the results already returned by the data driver in the initial query. For implementation purposes we would retain the current msLayerGetShape() implementations to support easy random access and create a new function called msLayerResultsGetShape().

msLayerGetShape() would *only* be used via MapScript to preserve true random access functionality. Note that drawing uses msLayerNextShape() and does not rely on index values.

Under this last solution data drivers would need to do two things:

- update the population of the shapeObj index property (long int) with a value that will allow msLayerResultsGetShape() to randomly access a result
- creation of the driver-specific version of msLayerResultsGetShape() to retrieve a shape from the results created in msLayerWhichShapes()
- the default implementation of msLayerResultsGetShape() would simply wrap msLayerGetShape() since most drivers would not have to implement the newer function (e.g. OGR or shapefiles)

The query functions would need to:

- not close the layer when finished with a query (we assume that users will want to do something with the results)
- allow msLayerWhichItems() to retrieve ALL items so that the retrieved shapes are presentation-ready (draw, template, or ...)

The presentation functions:

- refrain from calling msLayerOpen(), msLayerWhichItems(), msLayerWhichShapes() since that has already been done in the query functions

MapScript layerObj wrappers:

- add resultsGetShape() method

This solution has been piloted in the single-pass sandbox with very promising results. In some cases queries run orders of magnitude faster. One positive side effect is that primary keys need not be used to retrieve features from the result set. It is the drivers responsibility to provide data to uniquely identify a row in the result set.

Backwards Compatability Issues

This solution will most likely require changes to MapScript applications that process query results depending on types of data being processed. Those hitting shapefiles for example will still function "as is" since there that driver will still be using msLayerGetShape(). Any script hitting a RDBMS data source will have to switch to using resultsGetShape() instead of getFeature()/getShape().

One casualty would be the query save/read functions. Since the processing of a set of results would be specific to dataset result handle it won't be possible to get back to a result once a layer is ultimately closed. A proposed solution to this problem is presented next.

Query File Support

Query files have provided a means of saving the results of a query operation for use in subsequent map production. The series of indexes gathered during a query are written to disk and read later to be used to access the data a feature at a time. With the proposed changes this simply won't work with RDBMS data sources. It becomes necessary to instead recreate the result set but re-executing the query. Problem is, there's no easy way to serialize query parameters.

I propose creating a new object, a queryObj, to store the various parameters associated with MapServer queries. It might look something like:

```
.. code-block:: python

typedef struct { int type; /* By rect, point, shape, attribute, etc... Types match the query functions. / int
    qlayer; / used by all functions */
    rectObj rect; / used by msQueryByRect() */
    char qitem; / used by msQueryByAttribute() / char *qstring; / used by msQueryByAttribute() */
    ...and so on...
} queryObj;
```

A single queryObj would hang off a mapObj and the mapObj would be the sole parameter passed to the various query methods. MapServer C code, primarily the CGI and OGC interfaces would simply populate the appropriate queryObj members and call the correct query function.

MapScript would be unchanged. The wrappers for the various query functions need only use the user supplied parameters to populate the queryObj and then call the query function. The queryObj would be immutable.

By storing all the information in a single store it should be easily serialized to disk. When read, the reconstituted queryObj could then be used to re-execute the appropriate query. The msSaveQuery() and msLoadQuery() function signatures would remain "as is" although the internals would change.

Files Impacted

- driver files: implement msXXXLayerResultsGetShape() function to shape fetching code if necessary
- maptemplate.c: don't open/close a layer when presenting results
- mapgml.c: don't open/close a layer when presenting results
- mapdraw.c: don't open/close a layer ect... IF if drawing a query map
- maplayer.c: refactor msLayerWhichItems(), add msLayerResultsGetShape() to the layer plugin API
- mapquery.c: re-work msSaveQuery() and msLoadQuery(), change query functions to take a lone mapObj as input, add msInitQuery() and msFreeQuery() functions
- mapserv.c: populate map->query before calling query functions
- mapwxs.c (various): populate map->query before calling query functions
- mapfile.c: leverage msInitQuery() and msFreeQuery() functions
- mapserver.h: define queryObj, add to mapObj
- mapscript (various): update map/layer query methods to populate a queryObj

- others? (mapcopy.c for one)

Although a number of files are impacted the changes in general are relatively simple.

Unknowns

To date only shapefiles, PostGIS and Oracle drivers have been tested with this new scheme, all with positive results. Even shapefiles showed a performance improvement simply due to incurring the overhead of opening files just once. It's not clear how OGR, SDE and raster queries will be impacted. I hope the owners of those drivers can comment further.

MapServer has supported a rather obscure query method called queryByIndex() as basically a wrapper to msLayerGetShape(). This change may render that method obsolete but more checking need be done.

Voting History

None

16.9.53 MS RFC 53: Guidelines for MapScript method return values

Date 2009/03/08

Authors Daniel Morissette

Contact dmorissette at mapgears.com

Last Edited 2009/03/08

Status Adopted on 2009/03/12

Version MapServer 5.4

Id \$Id\$

Overview

Ticket #244 pointed out that the return values of MapScript methods were not consistent: some methods return 0/-1 for success/failure and others return MS_SUCCESS/MS_FAILURE.

This mini-RFC defines guidelines for the return values to use with MapScript methods in the future.

Technical Solution

Existing methods will remain untouched to avoid breaking existing MapScript applications.

For new methods added to the MapScript API in the future, the following guidelines should apply:

1. Return values:
 - If the method returns only a success/failure status then the MS_SUCCESS/MS_FAILURE values should be used.
 - If the method returns a reference to an object, then it should return a valid object on success, or a NULL value on failure
 - If the method returns an positive integer, then it should return a positive integer on success and -1 on failure. This is a flexible rule which may not apply in some contexts.

2. Error reporting:

In case of errors/failures, MapScript developers should ensure that the MapScript application code can expect to find an errorObj in the error stack. In most cases the core function that MapScript maps to should take care of calling msSetError(), but in some cases the error may be caught by the wrapper code and then the wrapper code may be responsible for calling msSetError() on failure to ensure that the caller has valid error information.

Backwards Compatability Issues

None. These guidelines apply only to new MapScript methods. The existing MapScript API remains untouched.

Ticket Id

<http://trac.osgeo.org/mapserver/ticket/244>

Voting History

Adopted on 2009/03/12 with +1 from DanielM, UmbertoN, TomK, SteveW, TamasS, HowardB, AssefaY, PericlesN, JeffM and SteveL.

16.9.54 MS RFC 54: Rendering Interface API

Date 2009/03/01

Authors Thomas Bonfort

Contact Thomas.Bonfort at campocamp.com

Status Planning

Version MapServer 6.0

Id \$Id\$

Purpose

This RFC proposes the refactoring of MapServer's rendering backends, following an approach similar to the vtable architecture used by the input drivers.

The motivation for this refactoring is that in the current code, each renderer is responsible both for low-level drawing functionality (eg. strokes, fills, symbology) and for higher level interpretation of the combination of mapfile keywords (eg. scale-dependant size adjustments, line-following orientation for symbols ...). This leads to a lot of code duplication and difficult maintainance.

In a first phase, a cairo (<http://cairographics.org>) renderer will be added following this architecture, and will support traditional raster formats (png, jpeg) as well as vector formats (pdf, svg). Support for openGL and KML rendering backends will also be added similarly. During this phase, the new renderers will live alongside the older ones, and the functionality of the existing renderers should not be affected.

In a second phase, the existing renderers will be ported to the new architecture. Ideally all renderers should be ported to the new architecture, although this task might take more time and/or financing. The current PDF and SVG renderers could be phased out and replaced by the ones natively provided by cairo.

Note: While the current GD renderer could be ported to the API architecture, it probably isn't something we want to do as we would be losing some performance induced by the switching from GD's internal pixel representation to the generic one used by this API.

Low Level Rendering API

A new *renderObj* structure is defined and is attached to each outputformat depending on which driver is configured. A renderObj contains function pointers to the low-level functionality that each renderer should implement, and configuration options which can tell the higher level calling code what is supported or implemented by the renderer.

Adding a new output driver to mapserver therefore consists in two steps:

- implementing the low-level rendering functions (depending on the renderer's capabilities and configuration options, not all functions need be implemented)
- creating and registering a new outputformat driver, by making the renderObj function pointers point to the low-level functions

```
struct renderer{
    // configuration parameters

    // image creation functions

    // raster handling functions (input and output)

    // image saving functions (only for the renderers that cannot export a
    // raster format)

    // low level rendering functions lines and polygons symbology vector
    // ellipse pixmap truetype text handling label size calculation label
    // rendering

    // support for using an image cache for symbology creation of a tile
    // representing a cached symbol vector ellipse ... placement of a
    // cached tile at a point using a tile as a fill pattern on lines and
    // polygons

    // freeing functions (main imageObj and caches)
}
```

Configuration parameters

Each renderer can inform the higher level calling code of what functionality it supports or implements. This will primarily allow us to support vector and raster renderers. More details on each configuration parameter will be given when appropriate in the rest of this document.

Image Creation Functions

Each renderer must provide a function to create a new image. MapServer's imageObj structure will have an additional void* member that will be used by the renderer to store a structure containing any usefull information it may need.

```
imageObj* (*createImage)(int width, int height, outputFormatObj *format,
                        colorObj* bg);
```

Note: Renderer specific creation options would be extracted by each renderer from the outputFormatObj passed to it. (This would be used eg by the PDF renderer for page layout options).

Raster Handling Functions

Raster handling will follow different code paths depending on whether the underlying renderer is already natively a raster renderer (eg. PNG, JPEG), or if it is a vector one (eg. PDF, SVG).

Raster Buffer Structure A new structure defining a raster object in memory is defined, and is used to replace the current code that uses a gdImage as a common format.

```
typedef struct {

    unsigned int width,height;

    // pointers to the start of each band in the pixel buffer
    unsigned char *a,*r,*g,*b;

    // step between one component and its successor (inside the same band)
    unsigned int pixel_step

    //step between the beginning of each row in the image
    unsigned int row_step;

    // pointer to the actual pixels (should not be used by the high-level
    // code)
    // TODO: as this member is actually private, it should probably be
    // a void* so that any internal representation can be used
    unsigned char *pixelbuffer;

} rasterBufferObj;
```

A renderer must provide a function to initialize a rasterBuffer where the pixel alignment and the order of the bands best fits its internal representation of a raster array.

```
void (*initializeRasterBuffer) (rasterBufferObj *buffer, int width, int height);
```

Handling Raster Layers Depending on the renderer's capabilities, there are two possibilities here, that are determined by the *supports_pixel_buffer* parameter:

- if the renderer supports a pixel buffer, then the raster layer code is given a handle to the memory buffer used by the renderer, and directly sets individual pixels where needed. Such a renderer will thus implement a function to export a rasterBufferObj pointing to its internal pixel buffer:

```
void (*getRasterBuffer) (imageObj *img,rasterBufferObj *rb);
```

- if the renderer does not use an internal representation that can be directly filled by the raster layer code, it must provide two functions that will allow the higher level code to merge the created raster:

```
void (*mergeRasterBuffer) (imageObj *dest, rasterBufferObj *overlay,
                           double opacity, int dstX, int dstY)
```

Image Saving Functions

Similarly to raster layers, there are two code paths for saving a created image to a stream or to a buffer, depending also on the *supports_pixel_buffer* configuration parameter:

- if the renderer supports a pixel buffer, the exported rasterBufferObj will be treated by some new image writing code (relying on libpng/libjpeg/libgif) This will allow each renderer to not have to implement image saving and will allow us to treat all the formatoptions in a single place.
- if the renderer does not support exporting to a rasterBuffer, it should provide a function for writing itself to a given stream:

```
int (*saveImage) (imageObj *img, FILE *fp, outputFormatObj *format);
```

TODO: exporting to a buffer for mapscript getBytes()

Low Level Functions to be Implemented by a renderer

Polygons

- solid filled: The simplest case, needs only be passed a color
- pattern filled: is passed a tile. The size of the tile (i.e. the amount of transparent space around the actual marker inside the tile allows to tweak the spacing between markers inside the polygon)
- hatch fill: TBD - probably by drawing individual lines at a higher level

```
void (*renderPolygon) (imageObj *img, shapeObj *p, colorObj *color);
void (*renderPolygonTiled) (imageObj *img, shapeObj *p, void *tile);
```

Lines

- simple stroke: is passed a pattern (dashes) and line style (caps, joins)
- pattern fill: is passed a tile

```
void (*renderLine) (imageObj *img, shapeObj *p, strokeStyleObj *style);
void (*renderLineTiled) (imageObj *img, shapeObj *p, void *tile);
```

Markers

```
void (*renderVectorSymbol) (imageObj *img, double x, double y,
                           symbolObj *symbol, symbolStyleObj *style);

void (*renderPixmapSymbol) (imageObj *img, double x, double y,
                           symbolObj *symbol, symbolStyleObj *style);

void (*renderEllipseSymbol) (imageObj *img, double x, double y,
                           symbolObj *symbol, symbolStyleObj *style);

void (*renderTruetypeSymbol) (imageObj *img, double x, double y,
                           symbolObj *symbol, symbolStyleObj *style);

void (*renderTile) (imageObj *img, void *tile, double x, double y, double angle);
```

Labels and Text

- label size calculation: If passed an “advances pointer”, also calculates individual advances for each glyphs (for angle follow text)

```
int (*getTruetypeTextbbox) (imageObj *img, char *font, double size, char *string,
                           rectObj *rect, double **advances);
```

- glyph rendering: no real change

```
void (*renderGlyphs) (imageObj *img, double x, double y, labelStyleObj
                      *style, char *text);
```

```
void (*renderGlyphsLine) (imageObj *img, labelPathObj *labelpath,
                          labelStyleObj *style, char *text);
```

Tiles and Caches For some symbols and renderer combinations, it might be beneficial to use a cache so as not to have to render a complicated symbol over and over again. This behavior would probably have to be deactivated when using attribute binding (on size, angle, color...) as there would be too many cache misses and no real gain.

TBD: use a renderer specific format for a tile (passed back as a void*), or would a simple imageObj created by normally by the renderer suffice? Second solution is much simpler as we'd use the same functions for rendering a symbol than for rendering a tile. First solution is more flexible, as the renderer can cache anything.

Miscellaneous functions

```
void (*transformShape) (shapeObj *shape, rectObj extend, double cellsize);
```

These functions might be needed by some renderers. TBD

```
void (*startNewLayer) (imageObj *img, double opacity);
void (*closeNewLayer) (imageObj *img, double opacity);
```

Cleanup functions

```
void (*freeImage) (imageObj *image);
void (*freeSymbol) (symbolObj *symbol);
void (*freeShape) (shapeObj *shape);
```

Note: The freeSymbol and freeShape functions are added here as we will be adding a void* pointer to the symbolObj and shapeObj objects where a renderer can store a private cache containing an implementation specific representation of the object.

High Level Usage of the rendering API

Image Creation

nothing special. just pass on to the renderer.

Image Saving

Depending on whether the renderer can export a raster buffer or not:

- supported: get a raster buffer, eventually apply formatoptions (quantization) and pass the buffer to the MapServer's saving functions
- unsupported: call the renderer's saving function

Raster Layers

MapServer's Raster layer handling will be modified so that it can write to a rasterBufferObj and not only to a gdImage.

Note: TODO (FrankW) add some detail here about the changes induced here

```
if(renderer->supports_pixel_buffer) {
    rasterBufferObj buffer;
    renderer->getRasterBuffer(img,&buffer);
    msDrawRasterLayer(map,layer,&buffer);
}
else {
    rasterBufferObj buffer;
    renderer->initializeRasterBuffer(&buffer,width,height);
    msDrawRasterLayer(map,layer,&buffer);
    renderer->mergeRasterBuffer(img,&buffer,0,0);
    renderer->freeRasterBuffer(&buffer);
}
```

Symbol Cache and Marker Rendering

A symbol cache similar to the actual mapgd.c imagecache will be implemented in mapimagecache.c .

Note: As pointed out earlier, it is yet to be decided if the cache will store plain imageObjs or if we allow renderers to store a specific structure. This could also be a configuration option, with each renderer specifying if it can treat its own created imageObj as a cache, or if it needs a void* cache. This would keep the code simple for most renderers, while allowing more flexibility for others (the openGL renderer will probably be needing this)

The use of an image cache would be configurable by each renderer via the supports_imagecache configuration option, as its use isn't necessarily useful depending on the format.

```
if(renderer->supports_imagecache) {
    // this function looks in the global image cache if it finds a tile
    // corresponding to the current symbol and styling and returns it. If
    // it wasn't found, it calls the renderer functions to create a new
    // cache tile and adds it to the global cache.
    imageObj *tile = getTile(img, symbol, symbolstyle);
    renderer->renderTile(img, tile, x, y);
}
else {
    switch(symbol->type) {
        case VECTOR:
            renderer->renderVectorSymbol(img, params...);
            break;
        case ELLIPSE:
            /* ... */
    }
}
```

Line Rendering

- simple stroke: call the renderer directly
- marker symbols:
 - compute positions and orientations along the geometry
 - render a marker symbol with the renderer's marker functions for each of these positions. It probably isn't a good idea to use a tile cache if the symbols have to follow line orientation, as rotating a cached tile will produce poor results.
- pattern:
 - create the pattern's tile (with the renderer's marker functions)
 - pass the tile to the renderer

Polygon Rendering

- simple fill
- pattern fill:
 - create the pattern tile
 - eventually cache the tile for future use on another geometry
 - pass the tile to the renderer
- hatch fill: - compute the lines corresponding to the hatch - use the renderer's simple stroking function

Text Rendering

Nothing special to add here, except that the basic preliminary tests (if the font is defined, or if the string to render is NULL) and the lookup of the system path of the truetype font file will be done once by the high level code before calling the renderer drawing function.

Note: Raster fonts will not be supported (at least in a first phase) by this rendering API. Only truetype fonts are implemented.

Image I/O

Currently all image I/O is done through the GD library. To raise this dependency, the RFC proposes to have mapserver implement image loading and saving by directly interfacing the libpng / libjpeg / giflib libraries. The corresponding code will be added to a new file “mapimageio.c”, and will produce or read rasterBufferObj's.

These functions will implement the formatoptions that are currently supported. Adding new formatoptions would be done by adding the code to these i/o functions, and would thus add the support for all the renderers that use this rendering API architecture:

- jpeg:
 - quality: 0 - 100
- png:

- interlacing: will be set to OFF by default, as the creation is costlier, produces heavier images, and is incompatible with TileCache’s metatiling functionality.
- compression: could be added to select the quality of zlib compression
- quantization: produce palette-based pngs from rgb or rgba imagemodes.
- palette: produce palette-based pngs given a precomputed palette. Further enhancements could include automatically producing a palette by looping through the input mapfile to extract the colors and ensure they end up in the final image (this would only be supported for RGB, not RGBA)
- gif: TBD

Note: The initial implementation of this RFC will not include support for writing GIF images.

Note: The initial implementation of this RFC will not include image loading functions by direct usage of the libjpeg/libpng/giflib libraries. It will instead fallback to GD loading and convert the created gdImage to a rasterBuffer. This can be added in a second phase as it is lower priority, and does not induce a major architectural change.

Miscellaneous

Drawing some layers as rasters in vector renderers

The current pdf (and SVG?) renderers have the option of switching over to GD for some layers, that are then incorporated as a raster image in the final map rather than adding each feature in the usual way.

This functionality could probably be kept with this API with the mergeRasterBuffer function.

Note: A renderer using this functionality will have to take care as the rasterBuffer that it will be passed will be in the native format of the delegated renderer, and may not be in the exact same format it would have created with a call to initializeRasterBuffer.

Legend

The legend rendering code will have to be refactored, as it currently produces a gdImage. Legend rendering will be handled like a normal imageObj.

Note: TODO: “embed” mode is problematic.

If postlabelcache is on, then the created imageObj can easily be added to the main image using the renderTile function (for the renderers that support it. the others will probably have no embedded legend support)

If postlabelcache is off we have a problem, as the created legend is passed as a pixmap symbol to the main map rendering. This is incompatible with the vector renderers, as the imageObj they have created isn’t an array of pixels.

Scalebar

TBD

Reference Map

TBD. Should we even still be supporting this ?

Affected Files

- maprendering.c , mapimageio.c, mapcairo.c (added)
- mapfile.c (defaults, and keywords moved from symbolObj to styleObj)
- mapoutput.c (renderObj creation)
- mapdraw.c (msDrawXXX functions moved to maprendering.c)
- mapserver.h
- lots more

Documentation

No end documentation needed aside from the migration guide.

Mapscript

TBD

Backwards Incompatibility

Symbology should be better behaved between renderers, but does imply some backwards incompatible changes in how some symbols can be rendered (although this can probably seen as fixing bugs rather than backwards incompatibilities)

- reverse orientation of rotation for vector symbols. currently vector symbols are rotated in the opposite direction of the other symbols.
- for line geometries , the given pattern (dashes...) will be scaled by the actual width of the line. A dotted line will therefore be defined as PATTERN 1 1 END whatever the width of the line.
- More to come ?

Comments from Review period

Voting History

16.9.55 MS RFC 55: Improve control of output resolution

Date 2009/03/09

Authors Daniel Morissette

Contact dmorissette at mapgears.com

Last Edited 2009/10/06

Status Adopted (2009/03/16) and Implemented.

Version MapServer 5.6

Id \$Id\$

Overview

MapServer is often used to produce a printable map corresponding to the map currently being displayed in the Web interface.

Printed maps will usually require a resolution higher than the default 72 pixels per inch which is commonly used for the screen (e.g. 150 or 300 dpi). In general printing is done by setting the `map.resolution` and requesting a larger size image for the same map extents. Setting `map.resolution` to a higher value ensures that the layers `minscaledenom/maxscaledenom` are properly evaluated for the larger image, but one thing is missing: symbology (line widths, symbol and font sizes, etc) is not adjusted to reflect the resolution change and the result is a map in which symbology looks smaller than what it looked on screen.

This RFC proposes a mechanism to fix this by automatically scaling the symbology when resolution changes so that the map maintains the same look at each resolution.

Technical Solution

A new optional `DEFRESOLUTION` keyword will be added in the `mapObj` with a default value of 72 if not set. `DEFRESOLUTION` is the reference or default resolution for which all symbology sizes are defined in the mapfile.

At rendering time, if `RESOLUTION` is set to something different from `DEFRESOLUTION`, then the symbology in the layer definitions will be adjusted by a factor corresponding to `RESOLUTION/DEFRESOLUTION`. More specifically, this is done by multiplying the `layer->scalefactor` value by the `resolution/defresolution` ratio in `msPrepareImage()`.

The following rendering parameters will be affected:

- size (symbols and labels)
- width (lines)

The following rendering parameters which were not impacted by scaling in the past will also be fixed to follow the scaling from now on:

- offsets (line, point, polygon)
- pattern (line)
- gap (line)
- linewidth (labels)
- shadowsize, background-shadow-size (labels)
- buffer around labels (collision)
- minfeaturesize, mindistance (labels)

The case of `linewidth` for line styles is a bit different: it ignores the scalefactor so that we get a fixed outline width no matter what we use for size units, but we want it to follow the `resolution/defresolution` factor. For this case the line drawing code will need to have a reference to the `mapObj` passed to `msDrawLineSymbol()` so that it can access the `resolution` and `defresolution` parameters and do the right thing.

In the case of pixmap symbols, they will be scaled only if a size is set. If no size is set then no scaling happens.

Usage example

Example 1:

Let's say we've got a mapfile that we use to produce a 400x400 pixels image for use on the Web, with both defresolution and resolution set to 72.

```
MAP
...
RESOLUTION 72
DEFRESOLUTION 72
SIZE 400 400
...
END
```

In order to produce a 300dpi image for printing, the application code should request an image of 1667 x 1667 pixels ($400*300/72=1667$) and set resolution=300. MapServer will automagically scale all symbology sizes by a factor of $300/72=4.1667$.

The new values of size and resolution for printing will likely be passed as URL parameters or set via MapScript in most applications, but for the purpose of this example, expressed in mapfile syntax then we'd use the following mapObj settings for printing:

```
MAP
...
RESOLUTION 300
DEFRESOLUTION 72
SIZE 1667 1667
...
END
```

Example 2:

An application is using a mapfile developed for map.resolution=96 with MapServer 5.x. In order to take advantage of the new feature, one should set DEFRESOLUTION=96 in the mapfile, and at rendering time, setting RESOLUTION=300 will result in all symbology being scaled by a factor of $300/96=3.125$.

Backwards Compatibility Issues

Existing apps or mapfiles that set RESOLUTION to a value other than 72 **without** setting DEFRESOLUTION will end up with their symbology scaled. This change in behavior is more likely to be considered as a feature than as a bug in most cases, but in case this is a problem for an existing app then the fix will be to simply add a DEFRESOLUTION to the mapfile which matches the resolution for which all mapfile classes and styles are defined.

The rendering parameters listed above that did not follow scaling in the past will be fixed to follow the scaling.

Documentation notes

In addition to documenting the new feature, a note should be added somewhere in the mapserver docs that as of this change, the size values will reflect valid sizes (according to the SIZEUNITS settings, MS_PIXELS by default) only when the RESOLUTION is set to the default 72 or equal to the DEFRESOLUTION setting.

Files Impacted

- mapserver.h: new defresolution member in mapObj
- mapfile.c, maplexer.l, etc: new DEFRESOLUTION mapfile keyword

- mapdraw.c: adjust scalefactor as needed in msPrepareImage()
- mapscript/php3/php_mapscript.c: expose new defresolution member

Ticket Id

- <http://trac.osgeo.org/mapserver/ticket/2948>
- <http://trac.osgeo.org/mapserver/ticket/3153>

Voting History

Adopted on 2009/03/16 with +1 from DanielM, HowardB, SteveW, TamasS, PericlesN and AssefaY.

16.9.56 MS RFC 56: Tighten control of access to mapfiles and templates

Date 2009/03/24

Authors Daniel Morissette

Contact dmorissette at mapgears.com

Authors Steve Lime

Contact steve.lime at dnr.state.mn.us

Last Edited 2009/03/26

Status Adopted and implemented (2009/03/26)

Version MapServer 5.4.0, 5.2.2, and 4.10.4.

Id \$Id\$

Overview

MapServer versions 5.2.1 and older could potentially be used to access arbitrary files via the creation of mapfiles or templates in untrusted directories.

This RFC proposes a mechanism to tighten access control on mapfiles and templates and limit the risk of leaking arbitrary file contents.

The new access control mechanisms will be implemented and released in MapServer 5.4.0, 5.2.2 and 4.10.4.

Technical Solution

The following mechanisms will be put in place:

- Enforce the requirement for the MAP keyword at the beginning of mapfiles and for the SYMBOLSET keyword at the beginning of SYMBOLSETS.
- Require a Magic String at the beginning of all MapServer templates
- Use of environment variables to control and restrict access to mapfiles by the mapserv CGI:
 - MS_MAP_PATTERN
 - MS_MAP_NO_PATH

Each of the points above are described in more details in the following sections.

Enforce the requirement for the MAP and SYMBOLSET keywords

The MAP and SYMBOLSET keywords used to be optional at the beginning of mapfiles and symbolsets respectively.

With this change, the MAP keyword will be required on the first line of mapfiles and the SYMBOLSET keyword required on the first line of symbolset files.

If the keyword is missing then the parser will reject the file.

Require a Magic String at the beginning of all MapServer templates

With this change, the first line of a template must contain the “MapServer Template” magic string which can be surrounded by comment delimiters in the format of the template to facilitate template editing (see examples below). The first line of the template file will automatically be stripped from the template and will not be included in the MapServer output.

If the magic string is not found then the template will be rejected by MapServer.

HTML template example:

```
<!-- MapServer Template -->
<html>
  <head>...</head>
  <body>
    ...
  </body>
</html>
```

XML template example:

```
<!-- MapServer Template -->
<?xml version="1.0" encoding="UTF-8" ?>
<rootElement>
  ...
</rootElement>
```

GeoJSON template example:

```
// MapServer Template
  [resultset layer=foo] {
"type": "FeatureCollection",
"features": [
  [feature trim=','] {
    "type": "Feature",
    "id": "[id]",
    "geometry": {
      "type": "PointLineString",
      "coordinates": [
        {
          "type": "Point",
          "coordinates": [[x], [y]]
        }
      ]
    },
    "properties": {
      "description": "[description]",
      "venue": "[venue]",
      "year": "[year]"
    }
  }
]
```

```

        }
    },
    [/feature]
]
}
[/resultset]
```

MS_MAP_PATTERN Environment Variable

The optional MS_MAP_PATTERN environment variable, set via mod_env or other web server equivalents, can be used to specify a Regular Expression that must be matched by all mapfile paths passed to the mapserv CGI.

If MS_MAP_PATTERN is not set then any .map file can be loaded.

Example, use Apache's SetEnv directive to restrict mapfiles to the /opt/mapserver/ directory and subdirectories:

```
SetEnv MS_MAP_PATTERN "^\^/opt/mapserver/"
```

MS_MAP_NO_PATH Environment Variable

The optional MS_MAP_NO_PATH environment variable can be set to any value via mod_env or other web server equivalents to forbid the use of explicit paths in the map=... URL parameter. Setting MS_MAP_NO_PATH to **any value** forces the use of the map=<env_variable_name> mechanism in mapserv CGI URLs.

If this variable is not set then nothing changes and the mapserv CGI still accepts explicit file paths via the map=... URL parameter.

Example, set set MS_MAP_NOPATH and some mapfile paths in Apache's httpd.conf:

```
SetEnv MS_MAP_NO_PATH "foo"
SetEnv MY_MAPFILE "/opt/mapserver/map1/mymapfile.map"
```

... and then calls the mapserv CGI must use environment variables for the map=... parameter:

```
http://localhost/cgi-bin/mapserv?map=MY_MAPFILE&mode=...
```

Backwards Compatibility Issues

The MAP and SYMBOLSET keywords must be added to any mapfile and symbolset that did not contain them already.

All MapServer templates must be updated to contain the “MapServer Template” magic string on the first line.

The new environment variables are optional and will have no impact on existing applications that don't use them.

Files Impacted

- mapserver.h
- maptemplate.c
- mapserv.c

Ticket Id

Related security tickets:

- <http://trac.osgeo.org/mapserver/ticket/2939>
- <http://trac.osgeo.org/mapserver/ticket/2941>
- <http://trac.osgeo.org/mapserver/ticket/2942>
- <http://trac.osgeo.org/mapserver/ticket/2943>
- <http://trac.osgeo.org/mapserver/ticket/2944>

Voting History

Adopted on 2009-03-26 with +1 from DanielM, TomK, PericlesN, JeffM, SteveW, AssefaY, SteveL and TamasS.

16.9.57 MS RFC 57: Labeling enhancements: ability to repeat labels along a line/multiline

Date 2009/06/26

Authors Alan Boudreault

Contact aboudreault at mapgears.com

Last Edited 2009/06/29

Status Adopted (2009/07/21) and Implemented.

Version MapServer 6.0

Id \$Id\$

Overview

Currently, MapServer draws labels on the longest segment of a linear shape. Even if the shape is a long line or a multiline shape, only one label is drawn. In some cases, the map quality could be highly improved with more labels.

This RFC proposes a mechanism to fix this by adding the ability to add more labels along long lines or multiline shapes. There are two major enhancements that are proposed.

See the Images section to visualize the current and new behaviors.

Enhancement 1: Label all the lines in MultiLine shape

At the moment, if you've got a MultiLine shape (i.e. a shapeObj with numlines > 1) then only the longest of the Lines is labelled. This is fine in most cases, but in some cases, we may want each individual Line in the MultiLine to get a label. That's the first proposed enhancement: make it possible to label all lines in a MultiLine shape.

Enhancement 2: Ability to repeat labels along a line

At the moment, the label is placed at the center of a line in the case of ANGLE FOLLOW, and at the center of the longest segment of a line in the case of ANGLE AUTOconstant. In the case of very long lines (roads), and especially when using metatiles to render a tile cache, we may want to repeat the label at some interval along the line. That's the second enhancement: make it possible to repeat the label at a given interval along a line.

Technical Solution

The way to control this in the mapfile is to add a LABEL.REPEATDISTANCE parameter. By default this would be turned off and we would keep the current behavior. If REPEATDISTANCE is set to any value > 0 then the labels would be repeated on every line of a multiline shape (enhancement 1 above), and would be repeated multiple times along a given line at an interval of REPEATDISTANCE pixels (item 2 above). In all cases the MINDISTANCE value would still be handled by the label cache so that multiple labels ending up too close to each other for various reasons would be eliminated by the label cache.

To achieve better visual effect, here is an outline of the algorithm that applies when REPEATDISTANCE is set:

1. Calculate the number of labels candidates (N) that can fit in the length of the line.
2. Ensure that N is an odd number. If it's even then subtract one to get an odd number. We want an odd number of label candidates along a given line so that there is always one candidate that falls at the center of the line and which will remain in case of collisions. With an even number of candidates, when collisions happen along a line, the remaining labels are usually shifted one way or the other along the line instead of being centered which does not look as good.
3. Calculate the offset between labels and the position of candidates along the line.
4. Insert labels candidates into the label cache in an order that will ensure that the label cache will eliminate the right labels in case of collisions (keep in mind that collisions are still possible since MINDISTANCE remains in effect). We want to give higher priority to the label candidate at the center of the line and lower priority to other candidates as they get further away from the center. Since the label cache order is last in first out (LIFO), we start by inserting the labels candidates at the extremities of the line into the cache end end with the one at the center, giving it the highest priority.

Usage example

This example will repeat the labels every 80 pixels on each line of a multiline shape.

```
MAP
  ...
  LABEL
    REPEATDISTANCE 80
  END
  ...
END
```

Backwards Compatibility Issues

There is no backwards compatibility issues. By default the LABEL.REPEATDISTANCE parameter is set to 0, so not applied.

Files Impacted

- mapprimitive.c: Modify the labels placement algorithm
- mapfile.c, maplexer.l: new LABEL.REPEATDISTANCE mapfile keyword
- mapdraw.c: Modify the way how msPolylineLabel* calls are handled

Ticket Id

- <http://trac.osgeo.org/mapserver/ticket/3030>

Images

Since a picture is worth a thousand words:

- Repeat distance, visual explanation: http://trac.osgeo.org/mapserver/attachment/ticket/3030/repeat_label.gif
- Label placement algorithm: http://trac.osgeo.org/mapserver/attachment/ticket/3030/label_algorithm.gif
- Labels comparison: <http://trac.osgeo.org/mapserver/attachment/ticket/3030/label-comparison.jpg>
- Shields comparison: <http://trac.osgeo.org/mapserver/attachment/ticket/3030/shield-comparison.jpg>

Voting History

Adopted on 2009/07/21 with +1 from SteveW, DanielM, SteveL, AssefaY, ThomasB and PericlesN.

16.9.58 MS RFC 58: Kml Output

Date 2009/03/01

Authors Dvaid Kana (david.kana at gmail.com)

Authors Thomas.Bonfort (thomas.bonfort at gmail.com)

Authors Yewondwossen Assefa (yassefa at dmsolutions.ca)

Authors Michael Smith (michael.smith at usace.army.mil)

Status Planning

Version MapServer 6.0

Id \$

Purpose

This purpose of this RFC is to provide a KML output for MapServer 6.0. The initial work was done by David Kana during the 2009 Google Summer of Code.

The main task of the project is the implementation of the KML driver for generating KML output used mainly by Google Earth application. Code for KML rendering is based on new renderer API described in MS RFC 54

First intention was to use original KML library libkml provided by Google but due to its complexity libxml2 already included in MapServer was selected for xml generating.

General Functionnality

The general idea is to provide an output format that can be set at the map level and allows to generate a kml or kmz output from a MapServer map file. Output can be generated using MapServer cgi (example mode=map) or through a WMS request.

Output format

The default name of the output format is kml, and this name can be used to set the imagetype parameter in the map file.

The format can also be defined in the map file:

```
OUTPUTFORMAT
  NAME kml
  DRIVER "KML"
  MIMETYPE "application/vnd.google-earth.kml+xml"
  IMAGEMODE RGB
  EXTENSION "kml"
  FORMATOPTION 'ATTACHMENT=gmap75.kml' #name of kml file returned
END
```

kmz output will also be supported through the minizip library.

Build

- On windows: there is a flag KML in nmake.opt
- On Linux: –with-kml
- cairo and agg2 are for now necessary to build with. When agg2 will be finished, we will drop the cairo link.
Driver configuration options

Map

In terms for Kml object, the MapServer KML output will produce a <Document> element to include all the layers that are part of the MapServer map file. Features supported for the Document are:

Docu- ment element	Sup- ported	MapServer equivalence/Notes
name	Yes	Name in the map file
visibility	No	Can be supported if needed. Default is 1
open	No	Can be supported if needed. Default is 0
address	No	Could be supported for example using ows_address if available
AddressDe- tails	No	
pho- neNumber	No	Could be supported using ows_contactvoicetelephone is available
Snippet	No	
description	No	
Ab- stractView	No	
TimePrim- itive	No	
styleURL	No	
StyleSe- lector	Yes	Style element will be supported. All different styles from the layers will be stored here and referenced from the folders using a styleUrl. In addition to the Styles related to features, there is a ListStyle element added at the document level. This allows to control the way folders are presented. See Layers section (styleUrl) setting for more details.
Region	No	
Metadata	No	
Extended- Data	No	

Layers

Each layer of the MapServer map file will be inside a Kml <Folder> element. Supported Folder elements are:

Folder element	Sup- ported	MapServer equivalence/Notes
name	Yes	Name of the layer. If not available the name will be Layer concatenated with the layer's index (Layer1)
visibility	Yes	Always set to 1
open	No	Default is 0
atom:authoratom:linkaddressAdressDetailsphoneNumberSnippet	No	
description	No	Could be supported using ows_description
AbstarctView	No	
TimePrimitive	No	
styleUrl	Yes	The user can use the kml_folder_display layer or map level metedata to choose a setting. Possible values are 'check' (default), 'radioFolder', 'checkOffOnly', 'checkHideChildren'.
RegionMetadataExtended- Data	No	

Each element in the Layer will be inside a Kml <Placemark> element. As described in the Kml reference : « A Placemark is a Feature with associated Geometry. In Google Earth, a Placemark appears as a list item in the Places panel. A Placemark with a Point has an icon associated with it that marks a point on the Earth in the 3D viewer. (In the Google Earth 3D viewer, a Point Placemark is the only object you can click or roll over. Other Geometry objects do not have an icon in the 3D viewer. To give the user something to click in the 3D viewer, you would need to create a MultiGeometry object that contains both a Point and the other Geometry object.) »

For Polygon and Line layers, when a feature is associated with a label, a MultiGeometry element containing a point geometry and the geometry of the feature is created. The point feature will be located in the middle of the polygon or line

```
<Folder>
  <name>park</name>
  <visibility>1</visibility>
  <styleUrl>#LayerFolder_check</styleUrl>
  <Placemark>
    <name>Ellesmere Island National Park Reserve</name>
    <styleUrl>#style_line_ff787878_w4.0_polygon_ff00ffcc_label_ff0000ff</styleUrl>
    <MultiGeometry>
      <Polygon>
        <outerBoundaryIs>
          <LinearRing>
            <coordinates>
              ...
            <Point>
              <coordinates>
                -70.86810858,82.12291871
              </coordinates>
            </Point>
          </LinearRing>
        </MultiGeometry>
      </Placemark>
    </Folder>
```

Supported Features in the Placemark element are:

Placemark element	Supported	MapServer equivalence/Notes
name	Yes	Label attached with the feature. If there is no label a default name is assigned using the layer name and the shape id (ex. park.1)
visibility	No	Is is by default set to true
open	No	
address	No	
Addess-Details	No	
pho-neNum-ber	No	
Snippet	No	This is a short description the feature. If needed It could be supported.
descrip-tion	Yes	This information is what appears in the description balloon when the user clicks on the feature. The <description> element supports plain text as well as a subset of HTML formatting elements.Two ways of defining the description:
Ab-stractView	No	
TimePrim-i-tive	No	
styleUrl	Yes	Refers to a Style defined in the Document
StyleSe-lector	No	
Region	No	
Metadata	No	
Geometry	Yes	Depends on the layer type

General notes on layers

- Labelcache is turned off on each layer
- Projection block should be set. If not set It will be assumed that the data is in lat/lon projection (a debug message will be sent to the user: Debug Message 1)
- Possible to output vector layers as raster using metadata: “KML_OUTPUTASRASTER” “true”
- The user can use the KML_FOLDER_DSIPLAY layer or map level metedata to choose a setting. Possible values are ‘check’ (default), ‘radioFolder’, ‘checkOffOnly’, ‘checkHideChildren’.
- The user can use metedata KML_DESCRIPTION or KML_INCLUDE_ITEMS to define the description attached to each feature.
- The user can use metedata KML_ALTITUDEMODE to specify how altitude components in the <coordinates> element are interpreted. Possible values are: absolute, relativeToGround, clampToGround. <http://code.google.com/apis/kml/documentation/kmlreference.html#altitudemode>
- The user can use metedata KML_EXTRUDE to specify whether to connect the LinearRing to the ground. <http://code.google.com/apis/kml/documentation/kmlreference.html#tessellate>
- The user can use metedata KML_TESSELLATE to specify whether to allow the LinearRing to follow the terrain. <http://code.google.com/apis/kml/documentation/kmlreference.html#extrude>

Point Layers

- Each layer will be inside a Folder element.
- Each feature will be represented by a Placemark.
- The Geometry element for a Point layer would be represented as a Point geometry element in Kml. Supported elements are:

Line Layers

- Each layer will be inside a Folder element.
- Each feature in the layer would be represented by a Placemark.
- If a label is attached to the line, the Geometry element would be represented as a MultiGeometry that includes a LineString element and a Point element representing the position of the label. If no label is attached to a feature, the Geometry element will be a LineString.

Polygon Layers

- Each layer will be inside a Folder element.
- Each feature will be represented by a Placemark.
- If a label is attached to the polygon, the Geometry element would be represented as a MultiGeometry that includes a Polygon element and a Point element representing the position of the label.

Annotation Layers

Not supported yet.

Raster Layers

- Each layer will be inside a Folder element.
- A GroundOverlay feature is created for the layer, that includes an href link to the raster image generated and LatLongBox for the extents (map extents).
- The href is generated using the imagepath and imageurl settings in the map file.

WMS Layers

Not supported yet.

Styling

As described in Section 4, all different styles from the layers will be stored at the Document level and referenced from the folders using a styleUrl.

Point Layers

Point layers will be styled using the IconStyle styling element of kml. An image representing the symbol will be created and referenced from the IconStyle object. If a label is attached to the point, a LabelStyle element will also be used. The LabelStyle will have the color parameter set.

```
<Style id="style_label_ff0000ff_symbol_star_13.0_ff000000">
  <IconStyle>
    <Icon>
      <href>>http://localhost/ms_tmp/4beab862_19bc_0.png</href>
    </Icon>
  </IconStyle>
  <LabelStyle>
    <color>ff0000ff</color>
  </LabelStyle>
</Style>
```

Line Layers

Line layers will be styled using the LineStyle styling element of kml. Color and width parameters of the LineStyle will be used. If a label is attached to the layer, a LabelStyle element will also be used.

Polygon Layers

Polygon layers will be styled using the PolyStyle styling element of kml. Color parameter of the PolyStyle will be used. If an outline is defined in the map file, an addition LineStyle will be used. If a label is attached to the layer, a LabelStyle element will also be used.

Attributes

As described in section on Layers, two ways of defining the description:

- kml_description

- kml_include_items

Coordinate system

The map level projection should be set to epsg:4326. If not set, the driver will automatically set it. Layers are expected to have projection block if their projection is different from epsg:4326.

Warning and Error Messages

- When the projection of the map file is not set or is different from a lat/lon projection, the driver automatically sets the projection to epsg:4326. If the map is in debug mode, the following message is sent: « "KmlRenderer::checkProjection: Mapfile projection set to epsg:4326 »
- If imagepath and imageurl are not set in the web object, the following message is sent in debug mode: « KmlRenderer::startNewLayer: imagepath and imageurl should be set in the web object »

Testing

Development is done in mapserver svn (<http://svn.osgeo.org/mapserver/trunk/mapserver/>). It was initially in <http://svn.osgeo.org/mapserver/sandbox/davidK/>

Documentation

Comments from Review period

- instead of KML_DUMPATTRIBUTES we could possibly use the gml/ows_include_items
- error messages should be clarified for the projection and exact wording should be put in the RFC
- clearly define what control the user will have over KML styling (the description balloon, icon styles, and Google Earth TOC)

Voting History

Adopted 2010/04/08 on the condition that this RFC should be cleaned and updated with more details. This allows to move the source code from the sand box to trunk

- with +1 from DanielM, SteveL, TamasS, AssefaY, TomK, JeffM
- with +0 from SteveW

16.9.59 MS RFC 59: Add Variable Binding to Database Connection Types

Author Dan “Ducky” Little

Contact danlittle at yahoo.com

Last Edited 2010/02/20

Status Not Adopted

Version MapServer 6.0

Id \$Id\$

Purpose

Both of the major databases used for spatial data storage with MapServer, PostgreSQL and Oracle, offer the ability to “bind” variables in SQL statements. The reason they provide variable binding is to prevent needing to resolve data-type issues in the SQL and it prevent SQL injection. Various MapServer applications take untrusted user input from the CGI request and insert it into an SQL statement. This leaves an open vector for SQL injection. This also causes some issues as SQL requires properly escaping strings and integers. Not having to know that ahead of time is useful.

Implementation Details

There is a need to be able to create the key-value pairings for the various databases in a flexible format. For example, Oracle can use a named bind variable but PostgreSQL only accepts numbers. These are some examples of variable binding in PostgreSQL and Oracle to illustrate the differences:

PostgreSQL

```
select count(*) from parcels where city_id = $1
```

Oracle

```
select count(*) from parcels where city_id = :city_id
```

Alternatively, Oracle Could Also be Written

```
select count(*) from parcels where city_id = :1
```

This need for flexibility lends itself well to a hash object and it may be appropriate to create a new block in the LAYER object to support it. For example:

LAYER

```
...
BINDVALS
    '1'  '1345'
END
...
```

END

LAYER

```
...
BINDVALS
    'city_id' '1345'
END
...
END
```

Backward Compatibility Issues

The implementation would be completely optional and not provide any backward compatibility issues.

Documentation

The mainline documentation will need to add the description of the BINDVALS block and its functionality.

Files Impacted

- mapfile.c
- mapfile.h
- mappostgis.c
- maporaclespatial.c
- mapserver.h
- maplexer.c
- maplexer.l

Comments from Review period

Voting History

16.9.60 MS RFC 60: Labeling enhancement: ability to skip ANGLE FOLLOW labels with too much character overlap

Date 2009/06/26

Authors Daniel Morissette (dmorissette at mapgears.com)

Authors Alan Boudreault (aboudreault at mapgears.com)

Last Edited 2010-09-02

Status Adopted on 2010-09-23

Version MapServer 6.0

Id \$Id\$

Overview

At the moment, ANGLE FOLLOW labels on very sharp curved lines can result in labels on which some characters overlap, resulting in either bad looking or sometimes completely unreadable labels.

This RFC proposes a mechanism to detect overlapping characters in ANGLE FOLLOW labels and simply skip the labels, leaving room for other/better labels to fall around the same spot, leading to better looking maps.

In ticket #2221, several options were discussed to improve problematic ANGLE FOLLOW labels, including line smoothing, or increasing the spacing between the characters when overlaps are detected, those approaches may have potential but will be dealt with separately (i.e. in their own RFCs).

This RFC deals specifically with skipping bad labels with too much character overlap and ticket #3523 has been created for it.

Background

This issue was found as part of the FOSS4G 2010 Benchmarking exercise where one of the layers to render was contours with labels. We've seen that MapServer did a poor job of labeling some contours with sharp curves using ANGLE FOLLOW, resulting in overlapping characters and unreadable labels.

OTOH, we found that GeoServer for instance didn't have this type of problematic labels because it simply detected the overlapping chars and skipped those labels. This is the approach we propose to implement here.

Here are two maps of the same area, the first produced by MapServer with the bad labels and the second by GeoServer without the bad labels:

<http://trac.osgeo.org/mapserver/attachment/ticket/3523/mapserver-wms.png>

<http://trac.osgeo.org/mapserver/attachment/ticket/3523/geoserver-wms.png>

Experiments

We have found that it is of no use to test the character bboxes for overlap since most of them overlap in normal situations as we can see in the following images:

<http://trac.osgeo.org/mapserver/attachment/ticket/3523/mapserver-label-boxes.png>

OTOH we found that we could compare the angles of consecutive characters within a given label and use that as a better indicator of possible overlap. In most cases, a overlap of more than 22.5 degrees is a good threshold to use to decide to skip a given label.

The following image shows the same contours in which labels with character overlap larger than 22.5 degrees are skipped:

<http://trac.osgeo.org/mapserver/attachment/ticket/3523/mapserver-label-with-fix.png>

Here is another example with a street map:

<http://trac.osgeo.org/mapserver/attachment/ticket/3523/maxoverlapangle-2.png>

Technical Solution

A new MAXOVERLAPANGLE keyword will be added to the LABEL object, whose value is the angle threshold to use in filtering out ANGLE FOLLOW labels in which characters overlap (floating point value in degrees).

This filtering will be enabled by default starting with MapServer 6.0. The default MAXOVERLAPANGLE value will be 22.5 degrees, which also matches the default in GeoServer. Users will be free to tune the value up or down depending on the type of data they are dealing with and their tolerance to bad overlap in labels.

Setting MAXOVERLAPANGLE == 0 will completely disable filtering of labels based on this criteria, restoring the pre-6.0 behavior.

Usage example

This feature is enabled by default with a default value of 22.5 degrees, so no mapfile changes are required to enable it.

This example will increase the MAXOVERLAPANGLE to 30 degrees, resulting in less labels being skipped:

```
MAP
  ...
  LABEL
    ANGLE FOLLOW
    ...
    MAXOVERLAPANGLE 30
  END
  ...
END
```

Keep in mind that this option can be combined with REPEATDISTANCE and MINDISTANCE to produce maps with even more labels. Here is an example:

```
MAP
...
LABEL
    ANGLE FOLLOW
...
    MAXOVERLAPANGLE 22.5
    REPEATDISTANCE 400
    MINDISTANCE 100
END
...
END
```

... and here is the resulting contour map with the above settings:

<http://trac.osgeo.org/mapserver/attachment/ticket/3523/mapserver-collisions-repeatdistance-400-min-100.png>

Backwards Compatibility Issues

This new feature will be enabled by default with a default MAXOVERLAPANGLE value of 22.5 degrees. Existing mapfiles will work without any change, but may end up producing maps with less labels if they contain several bad labels with overlapping characters. It is always possible to come back to the old behavior (disabling filtering) using MAXOVERLAPANGLE 0 or to tune the value up or down to get better results.

There is no other backwards compatibility issue.

Files Impacted

- mapfile.c
- mapfile.h
- mapserver.h
- maplexer.c
- maplexer.l
- mapprimitive.c

Ticket Id

Main ticket:

- <http://trac.osgeo.org/mapserver/attachment/ticket/3523>

See also:

- <http://trac.osgeo.org/mapserver/attachment/ticket/2221>

Voting History

Adopted on 2010-09-23 with +1 from DanielM, SteveL, FrankW, TomK, PericlesN, ThomasB, SteveW, HowardB, AssefaY, JeffM and TamasS.

16.9.61 MS RFC 61: Enhance MapServer Feature Style Support

Date 2010/09/11

Author Tamas Szekeres

Contact szekerest at gmail.com

Last Edited \$Date\$

Status Adopted (Implemented on 2010.09.29, Documentation added)

Id \$Id\$

Description: This RFC proposes a generic implementation for rendering the feature styles retrieved from the various data sources. In this regard we intend to enhance the existing STYLEITEM option which could now be specified for all layer types and not restricted to the OGR driver.

Background

Currently only the OGR driver supports rendering the styles attached to a feature in the OGR data sources. Theoretically only a few data sources support storing the styles along with the features (like MapInfo, AutoCAD DXF, Microstation DGN), however those styles can easily be transferred to many other data sources as a separate attribute by using the ogr2ogr SQL option as follows:

```
ogr2ogr -sql "select *, OGR_STYLE from srclayer" "dstlayer" "srclayer"
```

As a result of the transfer, the OGR style string is added to the destination layer as a separate attribute. We could also rename this attribute during the transfer according to the following example:

```
ogr2ogr -sql "select *, OGR_STYLE as mystyleattribute from srclayer" "dstlayer" "srclayer"
```

Currently the style string transferred this way can only be rendered by the MapServer OGR driver, however it would be reasonable to implement such option for all layer types in MapServer.

Proposed New Syntax

This RFC wouldn't alter the current behaviour of STYLEITEM "AUTO" option, which causes the driver specific LayerGetAutoStyle vtable method to be called as before. If LayerGetAutoStyle is not implemented by a driver an error message is provided to the user "'STYLEITEM AUTO' not supported for this data source."

We will however add support for specifying the feature attribute containing the style string in the form: STYLEITEM "mystyleattribute" which will tell mapserver to initialize the style from the specified attribute in a generic way.

Supported Style Representations

We will implement support for either the current mapserver and OGR specific style representations.

The mapserver style representation follows the syntax of the STYLE and CLASS entries in the mapfile format like the following sample:

```
"STYLE BACKGROUNDCOLOR 128 0 0 COLOR 0 0 208 END"
```

By specifying the entire CLASS instead of a single style allows to use further options (like setting expressions, label attributes, multiple styles) on a per feature basis.

In addition to the mapserver style the OGR style string format will also be supported as described in the following documentation: http://www.gdal.org/ogr/ogr_feature_style.html

The actual style format will be identified at run-time according to the first characters of the style strings. This solution will allow to specify multiple style formats within the same layer.

Implementation Details

In order to implement this enhancement the following changes should be made in the MapServer codebase:

1. Modify `msDrawVectorLayer` (in `mapdraw.cpp`) to invoke a new method (`msLayerGetFeatureStyle`) when `STYLEITEM` is set for a particular layer.
2. Implement `msLayerGetFeatureStyle` in `maplayer.c` which will call either `msUpdateStyleFromString`, `msUpdateClassFromString` or the new method: `msOGRUpdateStyleFromString` according to the actual style format retrieved from the layer.
3. Modify `msOGRLayerGetAutoStyle` (in `mapogr.cpp`) and extract the bulk of the style initialization into a separate function (`msOGRUpdateStyle`). We will add a new function (`msOGRUpdateStyleFromString`) where the style manager will be initialized by using `OGRStyleMgr::InitStyleString` instead of `OGRStyleMgr::InitFromFeature`
4. Modify `msLayerWhichItems` in (`maplayer.c`) to retrieve the attribute containing the style string specified in the `STYLEITEM` parameter. By using `STYLEITEM` “`AUTO`” no additional attribute will be retrieved just as before.

MapScript Issues

There's no need to modify the MapScript interface since the `styleitem` parameter has already been exposed. However this attribute will now support the name of the style attribute not only the “`AUTO`” value.

Files affected

To implement the solution the following files would require to be changed:

- `mapserver.h` => Add the declaration for `msLayerGetFeatureStyle` and `msOGRUpdateStyleFromString`
- `mapogr.cpp` => Add `msOGRUpdateStyleFromString` and `msOGRUpdateStyle`
- `maplayer.c` => Modify `msLayerWhichItems` and implement `msLayerGetFeatureStyle`
- `mapdraw.c` => Call `msLayerGetFeatureStyle` in addition to `msLayerGetAutoStyle`

Backwards Compatibility Issues

Currently ‘`STYLEITEM` “`AUTO`”’ has only been implemented in the OGR driver which overrides `LayerGetAutoStyle` with a custom implementation. This behaviour would continue to work as previously since the generic implementation would not affect those drivers which provide custom auto style implementation.

When using the ‘`STYLEITEM` “`mystyleattribute`”’ setting, we provide a generic implementation to set the style directly from the feature attribute and no driver specific function will be called. This option will work for all drivers in the same way.

Further Considerations

In the future we may provide support further style representations in addition to the mapserver and OGR style strings. Each new representation will require a proper (and fast) method to identify the format from the style string itself.

Using the OGR style format will require the OGR driver to be compiled in. If we compile MapServer without OGR support and the ‘`STYLEITEM` “`mystyleattribute`”’ option is used, those features may not be rendered correctly where the actual style format is OGR style string.

Bug ID

The ticket for RFC-61 (containing the implementation) can be found here.

Bug [3544](#)

Voting history

+1 from SteveW, DanielM, SteveL, PericlesN, AssefaY, FrankW, ThomasB, HowardB and TamasS

16.9.62 MS RFC 62: Support Additional WFS GetFeature Output Formats

Date 2010/10/07

Author Frank Warmerdam

Contact warmerdam@pobox.com

Last Edited \$Date\$

Status Adopted

Id \$Id\$

Description: This RFC proposes to extend the ability of the WFS GetFeature request to support formats other than GML. Support for template query formatting (aka RFC 36) is introduced as well as support for output to OGR outputs. Control of output formats is managed via appropriate OUTPUTFORMAT declarations.

WFS GetFeature Changes

- 1) If the WFS OUTPUTFORMAT value is not one of the existing supported values, then the set of outputFormatObj's for the map will be searched for one with a matching name or mime type and an image mode of MS_IMAGEMODE_FEATURE.
- 2) If the wfs_getfeature_formatlist metadata exists on the layer, it should be a comma delimited list of output formats permitted for this layer. Any other will not be selectable with the OUTPUTFORMAT parameter to GetFeature. The value in this parameter will be the "NAME" from the OUTPUTFORMAT declaration. As a fallback it may also exist on the map instead of the layer.
- 3) The existing GML2/GML3 generation support will be retained in essentially it's current form within mapwfs.c, but it's preamble and postfix generation will be moved into separate functions to reduce the "gml clutter" in the main msWFSGetFeature() function.
- 4) If an outputFormatObj is being used instead of GML output, it will be generated by a call to msReturnTemplateQuery() which already supports output via the new template engine (RFC 36) as well as call outs for other renderers.

WFS GetCapabilities Changes

In WFS 1.1.0 mode the GetCapabilities document lists the set of formats allowed for the OUTPUTFORMAT parameter. As part of this development it will be extended to show all the legal output formats for all of the layers (based on wfs_getfeature_formatlist metadata).

Note that in WFS 1.0.0 there is no mechanism to discover the format list on a per-layer basis, only the overall list. WFS 1.1.0 supports an overall list and a per-layer list.

outputFormatObj

A new image mode value will be added, MS_IMAGEMODE_FEATURE, intended to be appropriate for formats that are feature oriented, and cannot be meaningfully seen as an image. RFC 36 style template output format declarations will now default to this imagemode. The WFS GetFeature() directive will only support output formats of this image mode.

As well a new renderer value, MS_RENDER_WITH_OGR, will be added for OGR output.

OGR OUTPUTFORMAT Declarations

The OGR renderer will support the following FORMATOPTION declarations:

DSCO:* Anything prefixed by DSCO: is used as a dataset creation option with the OGR driver.

LCO:* Anything prefixed by LCO: is used as a layer creation option.

FORM=simple/zip/multipart Indicates whether the result should be a simple single file (single), a mime multipart attachment (multipart) or a zip file (zip). “zip” is the default.

STORAGE=memory/filesystem/stream Indicates where the datasource should be stored while being written. “file” is the default.

If “memory” then it will be created in /vsimem/ - but this is only suitable for drivers supporting VSI*L which we can’t easily determine automatically.

If “file” then a temporary directory will be created under the IMAGEPATH were the file(s) will be written and then read back to stream to the client.

If “stream” then the datasource will be created with a name “/vsistdout” as an attempt to write directly to stdout. Only a few OGR drivers will work properly in this mode (ie. CSV, perhaps kml, gml).

COMPRESSION=none/gzip Should gzip compression be applied as the result is returned? This is generally not suitable for use with FORM=zip which is already compressing the image. “none” is the default.

GEOMTYPE=None/Unknown/Point/LineString/Polygon/GeometryCollection/MultiPoint/MultiLineString/MultiPolygon
This sets the OGR geometry type of the output layer created. It defaults to “Unknown”.

FILENAME=name Provides a name for the datasource created, default is “result.dat”.

Examples:

```
OUTPUTFORMAT
  NAME "CSV"
  DRIVER "OGR/CSV"
  MIMETYPE "text/csv"
  FORMATOPTION "LCO:GEOMETRY=AS_WKT"
  FORMATOPTION "STORAGE=memory"
  FORMATOPTION "FORM=simple"
  FORMATOPTION "FILENAME=result.csv"
END
```

```
OUTPUTFORMAT
  NAME "OGRGML"
  DRIVER "OGR/GML"
  FORMATOPTION "STORAGE=filesystem"
  FORMATOPTION "FORM=multipart"
  FORMATOPTION "FILENAME=result.gml"
END
```

```
OUTPUTFORMAT
```

```

NAME "SHAPEZIP"
DRIVER "OGR/ESRI Shapefile"
FORMATOPTION "STORAGE=memory"
FORMATOPTION "FORM=zip"
FORMATOPTION "FILENAME=result.zip"
END

```

OGR Renderer Implementation

The OGR Renderer will be implemented as the function msOGRWriteFromQuery() in the new file mapogroupoutput.c. It will create a new OGR datasource based on the information in the output format declaration. It will then create an output layer for each map layer with an active, non-empty query resultcache. Those resultcache shapes will be written.

- The `gml_include_items` and `gml_exclude_items` rules will be used to decide what attributes should be written to the output layers.
- The `gml` field name aliasing mechanism will be supported for OGR output.
- The `gml_[item]_type` metadata will be supported for OGR output.
- The `gml_[item]_width (new)` metadata will be supported for OGR output.
- The `gml_[item]_precision (new)` metadata will be supported for OGR output.
- When `gml_[item]_type` metadata is not available then all fields will be created with a type of `OFTString`.
- Some features, such as zip output, will only be supported with GDAL/OGR 1.8. These features will be made conditional on the GDAL/OGR version.

Geometry Types Supported

In MapServer we have POINT, LINE and POLYGON layers which also allow for features with multiple points, lines or polygons. However, in the OGC Simple Feature geometry model used by OGR a point and multipoint layer are quite distinct. Likewise for a LineString and MultiLineString and Polygon an MultiPolygon layer type. When features written to a layer could be of distinct types like this the only way we can create the layer is as geometry type “wkbUnknown” - that is with no distinct geometry type.

Some drivers, such as the OGR shapefile driver will establish a specific geometry type based on the first geometry encountered and discard with an error features of an unsupported geometry type. Some drivers support mixtures of geometry types.

The GEOMTYPE FORMATOPTION make it possible to force creation of the layer with a particular geometry type.

Attribute Field Definitions

For OGR output it is highly desirable to be able to create the output fields with the appropriate datatype, width and precision to reflect the source feature definition. In the past for GML output the `gml_[item]_type` metadata provided a mechanism for users to manually set the field type in generated GML as there was no supported mechanism to automatically discovered.

As a further step, for the OGR output mechanism it is planned to offer support for two new data items, `gml_[item]_width` and `gml_[item]_precision` which default the width and precision (number of decimal places) for fields.

It is not immediately planned to utilize the field width and precision information in the GML output though that may prove useful. The width and precision metadata will be parsed by `msGMLGetItems()` and added into the `gmlItemObj` structure. Values of “0” indicate a value is not known.

gml_types auto

Setting the field type information for all fields in a layer is tedious and error prone. So as a further extension it is intended to support a mechanism to automatically discover field type, width and precision for some data sources. This will be requested by setting the “gml_types” metadata item to a value of “auto”. This will be taken as a clue to implementing layer types to set the various metadata items on the layer to define the fields type, width and precision when the GetItems layer method is called.

As part of the development effort for this RFC support for automatic field definition discovered will be implemented for “OGR”, “POSTGIS”, “ORACLE” and “SHAPEFILE” layers. The maintainers of other feature sources can implement support if and when it is convenient.

Use of CPL Services

Support for WFS OGR output is dependent on USE_OGR being defined. But when available it implies that GDAL/OGR CPL (Common Portability Library) services are also available. These include the virtual file system interface (VSI*L) which provides services like “in memory” files. The /vsimem services will be used to avoid writing intermediate files to disk if STORAGE=memory, the default configuration.

Note that the /vsimem/ service is already being used for WMS layers to avoid having to write images from remove WMS servers to disk, in WCS to avoid writing GDAL-written images to disk and in WMS when using GDAL based outputformats. So this isn’t really new.

As well, CPL includes support for gzip compression via the /vsigzip virtual filesystem handler.

In the past GDAL has *not* had support for writing zip files; a feature that is very desirable as a mechanism for both compressing and grouping multi-file sets produced by many OGR drivers. As part of the development undertaken for this RFC it is intended that GDAL will be extended with a CPL API for writing zip files, or alternatively a /vsizip/ virtual file system mechanism to write files.

Backwards Compatibility Issues

There are no apparent backward compatibility issues with this proposal. Its effect is primarily in the situation where new OUTPUTFORMAT values are used in the WFS GetFeature directive.

Security Implications

There are no apparent security implications to this proposal.

Further Considerations

- It should be noted that the DescribeFeatureType WFS operation will still only support GML formatted description for feature types.
- A prototype implementation has been developed (by Frank Warmerdam) and is working though it is not quite feature complete, and will need some refinement before it can be committed.
- It is convenient to use the metadata and other structure originally intended to drive GML production but it does cause some confusion when “gml” metadata items are used to drive non-GML output.

Outstanding Issues

- How do we alter msReturnTemplate() to support the WFS limit on number of features, and offset to the first feature?
- What are the implications if queries in other circumstances than WFS GetFeature picking an OGR output format?

Testing

The msautotest/wxs suite will be extended with a few tests of OGR output. This will likely revolve around producing text output formats so it will be easy to compare to previous results as we do with gml output. Some advanced features, such as zipped output may not be convenient to add regression testing for.

Documentation

Documentation updates will be required in the following documents:

- WFS Server: extensive discussion of new gml items, and how OGR and templated output is invoked and controlled.
- MapFile Reference: Add information on OGR OUTPUTFORMAT declarations.
- Ideally we ought to document the new “gml_types auto” stuff in the document on how to write feature layer implementations, but the only document on this is RFC 3 which does not seem to define what the functions are supposed to do for the most part.

Ticket Id

- <http://trac.osgeo.org/mapserver/ticket/3570>

Voting history

Adopted on 2010/10/13 with +1 from SteveW, SteveL, AssefaY and FrankW.

16.9.63 MS RFC 63: Built-in OpenLayers map viewer

Date 2010-09-25

Author Daniel Morissette (dmorissette at mapgears.com)

Author Alan Boudreault (aboudreault at mapgears.com)

Last Edited 2010-10-26

Status Adopted on 2010-10-29. Implementation complete.

Version MapServer 6.0

Id \$Id\$

Overview

Users often request for a simple way to test mapfiles. This RFC proposes a **simple** way to preview, test and navigate a mapfile with MapServer using a built-in OpenLayers based map viewer that will be triggered via the cgi. This is for testing/development purposes only and not for production or deploying full-featured sites. This will use the a built-in **openlayers** template. It will return a simple html viewer based on OpenLayers.

Note that GeoServer already provides a similar functionnality and this is what this RFC was inspired from.

Implementation Details

In order to implement this enhancement, the following changes should be made in the MapServer codebase:

- Add a built-in **openlayers** template.
- Some new template tags will be needed. These tags will be used to construct the mapserver cgi url.
 - [mapserv_onlineresource]
 - or**
 - [protocol]
 - [host]
 - [program]

See [ticket 3552](#) for more detail.

The template will be triggered using one of the following ways:

- Using **mode=browse&template=openlayers**: The viewer will be initialized based on the mapfile defaults, and some of the traditional mapserv CGI params may also work (such as map size, layer selection, etc.)
- Using **FORMAT=application/openlayers** in a WMS GetMap request: The rest of the GetMap parameters would be used to configure the map to view (BBOX, WIDTH, HEIGHT, LAYERS, etc.)

Both cases would call the same functions internally to produce a simple OpenLayers viewer with one singletile layer for the whole map with the selected layers.

Here's the simple viewer html code that could be used:

```
<html>
<head>
    <title>MapServer Simple Viewer</title>
    <script src="http://www.mapserver.org/lib/OpenLayers-ms60.js"></script>
</head>
<body>
    <div style="width:[mapwidth]; height:[mapheight]" id="map"></div>
    <script defer="defer" type="text/javascript">
        var map = new OpenLayers.Map('map',
            {maxExtent: new OpenLayers.Bounds([minx], [miny], [maxx], [maxy]),
             maxResolution: [cellsize]} );

        var mslayer = new OpenLayers.Layer.MapServer( "MapServer Layer",
            "[mapserv_onlineresource]",
            {layers: '[layers]', singleTile: "true", ratio:1} );
        map.addLayer(mslayer);
        map.zoomToMaxExtent();
    </script>
```

```
</body>
</html>
```

OpenLayers Dependency

Obviously, this functionnality needs the OpenLayers javascript library. A minimal build will be used and hosted on the MapServer website at <http://www.mapserver.org/lib/OpenLayers-ms60.js>. The “ms60” suffix in the OpenLayers-ms60.js filename is so that we can increase the version number in the future if/when needed to match the requirements of future releases of MapServer.

Users will also be able to use their own OpenLayers library in one of two ways:

- Using a environment variable: by setting the environment variable MS_OPENLAYERS_JS_URL, MapServer will use that url rather than the default one.
- Using a CONFIG setting in the mapfile: by adding the config variable MS_OPENLAYERS_JS_URL in a mapfile, MapServer will use that url rather than the default one.

Files affected

To determine...

Further Considerations

In the future, we may provide a mechanism to support multiple frameworks and ship generic templates with MapServer.

Bug ID

The ticket for RFC-63 (containing the implementation) can be found here.

[Ticket 3549](#)

[Ticket 3552](#)

Voting history

Adopted on 2010-10-29 with +1 from SteveL, DanielM, JeffK, AssefaY, TomK, TamasS, SteveW and PerryN.

16.9.64 MS RFC 64 - MapServer Expression Parser Overhaul

Date 2010/11/2

Author Steve Lime

Contact sdlime at comcast.net

Last Edited 2010-11-2

Status Draft

Overview

This is a draft RFC addressing 1) how the Bison/Yacc parser for logical expressions is implemented and 2) where in the MapServer code the parser can be used. This RFC could have broader impacts on query processing depending on additional changes at the driver level, specifically the RDBMS ones. Those changes don't have to occur for this to be a useful addition.

A principle motivation for this work is to support OGC filter expressions in a single pass in a driver-independent manner.

All of the work detailed here is being prototyped in a sandbox, visit:

<http://svn.osgeo.org/mapserver/sandbox/sdlime/common-expressions/mapserver>
<<http://svn.osgeo.org/mapserver/sandbox/sdlime/common-expressions/mapserver>>

Existing Expression Parsing

The existing logical expression handling in MapServer works like so:

1. duplicate expression string[[BR]]
2. substitute shape attributes into string (e.g. '[name]' => 'Anoka')[[BR]]
3. parse with yyparse()

The parser internally calls yylex() for its tokens. Tokens are the smallest pieces of an expression.

Advantages

- it's simple and it works

Disadvantages

- limited by substitution to strings, no complex types can be handled
- have to perform the substitution and tokenize the resulting string for every feature

Proposed Technical Changes

This RFC proposes a number of technical changes. The core change, however, involved updating the way logical expressions work. Additional features capitalize on this core change to bring additional capabilities to MapServer.

Core Parser Update

I propose moving to a setup where a logical expression is tokenized once (via our Flex-generated lexer) and then Bison/Yacc parser works through tokens (via a custom version of yylex() defined in mapparser.y) as necessary for each feature. This eliminates the substitution and tokenize steps currently necessary and opens up possibilities for supporting more complex objects in expressions. Basically we'd hang a list of tokens off an expressionObj, populate it in msLayerWhichItems() and leverage the tokens as needed in the parser. The following new structs and enums are added to mapserver.h:

```
enum MS_TOKEN_LOGICAL_ENUM { MS_TOKEN_LOGICAL_AND=100, MS_TOKEN_LOGICAL_OR, MS_TOKEN_LOGICAL_NOT };  
enum MS_TOKEN_LITERAL_ENUM { MS_TOKEN_LITERAL_NUMBER=110, MS_TOKEN_LITERAL_STRING, MS_TOKEN_LITERAL_... };  
enum MS_TOKEN_COMPARISON_ENUM {  
    MS_TOKEN_COMPARISON_EQ=120, MS_TOKEN_COMPARISON_NE, MS_TOKEN_COMPARISON_GT, MS_TOKEN_COMPARISON_LT,  
    MS_TOKEN_COMPARISON_RE, MS_TOKEN_COMPARISON_IRE,  
    MS_TOKEN_COMPARISON_IN, MS_TOKEN_COMPARISON_LIKE,  
    MS_TOKEN_COMPARISON_INTERSECTS, MS_TOKEN_COMPARISON_DISJOINT, MS_TOKEN_COMPARISON_TOUCHES, MS_TOKEN_COMPARISON_TOUCHED  
};
```

```
enum MS_TOKEN_FUNCTION_ENUM { MS_TOKEN_FUNCTION_LENGTH=140, MS_TOKEN_FUNCTION_TOSTRING, MS_TOKEN_FUNC  
enum MS_TOKEN_BINDING_ENUM { MS_TOKEN_BINDING_DOUBLE=150, MS_TOKEN_BINDING_INTEGER, MS_TOKEN_BINDING_<br>  
  
typedef union {  
    double dblval;  
    int intval;  
    char *strval;  
    struct tm tmval;  
    shapeObj *shpval;  
    attributeBindingObj bindval;  
} tokenValueObj;  
  
typedef struct {  
    int token;  
    tokenValueObj tokenval;  
} tokenObj;
```

Some of these definitions hint at other features that will be detailed later. When we convert an expression string into a series of tokens we also store away the value associated with that token (if necessary). In many cases the token value is a literal (string or number), in other cases its a reference to a feature attribute. In the latter case we use the attributeBindingObj already in use by MapServer to encapsulate the information necessary to quickly access the correct data (typically an item index value).

We always have had to make expression data available to the parser (and lexer) via temporary global variables. That would continue to be the case here, although different data are shared in this context. One thing to note is that once an expression is tokenized we no longer have to rely on the flex-generated lexer so, in theory, it should be easier to implement a thread-safe parser should we choose to do so.

Extending the Yacc grammar to support spatial operators

The mapserver.h definitions above allow for using shapeObj's within the Yacc grammar (we also define a shapeObj as a new base token type within mapparser.y). There are two types of shape-related tokens: 1) a shape binding, that is, a reference to the geometry being evaluated and 2) shape literals, shapes described as WKT within the expression string. For example:

In the expression:

```
EXPRESSION (fromText('POINT(500000 5000000)') Intersects [shape])
```

- 1) `fromText('POINT(500000 5000000)')` defines a shape literal (the WKT to shapeObj conversion is done)
 - 2) `[shape]` is a shape binding

We can use these tokens in the grammar to implement all of the MapServer supported (via GEOS) logical operators. Note that in the above example `fromText()` appears as a function operating on a string. This is handled as a special case when tokenizing the string since we only want to do this once. So we create a shape literal based on the enclosed WKT string at this time.

Extending the grammar to support spatial functions

By supporting the use of more complex objects we can support functions on those objects. We could write:

EXPRESSION `(area([shape]) < 100000)`

or rely on even more of the GEOS operators. (Note: only the area function is present in the sandbox.) To do this we need to somehow store a shapeObj's scope so that working copies can be freed as appropriate. I would propose adding a "int scope" to the shapeObj structure definition. Shapes created in the course of expression evaluation would be tagged as having limited scope while literals or bindings would be left alone and presumably destroyed later. This saves having to make copies of shapes which can be expensive.

Context Sensitive Parsing

We could have done this all along but this would be an opportune time to implement context sensitive parser use. Presently we expect the parser to produce a true or false result, but certainly aren't limited to that. The idea is to use the parser to compute values in other situations. Two places are working in the sandbox and are detailed below.

Class **TEXT** Parameter

Currently you can write:

```
CLASS
  ...
  TEXT ([area] acres)
END
```

It looks as if the TEXT value is an expression (and it is stored as such) but it's not evaluated as one. It would be very useful to treat this as a true expression. This would open up a world of formatting options for drivers that don't support it otherwise (e.g. shapefiles). Ticket 2950 <<http://trac.osgeo.org/mapserver/ticket/2950>> is an example where this would come in handy. Within the sandbox I've added `toString`, `round` and `commify` functions so that you can write:

```
TEXT (commify(toString([area]*0.000247105381, "% .2f")) + ' ac')
```

Which converts area from sq. meters to acres, truncates the result to two decimal places adds commas (213234.123455 => 213,234.12) for crowd pleasing display. To add this support, in addition to grammar changes, we add these declarations to mapserver.h:

```
enum MS_PARSE_RESULT_TYPE_ENUM { MS_PARSE_RESULT_BOOLEAN, MS_PARSE_RESULT_STRING, MS_PARSE_RESULT_SH
typedef union {
  int intval;
  char *strval;
  shapeObj *shpval;
} parseResultObj;
```

Then in the grammar we set a parse result type and set the result accordingly. One side effect is that we have to define a standard way to convert numbers to strings when in the string context and simply using "%g" as a format string for `snprintf` does wonders to output.

Style **GEOMTRANSFORM**

Within the sandbox I've implemented GEOMTRANSFORMs as expressions as opposed to the original implementation. The parser has also been extended to support the GEOS buffer operator. So you can write:

```
STYLE
  GEOMTRANSFORM (buffer([shape], -3))
  ...
END
```

This does executes a buffer on the geometry before rendering (see `test.buffer.png` attachment). Because the GEOMTRANSFORM processing occurs this transformation happens **after** the feature is converted from map to image coordinates, but the effect is still valuable and the buffer value is given in pixels. In the future we might consider implementing a GEOMTRANSFORM at the layer level so that the transformation is available to all classes and/or styles (and consequently in query modes too).

Expression Use Elsewhere

Currently the logical expression syntax is also used with `REQUIRES/LABELREQUIRES` and with rasters. In the `REQUIRES/LABELREQUIRES` case the code would remain mostly "as is" we'd still do the substitutions bases on layer status, then explicitly tokenize and parse. Since this done at most once per layer there's really no need to do anything more.

Rasters present more of a challenge. We'd need to handle them as a special case when tokenizing an expression by defining pixel bindings and then pass a pixel to the parser when evaluating the expression. This should be **much, much** faster than the current method where each pixel value is converted to a string representation (and then back to a number), especially given the number of pixels often evaluated. Some interesting drawing effects are also possible if you could expose a pixel location to the GEOS operators. For example, one could create a mask showing only pixels within a particular geometry.

Query Impact

This is where things get interesting. I'm proposing adding a new query, `msQueryByFilter()` that would work off an expression string (this is working in the sandbox). The expression string would still have to be accompanied by an extent parameter. Drivers like shapefiles still need to first apply a bounding box before applying a secondary filter. Other drivers could choose to combine the extent and expression string (more likely the tokens) if they so choose. `msQueryByFilter()` works much like `msQueryByAttributes()`. The layer API has been extended to include a prototype, `msLayerSupportsCommonFilters()`, that allows the driver to say if it could process this common expression format natively somehow (e.g. via a FILTER and `msLayerWhichShapes()`/`msLayerNextShape()`) or if the expression would need to be applied after `msLayerNextShape()` is called repeatedly. The shapefile and tiled shapefile drivers would work natively, as would any driver that uses `msEvalExpression()`. My hope is that the RDBMS drivers could somehow translate (via the tokens) an expression into their native SQL but if not, we would still be able to use those sources.

Backwards Compatibility Issues

Surprisingly few. The parser changes would all be transparent to the user. Truly handling TEXT expressions as expressions is a regression, albeit a positive one IMHO. I would also propose a few expression level changes especially around case-insensitive string and regex comparisons within logical expression. I think it makes more sense and is more user friendly to simply define case-insensitive operators (e.g. EQ and IEQ for straight string equality, and ~ and ~* for regex (modeled after Postgres).

The additional operators, functions and parsing contexts are new functionality.

A great deal of code would be made obsolete if this were pursued. Much of the OWS filter evaluation would be handled by the `msQueryByFilter()` function and numerous associated enums, defines, etc... could go away.

Grammar summary (**bold** means new):

- Logical operators: AND, OR, NOT
- Comparison operators: =, =~, !=, >, <, >=, <=, ~, ~*, in
- Spatial comparison operators: **intersects**, **disjoint**, **touches**, **overlaps**, **crosses**, **within**, **contains**, **beyond**, **dwithin**
- Functions: length, **commify**, **round**, **tostring**
- Spatial functions: **fromtext**, **area**, **distance**, **buffer**

Security Issues

While the bulk of the work is in the bowels of MapServer any change of this magnitude could have unintended consequences. In this case I think the largest risks are buffer overflows associated with string operators in the parser and memory leaks. Care would need to be taken in developing a comprehensive set of test cases.

Todo's

1. The "IN" operator is in dire need of optimization.

2. All OGC filter operations need to be supported. Bounding box filters in particular have not been looked at.
3. Need "LIKE" operator code. (e.g. Dr. Dobbs, 9/08, "Matching Wildcards: An Algorithm", pp. 37-39)
4. How to handle layer tolerances in msQueryByFilter()?
5. Best way to manage tokens: array, list, tree? Bison/Yacc needs array or list, but both Frank and Paul have referred to trees. (Update: the tokens are now managed as a linked list.)
6. Thread safety...
7. Parser error handling, any errors have basically always been silently ignored.

Bug ID

#3613

Voting history

Passed on 12/1/2010 with a +1 from Steve L, Steve W, Perry, Assefa, Tamas.

16.9.65 MS RFC 65 - Single-pass Query Changes for 6.0

Date 2010/11/18

Author Steve Lime

Contact sdlime at comcast.net

Last Edited 2010-11-18

Status Draft

Overview

This is a proposal to straighten out issues introduced in 5.6 with the single-pass query support. We probably introduced more change than necessary in hindsight. This RFC represents a simplification of both the C and MapScript APIs.

Single-pass query is really a misnomer. Pre-5.6 we would do an initial query (by point, bbox or whatever) to identify candidate shapes and then n small queries to retrieve each result. This was obviously very slow in some cases, particular with the RDBMS drivers. In 5.6 we switched things to basically hold a result set open post query and retain index values to the result set. We still make 2 passes through the results but this is much more efficient than before.

Initially we stuck the result set id in the shapeindex attribute of a result (of type resultCacheMemberObj). This index was later used to retrieve the feature. Long story short, at the NYC sprint we discovered that some drivers were doing things differently. For Oracle, the result set ID was being passed in the tileindex and the shapeindex contained the global shape id. This was a reasonable thing to do and the PostGIS driver was changed at the sprint to behave the same way. So, the shapeindex contains the overall record index and the tileindex contains the index relative to the query result set. This re-use of the tileindex takes advantage of an attribute that otherwise would go unused and saves us from further complicating things. Layers that use tile indexes are always file-based and don't suffer (generally) from the performance problems what caused the changes in the first place.

Drivers that Implement msLayerResultsGetShape()

- Oracle Spatial as msOracleSpatialLayerResultGetShape()
- PostGIS as msPostGISLayerResultsGetShape()
- OGR as msOGLayerResultGetShape() (is identical to msOGLayerGetShape())

Proposed Technical Changes

Cleaning up the query result portion of the code.

1. Drop the layer API function msLayerResultsGetShape() in favor of msLayerGetShape().
2. Edit the msLayerGetShape() for drivers that support the result set indexes (now passed as a tile index value) to look for the tile index and if present work of the existing result set. If not, then work of the global id. That is, merge msLayerResultsGetShape() and msLayerGetShape() into a new msLayerGetShape().
3. Remove resultsGetShape() and getFeature() methods from MapScript.
4. Refactor getShape() MapScript method to a) return a shapeObj * like getFeature() does and to b) take a resultCacheMemberObj as input instead of the shape and tile indexes. That simplifies the interface and abstracts the indexes so that we have more flexibility moving forward. We wouldn't necessarily have to change the driver implementations to take a resultCacheMemberObj at this point, that could be done later.

The refactored getShape() signature would like so (in layer.i for SWIG):

```
%newobject getShape;
shapeObj *getShape(resultCacheMemberObj *r)
```

I'd also like to consider adding another query saving function to MapScript, something like saveQueryFeatures(). This function would write a pre-5.6 query file which consisted of a series of shape and tile indexes. We wouldn't write tile indexes for layers that weren't tiled (e.g. layers that didn't have a TILEINDEX). This would restore some useful functionality that was removed with the 5.6 changes.

1. Add signatures to the two styles of query files (query parameters and query results). This will allow us to write a single loader function and improve security.
2. Add an optional flag to saveQuery() method in MapScript to save the actual query results (e.g. all the resultCacheMemberObj's) instead of just the query parameters.

Post RFC a query action in MapScript would look like so:

```
...
my $rect = new mapscript::rectObj(420000, 5120000, 582000, 5200000);
$layer->queryByRect($map, $rect); # layer is left open after this operation

for(my $i=0; $i<$layer->getNumResults(); $i++) {
    my $shape = $layer->getShape($layer->getResult($)); # much simpler
    ...
}

# save query
$map->saveQuery('myquery.qy'); # new style (query parameters)
$map->saveQuery('myquery.qy', 1); # old style (query feature indexes)
```

The changes are relatively technically mild. The changes in MapScript are big in that scripts that process query results will need an update. In the end I think that's worth it and this will be more intuitive for users.

Bug ID

#3647

Voting history

Passed with a +1 from Steve L., Tom, Jeff, Steve W., Perry.

16.9.66 MS RFC 66: Better handling of temporary files

Date 2011-01-12

Author Alan Boudreault (aboudreault at mapgears.com)

Author Daniel Morissette (dmorissette at mapgears.com)

Last Edited 2011-01-12

Status Adopted on 2011-01-17

Version MapServer 6.0

Overview

At the moment, we write some temporary files in the web-accessible IMAGEPATH directory, this was a poor practice but still okay for some uses in the past (such as writing CONNECTIONTYPE WMS and WFS responses while we process them), but as our need for temporary files increase, we need to ensure that temp files are handled in a proper and safer way.

This is a proposal for a better handling of the temporary files. The goal is to add the ability to configure the temporary path.

Proposed Solution

The files will still be written on the disk. The temporary path can be set by the two following ways:

- The environment variable MS_TEMPPATH.
- In the mapfile

```
WEB
  TEMPPATH "/tmp/"
END
```

If the temporary path is not set, the function will try the standard path depending on the OS. “/tmp/” for Linux/MAC and “C:/temp” for Windows. Most of the work will be to modify the msTmpFile function.

Purposes of temporary files

- mapcontext.c: Load an OGC Web Map Context format from an URL
- mapgdal.c: msSaveImageGDAL() temporary file... memory support implemented
- mapkmlrenderer.cpp:
 - Merging raster buffer

- Create icon images
- Create a zip file with the kml file in it. Using cpl zip api.
- mapogcfilter.c: Save mapfiles after filter applied (debug only)
- mapogcsld.c:
 - Save sld files.
 - Save mapfiles after SLD applied (debug only)
 - Download the symbol referenced by the URL and create a pixmap
- mapogroutput.c:
 - Create zip file (write from query)
 - Create temporary directory (write from query)
- mapscript/php/image.c: Save web images
- mapwfslayer.c: Save gml files
- mapwmslayer.c: Save temporary request output files

Files affected

- maputil.c: The msTmpFile function.
- All files that call msTmpFile().

Future enhancement

The default behavior could be changed to write the temporary files in memory. This will only be available if MapServer is built with gdal/cpl, which has a virtual io support. This is more efficient than writing files on disk. The virtual file system interface approach will be based on the RFC 62 [CPL Services](#) implementation, which already uses memory files.

This will need the implementation of a few generic functions (or using msIO* functions) to open/read/write/close a file using the CPL functions when available. A memory file can only be handled by the CPL services.

This enhancement is not a part of the current RFC and will require another RFC.

Bug ID

The ticket for RFC-66 (containing the implementation) can be found here.

Ticket [3354](#)

References

RFC 62 [CPL Services](#)

Ticket [3570](#)

Voting history

Adopted on 2011-01-17 with +1 from SteveW, DanielM, FrankW, AssefaY, PericlesN

16.9.67 MS RFC 67: Enable/Disable Layers in OGC Web Services

Date 2011-02-01

Author Alan Boudreault (aboudreault at mapgears.com)

Author Daniel Morissette (dmorissette at mapgears.com)

Author Yewondwossen Assefa (yassefa at dmsolutions.ca)

Last Edited 2011-02-10

Status Adopted on 2010-02-25 and implemented in MapServer 6.0

Version MapServer 6.0

Overview

At the moment, it is not possible to hide/disable a layer in OGC Web Services. Everybody recognizes the need to be able to hide layers from a given mapfile from some or all OGC Web Service (OWS) requests.

This is a proposal to add the ability to enable/disable layers in OGC Web Services in MapServer.

There was also a discussion on this topic in the wiki at <http://trac.osgeo.org/mapserver/wiki/HidingLayersInOGCWebServices>

Use Cases

Here are some use cases to demonstrate the need of hiding layers:

- One needs the ability to hide tileindex layers to all OGC services
- In a WMS mapfile where multiple scale-dependent layers are in a common group, we want only the group to appear in GetCapabilities? and not the individual layers. However the layers should not be completely turned off since we want them to be visible in GetMap and queryable with GetFeatureInfo when the group is selected. This use case is common for WMS and may (or may not) apply to other OGC services.
- One may want to offer a given layer via WMS but not via WFS (or any combination of services). In other words, we need the ability to select in which OGC services a given layer is exposed.
- The copyright notice (i.e. layer with STATUS DEFAULT) shall not appear in the GetCapabilities output and shall not be queryable.
- Not about hiding a full layer, but setting the ability to say that one wants a certain layer to return the geometry as gml in a wms-getfeatureinfo-response (at this moment it is never returned)
- Handle wms_group_layers as real layers (relevant for INSPIRE), but move the rendering part into hidden layers in order to avoid redundant style configurations in the group layer and the sub layer.

Proposed Solution

The main concern was to minimize user's changes in their mapfiles. It seems that the easier way to go would be to use metadata, as we already do currently for some ows settings.

All OWS services will be disabled by default unless enabled at map or layer level. The OWS services can be enabled using the following metadata:

- ows_enable_request: Apply to all OGC Web Services
- wms_enable_request: Apply to Web Map Service (WMS)
- wfs_enable_request: Apply to Web Feature Service (WFS)

- `sos_enable_request`: Apply to Sensor Observation Service (SOS)
- `wcs_enable_request`: Apply to Web Coverage Service (WCS)

The value of the metadata is a list of the requests to enable:

```
"GetMap GetFeature GetFeatureInfo"
```

The possible values are the request names for each service type as defined in the corresponding OGC specification.

For convenience, there are also two special characters we can use in the requests list:

- `*`: Used alone, means all requests
- `!`: Placed before a request name, means disable this request
- `!*`: Means disable all requests

Examples:

Fully enable WMS:

```
wms_enable_request "*"
```

Enable WMS, all requests except GetFeatureInfo:

```
wms_enable_request "* !GetFeatureInfo"
```

Enable WMS with only GetMap and GetFeatureInfo:

```
wms_enable_request "GetMap GetFeatureInfo"
```

Enable any/all OGC Web Service request types:

```
ows_enable_request "*"
```

Disable any/all OGC Web Service request types, mostly useful at the layer level to hide a specific layer:

```
ows_enable_request "!*"
```

Inheritance

A particularity of the proposed solution is the inheritance of settings between the map and the layer level. The settings at the map level apply to all layers unless they are overridden at the layer level. Example:

Fully enable WFS for all layers at the map level:

```
wfs_enable_request "*"
```

Disable WFS GetFeature request in a specific layer (All other requests will remain enabled):

```
wfs_enable_request "!GetFeature"
```

Implementation notes

- Don't forget to also update the list of supported operations in the GetCapabilities (e.g. don't write out GetFeatureInfo as an operation if "`wms_enable_request`" "`!GetFeatureInfo`")

Improved handling of wms_layer_group as real layers

The current behavior of the wms_layer_group is to provide hierarchy of layers and expose it through the capabilities document. The parent layers do not contain a <Name> tag, thus are not accessible through the GetMap and GetFeatureInfo requests. With an upgrade of wms_layer_group functionality to use Group parameter to indicate the level of the XPath expression that can be requested (refer to <http://trac.osgeo.org/mapserver/ticket/1632>), and the addition of the functionality discussed in this RFC, the user will have flexibility to configure the map file to show/hide low level layers and to allow or not WMS requests at different levels of the tree hierarchy. This is especially important to be able to support the INSPIRE requirements.

Note: This section of the RFC was not implemented and will be done as part of future INSPIRE related enhancements, likely in 6.2.

Backwards Compatibility Issues

All OWS services will be disabled by default. This implies that all users will have to modify their mapfiles and add the following line to get their ogc services working as before.

```
ows_enable_request "*"
```

Tickets

Main ticket:

- <http://trac.osgeo.org/mapserver/ticket/3703>

Related tickets:

- <http://trac.osgeo.org/mapserver/ticket/337> : Need a way to prevent layers from being served via WMS
- <http://trac.osgeo.org/mapserver/ticket/300> : Extend behavior of DUMP mapfile parameter for GML output
- <http://trac.osgeo.org/mapserver/ticket/1952> : Tileindex Layer and WMS Get Capabilities
- <http://trac.osgeo.org/mapserver/ticket/1632> : support for named group layers using wms_layer_group
- <http://trac.osgeo.org/mapserver/ticket/3608> : INSPIRE related support
- <http://trac.osgeo.org/mapserver/ticket/3830> : DUMP keyword is made obsolete by RFC 67

Voting history

Adopted on 2010-02-25 with +1 from FrankW, PericlesN, SteveW, DanielM, AssefaY, JeffM, TamasS

16.9.68 MS RFC 68: Support for combining features from multiple layers

Date 2011/02/10

Author Tamas Szekeres

Contact szekerest@gmail.com

Last Edited \$Date\$

Status Adopted (Implemented on 2011-03-04)

Version MapServer 6.0

Id \$Id\$

Description: This RFC proposes an implementation for creating a new data provider (CONNECTIONTYPE=UNION) which provides an option to represent features from multiple layers in a single layer.

1. Overview

Today, you can combine multiple files using a tileindex, but only if they have the same attributes, and description. In theory, it might be nice to be able to have multiple source layers that have similar attributes and to be able to combine them into a single layer (being called as union layer) using some compatible subset of the source column attributes so that the combined layer could be treated as a single layer. We could then use this single layer in the same way as any other layer when setting up the classes styles and labels. This layer could also provide the option to use features from multiple layers when configuring clustering support as per [MS RFC 69](#).

2. The proposed solution

This functionality will be implemented as a separate layer data provider (CONNECTIONTYPE=UNION). The union layer will use the CONNECTION parameter to define the source layers in the mapfiles as follows:

```
LAYER
  CONNECTIONTYPE UNION
  CONNECTION "layer1,layer2,layer3" # reference to the source layers
  NAME "union-layer"
  PROCESSING "ITEMS=itemname1,itemname2,itemname3"
  ...
END
LAYER
  CONNECTIONTYPE OGR
  NAME layer1
  ...
END
LAYER
  CONNECTIONTYPE SHAPE
  NAME layer2
  ...
END
LAYER
  CONNECTIONTYPE SHAPE
  NAME layer3
  ...
END
```

The new layer data provider will work in the following way:

1. In LayerOpen, it will open all of the source layers specified by the CONNECTION parameter
2. The LayerWhichShapes call will be delegated to the underlying layers and provide the rectangle for the area of interest
3. LayerNextShape will iterate through the layers and call LayerNextShape for the subsequent shapes. The layer index is assigned to the tileindex of the returned shapes. If we finish retrieving the shapes from one layer we start retrieving the features from the next source layer.
4. LayerGetShape will identify the layer based on the tile index and then call LayerGetShape of this layer

The union layer and the source layers must have the same geometry type otherwise an error is generated in the LayerOpen call.

2.1 Handling the layer attributes (items)

In general the source layers must provide those attributes which are required when rendering the union layer, however the underlying data may contain further attributes, which are not used when fetching the data from the original source. When all attributes are requested (in the query operations) then the union layer will provide only some aggregated attributes (like the layer name or the group name of the source layer the feature belongs to). The set of the items can manually be overridden (and further attributes can be exposed) by using the existing ITEMS processing option. At this stage of the development, the driver will expose the following additional attributes:

1. Combine:SourceLayerName - The name of the source layer the feature belongs to
2. Combine:SourceLayerGroup - The group of the source layer the feature belongs to

2.2 Projections

It is suggested to use the same projection of the union layer and the source layers. The layer provider will however support transforming the feature positions between the source layers and the union layer.

2.3 Handling classes and styles

We can define the symbology and labelling of the union layers in the same way as any other layer by specifying the classes and styles. In addition we will also support the STYLEITEM AUTO option for the union layer, which is essential if we want to display the features in the same way as with the source layers. The source layers may also use the STYLEITEM AUTO setting if the underlying data source provides that.

2.4 Query processing

The driver will create (and operate on) a copy of the source layers which will allow to keep the underlying layers open until the union layer is open. This will provide the single pass query to work in case if the source layer supports it. The queries on the union layer will anyway behave the same like with the other layers.

3. Implementation Details

In order to implement this enhancement the following changes should be made in the MapServer codebase:

1. Modify the lexer to interpret the new connection type (UNION).
2. Implement mapunion.c containing the code of the union layer data source.

3.1 Files affected

The following files will be modified/created by this RFC:

```
maplexer.l (maplexer.c)
mapserver.h
Makefile.vc
Makefile.in
mapunion.c (new)
```

3.2 MapScript Issues

The connection type of this new layer will be exposed in the MapScript interface. No further impact is taken into account at the moment.

3.3 Backwards Compatibilty Issues

This change provides a new functionality with no backwards compatibility issues being considered.

4. Bug ID

The ticket for RFC-68 (containing implementation code) can be found here.

Bug 3674

5. Voting history

+1 from SteveW, DanielM, AssefaY, PericlesN, ThomasB, SteveL, TamasS

16.9.69 MS RFC 69: Support for clustering of features in point layers

Date 2011/02/19

Author Tamas Szekeres

Contact szekerest at gmail.com

Last Edited \$Date\$

Status Adopted (Implemented on 2011-03-04)

Version MapServer 6.0

Id \$Id\$

Description: This RFC proposes an implementation for clustering multiple features from a layer to single (aggregated) features based on their relative positions.

1. Overview

In order to make the maps perspicuous at a given view, we may require to limit the number of the features rendered at neighbouring locations which would normally overlap each other. Currently there's no such mechanism in MapServer which would prevent from the symbols to overlap based on their relative locations. In a feasible solution we should provide rendering the isolated symbols as is, but create new (clustered) features for those symbols that would overlap in a particular scale. According to the example at <http://trac.osgeo.org/mapserver/attachment/ticket/3700/cluster.png> the number of the features forming the clusters are displayed in the labels for each clustered features.

3. The proposed soution

This functionality will be implemented as a separate layer data provider (implemented in mapcluster.c) This provider will be used internally (being invoked in msLayerOpen). The clustering parameters can be specified for each layer type as follows:

```
LAYER
  TYPE POINT
  CONNECTIONTYPE OGR
  NAME cluster
  CLUSTER
    MAXDISTANCE 20 # in pixels
    REGION ellipse # can be rectangle or ellipse
```

```
    GROUP (expression) # we can define an expression to create separate groups for each value
    FILTER (expression) # we can define a logical expression to specify the grouping condition
END
...
END
```

We can also use multiple classes to display the clustered shapes. The referred example above use the following layer definition:

```
LAYER
  CLUSTER
    MAXDISTANCE 50
    REGION "rectangle"
  END
  LABELITEM "Cluster:FeatureCount"
  CLASSITEM "zoomcode"

  CLASS
    TEMPLATE "query.html"
    STYLE
      SYMBOL "image4"
    END
    LABEL
    ...
    END
    EXPRESSION "Cluster:Empty"
  END

  CLASS
    TEMPLATE "query.html"
    STYLE
      SYMBOL "image1"
    END
    LABEL
    ...
    END
    EXPRESSION "5"
  END
  CLASS
    TEMPLATE "query.html"
    STYLE
      SYMBOL "image2"
    END
    LABEL
    ...
    END
    EXPRESSION "4"
  END
  CLASS
    TEMPLATE "query.html"
    STYLE
    COLOR 0 0 255
    SYMBOL "image3"
    END
    LABEL
    ...
    END
    EXPRESSION "3"
  END
```

END

3.1 The concept of the implementation

In the proposed solution msLayerOpen will call the vtable method of the cluster layer provider instead of the original vtable method depending on the existence of the clustering options, something like:

```
if (layer->cluster.region)
    return msClusterLayerOpen(layer);
```

In msClusterLayerOpen the data provider will override the vtable functions so that the subsequent LayerWhichShapes/LayerNextShape/LayerClose (and some further) functions will be handled by this provider and not by the original data source. The clustering process itself will be handled in the LayerWhichShapes call. This is the only place where the features are retrieved from the original data source and then cached in the local clustering database (stored in layerinfo).

The clustering process itself will be implemented in the following way:

1. For each feature we create a tentative cluster with some aggregate attributes (like the feature count, the average position and the variance) the features are added into a customized quadtree data structure which provides quick access when searching for the neighboring shapes
2. For each feature we will retrieve all the neighbouring shapes (that has already been retrieved earlier) within the specified distance (CLUSTERMAXDISTANCE) and search shape (CLUSTERREGION) by using a quadtree search. We will also inspect the filter and group conditions in each relations, In the related clusters we update the feature count (n) average positions (avg) and the variance (var) for each intersecting clusters by using the following recursive formula:

```
n = n + 1
avg(n) = avg(n-1) * (n-1) / n + x(n) / n
var(n) = var(n-1) * (n-1) / n + pow2(x(n) - avg(n)) / (n-1)
```

3. In a second turn we evaluate the tentative clusters based on their feature count and the offset of the average position related to the initial position and the variance. The best ranking clusters will be identified by minimizing the position offset and the variance. The individual features (having rank=0) will be retrieved first in this approach.
4. The best ranking clusters will be added to the finalization list (in layerinfo) and the finalized clusters (and the related features) will be removed from the quadtree as well.
5. Based on the finalized features we update the average position and the variance of the affected clusters which are still exist in the quadtree.
6. Repeat from #4 until we have features in the quadtree.

In LayerNextShape the features are served from the finalization list which is preserved until the layer is open. In LayerClose the vtable of the layer will be restored to the original methods (by calling msInitializeVirtualTable)

3.2 Handling the feature attributes (items)

The clustered layer itself will provide the following aggregate attributes:

- 1) Cluster:FeatureCount - count of the features in the clustered shape
- 1) Cluster:Group - The group value of the cluster (to which the group expression is evaluated)

These attributes can be used to configure the labels of the features and can also be used in expressions. The clustered layer will also support to get further attributes from the original data source as referenced in the LAYER configuration.

The ITEMS processing option can be used to specify additional attributes from the source layer according to the user preference.

If we retrieve the original attributes then the layer provider will provide only those values which are equal for each shapes in the cluster. The other values are set to “Cluster:Empty”. In the future we may probably extend this by implementing aggregate functions to define the attributes, like min([attributename]) or max([attributename])

3.3 Handling classes and styles

We can define the symbology and labelling of the clustered layers in the same way as any other layer by specifying the classes and styles. STYLEITEM AUTO is not considered to be supported at this phase.

3.4 Query processing

In the query operations the clustered features are retrieved as single shapes with the attribute set as specified in the ITEMS processing option. The clustered features are preserved until the layer is open, so the single pass query approach is provided by this driver.

4. Implementation Details

In order to implement this enhancement the following changes should be made in the MapServer codebase:

1. Modify the lexer to contain the new keywords
2. Create a new struct (clusterObj) to contain the clustering parameters and implement the handlers (initCluster, loadCluster, freeCluster, writeCluster) in mapfile.c
3. Modify maplayer.c to invoke msClusterlayerOpen based on the existence of the clustering parameters, and make msLayerWhichItems aware of the group and filter expressions
4. Implement mapcluster.c containing the code of the cluster layer data provider

4.1 Files affected

The following files will be modified/created by this RFC:

```
Makefile.vc  
Makefile.in  
maplayer.c (msLayerOpen and msLayerWhichItems)  
mapfile.c, mapfile.h(for handling clusterObj)  
mapcluster.c (the code of the new data provider)  
cluster.i (SWIG interface file to expose clusterObj)  
maplexer.l  
mapserver.h
```

4.2 MapScript Issues

The new object (clusterObj) will be exposed to the mapscript interface.

4.3 Backwards Compatibility Issues

This change provides a new functionality with no backwards compatibility issues being considered.

5. Bug ID

The ticket for RFC-69 (containing implementation code) can be found here.

Bug [3700](#)

6. Voting history

+1 from SteveL, AssefaY, ThomasB and TamasS

16.9.70 MS RFC 70: Integration of TinyOWS in MapServer project

Date 2011/04/14

Author Olivier Courtin

Contact olivier dot courtin at oslandia.com

Last Edited \$Date\$

Status Adopted

Version MapServer 6.2

Id \$Id\$

Description: This RFC proposes a TinyOWS integration under MapServer Umbrella.

1. Overview

TinyOWS is often used tiedly with MapServer to provide WFS-T functionnalities.

The idea here is to bring to end user a more integrated solution through a single MapFile configuration file for both apps.

And also to put TinyOWS under MapServer project umbrella, to increase again its usage.

2. The proposed solution

2.1 Keeping the cycle release independant

MapServer and TinyOWS cycles releases are kept independant.

2.2 SVN

On SVN, TinyOWS location should be:

svn.osgeo.org/mapserver/trunk/tinyows
svn.osgeo.org/mapserver/tags/tinyows-1.0.0

svn.osgeo.org/mapserver/branches/tinyows-1.0

2.3 A common MapFile as config file

Aim is to be able to have for end user a single config file, so a text MapFile.

TinyOWS trunk already able to deal with MapFile to retrieve all it's config stuff, through a dedicated MapFile lexer.

The idea, in a quite near future, is to bring an LibMapFile API and so to allow others apps to use MapFile as a single config file way.

It will simplify the maintenance of such a parser, and avoid possibility to have distinct behaviours.

This LibMapFile API, is out of the scope of this RFC.

2.4 Perspective: Packaged build system

We could imagine from this RFC (and also with related mod_geocache integration), to provide an meta package with a single configure/make/make install, managing the build of MapServer, TinyOWS and mod_geocache at once.

These meta package build system is also out of the scope of this RFC.

3. Solution Details

3.0 Naming

TinyOWS will be called: MapServer TinyOWS (To keep the previous quite known name, and to give it the MapServer prefix)

3.1 Documentation

Move TinyOWS trac Wiki documentation to RST syntax.

Also need to enhance documentation to provide more examples and a comprehensive user manual, or at least something like and FAQ.

Native English writers, and guys who are not (yet) familiar with the project are really appreciated on helping on this.

3.2 Licence

TinyOWS already use MIT licence, as MapServer does. Copyright holders (Barbara Philippot and Olivier Courtin) should be kept on existing TinyOWS files.

3.3 Tickets

TinyOWS use a Trac, but as only few tickets are still open, an efficient way is just to create them back in MapServer one.

Should imply a new component in MapServer Trac, called: TinyOWS.

3.4 Developers & PSC

Olivier Courtin should enter in MapServer PSC and have commit access to MapServer trunk, and will keep (at least for a while) the lead in the TinyOWS development stuff.

Others TinyOWS devs are already involved in MapServer project (Assefa, Alan).

One aim is also to have more MapServer devs ready to look at the code, and committing patches.

The MapServer PSC will become the ultimate decision authority for MapServer TinyOWS module.

3.5 SVN Import

TinyOWS trunk and 1.0 (coming) branch should be imported in MapServer SVN.

Previous commit history will be kept on the old TinyOWS SVN, for a while.

3.6 Code Convention

We have to call astyle on the whole code, to make it MapServer compliant: astyle --style=kr --unpad=paren --indent=spaces=2

3.7 Redirections

tinyows.org domain could be redirected to the coming MapServer TinyOWS documentation pages.

Mailings lists: tinyows-dev and tinyows-users should be stopped and news discussions should occur to relevant mapserver ones.

3.8 Project Maturity

If we compare to MapServer, TinyOWS is a far more younger project, with a really small dev team. So it implies that decision, and administrative part of the project must be kept lightweight, at least for a while.

So RFC must be used only for big and major changes, all the others common stuff, should be done ‘only’ with simple Trac tickets, like:

- Correct/improve OGC standard compliance, and interoperability
- Bug and security fixes
- Minor feature enhancement
- Small code refactoring
- Unit tests policy
- ...

4. TinyOWS Code Review

4.1 Code Origin

All C code was written from scratch by TinyOWS devs, so should not be a real problem.

For XSD Schema coming from OGC, and OGC CITE Unit tests: Official OGC LICENSE is described here: <http://www.opengeospatial.org/ogc/document> it allows public diffusion, but not to modify it.

4.2 Code Quality

All code compile without any warning on commons Unix like platforms, with flags: -ansi -pedantic -Wall

All OGC CITE Units tests are valgrinded, (no error, no memory leak), but it's doesn't cover all the code branchs.

Some units tests like Cunit could be helpfull in a future.

4.3 Security Audit

No external security audit never been perform on the code. The main inherent risk is SQL Injection.

Somes checks already have been done with automated tools like sqlmap, but will need to be improved to adjust to some WFS-T and FE peculiar uses cases.

(No security hole 've been found on TinyOWS trunk with sqlmap)

4.4 OGC WFS-T compliancy

Implementation of WFS 1.0.0, WFS 1.1.0, FE 1.0.0 and FE 1.1.0. Basic and Transactional profile, SF-0. (No Xlink nor Lock profile implemented)

TinyOWS trunk on OGC CITE unit test:

- WFS-T 1.1.0 (r4) : 559 'Passed' / 0 'Failed'
- WFS-T 1.0.0 (r3) : 398 'Passed' / 0 'Failed'

4.5 External Dependancies

- LibXML2 >= 2.6.20 (and libxml2 trunk to avoid GML XSD Schema, see: <http://tinyows.org/trac/wiki/LibxmlSchemaGmlBug>)
- PostgreSQL >= 8.1.0
- PostGIS >= 1.5.0
- FastCGI is optional (but recommended)

4.6 MapFile notions not yet addressed

Some Mapfile concepts are not yet present in TinyOWS:

- Only PostGIS CONNECTIONTYPE are handled
- TinyOWS don't pretend to support right now all the WFS parameters available in MapFile
- But on the other hand you should be able to configure every part of TinyOWS from MapFile
- Each CONNECTION string value in layers must be the same.
- MapFile PROJECTION content is not parsed, so use explicit wfs_srs
- MapFile LAYER/FILTER is not parsed.
- Defaults values are TinyOWS ones, even for common properties shared by both apps.
- TinyOWS don't use DATA element from MapFile, so you have to use tinyows_table (and tinyows_schema if needed) in each layer.
- If DUMP is not set to TRUE on a layer both Read and Write access are shutdown for these layer

4.7 Build system

TinyOWS use like MapServer autoconf and Makefile to build stuff.

4.8 Roadmap and vision

General aim is to keep the application the faster alternative available for WFS-T, as compliant as possible to next OGC and INSPIRE standards, and of course robust.

Mains future works area are (they will imply futures RFC, just here to notice them):

- Add new export formats (Shapefile, KML...)
- Apache Module support
- More exhaustive unit tests policy (not only OGC ones)
- More consistent behaviour and configuration directives for both TinyOWS and MS.
- Oracle Spatial support
- Application Schema support
- WFS 2.0 and INSPIRE compliancy

5. Voting history

Passed with +1's from Steve L., Steve W., Tamas, Dan, Howard, Assefa, Thomas and Tom on 8/19/2011.

16.9.71 MS RFC 71: Integration of Mod-Geocache in the MapServer project

Date 2011/05/20

Author Thomas Bonfort

Contact tbonfort at terriscope dot fr

Last Edited \$Date\$

Status Adopted

Version MapServer 7.0

Id \$Id\$

Description: This RFC proposes the integration of [mod-geocache](#) in the MapServer project.

1. Overview

[Mod-Geocache](#) is a recent tile caching solution that runs in front of a WMS server either as an apache module or as a fastCGI executable. It can connect to any WMS compliant server, but given its source code language and the roots of its core developers, it would make sense to integrate it tightly with the mapserver project, to ease configuration for end-users, and provide higher QA through a larger development team.

1.1 The need for a tile caching solution

The usage patterns of web mapping have evolved in the past years and is more and more based around the pre-generation of image tiles rather than the direct creation of images from the source data.

Current solutions for serving map tiles include TileCache, MapProxy, and GeoWebCache, all of which accomplish the task successfully but in a manner that does not integrate ideally with the MapServer project:

- They do not run native code, which incurs a minor performance overhead, and can be an inconvenience in the context of high performance data dissemination
- They do not share their configuration with the server they are proxying, as such requiring users to duplicate configuration variables and metadata.
- In the case of the python servers, they require an additional component to function (mod-python, mod-wsgi, or fastcgi wrapper) that is cumbersome to configure on non-mainstream platforms. The GIL is also a bottleneck for multi-threaded servers for the requests that require an access to native code (notably related to image format encoding and decoding).
- NIH ;) and as it can be written in C, why not use that directly?

1.2 The mod-geocache project

Mod-geocache is a recent project (oct 2010), distributed under an apache license. It is written in plain C using a semi object-oriented architecture (heavy use of structure inheritance and function pointers). Being primarily aimed at being run as an apache module, it is very fast as it runs as native code inside the process treating the http requests (there is no overhead in cgi process creation or fastcgi ipc).

Its list of features include:

- services WMS, WMTS, TMS, VirtualEarth/Bing and GoogleMaps requests
- ability to respond to untile WMS requests by merging tiles from the cache or forwarding them to the wms source
- responds to WMS/WMTS GetFeatureInfo requests (forwarded to source service)
- KML superoverlay generation
- data provided by WMS backends (GDAL supported sources planned)
- experimental memcached cache
- configurable metatiling, with inter-process/inter-thread locking and synchronization to avoid overloading the source wms when the tiles are not seeded yet.
- on-the-fly tile merging for combining multiple tiles into a single image
- image post-processing (recompression and quantization) when arriving from a backend
- interprets and produces cache control headers: Last-Modified, If-Modified-Since, Expires
- multithreaded seeding utility
- ability to add a custom watermark on stored tiles
- can produce a fastCGI executable for using with other webservers than apache
- configurable symbolic linking of blank tiles to gain disk storage
- configurable error reporting: plain http error code, textual message, or empty (blank) image
- ability to specify vendor params or dimensions to be forwarded to the WMS backend (and build a cache that takes these parameters into account)

- rule-based proxying of non-tile requests to (an)other server(s), e.g. for WFS, WFS-T, etc...

1.3 Integration Overview

Mod-geocache will be modified to read its configuration from a supplied mapfile rather than its own xml file as is now. When used in conjunction with mapserver and tinyOWS, it will act as a proxy to these servers: if an incoming request corresponds to something that can be served from cache it will act as a classic tile server, if not it will proxy the request to mapserver or tinyows (or any other OGC compliant server).

2. Governance

2.1 Finding a Name

“Mod-Geocache” as a name is a poor choice, and should be changed during the integration with MapServer. The author has no predefined idea as to what the solution should be named, ideas will be greatly appreciated.

2.2 Release Cycles

Mod-geocache being a recent project, it is undergoing development at a pace that is incompatible with the MapServer release cycle. As such, the release cycle of mod-geocache will be at first decoupled from the mapserver one: mod-geocache releases will be produced any time there is a mapserver release, but also at a faster rate if needed.

2.3 Source Code Location

The mod-geocache code will be located in a subdirectory of the mapserver repository, e.g. trunk/mapserver/mod-geocache

2.4 RFCs and Decision Process

In the early steps of the integration, development surrounding the core of mod-geocache unrelated to the MapServer project will be undertaken in a relaxed manner compared to the RFC based decision taking that prevails for MapServer.

All non trivial changes to the mod-geocache core will be announced for discussion on the mapserver-dev mailing list, but will not undergo the rfc voting process unless there is a direct interaction with the actual mapserver functionality.

Once the transitionning phase of the integration has been completed, the development on mod-geocache will follow the traditional RFC based decision taking.

2.5 Licence

The apache licence of mod-geocache will be switched to the same licence as MapServer.

2.6 Tickets

Mod-geocache is hosted on google-code and uses its integrated issue tracking system. The MapServer trac instance will be used, once a dedicated component for mod-geocache has been created.

There are currently no open bugs to transition to the MapServer trac. The open feature enhancements will be manually migrated to the MapServer trac instance.

2.7 SVN Import

Mod-geocache trunk will be imported in MapServer SVN.

Previous commit history will be kept on the old google-code SVN, for a while.

3 A common MapFile as config file

3.1 LibMapfile API

A LibMapFile API will be created out of the mapserver source tree, and will require some refactoring of header and source files. The MapServer API itself should not be changed as the refactoring will mostly concern moving some functions and declarations out into separate files.

3.2 Configuration Directives

New keywords and/or metadata will have to be added to the mapserver parser. The exact syntax and the extent of the configuration keywords must be discussed as part of the commenting period of this RFC.

The configuration directives being rather extensive, a tradeoff will have to be found between ease of syntax and similarity to actual mapserver keywords.

3.3 Documentation

The mod-geocache documentation is rather sparse, and consists essentially of a commented configuration file. There will have to be an effort to add documentation to the main mapserver doc site, and to migrate the few wiki pages from the google-code hosting.

4. Code Review

4.1 Code Origin

All C code was written from scratch by myself and Steve Woodbridge, so should not be a real problem. Image io functions based on libpng/libjpeg have been vastly inspired by the same functions in mapserver, and could be merged together in a second phase.

4.2 Code Quality

Similar to MapServer.

4.3 Security Audit

No external security audit has been performed on the code. Being run as an apache module that potentially receives untrusted data, security has always been a concern when writing the code, but I'm no security expert.

4.4 External Dependancies

- libcurl (required)
- apr(required) / apr-util(optional)
- libpng (required)
- libjpeg (required)
- pcre (optional)
- OGR (for the seeder, optional)
- libcairo (optional, required for servicing GetMap requests built from cached tiles)
- FastCGI (optional)

4.5 Build system

mod-geocache like MapServer uses autoconf (without automake) and Makefiles to build stuff.

4.6 IP and Patent overview

Patent review is left as an exercise for users coming from countries with a broken patent system ;)

5. Voting history

Passed with +1's from Steve L., Steve W., Tamas, Dan, Howard, Assefa, Thomas and Tom on 8/19/2011.

16.9.72 MS RFC 72: Layer and Label-Level Geomtransforms

Date 2011/06/27

Author Steve Lime

Contact sdlime at comcast.net

Last Edited \$Date\$

Status Draft

Version MapServer 6.2

Id \$Id\$

1. Overview

MapServer 6.0 introduced the concept of geometry expressions within a styleObj-geomtransform. For example, one could write:

```
STYLE
  GEOMTRANSFORM (buffer([shape], -5)
  ...
END
```

This would cause a buffer operation to be run on the shape before being rendered with a given style.

This is useful for certain cartographic effects but is limited in a couple of ways:

1. it operates in pixel space (e.g. once a feature is converted from map to image coordinates)
2. the resulting shape can only be used with a single style so it is not efficient to, say, create a complex rendering of a buffered feature
3. it is not possible to query transformed features
4. the resulting shape cannot be used in any labeling operations

2. The proposed solution

This RFC proposes to extend GEOMTRANSFORMS to both the layer and label contexts. Basically the same keyword and syntax would become valid in other objects.

For a layer the transformation would be applied to geometries as they are read from a datasource and before any drawing or query operations. As a result it would be much more efficient to perform complex rendering of a transformed shape. In addition the resulting shape would also be queryable in a consistent manner since the transformation would be independent of the map being drawn (e.g. scale, bounding box, etc...).

For a label the transformation would be applied ahead label point computation, in pixel coordinates much like the current style implementation. This will allow for effects like labeling the inside edge of a polygon or perhaps creating a curved labels within a polygon.

These operations are computationally intensive so users would need to understand the performance impact but as tiling becomes the norm this is less an issue.

3. Implementation Details

For layers I propose adding a check to the functions msLayerGetShape() and msLayerNextShape() to conditionally apply the GEOMSTRANFORM before returning the shape. The resulting shape would contain all the attributes of the parent. (Note: one potential issue is that certain operations might affect the bounding box used to select candidate shapes via msLayerWhichShapes()).

For labels the check and transformation would be applied within the msLayerDrawShape() function.

Small changes to the logical expression grammar (mapparser.y) and expression tokenizer would need to be made.

3.1 Files affected

The following files will be modified/created by this RFC:

```
mapfile.c (layer/label read/write)
mapdraw.c (update msDrawShape())
maplayer.c (update msLayerGetShape(), msLayerNextShape(), msLayerWhichItems() and msLayerGetTokens())
maplexer.l (add additional GEOS operators, in trunk only buffer and difference are currently implemented)
mapparser.y (extend the grammar)
```

3.2 MapScript Issues

These are just expressionObj's so functions to get/set them already exist.

3.3 Security Issues

Care must be taken to avoid memory leaks associated with the production of the transformed shapes. It would make sense to allow runtime substitution like is done with layer filters and class expressions. Similarly, validation patterns would be required.

3.4 Backwards Compatibility Issues

This change provides a new functionality with no backwards compatibility issues being considered.

4. Bug ID

None assigned. See related ticket #3871.

5. Voting history

None

16.9.73 MS RFC 73: Improved SVG symbols support

Date 2011/05/19

Authors Zak James (zjames at dmsolutions.ca)

Authors Yewondwossen Assefa (yassefa at dmsolutions.ca)

Last Edited 2011/05/19

Status Proposed

Version MapServer 6.2

Id \$Id\$

Overview

The SVG format offers several advantages over existing mapserver symbol types but existing support is limited. We propose the implementation of complete support using the libsvg-cairo library, part of the cairo project.

Technical Solution

All renderers will be extended with an added supports_svg flag, set to 0 for all but the cairo renderer. When an SVG symbol is requested, other renderers will trigger a call to msRenderSVGToPixmap which will parse the referenced svg file (using libsvg-cairo) and render the svg into the symbol's pixmapbuffer using cairo. After this operation, normal pixmap symbol handling will be used.

For the cairo renderer, the renderSVGSymbolCairo function will use libsvg-cairo to parse the symbol, but will then use the cairo api to render the symbol directly.

Configure.in will be modified to detect the --with-libsvg-cairo configure option and define USE_LIBSVG_CAIRO.

Existing Partial Implementation

If this rfc is adopted the existing SVG symbol code (see <http://trac.osgeo.org/mapserver/ticket/3343>) would be superceeded and would be removed.

The proposed implementation will reuse the existing changes to the parser but the approach for reading and rendering the symbols would be different. It will use an existing SVG parser which includes a more complete SVG implementation and will pass through the SVG instructions directly in the case of a cairo (pdf or postscript) outputformat to improve quality. Additionally, this version will pre-scale and rotate the SVG before rasterizing with agg to avoid bitmap artifacts.

Usage example

```
SYMBOL
  NAME "svgsymbol"
  TYPE SVG
  IMAGE "/path/to/symbol.svg"
END
```

... once defined, the symbol is used within the mapfile like any other.

Backwards Compatibility Issues

There are no compatibility issues with existing mapfiles. The SVG symbol type is already allowed within a SYMBOLSET. SVG Symbol support will be disabled by default. Enabling it will require installation of the libsvg-cairo library available from * <http://cairographics.org/snapshots/libsvg-cairo-0.1.6.tar.gz>

Affected Files

- mapserver.h
- mapdraw.c
- mapdummyrenderer.c
- maprendering.c
- mapsymbol.c
- mapsymbol.h
- mapcairo.c
- mapagg.cpp
- configure.in

Ticket Id

- <http://trac.osgeo.org/mapserver/ticket/3671>

Voting History

+1 from DanielM, SteveW, ThomasB, SteveL, MichaelS, AssefaY

16.9.74 MS RFC 74: Includes from non-file connections (eg Databases)

Date 2011/07/29

Author Michael Smith, Daniel Morissette

Contact michael.smith at usace.army.mil, dmorissette at mapgears.com

Last Edited 09/17/2011

Status Draft

Version MapServer 6.2

1. Overview

MapServer 4.10 introduced the concept of INCLUDE files. When this directive is encountered parsing switches to the included file immediately. As a result the included file can be comprised of any valid mapfile syntax. For example, one could write:

```
INCLUDE 'myLayer.map'
```

This would include the contents in the mapfile at runtime.

It would be useful to extend this to allow INCLUDEs from database connections. This provides another mechanism for dynamic mapfiles without requiring MapScript.

2. The proposed solution

This RFC proposes to add a new DBINCLUDE mapfile item. This item would have a number of associated mapfile items including:

```
CONNECTIONTYPE CONNECTION DATA INCLUDEITEM FILTER METADATA
```

And be closed with an END keyword.

Example

```
D B INCLUDE
CONNECTIONTYPE oraclespatial
CONNECTION "%uid%/%passwd%@tns_connection"
DATA "MAPLAYER_TABLE_NAME"
I N C L U D E I T E M "MAPLAYERS"
FILTER "condition=%layer_variable%"
METADATA
"layer_variable_validation_pattern" "condition1|condition2$"
END
END
```

The only new item, beside the DBINCLUDE keyword, is the INCLUDEITEM. It defines the attribute from which to pull the layers definitions. It functions similarly to TILEITEM.

Allowed CONNECTIONTYPES would include OGR, POSTGIS, ORACLESpatial.

An Example of the query would be

```
select maplayers from maplayer_table_name where condition = condition1;
```

The content of the MAPLAYERS content would be strings to include in the mapfile just as INCLUDE would do. One difference is that the query could return a resultset of strings to add, and would be equivalent to N INCLUDE statements.

2.5 Use Cases

A common use case is providing a custom classed layer for an individual. Currently, this is very difficult to do without MapScript.

For example, in a table one column would be username and the second column would be the layer class level text string.

Table 16.2: Example Table

user	class
jeff	CLASS Name "Jeff Layer" STYLE OUTLINECOLOR 255 0 0 SYMBOL 0 COLOR 0 0 255 END END
daniel	CLASS Name "Daniel Layer" STYLE OUTLINECOLOR 122 180 200 SYMBOL 0 END END
steve	CLASS Name "Steve Layer" EXPRESSION "type=brewery" STYLE SYMBOL 0 COLOR 0 255 255 WIDTH 4 END END

Another common case is dynamically classifying a layer as the data changes. With SQL, a text string can be calculated on the fly from the data itself, by looking at the DISTINCT values of a dataset to generate the classes that will be used to display that data.

3. Implementation Details

3.1 Files affected

The following files will be modified/created by this RFC:

mapfile.c
mapogr.c
maplayer.c
maplexer.l
mapparser.y

3.2 MapScript Issues

There should be no mapscript issues, this is really only useful for CGI

3.3 Security Issues

The security issues should be the same as any existing database connection layer

3.4 Backwards Compatibility Issues

This change provides a new functionality with no backwards compatibility issues being considered.

4. Bug ID

None assigned.

5. Voting history

None

16.9.75 MS RFC 75: INSPIRE view service support

Date 2011/07/01

Author Stefan Leopold (stefan.leopold at reflex.at)

Author Stephan Meissl (stephan.meissl at eox.at)

Last Edited 2012/03/09

Status Adopted on 2012/03/08

Version MapServer 6.2

Id \$Id\$

1. Overview

In order to achieve INSPIRE view service compliance, several enhancements need to be implemented in MapServer to support the [specification](#) :

- Activation of INSPIRE support (two scenarios)
- Multi-language support for certain capabilities fields
- Provision of INSPIRE specific metadata
- Named group layers
- Style section for root layer and possibly existing group layers

This RFC aggregates and extends the already provided ideas/solutions regarding INSPIRE view service support.

2. Activation of INSPIRE support

INSPIRE specific metadata can either be referenced in an external INSPIRE service metadata document (scenario 1) or can be directly embedded in the capabilities document (scenario 2). MapServer needs to support both scenarios.

As suggested in [Ticket 3608](#), activation of the corresponding scenario for INSPIRE support takes place in the WEB.METADATA section of the mapfile through “wms_inspire_capabilities”. If activated, the corresponding INSPIRE namespace as well as appropriate validation warnings are generated in the capabilities document.

Scenario 1 - activate INSPIRE support using a reference to external service metadata

```
WEB
METADATA
  "wms_inspire_capabilities" "url"
  ...
END
END
```

Scenario 2 - activate INSPIRE support using embedded service metadata

```
WEB
METADATA
  "wms_inspire_capabilities" "embed"
  ...
END
END
```

3. Multi-language support for certain capabilities fields

INSPIRE requires multi-language support and requests a list of all supported languages as well as the default language in the capabilities document. Based on the language parameter in the GetCapabilites request, certain specific metadata values, namely

- “wms_title”
- “wms_abstract”
- “wms_rootlayer_title”
- “wms_rootlayer_abstract”
- “wms_group_title”
- “wms_group_abstract”
- “wms_style_title”
- “wms_style_<name>_title”

as well as language dependent reference data like

- DATA “road_eng”
- CONNECTION “db_ger”

need to be provided in the requested language. If the language is not supported (or no language parameter is present), the default language has to be used.

As suggested in [Ticket 3608](#), all supported languages are specified as comma separated list (first language is default) through “wms_languages” in the WEB.METADATA section of the mapfile. This language parameter is also added to the onlineresource in the GetCapabilites output.

```
WEB
METADATA
...
"wms_languages" "eng,ger"           #first default, values according ISO 639-2/B
...
END
END
```

To address the second issue, different [options](#) regarding implementation were evaluated.

For language specific metadata values, a key extension method is applied.

```
WEB
METADATA
...
"wms_title.eng" "myservicetitle"
"wms_title.ger" "myservicetitleger"
"wms_abstract" "mylayerabstract"      #fallback
"wms_abstract.ger" "mylayerabstractger"
...
END
END
```

For language dependent reference data, a similar approach like the [runtime-substitution](#) feature of MapServer has been followed (only DATA and CONNECTION values with %language% are substituted).

```
...
LAYER
  NAME TN.RoadTransportNetwork.RoadLink
```

```

    DATA "road_%language%"
    ...
END
...

```

If the language is not supported (or no language parameter is present), the default language is substituted.

4. Provision of INSPIRE specific metadata

Depending on the scenario, additional metadata information is required to support the specification. The INSPIRE related fields are provided below:

Scenario 1 - INSPIRE related fields using referenced external service metadata

```

WEB
METADATA
  "wms_inspire_capabilities" "url"
  "wms_languages" "eng,ger"          #first default, values according ISO 639-2/B
  "wms_inspire_metadataurl_href" "http://INSPIRE.service/metadata"
  "wms_inspire_metadataurl_format" "application/vnd.ogc.csw.capabilities.response_xml"
  "wms_keywordlist_ISO_items" "infoMapAccessService" #value according "classification of spatial data"
  "wms_keywordlist_vocabulary" "ISO"
  "wms_title" "myservicetitle"
  "wms_abstract" "myabstract"
  "wms_fees" "conditions unknown"      #value either "no conditions apply" | default "conditions un
  "wms_accessconstraints" "None"        #value according ISO 19115 (MD_RestrictionCode codelist) or
  "wms_contactorganization" "MapServer" #responsible organization
  "wms_contactposition" "owner"        #responsible organization, value according "INSPIRE Metadata
  ...
END
END

```

Scenario 2 - INSPIRE related fields using embedded service metadata

```

WEB
METADATA
  "wms_inspire_capabilities" "embed"
  "wms_languages" "eng,ger"          #first default, values according ISO 639-2/B
  "wms_inspire_temporal_reference" "2011-09-19" #date of last revision, value according YYYY-MM-DD
  "wms_inspire_mpoc_name" "mympocname"      #point of contact
  "wms_inspire_mpoc_email" "mympoc@e.mail" #point of contact
  "wms_inspire_metadataadate" "2011-09-19" #value according YYYY-MM-DD
  "wms_inspire_resourcelocator" "http://myinspireresource" #URL for ResourceLocator
  "wms_inspire_keyword" "infoMapAccessService" #value according "classification of spatial data serv
  "wms_keywordlist_ISO_items" "infoMapAccessService"
  "wms_keywordlist_vocabulary" "ISO"
  "wms_title" "myservicetitle"
  "wms_abstract" "myabstract"
  "wms_fees" "conditions unknown"      #value either "no conditions apply" | default "conditions un
  "wms_accessconstraints" "None"        #value according ISO 19115 (MD_RestrictionCode codelist) or
  "wms_contactorganization" "MapServer" #responsible organization
  "wms_contactposition" "owner"        #responsible organization, value according "INSPIRE Metadata
  ...
END
END

```

Notes:

- several fields require certain values, these values are not validated by MapServer itself, instead a manual validation against the [INSPIRE schemas](#) or the [WMS INSPIRE tester](#) is recommended
- as suggested in this [document](#) regarding scenario 2, `<inspire_common:ResourceType>` is always set to service and `<inspire_common:SpatialDataServiceType>` is always set to view, both values can't be altered through the mapfile
- conformity is always set to not evaluated, based on the latest [INSPIRE Metadata Implementing Rules](#) (page 7), a specification document, the specification date and a specification URI or URL need to be provided for degree conformant/not conformant, which is currently not implemented

5. Named group layers

INSPIRE mandates usage of named group layers. Thus the functionality of `wms_layer_group` is extended to support named group layers. If a layer with the same name as used in `wms_layer_group` is found it is treated as named group if no layer with this name is found as unnamed group as before.

To provide this functionality the variable `isUsedInNestedGroup` is introduced in methods `msWMSPrepareNestedGroups()` and `msWMSPrintNestedGroups()` which is used in the various methods to prepare WMS responses e.g. `msWMSGetCapabilities()`.

Provided that ability, a hierarchy of any level can be achieved. See the “wms_inspire.map” mapfile in msautotest for an example.

```
TN
+--- TN.CommonTransportElements
    +--- TN.CommonTransportElements.TransportArea
    +--- TN.CommonTransportElements.TransportLink
    +--- TN.CommonTransportElements.TransportNode
+--- TN.RoadTransportNetwork
    +--- TN.RoadTransportNetwork
    +--- TN.RoadTransportNetwork.VehicleTrafficArea
    +--- TN.RoadTransportNetwork.RoadServiceArea
    +--- TN.RoadTransportNetwork.RoadArea
+--- TN.RailTransportNetwork
    +--- TN.RailTransportNetwork.RailwayLink
    +--- TN.RailTransportNetwork.RailwayStationArea
    +--- TN.RailTransportNetwork.RailwayYardArea
    +--- TN.RailTransportNetwork.RailwayArea
```

6. Style section for root layer and possibly existing group layers

For regular layers, the concept of `GROUP` and `CLASSGROUP` can be used to set the layer style name to the according value. Additionally - as suggested in Ticket [3850](#) - the layer style titles can be overwritten through `wms_style_<stylename>_title` and the layer style legendURLs through `wms_style_<stylename>_legendurl_*` (width, height, format and href need to be provided).

```
...
LAYER
  NAME TN.RoadTransportNetwork.RoadLink
  DATA "road"
  METADATA
    "wms_title.eng" "Transport networks: Road Link"
    "wms_title.ger" "Verkehrsnetze: Strassensegment"
  ...
  "wms_style_inspire_common:DEFAULT_title" "mylayerstyletitle"          #style title
  "wms_style_inspire_common:DEFAULT_legendurl_width" "85"             #override style legendu
```

```

    "wms_style_inspire_common:DEFAULT_legendurl_height" "40"
    "wms_style_inspire_common:DEFAULT_legendurl_format" "image/png"
    "wms_style_inspire_common:DEFAULT_legendurl_href" "http://path/to/onlineresource...roadlink"
END
...
CLASSGROUP "inspire_common:DEFAULT"
CLASSITEM "NAME_E"

CLASS
  NAME "myclass1"
  GROUP "inspire_common:DEFAULT"
  EXPRESSION "Trans-Canada Highway"
  COLOR 255 0 0
END

CLASS
  NAME "myclass2"
  GROUP "inspire_common:DEFAULT"
  COLOR 0 255 0
END
...

```

The following method is suggested to support (customizable) style sections in the root layer

- use wms_style_name in the WEB.METADATA section to add a style section to the root layer
- use wms_style_title to override the style title (optional)
- use wms_style_legendurl_* to override width, height, format and href of the legendURL (optional)

and possibly existing group layers

- use wms_group_style_name in the first corresponding LAYER.METADATA section to add a style section to the group layer
- use wms_group_style_title to override the style title (optional)
- use wms_group_style_legendurl_* to override width, height, format and href of the legendURL (optional)

...

```

WEB
METADATA
...
"wms_style_name" "inspire_common:DEFAULT"      #style name
"wms_style_title" "myroadarealayerstyletitle"  #style title
"wms_style_legendurl_width" "85"                #override style legendurl (mandatory: width,
"wms_style_legendurl_height" "40"
"wms_style_legendurl_format" "image/png"
"wms_style_legendurl_href" "http://path/to/onlineresource...roadarea"
END
END

LAYER
NAME TN.RailTransportNetwork.RailwayLink
GROUP TN.CommonTransportElements.TransportLink
DATA "road"
METADATA
  "wms_group_title.eng" "Transport networks: Generic Transport Link"
  "wms_group_title.ger" "Verkehrsnetze: Generisches Verkehrssegment"

```

```
"wms_group_abstract" "mygenerictransportlinklayerabstract" #fallback
"wms_group_abstract.ger" "mygenerictransportlinklayerabstract"
"wms_group_style_name" "inspire_common:DEFAULT" #style name
"wms_group_style_title" "mygenerictransportlinklayerstyletitle" #style title
"wms_group_style_legendurl_width" "85"           #override style legendurl (mandatory: width,
"wms_group_style_legendurl_height" "40"
"wms_group_style_legendurl_format" "image/png"
"wms_group_style_legendurl_href" "http://path/to/onlineresource...generictransportlink"
"wms_title.eng" "Transport networks: Railway Link"
"wms_title.ger" "Verkehrsnetze: Eisenbahnverbindung"
"wms_abstract" "myrailwaylinklayerabstract"    #fallback
"wms_abstract.ger" "myrailwaylinklayerabstractger"
...
END
...
END
...
```

Provided that ability, 3 levels of hierarchy can be achieved as done in the example mapfiles “wms_inspire_scneario1.map” and “wms_inspire_scneario2.map” in msautotest.

```
TN.RoadTransportNetwork.RoadArea
+--- TN.RoadTransportNetwork.RoadLink
+--- TN.CommonTransportElements.TransportLink
    +--- TN.RailTransportNetwork.RailwayLink
    +--- TN.AirTransportNetwork.AirLink
```

7. Implementation details

In order to implement these enhancements, the following changes need to be implemented in the MapServer codebase:

1. get language from request and validate it
2. detect if INSPIRE support is activated, if so add corresponding namespace
3. output extended capabilities with language list and INSPIRE specific metadata (depending on scenario 1 or 2)
4. add language parameter to onlineresource in output
5. consider key extension based on language (e.g. “wms_title.eng”) when deriving metadata from the mapobject, use fallback with no extension (e.g. “wms_title”)
6. group layers according to “wms_layer_group”
7. override style titles and legendURLs if specified in mapfile (e.g. “wms_style_<stylename>_title”)
8. add warnings for missing but mandatory INSPIRE specific metadata
9. include information from any nested layers in various request types

7.1 Files affected

The following files are affected by this RFC:

mapows.c/mapows.h

```
[N] MS_DLL_EXPORT const char *msOWSLookupMetadataWithLanguage(.., const char *validated_language)
[N] MS_DLL_EXPORT char *msOWSGetOnlineResource2(.., const char *validated_language)
[N] MS_DLL_EXPORT char **msOWSGetInspireLanguageList(..)
```

```
[N] MS_DLL_EXPORT char *msOWSGetInspireLanguage(..., const char *requested_language)
[N] MS_DLL_EXPORT int msOWSPrintInspireCommonExtendedCapabilities...
[N] int msOWSPrintInspireCommonMetadata...
[N] int msOWSPrintInspireCommonLanguages...
[C] int msOWSPrintEncodeMetadata...
[N] int msOWSPrintEncodeMetadata2(..., const char *validated_language)
[C] int msOWSPrintGroupMetadata...
[N] int msOWSPrintGroupMetadata2(..., const char *validated_language)
[C] int msOWSPrintMetadataList...
[C] int msOWSPrintEncodeMetadataList...

mapwms.c

[S] int msDumpLayer(..., const char *validated_language, int grouplayer)
[S] void msWMSPrepareNestedGroups(..., int* isUsedInNestedGroup)
[S] void msWMSPrintNestedGroups(..., int* isUsedInNestedGroup, const char *validated_language)
[S] int msWMSGetCapabilities(..., const char *requested_language)
[C] int msWMSLoadGetMapParams...
[C] int msWMSFeatureInfo...
[C] int msWMSDescribeLayer...
[C] int msWMSGetLegendGraphic...
[C] int msWMSGetStyles...
[C] int msWMSDispatch...
[N] void msWMSPrintAuthorityURL...
[N] void msWMSPrintIdentifier...
[N] void msWMSPrintKeywordlist...

mapdraw.c

[C] int msLayerIsVisible...

maputil.c

[C] int msExtentsOverlap...



- [C] function changed
- [N] new function
- [S] signature of function also changed

```

7.2 MapScript issues

This changes provide new functionality with no MapScript issues being considered.

7.3 Backwards compatibility issues

This change provides new functionality with no backwards compatibility issues being considered.

8. Solution

The code for this RFC can be found in the [inspire_soc2011](#) sandbox.

Incorporated tickets:

- Ticket 3608: INSPIRE related support

- Ticket 3850: allow to define a title for styles and possibility to override autogenerated legendurl href
- Ticket 1632: support for named group layers using wms_layer_group
- Ticket 4129: root layer metadata
- Ticket 4148: WMS GetFeatureInfo has wrong content-type
- Ticket 4149: wrong default WMS LegendUrl image format
- Ticket 4151: add vocabulary attribute to keywords in capabilities document
- Ticket 4144: GetLegendGraphic should work without OGR compiled
- Ticket 4126: copyright (annotation) layer inside data extent only

9. Tests

3 example mapfiles were created for testing purposes:

- [wms_inspire.map](#) INSPIRE scenario 1 using wms_layer_group
- [wms_inspire_scenario1.map](#)
- [wms_inspire_scenario2.map](#)

The GetCapabilites responses with these mapfiles validate against the [INSPIRE](#) schemas as well as the [WMS INSPIRE](#) tester without any critical warnings or errors.

10. Voting history

Adopted on 2012/03/08 with +1 from FrankW, SteveL, and DanielM and +0 from SteveW.

16.9.76 MS RFC 76: Adding License Metadata to Output Images

Date 2011/06/22

Author Paul Ramsey

Contact pramsey at opengeo.org

Last Edited \$Date\$

Status Draft

Version MapServer 6.2

Id \$Id\$

Description: This RFC proposes allowing XML metadata information to be embedded in MapServer output images. The use case is for any organization producing maps that wishes to embed licensing and authorship information directly in the output images.

1. Overview

XMP is the “extensible metadata platform”¹ which allows the embedding of metadata information across a wide range of document and image formats: PNG, GIF, JPEG, PDF, etc. XMP was originally developed by Adobe² and is supported across their product line. It is now being increasingly included in other standards for metadata embedding

¹ http://en.wikipedia.org/wiki/Extensible_Metadata_Platform

² <http://www.adobe.com/products/xmp/overview.html>

and supported by tools for viewing image information (e.g. exiftools). Creative Commons has standards for using XMP to embed commons licensing ³ in images and other document, including a specific Creative Commons schema.

One of the challenges of advertising licensing and terms of use in WMS and other web mapping services is that the terms are usually advertised separately from the actual content. So a WMS service might specify terms in the Capabilities document, but the images themselves will be unmarked. Embedding license URLs inside the images themselves using a standard markup allows organizations to be unambiguous about the conditions attached to their content.

The goal of this change is to allow users the option of embedding XMP metadata in their MapServer output using an open source XMP utility library.

2. Proposed Technical Change

2.1. Driver Support

libexempi ⁴ provides a standard C interface for reading and writing XMP content from multiple image formats. One limitation of libexempi (and all other XMP libraries we investigated) is that it only works on existing files. That means that any image that is going to be tagged with metadata must be written to the disk first. Fortunately the GDAL image driver already writes a temporary file to disk for every request, so we propose that XMP support be available only when using the GDAL output format driver.

For example:

```
OUTPUTFORMAT
  NAME png
  DRIVER "GDAL/PNG"
  MIMETYPE "image/png"
  IMAGEMODE RGB
  EXTENSION "png"
END
```

The XMP metadata embedding code will be called in msSaveImageGDAL just before the temporary file is streamed back to the client.

2.2. Map File Configuration

Metadata information is written per-image, so will be stored in the METADATA block of the WEB object in the MAP file.

The metadata key for each tag will have the form “xmp_<namespace>_<tag>”, so for example: “xmp_dc_Title”, for the Dublin Core title.

Eight namespaces will be supported by default:

- “meta” which is the standard XMP tag set ⁵
- “cc” which is the Creative Commons tag set ⁶
- “dc” which is the Dublin Core tag set ⁷
- “rights” which is the standard XMP Rights tag set ⁸

³ <http://wiki.creativecommons.org/XMP>

⁴ <http://libopenraw.freedesktop.org/wiki/Exempi>

⁵ <http://www.sno.phy.queensu.ca/~phil/exiftool/TagNames/XMP.html#xmp>

⁶ <http://www.sno.phy.queensu.ca/~phil/exiftool/TagNames/XMP.html#cc>

⁷ <http://www.sno.phy.queensu.ca/~phil/exiftool/TagNames/XMP.html#dc>

⁸ <http://www.sno.phy.queensu.ca/~phil/exiftool/TagNames/XMP.html#xmpRights>

- “exif” which is the EXIF tags set ⁹
- “tiff” which is the TIFF tags set ¹⁰
- “crs” which is the Photoshop Camera Raw Schema ¹¹
- “photoshop” which is the Photoshop tag set ¹²

Within those names spaces, users can specify any tag. The MapServer code will not check that the tags are valid for the namespace, that responsibility will fall to the user.

Here are some examples of common tags within the default name spaces:

- xmp_rights_Marked (‘true’ or ‘false’) indicates whether the image is copyright (true) or public domain (false)
- xmp_rights_WebStatement (URL) link to a page that explains the terms and conditions under which the image is licensed
- xmp_rights_UsageTerms (text) a description of the terms and conditions under which the image is licensed. To save image space and ensure licensing is kept up to date, the web statement is preferred over the usage terms.
- xmp_cc_License (URL) link to the creative commons license that applies to this image (e.g. <http://creativecommons.org/licenses/by-sa/2.0/>)
- xmp_cc_MorePermissions (URL) link to a page describing additional terms and conditions beyond the CC terms
- xmp_cc_AttributionURL (URL) link to a page of information about the author or organization that produced the content
- xmp_cc_AttributionName (text) name of the person or organization that produced the content
- xmp_dc_Title (text) title of the image
- xmp_dc_Rights (text) textual description of the license regime of the image

Here is an example of setting tags using the default namespaces:

```
WEB
METADATA
    "xmp_rights_Marked" "true"
    "xmp_cc_License" "http://creativecommons.org/licenses/by-sa/2.0/"
    "xmp_cc_AttributionURL" "http://www.landgate.wa.gov.au/corporate.nsf/web/About+Us"
    "xmp_cc_AttributionName" "Landgate (landgate.wa.gov.au)"
END
END
```

Users can also set up their own namespace and insert tags into it. The user must include a metadata key of the form “xmp_<name>_namespace” with a namespace URI as the value. Once the namespace is declared, other metadata keys of the usual form can be used to insert tags into the XMP.

Here is an example of setting tags using a custom namespace:

```
WEB
METADATA
    "xmp_lightroom_namespace" "http://ns.adobe.com/lightroom/1.0/"
    "xmp_lightroom_PrivateRTKInfo" "My Information Here"
END
END
```

⁹ <http://www.sno.phy.queensu.ca/~phil/exiftool/TagNames/XMP.html#exif>

¹⁰ <http://www.sno.phy.queensu.ca/~phil/exiftool/TagNames/XMP.html#tiff>

¹¹ <http://www.sno.phy.queensu.ca/~phil/exiftool/TagNames/XMP.html#crs>

¹² <http://www.sno.phy.queensu.ca/~phil/exiftool/TagNames/XMP.html#photoshop>

2.3. Build Configuration

XMP metadata support will require the presence of the libexempi library. The library must be requested or pointed to directly to using the `--with-exempi=[yes|no|path]` configuration option in the `./configure` script. If `--with-exempi` is not used, XMP metadata support will not be enabled.

3. Implementation Details

3.1. Files Affected

The following files will be modified for this RFC:

```
Makefile.in  
Makefile.vc  
mapgdal.c  
mapxmp.c  
configure.in  
configure
```

3.2. Bug ID

The ticket for RFC 76 (containing proof-of-concept code) can be found here ([Bug 3932](#)).

3.3. Documentation

Documentation for this feature will be added to the appropriate map file documentation (metadata keywords) and a separate howto document will be created explaining XMP metadata.

4. Enhancements

The ability to use the XMP facility across output drivers would be desirable, but that requires intercepting the image before it is streamed to the user and writing it to disk to allow the exempli library to alter the metadata. For GDAL, the write-to-disk step is already part of the output sequence. Other drivers stream their output direct to stdout.

5. Voting history

```
Steve Lime  
+1 Daniel Morissette  
+1 Frank Warmerdam  
+1 Assefa Yewondwossen  
    Howard Butler  
+1 Steve Woodbridge  
+1 Perry Nacionales  
+1 Tom Kralidis  
+1 Jeff McKenna  
    Umberto Nicoletti  
    Tamas Szekeres  
+0 Thomas Bonfort  
+1 Olivier Courtin  
+1 Mike Smith
```

16.9.77 MS RFC 77: Support for Multiple Label Objects Within a Class

Date 2011/10/01

Author Steve Lime, Thomas Bonfort

Contact sdlime at comcast.net,

Last Edited \$Date\$

Status Adopted on 2011-12-15

Version MapServer 6.2

Id \$Id\$

1. Overview

This RFC proposes allowing for the definition of multiple label objects within a class. There are a number of use cases where this would be valuable.

- Adding text below a label with different styling, for example an alternate name shown in italics.
- Labeling roads with multiple shields and road numbers.
- Supporting complex meteorological rendering where many values are placed around a point.

Presently only very limited support for these use cases is available. Basically you have to draw layers multiple times and place each piece of text separately. This is inefficient and does not allow for group label collision avoidance.

2. Proposed Technical Change

2.1 Core Object Changes

Class object would need to support multiple label objects in much the same way as they support multiple styles. In fact, implementation would follow the styleObj pattern.

A key requirement is that the extra labels be self-contained, that is, they need to allow for the definition of label text and conditional display within the labelObj. To do this we propose adding the following attributes to labelObj's:

- expression
- text

These attributes behave just like their classObj equivalents. In addition a labelObj will be extended with several attributes that will be used to hold per-feature values in the context of the label cache. They are:

- labeltext (string to be drawn)
- labelpoly (bounding box shapeObj)

A label's labeltext will be set according to the following order:

- label text (new for this RFC)
- class text
- layer labelitem
- shape text

A NULL labeltext value means that label will not be rendered.

The labelCacheMemberObj will also require change. First, it needs to support multiple labelObj's (see point and polygon discussion below) just like the styles attribute currently supported. A label counter will be added as well. Because the text to be drawn will be carried in a label the text attribute can be removed.

2.2 Label Rendering Changes

2.2.1 Point and Polygon Labels

The labeling of point and polygon features is done based on a single computed label point. Multiple labels within a classObj will be applied to a label point as a group, that is, all label text must be placed successfully or the entire group will not be drawn. In this case a new function, msAddLabelGroup() is available to add all labels from a class to the label cache as a single element. The bounding shapes for a group of labels will be considered as one for collision avoidance computations.

Positioning of the multiple labels will be done as always- relative to the label point using label->position and/or label->offset.

In the case of a label group label priority will be taken from the first label defined in a class. Scale thresholds will be taken into account when a labels labeltext value is assigned (outside of the cache population code). A label that is out of scale will set labeltext=NULL and will not be drawn although others in the group could be.

Label cache collision functions will have to be updated to look a multiple labels, especially the code that looks for duplicate text (label->mindistance).

2.2.2 Line Labels

Line labeling is another story. Lines often are used to derive curved text, repeating labels and sometimes both. In this case a single feature might contribute dozens of labels to the cache. It is impractical to handle these as we would a point or polygon with a single label point. A for more common use will be to label a line with multiple names or a combination of a name and a marker/text combination. So, for line labels the approach will be to simply use the existing cache facilities but with an added loop to process multiple labels if available.

It might be possible in the future to use the label grouping described above in certain instances but that is outside the scope of this work.

2.3 MapScript

Class objects will need support for labels similar to what is in place for styles. Presently a classObj supports the following methods: getStyle, insertStyle, removeStyle, moveStyleUp and moveStyleDown. We propose adding label equivalents for the first three (label order is not nearly as import as style order).

It is not quite clear how classes label is defined/manipulated from within MapScript. In SWIG/MapScript labels are marked as immutable. Further work needs to be done to understand if this represents a regression.

3. Implementation Details

3.1. Files Affected

Change lis limited primarily to:

- mapserver.h: core structure changes
- mapfile.c: read/write/initialize changes

- mapdraw.c: significant changes to msDrawShape() and msDrawLabelCache()
- maplabel.c: changes to msAddLabel() and addition of msAddLabelGroup()
- maplayer.c: changes to msLayerWhichItems() to account for label text and expressions
- maputil.c: changes to msBindLayerToShape() and msShapeGetAnnotation()

Various other files see small changes with the change in classObj from one label to many.

3.2 Documentation Changes

Documentation for classObj (labels 0 .. n) and labelObj (text and expression) will need update. MapScript documentation will need changes to document new methods and the change in object hierarchy between classes and labels. Mapfile XML file must be changed as well. A number of test cases will be added to the MapServer regression test suite—all existing labeling tests should continue to be useful.

3.3 Bug ID

#4127. Work is underway in a sandbox (<http://svn.osgeo.org/mapserver/sandbox/sdlime/rfc-77/>).

4 Configuration Examples

Adding optional text below other text:

```
LABELITEM 'item1'  
CLASS  
...  
    LABEL # always displayed using LAYER:LABELITEM as a source for text  
        FONT 'arial'  
        ...  
    END  
    LABEL # conditionally displayed using LABEL:TEXT as a source for text  
        EXPRESSION ('[item2]' ~ '.') # item2 has something in it  
        FONT 'arial-italic'  
        TEXT '[item2]'  
        OFFSET 0 15  
        ...  
    END  
END
```

5. Backwards Compatibility

At the mapfile level there are no issues, existing mapfiles should run without any change. It is possible that this could introduce regressions within MapScript although the scope is not fully known.

5.1 Relationship to Other Outstanding Label Bugs

- #1355 - None, test is valid w/grouped labels too.
- #2866 - None.
- #2981 - None.
- #3009 - None.

- #3044 - This is already supported (ticket can be closed).
- #3335 - Styles are supported for each additional label.
- #3675 - This will be addressed by this RFC. Label content will be defined by the new TEXT attribute.

6. Enhancements

Although beyond the scope of this work it seems that some interesting work related to the relative placement of grouped labels might be possible. For example, it could be useful to define positions relative to the previous label instead of relative to a label point.

7. Voting history

Adopted on 12-15-2011 with +1 from SteveL, DanM, JeffM, ThomasB, SteveW, HowardW.

16.9.78 MS RFC 78: Vector Field Rendering (CONNECTIONTYPE UVRASTER)

Date 2011/11/04

Author Alan Boudreault

Contact aboudreault at mapgears.com

Last Edited \$Date\$

Status Adopted on 2011-11-24. Implementation completed.

Version MapServer 6.2

Id \$Id\$

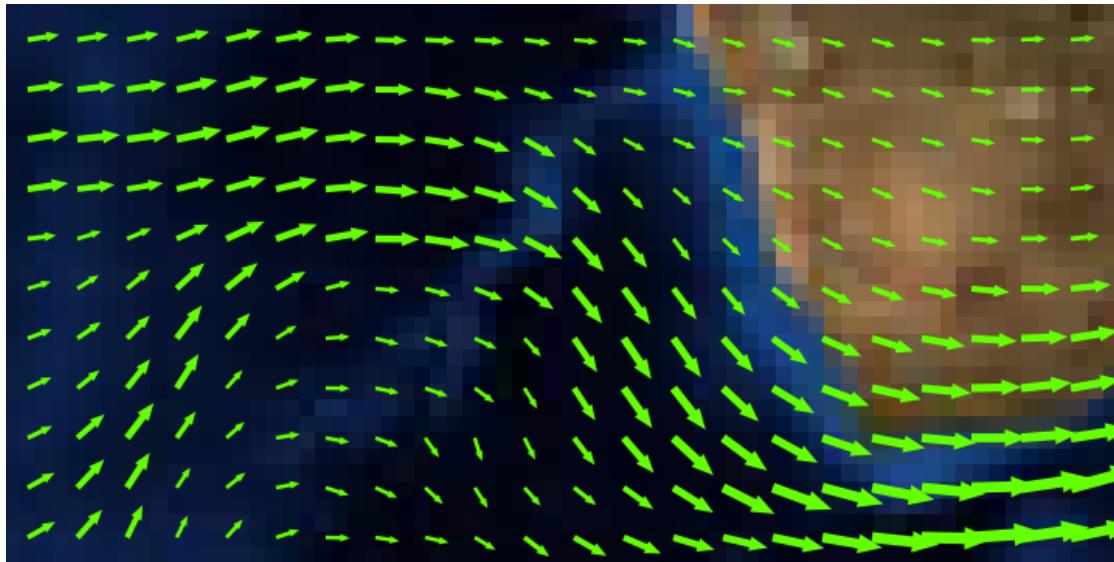
1. Overview

This is a proposal to add the ability to render vector field layers in MapServer. Vector fields are used for instance in meteorology to store/display wind direction and magnitude.

The source is two bands of raster data, one band represents the U component of the vector, and the 2nd band the V component. Using the u,v values at a given location we can compute a rotation and magnitude and use that to draw an arrow of a size proportional to the magnitude and pointing in the direction of the phenomenon (wind, current, etc.)

For more details about vector fields, refer to: http://en.wikipedia.org/wiki/Vector_field

Visual example (rendered with MapServer):



2. The proposed solution

This RFC proposes the addition of a new type of layer in MapServer: CONNECTIONTYPE UVRASTER. The new type is a hybrid layer, which has a raster data source as input and vector features as output. Initially, only the point representation of those vector features will be supported. Also, queries won't be supported in this phase.

Since the data source is a raster, all raster processing options can be used (e.g. RESAMPLE). After a few tests, we determined that the best results (for all different zoom levels) for vector fields were when using RESAMPLE=AVERAGE and this will be set by default for UV layers unless another type of resampling is explicitly specified in the layer definition.

To render a vector field layer, we need to define a layer in the mapfile with the following options:

- Set the layer TYPE to POINT.
- Set CONNECTIONTYPE to UVRASTER.
- Set the DATA to the raster file that contains u/v bands.
- Specify the 2 bands to use as u and v.
- Specify a class to render the point features.

Optional “PROCESSING” settings:

- UV_SPACING: The spacing is simply the distance, in pixels, between arrows to be displayed in the vector field. Default is 32.
- UV_SIZE_SCALE: The uv size scale is used to convert the vector lengths (magnitude) of the raster to pixels for a better rendering. Default is 1.

The UVRASTER layer has 4 attribute bindings that can be used in the layer definition and/or class expressions:

- [u]: the raw u value
- [v]: the raw v value
- [uv_angle]: the vector angle
- [uv_length]: the vector length (scaled with the UV_SIZE_SCALE option value)

Example of a layer definition:

```
LAYER
  NAME "my_uv_layer"
  TYPE POINT
  STATUS DEFAULT
  CONNECTIONTYPE UVRASTER
  DATA /mnt/data/raster/grib/wind.grib2
  PROCESSING "BANDS=1,2"
  PROCESSING "UV_SPACING=40"
  PROCESSING "UV_SIZE_SCALE=0.2"
  CLASS
    STYLE
      ANGLE [uv_angle]
      SYMBOL "arrow"
      SIZE [uv_length]
      COLOR 255 0 0
      POSITION CC
      MINSIZE 5
  END
END
```

3. Implementation Details

Internally, a UVRASTER layer will have its own renderer/driver code. It's a hybrid layer because it reads the raster source as a normal raster layer does, but all other functions behave like a vector layer. The layer can be drawn as a normal point layer using whichShape, GetShape etc.

Basic internal draw process of a UVRASTER layer:

1. whichShape() is called: the raster data source is read using the internal GDAL functions, resample and all other raster options are applied and the u,v pixels result is stored in the internal layer structure.
2. getShape() is called: loop through the raster pixels and returns a shapeObj (Point) created with the pixel location.
3. MapServer draws its point feature as any other vector layer.

3.1 Files affected

The following files will be modified/created by this RFC:

```
mapserver.h/mapfile.c (Connection type UVRASTER support in the mapfile)
mapuvraster.c (new file for the UVRASTER renderer)
maplayer.c (new layer type handling, virtual tables init etc.)
maplexer.l (add additional UVRASTER keyword)
```

3.2 MapScript

No issue for any MapScript bindings. The UVRASTER layer is handled/rendered internally as any other layer..

3.4 Backwards Compatibility Issues

This change provides a new functionality with no backwards compatibility issues being considered.

4. Bug ID

- <http://trac.osgeo.org/mapserver/ticket/4094>

5. Voting history

+1 from Jeff, Olivier, Assefa, Perry, FrankW, Daniel, Stephen, Michael, Thomas, Tom and Steve.

16.9.79 MS RFC 79: Layer Masking

Date 2011/11/30

Author Thomas Bonfort

Author Alan Boudreault

Contact tbonfort at terriscope.fr

Contact aboudreault at mapgears.com

Last Edited 2012/05/11

Status Implemented

Version MapServer 6.2

1. Overview

For some applications, it is desirable to mask out one or more layers so that only the features that intersect another set of features are rendered in the returned image. While it is relatively trivial to achieve this goal with sql joins if all the data is stored in postgis, the task becomes much more evolved or even impossible if the layer to be masked, or the layer to use as a mask, comes from a shapefile or a raster datasource.

A example use-case for this could be rendering meteo data for a given client, but only on the areas where the client has purchased the service. In this case, the meteo data should only be rendered on the areas covered by a set of polygons that represent the purchased areas.

Another example use-case given an input DEM raster, could be to only render data where the elevation is comprised in a given range.

To achieve these goals, the present RFC proposes the introduction of “MASK” layers, where only the features that intersect the given mask are rendered onto the final image.

2. Proposed solution

In order to work with all layer types, this RFC proposes to implement layer masking at the pixel level, with the addition of a single “MASK” mapfile keyword. The MASK keyword is placed at the layer level, and takes a single argument which is the name of another mapfile layer that should be used as a mask.

The mechanism to achieve masking at rendering time is:

- Each layer that is used as a mask is rendered in its own temporary image. All the filtering and styling is done as usual, which implies that raster classification/filtering can be performed, as well as style-level geomtransforms, etc...
- When a layer references a MASK, it is rendered in its own temporary image, in the same way that is done when OPACITY is set. As before, all kind of filtering/transformation can be performed on the masked layer

- The masked layer is blended onto the final map image, but only for the pixels that have been set in the mask image.

Example of MASK usage:

```
LAYER
  NAME "parcels"
  TYPE POLYGON
  STATUS OFF
  DATA "the_geom from parcels where clientid='%token%'"
  CLASS
    STYLE
      COLOR 0 0 0
    END
  END
END

LAYER
  NAME "meteo"
  STATUS ON
  TYPE RASTER
  DATA "raster.tif"
  MASK "parcels"
END
```

Note: The layer used as a mask **will** be rendered in the final map image if its status is set to DEFAULT, or if its status is set to ON and the layer name is included in the requested layers. Most users of this feature will probably want to set the mask layer to STATUS OFF.

3. Implementation Details

- The parser will have a MASK keyword added to it, expecting a string
- The layerObj will have two properties added to it:
 - char* masklayer : the name of the layer that should be used as a mask
 - imageObj* maskimage : for a layer that has been referenced as a mask by another layer, this will contain the pixels that should be used to determine where data can be rendered on the final map image. This is to prevent the mask layer from being rendered multiple times if it is referenced by multiple layers.
- In msDrawLayer(), if the current layer references a MASK layer:
 - a temp image is created and rendered into by another call to msDrawLayer()
 - a temp image is created and rendered into following the same codepath as if layer->opacity has been set
 - the second temporary image's alpha channel is tampered with and set to 0 for all the pixels that haven't been set in the first temporary image.
 - the second temporary image is blended into the final map image, again following codepath as if layer->opacity has been set.

3.1 Files affected

The following files will be modified/created by this RFC:

```
mapserver.h/mapfile.c/mapfile.h/maplexer.l/mapcopy.c: parser and new layerObj members  
mapdraw.c: implementation in msDrawLayer()  
maplabel.c: implementation for dropping labels from the labelcache if they don't  
intersect the mask layer in msAddLabel()
```

3.2 MapScript

Getters and Setters will have to be added to programmatically add a MASK to a layerObj. No other issues are to be expected.

3.4 Backwards Compatibility Issues

This change provides a new functionality with no backwards compatibility issues being considered.

4. Limitations

- Querying: The masking is done at the pixel level, as such all operations that query the datasource will not mask out features.
- Vector renderers: masking operations will not be supported on the vector renderers (svg,pdf)
- Labelling: Labelling is usually performed after all layers have been rendered, in the labelcache phase.
 - For layers that are referenced as a mask, the layer's labelcache will be set to OFF, which results in all labels being directly added to the temporary mask image instead of being added to the labelcache. Of course, it is not recommended to add labels to a layer used as a mask (that is, unless someone finds a compelling use-case to do so)
 - If the layer that is being masked has labels, these have the potential to be rendered outside the mask area if they go through the labelcache. To overcome this, there will be a test to ensure that the labelpoint is contained in the masked areas before adding it to the labelcache. Note that the label text itself might be rendered outside of the masked areas, but this should not be an issue. If the masked layer is set with LABELCACHE FALSE, the rendered labels will be filtered out automatically at the pixel level, although there will probably be truncated labels that can appear.

5. Error Handling

There are no special cases to treat here aside from the classic ones (parsing errors, invalid layer referenced by MASK, invalid renderer selected)

6. Bug ID

<https://github.com/mapserver/mapserver/issues/4111>

7. Voting history

Passed with +1 from ThomasB, MichaelS, StephenW, AssefaY, FrankW, TamasS, DanielM, JeffMcK, TomK, OlivierC, SteveL

16.9.80 MS RFC 80: Font Fallback Support

Date 2011/12/07

Author Thomas “fake” Jakobi

Author Thomas Bonfort

Contact thomas at derfake.com

Contact tbonfort at terriscope.fr

Last Edited \$Date\$

Status Passed

Version MapServer 6.2

Id \$Id\$

1. Overview

This RFC proposes allowing for the definition of fallback fonts for labels, to be used when a glyph is not available in the initial font.

Presently, if a glyph is not available in the font of a label, the font’s error glyph is drawn (usually an empty box). This is problematic when rendering international data, as it may contain a wide range of unicode characters. Up to now, this can only be fixed using a (near-)complete unicode font. The free “unifont” contains all glyphs of the basic unicode set (~60.000), but does not look very pleasing as a default font.

With fallback fonts, glyph lookup would try a set of fonts, in a given order, before accepting the error glyph. This way, a unicode font like unifont would only be used as “last resort” on a glyph-by-glyph basis.

In the mapfile, a list of fonts would be given as a comma-separated string like “font1,font2,font3”, where each font is listed in the fonts.lst as usual. If only one font is specified, this functionality has no effect. The same fontlist support is available for attribute binding.

2. Proposed Technical Change

2.1 Core Object Changes

The Label Style Object would need to support multiple fonts. The proposed implementation uses a hard limit to the number of fonts, to avoid overhead. The number of fonts can be changed using the MS_MAX_LABEL_FONTS define, the suggested default is 5.

2.2 Label Rendering Changes

The function pointer signature of GetTruetypeTextBBox needs to be changed to be able to receive multiple fonts and their count. This requires a change to every renderer, as does the change of the labelStyleObj.

Renderers supporting single-glyph operation like cairo and agg can use the font list passed in to implement the glyph fallback. Renderers operating on complete strings can use fonts[0] for no change in behavior.

2.3 MapScript

The mapscript getters and setters are unchanged, but the semantics of the string passed to labelObj->setFont() is modified as it now expects a comma-separated list of fontset keys.

3. Implementation Details

The proposed implementation adds font fallback support to the cairo and agg renderers.

The labelObj is unchanged, but its “char* font” member semantics is changed to contain a comma separated list of fontset keys instead of a single fontset key. This ensures minimal backwards incompatibility for mapscript applications and datasource bindings.

A new function “msFontsetLookupFonts()” is called before labelling renderer-specific functions are called, and maps the comma-separated labelObj->font into an array of full font filenames, by iterating through the labelObj->font keys and calling msFontsetLookup.

The renderer-specific labelling function signatures are modified to take a list of font filenames instead of a single filename as is the case now. Renderers that do not (yet?) support multiple font fallbacks are slightly modified to use the first entry of the font array, while the other renderers use some specific code to detect missing characters and use the fallback fonts when needed.

3.1. Files Affected

- maplabel.c:
- add msFontsetLookupFonts implementation that splits the input font on commas and looks up each font key in the fontset.
- call msFontsetLookupFonts before calling the renderer vtable boundingbox calculation functions.
- maprendering.c: call msFontsetLookupFonts to set list of fonts in labelStyleObj
- mapagg.cpp: glyph fallback implementation, agg specific
- mapcairo.c: glyph fallback implementation, cairo and freetype specific
- mapgd.c, mapkml.c, mapogl.cpp:
- use only the first font of the given font list
- getTruetypeTextBBox function signature update
- mapserver.h:
 - add msFontsetLookupFonts function and MS_MAX_LABEL_FONTS define
 - change labelStyleObj char* font to char* font[MS_MAX_LABEL_FONTS]
- mapsymbol.c: symbol font fallback adoptions
- maputil.c: only bind font from shape if it's different
- mapdummyrenderer.c: getTruetypeTextBBox signature change

3.2 Bug ID

- <http://trac.osgeo.org/mapserver/ticket/4114>

4. Backwards compatibility issues

None expected, unless existing fontset keys contained commas. I'm not sure this was valid syntax anyways, and was definitely bad practice.

5. Error reporting

The hard limit on the maximum number of fonts allowed is enforced in msFontsetLookupFonts() which will halt processing and return an error message stating that the maximum number of fonts is set to MS_MAX_LABEL_FONTS. The renderers themselves will report the usual error message if one of the referenced fonts could not be loaded (due to an inaccessible or corrupt ttf file).

6. Example Usage

- see msautotest entry <http://trac.osgeo.org/mapserver/changeset/12863>

7. Voting history

Passed with +1 from ThomasB, SteveW, MichaelS, SteveL, PerryN, DanielM

16.9.81 MS RFC 81: Offset Labels with Leader Lines

Date 2011/12/15

Author Thomas Bonfort

Contact tbonfort at terriscope.fr

Last Edited \$Date\$

Status Draft

Version MapServer 6.2

Id \$Id\$

1. Overview

Current labelling schemes place label text at the proximity of the point they are attached to. In the labelcache phase, depending on the label's POSITION, either one or nine label positions are tested, and the label is discarded if all of these positions cause a collision with the already rendered labels.

This RFC proposes to extend the number of positions that are tested for a given label, and eventually render a leader line from the rendered text to the actual position the label is attached to.

An example rendering of the proposed change can be:



2. Proposed Technical Change

The labelcache code will be extended to test for extended labelling positions if the label was configured with “leader” parameters. There will be two configuration options that specify how the offsetted positions are determined:

- LEADERMAXDISTANCE will determine the maximum distance that the label text can be placed from its original anchoring position
 - LEADERGRIDSTEP will determine the step in pixels between each tested position.

If a label cannot be placed due to a collision with an existing label or marker, alternate positions are sampled for by iterating further and further away from the original label point. In the figures below, “X” represents the original label point, “.” represents an individual pixel, “0” represents an offset that has already been tested for in a previous iteration, and “1”, “2”, “3”, represents the order in which the positions are tested for in the current iteration.

1st iteration:

```

2...1...2
.....
.....
.....
1...X...1
.....
.....
.....
2...1...2

```

second iteration:

```
3...2...1...2...3
.....
.....
.....
2...0...0...0...2
.....
.....
.....
1...0...x...0...1
.....
.....
.....
2...0...0...0...2
.....
.....
.....
3...2...1...2...3
```

third iteration:

```
3...2...2...1...2...2...3
.....
.....
.....
2...0...0...0...0...0...2
.....
.....
.....
2...0...0...0...0...0...2
.....
.....
.....
1...0...0...x...0...0...1
.....
.....
.....
2...0...0...0...0...0...2
.....
.....
.....
2...0...0...0...0...0...2
.....
.....
.....
3...2...2...1...2...2...3
```

For each offset position, the actual position of the text is adapted depending on the general direction of the offset (e.g. with position “uc” for a label at the vertical of the original point, “ur” for the top right diagonal, etc...)

The iterations stop once an offset position does not cause a collision with the existing labels, in which case the label text is sent down to the rendering backend, or once the first offset position is further away than the configured LEADERMAXDISTANCE.

The collision detection functions will be extended to account for these added constraints:

- A label cannot collide with an existing leader line, and a leader line cannot collide with an existing label. Note that these collision detections operate on the bounding box of the label itself, without taking the label BUFFER into account (i.e. a leader line is allowed to cross the buffer area around an existing label)

- A leader line cannot intersect another leader line.
- A label who's original position is inside the edge_buffer cannot be offseted, as this would cause rendering artifacts for tiled output.

If an offseted label has been placed, a line between the original and the offseted position is rendered with the label style(s) that has(ve) the “LABELLEADER” geomtransform.

2.1 Expected issues

- With RFC77’s multiple labels per feature, the offset should be applied as a whole to all the labels of the feature. In this sense, the leader parameters should be owned by the classObj and not the labelObj, which is semantically awkward.
- For labels with LABELPNT geomtransform, should the marker be rendered at the original label point, or at the position the label was offseted to? This probably calls for an additional label style geomtransform.
- This functionality is computationally expensive as the label collision functions are called much more frequently than beforehand. The gridstep and maxdistance parameters allow to cut down the number of iterations and therefore the number of times the collision detection is called, at the expense of missing out some potential correct offseted positions. Note that with a gridstep of 1 and a maxdistance of the size of the image, there is the potential that every pixel in the image be tested for collisions. Reasonable values are a gridstep of 5 pixels, and a maxdistance of 30 pixels.

3. Implementation Details

A function will be added in maplabel.c to test the configured offsetted positions for a labelcache member against the already rendered labels. A configuration option (TBD) will be added, and this function will be called:

- either immediately once a label hasn’t been successfully rendered on its original position
- either after a label priority loop has finished. In this case, the function will be called for all unsuccessful labels of the current priority phase.

The labelcache member objects will have two members added, namely a lineObj containing the leader line, and a shapeObj representing the unbuffered label’s bounding box.

The functions that test for collision with existing labels will be extended to check for intersections between leader lines and unbuffered existing labels.

3.1. Files Affected

- mapserver.h: additional members for labelcachememberobj and labelobj
- mapfile.c, maplexer.* , mapcopy.c : parsing and utility functions
- maplabel.c: additonal collision tests in msTestLabelCacheCollisions
- mapdraw.c:
 - function for trying a label at offset positions
 - calls to this function in msDrawLabelCache

3.2 Bug ID

- <http://trac.osgeo.org/mapserver/ticket/XXX>

4. Backwards compatibility issues

None expected, new functionality.

5. Error reporting

No additional error reporting aside from parsing errors.

6. Example Usage

TBD.

7. Voting history

TBD.

16.9.82 MS RFC 82: Support for Enhanced Layer Metadata Management

Date 2012/01/24

Authors Tom Kralidis (tomkralidis at hotmail.com)

Last Edited 2012/10/08

Status Adopted

Version MapServer 6.2

Id \$Id:\$

Overview

OGC Web Services (OWS) have the ability to advertise content metadata associated with a given resource (WMS Layer, WFS FeatureType, WCS Coverage, SOS ObservationOffering), both inline to the Capabilities document and as a reference to a given URL (i.e. ISO metadata XML document).

MapServer supports both inline (e.g. wms_title, wms_abstract) and URL based (e.g. wms_metadataurl_href) metadata advertising for OWS Capabilities.

In the case that a given dataset does not have associated formal XML metadata, Capabilities XML references to metadata (i.e. WMS MetadataURL) are not available, even though between the LAYER.METADATA/ows_* values and the layer's spatial properties, enough information can be processed to generate a useful XML metadata document.

The existence of formal XML metadata in MapServer OGC services Capabilities XML provides value to Catalogue services which harvest metadata to support discovery.

It is proposed that MapServer be enhanced to support the generation of XML metadata documents from a given layer's METADATA and spatial properties.

This enhancement provides dynamic publishing of XML metadata for OWS services for cases where XML metadata does not exist / is not specified for a given resource.

Technical Solution

MapServer will have the ability to generate an ISO 19139:2007 metadata XML document dynamically from LAYER.METADATA/ows_* directives and the given layer's spatial properties.

MapServer will also provide support for output of a service metadata document formatted as ISO 19119:2005 based on WEB.METADATA ows_* directives. This is an additional service description that supports the INSPIRE initiative.

This functionality will be made available through a MapServer specific HTTP operation called `GetMetadata` with the following parameters:

- `layer`: layer NAME. Optional parameter. If `layer` is not specified, then an ISO metadata document of the service metadata is returned. If an invalid `layer` parameter specified, an `ows:ExceptionReport` is returned
- `outputschema`: response schema of metadata. Optional parameter. Possible values:
 - `http://www.isotc211.org/2005/gmd` (ISO 19139:2007 [default])
 - `http://www.opengis.net/cat/csw/2.0.2` (Dublin Core)
 - `http://www.opengis.net/cat/csw/csdgm` (FGDC CSDGM)

If an invalid `outputschema` parameter specified, an `ows:ExceptionReport` is returned

Calling `GetMetadata` with no parameters will return an ISO metadata document of the service metadata.

The initial implementation will cover the ISO metadata standards, and will allow for additional metadata formats to be implemented in the future. In particular, this RFC provides a building block to support the INSPIRE metadata format requirements.

Examples

Requesting service metadata:

```
http://my.host.com/cgi-bin/mapserv?request=GetMetadata
```

Requesting specific layer metadata:

```
http://my.host.com/cgi-bin/mapserv?request=GetMetadata&layer=foo
```

Implementation Details

mapows.c (in msOWSDispatch)

```
...
if (ows_request.service == NULL) {
    if (EQUAL(ows_request.request, "GetMetadata")) {
        status = msMetadataDispatch(map, request, &ows_request);
    } else if(force_ows_mode) { /* exit if service is not set */
...
}
```

mapmetadata.c

```
int msMetadataDispatch(mapObj *map, cgiRequestObj *requestobj,
                      owsRequestObj *ows_request)
{
    if layer parameter is not specified
        return msMetadataGetServiceMetadata(map, paramsObj, ows_request);
    else
        return msMetadataGetLayerMetadata(map, paramsObj, ows_request);
```

...

```

int msMetadataGetLayerMetadata(mapObj *map, metadataParamsObj *paramsObj,
    owsRequestObj *ows_request)
    if MAP.LAYER.METADATA/ows_metadataurl_href
        return HTTP 301 redirect to MAP.LAYER.METADATA/ows_metadataurl_href
    else
        generate metadata XML based on LAYER metadata spatial properties
    ...

int msMetadataGetServiceMetadata(mapObj *map, metadataParamsObj *paramsObj,
    owsRequestObj *ows_request)
    read map->web.metadata
    return ISO 19119:2005 XML

```

Downstream OGC web service code then implements:

```

if !LAYER.METADATA.ows_metadataurl_href
    set ows_metadataurl_href to http://host/mapserv?request=GetMetadata&layer=foo
    set ows_metadataurl_format to "text/xml"
    set ows_metadataurl_type to "TC211"

```

Testing

The msautotest/wxs suite will be extended with test cases exemplifying the expected behaviour of GetMetadata.

Documentation

Documentation will be updated by adding ogc/mapmetadata.txt to ogc/index.txt. As well, wms_server.txt, wfs_server.txt, wcs_server.txt, sos_server.txt will be updated to explain default output if ows_metadataurl_href is not set.

Backwards Compatibility Issues

There are no compatibility issues with existing mapfiles.

This implementation will result in the ability for MapServer OWS Capabilities XML to always advertise XML metadata by reference of a metadata URL (i.e. WMS MetadataURL), but will not override existing behaviour. That is, if a given layer has set ows_metadataurl_href, then this value will be used to advertise metadata XML references. If ows_metadataurl_href is not set, then the code will advertise the metadata via a reference to the GetMetadata operation.

Affected Files

- mapmetadata.c (new)
- mapows.c
- mapwms.c
- mapwfs.c
- mapwfs11.c
- mapwcs.c

- mapwcs11.c
- mapwcs20.c
- mapogcsos.c

Ticket Id

- <https://github.com/mapserver/mapserver/pull/4486>

Voting History

Adopted on 2012/10/08 with +1 from ThomasB, SteveL, StephanM, PerryN, SteveW, DanielM, and TomK.

16.9.83 MS RFC 83: Source tree reorganization

Date 2012-02-06

Author Daniel Morissette

Contact dmorissette at mapgears.com

Last Edited \$Date: 2011-11-25 15:59:20 -0500 (Fri, 25 Nov 2011) \$

Status Draft

Version MapServer 6.2

Id \$Id: ms-rfc-78.txt 12806 2011-11-25 20:59:20Z aboudreault \$

1. Overview

With the inclusion of the new MapCache and TinyOWS components in the MapServer project, it would be ideal to reorganize the directory structure of the source tree to facilitate builds and maintenance in the future.

2. Current directory structure

```
ls -R | grep -v svn | grep ":$" | sed -e 's/:$/'' -e 's/[^-] [^/]*/\//g' -e 's/^/' -e 's/-|/'  
mapserver  
|-fonts  
|-m4  
|-mapcache  
|---apache  
|---cgi  
|---include  
|---lib  
|---m4  
|---nginx  
|---static  
|---util  
|-mapscript  
|---csharp  
|----config  
|----examples
```

```

|---doc
|---java
|----data
|----examples
|----tests
|----threadtest
|---perl
|----examples
|---php
|----examples
|---python
|----examples
|----pygdiotx
|----tests
|----cases
|----timing
|---ruby
|----examples
|---swiginc
|---tcl
|----examples
|----win
|-opengl
|-renderers
|---agg
|----include
|----util
|----src
|-symbols
|-tests
|---vera
|-xmlmapfile
|---tests

```

Where the most interesting pieces are:

```

mapserver
|-mapcache
|-mapscript
|-opengl
|-renderers
|---agg
|-xmlmapfile

```

3. New proposed directory structure

The most important change is that most of the .c/.h source files currently in the mapserver root directory will be moved to one of two new sub-directories:

- lib: Contains all the mapserver core source files that are built into libmapserver.so and shared with multiple components. This directory would also be the home of libmapfile.so when we create it.
- apps: Contains the source files related to the traditional mapserv CGI/FastCGI application and command-line utilities such as shp2img, etc.

A new “tinyows” sub-directory will be created to serve as the future home of TinyOWS source files.

The result will look like this:

```
mapserver
|-lib
|---renderers
|----agg
|----opengl
|-apps
|-mapscript
|-mapcache
|-tinyows
|-xmlmapfile
```

For the time being, the following files will continue to reside in the mapserver root directory:

```
configure.in
Makefile.in
HISTORY.TXT (applicable to releases of the full suite)
```

Initially the root directory's configure.in will be the same one that we currently have, and it will update the Makefile.in in the lib, apps and mapscript sub-directories.

Our long term goal (to happen slowly over time) is that most of the sub-directories (especially mapserv, mapscript, mapcache and tinyows) will also eventually contain their own standalone configure script and Makefile to allow building a given component independently. At that point the master configure script and Makefile in the mapserver root directory will simply call each sub-project's configure and Makefile to automate building of multiple selected components at once.

HISTORY.TXT files will be maintained at two levels:

- HISTORY.TXT in root directory: contains history information relevant to releases of the full suite
- HISTORY.TXT in each sub-project directory: contains detailed history information related to each specific component. The current HISTORY.TXT would be moved to the libmapserver.so sub-directory.

4. Backwards Compatibility Issues

Patches against older releases may not apply directly any more due to files moving around. For the same reasons, merging of changes from a svn sandbox or branch may be more complicated.

5. Bug ID

- TBD

6. Voting history

No vote yet.

16.9.84 MS RFC 84: Migrate project repository from svn to git

Date 2012-03-23

Author Thomas Bonfort

Contact tbonfort at terriscope dot fr

Last Edited \$Date\$

Status Draft

Version MapServer 6.2

Id \$Id\$

1. Overview

While SVN suits our needs as a collaborative source code versioner, it has shortcomings that make it difficult to work with for developers working on multiple tasks in parallel. Git's easy branching makes it possible to set up branches for individual task, isolating code changes from other branches, thus making the switch from one task to another possible without the risk of losing or erroneously committing work-in-progress code. Three-way merging of different branches means that merging code from one branch to another becomes a rapid task, by only having to deal with actual conflicts in the code. Offline committing and access to entire history make working offline possible.

There is already somewhat of a consensus that the migration from SVN to git is a good move. Discussion remains as to how this transition should be performed. This RFC outlines the different options available for hosting the official repository, and the different options available for our ticket tracking.

Current investigation has retained two major options that we could go down with:

- Repository migrated to github, use github provided issue tracking. This option will be referred to as “Github hosting”.
- Repository hosted by osgeo, current trac instance migrated to hook on the new repository. This option will be referred to as “Osgeo hosting”

2. Github hosting

This option consists in moving our entire code+ticket infrastructure to github. The current trac instance becomes nearly read-only, new tickets cannot be created on it. Existing tickets are migrated to github with a script taking a trac postgresql dump (once the migration starts, our trac instance becomes read-only).

Advantages

- Code hosting:
- No need to worry about hosting infrastructure
- Can be up and running in a short delay
- Support for pull requests, allowing external contributions to be rapidly merged into our repository
- Online code editing for quick fixups
- Github visualization tools, for example to check which branches are likely to contain conflicting code sections
- Code and patch commenting make collaboratively working on a given feature very lightweight, i.e. just at your comment on the code line which seems problematic to you
- Documentation contributions highly simplified for one-shot contributions.
- Issue tracking:
- Integration of ticket state with commit messages (e.g: “fix mem allocation in mapDraw(), closes issue #1234
- Email replies to ticket notifications
- The free-form label tagging of issues might open up some interesting usages
- Versioned text-base attachments (gists), with commenting

Inconveniences

- Hosting by a private company, which might become an issue if their TOS evolve or if they go out of business. The source code availability is not an issue as is possible to maintain a mirror on an osgeo server, and each developper has a checkout of the full source control history. Ticket migration would be an issue, but there are APIs available to extract existing tickets.
- Issue tracker is in some ways less featurefull than trac. The only hardcoded attributes are the assignee and the milestone. All the other triaging information goes into free formed labels, a la gmail.
- No way to automatically assign a ticket owner given a component
- No support for image attachments, can be referenced by url but must be hosted elsewhere.
- No support for private security tickets
- Administering committer access will be done through github, osgeo credentials do not apply. Git does not support fine-grained commit permissions per directory, there will be a separate repository for the docs to account for the larger number of committers there.

3. Git Worflows

Stable Branches

This document outlines a workflow for fixing bugs in our stable branches: http://www.net-snmp.org/wiki/index.php/Git_Workflow I beleive it is a very good match for our stable release management: - pick the oldest branch where the fix should be applied - commit the fix to this oldest branch - merge the old branch down to all the more recent ones, including master

Release Management

Instead of freezing development during our beta cycle, a new release branch is created once the feature freeze is decided, and our betas, release and subsequent bugfix releases are tagged off of this branch. Bug fixes are committed to this new stable branch, and merged into master. New features can continue to be added to master during all the beta phase. <http://nvie.com/posts/a-successful-git-branching-model/> is an interesting read even if it does not fit our stable release branches exactly.

4. Upgrade path for SVN users

For those users who do not wish to change their workflow and continue with SVN commands. This is not the recommended way to work with git, as local or remote changes might end up in having conflicts to resolve, like with svn.

checkout:

- git clone <git@github.com:mapserver/mapserver>

update

- git pull origin master

commit files

- git add [list of files]
- git commit -m "foo"

- git push origin master

fix in branch, and merge fix into master

- git checkout ms-branch-6-0
- git add [list of files]
- git commit -m “foo”
- git push origin ms-branch-6-0
- git checkout master
- git merge ms-branch-6-0
- git push origin master

5. Tasks

- import svn to git
- assign github users
- split into sub-projects (c.f. rfc83):
 - mapserver
 - mapcache
 - tinyows
 - msautotest
 - docs
- document release process
- migrate website scripts
- switch trac site to read-only

6. Bug ID

- TBD

6. Voting history

+1 from ThomasB ,MikeS, UmbertoN, HowardB, SteveW, DanielM, SteveL, TamasS, JeffM, AssefaY, TomK, PerryN
-0 from OlivierC

16.9.85 MS RFC 85: Vector Contour Rendering (CONNECTIONTYPE CONTOUR)

Date 2012/09/18

Author Alan Boudreault

Contact aboudreault at mapgears.com

Last Edited \$Date\$

Status Draft

Version MapServer 6.4

Id \$Id\$

1. Overview

This is a proposal to add the ability to compute and render contour layers on the fly in MapServer from a raster source. The source is one band of raster data, which represents a digital elevation model (DEM). More info about DEMs at: http://en.wikipedia.org/wiki/Digital_elevation_model

Contours can already be rendered today using a standard vector layer but this requires an extra processing step with gdal_contour to pre-generate the contours from the raster source. Plus this also implies some overhead for the gdal_contour files management, etc.

2. The proposed solution

This RFC proposes the addition of a new type of layer in MapServer: CONNECTIONTYPE CONTOUR. The new type is a hybrid layer, which has a raster data source as input and vector features as output. Initially, only the line representation of those vector features will be supported.

Since the internal layer is of type vector, queries will be supported and operate on the vectors (not on the raw raster source). In the future we might see a need to add a query mode that queries the raster source, but this is not included in this phase of work.

To render a contour layer, we need to define a layer in the mapfile with the following options:

- Set the layer TYPE to LINE.
- Set CONNECTIONTYPE to CONTOUR.
- Set the DATA to the raster file that contains the elevation band.
- Specify the band to use as elevation using PROCESSING “BANDS”, same as regular raster.
- Specify one or more classes and styles to render the line features.

PROCESSING settings:

These options should be specified at layer level:

- CONTOUR_INTERVAL: elevation interval between contours
- CONTOUR_LEVELS: comma-separated list of one or more ‘fixed levels’ to extract
- CONTOUR_ITEM: provides a name for the item (attribute) in which to put the elevation. (optional)

You can also provide explicit min/max scaledenom in the CONTOUR_INTERVAL or CONTOUR_LEVELS values if you wish to use scale-dependent contour spacing. This is done by adding an optional “mscaledenom,maxscaledenom:” prefix to the value or list of values. See the example below.

Example of a simple layer definition:

```
LAYER NAME "my_contour_layer"
  TYPE LINE
  STATUS DEFAULT
  CONNECTIONTYPE CONTOUR
  DATA /mnt/data/raster/grib/dem.grib
  PROCESSING "BANDS=1"
  PROCESSING "CONTOUR_ITEM=elevation"
```

```

PROCESSING "CONTOUR_INTERVAL=10"
CLASS
  STYLE
    WIDTH 2
    COLOR 255 0 0
  END
END

```

Example of a layer definition with scale-dependent contour ranges:

```

LAYER NAME "my_contour_layer"
  TYPE LINE
  STATUS DEFAULT
  CONNECTIONTYPE CONTOUR
  DATA /mnt/data/raster/grib/dem.grib
  PROCESSING "BANDS=1"
  PROCESSING "CONTOUR_ITEM=elevation"
  PROCESSING "CONTOUR_INTERVAL=0,25000:5" # interval of 5 for scales of 25000 or less
  PROCESSING "CONTOUR_INTERVAL=25000,500000:10" # interval of 10 for scales in the 25000 to 500000 range
  PROCESSING "CONTOUR_LEVELS=500000,0:10,25,50,100" # explicit list of levels for scales of 500000 and above
  LABELITEM "elevation"
  CLASS
    STYLE
      WIDTH 2
      COLOR 255 0 0
    END
    LABEL
      ...
    END
  END

```

3. Implementation Details

Internally, a CONTOUR layer will have its own renderer/driver code. It's an hybrid layer because it reads the raster source and creates a vector dataset from it. It uses the internal GDAL function GDALContourGenerate(). All other functions behave like a vector layer. The layer can be drawn as a normal line layer using whichShape, GetShape etc.

Basic internal draw process of a CONTOUR layer:

1. whichShape() is called: the raster data source is read using the internal GDAL functions, an ogr dataset is stored in the internal layer structure.
2. getShape() is called: loop through the ogr dataset and return the shapeObj (Line).
3. MapServer draws its line feature as any other vector layer.

More info about GDALContourGenerate algorithm at: http://www.gdal.org/gdal__alg_8h.html#aceaf98ad40f159cbfb626988c054c085

3.1 OGR Input driver

Once the raster source will be processed with gdal raster/contour functions, a OGR DataSource will be stored internally using the “Memory” driver. Since mapserver has already an OGR input-driver, it will be used to avoid unnecessary code duplication and maintenance. A layerObj with connectiontype=MS_OGR will be used internally to render/query the vector features.

A OGR Datasource using the “Memory” driver cannot be reopened and can only be created. The msOGRLayerOpen() function will try to open the dataset. In this case, our datasource is already opened. To solve this minor issue, the connection pooling API will be used.

3.2 Resample and Reprojection

The raster resample and layer reprojection will be supported. It will be done in one of the two ways:

- In GDAL functions during the raster processing. (resample + reprojection)
- In MapServer, like any other vector layer. (reprojection)

3.3 Labeling

Since the layer is a line vector layer internally, the labeling is not affected and will be rendered as normal.

3.4 Tile boundaries

After some review of the GDALContourGenerate algorithm, it has been determined that the tile boundaries of the line should match properly. So this shouldn't be an issue but will have to be tested.

3.5 Files affected

The following files will be modified/created by this RFC:

```
mapserver.h/mapfile.c (Connection type CONTOUR support in the mapfile)
mapcontour.c (new file for the CONTOUR renderer)
maplayer.c (new layer type handling, virtual tables init etc.)
maplexer.l (add additional CONTOUR keyword)
```

3.6 MapScript

No issue for any MapScript bindings. The CONTOUR layer is handled/rendered internally as any other layer.

3.7 Backwards Compatibility Issues

This change provides a new functionality with no backwards compatibility issues being considered.

4. Tests

msautotest will be modified to add some tests related to that new layer type rendering and queries.

5. Bug ID

6. Voting history

None

16.9.86 MS RFC 86: Scale-dependant String Substitutions

Date 2012/10/08

Author Thomas Bonfort

Contact tbonfort@terriscience.fr

Status Draft

Version MapServer 6.4

1. Overview

MapServer has the ability to use multiple layers with MINSCALE/MAXSCALE filtering GROUP'd together when the need for scale-dependant datasources arises, e.g. like:

```
LAYER
  NAME "roads_far"
  GROUP "roads"
  TYPE LINE
  MINSCALE 100000
  DATA "the_geom from roads_far"
  CLASS
    ...
  END
  CLASS
  ...
  END
END
LAYER
  NAME "roads_close"
  GROUP "roads"
  TYPE LINE
  MAXSCALE 100000
  DATA "the_geom from roads_close"
  CLASS
  ...
  END
  CLASS
  ...
END
```

While this solution works, it has the inconvenience of necessitating a duplication of the symbology throughout multiple layers, and may require some tweaking in order to hide the multiple layers in capabilities documents.

The current RFC proposes to mimic our current `runtime-substitution` mechanism to replace tokens inside a layer's DATA statement. Instead of using an url parameter to accomplish the replacements, the token is replaced by a value that is dependant on the current map scale.

2. Proposed solution

Examples are worth a thousand words here...

2.1. Example 1

```
LAYER
  ...
  [S C A L E T O K E N]
    NAME "%priority%"
    V A L U E S
      "0" "1"
      "1000" "2"
      "10000" "3"
  END
END
DATA "the_geom from mytable_%priority%" #data comes from a specific table
DATA "/path/to/roads_%priority%.shp" #data comes from a specific shapefile
DATA "the_geom_%priority% from roads" #data comes from a specific column in the table
DATA "the_geom_%priority% from (select * from roads where priority > %priority%) as foo" #data is ...
CLASS
  ...
END
END
```

In the previous example, %priority% would be replaced by:

- “1” for scales under 1,000 , giving:

```
DATA "the_geom from mytable_1"
DATA "/path/to/roads_1.shp"
DATA "the_geom_1 from roads"
DATA "the_geom_1 from (select * from roads where priority > 1) as foo"
```

- “2” for scales between 1,000 and 10,000

```
DATA "the_geom from mytable_2"
DATA "/path/to/roads_2.shp"
DATA "the_geom_2 from roads"
DATA "the_geom_2 from (select * from roads where priority > 2) as foo"
```

- “3” for scales over 10,000

```
DATA "the_geom from mytable_3"
DATA "/path/to/roads_3.shp"
DATA "the_geom_3 from roads"
DATA "the_geom_3 from (select * from roads where priority > 3) as foo"
```

2.2 Example 2

```
LAYER
  ...
  [S C A L E T O K E N]
    NAME "%table%"
    V A L U E S
      "0" "roads"
      "1000" "roads_gen_1"
      "10000" "roads_gen_0"
  END
END
DATA "the_geom from %table%" #data comes from a specific table
DATA "/path/to/%table%.shp" #data comes from a specific shapefile
```

```

CLASS
...
END
END

```

In the previous example, %table% would be replaced by:

- “roads” for scales under 1,000 , giving:
- ```

DATA "the_geom from roads"
DATA "/path/to/roads.shp"

```
- “roads\_gen\_1” for scales between 1,000 and 10,000
- ```

DATA "the_geom from roads_gen_1"
DATA "/path/to/roads_gen_1.shp"

```
- “roads_gen_0” for scales over 10,000
- ```

DATA "the_geom from roads_gen_0"
DATA "/path/to/roads_gen_0.shp"

```

## 2.3 Example 3

```

LAYER
...
S C A L E T O K E N
NAME "%filter%"
V A L U E S
"0"
"1000" "where type in ('motorway','trunk','primary')"
"10000" "where type='motorway'"
END
END
DATA "the_geom from (select * from roads %filter%) as foo"
CLASS
...
END
END

```

In the previous example, %filter% would be replaced by:

- nothing for scales under 1,000 , giving:
- ```

DATA "the_geom from (select * from roads) as foo"

```
- “where type in ('motorway','trunk','primary')” for scales between 1,000 and 10,000
- ```

DATA "the_geom from (select * from roads where type in ('motorway','trunk','primary')) as foo"

```
- “where type='motorway'” for scales over 10,000
- ```

DATA "the_geom from (select * from roads where type='motorway') as foo"

```

2.4 Discussion

- Multiple tokens can be used for a single layer, e.g for applying a filter *and* hitting generalized tables.
- Inside the VALUES block, the first scale entry **must** be “0”, and entries **must** be in ascending order.

- The examples use the “%keyname%” notation in order to mimic MapServer’s existing url runtime substitutions. The “%...%” notation is not enforced, the code does a simple string replacement. (i.e. “priority” or “#table#” are valid VALUES, provided the “priority” or “#table#” substrings appear in the DATA statements).
- Scale dependant substitutions would apply to the layer’s DATA, TILEINDEX, TILEITEM, FILTERITEM and FILTER. Applying it to other elements might make sense, but is more involved in terms of impact to the code. Scale-dependant substitutions on FILTER may be incompatible with filters set through MapServer’s WFS filter handling.
- Bug [3150](#) discusses the need for such a substitution, but is much more limited in scope.
- It might be desirable to provide SCALETOKEN entries at the MAP level (and not only LAYER level) in case the token has the vocation of being replaced in multiple layers. MAP level SCALETOKEN will not be present in the initial implementation.
- Provide a default token to use when scale is irrelevant (queries...)

3. Implementation Details

3.1 Overview

- layerObj gets a new member containing the scale dependant tokens applicable.
- the actual struct to use to represent a given token:

```
typedef struct {
    double minscale;
    double maxscale;
    char* value;
} scaleTokenEntryObj;

typedef struct {
    char* name;
    char* default_value;
    int n_entries;
    scaleTokenEntryObj* tokens;
} scaleTokenObj;

struct layerObj {
    ...
    scaleTokenObj* tokens;
    int numscaletokens;
    ...

    char* orig_data;
    char* orig_tileindex;
    char* orig_tileitem;
    ... etc ...
}
```

- in msLayerOpen(), replace tokens inside layerObj->data, layerObj->tileindex, etc... The original layerObj->data is stored beforehand in layerObj->orig_data, and is restored in msLayerClose()
- For the special case of layerObj->filter, msLoadExpressionString() is called on the substituted text in order to update the expressionObj. Likewise, it is called in msLayerClose() when the original filter is restored.

3.2 Files affected

The following files will be modified/created by this RFC:

- mapserver.h/mapfile.c: layerObj members, mapfile keywords
- mapcopy.c/mapfile.c: copy functions, write-to-file functions
- maplayer.c: call to token replacements inside msLayerOpen(), eventually msLayerClose(). Add function to apply the substitutions depending on current scale..
- maplexer.l: parser keywords

3.3 MapScript

add getters/setters on layer scaletokens

3.4 Backwards Compatibilty Issues

This change provides a new functionality with no backwards compatibility issues being considered.

4. Security implications

The tokens are defined in the mapfile and are not overridable by url, thus implying no more risk of sql injection or file system traversal than a classical DATA statement.

4. Performance implications

The token replacement is only done in msLayerOpen(), the performance impact should be negligable as this happens only once per rendered layer.

5. Bug ID

6. Voting history

None

16.9.87 MS RFC 87: Bitmap pattern support

Date 2013/01/14

Author Tamas Szekeres

Contact szekerest at gmail.com

Status Draft

Version MapServer 6.3-dev

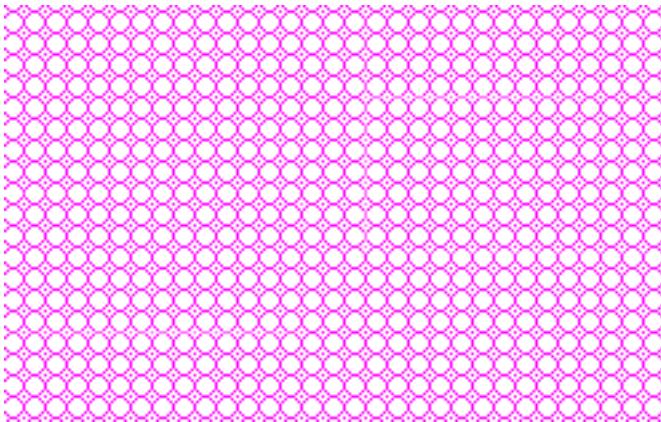
1. Overview

With this addition we could easily define brush patterns which are aware of color and backgroundcolor settings and rendered equally well with the various kind of renderers. Currently we have no such option to achieve the same result, by using vector symbols we can not provide the same look for most of the renderers (agg, cairo), due to the possible antialiasing behaviour of the line drawings.

Bitmap patterns would be defined as symbols of type PATTERNMAP according to the example below:

```
SYMBOL
  NAME "mapinfo-brush-54"
  TYPE P A T T E R N M A P
  IMAGE " |10000010|01000100|00111001|01000100|10000010|00000001|00000001|00000001"
END
```

This symbol will provide the following brush fill:



Bitmap patterns can be defined with any size according to length of the rows specified in the IMAGE section.

Bitmap patterns are non scalable, cannot be rotated, and the gap is always set to zero. The patterns are aware of COLOR and BACKGROUNDCOLOR defined in the STYLE section.

2. Proposed Solution

We will define a new symbol type PATTERNMAP, maplexer.l will be modified to be aware of this new keyword. The new symbol type would be rendered in the same way a the PIXMAP symbols. The mos significant difference is that the tile image is created on the fly instead of loading the image from file.

3. Implementation Details

In mapsymbol.c msPreloadImageSymbol will be modified to initialize the raster buffer with the proper size according to the bitmap specified in the IMAGE section. In maprendering.c getTile will be modified to render the image:

```
case (MS_SYMBOL_PATTERNMAP) :
    if(msPreloadImageSymbol(renderer,symbol) != MS_SUCCESS) {
        return NULL; /* failed to load image, renderer should have set the error message */
    }
    msCreateBitmapSymbol(symbol, s);
    renderer->renderPixmapSymbol(tileimg, p_x, p_y, symbol, s);
break;
```

The new function msCreateBitmapSymbol will process the IMAGE section in the symbol definition and set the pixels according to the STYLE colors.

computeSymbolStyle (in maprendering.c) will be modified to set up colors scale gap and rotation parameters before the rendering is taking place.

4. Files Affected

- maplexer.l, maplexer.l: Add PATTERNMAP keyword
- mapsymbol.h: Add MS_SYMBOL_PATTERNMAP enum value
- mapsymbol.c: Modify the parser, writer and msPreloadImageSymbol
- maprendering.c: Add msCreateBitmapSymbol, modify computeSymbolStyle, getTile etc.
- mapdraw.c: Modify msDrawVectorLayer, msDrawShape to be aware of MS_SYMBOL_PATTERNMAP

5. Bug ID

- <https://github.com/mapserver/mapserver/issues/4561>

Contains link for the sample implementation.

6. Backwards compatibility issues

None expected, new functionality.

7. MapScript changes

MS_SYMBOL_PATTERNMAP will be exposed as a new symbol type.

8. Voting history

TBD.

16.9.88 MS RFC 88: Saving MapServer Objects to Strings

Date 2013/01/15

Author Tamas Szekeres

Contact szekerest at gmail.com

Status Accepted (2013/03/02)

Version MapServer 6.3-dev

1. Overview

This RFC provides the option to save map objects to strings as mapfile string fragments. This functionality will mainly be utilized in MapScript and a new method (convertToString) will be added to the corresponding objects. This new method will provide the inverse option for updateFromString that has already been added within the scope of RFC 31.

2. Proposed Solution

The solution will utilize the existing msIO machinery when writing mapfiles. The key point of the implementation is to replace all occurrences of fprintf with msIO_fprintf in mapfile.c and mapsymbol.c. This replacement will establish the option to redirect mapfile writes to a buffer.

3. Implementation Details

Assuming the replacement of fprintf is done, writing objects to strings could be implemented by adding a new function for each object type something like:

```
char* msWriteLayerToString(layerObj *layer)
{
    msIOContext context;
    msIOBuffer buffer;

    context.label = NULL;
    context.write_channel = MS_TRUE;
    context.readWriteFunc = msIO_bufferWrite;
    context.cbData = &buffer;
    buffer.data = NULL;
    buffer.data_len = 0;
    buffer.data_offset = 0;

    msIO_installHandlers( NULL, &context, NULL );

    writeLayer(stdout, 0, layer);
    msIO_bufferWrite( &buffer, "", 1 );

    msIO_installHandlers( NULL, NULL, NULL );

    return buffer.data;
}
```

The ownership of the returned buffer is passed to the caller, so we should hook this function in layer.i as follows:

```
%newobject convertToString;
char* convertToString()
{
    return msWriteLayerToString(self);
}
```

In order to implement the writer for mapObj (msWriteMapToString) we will require to isolate the bulk of the writing code in a separate function writeMap from msSaveMap. In this regard msSaveMap will now look something like:

```
int msSaveMap(mapObj *map, char *filename)
{
    FILE *stream;
    char szPath[MS_MAXPATHLEN];

    if(!map) {
        msSetError(MS_MISCERR, "Map is undefined.", "msSaveMap()");
        return(-1);
    }

    if(!filename) {
        msSetError(MS_MISCERR, "Filename is undefined.", "msSaveMap()");
        return(-1);
    }
```

```

}

stream = fopen(msBuildPath(szPath, map->mappath, filename), "w");
if(!stream) {
    msSetError(MS_IOERR, "(%s)", "msSaveMap()", filename);
    return(-1);
}

writeMap(stream, 0, map);
fclose(stream);

return(0);
}

```

As the result of this implementation the following new functions will be exposed in mapserver.h

```

MS_DLL_EXPORT char *msWriteLayerToString(layerObj *layer);
MS_DLL_EXPORT char *msWriteMapToString(layerObj *layer);
MS_DLL_EXPORT char *msWriteClassToString(classObj *_class);
MS_DLL_EXPORT char *msWriteStyleToString(styleObj *style);
MS_DLL_EXPORT char *msWriteLabelToString(labelObj *label)
MS_DLL_EXPORT char *msWriteWebToString(webObj *web)
MS_DLL_EXPORT char *msWriteScalebarToString(scalebarObj *scalebar)
MS_DLL_EXPORT char *msWriteQueryMapToString(queryMapObj *querymap)
MS_DLL_EXPORT char *msWriteReferenceMapToString(referenceMapObj *ref)
MS_DLL_EXPORT char *msWriteLegendToString(legendObj *legend)
MS_DLL_EXPORT char *msWriteClusterToString(clusterObj *cluster)

```

4. Files Affected

- mapserver.h: Expose msWriteXXXToString methods
- mapfile.c: Implement msWriteXXXToString methods
- mapsymbol.c: Implement msWriteSymbolToString methods
- mapscript/swiginc/map.i: Add convertToString method
- mapscript/swiginc/layer.i: Add convertToString method
- mapscript/swiginc/class.i: Add convertToString method
- mapscript/swiginc/web.i: Add convertToString method
- mapscript/swiginc/legend.i: Add convertToString method
- mapscript/swiginc/scalebar.i: Add convertToString method
- mapscript/swiginc/querymap.i: Add convertToString method
- mapscript/swiginc/referencemap.i: Add convertToString method
- mapscript/swiginc/cluster.i: Add convertToString method
- mapscript/swiginc/label.i: Add convertToString method
- mapscript/swiginc/style.i: Add convertToString method
- mapscript/php/php_mapscript.h: Declare new functions
- mapscript/php/mapscript_i.c: Add proxys for new functions
- mapscript/php/map.c: Add convertToString method

- mapscript/php/layer.c: Add convertToString method
- mapscript/php/class.c: Add convertToString method
- mapscript/php/web.c: Add convertToString method
- mapscript/php/legend.c: Add convertToString method
- mapscript/php/scalebar.c: Add convertToString method
- mapscript/php/querymap.c: Add convertToString method
- mapscript/php/referencemap.c: Add convertToString method
- mapscript/php/cluster.c: Add convertToString method
- mapscript/php/label.c: Add convertToString method
- mapscript/php/style.c: Add convertToString method

5. Bug ID

- <https://github.com/mapserver/mapserver/issues/4563>

6. Backwards compatibility issues

None expected, new functionality.

7. MapScript changes

New function convertToString will be added to the corresponding objects.

8. Voting history

Tom Kralidis +1 Steve Lime +1 Jeff McKenna +1 Daniel Morissette +1 Umberto Nicoletti +1 Michael Smith +1 Tamas Szekeres +1 Stephen Woodbridge +1

16.9.89 MS RFC 89: Layer Geomtransforms

Date 2013/02/05

Author Alan Boudreault

Contact aboudreault at mapgears.com

Last Edited \$Date\$

Status Draft

Version MapServer 6.4

Id \$Id\$

1. Overview

MapServer 6.0 introduced the concept of geometry expressions within a styleObj-geomtransform. For example, one could write:

```
STYLE
  GEOMTRANSFORM (buffer([shape], -5)
  ...
END
```

This would cause a buffer operation to be run on the shape before being rendered with a given style. However, if we want to work with the transformed shape and apply multiple styles, the performance of the rendering will be significantly affected since the geom transform have to be done on each style. There are some other cases a layer geom transform would be useful. In example, if we want to simplify our lines.

This is a proposal to add a the ability to set a geomtransform at the layer level. For more information about the geomtransform implemented for the style object: see <http://mapserver.org/development/rfc/ms-rfc-48.html>.

2. The proposed solution

This RFC proposes the addition of a new layer option: GEOMTRANSFORM. The functionnality is mostly the same than the the style geomtransform, except that not *all* the parameters will be implemented. Unless we really see a need for the following transformations at the layer level, they *wont* be implemented: bbox, start, end, vertices. All other parameters will be accepted (EXPRESSIONS).

To set a geomtransform to a layer, you just need to add this option in the mapfile:

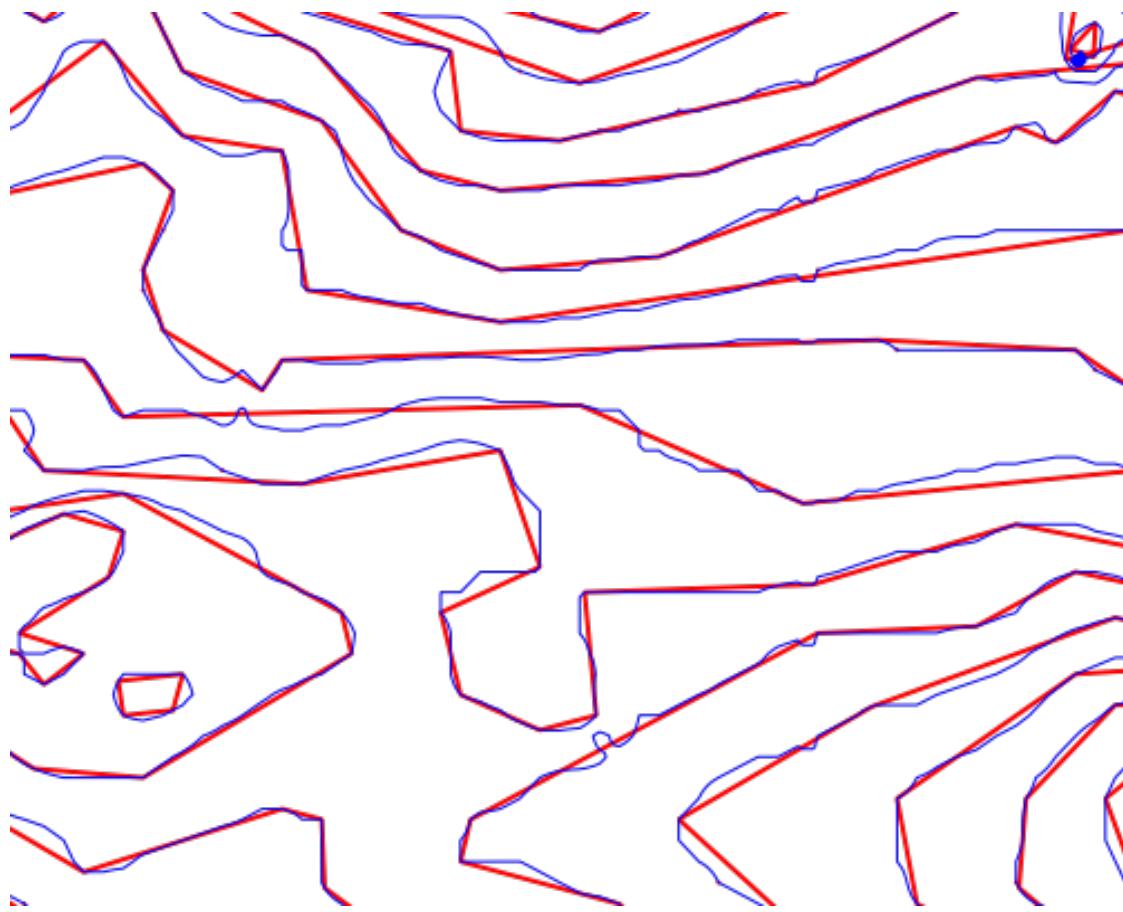
```
LAYER NAME "my_layer"
  TYPE LINE
  STATUS DEFAULT
  DATA "lines.shp"
  GEOMTRANSFORM (simplify([shape], 10))
  CLASS
    STYLE
      WIDTH 2
      COLOR 255 0 0
    END
  END
```

3. New Geomtransform Parameters

3 new parameters will be added as a geomtransform parameter:

- **simplify**: Simplify using GEOS.
- **simplifypt**: SimplifyPreserveTopology using GEOS.
- **generalize**: Custom implementation of the following algorithm: <http://trac.osgeo.org/gdal/ticket/966>

Those parameters will be available through the style geomtransform as well. Here is an example of the simplifypt geomtransform (the blue line is the original shape and the red one the transformed shape):



4. MapScript

No issue for any MapScript bindings. The geomtransform is handled internally and does not affect anything.

6. Backwards Compatibility Issues

This change provides a new functionality with no backwards compatibility issues being considered.

7. Tests

msautotest will be modified to add some tests of this new functionnality.

8. Bug ID

9. Voting history

None

16.9.90 MS RFC 90: Enable/Disable Layers in OGC Web Services by IP Lists

Date 2013/02/14

Author Tamas Szekeres

Contact szekerest at gmail.com

Status Accepted (2013/03/02)

Version MapServer 6.3-dev

1. Overview

This RFC provides the option to enable or disable OWS layers by IP lists. The aim is to let the admin to define list of users, identified through their IPs to allow or deny access to one or more specific WxS layers.

2. Proposed Solution

This addition will provide 2 more parameters in the WEB/METADATA section of the mapfile and/or in the META-DATA section of every single layer.

- **ows_allowed_ip_list**: contains the list of the allowed ip addresses or ranges
- **ows_denied_ip_list**: contains the list of the denied ip addresses or ranges

These parameters support both a list of addresses from a file, or the ability to provide the values directly in the mapfile, in the cases where there are only a couple of IPs or ranges to be specified.

When setting the IP list inline, we can use spaces as separators, like:

```
LAYER
  METADATA
    "ows_allowed_ip_list" "123.45.67.89 11.22.33.44"
  END
END
```

Or we can specify a file containing the list of the IP addresses (IPs and ranges in the file are separated by spaces or newlines)

```
LAYER
  METADATA
    "ows_allowed_ip_list" "file:/path/to/list_of_ips.txt"
  END
END
```

We can also specify IP ranges using the [CIDR notation](#), like: “192.168.1.0/24”

Setting `ows_allowed_ip_list` will deny all other IPs not specified in the list, and setting `ows_denied_ip_list` will allow all other IPs not specified in the list. When we both allow and deny a given IP the denial will take precedence.

The setting of **ows_enable_request** (added in [MS RFC 67](#)) will also be taken into account. Disabled requests cannot be re-enabled by IP lists, however we can restrict the access to a subset of layers by IP lists within the enabled OGC web services.

We will also be able to use the corresponding service specific settings (like `wms_allowed_ip_list` or `wfs_allowed_ip_list`)

This addition will support using both ipv4 and ipv6 IP addresses.

3. Disable the stock CGI operations

We also require to prevent the clients to work around the IP restrictions by using the stock CGI operations (mode=...). For this reason we add a new parameter to the WEB section of the mapfile (**ms_enable_modes**) to control which modes should be enabled. The **ms_enable_modes** will rely on the current implementation of enable_request, so can use the asterisk '*' to specify all modes and a preceding exclamation sign '!' can be used to negate a given condition.

To retain the backwards compatibility, if we don't specify the **ms_enable_modes** then all of the modes are enabled and dispatched.

When using OGC Web services, we don't require to specify modes by the URL, so we can block all CGI modes by using the following setting:

```
WEB
  METADATA
    # Block all CGI modes by default for this mapfile
    "ms_enable_modes" "!*"
  END
END
```

This will dispatch only those requests where explicit mode is not set by URL. It is suggested for all existing users to include this setting in the mapfiles if they intend to provide just OGC web services.

We'll also be able to enable the modes selectively, as follows:

```
WEB
  METADATA
    # Enable Only MAP and LEGEND modes for this mapfile
    "ms_enable_modes" "!* MAP LEGEND"
  END
END
```

To enable all modes except MAP:

```
WEB
  METADATA
    # Enable all modes except MAP for this mapfile
    "ms_enable_modes" "!MAP"
  END
END
```

Given the mode specified by URL is disabled, MapServer will provide the following error message:

“The specified mode ... is not supported by the current map configuration”

Within the scope of this RFC we don't intend to support LAYER level setting of **ms_enable_modes**.

4. Implementation Details

This change will utilize the mechanism established in [MS RFC 67](#), which makes the implementation fairly straightforward. Most of the functionality is provided by adding a new functions (msOWSIpDisabled, msOWSIpInMetadata, msOWSIpInList, msOWSIpParse) to mapows.c, to check whether a particular IP is disabled or not. The msOWSIpDisabled function is invoked from msOWSRequestIsEnabled and msOWSRequestLayersEnabled to prevent from adding the disabled layer to the enabled_layers list.

msOWSIpParse will parse the sting representation and the subnet into byte arrays. To test whether the IPs match, we make sure the following condition is true for each byte position

```
(ip1[i] & mask[i]) == (ip2[i] & mask[i])
```

The length of the byte array can be 4 (ipv4) or 16 (ipv6).

With regards to ipv6 we support both upper and lowercases in hex digits and support omitting the trailing zeros for each segment. We'll also support the shorthand of subsequent segments containing zeros by using double colons '::' like: 2001:0db8::ff00:0042:8329 When parsing ipv6 we write each segment of the IPs and masks as unsigned shorts, which should work with both the big endian and little endian memory representations.

The setting **ms_enable_modes** will be implemented in msCGISetMode directly (in mapservutil.c). The implementation will explicitly call the current msOWSParseRequestMetadata function:

```
if (mapserv->Mode >= 0)
{
    int disabled = MS_FALSE;
    const char* enable_modes = msLookupHashTable(&mapserv->map->web.metadata, "ms_enable_modes");

    if (!msOWSParseRequestMetadata(enable_modes, mode, &disabled) && disabled) {
        /* the current mode is disabled */
        msSetError(MS_WEBERR, "The specified mode '%s' is not supported by the current map configuration");
        return MS_FAILURE;
    }
}
```

5. Files Affected

- mapows.c: Implement and call msOWSIpDisabled, msOWSIpInMetadata, msOWSIpInList, msOWSIpParse methods
- mapservutil.c: Implement and **ms_enable_modes** logic

6. Bug ID

<https://github.com/mapserver/mapserver/issues/4588>

7. Backwards compatibility issues

None expected, new functionality.

8. Documentation

Within the scope of this addition we will also update the following documents:

- SOS Server : Adding **sos_allowed_ip_list**, **sos_denied_ip_list**
- WCS Server : Adding **wcs_allowed_ip_list**, **wcs_denied_ip_list**
- WFS Server : Adding **wfs_allowed_ip_list**, **wfs_denied_ip_list**
- WMS Server : Adding **wms_allowed_ip_list**, **wms_denied_ip_list**
- MapFile/WEB : Adding **ms_enable_modes** in the WEB METADATA section

9. Sponsorship

Developed for Faunalia (<http://www.faunalia.it>) with funding from Regione Toscana - Settore SISTEMA INFORMATIVO TERRITORIALE ED AMBIENTALE". For the project: "Sviluppo strumenti software per il trattamento di dati geografici basati su QuantumGIS e Postgis (CIG 0494241492)"

10. Voting history

Thomas Bonfort -0 Tom Kralidis +1 Daniel Morissette +1 Tamas Szekeres +1 Stephen Woodbridge +1

16.9.91 MS RFC 91: Layer Filter Normalization

Date 2012/11/24

Author Steve Lime

Contact sdlime@comcast.net

Status Draft

Version MapServer 6.4

1. Overview

Layer filters are driver specific expressions that are used within MapServer in a couple of ways:

1. to define feature subsets for rendering (independent of classes)
2. to define feature subsets for selected query operations

The first use case generally applies to drivers that don't support some sort expression language (e.g. SQL). While supported for PostGIS and Oracle Spatial there is little reason to use filters since the necessary SQL is better expressed in the layer data statement. For non-RDMS drivers filters are defined either by a item/value combination or a using MapServer's standard expression syntax.

The second use case applies to all drivers where filters are defined using driver specific syntax to extract features from a data source. This leads to a number of issues:

- confusion and inconsistencies in mapfile syntax
- lack of portability of filters between drivers
- performance limitations because only the simplest filters are easy to represent and secure

Furthermore, the above two use cases are mutually exclusive which again can lead to user confusion. Existing query operations that rely on filters (by attribute, by operator) cache the existing filter before defining and applying a new one. While this limitation could be addressed independently it becomes a much more manageable task when using a standardized filter definition.

2. Proposed solution

This SLA proposed standardizing filter definitions using the common expression syntax implemented as part of RFC XX. Drivers capable of handling complex expressions will translate MapServer expressions to an internal representation which should lead to very significant performance improvements. Drivers that don't have that capability would apply filtering to features much the same way as the native MapServer shapefile and tiled shapefiles already do (via `msXXXLayerNextShape()`)

2.1 Driver Filter Translation

Drivers that support complex expressions (e.g. PostGIS and Oracle Spatial) will need to implement a new layer API function (`propose msXXXLayerTranslateFilter()`) to translate a MapServer common expression to a native representation. MapServer expressions consist of a series of tokens that are from left to right. It should be possible then to

2.2 Filter Merging

TODO

2.3 Discussion

TODO (bulleted list of topics)

3. Implementation Details

3.1 Overview

- there are no new keywords with minor structure changes (expressionObj)
- there are no changes to the MapScript API
- drivers that support complex expressions (e.g. PostGIS, Oracle, SQL Server) need to implement a translation function to construct a partial “WHERE” clause from a set of expression/filter tokens
- ...

3.2 Files affected

The following files will be modified by this RFC:

- mapquery.c
- maplayer.c: changes/additions to layer API function
- mapshape.c, mappostgis.c, mapogr.c..... : changes/additions to driver functions

3.3 MapScript

No changes necessary.

3.4 Backwards Compatibilty Issues

By respecting a pre-defined FILTER...

4. Security implications

TODO

5. Performance implications

The token replacement is only done in msLayerOpen(), the performance impact should be negligible as this happens only once per rendered layer. Performance will improve greatly in some cases where operations are offloaded to the database - less network traffic, more efficient algorithms.

6. Bug ID

None assigned.

7. Voting history

None

16.10 Mapfile Editing

16.10.1 VIM Syntax

Author Andreas Hirner

Contact andreas.hirner at dlr.de

Author Schuyler Erle

Contact schuyler at tridity.org

Revision \$Revision\$

Date \$Date\$

Last Updated 2006/5/5

Table of Contents

- [VIM Syntax](#)
 - [General remarks](#)
 - [Installation](#)
 - [Folding](#)
 - [Closing Remarks](#)

General remarks

vi (vim) resides in: /usr/share/vim/current (vim_root).

Syntax definitions are in vim_root/syntax/*.vim files. Linking file types to extensions is done in vim_root/ftdetect/*.vim. (The star denotes the extension and would be replaced with map to define highlighting of MapServer config files).

Installation

The installation process requires two steps:

1. Copy the map.vim syntax file to the syntax directory

Copy map.vim to the vim syntax directory (on Suse: /usr/share/vim/current/syntax)

2. Register the syntax file in the custom filetype directory

If absent, create a new directory called ftdetect in vim_root (on Suse Linux: /usr/share/vim/current). Create a new file called map.vim in ftdetect according to the example shown below:

```
" MapServer config file
au BufNewFile,BufRead *.map          setf map
```

Now restart vim and open a map file

Folding

Introduction

Vim [code folding](#) can be an extremely handy way to simplify the task of editing complex MapServer mapfiles inside the Vim editor. A Vim command file called `map_fold.vim` is attached to this document, which defines a folding mode for mapfiles. This file also lives at http://iconocla.st/code/dot/map_fold.vim.

Installation

In Vim 6, you can copy `map_fold.vim` as-is to your `$VIMROOT/ftplugin/` directory, and it should more or less work.

To use locally, create a `~/.vim/ftplugin` directory, copy `map_fold.vim` to it, and then add the following to your `~/.vimrc`:

```
autocmd BufRead *.map set filetype=map
```

`map_fold.vim` is totally compatible with the `map.vim` syntax highlighter, and their combined use is even recommended.

Use

The Vim [folding tutorial](#) (at least the first two or three sections) is highly recommended. The Vim [folding reference](#) may also be helpful.

Conclusion

Hope this helps! Please let me know if you find it useful, or if you find ways to improve it. Thanks!

Closing Remarks

The keywords are based on the TextPad Symbol Map_40.syn file contributed by Christopher Thorne, which can also be found on the MapServer utility page. I hope the file is somehow useful to anybody out there. If there are any questions or suggestions, please feel free to contact me.

16.11 External Links

- [Buildbot](#)
- [Developers](#)
- [Ohloh](#)
- [Release Plans \(wiki\)](#)

Download

17.1 Source

17.1.1 Current Release(s)

- **2012-11-14** [mapserver-6.2.0.tar.gz](#) *Announcement*
- **2012-11-14** [mapcache-1.0.0.tar.gz](#) *Announcement*
- **2012-11-14** [tinyows-1.1.0.tar.bz2](#) *Announcement*
- **2012-11-14** [mapserver-suite-12.11.tar.gz](#) *Announcement*

17.1.2 Development Releases

- **2012-10-10** [mapserver-6.2.0-rc1.tar.gz](#) *Changelog*
- **2012-09-27** [mapserver-6.2.0-beta4.tar.gz](#) *Changelog*
- **2012-09-06** [mapserver-6.2.0-beta3.tar.gz](#) *Changelog*
- **2012-08-01** [mapserver-6.2.0-beta2.tar.gz](#) *Changelog*
- **2012-06-29** [mapserver-6.2.0-beta1.tar.gz](#) *Changelog*

17.1.3 Past Releases

- **2012-05-18** [mapserver-6.0.3.tar.gz](#) *Changelog*
- **2012-02-08** [mapserver-6.0.2.tar.gz](#) *Changelog*
- **2011-07-12** [mapserver-6.0.1.tar.gz](#) *Changelog*
- **2011-07-12** [mapserver-5.6.7.tar.gz](#) *Changelog*
- **2009-07-23** [mapserver-5.4.2.tar.gz](#) *Changelog*
- **2009-07-23** [mapserver-5.2.3.tar.gz](#) *Changelog*
- **2011-07-12** [mapserver-4.10.7.tar.gz](#) *Changelog*

17.1.4 Development Source

- Git Repository: <https://github.com/mapserver/mapserver>
 - Latest Release Branch: branch-6-2
-

Note: More information about MapServer development can be found at [Development](#)

17.2 Documentation

Note: If you plan on upgrading to the MapServer 6.0 release, be sure to review the [MapServer Migration Guide](#).

The entire documentation is available as a single PDF document.

17.2.1 Current Release

- MapServer-Documentation.pdf 

17.2.2 Previous Releases

- MapServer-6.0-Documentation.pdf 
- MapServer-5.6-Documentation.pdf 
- MapServer-5.4-Documentation.pdf 

17.3 Binaries

17.3.1 Windows

MS4W MapServer for Windows from MapTools.org. If you are a beginner looking for a complete MapServer solution on the Windows platform, or an advanced user looking to avoid compiling your own, this is what you're looking for. MS4W is a complete Web Server/MapServer/MapScript package. MS4W includes several flavors of MapScript (PHP, C#, Python, Java), and additional dlls for SDE and Oracle support. Several popular Web applications are also available for download, which are pre-configured for MS4W.

OSGeo4W OSGeo4W is a binary distribution of a broad set of Open Source geospatial software for Win32 environments (Windows XP, Vista, etc). OSGeo4W includes GDAL/OGR, GRASS, MapServer, OpenEV, uDig, as well as many other packages (about 70 as of summer 2008).

FWTools A collection of Open Source GIS tools provided by Frank Warmerdam. This goes beyond your basic web mapping tools and include many useful utilities for creating, manipulating, and serving geo-spatial data. New versions will probably not appear.

Gisinternals A collection of binary packages that are compiled daily based on the MapServer and GDAL SVN (development and stable branches).

17.3.2 Linux

DebianGIS DebianGIS provides a number of packages including MapServer, PostGIS, GDAL, QGIS, and GEOS. It sometimes lags a little bit behind the absolute latest release, but DebianGIS provides a solid integration environment for a giant slug of Open Source GIS software.

Enterprise Linux GIS The Enterprise Linux GIS (ELGIS) repository provides up to date packages of MapServer and related OSGeo tools for Enterprise Linux and derivatives, that is Red Hat Enterprise Linux (RHEL), CentOS and Scientific Linux.

FGS The FGS Linux Installer is a self-extracting file that will install MapServer with PHP/MapScript and all of their dependencies on your Linux system. It provides a stand-alone environment with all the required software (incl. Apache and PHP) to run PHP/MapScript webmapping applications. The bundled version of Apache can be configured to run on any port so it will not interfere with previous installations of Apache or other web servers on your system.

OpenSUSE The OpenSUSE Application:Geo repository provides stable Packages for MapServer and other OSGeo tools. Development versions are also made available for testing in other OBS before being migrated to the stable repository.

UbuntuGIS UbuntuGIS provides up to date packages of MapServer and related OSGeo tools for the last three releases of Ubuntu.

17.3.3 Mac OS X

Kyng Chaos William Kyngesburye provides excellent, up-to-date packages for Mac OS X. Most of the Open Source GIS stack is provided, including GEOS, GDAL, QGIS, and PostGIS.

17.4 Demo Application

Download MapServer 5.4.x Demo Download and unzip this file into your computer. Follow the directions in ReadMe.txt. You will most likely need to move the demo directory tree to an appropriate location in your httpd server. You will also need to edit some of the mapfile and template file parameters to reflect the changes in your paths (directory locations).

Environment Variables

A number of environment variables can be used to control MapServer's behavior or specify the location of some resources.

CURL_CA_BUNDLE

Used to specify the location of the Certificate Authority (CA) bundle file to be used by Curl when using HTTPS connections in WMS/WFS client layers. Curl comes bundled with its own CA bundle by default, so this variable is not required unless you have an unusual installation:

```
export CURL_CA_BUNDLE=/path/to/ca-bundle.crt
```

New in version 5.4.1.

MS_DEBUGLEVEL A default *DEBUG* level value can be set using the *MS_DEBUGLEVEL* environment variable in combination with the *MS_ERRORFILE* variable.

When set, this value is used as the default debug level value for all map and layer objects as they are loaded by the mapfile parser. This option also sets the debug level for any msDebug() call located outside of the context of a map or layer object, for instance for debug statements relating to initialization before a map is loaded. If a *DEBUG* value is also specified in the mapfile in some map or layer objects then the local value (in the mapfile) takes precedence over the value of the environment variable.

This option is mostly useful when tuning applications by enabling timing/debug output before the map is loaded, to capture the full process initialization and map loading time, for instance. New in version 5.0.

See Also:

[MS RFC 28: Redesign of LOG/DEBUG output mechanisms](#)

MS_ENCRYPTION_KEY

See Also:

[msencrypt](#)

New in version 4.10.

MS_ERRORFILE The *MS_ERRORFILE* environment variable specifies the location of the logging/debug output, with possible values being either a file path on disk, or one of the following special values:

- “stderr” to send output to standard error. Under Apache stderr is the Apache error_log file. Under IIS stderr goes to stdout so its use is discouraged. With IIS it is recommended to do direct output to a file on disk instead.

- “stdout” to send output to standard output, combined with the rest of MapServer’s output.
- “windowsdebug” to send output to the Windows OutputDebugString API, allowing the use of external programs like SysInternals debugview to display the debug output.

It is possible to specify *MS_ERRORFILE* either as an environment variable or via a *CONFIG* directive inside a mapfile:

```
CONFIG "MS_ERRORFILE" "/tmp/mapserver.log"
```

or:

```
CONFIG "MS_ERRORFILE" "stderr"
```

If both the *MS_ERRORFILE* environment variable is set and a *CONFIG MS_ERRORFILE* is set, then the *CONFIG* directive takes precedence.

If *MS_ERRORFILE* is not set, then error/debug logging is disabled. During parsing of a mapfile, error/debug logging may become available only after the *MS_ERRORFILE* directive has been parsed.

See Also:

[MS RFC 28: Redesign of LOG/DEBUG output mechanisms](#)

MS_MAP_NO_PATH The *MS_MAP_NO_PATH* environment variable can be set to any value to forbid the use of explicit paths in the map=... URL parameter. Setting *MS_MAP_NO_PATH* to **any value** forces the use of the map=<env_variable_name> mechanism in mapserv CGI URLs.

If this variable is not set then nothing changes and the mapserv CGI still accepts explicit file paths via the map=... URL parameter.

Example, set *MS_MAP_NOPATH* and some mapfile paths in Apache’s httpd.conf:

```
SetEnv MS_MAP_NO_PATH "foo"  
SetEnv MY_MAPFILE "/opt/mapserver/map1/mymapfile.map"
```

and then calls the mapserv CGI must use environment variables for the map=... parameter:

```
http://localhost/cgi-bin/mapserv?map=MY_MAPFILE&mode=...
```

New in version 5.4.

See Also:

[MS RFC 56: Tighten control of access to mapfiles and templates](#)

MS_MAPFILE The mapfile to use if the map=... URL parameter is not provided.

It is also possible to use an environment variable name as the value of the map=... URL parameter. The value of this environment variable will be used as the mapfile path:

```
map=ENV_VAR
```

MS_MAPFILE_PATTERN *MS_MAPFILE_PATTERN* can be used to override the default regular expression which is used to validate mapfile filename extensions.

The default value for this variable is:

```
MS_MAPFILE_PATTERN='\.map$'
```

MS_MAP_PATTERN The *MS_MAP_PATTERN* environment variable can be used to specify a Regular Expression that must be matched by all mapfile paths passed to the mapserv CGI in the map=... URL parameter.

If *MS_MAP_PATTERN* is not set then any .map file can be loaded.

Example, use Apache's SetEnv? directive to restrict mapfiles to the /opt/mapserver/ directory and subdirectories:

```
SetEnv MS_MAP_PATTERN "^/opt/mapserver/"
```

New in version 5.4.

See Also:

[MS RFC 56: Tighten control of access to mapfiles and templates](#)

MS_MODE Default value for the mode=... URL parameter. Setting mode=... in the URL takes precedence over the environment variable.

MS_OPENLAYERS_JS_URL The URL to the OpenLayers javascript library (can be used when testing WMS services using imagetype application/openlayers), for instance:

```
http://openlayers.org/api/OpenLayers.js
```

MS_TEMPPATH Set the [WEB TEMPPATH](#). New in version 6.0.

MS_XMLMAPFILE_XSLT Used to enable XML Mapfile support. Points to the location of the XSLT to use for the XML->text mapfile conversion.

See Also:

[XML Mapfile support](#)

PROJ_LIB The *PROJ_LIB* environment variable or *CONFIG* directive can be used to specify the directory where the PROJ.4 data files (including the "epsg" file) are located, if they are not in the default directory where PROJ.4 expects them.

See Also:

Setting the location of the epsg file in [Errors](#).

Glossary

AGG Anti-Grain Geometry A high quality graphics rendering engine that MapServer 5.0+ can use. It supports sub-pixel anti-aliasing, as well as many more features.

CGI Wikipedia provides excellent coverage of [CGI](#).

EPSG EPSG codes are numeric codes associated with coordinate system definitions. For instance, EPSG:4326 is geographic WGS84, and EPSG:32611 is “UTM zone 11 North, WGS84”. The WMS protocol uses EPSG codes to describe coordinate systems. EPSG codes are published by the [OGP Surveying and Positioning Committee](#). A list of PROJ.4 definitions corresponding to the EPSG codes can be found in the file /usr/local/share/proj/epsg. [PROJECTION](#) describes how to use these in your *Mapfile*.

See Also:

<http://spatialreference.org> for a listing of spatial references and an interface to search for spatial references.

Filter Encoding Filter Encoding is an [OGC](#) standard which defines an XML encoding for filter expressions to allow for spatial and attribute querying.

See Also:

[WFS Filter Encoding](#)

FreeType FreeType is a font engine that MapServer uses for accessing and rendering TrueType fonts.

GD GD is a graphics library for dynamic generation of images. It was the first graphics renderer that was available for MapServer, and it is required by MapServer to operate.

GDAL GDAL (Geospatial Data Abstraction Library) is a multi-format raster reading and writing library. It is used as the primary mechanism for reading raster data in MapServer. It is hosted at <http://www.gdal.org/>

GEOS Geometry Engine Open Source is a C/C++ port of the Java Topology Suite. It is used for geometric algebra operations like determining if a polygon is contained in another polygon or determining the resultant intersection of two or more polygons. MapServer optionally uses GEOS for geometric algebra operations.

GML Geography Markup Language is an [OGC](#) standard which defines an abstract model for geographic features

See Also:

[WFS Server](#)

GPX GPS eXchange Format is an XML Schema for describing GPS data. [OGR](#) can be used to transform and render this data with MapServer.

Map Scale A treatise of mapping scale can be found on [about.com](#).

Mapfile [Mapfile](#) is the declarative language that MapServer uses to define data connections, map styling, templating, and server directives. Its format is xml-like and hierarchical, with closing END tags, but the format is not xml.

MapScript [MapScript](#) is an alternative the the [CGI](#) application of *mapserv* that allows you to program the MapServer object API in many languages.

Mercator Wikipedia provides excellent coverage of the [Mercator](#) projection.

OGC The [Open Geospatial Consortium](#) is a standards organization body in the GIS domain. MapServer supports numerous OGC standards.

See Also:

[WMS Server](#) and [WMS Time](#) and [WMS Client](#) and [WFS Server](#) and [WFS Client](#) and [WCS Server](#) and [Map Context](#) and [SLD](#) and [WFS Filter Encoding](#) and [SOS Server](#)

OGR OGR is the vector data access portion of the [GDAL](#) library. It provides access to a multitude of data formats.

See Also:

[OGR](#)

OM [Observations and Measurements](#) is an [OGC](#) standard which defines an abstract model for sensor based data.

See Also:

[SOS Server](#)

OpenLayers [OpenLayers](#) is a JavaScript library for developing draggable, “slippy map” web applications.

Proj.4 [Proj4](#) is a library for projecting map data. It is used by MapServer and GDAL and a multitude of other Open Source GIS libraries.

Projection A map projection is a mathematical transformation of the surface of a sphere (3D) onto a 2D plane. Due to the laws of the universe, each type of projection must make tradeoffs on how and what features it distorts.

Raster A raster is a rectangular grid of pixels. Essentially an image. Rasters are supported in MapServer with a layer type of RASTER, and a variety of formats are supported including GeoTIFF, JPEG, and PNG.

Shapefile Shapefiles are simple GIS vector files containing points, lines or areas. The format was designed and published by ESRI and is widely supported in the GIS world. It is effectively the native and highest performance format for MapServer.

See Also:

[Wikimedia](#)

SLD SLD is an [OGC](#) standard which allows for custom symbolization for portrayal of data.

See Also:

[SLD](#)

SOS SOS is an [OGC](#) standard which provides an API for managing deployed sensors and retrieving sensor and observation data.

See Also:

[SOS Server](#)

Spherical Mercator Spherical Mercator is a term used to describe the [PROJECTION](#) used by many commercial API providers.

SVG Scalable Vector Graphics is an XML format that MapServer can output. It is frequently used in browser and mobile devices.

See Also:

SVG

SWF Shockwave Flash format that MapServer can generate for output.

See Also:

Flash Output

SWIG Simplified Wrapper Interface Generator is the library that MapServer uses for generating the language bindings for all languages other than C/C++ and PHP. *MapScript* describes these bindings.

Tileindex A tileindex is a *Shapefile* or other *Vector* data source that contains footprints of *Raster* data coverage. MapServer can use a tileindex to render a directory of raster data. The tileindex allows MapServer to only read the data that intersects the requested map extent, rather than reading all of the data.

See Also:

Tile Indexes

Vector Geographic features described by geometries (point, line, polygon) on a (typically) cartesian plane.

WCS *WCS* is an *OGC* standard that describes how to systematically produce structured *Raster* cartographic data from a service and return them to a client

See Also:

WCS Server and *WCS Use Cases*

WFS *WFS* is an *OGC* standard that describes how to systematically produce structured *Vector* cartographic data from a service and return them to a client.

See Also:

WFS Server and *WFS Client*

WMC Web Map Context is an *OGC* standard which allows for sharing of map views of *WMS* layers in multiple applications.

See Also:

Map Context

WMS *WMS* is an *OGC* standard that describes how to systematically produce rendered map images from a service and return them to a client.

See Also:

WMS Server and *WMS Client*

Errors

20.1 drawEPP(): EPPL7 support is not available

Error displayed when not using EPPL7 data.

This is a confusing error for users who are not even trying to view EPPL7 layers (EPPL7 is a raster format). The full error displayed may appear as follows:

```
msDrawRaster(): Unrecognized or unsupported image format ...
drawEPP(): EPPL7 support is not available.
```

20.1.1 Explanation

When MapServer tries to draw a layer, it will attempt to use all of the drivers it knows about, and the EPPL7 driver is the very last driver it will try. This means that if a layer fails to draw for any reason, you will see this error message.

There are other possible instances when this error can appear however, here are a few:

- the server is returning either a ServiceException (which MapServer does not yet detect and parse into a reasonable error message) or it is returning an image in an unrecognized format ... for instance it is returning a GIF image and MapServer is not built to support GIF images.
- WMS servers often advertise multiple image formats but don't respect them in the getmap request.

20.2 loadLayer(): Unknown identifier. Maximum number of classes reached

Error displayed when attempting to draw a layer with a large number of classes.

This error states that MapServer has reached its limit for the maximum number of classes for the layer. This maximum can be modified in the MapServer source, and can then be re-compiled. *map.h* contains the default values, and below are the defaults for MapServer 4.10 and 4.8:

```
#define MS_MAXCLASSES 250
#define MS_MAXSTYLES 5
#define MS_MAXLAYERS 200
```

Note: This limitation was corrected in MapServer 5.0 and should no longer be a problem.

20.3 loadMapInternal(): Given map extent is invalid

When loading your mapfile or one of your layers, MapServer complains about an invalid extent.

Beginning in MapServer 4.6, MapServer got more strict about LAYER and MAP extents. If minx is greater than maxx, or miny is greater than maxy, this error will be generated. Check your MAP's EXTENT, LAYER's EXTENT, or wms_extent setting to make sure this is not the case. MapServer **always** takes in extents in the form of:

```
EXTENT minx miny maxx maxy
```

20.3.1 How to get a file's EXTENT values?

The easiest way to get a vector file's EXTENT is to use the [ogrinfo](#) utility, that is part of the GDAL/OGR library (for raster files you would use the [gdalinfo](#) utility). Windows users can download the [FWTools](#) package, which includes all of the GDAL and OGR commandline utilities. [MS4W](#) also includes the utilities (in *ms4w/tools/gdal-ogr-utils/*). Linux users will probably already have the GDAL libraries, if not you can also use the *FWTools* package.

For example, here is the results of the ogrinfo command on a shapefile (notice the "Extent" line):

```
$ ogrinfo province.shp province -summary
INFO: Open of 'province.shp'
      using driver 'ESRI Shapefile' successful.

Layer name: province
Geometry: Polygon
Feature Count: 1071
Extent: (-2340603.750000, -719746.062500) - (3009430.500000, 3836605.250000)
Layer SRS WKT:
(unknown)
AREA: Real (16.0)
PERIMETER: Real (16.0)
PROVINCE_: Real (16.0)
PROVINCE_I: Real (16.0)
STATUS: String (64.0)
NAME: String (64.0)
NAME_E: String (64.0)
NAME_F: String (64.0)
REG_CODE: Real (16.0)
POLY_FEATU: Real (16.0)
ISLAND: String (64.0)
ISLAND_E: String (64.0)
ISLAND_F: String (64.0)
YYY: Real (16.0)
SIZE: Real (16.0)
ANGLE: Real (16.0)
```

Ogrinfo gives the file's extent in the form of (minx, miny),(maxx, maxy), therefore the EXTENT in a mapfile would be:

```
EXTENT -2340603.750000 -719746.062500 3009430.500000 3836605.250000
```

Note: The EXTENT in a mapfile must be in the same units as the *MAP* -level *PROJECTION*.

20.4 msGetLabelSize(): Requested font not found

Error displayed when attempting to display a specific font.

This message tells you that MapServer cannot find specified font.

Make sure that the font is properly referenced in the FONTSET lookup file.

See Also:

FONTSET

20.5 msLoadFontset(): Error opening fontset

Error when attempting to display a label.

This message tells you that MapServer cannot find the *FONTSET* specified in the *Mapfile*.

The FONTSET path is relative to the mapfile location.

See Also:

FONTSET

20.6 msLoadMap(): Failed to open map file

Error displayed when trying to display map image.

The message tells you that MapServer cannot find map file or has problems with the map file. Verify that you have specified the correct path to the mapfile. Linux/Unix users should make sure that the web user has access permissions to the mapfile path as well. Verify that the map file using shp2img to make sure that the syntax is correct.

The error message states where MapServer thinks the mapfile is:

```
[MapServer Error]: msLoadMap(): (D:/ms4w/apps/blah/blah.map)
Failed to open map file D:/ms4w/apps/blah/blah.map
```

20.7 msProcessProjection(): no options found in ‘init’ file

Error displayed when attempting to use a specific projection.

The message tells you that the projection you’re trying to use isn’t defined in the epsg file. Open your epsg file in a text editor and search for your projection to make sure that it exists.

On Windows, the default location of the epsg file is *c:\proj\nad*. MS4W users will find the epsg file in *\ms4w\proj\nad*.

See Also:

PROJECTION and <http://spatialreference.org>

20.8 msProcessProjection(): No such file or directory

Error displayed when trying to refer to an epsg file.

The message tells you that MapServer cannot find the epsg file.

On Windows, the default location of the epsg file is *c:\proj\nad*. MS4W users will find the epsg file in *\ns4w\proj\nad*.

Linux/Unix users should be careful to **specify the correct case** when referring to the epsg file, since filenames are case sensitive on Linux/Unix. “init=epsg:4326” refers to the epsg filename, and therefore “init=EPSG:4326” will not work because it will be looking for an *EPSG* file in uppercase.

20.8.1 Setting the location of the epsg file

There are a few options available if you need to set the epsg location:

1. Use a system variable (“environment variable” on windows) called “PROJ_LIB” and point it to your epsg directory.
2. Use the mapfile parameter CONFIG to force the location of the epsg file. This parameter is specified at the MAP level

See Also:

Mapfile

MAP

```
...
CONFIG "PROJ_LIB" "C:/somedir/proj/nad/"
...
END
```

3. Set an environment variable through your web server. Apache has a SetEnv directive that can set environment variables. Add something like the following to your Apache *httpd.conf* file:

```
SetEnv PROJ_LIB C:/somedir/proj/nad/
```

20.9 msProcessProjection(): Projection library error.major axis or radius = 0 not given

Error displayed when attempting to specify projection parameters.

Since MapServer 4.0, you are required to specify the ellipsoid for the projection. Omitting this ellipsoid parameter in later MapServer versions will cause this error.

20.9.1 Valid Examples

4.0 and newer:

```
PROJECTION
  "proj=latlong"
  "ellps=WGS84"
END
```

before MapServer 4.0:

```
PROJECTION
  "proj=latlong"
END
```

See Also:

PROJECTION and <http://spatialreference.org>

20.10 msQueryByPoint: search returned no results

Why do I get the message “msQueryByPoint(): Search returned no results. No matching record(s) found” when I query a feature known to exists?

The query feature requires a TEMPLATE object in the CLASS object of your LAYER definition. The value points to a html fragment using MapServer template syntax.

Example MapFile fragment:

```
LAYER
  NAME "Parcel9"
  TYPE POLYGON
  STATUS OFF
  DATA "Parcels/area09_parcels"
  CLASS
    STYLE
      OUTLINECOLOR 128 128 128
      COLOR 153 205 255
    END
    TEMPLATE "templates/Parcels/area09_parcels.html"
  END

  HEADER "templates/Parcels/area09_parcels_header.html"
  FOOTER "templates/Parcels/area09_parcels_footer.html"

END
```

Example Template:

```
<tr>
  <td>[lrn]</td>
  <td>[PIN]</td>
</tr>
```

The [lrn] is a special keyword that indicates the resulting line number which starts at 1. [PIN] is the name of a feature attribute.

20.11 msReturnPage(): Web application error. Malformed template name

This error may occur when you are attempting to use a URL template for a query. The issue is that URL templates are only allowed for query modes that return only one result (e.g. query or itemquery)

You can only use a URL template for a query in mode=query or mode=itemquery. If you try it with mode=nquery or mode=itemnquery, you will get the error:

Content-type: text/html msReturnPage(): Web application error. Malformed template name

See Also:

MapServer CGI Controls

20.12 msSaveImageGD(): Unable to access file

Error displayed when attempting to display map image.

This error is displayed if MapServer cannot display the map image. There are several things to check:

- IMAGEPATH and IMAGEURL parameters in mapfile are valid
- In CGI mode, any IMAGEPATH and IMAGEURL variables set in the init pages are valid
- Linux/Unix users should verify that the web user has permissions to write to the IMAGEPATH

20.13 msWMSLoadGetMapParams(): WMS server error. Image Size out of range, WIDTH and HEIGHT must be between 1 and 2048 pixels

Error that is returned / displayed when a user has requested a map image (via WMS) that exceeds the maximum width or height that the service allows.

To increase the maximum map width and height for the service, use the MAXSIZE parameter of the [MAP](#) object. Producing larger map images requires more processing power and more memory, so take care.

20.14 Unable to load dll (*MapScript*)

One of the dll-s could not be loaded that mapscript.dll depends on.

You can get this problem on Windows and in most cases it can be dedicated to a missing or an unloadable shared library. The error message talks about mapscript.dll but surely one or more of the dll-s are missing that libmap.dll depends on. So firstly you might want to check for the dependencies of your libmap.dll in your application directory. You can use the Visual Studio Dependency Walker to accomplish this task. You can also use a file monitoring tool (like SysInternal's filemon) to detect the dll-s that could not be loaded. I propose to store all of the dll-s required by your application in the application folder. If you can run the mapscript sample applications properly your compilation might be correct and all of the dlls are available.

20.14.1 C#-specific information

You may find that the mapscript C# interface behaves differently for the desktop and the ASP.NET applications. Although you can run the drawmap sample correctly you may encounter the dll loading problem with the ASP.NET applications. When creating an ASP.NET project your application folder will be 'Inetpubwwwroot[YourApp]bin' by default. The host process of the application will aspnet_wp.exe or w3wp.exe depending on your system. The application will run under a different security context than the interactive user (under the context of the ASPNET user by default). When placing the dll-s outside of your application directory you should consider that the PATH environment variable may differ between the interactive and the ASPNET user and/or you may not have enough permission to access a dll outside of your application folder.

FAQ

21.1 Where is the MapServer log file?

See *MS RFC 28: Redesign of LOG/DEBUG output mechanisms*

21.2 What books are available about MapServer?

“Mapping Hacks” by Schuyler Erle, Rich Gibson, and Jo Walsh is available from O’Reilly.

“Web Mapping Illustrated” by Tyler Mitchell is available from O’Reilly. Introduces MapServer and many other related technologies including, GDAL/OGR, MapScript, PostGIS, map projections, etc.

“MapServer: Open Source GIS Development” by Bill Kropla.

21.3 How do I compile MapServer for Windows?

See *Compiling on Win32*. Also, you can use the development libraries in *OSGeo4W* as a starting point instead of building all of the dependent libraries yourself.

21.4 What do MapServer version numbers mean?

MapServer’s version numbering scheme is very similar to Linux’s. For example, a MapServer version number of 4.2.5 can be decoded as such:

- 4: Major version number. MapServer releases a major version every two to three years.
- 2: Minor version number. Increments in minor version number almost always relate to additions in functionality.
- 5: Revision number. Revisions are bug fixes only. No new functionality is provided in revisions.

From a developer’s standpoint, MapServer version numbering scheme is also like Linux. Even minor version numbers (0..2..4..6) relate to *release* versions, and odd minor versions (1..3..5..7) correspond to developmental versions.

21.5 Is MapServer Thread-safe?

Q: Is MapServer thread-safe?

A: Generally, no (but see the next question). Many components of MapServer use static or global data that could potentially be modified by another thread. Under heavy load these unlikely events become inevitable, and could result in sporadic errors.

Q: Is it possible to safely use any of MapServer in a multi-threaded application?

A: Some of it, yes, with care. Or with Python :) Programmers must either avoid using the unsafe components of MapServer or carefully place locks around them. Python's global interpreter lock immunizes against MapServer threading problems; since no mapscript code ever releases the GIL all mapscript functions or methods are effectively atomic. Users of mapscript and Java, .NET, mod_perl, or mod_php do not have this extra layer of protection.

A: Which components are to be avoided?

Q: Below are lists of unsafe and unprotected components and unsafe but locked components.

Unsafe:

- OGR layers: use unsafe CPL services
- Cartoline rendering: static data
- Imagemap output: static data
- SWF output: static data and use of unsafe msGetBasename()
- SVG output: static data
- WMS/WFS server: static data used for state of dispatcher
- Forcing a temporary file base (an obscure feature): static data
- MyGIS: some static data

Unsafe, but locked:

- Map config file loading: global parser
- Setting class and and layer filter expressions (global parser)
- Class expression evaluation (global parser)
- Setting map and layer projections (PROJ)
- Raster layer rendering and querying (GDAL)
- Database Connections (mappool.c)
- PostGIS support
- Oracle Spatial (use a single environment handle for connection)
- SDE support (global layer cache)
- Error handling (static repository of the error objects)
- WMS/WFS client connections: potential race condition in Curl initialization
- Plugin layers (static repository of the loaded dll-s)

Rather coarse locks are in place for the above. Only a single thread can use the global parser at a time, and only one thread can access GDAL raster data at a time. Performance is exchanged for safety.

21.6 What does STATUS mean in a LAYER?

STATUS ON and STATUS OFF set the default status of the layer. If a map is requested, those layers will be ON/OFF unless otherwise specified via the layers parameter. This is particularly the case when using MapScript and MapServer's built-in template mechanism, but is also useful as a hint when writing your own apps and setting up the initial map view.

STATUS DEFAULT means that the layer is always on, even if not specified in the layers parameter. A layer's status can be changed from DEFAULT to OFF in MapScript, but other than that, it's always on.

CGI turns everything off that is not “STATUS DEFAULT” off so all layers start from the same state (e.g. off) and must be explicitly requested to be drawn or query. That common state made (at least in my mind) implementations easier. I mean, if a layer “lakes” started ON the doing layer=lakes would turn it OFF. So I wanted to remove the ambiguity of a starting state.

21.7 How can I make my maps run faster?

There are a lot of different approaches to improving the performance of your maps, aside from the obvious and expensive step of buying faster hardware. Here are links to some individual howtos for various optimizations.

- [*Tuning your mapfile for performance*](#)
- [*Optimizing the performance of vector data sources*](#)
- [*Optimizing the performance of raster data sources*](#)
- [*Tileindexes for mosaicing and performance*](#)

Some general tips for all cases:

- First and foremost is hardware. An extra GB of RAM will give your map performance increases beyond anything you're likely to achieve by tweaking your data. With the price of RAM these days, it's cheap and easy to speed up every map with one inexpensive upgrade.
- Use the scientific method. Change one thing at a time, and see what effect it had. Try disabling all layers and enabling them one at a time until you discover which layer is being problematic.
- Use [*shp2img*](#) program to time your results. This runs from the command line and draws an image of your entire map. Since it's run from the command line, it is immune to net lag and will give more consistent measurements than your web browser.

21.8 What does Polyline mean in MapServer?

There's confusion over what POLYLINE means in MapServer and via ESRI. In MapServer POLYLINE simply means a linear representation of POLYGON data. With ESRI polyline means multi-line. Old versions of the Shapefile technical description don't even refer to polyline shapefiles, just line. So, ESRI polyline shapefiles are just linework and can only be drawn and labeled as LINE layers. Those shapefiles don't have feature closure enforced as polygon shapefiles do which is why the distinction is so important. I suppose there is a better choice than POLYLINE but I don't know what it would be.

Note: The only difference between POLYLINE and LINE layers is how they are labeled.

21.9 What is MapScript?

MapScript is the scripting interface to MapServer, usually generated by *SWIG* (except in the case of *PHP MapScript*). MapScript allows you to program with MapServer's objects directly instead of interacting with MapServer through its *CGL* and *Mapfile*.

21.10 Does MapServer support reverse geocoding?

No.

Reverse geocoding is an activity where you take a list of street features that you already have and generate postal addresses from them. This kind of spatial functionality is provided by proprietary packages such as the ESRI suite of tools, as well as services such as those provided by GDT. MapServer is for *map rendering*, and it does not provide for advanced spatial operations such as this.

21.11 Does MapServer support geocoding?

No.

Geocoding is an activity where you take a list of addresses and generate lat/lion points for them. This kind of spatial functionality is provided by proprietary packages such as the ESRI suite of tools, as well as services such as those provided by GDT. MapServer is for *map rendering*, and it does not provide for advanced spatial operations such as this.

If you are using MapScript, there is a free geocoder available through XMLRPC and SOAP at <http://geocoder.us>. You could hook your application up to use this service to provide lat/lion pairs for addresses, and then use MapServer to display those points.

21.12 How do I set line width in my maps?

In the current MapServer version, line width is set using the STYLE parameter WIDTH. For a LINE layer, lines can be made red and 3 pixels wide by using the following style in a CLASS.

```
STYLE
  COLOR 255 0 0
  WIDTH 3
END
```

In earlier versions of MapServer , you could set the symbol for the LAYER to 'circle' and then you can set the symbol SIZE to be the width you want. A 'circle' symbol can be defined as

```
SYMBOL
  NAME 'circle'
  TYPE ELLIPSE
  FILLED TRUE
  POINTS 1 1 END
END
```

21.13 Why do my JPEG input images look crappy via MapServer?

You must be using an old version of MapServer (where GD was the default library for rendering).

Newer versions of MapServer use AGG for rendering, and the default output formats is 24 bit colour, so there should not be a problem.

The default output format for MapServer with GD was 8bit pseudo-colored PNG or GIF. Inherently there will be some color degradation in converting a 24bit image (16 million colors) image into 8bit (256 colors).

With GD output, MapServer used quite a simple method to do the transformation, converting pixels to the nearest color in a 175 color colordcube. This would usually result in blotchy color in a fairly smoothly varying image.

For GD, solutions used to be:

- Select 24bit output. This might be as easy as “IMAGETYPE JPEG” in your MAP section.
- Enable dithering (PROCESSING “DITHER=YES”) to produce a better color appearance.
- Preprocess your image to 8bit before using it in MapServer with an external application like the GDAL rgbd2pct.py script.

For more information review the [Raster Data](#).

21.14 Which image format should I use?

Although MapScript can generate the map in any desired image format it is sufficient to only consider the three most prevalent ones: JPEG, PNG, and GIF.

JPEG is an image format that uses a lossy compression algorithm to reduce an image’s file size and is mostly used when loss of detail through compression is either not noticeable or negligible, as in most photos. Maps on the other hand mainly consist of fine lines and areas solidly filled in one colour, which is something JPEG is not known for displaying very well. In addition, maps, unless they include some aerial or satellite imagery, generally only use very few different colours. JPEG with its 24bit colour depth capable of displaying around 16.7 million colours is simple not suitable for this purpose. GIF and PNG however use an indexed colour palette which can be optimized for any number (up to 256) of colours which makes them the perfect solution for icons, logos, charts or maps. The following comparison (generated file sizes only; not file generation duration) will therefore only include these two file formats:

Table 21.1: GIF vs. PNG vs. PNG24 Generated Map File Sizes

	GIF	PNG	PNG24
Vector Data only	59kb	26kb	69kb
Vector Data & Satellite Image coloured	156kb	182kb	573kb
Vector Data & Satellite Image monochrome	142kb	134kb	492kb

(results based on an average 630x396 map with various colours, symbols, labels/annotations etc.)

Although GIF shows a quantitative as well as qualitative advantage over PNG when generating maps that contain full coloured remote sensing imagery, PNG is the clear quantitative winner in terms of generated file sizes for maps with or without additional monochrome imagery and should therefore be the preferred image format. If the mapping application however can also display fullcolour aerial or satellite imagery, the output file format can be changed dynamically to either GIF or even PNG24 to achieve the highest possible image quality.

21.15 Why doesn't PIL (Python Imaging Library) open my PNGs?

PIL does not support interlaced PNGs at this time (no timetable on when it actually will either). To be able to read

PNGs in PIL, they must not be interlaced. Modify your OUTPUTFORMAT with a FORMATOPTION like so:

```
OUTPUTFORMAT
  NAME png
  DRIVER "GD/PNG"
  MIMETYPE "image/png"
  IMAGEMODE RGB
  EXTENSION "png"
  FORMATOPTION "INTERLACE=OFF"
END
```

21.16 Why do my symbols look poor in JPEG output?

When I render my symbols to an 8bit output (PNG, GIF) they look fine, but in 24bit jpeg output they look very blocky and gross.

You must be using an old version of MapServer . This should not be problem with newer versions. The following explains the old (GD) behaviour.

In order to render some classes of symbols properly in 24bit output, such as symbols from true type fonts, it is necessary to force rendering to occur in RGBA. This can be accomplished by including the “TRANSPARENCY ALPHA” line in the layer definition. Don’t use this unnecessarily as there is a performance penalty.

This problem also affects PNG24 output or any RGB output format. 8bit (PC256) or RGBA output types are already ok.

21.17 How do I add a copyright notice on the corner of my map?

You can use an inline feature, with the [FEATURE](#) object, to make a point on your map. Use the TEXT parameter of the FEATURE object for the actual text of the notice, and a [LABEL](#) object to style the notice.

21.17.1 Example Layer

```
LAYER
  NAME "copyright"
  STATUS on
  TYPE point
  TRANSFORM 11 # set the image origin to be lower left
  UNITS PIXELS # sets the units for the feature object
  FEATURE
    POINTS
      60 -10    # the offset (from lower left) in pixels
    END # Points
    TEXT "© xyz company 2006" # this is your displaying text
  END # Feature
  CLASS
    STYLE      # has to have a style
  END # style
    LABEL      # defines the font, colors etc. of the text
      FONT "times"
      TYPE truetype
      SIZE 8
      BUFFER 1
```

```

COLOR 0 0 0
FORCE true
STYLE
  GEOMTRANSFORM 'labelpoly'
  COLOR 255 255 255 # white
END # Style
END # Label
END # Class
END # Layer

```

21.17.2 Result



21.18 How do I have a polygon that has both a fill and an outline with a width?

How do I have a polygon that has both a fill and an outline with a width? Whenever I put both a color (fill) and an outlinecolor with a width on a polygon within a single STYLE, the outline width isn't respected.

For historical reasons, width has two meanings within the context of filling polygons and stroke widths for the outline. If a polygon is filled, then the width defines the width of the symbol *inside* the filled polygon. In this event, the outline width is disregarded, and it is always set to 1. To achieve the effect of *both* a fill and an outline width, you need to use two styles in your class.

```
STYLE # solid fill
  COLOR 255 0 0
END
STYLE # thick outline
  OUTLINECOLOR 0 0 0
  WIDTH 3
END
```

21.19 How can I create simple antialiased line features?

With AGG (used in recent MapServer version), antialiased lines is the default, and can't be turned off.

With GD, the easiest way to produce antialiased lines is to:

- use a 24-bit output image type (IMAGEMODE RGB (or RGBA))
- set TRANSPARENCY ALPHA in the layer using antialiased lines
- set ANTIALIAS TRUE in the STYLE element of the CLASS with antialiased lines

The following mapfile snippets enable antialiased county borders for GD:

```
...
IMAGETYPE "png24"
...
OUTPUTFORMAT
  NAME "png24"
  DRIVER "GD/PNG"
  MIMETYPE "image/png"
  IMAGEMODE RGB
  EXTENSION "png"
END
...
LAYER
  NAME "counties"
  TYPE line
  STATUS default
  DATA "bdry_counln2"
  TRANSPARENCY alpha
  SYMBOLSCALE 5000000
  CLASS
    STYLE
      WIDTH 3
      COLOR 1 1 1
      ANTIALIAS true
    END
  END
END
...
```

Note: The bdry_counln2 shapefile referenced in the counties layer is a line shapefile. A polygon shapefile could be substituted with roughly the same results, though owing to the nature of shapefiles each border would be rendered twice and the resulting output line would likely appear to be slightly thicker. Alternatively, one could use a polygon shapefile, set TYPE to POLYGON, and use OUTLINECOLOR in place of COLOR in the STYLE element.

Note: You can tweak the combination of STYLE->WIDTH and SYMBOLSCALE to modify line widths in your output images.

See Also:

Cartoline symbols can be used to achieve fancier effects.

21.20 Which OGC Specifications does MapServer support?

See: *MapServer OGC Specification support*.

21.21 Why does my requested WMS layer not align correctly?

Requesting a layer from some ArcIMS WMS connectors results in a map with misaligned data (the aspect ratio of the pixels looks wrong).

Some ArcIMS sites are not set up to stretch the returned image to fit the requested envelope by default. This results in a map with data layers that overlay well in the center of the map, but not towards the edges. This can be solved by adding “*reaspect=false*” to the request (by tacking it on to the connection string).

For example, if your mapfile is in a projection other than EPSG:4326, the following layer will not render correctly:

```
LAYER
  NAME "hillshade"
  TYPE RASTER
  STATUS OFF
  TRANSPARENCY 70
  CONNECTIONTYPE WMS
  CONNECTION "http://gisdata.usgs.net:80/servlet19/com.esri.wms.Esrimap/USGS_WMS_NED?"
  PROJECTION
    "init=epsg:4326"
  END
  METADATA
    "wms_srs" "EPSG:4326"
    "wms_title" "US_NED_Shaded_Relief"
    "wms_name" "US_NED_Shaded_Relief"
    "wms_server_version" "1.1.1"
    "wms_format" "image/png"
  END
END
```

Adding “*reaspect=false*” to the connection string solves the problem:

```
LAYER
  NAME "hillshade"
  TYPE RASTER
  STATUS OFF
  TRANSPARENCY 70
  CONNECTIONTYPE WMS
  CONNECTION "http://gisdata.usgs.net:80/servlet19/com.esri.wms.Esrimap/USGS_WMS_NED?reaspect=false"
  PROJECTION
    "init=epsg:4326"
  END
  METADATA
    "wms_srs" "EPSG:4326"
```

```
"wms_title" "US_NED_Shaded_Relief"
"wms_name" "US_NED_Shaded_Relief"
"wms_server_version" "1.1.1"
"wms_format" "image/png"
END
END
```

21.22 When I do a GetCapabilities, why does my browser want to download mapserv.exe/mapserv?

A beginner question here... I'm new to MS and to Apache. I've got MS4W up and running with the Itasca demo. Now I want to enable it as a WMS server. mapserv -v at the command line tells me it supports WMS_SERVER. When I point my browser to it, my browser just wants to download mapserv.exe!

What am I missing?

Here is the URL I'm using to issue a GetCapabilities WMS request: <http://localhost/cgi-bin/mapserv.exe?map=..%2fhtdocs%2fitasca%2fdemo.map&SERVICE=WMS&VERSION=1.1.1&REQUEST=GetCapabilities>

The OGC:WMS 1.1.0 and 1.1.1 specifications (which are both supported by MapServer) state that, for GetCapabilities responses, the OGC:WMS server returns a specific MIME type (i.e. application/vnd.ogc.xml (see subclause 6.5.3 of [OGC:WMS 1.1.1](#)).

A MIME type is passed from the web server to the client (in your case, a web browser), from which a client can decide how to process it.

Example 1: if using a web browser, if a web server returns an HTTP Header of “Content-type:image/png”, then the web browser will know that this is a PNG image and display it accordingly.

Example 2: if using a web browser, if a web server returns an HTTP Header of “Content-type:text/html”, then the web browser will know that this is an HTML page and display it accordingly (i.e. tables, divs, etc.)

Basically, what is happening is that the OGC:WMS is returning, in the headers of the HTTP response, a MIME type which your web browser does not understand, which usually prompts a dialog box on whether to open or download the content (i.e. Content-type:application/vnd.ogc.wms_xml).

You could configure your web browser to handle the application/vnd.ogc.wms_xml MIME type a certain way (i.e. open in Notepad, etc.).

21.23 Why do my WMS GetMap requests return exception using MapServer 5.0?

Before upgrading to MapServer 5.0, I was able to do quick GetMap tests in the form of: <http://wms.example.com/wms?service=WMS&version=1.1.1&request=GetMap&layers=foo>

Now when I try the same test, MapServer WMS returns an XML document saying something about missing required parameters. What's going on here?

This was a major change for WMS Server support in MapServer 5.0. MapServer WMS Server GetMap requests now require the following additional parameters:

- srs
- bbox
- width

- height
- format
- styles

Note: These parameters were always required in all versions of the WMS specification, but MapServer previously had not required them in a client request (even though most OGC WMS clients would issue them anyway to be consistent with the WMS spec).

The request below now constitutes a valid GetMap request:

```
http://wms.example.com/wms?service=WMS&version=1.1.1&request=GetMap&layers=foo&srs=EPSG:4326&bbox=-180
```

Which is consistent with the WMS specification.

More information on these parameters can be found in the [WMS Server](#) and the [OGC WMS 1.1.1](#) specification

For more detailed information, see [ticket 1088](#)

Warning: STYLES, though a required WMS parameter, is now optional again in MapServer. For more detailed information, see [ticket 2427](#)

21.24 Using MapServer 6.0, why don't my layers show up in GetCapabilities responses or are not found anymore?

MapServer 6.0 introduces the option of hiding layers against OGC Web Service requests. OGC Web Services can provide powerful access to your geospatial data. It was decided to disable layer level request access as a default. See [MS RFC 67: Enable/Disable Layers in OGC Web Services](#) provides a full explanation of the changes and implications.

To enable pre-6.0 behaviour, you can add the following to the [WEB](#) object's METADATA section in your mapfile:

```
"ows_enable_request" "*"
```

This will enable access of all layers to all OGC Web Service requests.

21.25 Where do I find my EPSG code?

There is a text file "epsg" in your PROJ4 installation (e.g. "/usr/local/share/proj/epsg") which contain the EPSG information used by PROJ4. In Windows, this is often located in C:\proj\nad or is found with an environment variable called PROJ_LIB.

<http://spatialreference.org> allows you to search for EPSG codes.

You can also have a look at: <http://ocean.csl.co.uk>

More information to EPSG: <http://www.epsg.org>

More information to PROJ4: <http://trac.osgeo.org/proj>

21.26 How can I reproject my data using ogr2ogr?

With ogr2ogr of course! ogr2ogr is a powerful utility that will transform the projections of your shapefiles when passed the appropriate parameters. In my case, I was using MapServer to serve data in RI State Plane Feet. In order to do so, the data had to first be converted to meters. Here is the command I used:

```
ogr2ogr -t_srs EPSG:32130 output.shp input.shp
```

Since my data already had a projection defined, I did not need to explicitly state a source projection. This command uses the EPSG definition for NAD83 Rhode Island (32130) and performs the feet to meters conversion.

Now say my data wasn't already projected? Here's how we deal with that:

```
ogr2ogr -s_srs "+proj=tmerc +lat_0=41.0833333333334 +lon_0=-71.5 +k=0.999994 +x_0=100000 +y_0=0 +ellps=GRS80"
```

Let's examine what is going on here:

The -s_srs parameter explicitly defines a projection for the data. The parameters used here were taken out of the EPSG definition (in this case, 32130) in the epsg file(see the projection FAQ for more details on locating EPSG definitions). The entry for RI in the epsg file is as follows:

```
# NAD83 / Rhode Island
<32130> +proj=tmerc +lat_0=41.0833333333334 +lon_0=-71.5 +k=0.999994 +x_0=100000 +y_0=0 +ellps=GRS80
```

You can see how the definition in the initial command is formulated. Notice that the “+units=m” parameter has been changed to “+to_meter=0.3408”. This is important for the conversion. Where did the value of 0.3408 come from you ask? From the EPSG file! It has many goodies buried in it so by simply running ‘grep “to_meter” epsg’ you can refresh your memory if you need to.

The next parameter in the command is “-t_srs EPSG:32130”. This command tells ogr2ogr to transform the data to the EPSG code of 32130. After this is declared, all you need to do is declare a file name for your new shape file and to set which file is being used as the input (note: make sure you don't confuse the order of these two).

Hit enter, bombs away, and enjoy your new data in meters!

21.27 How can I help improve the documentation on this site?

New documentation material and corrections to existing documentation are definitely very welcome. These contributions are handled through the same issue tracker used to track software bugs and enhancements.

Follow the directions for submitting bugs at: <http://www.mapserver.org/development/bugs.html>. When creating a ticket, in the Component field, select *MapServer Documentation*. If our ticket pertains to a specific web page, please include the URL to that page.

If you have tips or examples that don't really fit the definition of documentation, a good place to put them is the MapServer wiki at: <https://github.com/mapserver/mapserver/wiki>

21.28 What's with MapServer's logo?

The MapServer logo illustrates the confluence of the [Minnesota](#) and [Mississippi](#) rivers, quite near to the home of the [St. Paul Campus](#) of the [University of Minnesota](#), which was the [birthplace of MapServer](#).

License

Copyright (c) 1996-2008 Regents of the University of Minnesota.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “Software”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies of this Software or works derived from this Software.

THE SOFTWARE IS PROVIDED “AS IS”, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Credits

Major funding for the development of MapServer has been provided by NASA through cooperative agreements with the University of Minnesota, Department of Forest Resources. Additional enhancements have been made by the State of Minnesota, Department of Natural Resources and the Land Management Information Center. We would like to acknowledge other major contributions as well:

- MapServer and MapScript have been developed by Stephen Lime.
- Raster access module developed by Pete Olson and Stephen Lime.
- PHP/MapScript module was developed by [DM Solutions](#) and is maintained by [MapGears](#).
- Portions copyright (c) 1998 State of Minnesota, Land Management Information Center.
- Ongoing maintenance and support frequently provided by the US Army Corps of Engineers
- Several version 6.2 features funded through Météo-France

Bibliography

[FW1] Frank Warmerdam on the mapserver-dev:

Message-ID: <smptd.490f.4303f2ee.d8246.1@mtaout-c.tc.umn.edu>
Date: Wed, 17 Aug 2005 22:31:09 -0400
Subject: Re: MapServer Plug-in Infrastructure: RFC and PATCH

Index

Symbols

- .NET
 - Compilation, MapScript, 55
- 24bit
 - Raster, 421
- 8bit
 - Raster, 426
- A**
 - AGG, 1009
 - Aggregate functions
 - Cluster, 122
 - ALIGN
 - LABEL, 150
 - SCALEBAR, 177
 - ANCHORPOINT
 - SYMBOL, 185
 - and
 - Expressions, 132
 - ANGLE
 - LABEL, 150
 - MAP, 168
 - STYLE, 178
 - angle
 - WMS Vendor specific parameters, 511
 - annotation
 - LAYER TYPE, 162
 - ANTIALIAS
 - LABEL, 150
 - STYLE, 179
 - SYMBOL, 185
 - Apache
 - MS_MAPFILE, 497
 - ReWriteRule, 497
 - SetEnvIf, 498
 - Apache variables, 679
 - API
- MapScript, 210
- area
 - Expressions, 136
- Area symbols, 92
- Arithmetic expressions
 - Expressions, 133
- Arithmetic operations
 - Expressions, 135
- ASP script
 - IIS, 498
- Assymetrical line styling, 92
- Attributes
 - Expressions, 129
- AUTO
 - LAYER STYLEITEM, 161
- Axis order
 - Map projections, 499
- B**
 - BACKGROUNDCOLOR
 - CLASS, 118
 - SCALEBAR, 177
 - STYLE, 179
 - BANDS
 - LAYER PROCESSING, 421
 - Batch scripting, 670
 - bbox
 - STYLE GEOMTRANSFORM, 180
 - bevel
 - STYLE LINEJOIN, 181
 - beyond
 - Expressions, 134
 - bitmap
 - LABEL TYPE, 154
 - BLOCKXSIZE
 - OUTPUTFORMAT FORMATOPTION, 174
 - BLOCKYSIZE
 - OUTPUTFORMAT FORMATOPTION, 174

blue, 417
 Raster query, 424
Boolean values
 MapScript Variables, 295
browse
 CGI mode, 676
BROWSEFORMAT
 WEB, 205
BUFFER
 CLUSTER, 121
 LABEL, 151
buffer
 CGI, 675
 Expressions, 136
 STYLE GEOMTRANSFORM, 180
Build
 MapScript PHP, 51
butt
 STYLE LINECAP, 181
BYTE
 OUTPUTFORMAT IMAGEMODE, 174

C

Cartographical symbols, 73
cartoline
 SYMBOL TYPE, 186
Cascading requests
 WMS, 511
centroid
 STYLE GEOMTRANSFORM, 180
CGI, 61, 1009
 buffer, 675
 classgroup, 675
 context, 675
 icon, 675
 id, 676
 img, 676
 imgbox, 676
 imgext, 676
 imgshape, 676
 imgsize, 676
 imgxy, 676
 layer, 676
 layers, 676
 map, 676
 mapext, 676
 mapshape, 676
 mapsize, 676
 mapxy, 676
 maxx, 676
 maxy, 676
 minx, 676
 miny, 676
 mode, 676

mode browse, 676
mode coordinate, 677
mode featurenquery, 677
mode featurequery, 677
mode indexquery, 677
mode itemfeaturenquery, 677
mode itemfeaturequery, 677
mode itemnquery, 677
mode itemquery, 677
mode legend, 677
mode legendicon, 677
mode map, 677
mode nquery, 677
mode query, 677
mode reference, 677
mode scalebar, 677
mode zoomin, 677
mode zoomout, 677
qformat, 677
qitem, 677
qlayer, 677
qstring, 677
queryfile, 677
ref, 678
refxy, 678
savequery, 678
scaledenom, 678
searchmap, 678
shapeindex, 678
slayer, 678
tileindex, 678
zoom, 678
zoomdir, 678
zoomsize, 678
CGI_CONTEXT_URL
 MAP CONFIG, 168
Change
 URL, 497
Change map file parameters, 678
CHARACTER
 SYMBOL, 185
Character encoding, 129
chart
 LAYER TYPE, 162
circle
 LAYER TYPE, 162
CLASS, 118
 BACKGROUNDCOLOR, 118
 COLOR, 118
 DEBUG, 118
 EXPRESSION, 118
 GROUP, 119
 KEYIMAGE, 119
 LABEL, 119

LAYER, 155
 MAXSCALEDENOM, 119
 MAXSIZE, 119
 MINSCALEDENOM, 119
 MINSIZE, 119
 NAME, 119
 OUTLINECOLOR, 119
 SIZE, 120
 STATUS, 120
 STYLE, 120
 SYMBOL, 120
 TEMPLATE, 120
 TEXT, 120
 VALIDATION, 120
 class
 Raster query, 424
 Classes
 MapScript, 213
 MapScript PHP, 251
 MapScript Python, 285
 CLASSGROUP
 LAYER, 155
 classgroup
 CGI, 675
 CLASSITEM
 EXPRESSION, 130
 LAYER, 155
 classObj
 MapScript, 213
 MapScript PHP, 251
 Cloning
 MapScript Layer, 290
 MapScript Mapfile, 290
 CLOSE_CONNECTION
 LAYER PROCESSING, 159, 367
 CLUSTER, 120
 BUFFER, 121
 FILTER, 121
 GROUP, 121
 LAYER, 155
 MAXDISTANCE, 121
 REGION, 121
 Cluster, 120
 Aggregate functions, 122
 Feature attributes, 121, 163
 FeatureCount, 122
 Group, 122
 CLUSTER_GET_ALL_SHAPES
 LAYER PROCESSING, 121
 clusterObj
 MapScript PHP, 253
 COLOR
 CLASS, 118
 LABEL, 151
 QUERYMAP, 176
 REFERENCE, 177
 SCALEBAR, 177
 STYLE, 179
 COLOR_MATCH_THRESHOLD
 LAYER PROCESSING, 422
 colorObj
 MapScript, 215
 MapScript PHP, 253
 Combining symbols, 80
 Comments, 208
 commify
 Expressions, 135
 Compilation
 MapScript .NET, 55
 Win32, 42
 COMPRESS
 OUTPUTFORMAT FORMATOPTION, 174
 COMPRESSION
 OUTPUTFORMAT FORMATOPTION, 173
 CONFIG
 CGI_CONTEXT_URL, MAP, 168
 MAP, 168
 MS_ENCRYPTION_KEY, MAP, 168
 MS_ERRORFILE, MAP, 168
 MS_NONSQUARE, MAP, 168
 ON_MISSING_DATA, MAP, 168
 PROJ_LIB, MAP, 169
 CONNECTION
 JOIN, 145
 LAYER, 155
 Connection types
 MapScript Variables, 298
 CONNECTIONTYPE
 csv, JOIN, 145
 JOIN, 145
 LAYER, 155
 local, LAYER, 155
 mysql, JOIN, 145
 ogr, LAYER, 155
 oraclespatial, LAYER, 155
 plugin, LAYER, 155
 postgis, LAYER, 155
 postgresql, JOIN, 145
 sde, LAYER, 155
 union, LAYER, 155
 uvraster, LAYER, 155
 wfs, LAYER, 155
 wms, LAYER, 155
 Constants
 MapScript PHP, 250
 contains
 Expressions, 134
 context

CGI, 675
coordinate
 CGI mode, 677
CP1252
 ENCODING, 127
CPL_DEBUG
 Debugging, 638
crosses
 Expressions, 134
csv
 JOIN CONNECTIONTYPE, 145
CURL_CA_BUNDLE
 Environment variables, 1005

D

DATA
 LAYER, 155
Databases
 Optimization, 656
DATAPATTERN
 MAP, 169
DB connection types
 MapScript Variables, 298
dd
 LAYER UNITS, 162
 MAP UNITS, 171
DEBUG
 CLASS, 118
 LAYER, 156
 MAP, 169
Debug levels
 Debugging, 637
Debugging, 635
 CPL_DEBUG, 638
 Debug levels, 637
 GDB, 643
 MS_DEBUGLEVEL, 637
 MS_ERRORFILE, 636
 ON_MISSING_DATA, 640
 PHP Mapscript, 643
 PROJ_DEBUG, 638
 shp2img, 638
DEFRESOLUTIONx
 MAP, 170
difference
 Expressions, 136
Dimension requests
 WMS Server, 531
disjoint
 Expressions, 134
DITHER
 LAYER PROCESSING, 422
Download
 MapScript PHP, 50

drawEPP(): EPPL7 support is not available
 Error, 1013

DRIVER
 OUTPUTFORMAT, 173

DUMP
 LAYER, 157

dwithin
 Expressions, 134

E

Element support
 SLD, 564

ellipse
 SYMBOL TYPE, 186

Ellipse symbols, 74

EMPTY
 WEB, 205

ENCODING
 CP1252, 127
 EUC-JP, 127
 ISO-8859-1, 127
 ISO-8859-2, 127
 LABEL, 125, 151
 Shift-JIS, 127
 TIS-620, 127
 UTF-8, 127

Encrypting, 657
Encryption key, 657

end
 STYLE GEOMTRANSFORM, 180

Environment variable
 MS_TEMPPATH, 206

Environment variables, 1003
 CURL_CA_BUNDLE, 1005
 MS_DEBUGLEVEL, 1005
 MS_ENCRYPTION_KEY, 1005
 MS_ERRORFILE, 1005
 MS_MAP_NO_PATH, 1006
 MS_MAP_PATTERN, 1006
 MS_MAPFILE, 1006
 MS_MAPFILE_PATTERN, 1006
 MS_MODE, 1007
 MS_OPENLAYERS_JS_URL, 1007
 MS_TEMPPATH, 1007
 MS_XMLMAPFILE_XSLT, 1007
 PROJ_LIB, 1007

EPSG, 1009

eq
 Expressions, 132–134, 136

Erdas, 419

ERROR
 WEB, 205

Error
 drawEPP(): EPPL7 support is not available, 1013

loadLayer(): Unknown identifier. Maximum number of classes reached, 1013
 loadMapInternal(): Given map extent is invalid, 1014
 msGetLabelSize(): Requested font not found, 1015
 msLoadFontset(): Error opening fontset, 1015
 msLoadMap(): Failed to open map file, 1015
 msProcessProjection(): no options found in 'init' file, 1015
 msProcessProjection(): No such file or directory, 1015
 msProcessProjection(): Projection library error.major axis or radius = 0 not given, 1016
 msQueryByPoint: search returned no results, 1017
 msReturnPage(): Web application error. Malformed template name, 1017
 msSaveImageGD(): Unable to access file, 1018
 msWMSLoadGetMapParams(): WMS server error, 1018
 Unable to load dll, 1018
 Error return codes
 MapScript Variables, 299
 errorObj
 MapScript, 216
 MapScript PHP, 254
 Errors, 1011
 EUC-JP
 ENCODING, 127
 Exception handling
 MapScript Python, 286
 EXPRESSION
 CLASS, 118
 CLASSITEM, 130
 LABEL, 151
 expression
 STYLE GEOMTRANSFORM, 180
 Expression types, 130
 Expressions, 128
 and, 132
 area, 136
 Arithmetic expressions, 133
 Arithmetic operations, 135
 Attributes, 129
 beyond, 134
 buffer, 136
 commify, 135
 contains, 134
 crosses, 134
 difference, 136
 disjoint, 134
 dwithin, 134
 eq, 132–134, 136
 fromtext, 136
 ge, 133, 137
 gt, 133, 137
 in, 133
 intersects, 134
 le, 133, 137
 length, 135
 Logical expressions, 132
 lt, 132, 137
 MapServer expressions, 132
 ne, 132, 137
 not, 132
 or, 132
 overlaps, 134
 Regular expression comparison, 130
 round, 135
 Spatial expressions, 134
 Spatial functions, 136
 String comparison, 130
 String expressions, 132
 String functions, 135
 String operations, 134
 Temporal expressions, 136
 tostring, 135
 touches, 134
 within, 134
 EXTENSION
 OUTPUTFORMAT, 173
 EXTENT
 LAYER, 157
 MAP, 170
 REFERENCE, 177
 EXTENT_PRIORITY
 LAYER PROCESSING, 422
 External overviews
 Raster, 427
F
 FastCGI, 646
 FEATURE, 137
 ITEMS, 137
 LAYER, 157
 OUTPUTFORMAT IMAGEMODE, 175
 POINTS, 137
 TEXT, 137
 WKT, 137
 Feature attributes
 Cluster, 121, 163
 FeatureCount
 Cluster, 122
 featureenquiry
 CGI mode, 677
 featurequery
 CGI mode, 677
 feet
 LAYER SIZEUNITS, 160

LAYER UNITS, 162
MAP UNITS, 171
SCALEBAR UNITS, 178
File format
 FONTSET, 138
File management, 671
File paths, 208, 671
File placement, 671
File types
 MapScript Variables, 297
FILLED
 SYMBOL, 185
FILTER
 CLUSTER, 121
 LAYER, 157
 Run-time substitution, 681
Filter Encoding, 1009
Filter encoding
 Limitations, WFS, 558
 OGC conformance tests, WFS, 560
 Supported features, WFS, 554
 Units of measure, WFS, 555
 WFS, 553
FILTERITEM
 LAYER, 157
FLOAT32
 OUTPUTFORMAT IMAGEMODE, 174
FONT
 LABEL, 151
 SYMBOL, 185
Font types
 MapScript Variables, 296
Fonts
 Optimization, 651
FONTSET, 138
 File format, 138
fontsetObj
 MapScript, 216
FOOTER
 JOIN, 145
 LAYER, 157
 WEB, 205
FORCE
 LABEL, 151
FORMATOPTION
 BLOCKXSIZE, OUTPUTFORMAT, 174
 BLOCKYSIZE, OUTPUTFORMAT, 174
 COMPRESS, OUTPUTFORMAT, 174
 COMPRESSION, OUTPUTFORMAT, 173
 GAMMA, OUTPUTFORMAT, 173, 174
 GEO_ENCODING, OUTPUTFORMAT, 174
 INTERLACE, OUTPUTFORMAT, 174
 INTERLEAVE, OUTPUTFORMAT, 174
 METADATA_ITEM, OUTPUTFORMAT, 174
 NULLVALUE, OUTPUTFORMAT, 174
 OUTPUTFORMAT, 173
 PALETTE, OUTPUTFORMAT, 173
 PALETTE_FORCE, OUTPUTFORMAT, 173
 QUALITY, OUTPUTFORMAT, 173
 QUANTIZE_COLORS, OUTPUTFORMAT, 173
 QUANTIZE_FORCE, OUTPUTFORMAT, 173
 TILED, OUTPUTFORMAT, 174
FreeType, 1009
FROM
 JOIN, 145
fromtext
 Expressions, 136
Functions
 MapScript, 212
 MapScript PHP, 251

G

GAMMA
 OUTPUTFORMAT FORMATOPTION, 173, 174
GAP, 81
 STYLE, 179
GD, 1009
GDAL, 1009
gdaltindex, 654
GDB
 Debugging, 643
ge
 Expressions, 133, 137
GEO_ENCODING
 OUTPUTFORMAT FORMATOPTION, 174
Geographical reference systems, 175
GEOMTRANSFORM
 bbox, STYLE, 180
 buffer, STYLE, 180
 centroid, STYLE, 180
 end, STYLE, 180
 expression, STYLE, 180
 labelpnt, STYLE, 180
 labelpoly, STYLE, 180
 start, STYLE, 180
 STYLE, 180
 vertices, STYLE, 180
Georeferencing
 Raster, 427
GEOS, 1009
Geospatial
 PDF, 174
GeoTIFF, 419
GetLegendGraphic
 WMS, 496
GetMap
 WMS, 495
GETSHAPE_STYLE_ITEMS

LAYER PROCESSING, 160
GIF, 419
GML, 1009
 WFS Server, 542
gml_constants
 WFS METADATA, 547
gml_exclude_items
 WFS METADATA, 548
 WMS METADATA, 505
gml_featureid
 WFS METADATA, 548
gml_geometries
 WFS METADATA, 548
 WMS METADATA, 505
gml_groups
 WFS METADATA, 548
 WMS METADATA, 505
gml_include_items
 WFS METADATA, 548
 WMS METADATA, 505
gml_types
 WFS METADATA, 549
gml_xml_items
 WFS METADATA, 549
 WMS METADATA, 506
gml_[geometry name]_occurrences
 WFS METADATA, 548
gml_[geometry name]_type
 WFS METADATA, 548
 WMS METADATA, 506
gml_[group name]_group
 WFS METADATA, 548
 WMS METADATA, 505
gml_[item name]_alias
 WFS METADATA, 548
 WMS METADATA, 506
gml_[item name]_precision
 WFS METADATA, 549
gml_[item name]_type
 WFS METADATA, 549
 WMS METADATA, 506
gml_[item name]_value
 WFS METADATA, 549
gml_[item name]_width
 WFS METADATA, 549
GPX, 1009
green, 417
 Raster query, 424
GRID, 139
 LABELFORMAT, 139
 LAYER, 157
 MAXARCS, 139
 MAXINTERVAL, 139
 MAXSUBDIVIDE, 139
 MINARCS, 139
 MININTERVAL, 139
 MINSUBDIVIDE, 139
gridObj
 MapScript PHP, 255
GRIDSTEP
 LEADER, 163
GROUP
 CLASS, 119
 CLUSTER, 121
 LAYER, 157
Group
 Cluster, 122
gt
 Expressions, 133, 137

H

hashTableObj
 MapScript, 216
 MapScript PHP, 255
hatch
 SYMBOL TYPE, 186
Hatch polygon fill, 93
HEADER
 JOIN, 145
 LAYER, 157
 WEB, 205
https connections, 606

I

icon
 CGI, 675
id
 CGI, 676
IIS, 61
 ASP script, 498
IMAGE
 REFERENCE, 177
 SYMBOL, 185
Image formats
 Optimization, 652
Image modes
 MapScript Variables, 299
Image types
 MapScript Variables, 298
IMAGECOLOR
 LEGEND, 167
 MAP, 170
 SCALEBAR, 177
IMAGEMODE
 BYTE, OUTPUTFORMAT, 174
 FEATURE, OUTPUTFORMAT, 175
 FLOAT32, OUTPUTFORMAT, 174
 INT16, OUTPUTFORMAT, 174

OUTPUTFORMAT, 174
PC256, OUTPUTFORMAT, 174
RGB, OUTPUTFORMAT, 174
RGBA, OUTPUTFORMAT, 174
imageObj
 MapScript, 217
 MapScript PHP, 256
 MapScript Python, 285
IMAGEPATH
 WEB, 205
IMAGETYPE
 jpeg, MAP, 170
 MAP, 170
 pdf, MAP, 170
 png, MAP, 170
 svg, MAP, 170
IMAGEURL
 WEB, 205
img
 CGI, 676
imgbox
 CGI, 676
imgext
 CGI, 676
imgshape
 CGI, 676
imgsize
 CGI, 676
imgxy
 CGI, 676
in
 Expressions, 133
inches
 LAYER SIZEUNITS, 160
 LAYER UNITS, 162
 MAP UNITS, 171
 SCALEBAR UNITS, 178
INCLUDE
 MAP, 143
Include, 143
indexquery
 CGI mode, 677
INITIALGAP
 STYLE, 180
INSPIRE, 514
INSPIRE View Service, 514
Installation, 31
 MapScript PHP, 51
 Oracle, 63
 Unix, 33
 Win32, 42
INT16
 OUTPUTFORMAT IMAGEMODE, 174
intarray
MapScript, 218
INTERLACE
 OUTPUTFORMAT FORMATOPTION, 174
INTERLEAVE
 OUTPUTFORMAT FORMATOPTION, 174
Internal overviews
 Raster, 426
International characters, 124
intersects
 Expressions, 134
INTERVALS
 SCALEBAR, 177
Introduction
 MapScript, 209
ISO-8859-1
 ENCODING, 127
ISO-8859-2
 ENCODING, 127
itemfeaturequery
 CGI mode, 677
itemfeaturequery
 CGI mode, 677
itemnquery
 CGI mode, 677
itemquery
 CGI mode, 677
ITEMS
 FEATURE, 137
 LAYER PROCESSING, 159
J
JOIN, 144
 CONNECTION, 145
 CONNECTIONTYPE, 145
 CONNECTIONTYPE csv, 145
 CONNECTIONTYPE mysql, 145
 CONNECTIONTYPE postgresql, 145
 FOOTER, 145
 FROM, 145
 HEADER, 145
 LAYER, 145, 157
 NAME, 145
 Supported formats, 145
 TABLE, 145
 TEMPLATE, 145
 TO, 145
 TYPE, 145
Join types
 MapScript Variables, 298
JPEG, 419
jpeg
 MAP IMAGETYPE, 170

K

KEYIMAGE
 CLASS, 119
KEYSIZE
 LEGEND, 167
KEYSPACING
 LEGEND, 167
kilometers
 LAYER SIZEUNITS, 160
 LAYER UNITS, 162
 MAP UNITS, 171
 SCALEBAR UNITS, 178

L

LABEL, 150
 ALIGN, 150
 ANGLE, 150
 ANTIALIAS, 150
 BUFFER, 151
 CLASS, 119
 COLOR, 151
 ENCODING, 125, 151
 EXPRESSION, 151
 FONT, 151
 FORCE, 151
 LEGEND, 167
 MAXLENGTH, 151
 MAXOVERLAPANGLE, 152
 MAXSCALEDENOM, 152
 MAXSIZE, 152
 MINDISTANCE, 152
 MINFEATURESIZE, 152
 MINSCALEDENOM, 152
 MINSIZE, 152
 OFFSET, 152
 OUTLINECOLOR, 153
 OUTLINEWIDTH, 153
 PARTIALS, 153
 POSITION, 153
 PRIORITY, 153
 REPEATDISTANCE, 153
 SCALEBAR, 177
 SHADOWCOLOR, 153
 SHADOWSIZE, 153
 SIZE, 154
 STYLE, 154
 TEXT, 154
 TYPE, 154
 TYPE bitmap, 154
 TYPE truetype, 154
 WRAP, 155
Label positions
 MapScript Variables, 296
Label size

MapScript Variables, 296
LABEL_NO_CLIP
 LAYER PROCESSING, 159
LABELCACHE
 LAYER, 157
labelcache_map_edge_buffer
 WEB METADATA, 206
labelCacheMemberObj
 MapScript, 218
labelcacheMemberObj
 MapScript PHP, 256
labelCacheObj
 MapScript, 219
labelcacheObj
 MapScript PHP, 257
LABELFORMAT
 GRID, 139
LABELITEM
 LAYER, 157
LABELMAXSCALEDENOM
 LAYER, 157
LABELMINSCALEDENOM
 LAYER, 157
labelObj
 MapScript, 219
 MapScript PHP, 257
labelpnt
 STYLE GEOMTRANSFORM, 180
labelpoly
 STYLE GEOMTRANSFORM, 180
LABELREQUIRES
 LAYER, 158
LAYER, 155
 CLASS, 155
 CLASSGROUP, 155
 CLASSITEM, 155
 CLUSTER, 155
 CONNECTION, 155
 CONNECTIONTYPE, 155
 CONNECTIONTYPE local, 155
 CONNECTIONTYPE ogr, 155
 CONNECTIONTYPE oraclespatial, 155
 CONNECTIONTYPE plugin, 155
 CONNECTIONTYPE postgis, 155
 CONNECTIONTYPE sde, 155
 CONNECTIONTYPE union, 155
 CONNECTIONTYPE uvraster, 155
 CONNECTIONTYPE wfs, 155
 CONNECTIONTYPE wms, 155
 DATA, 155
 DEBUG, 156
 DUMP, 157
 EXTENT, 157
 FEATURE, 157

FILTER, 157
FILTERITEM, 157
FOOTER, 157
GRID, 157
GROUP, 157
HEADER, 157
JOIN, 145, 157
LABELCACHE, 157
LABELITEM, 157
LABELMAXSCALEDENOM, 157
LABELMINSCALEDENOM, 157
LABELREQUIRES, 158
MAP, 170
MASK, 158
MAXFEATURES, 158
MAXGEOWIDTH, 158
MAXSCALEDENOM, 158
METADATA, 158
METADATA, SOS, 602
METADATA, WCS, 586
METADATA, WFS, 547
METADATA, WFS Client, 551
METADATA, WMS, 505
METADATA, WMS Client, 522
MINGEOWIDTH, 158
MINSCALEDENOM, 159
NAME, 159
OFFSITE, 159
OPACITY, 159
PLUGIN, 159
POSTLABELCACHE, 159
PROCESSING, 159
PROCESSING BANDS, 421
PROCESSING CLOSE_CONNECTION, 159, 367
PROCESSING CLUSTER_GET_ALL_SHAPES,
 121
PROCESSING COLOR_MATCH_THRESHOLD,
 422
PROCESSING DITHER, 422
PROCESSING EXTENT_PRIORITY, 422
PROCESSING GETSHAPE_STYLE_ITEMS, 160
PROCESSING ITEMS, 159
PROCESSING LABEL_NO_CLIP, 159
PROCESSING LOAD_FULL_RES_IMAGE, 422
PROCESSING LOAD_WHOLE_IMAGE, 422
PROCESSING LUT[_n], 422
PROCESSING MSSQL_READ_WKB, 367
PROCESSING OVERSAMPLE_RATIO, 423
PROCESSING POLYLINE_NO_CLIP, 160
PROCESSING raster options, 160
PROCESSING RESAMPLE, 423
PROCESSING SCALE, 423
PROCESSING WORLDFILE, 423
PROJECTION, 160
REQUIRES, 160
SIZEUNITS, 160
SIZEUNITS feet, 160
SIZEUNITS inches, 160
SIZEUNITS kilometers, 160
SIZEUNITS meters, 160
SIZEUNITS miles, 160
SIZEUNITS nauticalmiles, 160
SIZEUNITS pixels, 160
STATUS, 160
STYLEITEM, 160
STYLEITEM AUTO, 161
SYMBOLSCALEDENOM, 161
TEMPLATE, 161
TILEINDEX, 161
TILEITEM, 161
TOLERANCE, 161
TOLERANCEUNITS, 161
TRANSFORM, 161
TYPE, 162
TYPE annotation, 162
TYPE chart, 162
TYPE circle, 162
TYPE line, 162
TYPE point, 162
TYPE polygon, 162
TYPE query, 162
TYPE raster, 162
UNITS, 162
UNITS dd, 162
UNITS feet, 162
UNITS inches, 162
UNITS kilometers, 162
UNITS meters, 162
UNITS miles, 162
UNITS nauticalmiles, 162
UNITS percentages, 162
UNITS pixels, 162
VALIDATION, 162

Layer
 Cloning, MapScript, 290
layer
 CGI, 676
Layer types
 MapScript Variables, 296
layerObj
 MapScript, 221
 MapScript PHP, 259
Layers
 Optimization, 650
layers
 CGI, 676
le
 Expressions, 133, 137

LEADER, 162
 GRIDSTEP, 163
 MAXDISTANCE, 163
 Leader, 162
 LEGEND, 167
 IMAGECOLOR, 167
 KEYSIZE, 167
 KEYSPACING, 167
 LABEL, 167
 MAP, 170
 OUTLINECOLOR, 167
 POSITION, 167
 POSTLABELCACHE, 167
 STATUS, 167
 TEMPLATE, 167
 TRANSPARENT, 168
 legend
 CGI mode, 677
 Utility, 657
 LEGENDFORMAT
 WEB, 205
 legendicon
 CGI mode, 677
 legendObj
 MapScript, 227
 MapScript PHP, 263
 length
 Expressions, 135
 libexslt, 207
 libiconv, 125
 libxslt, 207
 Limitations
 WFS Filter encoding, 558
 Limiters
 MapScript Variables, 299
 line
 LAYER TYPE, 162
 Line join types
 MapScript Variables, 298
 Line symbol overlay, 81
 Line symbols, 81
 LINECAP
 butt, STYLE, 181
 round, STYLE, 181
 square, STYLE, 181
 STYLE, 89, 181
 LINEJOIN
 bevel, STYLE, 181
 miter, STYLE, 181
 round, STYLE, 181
 STYLE, 89, 181
 LINEJOINMAXSIZE
 STYLE, 89, 181
 lineObj

MapScript, 228
 MapScript PHP, 264
 LOAD_FULL_RES_IMAGE
 LAYER PROCESSING, 422
 LOAD_WHOLE_IMAGE
 LAYER PROCESSING, 422
 loadLayer(): Unknown identifier. Maximum number of classes reached
 Error, 1013
 loadMapInternal(): Given map extent is invalid
 Error, 1014
 local
 LAYER CONNECTIONTYPE, 155
 Logical expressions
 Expressions, 132
 lt
 Expressions, 132, 137
 LUT[_n]
 LAYER PROCESSING, 422

M

MAP, 168
 ANGLE, 168
 CONFIG, 168
 CONFIG CGI_CONTEXT_URL, 168
 CONFIG MS_ENCRYPTION_KEY, 168
 CONFIG MS_ERRORFILE, 168
 CONFIG MS_NONSQUARE, 168
 CONFIG ON_MISSING_DATA, 168
 CONFIG PROJ_LIB, 169
 DATAPATTERN, 169
 DEBUG, 169
 DEFRESOLUTIONx, 170
 EXTENT, 170
 IMAGECOLOR, 170
 IMAGETYPE, 170
 IMAGETYPE jpeg, 170
 IMAGETYPE pdf, 170
 IMAGETYPE png, 170
 IMAGETYPE svg, 170
 INCLUDE, 143
 LAYER, 170
 LEGEND, 170
 MAXSIZE, 170
 NAME, 170
 PROJECTION, 170
 QUERYMAP, 170
 REFERENCE, 170
 RESOLUTION, 171
 SCALEBAR, 171
 SCALEDENOM, 171
 SHAPEPATH, 171
 SIZE, 171
 STATUS, 171

SYMBOLSET, 171
TEMPLATEPATTERN, 171
UNITS, 171
UNITS dd, 171
UNITS feet, 171
UNITS inches, 171
UNITS kilometers, 171
UNITS meters, 171
UNITS miles, 171
UNITS nauticalmiles, 171
WEB, 171

map
 CGI, 676
 CGI mode, 677
Map projections, 175
 Axis order, 499
Map Scale, 1009
mapext
 CGI, 676
Mapfile, 67, 1010
 Cloning, MapScript, 290
 MapScript, 289
 Saving, MapScript, 290
 SOS Server, 596
 WCS Server, 573
 WFS Client, 551
 WFS Server, 542
 WMS Client, 521
 WMS Server, 491
Mapfile tuning, 649
mapObj
 MapScript, 228, 289
 MapScript PHP, 265
MapScript, 1010
 .NET Compilation, 55
 API, 210
 Classes, 213
 classObj, 213
 colorObj, 215
 errorObj, 216
 fontsetObj, 216
 Functions, 212
 hashTableObj, 216
 imageObj, 217
 intarray, 218
 Introduction, 209
 labelCacheMemberObj, 218
 labelCacheObj, 219
 labelObj, 219
 Layer Cloning, 290
 layerObj, 221
 legendObj, 227
 lineObj, 228
 Mapfile, 289

Mapfile Cloning, 290
Mapfile Saving, 290
mapObj, 228, 289
markerCacheMemberObj, 234
outputFormatObj, 234
OWSRequest, 235
PHP, 49, 249
PHP Build, 51
PHP Classes, 251
PHP classObj, 251
PHP clusterObj, 253
PHP colorObj, 253
PHP Constants, 250
PHP Download, 50
PHP errorObj, 254
PHP Functions, 251
PHP gridObj, 255
PHP hashTableObj, 255
PHP imageObj, 256
PHP Installation, 51
PHP labelcacheMemberObj, 256
PHP labelcacheObj, 257
PHP labelObj, 257
PHP layerObj, 259
PHP legendObj, 263
PHP lineObj, 264
PHP mapObj, 265
PHP outputformatObj, 271
PHP OwsrequestObj, 271
PHP pointObj, 272
PHP projectionObj, 273
PHP querymapObj, 274
PHP rectObj, 274
PHP referenceMapObj, 275
PHP resultObj, 276
PHP scalebarObj, 276
PHP Setup, 50
PHP shapefileObj, 277
PHP shapeObj, 277
PHP styleObj, 280
PHP symbolObj, 281
PHP webObj, 283
pointObj, 237
projectionObj, 238
Python, 285
Python Classes, 285
Python Exception handling, 286
Python imageObj, 285
Python pointObj, 285
Python rectObj, 286
Querying, 292
rectObj, 238
referenceMapObj, 239
resultCacheMemberObj, 239

resultCacheObj, 240
 scalebarObj, 240
 shapefileObj, 241
 shapeObj, 241
 styleObj, 243
 symbolObj, 245
 symbolSetObj, 246
 Variables, 294
 Variables Boolean values, 295
 Variables Connection types, 298
 Variables DB connection types, 298
 Variables Error return codes, 299
 Variables File types, 297
 Variables Font types, 296
 Variables Image modes, 299
 Variables Image types, 298
 Variables Join types, 298
 Variables Label positions, 296
 Variables Label size, 296
 Variables Layer types, 296
 Variables Limiters, 299
 Variables Line join types, 298
 Variables Measured shape types, 297
 Variables Query types, 297
 Variables Querymap styles, 297
 Variables Return codes, 299
 Variables Shape types, 297
 Variables Shapefile types, 297
 Variables Status values, 295
 Variables Symbol types, 299
 Variables Units, 295
 webObj, 247

Mapscript
 Wrapper, 498

Mapscript wrappers
 WxS Services, 608

MapServer expressions
 Expressions, 132

mapshape
 CGI, 676

mapsize
 CGI, 676

mapxy
 CGI, 676

MARKER
 REFERENCE, 177

markerCacheMemberObj
 MapScript, 234

MARKERSIZE
 REFERENCE, 177

MASK
 LAYER, 158

MAXARCS
 GRID, 139

MAXBOXSIZE
 REFERENCE, 177

MAXCLASSES, 208

MAXDISTANCE
 CLUSTER, 121
 LEADER, 163

MAXFEATURES
 LAYER, 158

MAXGEOWIDTH
 LAYER, 158

MAXINTERVAL
 GRID, 139

MAXLENGTH
 LABEL, 151

MAXOVERLAPANGLE
 LABEL, 152

MAXSCALEDENOM
 CLASS, 119
 LABEL, 152
 LAYER, 158
 STYLE, 181
 WEB, 205

MAXSIZE
 CLASS, 119
 LABEL, 152
 MAP, 170
 STYLE, 181

MAXSTYLES, 208

MAXSUBDIVIDE
 GRID, 139

MAXSYMBOLS, 208

MAXTEMPLATE
 WEB, 205

MAXWIDTH
 STYLE, 181

maxx
 CGI, 676

maxy
 CGI, 676

Measured shape types
 MapScript Variables, 297

Mercator, 1010

METADATA
 gml_constants, WFS, 547
 gml_exclude_items, WFS, 548
 gml_exclude_items, WMS, 505
 gml_featureid, WFS, 548
 gml_geometries, WFS, 548
 gml_geometries, WMS, 505
 gml_groups, WFS, 548
 gml_groups, WMS, 505
 gml_include_items, WFS, 548
 gml_include_items, WMS, 505
 gml_types, WFS, 549

gml_xml_items, WFS, 549
gml_xml_items, WMS, 506
gml_[geometry name]_occurrences, WFS, 548
gml_[geometry name]_type, WFS, 548
gml_[geometry name]_type, WMS, 506
gml_[group name]_group, WFS, 548
gml_[group name]_group, WMS, 505
gml_[item name]_alias, WFS, 548
gml_[item name]_alias, WMS, 506
gml_[item name]_precision, WFS, 549
gml_[item name]_type, WFS, 549
gml_[item name]_type, WMS, 506
gml_[item name]_value, WFS, 549
gml_[item name]_width, WFS, 549
labelcache_map_edge_buffer, WEB, 206
LAYER, 158
ows_http_max_age, WMS, 501
ows_language, SOS, 600
ows_schemas_location, SOS, 600
ows_schemas_location, WFS, 546
ows_schemas_location, WMS, 501
ows_sld_enabled, WMS, 501
ows_updatesequence, SOS, 601
ows_updatesequence, WFS, 546
ows_updatesequence, WMS, 501
SOS LAYER, 602
SOS WEB, 600
sos_abstract, SOS, 601
sos_accessconstraints, SOS, 601
sos_address, SOS, 601
sos_addresstype, SOS, 601
sos_city, SOS, 601
sos_contactelectronicmailaddress, SOS, 601
sos_contactfacsimiletelephone, SOS, 601
sos_contactinstructions, SOS, 601
sos_contactorganization, SOS, 601
sos_contactperson, SOS, 601
sos_contactposition, SOS, 601
sos_contactvoicetelephone, SOS, 601
sos_country, SOS, 601
sos_describesensor_url, SOS, 602
sos_enable_request, SOS, 601, 602
sos_encoding_blockSeparator, SOS, 601
sos_encoding_tokenSeparator, SOS, 601
sos_fees, SOS, 602
sos_hoursofservice, SOS, 602
sos_keywordlist, SOS, 602
sos_maxfeatures, SOS, 602
sos_observedproperty_authority, SOS, 603
sos_observedproperty_id, SOS, 603
sos_observedproperty_name, SOS, 603
sos_observedproperty_version, SOS, 603
sos_offering_description, SOS, 603
sos_offering_extent, SOS, 603
sos_offering_id, SOS, 604
sos_offering_intendedapplication, SOS, 604
sos_offering_name, SOS, 604
sos_offering_timeextent, SOS, 604
sos_onlineresource, SOS, 602
sos_postcode, SOS, 601
sos_procedure, SOS, 604
sos_procedure_item, SOS, 604
sos_role, SOS, 602
sos_service_onlineresource, SOS, 602
sos_srs, SOS, 602
sos_stateorprovince, SOS, 601
sos_timeitem, SOS, 604
sos_title, SOS, 602
sos_[item name]_alias, SOS, 603
sos_[item name]_definition, SOS, 603
sos_[item name]_uom, SOS, 603
WCS LAYER, 586
WCS WEB, 584
wcs_abstract, WCS, 584, 586
wcs_accessconstraints, WCS, 585
wcs_address, WCS, 585
wcs_city, WCS, 585
wcs_contactelectronicmailaddress, WCS, 585
wcs_contactfacimiletelephone, WCS, 585
wcs_contactorganization, WCS, 585
wcs_contactperson, WCS, 585
wcs_contactposition, WCS, 585
wcs_contactvoicetelephone, WCS, 585
wcs_country, WCS, 585
wcs_description, WCS, 585, 586
wcs_enable_request, WCS, 585, 586
wcs_extent, WCS, 586
wcsfees, WCS, 585
wcs_formats, WCS, 586
wcs_keywords, WCS, 585, 586
wcs_label, WCS, 585, 586
wcs_metadataalink_format, WCS, 585, 586
wcs_metadataalink_href, WCS, 585, 587
wcs_metadataalink_type, WCS, 585, 587
wcs_name, WCS, 585, 587
wcs_native_format, WCS, 587
wcs_nativeformat, WCS, 587
wcs_postcode, WCS, 585
wcs_rangeset_axes, WCS, 587
wcs_rangeset_label, WCS, 587
wcs_rangeset_name, WCS, 587
wcs_responsibleparty_address_administrativearea, WCS, 585
wcs_responsibleparty_address_city, WCS, 585
wcs_responsibleparty_address_country, WCS, 585
wcs_responsibleparty_address_deliverypoint, WCS, 585

wcs_responsibleparty_address_emailaddress, WCS, 585
 wcs_responsibleparty_address_postalcode, WCS, 585
 wcs_responsibleparty_individualname, WCS, 585
 wcs_responsibleparty_onlineresource, WCS, 585
 wcs_responsibleparty_organizationname, WCS, 585
 wcs_responsibleparty_phone_facsimile, WCS, 585
 wcs_responsibleparty_phone_voice, WCS, 585
 wcs_responsibleparty_postionname, WCS, 585
 wcs_service_onlineresource, WCS, 586
 wcs_srs, WCS, 587
 wcs_stateorprovince, WCS, 585
 wcs_timeitem, WCS, 588
 wcs_timeposition, WCS, 588
 WEB, 205
 WFS Client LAYER, 551
 WFS LAYER, 547
 WFS WEB, 546
 wfs_abstract, WFS, 546, 549
 wfs_accessconstraints, WFS, 546
 wfs_anable_request, WFS, 546, 549
 wfs_encoding, WFS, 547
 wfs_extent, WFS, 549
 wfs_feature_collection, WFS, 547
 wfs_featureid, WFS, 549
 wfs_fees, WFS, 547
 wfs_getcapabilities_version, WFS, 547
 wfs_getfeature_formatlist, WFS, 549
 wfs_keywordlist, WFS, 547, 549
 wfs_maxfeatures, WFS, 547
 wfs_metadataurl_format, WFS, 549
 wfs_metadataurl_href, WFS, 549
 wfs_metadataurl_type, WFS, 549
 wfs_namespace_prefix, WFS, 547
 wfs_namespace_uri, WFS, 547
 wfs_onlineresource, WFS, 547
 wfs_service_onlineresource, WFS, 547
 wfs_srs, WFS, 547, 550
 wfs_title, WFS, 547, 550
 WMS Client LAYER, 522
 WMS LAYER, 505
 WMS WEB, 501
 wms_abstract, WMS, 501, 506
 wms_accessconstraints, WMS, 501
 wms_address, WMS, 501
 wms_addresses, WMS, 501
 wms_attribution_logourl_format, WMS, 502, 506
 wms_attribution_logourl_height, WMS, 502, 506
 wms_attribution_logourl_href, WMS, 502, 507
 wms_attribution_logourl_width, WMS, 502, 507
 wms_attribution_onlineresource, WMS, 502, 507
 wms_attribution_title, WMS, 502, 507
 wms_authorityurl_href, WMS, 507
 wms_authorityurl_name, WMS, 507
 wms_bbox_extended, WMS, 502, 507
 wms_city, WMS, 501
 wms_contactelectronicmailaddress, WMS, 502
 wms_contactfacsimiletelephone, WMS, 502
 wms_contactorganization, WMS, 502
 wms_contactperson, WMS, 502
 wms_contactposition, WMS, 502
 wms_contactvoicetelephone, WMS, 502
 wms_country, WMS, 501
 wms_dataurl_format, WMS, 507
 wms_dataurl_href, WMS, 507
 wms_enable_request, WMS, 503, 507
 wms_encoding, WMS, 503
 wms_exclude_items, WMS, 508
 wms_extent, WMS, 508
 wms_feature_info_mime_type, WMS, 503
 wms_fees, WMS, 503
 wms_getcapabilities_version, WMS, 503
 wms_getfeatureinfo_formatlist, WMS, 508
 wms_getlegendgraphic_formatlist, WMS, 503, 508
 wms_getmap_formatlist, WMS, 503, 508
 wms_group_abstract, WMS, 508
 wms_group_title, WMS, 508
 wms_identifier_authority, WMS, 508
 wms_identifier_value, WMS, 508
 wms_include_items, WMS, 509
 wms_keywordlist, WMS, 503, 509
 wms_keywordlist_vocabulary, WMS, 503, 509
 wms_keywordlist_[vocabulary's name]_items, WMS, 504, 509
 wms_languages, WMS, 504
 wms_layer_group, WMS, 509
 wms_layerlimit, WMS, 504
 wms_metadataurl_format, WMS, 509
 wms_metadataurl_href, WMS, 509
 wms_metadataurl_type, WMS, 510
 wms_onlineresource, WMS, 504
 wms_opaque, WMS, 510
 wms_postcode, WMS, 501
 wms_resx, WMS, 504
 wms_resy, WMS, 504
 wms_rootlayer_abstract, WMS, 504
 wms_rootlayer_keywordlist, WMS, 504
 wms_rootlayer_title, WMS, 504
 wms_service_onlineresource, WMS, 504
 wms_srs, WMS, 505, 510
 wms_stateorprovince, WMS, 501
 wms_style, WMS, 510
 wms_style_[style's_name]_legendurl_format, WMS, 510
 wms_style_[style's_name]_legendurl_height, WMS, 510

wms_style_[style's_name]_legendurl_href, WMS, MINWIDTH
510 STYLE, 181
wms_style_[style's_name]_legendurl_width, WMS, minx
510 CGI, 676
wms_timeextent, WMS, 510
wms_timeformat, WMS, 505, 510
wms_timeitem, WMS, 511
wms_title, WMS, 505, 511
Metadata
SOS, 600
WCS, 584
WFS, 546
WMS, 501
METADATA_ITEM
OUTPUTFORMAT FORMATOPTION, 174
meters
LAYER SIZEUNITS, 160
LAYER UNITS, 162
MAP UNITS, 171
SCALEBAR UNITS, 178
Microsoft SQL Server 2008, 364
miles
LAYER SIZEUNITS, 160
LAYER UNITS, 162
MAP UNITS, 171
SCALEBAR UNITS, 178
MIMETYPE
OUTPUTFORMAT, 175
MINARCS
GRID, 139
MINBOXSIZE
REFERENCE, 177
MINDISTANCE
LABEL, 152
MINFEATURESIZE
LABEL, 152
MINGEOWIDTH
LAYER, 158
MININTERVAL
GRID, 139
MINSCALEDENOM
CLASS, 119
LABEL, 152
LAYER, 159
STYLE, 181
WEB, 206
MINSIZE
CLASS, 119
LABEL, 152
STYLE, 181
MINSUBDIVIDE
GRID, 139
MINTEMPLATE
WEB, 206
miny
CGI, 676
miter
STYLE LINEJOIN, 181
mode
browse, CGI, 676
CGI, 676
coordinate, CGI, 677
featurequery, CGI, 677
featurequery, CGI, 677
indexquery, CGI, 677
itemfeaturequery, CGI, 677
itemfeaturequery, CGI, 677
itemnquery, CGI, 677
itemquery, CGI, 677
legend, CGI, 677
legendicon, CGI, 677
map, CGI, 677
nquery, CGI, 677
query, CGI, 677
reference, CGI, 677
scalebar, CGI, 677
zoomin, CGI, 677
zoomout, CGI, 677
MS_DEBUGLEVEL
Debugging, 637
Environment variables, 1005
MS_ENCRYPTION_KEY
Environment variables, 1005
MAP CONFIG, 168
MS_ERRORFILE
Debugging, 636
Environment variables, 1005
MAP CONFIG, 168
MS_MAP_NO_PATH
Environment variables, 1006
MS_MAP_PATTERN
Environment variables, 1006
MS_MAPFILE
Apache, 497
Environment variables, 1006
MS_MAPFILE_PATTERN
Environment variables, 1006
MS_MODE
Environment variables, 1007
MS_NONSQUARE
MAP CONFIG, 168
MS_OPENLAYERS_JS_URL
Environment variables, 1007
MS_TEMPPATH

Environment variable, 206
 Environment variables, 1007
MS_XMLMAPFILE_XSLT, 207
 Environment variables, 1007
msencrypt
 Utility, 657
msGetLabelSize(): Requested font not found
 Error, 1015
msLoadFontset(): Error opening fontset
 Error, 1015
msLoadMap(): Failed to open map file
 Error, 1015
msProcessProjection(): no options found in 'init' file
 Error, 1015
msProcessProjection(): No such file or directory
 Error, 1015
msProcessProjection(): Projection library error.major axis
 or radius = 0 not given
 Error, 1016
msQueryByPoint: search returned no results
 Error, 1017
msReturnPage(): Web application error. Malformed template name
 Error, 1017
msSaveImageGD(): Unable to access file
 Error, 1018
MSSQL_READ_WKB
 LAYER PROCESSING, 367
msWMSLoadGetMapParams(): WMS server error
 Error, 1018
mysql
 JOIN CONNECTIONTYPE, 145

N

NAME
 CLASS, 119
 JOIN, 145
 LAYER, 159
 MAP, 170
 OUTPUTFORMAT, 175
 SYMBOL, 185
nauticalmiles
 LAYER SIZEUNITS, 160
 LAYER UNITS, 162
 MAP UNITS, 171
 SCALEBAR UNITS, 178
ne
 Expressions, 132, 137
not
 Expressions, 132
nquery
 CGI mode, 677
NULLVALUE
 OUTPUTFORMAT FORMATOPTION, 174

O

OFFSET
 LABEL, 152
 STYLE, 91, 181
OFFSITE
 LAYER, 159
OGC, 1010
 OGC conformance tests
 WFS Filter encoding, 560
OGC Support, 489
OGR, 1010
ogr
 LAYER CONNECTIONTYPE, 155
ogrindex, 654
OM, 1010
ON_MISSING_DATA
 Debugging, 640
 MAP CONFIG, 168
OPACITY
 LAYER, 159
 STYLE, 182
OpenLayers, 1010
Optimization, 634
 Databases, 656
 Fonts, 651
 Image formats, 652
 Layers, 650
 PostGIS, 655
 Projections, 650
 Raster, 652
 Raster Tiling, 652
 Shape datasets, 655
 Symbols, 651
 Tile indexes, 653
 TILEINDEX, 654
 Vector, 655
or
 Expressions, 132
Oracle, 386
 Installation, 63
oraclespatial
 LAYER CONNECTIONTYPE, 155
OUTLINECOLOR
 CLASS, 119
 LABEL, 153
 LEGEND, 167
 REFERENCE, 177
 SCALEBAR, 177
 STYLE, 182
OUTLINEWIDTH
 LABEL, 153
 STYLE, 182
Output formats
 WCS Server, 575

OUTPUTFORMAT, 171
DRIVER, 173
EXTENSION, 173
FORMATOPTION, 173
FORMATOPTION BLOCKXSIZE, 174
FORMATOPTION BLOCKYSIZE, 174
FORMATOPTION COMPRESS, 174
FORMATOPTION COMPRESSION, 173
FORMATOPTION GAMMA, 173, 174
FORMATOPTION GEO_ENCODING, 174
FORMATOPTION INTERLACE, 174
FORMATOPTION INTERLEAVE, 174
FORMATOPTION METADATA_ITEM, 174
FORMATOPTION NULLVALUE, 174
FORMATOPTION PALETTE, 173
FORMATOPTION PALETTE_FORCE, 173
FORMATOPTION QUALITY, 173
FORMATOPTION QUANTIZE_COLORS, 173
FORMATOPTION QUANTIZE_FORCE, 173
FORMATOPTION TILED, 174
IMAGEMODE, 174
IMAGEMODE BYTE, 174
IMAGEMODE FEATURE, 175
IMAGEMODE FLOAT32, 174
IMAGEMODE INT16, 174
IMAGEMODE PC256, 174
IMAGEMODE RGB, 174
IMAGEMODE RGBA, 174
MIMETYPE, 175
NAME, 175
Template-driven output, 476
TRANSPARENT, 175
outputFormatObj
 MapScript, 234
outputformatObj
 MapScript PHP, 271
overlaps
 Expressions, 134
OVERSAMPLE_RATIO
 LAYER PROCESSING, 423
ows_http_max_age
 WMS METADATA, 501
ows_language
 SOS METADATA, 600
ows_schemas_location
 SOS METADATA, 600
 WFS METADATA, 546
 WMS METADATA, 501
ows_sld_enabled
 WMS METADATA, 501
ows_updatesequence
 SOS METADATA, 601
 WFS METADATA, 546
 WMS METADATA, 501

OWSRequest
 MapScript, 235
OwsrequestObj
 MapScript PHP, 271
P
PALETTE
 OUTPUTFORMAT FORMATOPTION, 173
PALETTE_FORCE
 OUTPUTFORMAT FORMATOPTION, 173
PARTIALS
 LABEL, 153
PATTERN, 81
 STYLE, 182
PC256
 OUTPUTFORMAT IMAGEMODE, 174
PDF
 Geospatial, 174
pdf
 MAP IMAGETYPE, 170
percentages
 LAYER UNITS, 162
Performance tips
 Raster, 425
PHP
 Build, MapScript, 51
 Classes, MapScript, 251
 classObj, MapScript, 251
 clusterObj, MapScript, 253
 colorObj, MapScript, 253
 Constants, MapScript, 250
 Download, MapScript, 50
 errorObj, MapScript, 254
 Functions, MapScript, 251
 gridObj, MapScript, 255
 hashTableObj, MapScript, 255
 imageObj, MapScript, 256
 Installation, MapScript, 51
 labelcacheMemberObj, MapScript, 256
 labelcacheObj, MapScript, 257
 labelObj, MapScript, 257
 layerObj, MapScript, 259
 legendObj, MapScript, 263
 lineObj, MapScript, 264
 mapObj, MapScript, 265
 MapScript, 49, 249
 outputformatObj, MapScript, 271
 OwsrequestObj, MapScript, 271
 pointObj, MapScript, 272
 projectionObj, MapScript, 273
 querymapObj, MapScript, 274
 rectObj, MapScript, 274
 referenceMapObj, MapScript, 275
 resultObj, MapScript, 276

scalebarObj, MapScript, 276
 Setup, MapScript, 50
 shapefileObj, MapScript, 277
 shapeObj, MapScript, 277
 styleObj, MapScript, 280
 Support, 50
 symbolObj, MapScript, 281
 webObj, MapScript, 283
 php, 61
 PHP Mapscript
 Debugging, 643
 pixel, 417
 pixels
 LAYER SIZEUNITS, 160
 LAYER UNITS, 162
 pixmap
 SYMBOL TYPE, 186
 Pixmap polygon fill, 94
 Pixmap symbols, 76
 PLUGIN
 LAYER, 159
 plugin
 LAYER CONNECTIONTYPE, 155
 PNG, 419
 png
 MAP IMAGETYPE, 170
 point
 LAYER TYPE, 162
 Point symbols, 74
 pointObj
 MapScript, 237
 MapScript PHP, 272
 MapScript Python, 285
 POINTS
 FEATURE, 137
 SYMBOL, 186
 POLAROFFSET
 STYLE, 183
 polygon
 LAYER TYPE, 162
 Polygon outlines, 108
 POLYLINE_NO_CLIP
 LAYER PROCESSING, 160
 POSITION
 LABEL, 153
 LEGEND, 167
 SCALEBAR, 177
 PostGIS
 Optimization, 655
 postgis
 LAYER CONNECTIONTYPE, 155
 postgresql
 JOIN CONNECTIONTYPE, 145
 POSTLABELCACHE
 LAYER, 159
 LEGEND, 167
 SCALEBAR, 178
 Preprocessing
 Raster, 425
 PRIORITY
 LABEL, 153
 PROCESSING, 159
 BANDS, LAYER, 421
 CLOSE_CONNECTION, LAYER, 159, 367
 CLUSTER_GET_ALL_SHAPES, LAYER, 121
 COLOR_MATCH_THRESHOLD, LAYER, 422
 DITHER, LAYER, 422
 EXTENT_PRIORITY, LAYER, 422
 GETSHAPE_STYLE_ITEMS, LAYER, 160
 ITEMS, LAYER, 159
 LABEL_NO_CLIP, LAYER, 159
 LAYER, 159
 LOAD_FULL_RES_IMAGE, LAYER, 422
 LOAD_WHOLE_IMAGE, LAYER, 422
 LUT[_n], LAYER, 422
 MSSQL_READ_WKB, LAYER, 367
 OVERSAMPLE_RATIO, LAYER, 423
 POLYLINE_NO_CLIP, LAYER, 160
 raster options, LAYER, 160
 RESAMPLE, LAYER, 423
 SCALE, LAYER, 423
 WORLDFILE, LAYER, 423
 Processing directives
 Raster, 421
 Proj.4, 1010
 PROJ_DEBUG
 Debugging, 638
 PROJ_LIB
 Environment variables, 1007
 MAP CONFIG, 169
 PROJECTION, 175
 LAYER, 160
 MAP, 170
 Projection, 1010
 projectionObj
 MapScript, 238
 MapScript PHP, 273
 Projections
 Optimization, 650
 Python
 Classes, MapScript, 285
 Exception handling, MapScript, 286
 imageObj, MapScript, 285
 MapScript, 285
 pointObj, MapScript, 285
 rectObj, MapScript, 286

Q

qformat
 CGI, 677
qitem
 CGI, 677
qlayer
 CGI, 677
QString
 CGI, 677
QUALITY
 OUTPUTFORMAT FORMATOPTION, 173
QUANTIZE_COLORS
 OUTPUTFORMAT FORMATOPTION, 173
QUANTIZE_FORCE
 OUTPUTFORMAT FORMATOPTION, 173
Query
 Raster, 424
query
 CGI mode, 677
 LAYER TYPE, 162
Query types
 MapScript Variables, 297
queryfile
 CGI, 677
QUERYFORMAT
 WEB, 206
Querying
 MapScript, 292
QUERYMAP, 176
 COLOR, 176
 MAP, 170
 SIZE, 176
 STATUS, 176
 STYLE, 176
Querymap styles
 MapScript Variables, 297
querymapObj
 MapScript PHP, 274
Quotes escaping, 129

R

radius
 WMS Vendor specific parameters, 511
Raster, 1010
 24bit, 421
 8bit, 426
 External overviews, 427
 Georeferencing, 427
 Internal overviews, 426
 Optimization, 652
 Performance tips, 425
 Preprocessing, 425
 Processing directives, 421
 Query, 424
Tile indexing, 420
Tiled datasets, 426
Tiling, Optimization, 652
Warping, 421
World files, 427
raster
 LAYER TYPE, 162
Raster classification, 417
Raster data, 416
Raster formats, 419
Raster options, 159
raster options
 LAYER PROCESSING, 160
Raster query
 blue, 424
 class, 424
 green, 424
 red, 424
 value_list, 424
 value_n, 424
 x, 424
 y, 424
rectObj
 MapScript, 238
 MapScript PHP, 274
 MapScript Python, 286
red, 417
 Raster query, 424
ref
 CGI, 678
REFERENCE, 177
 COLOR, 177
 EXTENT, 177
 IMAGE, 177
 MAP, 170
 MARKER, 177
 MARKERSIZE, 177
 MAXBOXSIZE, 177
 MINBOXSIZE, 177
 OUTLINECOLOR, 177
 SIZE, 177
 STATUS, 177
reference
 CGI mode, 677
referenceMapObj
 MapScript, 239
 MapScript PHP, 275
refxy
 CGI, 678
REGION
 CLUSTER, 121
Regular expression comparison
 Expressions, 130
Regular expressions, 130, 208

REPEATDISTANCE
 LABEL, 153

REQUIRES
 LAYER, 160

RESAMPLE
 LAYER PROCESSING, 423

RESOLUTION
 MAP, 171

resultCacheMemberObj
 MapScript, 239

resultCacheObj
 MapScript, 240

resultObj
 MapScript PHP, 276

Return codes
 MapScript Variables, 299

ReWriteRule
 Apache, 497

RGB
 OUTPUTFORMAT IMAGEMODE, 174

RGBA
 OUTPUTFORMAT IMAGEMODE, 174

ROSA-Applet controls, 680

round
 Expressions, 135
 STYLE LINECAP, 181
 STYLE LINEJOIN, 181

Run-time substitution, 680
 FILTER, 681
 Supported parameters, 681

S

savequery
 CGI, 678

Saving
 MapScript Mapfile, 290

SCALE
 LAYER PROCESSING, 423

SCALEBAR, 177
 ALIGN, 177
 BACKGROUNDCOLOR, 177
 COLOR, 177
 IMAGECOLOR, 177
 INTERVALS, 177
 LABEL, 177
 MAP, 171
 OUTLINECOLOR, 177
 POSITION, 177
 POSTLABELCACHE, 178
 SIZE, 178
 STATUS, 178
 STYLE, 178
 UNITS, 178
 UNITS feet, 178

UNITS inches, 178
 UNITS kilometers, 178
 UNITS meters, 178
 UNITS miles, 178
 UNITS nauticalmiles, 178

scalebar
 CGI mode, 677
 Utility, 659

scalebarObj
 MapScript, 240
 MapScript PHP, 276

SCALEDENOM
 MAP, 171

scaledenom
 CGI, 678

Scaling of symbols, 74

sde
 LAYER CONNECTIONTYPE, 155

searchmap
 CGI, 678

SetEnvIf
 Apache, 498

Setup
 MapScript PHP, 50
 WMS Server, 491

SHADOWCOLOR
 LABEL, 153

SHADOWSIZE
 LABEL, 153

Shape datasets
 Optimization, 655

Shape types
 MapScript Variables, 297

Shapefile, 1010

Shapefile types
 MapScript Variables, 297

shapefileObj
 MapScript, 241
 MapScript PHP, 277

shapeindex
 CGI, 678

shapeObj
 MapScript, 241
 MapScript PHP, 277

SHAPEPATH
 MAP, 171

Shift-JIS
 ENCODING, 127

shp2img
 Debugging, 638
 Utility, 659

shptree
 Utility, 660

shptreetst

Utility, 662
simple: CGI controls, 675
simple: OpenLayers viewer, 684
SIZE
 CLASS, 120
 LABEL, 154
 MAP, 171
 QUERYMAP, 176
 REFERENCE, 177
 SCALEBAR, 178
 STYLE, 183
SIZEUNITS
 feet, LAYER, 160
 inches, LAYER, 160
 kilometers, LAYER, 160
 LAYER, 160
 meters, LAYER, 160
 miles, LAYER, 160
 nauticalmiles, LAYER, 160
 pixels, LAYER, 160
slayer
 CGI, 678
SLD, 561, 1010
 Element support, 564
sortshp
 Utility, 664
SOS, 1010
 LAYER METADATA, 602
 Metadata, 600
 METADATA ows_language, 600
 METADATA ows_schemas_location, 600
 METADATA ows_updatesequence, 601
 METADATA sos_abstract, 601
 METADATA sos_accessconstraints, 601
 METADATA sos_address, 601
 METADATA sos_addresses, 601
 METADATA sos_city, 601
 METADATA sos_contactelectronicmailaddress, 601
 METADATA sos_contactfacsimiletelephone, 601
 METADATA sos_contactinstructions, 601
 METADATA sos_contactorganization, 601
 METADATA sos_contactperson, 601
 METADATA sos_contactposition, 601
 METADATA sos_contactvoicetelephone, 601
 METADATA sos_country, 601
 METADATA sos_describesensor_url, 602
 METADATA sos_enable_request, 601, 602
 METADATA sos_encoding_blockSeparator, 601
 METADATA sos_encoding_tokenSeparator, 601
 METADATA sos_fees, 602
 METADATA sos_hoursofservice, 602
 METADATA sos_keywordlist, 602
 METADATA sos_maxfeatures, 602
 METADATA sos_observedproperty_authority, 603
 METADATA sos_observedproperty_id, 603
 METADATA sos_observedproperty_name, 603
 METADATA sos_observedproperty_version, 603
 METADATA sos_offering_description, 603
 METADATA sos_offering_extent, 603
 METADATA sos_offering_id, 604
 METADATA sos_offering_intendedapplication, 604
 METADATA sos_offering_name, 604
 METADATA sos_offering_timeextent, 604
 METADATA sos_onlineresource, 602
 METADATA sos_postcode, 601
 METADATA sos_procedure, 604
 METADATA sos_procedure_item, 604
 METADATA sos_role, 602
 METADATA sos_service_onlineresource, 602
 METADATA sos_srs, 602
 METADATA sos_stateorprovince, 601
 METADATA sos_timeitem, 604
 METADATA sos_title, 602
 METADATA sos_[item name]_alias, 603
 METADATA sos_[item name]_definition, 603
 METADATA sos_[item name]_uom, 603
 WEB METADATA, 600
SOS Server, 594
 Mapfile, 596
sos_abstract
 SOS METADATA, 601
sos_accessconstraints
 SOS METADATA, 601
sos_address
 SOS METADATA, 601
sos_addresses
 SOS METADATA, 601
sos_city
 SOS METADATA, 601
sos_contactelectronicmailaddress
 SOS METADATA, 601
sos_contactfacsimiletelephone
 SOS METADATA, 601
sos_contactinstructions
 SOS METADATA, 601
sos_contactorganization
 SOS METADATA, 601
sos_contactperson
 SOS METADATA, 601
sos_contactposition
 SOS METADATA, 601
sos_contactvoicetelephone
 SOS METADATA, 601
sos_country
 SOS METADATA, 601
sos_describesensor_url
 SOS METADATA, 602
sos_enable_request

SOS METADATA, 601, 602
 sos_encoding_blockSeparator
 SOS METADATA, 601
 sos_encoding_tokenSeparator
 SOS METADATA, 601
 sos_fees
 SOS METADATA, 602
 sos_hoursoservice
 SOS METADATA, 602
 sos_keywordlist
 SOS METADATA, 602
 sos_maxfeatures
 SOS METADATA, 602
 sos_observedproperty_authority
 SOS METADATA, 603
 sos_observedproperty_id
 SOS METADATA, 603
 sos_observedproperty_name
 SOS METADATA, 603
 sos_observedproperty_version
 SOS METADATA, 603
 sos_offering_description
 SOS METADATA, 603
 sos_offering_extent
 SOS METADATA, 603
 sos_offering_id
 SOS METADATA, 604
 sos_offering_intendedapplication
 SOS METADATA, 604
 sos_offering_name
 SOS METADATA, 604
 sos_offering_timeextent
 SOS METADATA, 604
 sos_onlinerelource
 SOS METADATA, 602
 sos_postcode
 SOS METADATA, 601
 sos_procedure
 SOS METADATA, 604
 sos_procedure_item
 SOS METADATA, 604
 sos_role
 SOS METADATA, 602
 sos_service_onlinerelource
 SOS METADATA, 602
 sos_srs
 SOS METADATA, 602
 sos_stateorprovince
 SOS METADATA, 601
 sos_timeitem
 SOS METADATA, 604
 sos_title
 SOS METADATA, 602
 sos_[item name]_alias

SOS METADATA, 603
 sos_[item name]_definition
 SOS METADATA, 603
 sos_[item name]_uom
 SOS METADATA, 603
 Spatial expressions
 Expressions, 134
 Spatial functions
 Expressions, 136
 SpatialLite, 403
 Special options, 159
 Spherical Mercator, 1010
 square
 STYLE LINECAP, 181
 SRS
 WFS Server, 544
 start
 STYLE GEOMTRANSFORM, 180
 STATUS
 CLASS, 120
 LAYER, 160
 LEGEND, 167
 MAP, 171
 QUERYMAP, 176
 REFERENCE, 177
 SCALEBAR, 178
 Status values
 MapScript Variables, 295
 String comparison
 Expressions, 130
 String expressions
 Expressions, 132
 String functions
 Expressions, 135
 String operations
 Expressions, 134
 String quotation, 128
 STYLE, 178
 ANGLE, 178
 ANTIALIAS, 179
 BACKGROUNDCOLOR, 179
 CLASS, 120
 COLOR, 179
 GAP, 179
 GEOMTRANSFORM, 180
 GEOMTRANSFORM bbox, 180
 GEOMTRANSFORM buffer, 180
 GEOMTRANSFORM centroid, 180
 GEOMTRANSFORM end, 180
 GEOMTRANSFORM expression, 180
 GEOMTRANSFORM labelpnt, 180
 GEOMTRANSFORM labelpoly, 180
 GEOMTRANSFORM start, 180
 GEOMTRANSFORM vertices, 180

INITIALGAP, 180
LABEL, 154
LINECAP, 89, 181
LINECAP butt, 181
LINECAP round, 181
LINECAP square, 181
LINEJOIN, 89, 181
LINEJOIN bevel, 181
LINEJOIN miter, 181
LINEJOIN round, 181
LINEJOINMAXSIZE, 89, 181
MAXSCALEDENOM, 181
MAXSIZE, 181
MAXWIDTH, 181
MINSCALEDENOM, 181
MINSIZE, 181
MINWIDTH, 181
OFFSET, 91, 181
OPACITY, 182
OUTLINECOLOR, 182
OUTLINEWIDTH, 182
PATTERN, 182
POLAROFFSET, 183
QUERYMAP, 176
SCALEBAR, 178
SIZE, 183
SYMBOL, 184
WIDTH, 184
STYLEITEM
 AUTO, LAYER, 161
 LAYER, 160
styleObj
 MapScript, 243
 MapScript PHP, 280
Support
 PHP, 50
Supported features
 WFS Filter encoding, 554
Supported formats
 JOIN, 145
Supported parameters
 Run-time substitution, 681
SVG, 1010
svg
 MAP IMAGETYPE, 170
 SYMBOL TYPE, 186
SWF, 1011
SWIG, 1011
sym2img
 Utility, 666
SYMBOL, 185
 ANCHORPOINT, 185
 ANTIALIAS, 185
 CHARACTER, 185
 CLASS, 120
 FILLED, 185
 FONT, 185
 IMAGE, 185
 NAME, 185
 POINTS, 186
 STYLE, 184
 TRANSPARENT, 186
 TYPE, 186
 TYPE cartoline, 186
 TYPE ellipse, 186
 TYPE hatch, 186
 TYPE pixmap, 186
 TYPE svg, 186
 TYPE truetype, 186
 TYPE vector, 186
Symbol center, 113
Symbol construction, 69
Symbol scaling, 72
Symbol specification, 72
Symbol types
 MapScript Variables, 299
symbolObj
 MapScript, 245
 MapScript PHP, 281
Symbology examples, 186
Symbols
 Optimization, 651
SYMBOLSCALEDENOM
 LAYER, 161
SYMBOLSET
 MAP, 171
symbolSetObj
 MapScript, 246

T

TABLE
 JOIN, 145
TEMPLATE
 CLASS, 120
 JOIN, 145
 LAYER, 161
 LEGEND, 167
 WEB, 206
Template substitution tags
 Template-driven output, 477
Template-driven output, 476
 OUTPUTFORMAT, 476
 Template substitution tags, 477
TEMPLATEPATTERN
 MAP, 171
Templating, 190
Temporal expressions
 Expressions, 136

Temporary directory, 206
 Temporary files, 206, 671
TEMPPATH
 WEB, 206
TEXT
 CLASS, 120
 FEATURE, 137
 LABEL, 154
TIFF, 419
 Tile indexes
 Optimization, 653
 Tile indexing
 Raster, 420
tile4ms
 Utility, 667
TILED
 OUTPUTFORMAT FORMATOPTION, 174
 Tiled datasets
 Raster, 426
TILEINDEX
 LAYER, 161
 Optimization, 654
Tileindex, 1011
tileindex
 CGI, 678
TILEITEM
 LAYER, 161
Tiling
 Optimization Raster, 652
Time requests
 WMS Server, 527
TIS-620
 ENCODING, 127
TO
 JOIN, 145
TOLERANCE
 LAYER, 161
TOLERANCEUNITS
 LAYER, 161
tostring
 Expressions, 135
touches
 Expressions, 134
TRANSFORM
 LAYER, 161
TRANSPARENT
 LEGEND, 168
 OUTPUTFORMAT, 175
 SYMBOL, 186
truetype
 LABEL TYPE, 154
 SYMBOL TYPE, 186
Truetype symbols, 76
Tutorial, 25

TYPE
 annotation, LAYER, 162
 bitmap, LABEL, 154
 cartoline, SYMBOL, 186
 chart, LAYER, 162
 circle, LAYER, 162
 ellipse, SYMBOL, 186
 hatch, SYMBOL, 186
 JOIN, 145
 LABEL, 154
 LAYER, 162
 line, LAYER, 162
 pixmap, SYMBOL, 186
 point, LAYER, 162
 polygon, LAYER, 162
 query, LAYER, 162
 raster, LAYER, 162
 svg, SYMBOL, 186
 SYMBOL, 186
 truetype, LABEL, 154
 truetype, SYMBOL, 186
 vector, SYMBOL, 186

U

Unable to load dll
 Error, 1018
union
 LAYER CONNECTIONTYPE, 155
Union layer, 200
UNITS
 dd, LAYER, 162
 dd, MAP, 171
 feet, LAYER, 162
 feet, MAP, 171
 feet, SCALEBAR, 178
 inches, LAYER, 162
 inches, MAP, 171
 inches, SCALEBAR, 178
 kilometers, LAYER, 162
 kilometers, MAP, 171
 kilometers, SCALEBAR, 178
 LAYER, 162
 MAP, 171
 meters, LAYER, 162
 meters, MAP, 171
 meters, SCALEBAR, 178
 miles, LAYER, 162
 miles, MAP, 171
 miles, SCALEBAR, 178
 nauticalmiles, LAYER, 162
 nauticalmiles, MAP, 171
 nauticalmiles, SCALEBAR, 178
 percentages, LAYER, 162
 pixels, LAYER, 162

SCALEBAR, 178
Units
 MapScript Variables, 295
Units of measure
 WFS Filter encoding, 555
Unix
 Installation, 33
 Wrapper script, 499
URL
 Change, 497
Use cases
 WCS, 589
UTF-8
 ENCODING, 127
Utility
 legend, 657
 msencrypt, 657
 scalebar, 659
 shp2img, 659
 shptree, 660
 shptreetst, 662
 sortshp, 664
 sym2img, 666
 tile4ms, 667
uvraster, 408
 LAYER CONNECTIONTYPE, 155

V

VALIDATION, 682
 CLASS, 120
 LAYER, 162
 WEB, 207
value_list
 Raster query, 424
value_n
 Raster query, 424
Variables
 Boolean values, MapScript, 295
 Connection types, MapScript, 298
 DB connection types, MapScript, 298
 Error return codes, MapScript, 299
 File types, MapScript, 297
 Font types, MapScript, 296
 Image modes, MapScript, 299
 Image types, MapScript, 298
 Join types, MapScript, 298
 Label positions, MapScript, 296
 Label size, MapScript, 296
 Layer types, MapScript, 296
 Limiters, MapScript, 299
 Line join types, MapScript, 298
 MapScript, 294
 Measured shape types, MapScript, 297
 Query types, MapScript, 297

Querymap styles, MapScript, 297
Return codes, MapScript, 299
Shape types, MapScript, 297
Shapefile types, MapScript, 297
Status values, MapScript, 295
Symbol types, MapScript, 299
Units, MapScript, 295

Vector, 1011
 Optimization, 655
vector
 SYMBOL TYPE, 186
Vector field, 408
Vector polygon fill, 97
Vector symbols, 74
Vendor specific parameters
 angle, WMS, 511
 radius, WMS, 511
 WMS, 511
vertices
 STYLE GEOMTRANSFORM, 180

W

Warping
 Raster, 421

WCS, 1011
 LAYER METADATA, 586
 Metadata, 584
 METADATA wcs_abstract, 584, 586
 METADATA wcs_accessconstraints, 585
 METADATA wcs_address, 585
 METADATA wcs_city, 585
 METADATA wcs_contactelectronicmailaddress, 585
 METADATA wcs_contactfacimiletelephone, 585
 METADATA wcs_contactorganization, 585
 METADATA wcs_contactperson, 585
 METADATA wcs_contactposition, 585
 METADATA wcs_contactvoicetelephone, 585
 METADATA wcs_country, 585
 METADATA wcs_description, 585, 586
 METADATA wcs_enable_request, 585, 586
 METADATA wcs_extent, 586
 METADATA wcs_fees, 585
 METADATA wcs_formats, 586
 METADATA wcs_keywords, 585, 586
 METADATA wcs_label, 585, 586
 METADATA wcs_metadatalink_format, 585, 586
 METADATA wcs_metadatalink_href, 585, 587
 METADATA wcs_metadatalink_type, 585, 587
 METADATA wcs_name, 585, 587
 METADATA wcs_native_format, 587
 METADATA wcs_nativeformat, 587
 METADATA wcs_postcode, 585
 METADATA wcs_rangeset_axes, 587

METADATA wcs_rangeset_label, 587
 METADATA wcs_rangeset_name, 587
 METADATA wcs_responsibleparty_address_administrativearea, 585
 METADATA wcs_responsibleparty_address_city, 585
 METADATA wcs_responsibleparty_address_country, 585
 METADATA wcs_responsibleparty_address_deliverypoint, 585
 METADATA wcs_responsibleparty_address_electronicmailaddress, 585
 METADATA wcs_responsibleparty_address_postalcode, 585
 METADATA wcs_responsibleparty_individualname, 585
 METADATA wcs_responsibleparty_onlineresource, 585
 METADATA wcs_responsibleparty_organizationname, 585
 METADATA wcs_responsibleparty_phone_facsimile, 585
 METADATA wcs_responsibleparty_phone_voice, 585
 METADATA wcs_responsibleparty_positionname, 585
 METADATA wcs_service_onlineresource, 586
 METADATA wcs_srs, 587
 METADATA wcs_stateorprovince, 585
 METADATA wcs_timeitem, 588
 METADATA wcs_timeposition, 588
 Use cases, 589
 WEB METADATA, 584
 WCS 1.1.0, 577
 WCS 2.0, 578
 WCS Server, 572
 Mapfile, 573
 Output formats, 575
 wcs_abstract
 WCS METADATA, 584, 586
 wcs_accessconstraints
 WCS METADATA, 585
 wcs_address
 WCS METADATA, 585
 wcs_city
 WCS METADATA, 585
 wcs_contactelectronicmailaddress
 WCS METADATA, 585
 wcs_contactfacimiletelephone
 WCS METADATA, 585
 wcs_contactorganization
 WCS METADATA, 585
 wcs_contactperson
 WCS METADATA, 585
 wcs_contactposition
 WCS METADATA, 585
 wcs_contactvoicetelephone
 WCS METADATA, 585
 wcs_description
 WCS METADATA, 585, 586
 wcs_enable_request
 WCS METADATA, 585, 586
 wcs_email
 WCS METADATA, 586
 wcs_fees
 WCS METADATA, 585
 wcs_formats
 WCS METADATA, 586
 wcs_keywords
 WCS METADATA, 585, 586
 wcs_label
 WCS METADATA, 585, 586
 wcs_metadatalink_format
 WCS METADATA, 585, 586
 wcs_metadatalink_href
 WCS METADATA, 585, 587
 wcs_metadatalink_type
 WCS METADATA, 585, 587
 wcs_name
 WCS METADATA, 585, 587
 wcs_native_format
 WCS METADATA, 587
 wcs_nativeformat
 WCS METADATA, 587
 wcs_postcode
 WCS METADATA, 585
 wcs_rangeset_axes
 WCS METADATA, 587
 wcs_rangeset_label
 WCS METADATA, 587
 wcs_rangeset_name
 WCS METADATA, 587
 wcs_responsibleparty_address_administrativearea
 WCS METADATA, 585
 wcs_responsibleparty_address_city
 WCS METADATA, 585
 wcs_responsibleparty_address_country
 WCS METADATA, 585
 wcs_responsibleparty_address_deliverypoint
 WCS METADATA, 585
 wcs_responsibleparty_address_electronicmailaddress
 WCS METADATA, 585
 wcs_responsibleparty_address_postalcode
 WCS METADATA, 585
 wcs_responsibleparty_individualname
 WCS METADATA, 585

wcs_responsibleparty_onlinerelation
 WCS METADATA, 585

wcs_responsibleparty_organizationname
 WCS METADATA, 585

wcs_responsibleparty_phone_facsimile
 WCS METADATA, 585

wcs_responsibleparty_phone_voice
 WCS METADATA, 585

wcs_responsibleparty_postionname
 WCS METADATA, 585

wcs_service_onlinerelation
 WCS METADATA, 586

wcs_srs
 WCS METADATA, 587

wcs_stateorprovince
 WCS METADATA, 585

wcs_timeitem
 WCS METADATA, 588

wcs_timeposition
 WCS METADATA, 588

WEB, 205

- BROWSEFORMAT, 205
- EMPTY, 205
- ERROR, 205
- FOOTER, 205
- HEADER, 205
- IMAGEPATH, 205
- IMAGEURL, 205
- LEGENDFORMAT, 205
- MAP, 171
- MAXSCALEDENOM, 205
- MAXTEMPLATE, 205
- METADATA, 205
- METADATA labelcache_map_edge_buffer, 206
- METADATA SOS, 600
- METADATA WCS, 584
- METADATA WFS, 546
- METADATA WMS, 501
- MINSCALEDENOM, 206
- MINTEMPLATE, 206
- QUERYFORMAT, 206
- TEMPLATE, 206
- TEMPPATH, 206
- VALIDATION, 207

Web map context

- WMS, 534

webObj

- MapScript, 247
- MapScript PHP, 283

WFS, 1011

- Filter encoding, 553
- Filter encoding Limitations, 558
- Filter encoding OGC conformance tests, 560
- Filter encoding Supported features, 554

Filter encoding Units of measure, 555

LAYER METADATA, 547

Metadata, 546

- METADATA gml_constants, 547
- METADATA gml_exclude_items, 548
- METADATA gml_featureid, 548
- METADATA gml_geometries, 548
- METADATA gml_groups, 548
- METADATA gml_include_items, 548
- METADATA gml_types, 549
- METADATA gml_xml_items, 549
- METADATA gml_[geometry name]_occurrences, 548
- METADATA gml_[geometry name]_type, 548
- METADATA gml_[group name]_group, 548
- METADATA gml_[item name]_alias, 548
- METADATA gml_[item name]_precision, 549
- METADATA gml_[item name]_type, 549
- METADATA gml_[item name]_value, 549
- METADATA gml_[item name]_width, 549
- METADATA ows_schemas_location, 546
- METADATA ows_updatesequence, 546
- METADATA wfs_abstract, 546, 549
- METADATA wfs_accessconstraints, 546
- METADATA wfs_anable_request, 546, 549
- METADATA wfs_encoding, 547
- METADATA wfs_extent, 549
- METADATA wfs_feature_collection, 547
- METADATA wfs_featureid, 549
- METADATA wfs_fees, 547
- METADATA wfs_getcapabilities_version, 547
- METADATA wfs_getfeature_formatlist, 549
- METADATA wfs_keywordlist, 547, 549
- METADATA wfs_maxfeatures, 547
- METADATA wfs_metadataurl_format, 549
- METADATA wfs_metadataurl_href, 549
- METADATA wfs_metadataurl_type, 549
- METADATA wfs_namespace_prefix, 547
- METADATA wfs_namespace_uri, 547
- METADATA wfs_onlinerelation, 547
- METADATA wfs_service_onlinerelation, 547
- METADATA wfs_srs, 547, 550
- METADATA wfs_title, 547, 550

WEB METADATA, 546

wfs

- LAYER CONNECTIONTYPE, 155

WFS Client, 550

- LAYER METADATA, 551
- Mapfile, 551

WFS Server, 541

- GML, 542
- Mapfile, 542
- SRS, 544

wfs_abstract

WFS METADATA, 546, 549
wfs_accessconstraints
 WFS METADATA, 546
wfs_anable_request
 WFS METADATA, 546, 549
wfs_encoding
 WFS METADATA, 547
wfs_extent
 WFS METADATA, 549
wfs_feature_collection
 WFS METADATA, 547
wfs_featureid
 WFS METADATA, 549
wfs_fees
 WFS METADATA, 547
wfs_getcapabilities_version
 WFS METADATA, 547
wfs_getfeature_formatlist
 WFS METADATA, 549
wfs_keywordlist
 WFS METADATA, 547, 549
wfs_maxfeatures
 WFS METADATA, 547
wfs_metadataurl_format
 WFS METADATA, 549
wfs_metadataurl_href
 WFS METADATA, 549
wfs_metadataurl_type
 WFS METADATA, 549
wfs_namespace_prefix
 WFS METADATA, 547
wfs_namespace_uri
 WFS METADATA, 547
wfs_onlineresource
 WFS METADATA, 547
wfs_service_onlineresource
 WFS METADATA, 547
wfs_srs
 WFS METADATA, 547, 550
wfs_title
 WFS METADATA, 547, 550
WIDTH
 STYLE, 184
Win32
 Compilation, 42
 Installation, 42
within
 Expressions, 134
WKT
 FEATURE, 137
WMC, 1011
WMS, 1011
 Cascading requests, 511
 GetLegendGraphic, 496
 GetMap, 495
 LAYER METADATA, 505
 Metadata, 501
 METADATA *gml_exclude_items*, 505
 METADATA *gml_geometries*, 505
 METADATA *gml_groups*, 505
 METADATA *gml_include_items*, 505
 METADATA *gml_xml_items*, 506
 METADATA *gml_[geometry name]_type*, 506
 METADATA *gml_[group name]_group*, 505
 METADATA *gml_[item name]_alias*, 506
 METADATA *gml_[item name]_type*, 506
 METADATA *ows_http_max_age*, 501
 METADATA *ows_schemas_location*, 501
 METADATA *ows_sld_enabled*, 501
 METADATA *ows_updatesequence*, 501
 METADATA *wms_abstract*, 501, 506
 METADATA *wms_accessconstraints*, 501
 METADATA *wms_address*, 501
 METADATA *wms_addresstype*, 501
 METADATA *wms_attribution_logourl_format*, 502, 506
 METADATA *wms_attribution_logourl_height*, 502, 506
 METADATA *wms_attribution_logourl_href*, 502, 507
 METADATA *wms_attribution_logourl_width*, 502, 507
 METADATA *wms_attribution_onlineresource*, 502, 507
 METADATA *wms_attribution_title*, 502, 507
 METADATA *wms_authorityurl_href*, 507
 METADATA *wms_authorityurl_name*, 507
 METADATA *wms_bbox_extended*, 502, 507
 METADATA *wms_city*, 501
 METADATA *wms_contactelectronicmailaddress*, 502
 METADATA *wms_contactfacsimiletelephone*, 502
 METADATA *wms_contactorganization*, 502
 METADATA *wms_contactperson*, 502
 METADATA *wms_contactposition*, 502
 METADATA *wms_contactvoicetelephone*, 502
 METADATA *wms_country*, 501
 METADATA *wms_dataurl_format*, 507
 METADATA *wms_dataurl_href*, 507
 METADATA *wms_enable_request*, 503, 507
 METADATA *wms_encoding*, 503
 METADATA *wms_exclude_items*, 508
 METADATA *wms_extent*, 508
 METADATA *wms_feature_info_mime_type*, 503
 METADATA *wms_fees*, 503
 METADATA *wms_getcapabilities_version*, 503
 METADATA *wms_getfeatureinfo_formatlist*, 508

METADATA wms_getlegendgraphic_formatlist, 503, 508
METADATA wms_getmap_formatlist, 503, 508
METADATA wms_group_abstract, 508
METADATA wms_group_title, 508
METADATA wms_identifier_authority, 508
METADATA wms_identifier_value, 508
METADATA wms_include_items, 509
METADATA wms_keywordlist, 503, 509
METADATA wms_keywordlist_vocabulary, 503, 509
METADATA wms_keywordlist_[vocabulary's name]_items, 504, 509
METADATA wms_languages, 504
METADATA wms_layer_group, 509
METADATA wms_layerlimit, 504
METADATA wms_metadataurl_format, 509
METADATA wms_metadataurl_href, 509
METADATA wms_metadataurl_type, 510
METADATA wms_onlineresource, 504
METADATA wms_opaque, 510
METADATA wms_postcode, 501
METADATA wms_resx, 504
METADATA wms_resy, 504
METADATA wms_rootlayer_abstract, 504
METADATA wms_rootlayer_keywordlist, 504
METADATA wms_rootlayer_title, 504
METADATA wms_service_onlineresource, 504
METADATA wms_srs, 505, 510
METADATA wms_stateorprovince, 501
METADATA wms_style, 510
METADATA wms_style_[style's_name]_legendurl_formats_city, 510
METADATA wms_style_[style's_name]_legendurl_heights_contactelectronicmailaddress, 510
METADATA wms_style_[style's_name]_legendurl_hrefms_contactfacsimiletelephone, 510
METADATA wms_style_[style's_name]_legendurl_widths_contactorganization, 510
METADATA wms_timeextent, 510
METADATA wms_timeformat, 505, 510
METADATA wms_timeitem, 511
METADATA wms_title, 505, 511
Vendor specific parameters, 511
Vendor specific parameters angle, 511
Vendor specific parameters radius, 511
Web map context, 534
WEB METADATA, 501

wms
 LAYER CONNECTIONTYPE, 155
WMS 1.3.0, 499
WMS Client, 519
 LAYER METADATA, 522
 Mapfile, 521

 WMS Server, 489
 Dimension requests, 531
 Mapfile, 491
 Setup, 491
 Time requests, 527

wms_abstract
 WMS METADATA, 501, 506

wms_accessconstraints
 WMS METADATA, 501

wms_address
 WMS METADATA, 501

wms_addresstype
 WMS METADATA, 501

wms_attribution_logourl_format
 WMS METADATA, 502, 506

wms_attribution_logourl_height
 WMS METADATA, 502, 506

wms_attribution_logourl_href
 WMS METADATA, 502, 507

wms_attribution_logourl_width
 WMS METADATA, 502, 507

wms_attribution_onlineresource
 WMS METADATA, 502, 507

wms_attribution_title
 WMS METADATA, 502, 507

wms_authorityurl_href
 WMS METADATA, 507

wms_authorityurl_name
 WMS METADATA, 507

wms_bbox_extended
 WMS METADATA, 502, 507

wms_contacts_email
 WMS METADATA, 501

wms_contacts_email
 WMS METADATA, 502

wms_contacts_facsimile
 WMS METADATA, 502

wms_contacts_organization
 WMS METADATA, 502

wms_contactperson
 WMS METADATA, 502

wms_contactposition
 WMS METADATA, 502

wms_contactvoicetelephone
 WMS METADATA, 502

wms_country
 WMS METADATA, 501

wms_dataurl_format
 WMS METADATA, 507

wms_dataurl_href
 WMS METADATA, 507

wms_enable_request
 WMS METADATA, 503, 507

wms_encoding

WMS METADATA, 503
 wms_exclude_items
 WMS METADATA, 508
 wms_extent
 WMS METADATA, 508
 wms_feature_info_mime_type
 WMS METADATA, 503
 wms_fees
 WMS METADATA, 503
 wms_getcapabilities_version
 WMS METADATA, 503
 wms_getfeatureinfo_formatlist
 WMS METADATA, 508
 wms_getlegendgraphic_formatlist
 WMS METADATA, 503, 508
 wms_getmap_formatlist
 WMS METADATA, 503, 508
 wms_group_abstract
 WMS METADATA, 508
 wms_group_title
 WMS METADATA, 508
 wms_identifier_authority
 WMS METADATA, 508
 wms_identifier_value
 WMS METADATA, 508
 wms_include_items
 WMS METADATA, 509
 wms_keywordlist
 WMS METADATA, 503, 509
 wms_keywordlist_vocabulary
 WMS METADATA, 503, 509
 wms_keywordlist_[vocabulary's name]_items
 WMS METADATA, 504, 509
 wms_languages
 WMS METADATA, 504
 wms_layer_group
 WMS METADATA, 509
 wms_layerlimit
 WMS METADATA, 504
 wms_metadataurl_format
 WMS METADATA, 509
 wms_metadataurl_href
 WMS METADATA, 509
 wms_metadataurl_type
 WMS METADATA, 510
 wms_onlineresource
 WMS METADATA, 504
 wms_opaque
 WMS METADATA, 510
 wms_postcode
 WMS METADATA, 501
 wms_resx
 WMS METADATA, 504
 wms_resy

WMS METADATA, 504
 wms_rootlayer_abstract
 WMS METADATA, 504
 wms_rootlayer_keywordlist
 WMS METADATA, 504
 wms_rootlayer_title
 WMS METADATA, 504
 wms_service_onlineresource
 WMS METADATA, 504
 wms_srs
 WMS METADATA, 505, 510
 wms_stateorprovince
 WMS METADATA, 501
 wms_style
 WMS METADATA, 510
 wms_style_[style's_name]_legendurl_format
 WMS METADATA, 510
 wms_style_[style's_name]_legendurl_height
 WMS METADATA, 510
 wms_style_[style's_name]_legendurl_href
 WMS METADATA, 510
 wms_style_[style's_name]_legendurl_width
 WMS METADATA, 510
 wms_timeextent
 WMS METADATA, 510
 wms_timeformat
 WMS METADATA, 505, 510
 wms_timeitem
 WMS METADATA, 511
 wms_title
 WMS METADATA, 505, 511
 World files
 Raster, 427
 WORLDFILE
 LAYER PROCESSING, 423
 WRAP
 LABEL, 155
 Wrapper
 Mapsript, 498
 Wrapper script
 Unix, 499
 WxS Services
 Mapsript wrappers, 608

X

x
 Raster query, 424

Y

y
 Raster query, 424

Z

zoom
 CGI, [678](#)
zoomdir
 CGI, [678](#)
zoomin
 CGI mode, [677](#)
zoomout
 CGI mode, [677](#)
zoomsize
 CGI, [678](#)