

MAGE

Generated by Doxygen 1.8.12

Contents

1	Namespace Index	1
1.1	Namespace List	1
2	Hierarchical Index	3
2.1	Class Hierarchy	3
3	Class Index	7
3.1	Class List	7
4	Namespace Documentation	11
4.1	Image Namespace Reference	11
4.1.1	Typedef Documentation	19
4.1.1.1	color	19
4.1.1.2	ComPtr	19
4.1.1.3	float2	19
4.1.1.4	float3	19
4.1.1.5	float4	19
4.1.1.6	int2	19
4.1.1.7	int3	20
4.1.1.8	SharedHandle	20
4.1.1.9	SharedPtr	20
4.1.1.10	UniqueHandle	20
4.1.1.11	UniquePtr	20
4.1.2	Enumeration Type Documentation	20
4.1.2.1	DDS_ALPHA_MODE	20

4.1.2.2	DDS_MISC_FLAGS2	20
4.1.2.3	ReadWriteMutexLockType	21
4.1.2.4	SpriteEffects	21
4.1.2.5	TokenResult	21
4.1.2.6	VariableType	21
4.1.3	Function Documentation	22
4.1.3.1	AllocAligned()	22
4.1.3.2	AtomicAdd() [1/2]	22
4.1.3.3	AtomicAdd() [2/2]	23
4.1.3.4	AtomicCompareAndSwap()	23
4.1.3.5	AtomicCompareAndSwapPointer()	24
4.1.3.6	BitsPerPixel()	24
4.1.3.7	BytesBigEndianToDouble()	24
4.1.3.8	BytesBigEndianToFloat()	24
4.1.3.9	BytesBigEndianToInt16()	24
4.1.3.10	BytesBigEndianToInt32()	25
4.1.3.11	BytesBigEndianToInt64()	25
4.1.3.12	BytesBigEndianToInt8()	25
4.1.3.13	BytesBigEndianToUInt16()	25
4.1.3.14	BytesBigEndianToUInt32()	25
4.1.3.15	BytesBigEndianToUInt64()	25
4.1.3.16	BytesBigEndianToUInt8()	25
4.1.3.17	BytesBigEndianToValue()	25
4.1.3.18	BytesLittleEndianToDouble()	25
4.1.3.19	BytesLittleEndianToFloat()	26
4.1.3.20	BytesLittleEndianToInt16()	26
4.1.3.21	BytesLittleEndianToInt32()	26
4.1.3.22	BytesLittleEndianToInt64()	26
4.1.3.23	BytesLittleEndianToInt8()	26
4.1.3.24	BytesLittleEndianToUInt16()	26

4.1.3.25	BytesLittleEndianToUInt32()	26
4.1.3.26	BytesLittleEndianToUInt64()	26
4.1.3.27	BytesLittleEndianToUInt8()	26
4.1.3.28	BytesToDouble()	27
4.1.3.29	BytesToFloat()	27
4.1.3.30	BytesToInt16()	27
4.1.3.31	BytesToInt32()	27
4.1.3.32	BytesToInt64()	27
4.1.3.33	BytesToInt8()	27
4.1.3.34	BytesToUInt16()	27
4.1.3.35	BytesToUInt32()	27
4.1.3.36	BytesToUInt64()	28
4.1.3.37	BytesToUInt8()	28
4.1.3.38	ComboBoxAdd()	28
4.1.3.39	ComboBoxContains()	28
4.1.3.40	ComboBoxCount()	29
4.1.3.41	ComboBoxSelect() [1/2]	29
4.1.3.42	ComboBoxSelect() [2/2]	29
4.1.3.43	ComboBoxSelected()	30
4.1.3.44	ComboBoxSomethingSelected()	30
4.1.3.45	CompileShaderFromFile()	30
4.1.3.46	ConsoleWidth()	31
4.1.3.47	ConvertToSRGB()	31
4.1.3.48	CreateD3DResources()	31
4.1.3.49	CreateDDSTextureFromFile() [1/4]	32
4.1.3.50	CreateDDSTextureFromFile() [2/4]	32
4.1.3.51	CreateDDSTextureFromFile() [3/4]	32
4.1.3.52	CreateDDSTextureFromFile() [4/4]	32
4.1.3.53	CreateDDSTextureFromFileEx() [1/4]	32
4.1.3.54	CreateDDSTextureFromFileEx() [2/4]	33

4.1.3.55	CreateDDSTextureFromFileEx() [3/4]	33
4.1.3.56	CreateDDSTextureFromFileEx() [4/4]	33
4.1.3.57	CreateDDSTextureFromMemory() [1/4]	33
4.1.3.58	CreateDDSTextureFromMemory() [2/4]	34
4.1.3.59	CreateDDSTextureFromMemory() [3/4]	34
4.1.3.60	CreateDDSTextureFromMemory() [4/4]	34
4.1.3.61	CreateDDSTextureFromMemoryEx() [1/4]	34
4.1.3.62	CreateDDSTextureFromMemoryEx() [2/4]	35
4.1.3.63	CreateDDSTextureFromMemoryEx() [3/4]	35
4.1.3.64	CreateDDSTextureFromMemoryEx() [4/4]	35
4.1.3.65	CreateLambertianShader()	35
4.1.3.66	CreateModelDescriptor()	36
4.1.3.67	CreateSharedHandle()	36
4.1.3.68	CreateTexture()	36
4.1.3.69	CreateTextureFromDDS()	36
4.1.3.70	CreateVariableScript()	36
4.1.3.71	Debug()	37
4.1.3.72	Error()	37
4.1.3.73	ExportVariableScriptToFile()	37
4.1.3.74	ExportVSToFile()	38
4.1.3.75	Fatal()	38
4.1.3.76	FillInitData()	38
4.1.3.77	FindWordEnd()	39
4.1.3.78	FreeAligned()	39
4.1.3.79	GetAlphaMode()	39
4.1.3.80	GetDXGIFormat()	39
4.1.3.81	GetFileExtension() [1/2]	39
4.1.3.82	GetFileExtension() [2/2]	40
4.1.3.83	GetFilename() [1/2]	40
4.1.3.84	GetFilename() [2/2]	40

4.1.3.85	GetFileName() [1/2]	41
4.1.3.86	GetFileName() [2/2]	41
4.1.3.87	GetModelRenderingDevice()	41
4.1.3.88	GetModelResourceFactory()	41
4.1.3.89	GetPathName() [1/2]	41
4.1.3.90	GetPathName() [2/2]	42
4.1.3.91	GetRenderingDevice()	42
4.1.3.92	GetResourceFactory()	42
4.1.3.93	GetSurfaceInfo()	42
4.1.3.94	GotoDelimiters() [1/2]	42
4.1.3.95	GotoDelimiters() [2/2]	43
4.1.3.96	HandleDeleter()	43
4.1.3.97	HasBool()	43
4.1.3.98	HasChars()	43
4.1.3.99	HasDouble()	43
4.1.3.100	HasFloat()	43
4.1.3.101	HasInt16()	43
4.1.3.102	HasInt32()	43
4.1.3.103	HasInt64()	44
4.1.3.104	HasInt8()	44
4.1.3.105	HasQuotedString()	44
4.1.3.106	HasString()	44
4.1.3.107	HasUInt16()	44
4.1.3.108	HasUInt32()	44
4.1.3.109	HasUInt64()	44
4.1.3.110	HasUInt8()	44
4.1.3.111	ImportFontFromFile()	45
4.1.3.112	ImportMaterialFromFile()	45
4.1.3.113	ImportMTLMaterialFromFile()	45
4.1.3.114	ImportOBJMeshFromFile()	45

4.1.3.115 ImportSpriteFontFromFile()	47
4.1.3.116 ImportTextureFromFile()	47
4.1.3.117 ImportVariableScriptFromFile()	47
4.1.3.118 ImportVSFromFile()	48
4.1.3.119 Info()	48
4.1.3.120 InitializeConsole()	48
4.1.3.121 InvertHandness() [1/4]	49
4.1.3.122 InvertHandness() [2/4]	49
4.1.3.123 InvertHandness() [3/4]	49
4.1.3.124 InvertHandness() [4/4]	49
4.1.3.125 LoadModelFromFile()	49
4.1.3.126 LoadTextureDataFromFile()	50
4.1.3.127 MainWindowProc()	50
4.1.3.128 MakeSRGB()	50
4.1.3.129 NumberOfSystemCores()	50
4.1.3.130 operator<<() [1/3]	51
4.1.3.131 operator<<() [2/3]	51
4.1.3.132 operator<<() [3/3]	51
4.1.3.133 Overlap()	51
4.1.3.134 OverlapStrict()	51
4.1.3.135 PrintConsoleHeader()	52
4.1.3.136 ProcessError()	52
4.1.3.137 ReadBinaryFile()	52
4.1.3.138 ReadBool()	52
4.1.3.139 ReadChars()	52
4.1.3.140 ReadDouble()	53
4.1.3.141 ReadFloat()	53
4.1.3.142 ReadFloat2()	53
4.1.3.143 ReadFloat3()	53
4.1.3.144 ReadFloat4()	53

4.1.3.145 ReadInt16()	53
4.1.3.146 ReadInt32()	54
4.1.3.147 ReadInt64()	54
4.1.3.148 ReadInt8()	54
4.1.3.149 ReadQuotedString()	54
4.1.3.150 ReadString()	54
4.1.3.151 ReadUInt16()	54
4.1.3.152 ReadUInt32()	55
4.1.3.153 ReadUInt64()	55
4.1.3.154 ReadUInt8()	55
4.1.3.155 RejectDisplayMode()	55
4.1.3.156 RemoveAndDestructAllElements()	55
4.1.3.157 RemoveAndDestructAllSecondElements()	56
4.1.3.158 RemoveIf()	56
4.1.3.159 SafeHandle()	57
4.1.3.160 SetDebugObjectName()	57
4.1.3.161 SettingsDialogProcDelegate()	57
4.1.3.162 SkipDelimiters() [1/2]	57
4.1.3.163 SkipDelimiters() [2/2]	57
4.1.3.164 str_contains() [1/4]	58
4.1.3.165 str_contains() [2/4]	59
4.1.3.166 str_contains() [3/4]	59
4.1.3.167 str_contains() [4/4]	59
4.1.3.168 str_convert() [1/4]	60
4.1.3.169 str_convert() [2/4]	60
4.1.3.170 str_convert() [3/4]	60
4.1.3.171 str_convert() [4/4]	61
4.1.3.172 str_equals() [1/2]	61
4.1.3.173 str_equals() [2/2]	61
4.1.3.174 str_escape_first() [1/4]	62

4.1.3.175 <code>str_escape_first()</code> [2/4]	62
4.1.3.176 <code>str_escape_first()</code> [3/4]	63
4.1.3.177 <code>str_escape_first()</code> [4/4]	63
4.1.3.178 <code>str_gets()</code> [1/2]	63
4.1.3.179 <code>str_gets()</code> [2/2]	64
4.1.3.180 <code>StringPrefixToDouble()</code>	64
4.1.3.181 <code>StringPrefixToFloat()</code>	64
4.1.3.182 <code>StringPrefixToInt16()</code>	65
4.1.3.183 <code>StringPrefixToInt32()</code>	65
4.1.3.184 <code>StringPrefixToInt64()</code>	65
4.1.3.185 <code>StringPrefixToInt8()</code>	65
4.1.3.186 <code>StringPrefixToUInt16()</code>	65
4.1.3.187 <code>StringPrefixToUInt32()</code>	65
4.1.3.188 <code>StringPrefixToUInt64()</code>	65
4.1.3.189 <code>StringPrefixToUInt8()</code>	65
4.1.3.190 <code>StringToBool()</code> [1/2]	66
4.1.3.191 <code>StringToBool()</code> [2/2]	66
4.1.3.192 <code>StringToDouble()</code> [1/2]	66
4.1.3.193 <code>StringToDouble()</code> [2/2]	66
4.1.3.194 <code>StringToFloat()</code> [1/2]	66
4.1.3.195 <code>StringToFloat()</code> [2/2]	66
4.1.3.196 <code>StringToInt16()</code> [1/2]	66
4.1.3.197 <code>StringToInt16()</code> [2/2]	67
4.1.3.198 <code>StringToInt32()</code> [1/2]	67
4.1.3.199 <code>StringToInt32()</code> [2/2]	67
4.1.3.200 <code>StringToInt64()</code> [1/2]	67
4.1.3.201 <code>StringToInt64()</code> [2/2]	67
4.1.3.202 <code>StringToInt8()</code> [1/2]	67
4.1.3.203 <code>StringToInt8()</code> [2/2]	67
4.1.3.204 <code>StringToUInt16()</code> [1/2]	68

4.1.3.205	StringToUInt16() [2/2]	68
4.1.3.206	StringToUInt32() [1/2]	68
4.1.3.207	StringToUInt32() [2/2]	68
4.1.3.208	StringToUInt64() [1/2]	68
4.1.3.209	StringToUInt64() [2/2]	68
4.1.3.210	StringToUInt8() [1/2]	68
4.1.3.211	StringToUInt8() [2/2]	69
4.1.3.212	Union() [1/2]	69
4.1.3.213	Union() [2/2]	69
4.1.3.214	Warning()	69
4.1.4	Variable Documentation	70
4.1.4.1	DDS_MAGIC	70
4.1.4.2	g_device_enumeration	70
4.1.4.3	g_engine	70
4.1.4.4	g_feature_levels	70
4.1.4.5	g_logging_configuration	70
4.1.4.6	g_pixel_formats	70
5	Class Documentation	71
5.1	mage::AABB Struct Reference	71
5.1.1	Detailed Description	71
5.1.2	Constructor & Destructor Documentation	72
5.1.2.1	AABB() [1/5]	72
5.1.2.2	AABB() [2/5]	72
5.1.2.3	AABB() [3/5]	72
5.1.2.4	AABB() [4/5]	72
5.1.2.5	AABB() [5/5]	73
5.1.2.6	~AABB()	73
5.1.3	Member Function Documentation	73
5.1.3.1	Centroid()	73
5.1.3.2	Diagonal()	73

5.1.3.3	EnclosedBy()	73
5.1.3.4	EnclosedStrictBy()	74
5.1.3.5	Encloses() [1/3]	74
5.1.3.6	Encloses() [2/3]	74
5.1.3.7	Encloses() [3/3]	76
5.1.3.8	EnclosesStrict() [1/3]	76
5.1.3.9	EnclosesStrict() [2/3]	76
5.1.3.10	EnclosesStrict() [3/3]	77
5.1.3.11	operator=()	77
5.1.3.12	Overlaps()	77
5.1.3.13	OverlapsStrict()	78
5.1.4	Member Data Documentation	78
5.1.4.1	p_max	78
5.1.4.2	p_min	78
5.2	mage::Variable::AbstractValue Struct Reference	78
5.2.1	Detailed Description	79
5.2.2	Constructor & Destructor Documentation	79
5.2.2.1	~AbstractValue()	79
5.2.2.2	AbstractValue() [1/2]	79
5.2.2.3	AbstractValue() [2/2]	79
5.2.3	Member Function Documentation	80
5.2.3.1	GetValue()	80
5.2.3.2	operator=()	80
5.3	mage::BehaviorScript Class Reference	80
5.3.1	Detailed Description	81
5.3.2	Constructor & Destructor Documentation	81
5.3.2.1	BehaviorScript() [1/2]	81
5.3.2.2	~BehaviorScript()	81
5.3.2.3	BehaviorScript() [2/2]	81
5.3.3	Member Function Documentation	81

5.3.3.1	Close()	81
5.3.3.2	GetName()	81
5.3.3.3	Load()	82
5.3.3.4	operator=()	82
5.3.3.5	SetName()	82
5.3.3.6	Update()	82
5.3.4	Member Data Documentation	82
5.3.4.1	m_name	82
5.4	mage::BigEndianBinaryReader Class Reference	83
5.4.1	Constructor & Destructor Documentation	83
5.4.1.1	BigEndianBinaryReader() [1/2]	83
5.4.1.2	~BigEndianBinaryReader()	84
5.4.1.3	BigEndianBinaryReader() [2/2]	84
5.4.2	Member Function Documentation	84
5.4.2.1	GetFilename()	84
5.4.2.2	HasCharsLeft()	84
5.4.2.3	operator=()	84
5.4.2.4	Read()	84
5.4.2.5	ReadFromFile()	84
5.4.2.6	ReadFromMemory()	84
5.4.2.7	ReadValue()	85
5.4.2.8	ReadValueArray()	85
5.4.3	Member Data Documentation	85
5.4.3.1	m_data	85
5.4.3.2	m_end	85
5.4.3.3	m_fname	85
5.4.3.4	m_pos	85
5.5	mage::BinaryReader Class Reference	85
5.5.1	Constructor & Destructor Documentation	86
5.5.1.1	BinaryReader() [1/2]	86

5.5.1.2	~BinaryReader()	86
5.5.1.3	BinaryReader() [2/2]	86
5.5.2	Member Function Documentation	87
5.5.2.1	GetFilename()	87
5.5.2.2	HasCharsLeft()	87
5.5.2.3	operator=()	87
5.5.2.4	Read()	87
5.5.2.5	ReadChars()	87
5.5.2.6	ReadDouble()	87
5.5.2.7	ReadFloat()	87
5.5.2.8	ReadFromFile()	87
5.5.2.9	ReadFromMemory()	87
5.5.2.10	ReadInt16()	88
5.5.2.11	ReadInt32()	88
5.5.2.12	ReadInt64()	88
5.5.2.13	ReadInt8()	88
5.5.2.14	ReadUInt16()	88
5.5.2.15	ReadUInt32()	88
5.5.2.16	ReadUInt64()	88
5.5.2.17	ReadUInt8()	88
5.5.3	Member Data Documentation	88
5.5.3.1	m_big_endian	88
5.5.3.2	m_data	88
5.5.3.3	m_end	89
5.5.3.4	m_fname	89
5.5.3.5	m_pos	89
5.6	mage::BS Struct Reference	89
5.6.1	Detailed Description	89
5.6.2	Constructor & Destructor Documentation	90
5.6.2.1	BS() [1/5]	90

5.6.2.2	BS() [2/5]	90
5.6.2.3	BS() [3/5]	90
5.6.2.4	BS() [4/5]	90
5.6.2.5	BS() [5/5]	90
5.6.2.6	~BS()	91
5.6.3	Member Function Documentation	91
5.6.3.1	Centroid()	91
5.6.3.2	EnclosedBy()	91
5.6.3.3	EnclosedStrictBy()	91
5.6.3.4	Encloses() [1/3]	92
5.6.3.5	Encloses() [2/3]	92
5.6.3.6	Encloses() [3/3]	92
5.6.3.7	EnclosesStrict() [1/3]	93
5.6.3.8	EnclosesStrict() [2/3]	93
5.6.3.9	EnclosesStrict() [3/3]	93
5.6.3.10	operator=()	94
5.6.4	Member Data Documentation	94
5.6.4.1	p	94
5.6.4.2	r	94
5.7	Image::Camera Class Reference	94
5.7.1	Detailed Description	95
5.7.2	Constructor & Destructor Documentation	95
5.7.2.1	~Camera()	95
5.7.2.2	Camera() [1/2]	95
5.7.2.3	Camera() [2/2]	96
5.7.3	Member Function Documentation	96
5.7.3.1	Clone()	96
5.7.3.2	GetFarZ()	96
5.7.3.3	GetHeight()	97
5.7.3.4	GetNearZ()	97

5.7.3.5	GetViewToProjectionMatrix()	97
5.7.3.6	GetWidth()	97
5.7.3.7	operator=()	97
5.7.3.8	SetFarZ()	98
5.7.3.9	SetHeight()	98
5.7.3.10	SetNearAndFarZ()	98
5.7.3.11	SetNearZ()	99
5.7.3.12	SetWidth()	99
5.7.3.13	SetWidthAndHeight()	99
5.7.4	Member Data Documentation	100
5.7.4.1	m_far_z	100
5.7.4.2	m_height	100
5.7.4.3	m_near_z	100
5.7.4.4	m_width	100
5.8	image::CartesianAxesSystem Struct Reference	100
5.8.1	Detailed Description	101
5.8.2	Constructor & Destructor Documentation	101
5.8.2.1	CartesianAxesSystem() [1/5]	101
5.8.2.2	CartesianAxesSystem() [2/5]	101
5.8.2.3	CartesianAxesSystem() [3/5]	101
5.8.2.4	CartesianAxesSystem() [4/5]	102
5.8.2.5	CartesianAxesSystem() [5/5]	102
5.8.2.6	~CartesianAxesSystem()	102
5.8.3	Member Function Documentation	102
5.8.3.1	GetAxisX()	102
5.8.3.2	GetAxisY()	103
5.8.3.3	GetAxisZ()	103
5.8.3.4	operator=()	103
5.8.4	Member Data Documentation	103
5.8.4.1	m_x	103

5.8.4.2	m_y	104
5.8.4.3	m_z	104
5.9	mage::CartesianCoordinateSystem Struct Reference	104
5.9.1	Detailed Description	104
5.9.2	Constructor & Destructor Documentation	104
5.9.2.1	CartesianCoordinateSystem() [1/3]	104
5.9.2.2	CartesianCoordinateSystem() [2/3]	105
5.9.2.3	CartesianCoordinateSystem() [3/3]	105
5.9.2.4	~CartesianCoordinateSystem()	105
5.9.3	Member Function Documentation	105
5.9.3.1	GetAxes()	105
5.9.3.2	GetAxisX()	106
5.9.3.3	GetAxisY()	106
5.9.3.4	GetAxisZ()	106
5.9.3.5	GetOrigin()	106
5.9.3.6	operator=()	106
5.9.4	Member Data Documentation	107
5.9.4.1	m_axes	107
5.9.4.2	m_o	107
5.10	mage::Color Struct Reference	107
5.10.1	Constructor & Destructor Documentation	107
5.10.1.1	Color() [1/4]	107
5.10.1.2	Color() [2/4]	108
5.10.1.3	Color() [3/4]	108
5.10.1.4	Color() [4/4]	108
5.10.1.5	~Color()	108
5.10.2	Member Function Documentation	108
5.10.2.1	operator=()	108
5.11	mage::CombinedShader Struct Reference	108
5.11.1	Constructor & Destructor Documentation	109

5.11.1.1	CombinedShader() [1/2]	109
5.11.1.2	CombinedShader() [2/2]	109
5.11.1.3	~CombinedShader()	109
5.11.2	Member Function Documentation	109
5.11.2.1	GetPixelShader()	109
5.11.2.2	GetVertexShader()	109
5.11.2.3	operator=()	109
5.11.2.4	Render()	109
5.11.2.5	SetPixelShader()	110
5.11.2.6	SetVertexShader()	110
5.11.3	Member Data Documentation	110
5.11.3.1	m_pixel_shader	110
5.11.3.2	m_vertex_shader	110
5.12	mage::ConditionVariable Class Reference	110
5.12.1	Detailed Description	111
5.12.2	Member Enumeration Documentation	111
5.12.2.1	anonymous enum	111
5.12.3	Constructor & Destructor Documentation	111
5.12.3.1	ConditionVariable() [1/2]	111
5.12.3.2	~ConditionVariable()	111
5.12.3.3	ConditionVariable() [2/2]	111
5.12.4	Member Function Documentation	112
5.12.4.1	Lock()	112
5.12.4.2	operator=()	112
5.12.4.3	Signal()	112
5.12.4.4	Unlock()	112
5.12.4.5	Wait()	112
5.12.5	Member Data Documentation	113
5.12.5.1	m_condition_mutex	113
5.12.5.2	m_events	113

5.12.5.3	m_nb_waiters	113
5.12.5.4	m_nb_waiters_mutex	113
5.13	mage::DDS_HEADER Struct Reference	113
5.13.1	Member Data Documentation	114
5.13.1.1	caps	114
5.13.1.2	caps2	114
5.13.1.3	caps3	114
5.13.1.4	caps4	114
5.13.1.5	ddspf	114
5.13.1.6	depth	114
5.13.1.7	flags	114
5.13.1.8	height	114
5.13.1.9	mip_map_count	114
5.13.1.10	pitch_or_linear_size	114
5.13.1.11	reserved1	115
5.13.1.12	reserved2	115
5.13.1.13	size	115
5.13.1.14	width	115
5.14	mage::DDS_HEADER_DXT10 Struct Reference	115
5.14.1	Member Data Documentation	115
5.14.1.1	array_size	115
5.14.1.2	dxgi_format	115
5.14.1.3	misc_flag	115
5.14.1.4	misc_flags2	116
5.14.1.5	resource_dimension	116
5.15	mage::DDS_PIXELFORMAT Struct Reference	116
5.15.1	Member Data Documentation	116
5.15.1.1	ABitMask	116
5.15.1.2	BBitMask	116
5.15.1.3	flags	116

5.15.1.4	fourCC	116
5.15.1.5	GBitMask	116
5.15.1.6	RBitMask	117
5.15.1.7	RGBBitCount	117
5.15.1.8	size	117
5.16	mage::DeviceEnumeration Class Reference	117
5.16.1	Detailed Description	118
5.16.2	Constructor & Destructor Documentation	118
5.16.2.1	DeviceEnumeration() [1/2]	118
5.16.2.2	~DeviceEnumeration()	118
5.16.2.3	DeviceEnumeration() [2/2]	118
5.16.3	Member Function Documentation	118
5.16.3.1	Enumerate()	118
5.16.3.2	GetAdapter()	119
5.16.3.3	GetDisplayMode()	119
5.16.3.4	GetOutput()	119
5.16.3.5	InitializeAdapterAndOutput()	119
5.16.3.6	InitializeDisplayModes()	119
5.16.3.7	IsFullScreen()	120
5.16.3.8	IsVSynced()	120
5.16.3.9	IsWindowed()	120
5.16.3.10	operator=()	120
5.16.3.11	SettingsDialogProc()	121
5.16.4	Friends And Related Function Documentation	121
5.16.4.1	Engine	121
5.16.4.2	SettingsDialogProcDelegate	121
5.16.5	Member Data Documentation	122
5.16.5.1	m_adapter	122
5.16.5.2	m_display_modes	122
5.16.5.3	m_output	122

5.16.5.4	m_selected_display_mode	122
5.16.5.5	m_settings_script	122
5.16.5.6	m_vsync	122
5.16.5.7	m_windowed	122
5.17	mage::Direction3 Struct Reference	123
5.17.1	Constructor & Destructor Documentation	123
5.17.1.1	Direction3() [1/6]	123
5.17.1.2	Direction3() [2/6]	123
5.17.1.3	Direction3() [3/6]	123
5.17.1.4	Direction3() [4/6]	123
5.17.1.5	Direction3() [5/6]	124
5.17.1.6	Direction3() [6/6]	124
5.17.1.7	~Direction3()	124
5.17.2	Member Function Documentation	124
5.17.2.1	operator=()	124
5.18	mage::EmptyPixelShader Class Reference	124
5.18.1	Constructor & Destructor Documentation	125
5.18.1.1	EmptyPixelShader() [1/2]	125
5.18.1.2	~EmptyPixelShader()	125
5.18.1.3	EmptyPixelShader() [2/2]	125
5.18.2	Member Function Documentation	125
5.18.2.1	operator=()	125
5.18.2.2	Render()	125
5.19	mage::EmptyVertexShader Class Reference	125
5.19.1	Constructor & Destructor Documentation	126
5.19.1.1	EmptyVertexShader() [1/2]	126
5.19.1.2	~EmptyVertexShader()	126
5.19.1.3	EmptyVertexShader() [2/2]	126
5.19.2	Member Function Documentation	126
5.19.2.1	operator=()	126

5.19.2.2	Render()	126
5.20	mage::Engine Class Reference	127
5.20.1	Detailed Description	127
5.20.2	Constructor & Destructor Documentation	128
5.20.2.1	Engine() [1/2]	128
5.20.2.2	~Engine()	129
5.20.2.3	Engine() [2/2]	129
5.20.3	Member Function Documentation	129
5.20.3.1	GetInputManager()	129
5.20.3.2	GetMainWindow()	129
5.20.3.3	GetRenderer()	130
5.20.3.4	GetResourceFactory()	130
5.20.3.5	InitializeSystems()	130
5.20.3.6	IsDeactive()	130
5.20.3.7	ModeSwitch()	131
5.20.3.8	operator=()	131
5.20.3.9	Run()	131
5.20.3.10	SetDeactiveFlag()	131
5.20.3.11	SetModeSwitchFlag()	132
5.20.3.12	SetScene()	132
5.20.4	Member Data Documentation	132
5.20.4.1	m_deactive	132
5.20.4.2	m_input_manager	132
5.20.4.3	m_main_window	132
5.20.4.4	m_mode_switch	132
5.20.4.5	m_renderer	133
5.20.4.6	m_resource_factory	133
5.20.4.7	m_scene	133
5.21	mage::EngineSetup Struct Reference	133
5.21.1	Detailed Description	134

5.21.2	Constructor & Destructor Documentation	134
5.21.2.1	~EngineSetup()	134
5.21.2.2	EngineSetup() [1/2]	134
5.21.2.3	EngineSetup() [2/2]	134
5.21.3	Member Function Documentation	134
5.21.3.1	CreateScene()	134
5.21.3.2	GetApplicationHinstance()	135
5.21.3.3	GetApplicationName()	135
5.21.3.4	operator=()	135
5.21.4	Member Data Documentation	135
5.21.4.1	m_hinstance	135
5.21.4.2	m_name	135
5.22	mage::FontReader Class Reference	136
5.22.1	Constructor & Destructor Documentation	136
5.22.1.1	FontReader() [1/2]	136
5.22.1.2	~FontReader()	136
5.22.1.3	FontReader() [2/2]	137
5.22.2	Member Function Documentation	137
5.22.2.1	IsHeaderValid()	137
5.22.2.2	operator=()	137
5.22.2.3	Read()	137
5.22.2.4	ReadTexture()	137
5.22.3	Member Data Documentation	137
5.22.3.1	m_desc	137
5.22.3.2	m_device	137
5.22.3.3	m_output	137
5.23	mage::Glyph Struct Reference	137
5.23.1	Constructor & Destructor Documentation	138
5.23.1.1	Glyph() [1/2]	138
5.23.1.2	Glyph() [2/2]	138

5.23.1.3	~Glyph()	138
5.23.2	Member Function Documentation	138
5.23.2.1	operator<() [1/2]	138
5.23.2.2	operator<() [2/2]	139
5.23.2.3	operator=()	139
5.23.3	Member Data Documentation	139
5.23.3.1	"@2	139
5.23.3.2	m_advance_x	139
5.23.3.3	m_character	139
5.23.3.4	m_offset_x	139
5.23.3.5	m_offset_y	139
5.23.3.6	m_offsets	139
5.23.3.7	m_sub_rectangle	139
5.24	mage::GlyphLessThan Struct Reference	140
5.24.1	Constructor & Destructor Documentation	140
5.24.1.1	GlyphLessThan() [1/2]	140
5.24.1.2	GlyphLessThan() [2/2]	140
5.24.1.3	~GlyphLessThan()	140
5.24.2	Member Function Documentation	140
5.24.2.1	operator>() [1/3]	140
5.24.2.2	operator>() [2/3]	140
5.24.2.3	operator>() [3/3]	140
5.24.2.4	operator=()	141
5.25	mage::HandleCloser Struct Reference	141
5.25.1	Member Function Documentation	141
5.25.1.1	operator>()	141
5.26	mage::IdGenerator Struct Reference	141
5.26.1	Detailed Description	141
5.26.2	Constructor & Destructor Documentation	141
5.26.2.1	IdGenerator() [1/2]	141

5.26.2.2	~IdGenerator()	142
5.26.2.3	IdGenerator() [2/2]	142
5.26.3	Member Function Documentation	142
5.26.3.1	GetNextId()	142
5.26.3.2	operator=()	142
5.26.4	Member Data Documentation	143
5.26.4.1	m_current_id	143
5.27	mage::InputManager Class Reference	143
5.27.1	Detailed Description	144
5.27.2	Constructor & Destructor Documentation	144
5.27.2.1	InputManager() [1/2]	144
5.27.2.2	~InputManager()	144
5.27.2.3	InputManager() [2/2]	144
5.27.3	Member Function Documentation	144
5.27.3.1	GetHandle()	144
5.27.3.2	GetKeyboard()	145
5.27.3.3	GetMouse()	145
5.27.3.4	InitializeDI()	145
5.27.3.5	InitializeInputSystems()	145
5.27.3.6	operator=()	145
5.27.3.7	Update()	146
5.27.4	Member Data Documentation	146
5.27.4.1	m_di	146
5.27.4.2	m_hwindow	146
5.27.4.3	m_keyboard	146
5.27.4.4	m_mouse	146
5.28	mage::Keyboard Class Reference	146
5.28.1	Detailed Description	147
5.28.2	Constructor & Destructor Documentation	147
5.28.2.1	Keyboard() [1/2]	147

5.28.2.2	~Keyboard()	147
5.28.2.3	Keyboard() [2/2]	148
5.28.3	Member Function Documentation	148
5.28.3.1	GetHandle()	148
5.28.3.2	GetKeyPress()	148
5.28.3.3	InitializeKeyboard()	148
5.28.3.4	operator=()	149
5.28.3.5	Update()	149
5.28.4	Member Data Documentation	149
5.28.4.1	m_hwindow	149
5.28.4.2	m_key_press_stamp	149
5.28.4.3	m_key_state	150
5.28.4.4	m_keyboard	150
5.28.4.5	m_press_stamp	150
5.29	mage::LambertianPixelShader Class Reference	150
5.29.1	Constructor & Destructor Documentation	151
5.29.1.1	LambertianPixelShader() [1/2]	151
5.29.1.2	~LambertianPixelShader()	151
5.29.1.3	LambertianPixelShader() [2/2]	151
5.29.2	Member Function Documentation	151
5.29.2.1	operator=()	151
5.29.2.2	Render()	151
5.29.3	Member Data Documentation	151
5.29.3.1	m_cb_material	151
5.29.3.2	m_sampler	152
5.30	mage::LambertianVertexShader Class Reference	152
5.30.1	Constructor & Destructor Documentation	152
5.30.1.1	LambertianVertexShader() [1/2]	152
5.30.1.2	~LambertianVertexShader()	152
5.30.1.3	LambertianVertexShader() [2/2]	153

5.30.2	Member Function Documentation	153
5.30.2.1	operator=()	153
5.30.2.2	Render()	153
5.30.3	Member Data Documentation	153
5.30.3.1	m_cb_transform	153
5.31	mage::LineReader Class Reference	153
5.31.1	Constructor & Destructor Documentation	155
5.31.1.1	LineReader() [1/2]	155
5.31.1.2	~LineReader()	155
5.31.1.3	LineReader() [2/2]	155
5.31.2	Member Function Documentation	155
5.31.2.1	GetCurrentLineNumber()	155
5.31.2.2	GetDelimiters()	155
5.31.2.3	GetFilename()	155
5.31.2.4	HasBool()	155
5.31.2.5	HasChars()	155
5.31.2.6	HasDouble()	155
5.31.2.7	HasFloat()	156
5.31.2.8	HasInt16()	156
5.31.2.9	HasInt32()	156
5.31.2.10	HasInt64()	156
5.31.2.11	HasInt8()	156
5.31.2.12	HasQuotedString()	156
5.31.2.13	HasString()	156
5.31.2.14	HasUInt16()	156
5.31.2.15	HasUInt32()	156
5.31.2.16	HasUInt64()	156
5.31.2.17	HasUInt8()	157
5.31.2.18	operator=()	157
5.31.2.19	Postprocess()	157

5.31.2.20 Preprocess()	157
5.31.2.21 ReadBool()	157
5.31.2.22 ReadChars()	157
5.31.2.23 ReadDouble()	157
5.31.2.24 ReadFloat()	157
5.31.2.25 ReadFloat2()	157
5.31.2.26 ReadFloat3()	158
5.31.2.27 ReadFloat4()	158
5.31.2.28 ReadFromFile()	158
5.31.2.29 ReadFromMemory()	158
5.31.2.30 ReadInt16()	158
5.31.2.31 ReadInt32()	158
5.31.2.32 ReadInt64()	158
5.31.2.33 ReadInt8()	158
5.31.2.34 ReadLine()	158
5.31.2.35 ReadLineRemaining()	159
5.31.2.36 ReadQuotedString()	159
5.31.2.37 ReadString()	159
5.31.2.38 ReadUInt16()	159
5.31.2.39 ReadUInt32()	159
5.31.2.40 ReadUInt64()	159
5.31.2.41 ReadUInt8()	159
5.31.3 Member Data Documentation	159
5.31.3.1 m_context	159
5.31.3.2 m_delimiters	159
5.31.3.3 m_fname	159
5.31.3.4 m_line_number	160
5.32 mage::Loadable Class Reference	160
5.32.1 Detailed Description	160
5.32.2 Constructor & Destructor Documentation	160

5.32.2.1	Loadable() [1/2]	160
5.32.2.2	Loadable() [2/2]	161
5.32.2.3	~Loadable()	161
5.32.3	Member Function Documentation	161
5.32.3.1	IsLoaded()	161
5.32.3.2	operator=()	161
5.32.3.3	SetLoaded()	162
5.32.4	Member Data Documentation	162
5.32.4.1	m_loaded	162
5.33	mage::LoggingConfiguration Struct Reference	162
5.33.1	Detailed Description	162
5.33.2	Constructor & Destructor Documentation	163
5.33.2.1	LoggingConfiguration() [1/2]	163
5.33.2.2	LoggingConfiguration() [2/2]	163
5.33.2.3	~LoggingConfiguration()	163
5.33.3	Member Function Documentation	163
5.33.3.1	IsQuiet()	163
5.33.3.2	IsVerbose()	163
5.33.3.3	operator=()	163
5.33.4	Member Data Documentation	164
5.33.4.1	m_quiet	164
5.33.4.2	m_verbose	164
5.34	mage::MainWindow Class Reference	164
5.34.1	Detailed Description	165
5.34.2	Constructor & Destructor Documentation	165
5.34.2.1	MainWindow() [1/2]	165
5.34.2.2	~MainWindow()	165
5.34.2.3	MainWindow() [2/2]	166
5.34.3	Member Function Documentation	166
5.34.3.1	GetHandle()	166

5.34.3.2	GetInstance()	166
5.34.3.3	GetName()	166
5.34.3.4	InitializeWindow() [1/2]	166
5.34.3.5	InitializeWindow() [2/2]	167
5.34.3.6	operator=()	167
5.34.3.7	Show()	167
5.34.3.8	UninitializeWindow()	168
5.34.4	Member Data Documentation	168
5.34.4.1	m_hinstance	168
5.34.4.2	m_hwindow	168
5.34.4.3	m_name	168
5.35	mage::Material Struct Reference	168
5.35.1	Constructor & Destructor Documentation	169
5.35.1.1	Material() [1/2]	169
5.35.1.2	Material() [2/2]	169
5.35.1.3	~Material()	169
5.35.2	Member Function Documentation	170
5.35.2.1	operator=()	170
5.35.3	Member Data Documentation	170
5.35.3.1	m_ambient_reflectivity	170
5.35.3.2	m_ambient_reflectivity_texture	170
5.35.3.3	m_bump_texture	170
5.35.3.4	m_decals_texture	170
5.35.3.5	m_diffuse_reflectivity	170
5.35.3.6	m_diffuse_reflectivity_texture	170
5.35.3.7	m_displacement_texture	171
5.35.3.8	m_dissolve	171
5.35.3.9	m_dissolve_texture	171
5.35.3.10	m_index_of_refraction	171
5.35.3.11	m_name	171

5.35.3.12	m_specular_exponent	171
5.35.3.13	m_specular_exponent_texture	171
5.35.3.14	m_specular_reflectivity	172
5.35.3.15	m_specular_reflectivity_texture	172
5.35.3.16	m_transmission_filter	172
5.36	mage::MaterialBuffer Struct Reference	172
5.36.1	Member Data Documentation	172
5.36.1.1	x	172
5.37	mage::MemoryArena Class Reference	172
5.37.1	Detailed Description	173
5.37.2	Constructor & Destructor Documentation	173
5.37.2.1	MemoryArena() [1/2]	173
5.37.2.2	~MemoryArena()	173
5.37.2.3	MemoryArena() [2/2]	173
5.37.3	Member Function Documentation	174
5.37.3.1	Alloc() [1/2]	174
5.37.3.2	Alloc() [2/2]	174
5.37.3.3	GetBlockSize()	175
5.37.3.4	GetCurrentBlockPtr()	175
5.37.3.5	GetCurrentBlockSize()	175
5.37.3.6	GetTotalBlockSize()	175
5.37.3.7	operator=()	175
5.37.3.8	Reset()	176
5.37.4	Member Data Documentation	176
5.37.4.1	m_available_blocks	176
5.37.4.2	m_block_size	176
5.37.4.3	m_current_block	176
5.37.4.4	m_current_block_pos	176
5.37.4.5	m_used_blocks	176
5.38	mage::Mesh Class Reference	176

5.38.1 Detailed Description	177
5.38.2 Constructor & Destructor Documentation	177
5.38.2.1 Mesh() [1/3]	177
5.38.2.2 Mesh() [2/3]	178
5.38.2.3 ~Mesh()	178
5.38.2.4 Mesh() [3/3]	179
5.38.3 Member Function Documentation	179
5.38.3.1 GetNumberOfIndices()	179
5.38.3.2 GetNumberOfVertices()	179
5.38.3.3 operator=()	179
5.38.3.4 Render()	180
5.38.4 Member Data Documentation	180
5.38.4.1 m_index_buffer	180
5.38.4.2 m_nb_indices	180
5.38.4.3 m_nb_vertices	180
5.38.4.4 m_vertex_buffer	180
5.38.4.5 m_vertex_size	180
5.39 mage::MeshDescriptor< VertexT > Struct Template Reference	180
5.39.1 Constructor & Destructor Documentation	181
5.39.1.1 MeshDescriptor() [1/2]	181
5.39.1.2 MeshDescriptor() [2/2]	181
5.39.1.3 ~MeshDescriptor()	181
5.39.2 Member Function Documentation	181
5.39.2.1 ClockwiseOrder()	181
5.39.2.2 InvertHandness()	182
5.39.2.3 operator=()	182
5.39.3 Member Data Documentation	182
5.39.3.1 m_clockwise_order	182
5.39.3.2 m_invert_handedness	182
5.40 mage::MeshModel Class Reference	182

5.40.1	Constructor & Destructor Documentation	183
5.40.1.1	MeshModel() [1/2]	183
5.40.1.2	MeshModel() [2/2]	183
5.40.1.3	~MeshModel()	183
5.40.2	Member Function Documentation	183
5.40.2.1	Clone()	183
5.40.2.2	GetMesh()	183
5.40.2.3	InitializeModel()	184
5.40.2.4	operator=()	184
5.40.2.5	RenderModel()	184
5.40.3	Member Data Documentation	184
5.40.3.1	m_mesh	184
5.41	mage::Model Class Reference	184
5.41.1	Detailed Description	185
5.41.2	Constructor & Destructor Documentation	185
5.41.2.1	~Model()	185
5.41.2.2	Model() [1/2]	185
5.41.2.3	Model() [2/2]	186
5.41.3	Member Function Documentation	186
5.41.3.1	AddSubModel()	186
5.41.3.2	Clone()	186
5.41.3.3	GetNumberOfSubModels()	186
5.41.3.4	GetSubModel()	186
5.41.3.5	HasSubModel()	186
5.41.3.6	operator=()	186
5.41.3.7	Render()	186
5.41.3.8	RenderModel()	187
5.41.3.9	RenderSubModels()	187
5.41.3.10	SubModelsBegin() [1/2]	187
5.41.3.11	SubModelsBegin() [2/2]	187

5.41.3.12 SubModelsEnd() [1/2]	187
5.41.3.13 SubModelsEnd() [2/2]	187
5.41.4 Member Data Documentation	187
5.41.4.1 m_submodels	187
5.42 mage::ModelDescriptor Class Reference	187
5.42.1 Constructor & Destructor Documentation	188
5.42.1.1 ModelDescriptor() [1/2]	188
5.42.1.2 ~ModelDescriptor()	188
5.42.1.3 ModelDescriptor() [2/2]	188
5.42.2 Member Function Documentation	188
5.42.2.1 GetMesh()	188
5.42.2.2 MaterialsBegin()	189
5.42.2.3 MaterialsEnd()	189
5.42.2.4 ModelPartsBegin()	189
5.42.2.5 ModelPartsEnd()	189
5.42.2.6 operator=()	189
5.42.3 Member Data Documentation	189
5.42.3.1 m_materials	189
5.42.3.2 m_mesh	189
5.42.3.3 m_model_parts	189
5.43 mage::ModelOutput< VertexT > Struct Template Reference	189
5.43.1 Constructor & Destructor Documentation	190
5.43.1.1 ModelOutput() [1/2]	190
5.43.1.2 ~ModelOutput()	190
5.43.1.3 ModelOutput() [2/2]	190
5.43.2 Member Function Documentation	190
5.43.2.1 EndModelPart()	190
5.43.2.2 HasModelPart()	191
5.43.2.3 operator=()	191
5.43.2.4 SetMaterial()	191

5.43.2.5	StartModelPart()	191
5.43.3	Member Data Documentation	191
5.43.3.1	index_buffer	191
5.43.3.2	material_buffer	191
5.43.3.3	model_parts	191
5.43.3.4	vertex_buffer	191
5.44	mage::ModelPart Struct Reference	192
5.44.1	Constructor & Destructor Documentation	192
5.44.1.1	ModelPart() [1/2]	192
5.44.1.2	ModelPart() [2/2]	192
5.44.1.3	~ModelPart()	192
5.44.2	Member Function Documentation	192
5.44.2.1	operator=()	192
5.44.3	Member Data Documentation	193
5.44.3.1	child	193
5.44.3.2	material	193
5.44.3.3	nb_indices	193
5.44.3.4	parent	193
5.44.3.5	start_index	193
5.45	mage::Mouse Class Reference	193
5.45.1	Detailed Description	194
5.45.2	Constructor & Destructor Documentation	194
5.45.2.1	Mouse() [1/2]	194
5.45.2.2	~Mouse()	194
5.45.2.3	Mouse() [2/2]	194
5.45.3	Member Function Documentation	195
5.45.3.1	GetDeltaWheel()	195
5.45.3.2	GetDeltaX()	195
5.45.3.3	GetDeltaY()	195
5.45.3.4	GetHandle()	195

5.45.3.5	GetMouseButtonPress()	195
5.45.3.6	GetPosX()	196
5.45.3.7	GetPosY()	196
5.45.3.8	InitializeMouse()	196
5.45.3.9	operator=()	197
5.45.3.10	Update()	197
5.45.4	Member Data Documentation	197
5.45.4.1	m_hwindow	197
5.45.4.2	m_mouse	197
5.45.4.3	m_mouse_button_press_stamp	197
5.45.4.4	m_mouse_position	198
5.45.4.5	m_mouse_state	198
5.45.4.6	m_press_stamp	198
5.46	mage::MTLReader Class Reference	198
5.46.1	Constructor & Destructor Documentation	199
5.46.1.1	MTLReader() [1/2]	199
5.46.1.2	~MTLReader()	199
5.46.1.3	MTLReader() [2/2]	199
5.46.2	Member Function Documentation	200
5.46.2.1	operator=()	200
5.46.2.2	ReadLine()	200
5.46.2.3	ReadMTLAmbientReflectivity()	200
5.46.2.4	ReadMTLAmbientReflectivityTexture()	200
5.46.2.5	ReadMTLBumpTexture()	200
5.46.2.6	ReadMTLDecalTexture()	200
5.46.2.7	ReadMTLDiffuseReflectivity()	200
5.46.2.8	ReadMTLDiffuseReflectivityTexture()	200
5.46.2.9	ReadMTLDisplacementTexture()	200
5.46.2.10	ReadMTLDissolve()	201
5.46.2.11	ReadMTLDissolveTexture()	201

5.46.2.12	ReadMTLMaterialName()	201
5.46.2.13	ReadMTLOpticalDensity()	201
5.46.2.14	ReadMTLSpectrum()	201
5.46.2.15	ReadMTLSpecularExponent()	201
5.46.2.16	ReadMTLSpecularExponentTexture()	201
5.46.2.17	ReadMTLSpecularReflectivity()	201
5.46.2.18	ReadMTLSpecularReflectivityTexture()	201
5.46.2.19	ReadMTLTexture()	201
5.46.2.20	ReadMTLTransmissionFilter()	202
5.46.3	Member Data Documentation	202
5.46.3.1	m_material_buffer	202
5.47	mage::Mutex Class Reference	202
5.47.1	Detailed Description	202
5.47.2	Constructor & Destructor Documentation	202
5.47.2.1	Mutex() [1/2]	202
5.47.2.2	Mutex() [2/2]	202
5.47.2.3	~Mutex()	203
5.47.3	Member Function Documentation	203
5.47.3.1	Create()	203
5.47.3.2	Destroy()	203
5.47.3.3	operator=()	203
5.47.4	Friends And Related Function Documentation	204
5.47.4.1	MutexLock	204
5.47.5	Member Data Documentation	204
5.47.5.1	m_critical_section	204
5.48	mage::MutexLock Struct Reference	204
5.48.1	Detailed Description	204
5.48.2	Constructor & Destructor Documentation	204
5.48.2.1	MutexLock() [1/2]	204
5.48.2.2	~MutexLock()	205

5.48.2.3	MutexLock() [2/2]	205
5.48.3	Member Function Documentation	205
5.48.3.1	operator=()	205
5.48.4	Member Data Documentation	205
5.48.4.1	m_mutex	205
5.49	mage::Normal3 Struct Reference	206
5.49.1	Constructor & Destructor Documentation	206
5.49.1.1	Normal3() [1/6]	206
5.49.1.2	Normal3() [2/6]	206
5.49.1.3	Normal3() [3/6]	206
5.49.1.4	Normal3() [4/6]	206
5.49.1.5	Normal3() [5/6]	207
5.49.1.6	Normal3() [6/6]	207
5.49.1.7	~Normal3()	207
5.49.2	Member Function Documentation	207
5.49.2.1	operator=()	207
5.50	mage::OBJReader< VertexT >::OBJComparatorXMUINT3 Struct Reference	207
5.50.1	Detailed Description	207
5.50.2	Member Function Documentation	207
5.50.2.1	operator()()	207
5.51	mage::OBJReader< VertexT > Class Template Reference	208
5.51.1	Constructor & Destructor Documentation	209
5.51.1.1	OBJReader() [1/2]	209
5.51.1.2	~OBJReader()	209
5.51.1.3	OBJReader() [2/2]	209
5.51.2	Member Function Documentation	209
5.51.2.1	ConstructVertex()	209
5.51.2.2	operator=()	210
5.51.2.3	Postprocess()	210
5.51.2.4	Preprocess()	210

5.51.2.5	ReadLine()	210
5.51.2.6	ReadOBJGroup()	210
5.51.2.7	ReadOBJMaterialLibrary()	210
5.51.2.8	ReadOBJMaterialUse()	210
5.51.2.9	ReadOBJObject()	210
5.51.2.10	ReadOBJTriangleFace()	211
5.51.2.11	ReadOBJVertex()	211
5.51.2.12	ReadOBJVertexCoordinates()	211
5.51.2.13	ReadOBJVertexIndices()	211
5.51.2.14	ReadOBJVertexNormal()	211
5.51.2.15	ReadOBJVertexNormalCoordinates()	211
5.51.2.16	ReadOBJVertexTexture()	211
5.51.2.17	ReadOBJVertexTextureCoordinates()	211
5.51.3	Member Data Documentation	212
5.51.3.1	m_mapping	212
5.51.3.2	m_mesh_desc	212
5.51.3.3	m_model_output	212
5.51.3.4	m_vertex_coordinates	212
5.51.3.5	m_vertex_normal_coordinates	212
5.51.3.6	m_vertex_texture_coordinates	212
5.52	mage::OrthographicCamera Class Reference	212
5.52.1	Detailed Description	213
5.52.2	Constructor & Destructor Documentation	213
5.52.2.1	OrthographicCamera() [1/2]	213
5.52.2.2	OrthographicCamera() [2/2]	213
5.52.2.3	~OrthographicCamera()	214
5.52.3	Member Function Documentation	214
5.52.3.1	Clone()	214
5.52.3.2	GetViewToProjectionMatrix()	214
5.52.3.3	operator=()	214

5.52.3.4	SetViewToProjectionMatrix()	215
5.53	mage::PerspectiveCamera Class Reference	215
5.53.1	Detailed Description	216
5.53.2	Constructor & Destructor Documentation	216
5.53.2.1	PerspectiveCamera() [1/2]	216
5.53.2.2	PerspectiveCamera() [2/2]	216
5.53.2.3	~PerspectiveCamera()	217
5.53.3	Member Function Documentation	217
5.53.3.1	Clone()	217
5.53.3.2	GetAspectRatio()	217
5.53.3.3	GetFOVY()	217
5.53.3.4	GetViewToProjectionMatrix()	217
5.53.3.5	operator=()	217
5.53.3.6	SetFOVY()	218
5.53.3.7	SetViewToProjectionMatrix()	218
5.53.4	Member Data Documentation	218
5.53.4.1	m_fov_y	218
5.54	mage::PixelShader Class Reference	219
5.54.1	Constructor & Destructor Documentation	219
5.54.1.1	PixelShader() [1/2]	219
5.54.1.2	~PixelShader()	219
5.54.1.3	PixelShader() [2/2]	219
5.54.2	Member Function Documentation	220
5.54.2.1	InitializeShader()	220
5.54.2.2	operator=()	220
5.54.2.3	Render()	220
5.54.3	Member Data Documentation	220
5.54.3.1	m_pixel_shader	220
5.55	mage::Point3 Struct Reference	220
5.55.1	Constructor & Destructor Documentation	221

5.55.1.1	Point3() [1/6]	221
5.55.1.2	Point3() [2/6]	221
5.55.1.3	Point3() [3/6]	221
5.55.1.4	Point3() [4/6]	221
5.55.1.5	Point3() [5/6]	221
5.55.1.6	Point3() [6/6]	221
5.55.1.7	~Point3()	221
5.55.2	Member Function Documentation	221
5.55.2.1	operator=()	221
5.56	mage::PointLight Class Reference	222
5.56.1	Constructor & Destructor Documentation	222
5.56.1.1	PointLight() [1/2]	222
5.56.1.2	PointLight() [2/2]	222
5.56.1.3	~PointLight()	223
5.56.2	Member Function Documentation	223
5.56.2.1	Clone()	223
5.56.2.2	GetIntensity()	223
5.56.2.3	GetRadius()	223
5.56.2.4	operator=()	223
5.56.2.5	SetIntensity()	223
5.56.2.6	SetRadius()	223
5.56.3	Member Data Documentation	223
5.56.3.1	m_intensity	223
5.56.3.2	m_name	224
5.56.3.3	m_radius	224
5.56.3.4	m_transform	224
5.57	mage::ProgressReporter Class Reference	224
5.57.1	Detailed Description	225
5.57.2	Constructor & Destructor Documentation	225
5.57.2.1	ProgressReporter() [1/2]	225

5.57.2.2	~ProgressReporter()	225
5.57.2.3	ProgressReporter() [2/2]	225
5.57.3	Member Function Documentation	225
5.57.3.1	Done()	225
5.57.3.2	operator=()	226
5.57.3.3	Update()	226
5.57.4	Member Data Documentation	226
5.57.4.1	m_buffer	226
5.57.4.2	m_current_pos	226
5.57.4.3	m_fout	226
5.57.4.4	m_mutex	227
5.57.4.5	m_nb_plusses_printed	227
5.57.4.6	m_nb_plusses_total	227
5.57.4.7	m_nb_work_done	227
5.57.4.8	m_nb_work_total	227
5.57.4.9	m_plus_char	227
5.57.4.10	m_timer	227
5.58	mage::ReadWriteMutex Class Reference	227
5.58.1	Detailed Description	228
5.58.2	Constructor & Destructor Documentation	228
5.58.2.1	ReadWriteMutex() [1/2]	228
5.58.2.2	ReadWriteMutex() [2/2]	228
5.58.2.3	~ReadWriteMutex()	229
5.58.3	Member Function Documentation	229
5.58.3.1	AcquireRead()	229
5.58.3.2	AcquireWrite()	229
5.58.3.3	Create()	229
5.58.3.4	Destroy()	229
5.58.3.5	operator=()	229
5.58.3.6	ReleaseRead()	230

5.58.3.7	ReleaseWrite()	230
5.58.4	Friends And Related Function Documentation	230
5.58.4.1	ReadWriteMutexLock	230
5.58.5	Member Data Documentation	230
5.58.5.1	m_active_writer_readers	230
5.58.5.2	m_critical_section	230
5.58.5.3	m_nb_readers_waiting	231
5.58.5.4	m_nb_writers_waiting	231
5.58.5.5	m_ready_to_read_handle	231
5.58.5.6	m_ready_to_write_handle	231
5.59	mage::ReadWriteMutexLock Struct Reference	231
5.59.1	Detailed Description	232
5.59.2	Constructor & Destructor Documentation	232
5.59.2.1	ReadWriteMutexLock() [1/2]	232
5.59.2.2	~ReadWriteMutexLock()	232
5.59.2.3	ReadWriteMutexLock() [2/2]	232
5.59.3	Member Function Documentation	232
5.59.3.1	DowngradeToRead()	232
5.59.3.2	operator=()	233
5.59.3.3	UpgradeToWrite()	233
5.59.4	Member Data Documentation	233
5.59.4.1	m_mutex	233
5.59.4.2	m_type	233
5.60	mage::Renderer Class Reference	233
5.60.1	Detailed Description	234
5.60.2	Constructor & Destructor Documentation	235
5.60.2.1	Renderer() [1/2]	235
5.60.2.2	~Renderer()	235
5.60.2.3	Renderer() [2/2]	235
5.60.3	Member Function Documentation	235

5.60.3.1	EndFrame()	235
5.60.3.2	GetDevice()	235
5.60.3.3	GetDeviceContext()	236
5.60.3.4	GetHandle()	236
5.60.3.5	GetHeight()	236
5.60.3.6	GetWidth()	236
5.60.3.7	InitializeRenderer()	236
5.60.3.8	IsFullScreen()	237
5.60.3.9	IsWindowed()	237
5.60.3.10	LostMode()	237
5.60.3.11	operator=()	237
5.60.3.12	SetupDepthStencilView()	237
5.60.3.13	SetupDevice()	238
5.60.3.14	SetupRasterizerStates()	238
5.60.3.15	SetupRenderTargetView()	238
5.60.3.16	SetupSwapChain()	238
5.60.3.17	SetupViewPort()	239
5.60.3.18	StartFrame()	239
5.60.3.19	StartSolidRasterizer()	239
5.60.3.20	StartWireframeRasterizer()	239
5.60.3.21	SwitchMode()	239
5.60.3.22	UnitalizeRenderer()	239
5.60.4	Member Data Documentation	240
5.60.4.1	m_depth_stencil	240
5.60.4.2	m_depth_stencil_view	240
5.60.4.3	m_device2	240
5.60.4.4	m_device_context2	240
5.60.4.5	m_display_mode	240
5.60.4.6	m_feature_level	240
5.60.4.7	m_fullscreen	240

5.60.4.8	m_hwindow	240
5.60.4.9	m_render_target_view	240
5.60.4.10	m_solid_rasterizer_state	241
5.60.4.11	m_swap_chain2	241
5.60.4.12	m_wireframe_rasterizer_state	241
5.61	mage::RenderingDevice Class Reference	241
5.61.1	Constructor & Destructor Documentation	242
5.61.1.1	RenderingDevice() [1/3]	242
5.61.1.2	RenderingDevice() [2/3]	242
5.61.1.3	RenderingDevice() [3/3]	242
5.61.1.4	~RenderingDevice()	242
5.61.2	Member Function Documentation	242
5.61.2.1	CheckFormatSupport()	242
5.61.2.2	CreateBuffer()	242
5.61.2.3	CreateConstantBuffer()	242
5.61.2.4	CreateIndexBuffer()	243
5.61.2.5	CreateLinearSamplerState()	243
5.61.2.6	CreatePixelShader()	243
5.61.2.7	CreateSamplerState()	243
5.61.2.8	CreateShaderResourceView()	243
5.61.2.9	CreateTexture1D()	243
5.61.2.10	CreateTexture2D()	243
5.61.2.11	CreateTexture3D()	244
5.61.2.12	CreateVertexBuffer()	244
5.61.2.13	CreateVertexInputLayout()	244
5.61.2.14	CreateVertexShader()	244
5.61.2.15	GetFeatureLevel()	244
5.61.2.16	operator=()	244
5.61.3	Member Data Documentation	244
5.61.3.1	m_device	244

5.62	mage::Resource Class Reference	245
5.62.1	Detailed Description	245
5.62.2	Constructor & Destructor Documentation	245
5.62.2.1	Resource() [1/2]	245
5.62.2.2	Resource() [2/2]	246
5.62.2.3	~Resource()	246
5.62.3	Member Function Documentation	246
5.62.3.1	GetFilename()	246
5.62.3.2	GetName()	246
5.62.3.3	GetPath()	246
5.62.3.4	operator=()	246
5.62.4	Member Data Documentation	247
5.62.4.1	m_fname	247
5.63	mage::ResourceFactory Class Reference	247
5.63.1	Constructor & Destructor Documentation	248
5.63.1.1	ResourceFactory() [1/2]	248
5.63.1.2	~ResourceFactory()	248
5.63.1.3	ResourceFactory() [2/2]	248
5.63.2	Member Function Documentation	248
5.63.2.1	CreateLambertianPixelShader()	248
5.63.2.2	CreateLambertianVertexShader()	248
5.63.2.3	CreateModelDescriptor()	248
5.63.2.4	CreateTexture()	248
5.63.2.5	CreateVariableScript()	248
5.63.2.6	operator=()	249
5.63.3	Member Data Documentation	249
5.63.3.1	m_model_descriptor_resource_manager	249
5.63.3.2	m_pixel_shader_resource_manager	249
5.63.3.3	m_texture_resource_manager	249
5.63.3.4	m_variable_script_resource_manager	249

5.63.3.5	m_vertex_shader_resource_manager	249
5.64	mage::ResourceManager< T > Class Template Reference	249
5.64.1	Detailed Description	250
5.64.2	Constructor & Destructor Documentation	250
5.64.2.1	ResourceManager() [1/2]	250
5.64.2.2	~ResourceManager()	250
5.64.2.3	ResourceManager() [2/2]	250
5.64.3	Member Function Documentation	251
5.64.3.1	AddResource()	251
5.64.3.2	ContainsResource()	251
5.64.3.3	GetNumberOfResources()	251
5.64.3.4	GetResource()	252
5.64.3.5	operator=()	252
5.64.3.6	RemoveAllResources()	252
5.64.3.7	RemoveResource() [1/2]	252
5.64.3.8	RemoveResource() [2/2]	253
5.64.4	Member Data Documentation	253
5.64.4.1	m_resources	253
5.65	mage::RGB Spectrum Struct Reference	253
5.65.1	Constructor & Destructor Documentation	254
5.65.1.1	RGB Spectrum() [1/5]	254
5.65.1.2	RGB Spectrum() [2/5]	254
5.65.1.3	RGB Spectrum() [3/5]	254
5.65.1.4	RGB Spectrum() [4/5]	254
5.65.1.5	RGB Spectrum() [5/5]	254
5.65.1.6	~RGB Spectrum()	254
5.65.2	Member Function Documentation	254
5.65.2.1	operator=()	254
5.66	mage::Scene Class Reference	254
5.66.1	Constructor & Destructor Documentation	255

5.66.1.1	~Scene()	255
5.66.1.2	Scene() [1/2]	256
5.66.1.3	Scene() [2/2]	256
5.66.2	Member Function Documentation	256
5.66.2.1	AddScript()	256
5.66.2.2	Close()	256
5.66.2.3	GetCamera()	256
5.66.2.4	GetName()	256
5.66.2.5	GetNumberOfScripts()	256
5.66.2.6	GetScript()	256
5.66.2.7	GetWorld()	256
5.66.2.8	HasScript() [1/2]	257
5.66.2.9	HasScript() [2/2]	257
5.66.2.10	Load()	257
5.66.2.11	operator=()	257
5.66.2.12	RemoveAllScripts()	257
5.66.2.13	RemoveScript() [1/2]	257
5.66.2.14	RemoveScript() [2/2]	257
5.66.2.15	Render()	257
5.66.2.16	ScriptsBegin() [1/2]	258
5.66.2.17	ScriptsBegin() [2/2]	258
5.66.2.18	ScriptsEnd() [1/2]	258
5.66.2.19	ScriptsEnd() [2/2]	258
5.66.2.20	SetCamera()	258
5.66.2.21	SetName()	258
5.66.2.22	Update()	258
5.66.3	Member Data Documentation	259
5.66.3.1	m_camera	259
5.66.3.2	m_name	259
5.66.3.3	m_scripts	259

5.66.3.4	m_world	259
5.67	mage::Semaphore Class Reference	259
5.67.1	Detailed Description	259
5.67.2	Constructor & Destructor Documentation	260
5.67.2.1	Semaphore() [1/2]	260
5.67.2.2	~Semaphore()	260
5.67.2.3	Semaphore() [2/2]	260
5.67.3	Member Function Documentation	260
5.67.3.1	operator=()	260
5.67.3.2	Post()	260
5.67.3.3	TryWait()	261
5.67.3.4	Wait()	261
5.67.4	Member Data Documentation	261
5.67.4.1	m_handle	261
5.68	mage::ShadedMaterial Struct Reference	261
5.68.1	Constructor & Destructor Documentation	262
5.68.1.1	ShadedMaterial() [1/2]	262
5.68.1.2	ShadedMaterial() [2/2]	262
5.68.1.3	~ShadedMaterial()	262
5.68.2	Member Function Documentation	262
5.68.2.1	GetMaterial() [1/2]	262
5.68.2.2	GetMaterial() [2/2]	262
5.68.2.3	GetShader() [1/2]	262
5.68.2.4	GetShader() [2/2]	262
5.68.2.5	operator=()	262
5.68.2.6	Render()	263
5.68.3	Member Data Documentation	263
5.68.3.1	m_material	263
5.68.3.2	m_shader	263
5.69	mage::SpriteBatch Class Reference	263

5.70	mage::SpriteFont Class Reference	263
5.70.1	Constructor & Destructor Documentation	264
5.70.1.1	SpriteFont() [1/2]	264
5.70.1.2	~SpriteFont()	264
5.70.1.3	SpriteFont() [2/2]	264
5.70.2	Member Function Documentation	264
5.70.2.1	ContainsCharacter()	264
5.70.2.2	DrawString()	264
5.70.2.3	GetDefaultCharacter()	265
5.70.2.4	GetGlyph()	265
5.70.2.5	GetLineSpacing()	265
5.70.2.6	InitializeSpriteFont()	265
5.70.2.7	MeasureDrawBounds()	265
5.70.2.8	MeasureString()	265
5.70.2.9	operator=()	265
5.70.2.10	SetDefaultCharacter()	265
5.70.2.11	SetLineSpacing()	265
5.70.3	Member Data Documentation	266
5.70.3.1	m_default_glyph	266
5.70.3.2	m_glyphs	266
5.70.3.3	m_line_spacing	266
5.70.3.4	m_texture	266
5.71	mage::SpriteFontDescriptor Struct Reference	266
5.71.1	Constructor & Destructor Documentation	266
5.71.1.1	SpriteFontDescriptor() [1/2]	266
5.71.1.2	SpriteFontDescriptor() [2/2]	267
5.71.1.3	~SpriteFontDescriptor()	267
5.71.2	Member Function Documentation	267
5.71.2.1	ForceSRGB()	267
5.71.2.2	operator=()	267

5.71.3	Member Data Documentation	267
5.71.3.1	m_force_srgb	267
5.72	mage::SpriteFontOutput Struct Reference	267
5.72.1	Constructor & Destructor Documentation	268
5.72.1.1	SpriteFontOutput() [1/2]	268
5.72.1.2	~SpriteFontOutput()	268
5.72.1.3	SpriteFontOutput() [2/2]	268
5.72.2	Member Function Documentation	268
5.72.2.1	operator=()	268
5.72.3	Member Data Documentation	268
5.72.3.1	m_default_character	268
5.72.3.2	m_glyphs	268
5.72.3.3	m_line_spacing	268
5.72.3.4	m_texture	269
5.73	mage::SpriteTransform Struct Reference	269
5.73.1	Detailed Description	270
5.73.2	Constructor & Destructor Documentation	270
5.73.2.1	SpriteTransform() [1/2]	270
5.73.2.2	SpriteTransform() [2/2]	270
5.73.2.3	~SpriteTransform()	271
5.73.3	Member Function Documentation	271
5.73.3.1	AddRotation() [1/2]	271
5.73.3.2	AddRotation() [2/2]	271
5.73.3.3	AddRotationOrigin() [1/2]	271
5.73.3.4	AddRotationOrigin() [2/2]	272
5.73.3.5	AddRotationOriginX()	272
5.73.3.6	AddRotationOriginY()	272
5.73.3.7	AddRotationX()	272
5.73.3.8	AddRotationY()	273
5.73.3.9	AddScale() [1/2]	273

5.73.3.10 AddScale() [2/2]	273
5.73.3.11 AddScaleX()	273
5.73.3.12 AddScaleY()	274
5.73.3.13 AddTranslation() [1/2]	274
5.73.3.14 AddTranslation() [2/2]	274
5.73.3.15 AddTranslationX()	274
5.73.3.16 AddTranslationY()	275
5.73.3.17 GetRotation()	275
5.73.3.18 GetRotationOrigin()	275
5.73.3.19 GetRotationOriginX()	275
5.73.3.20 GetRotationOriginY()	276
5.73.3.21 GetRotationX()	276
5.73.3.22 GetRotationY()	276
5.73.3.23 GetScale()	276
5.73.3.24 GetScaleX()	276
5.73.3.25 GetScaleY()	277
5.73.3.26 GetTranslation()	277
5.73.3.27 GetTranslationX()	277
5.73.3.28 GetTranslationY()	277
5.73.3.29 operator=()	277
5.73.3.30 SetComponents()	278
5.73.3.31 SetRotation() [1/2]	278
5.73.3.32 SetRotation() [2/2]	278
5.73.3.33 SetRotationOrigin() [1/2]	279
5.73.3.34 SetRotationOrigin() [2/2]	279
5.73.3.35 SetRotationOriginX()	279
5.73.3.36 SetRotationOriginY()	279
5.73.3.37 SetRotationX()	280
5.73.3.38 SetRotationY()	280
5.73.3.39 SetScale() [1/2]	280

5.73.3.40	SetScale() [2/2]	280
5.73.3.41	SetScaleX()	281
5.73.3.42	SetScaleY()	281
5.73.3.43	SetTranslation() [1/2]	281
5.73.3.44	SetTranslation() [2/2]	281
5.73.3.45	SetTranslationX()	282
5.73.3.46	SetTranslationY()	282
5.73.4	Member Data Documentation	282
5.73.4.1	m_rotation	282
5.73.4.2	m_rotation_origin	282
5.73.4.3	m_scale	282
5.73.4.4	m_translation	283
5.74	mage::SubModel Class Reference	283
5.74.1	Detailed Description	284
5.74.2	Constructor & Destructor Documentation	284
5.74.2.1	SubModel() [1/2]	284
5.74.2.2	SubModel() [2/2]	284
5.74.2.3	~SubModel()	284
5.74.3	Member Function Documentation	284
5.74.3.1	Clone()	284
5.74.3.2	GetMaterial()	284
5.74.3.3	GetNumberOfIndices()	284
5.74.3.4	GetStartIndex()	284
5.74.3.5	operator=()	285
5.74.3.6	RenderModel()	285
5.74.4	Member Data Documentation	285
5.74.4.1	m_material	285
5.74.4.2	m_nb_indices	285
5.74.4.3	m_start_index	285
5.75	mage::Texture Class Reference	285

5.75.1	Constructor & Destructor Documentation	286
5.75.1.1	Texture() [1/2]	286
5.75.1.2	~Texture()	286
5.75.1.3	Texture() [2/2]	286
5.75.2	Member Function Documentation	286
5.75.2.1	GetTextureResourceView()	286
5.75.2.2	operator=()	286
5.75.3	Member Data Documentation	286
5.75.3.1	m_texture_resource_view	286
5.76	mage::Timer Class Reference	287
5.76.1	Detailed Description	287
5.76.2	Constructor & Destructor Documentation	287
5.76.2.1	Timer() [1/2]	287
5.76.2.2	Timer() [2/2]	287
5.76.2.3	~Timer()	288
5.76.3	Member Function Documentation	288
5.76.3.1	operator=()	288
5.76.3.2	Reset()	288
5.76.3.3	Restart()	288
5.76.3.4	Start()	288
5.76.3.5	Stop()	289
5.76.3.6	Time()	289
5.76.3.7	time()	289
5.76.4	Member Data Documentation	289
5.76.4.1	m_elapsed	289
5.76.4.2	m_performance_counter	289
5.76.4.3	m_performance_frequency	289
5.76.4.4	m_performance_period	290
5.76.4.5	m_running	290
5.76.4.6	m_time0	290

5.77	mage::Transform Struct Reference	290
5.77.1	Detailed Description	292
5.77.2	Constructor & Destructor Documentation	292
5.77.2.1	Transform() [1/2]	292
5.77.2.2	Transform() [2/2]	293
5.77.2.3	~Transform()	293
5.77.3	Member Function Documentation	293
5.77.3.1	AddChild()	293
5.77.3.2	AddRotation() [1/2]	293
5.77.3.3	AddRotation() [2/2]	294
5.77.3.4	AddRotationX()	294
5.77.3.5	AddRotationY()	294
5.77.3.6	AddRotationZ()	295
5.77.3.7	AddScale() [1/2]	295
5.77.3.8	AddScale() [2/2]	295
5.77.3.9	AddScaleX()	295
5.77.3.10	AddScaleY()	296
5.77.3.11	AddScaleZ()	296
5.77.3.12	AddTranslation() [1/2]	296
5.77.3.13	AddTranslation() [2/2]	296
5.77.3.14	AddTranslationX()	297
5.77.3.15	AddTranslationY()	297
5.77.3.16	AddTranslationZ()	297
5.77.3.17	begin()	297
5.77.3.18	cbegin()	298
5.77.3.19	cend()	298
5.77.3.20	ContainsChild()	298
5.77.3.21	end()	298
5.77.3.22	GetInverseRotationMatrix()	298
5.77.3.23	GetInverseScaleMatrix()	299

5.77.3.24 GetInverseTranslationMatrix()	299
5.77.3.25 GetNumberOfChilds()	299
5.77.3.26 GetObjectAxes()	299
5.77.3.27 GetObjectAxisX()	299
5.77.3.28 GetObjectAxisY()	300
5.77.3.29 GetObjectAxisZ()	300
5.77.3.30 GetObjectCoordinateSystem()	300
5.77.3.31 GetObjectEye()	300
5.77.3.32 GetObjectForward()	300
5.77.3.33 GetObjectLeft()	301
5.77.3.34 GetObjectOrigin()	301
5.77.3.35 GetObjectToParentMatrix()	301
5.77.3.36 GetObjectToWorldMatrix()	301
5.77.3.37 GetObjectUp()	301
5.77.3.38 GetParentAxes()	302
5.77.3.39 GetParentAxisX()	302
5.77.3.40 GetParentAxisY()	302
5.77.3.41 GetParentAxisZ()	302
5.77.3.42 GetParentCoordinateSystem()	302
5.77.3.43 GetParentOrigin()	303
5.77.3.44 GetParentToObjectMatrix()	303
5.77.3.45 GetRotation()	303
5.77.3.46 GetRotationMatrix()	303
5.77.3.47 GetRotationX()	303
5.77.3.48 GetRotationY()	304
5.77.3.49 GetRotationZ()	304
5.77.3.50 GetScale()	304
5.77.3.51 GetScaleMatrix()	304
5.77.3.52 GetScaleX()	304
5.77.3.53 GetScaleY()	305

5.77.3.54 GetScaleZ()	305
5.77.3.55 GetTranslation()	305
5.77.3.56 GetTranslationMatrix()	305
5.77.3.57 GetTranslationX()	305
5.77.3.58 GetTranslationY()	306
5.77.3.59 GetTranslationZ()	306
5.77.3.60 GetWorldAxes()	306
5.77.3.61 GetWorldAxisX()	306
5.77.3.62 GetWorldAxisY()	306
5.77.3.63 GetWorldAxisZ()	307
5.77.3.64 GetWorldCoordinateSystem()	307
5.77.3.65 GetWorldEye()	307
5.77.3.66 GetWorldForward()	307
5.77.3.67 GetWorldLeft()	307
5.77.3.68 GetWorldOrigin()	308
5.77.3.69 GetWorldToObjectMatrix()	308
5.77.3.70 GetWorldToViewMatrix()	308
5.77.3.71 GetWorldUp()	308
5.77.3.72 operator=()	308
5.77.3.73 RemoveAllChilds()	309
5.77.3.74 RemoveChild()	309
5.77.3.75 SetComponents() [1/2]	309
5.77.3.76 SetComponents() [2/2]	309
5.77.3.77 SetRotation() [1/2]	310
5.77.3.78 SetRotation() [2/2]	310
5.77.3.79 SetRotationAroundDirection()	310
5.77.3.80 SetRotationX()	310
5.77.3.81 SetRotationY()	311
5.77.3.82 SetRotationZ()	311
5.77.3.83 SetScale() [1/2]	311

5.77.3.84 SetScale() [2/2]	312
5.77.3.85 SetScaleX()	312
5.77.3.86 SetScaleY()	312
5.77.3.87 SetScaleZ()	312
5.77.3.88 SetTranslation() [1/2]	313
5.77.3.89 SetTranslation() [2/2]	313
5.77.3.90 SetTranslationX()	313
5.77.3.91 SetTranslationY()	313
5.77.3.92 SetTranslationZ()	314
5.77.3.93 TransformObjectToParent()	314
5.77.3.94 TransformObjectToParentDirection()	314
5.77.3.95 TransformObjectToWorld()	314
5.77.3.96 TransformParentToObject()	315
5.77.3.97 TransformWorldToObject()	315
5.77.3.98 Update() [1/2]	315
5.77.3.99 Update() [2/2]	316
5.77.4 Member Data Documentation	316
5.77.4.1 m_childs	316
5.77.4.2 m_object_to_world	316
5.77.4.3 m_parent_to_world	316
5.77.4.4 m_rotation	316
5.77.4.5 m_scale	316
5.77.4.6 m_translation	317
5.77.4.7 m_world_to_object	317
5.77.4.8 m_world_to_parent	317
5.78 mage::TransformBuffer Struct Reference	317
5.78.1 Constructor & Destructor Documentation	317
5.78.1.1 TransformBuffer() [1/2]	317
5.78.1.2 TransformBuffer() [2/2]	318
5.78.1.3 ~TransformBuffer()	318

5.78.2	Member Function Documentation	318
5.78.2.1	operator=()	318
5.78.2.2	SetModelToWorld()	318
5.78.3	Member Data Documentation	318
5.78.3.1	m_model_to_world	318
5.78.3.2	m_view_to_projection	318
5.78.3.3	m_world_to_view	318
5.78.3.4	m_world_to_view_inverse_transpose	318
5.79	mage::UV Struct Reference	319
5.79.1	Constructor & Destructor Documentation	319
5.79.1.1	UV() [1/4]	319
5.79.1.2	UV() [2/4]	319
5.79.1.3	UV() [3/4]	319
5.79.1.4	UV() [4/4]	319
5.79.1.5	~UV()	319
5.79.2	Member Function Documentation	320
5.79.2.1	operator=()	320
5.80	mage::Variable::Value< T > Struct Template Reference	320
5.80.1	Detailed Description	320
5.80.2	Constructor & Destructor Documentation	321
5.80.2.1	Value() [1/2]	321
5.80.2.2	~Value()	321
5.80.2.3	Value() [2/2]	321
5.80.3	Member Function Documentation	321
5.80.3.1	GetValue()	321
5.80.3.2	operator=()	322
5.80.4	Member Data Documentation	322
5.80.4.1	m_value	322
5.81	mage::Variable Struct Reference	322
5.81.1	Detailed Description	323

5.81.2	Constructor & Destructor Documentation	323
5.81.2.1	Variable() [1/2]	323
5.81.2.2	~Variable()	323
5.81.2.3	Variable() [2/2]	323
5.81.3	Member Function Documentation	325
5.81.3.1	GetName()	325
5.81.3.2	GetType()	325
5.81.3.3	GetValue()	325
5.81.3.4	operator!=()	325
5.81.3.5	operator=()	326
5.81.3.6	operator==()	326
5.81.3.7	SetValue()	326
5.81.4	Member Data Documentation	327
5.81.4.1	m_name	327
5.81.4.2	m_type	327
5.81.4.3	m_value	327
5.82	mage::VariableScript Class Reference	327
5.82.1	Detailed Description	328
5.82.2	Constructor & Destructor Documentation	328
5.82.2.1	VariableScript() [1/2]	328
5.82.2.2	~VariableScript()	329
5.82.2.3	VariableScript() [2/2]	329
5.82.3	Member Function Documentation	329
5.82.3.1	AddVariable()	329
5.82.3.2	ExportScript()	329
5.82.3.3	GetNumberOfVariables()	330
5.82.3.4	GetValueOfVariable()	330
5.82.3.5	ImportScript()	330
5.82.3.6	IsEmpty()	331
5.82.3.7	operator=()	331

5.82.3.8	RemoveAllVariables()	331
5.82.3.9	RemoveVariable()	331
5.82.3.10	SetValueOfVariable()	332
5.82.4	Member Data Documentation	332
5.82.4.1	m_variables	332
5.83	mage::VertexPosition Struct Reference	332
5.83.1	Constructor & Destructor Documentation	333
5.83.1.1	VertexPosition() [1/3]	333
5.83.1.2	VertexPosition() [2/3]	333
5.83.1.3	VertexPosition() [3/3]	333
5.83.1.4	~VertexPosition()	333
5.83.2	Member Function Documentation	334
5.83.2.1	operator=()	334
5.83.3	Member Data Documentation	334
5.83.3.1	input_element_desc	334
5.83.3.2	nb_input_elements	334
5.83.3.3	p	334
5.84	mage::VertexPositionColor Struct Reference	334
5.84.1	Constructor & Destructor Documentation	335
5.84.1.1	VertexPositionColor() [1/3]	335
5.84.1.2	VertexPositionColor() [2/3]	335
5.84.1.3	VertexPositionColor() [3/3]	335
5.84.1.4	~VertexPositionColor()	336
5.84.2	Member Function Documentation	336
5.84.2.1	operator=()	336
5.84.3	Member Data Documentation	336
5.84.3.1	c	336
5.84.3.2	input_element_desc	336
5.84.3.3	nb_input_elements	337
5.84.3.4	p	337

5.85	mage::VertexPositionColorTexture Struct Reference	337
5.85.1	Constructor & Destructor Documentation	337
5.85.1.1	VertexPositionColorTexture() [1/3]	337
5.85.1.2	VertexPositionColorTexture() [2/3]	337
5.85.1.3	VertexPositionColorTexture() [3/3]	338
5.85.1.4	~VertexPositionColorTexture()	338
5.85.2	Member Function Documentation	338
5.85.2.1	operator=()	338
5.85.3	Member Data Documentation	338
5.85.3.1	c	338
5.85.3.2	input_element_desc	339
5.85.3.3	nb_input_elements	339
5.85.3.4	p	339
5.85.3.5	tex	339
5.86	mage::VertexPositionNormal Struct Reference	339
5.86.1	Constructor & Destructor Documentation	340
5.86.1.1	VertexPositionNormal() [1/3]	340
5.86.1.2	VertexPositionNormal() [2/3]	340
5.86.1.3	VertexPositionNormal() [3/3]	340
5.86.1.4	~VertexPositionNormal()	340
5.86.2	Member Function Documentation	341
5.86.2.1	operator=()	341
5.86.3	Member Data Documentation	341
5.86.3.1	input_element_desc	341
5.86.3.2	n	341
5.86.3.3	nb_input_elements	341
5.86.3.4	p	341
5.87	mage::VertexPositionNormalColor Struct Reference	342
5.87.1	Constructor & Destructor Documentation	342
5.87.1.1	VertexPositionNormalColor() [1/3]	342

5.87.1.2	VertexPositionNormalColor() [2/3]	342
5.87.1.3	VertexPositionNormalColor() [3/3]	343
5.87.1.4	~VertexPositionNormalColor()	343
5.87.2	Member Function Documentation	343
5.87.2.1	operator=()	343
5.87.3	Member Data Documentation	343
5.87.3.1	c	343
5.87.3.2	input_element_desc	343
5.87.3.3	n	344
5.87.3.4	nb_input_elements	344
5.87.3.5	p	344
5.88	mage::VertexPositionNormalColorTexture Struct Reference	344
5.88.1	Constructor & Destructor Documentation	345
5.88.1.1	VertexPositionNormalColorTexture() [1/3]	345
5.88.1.2	VertexPositionNormalColorTexture() [2/3]	345
5.88.1.3	VertexPositionNormalColorTexture() [3/3]	345
5.88.1.4	~VertexPositionNormalColorTexture()	345
5.88.2	Member Function Documentation	346
5.88.2.1	operator=()	346
5.88.3	Member Data Documentation	346
5.88.3.1	c	346
5.88.3.2	input_element_desc	346
5.88.3.3	n	346
5.88.3.4	nb_input_elements	347
5.88.3.5	p	347
5.88.3.6	tex	347
5.89	mage::VertexPositionNormalTexture Struct Reference	347
5.89.1	Constructor & Destructor Documentation	347
5.89.1.1	VertexPositionNormalTexture() [1/3]	347
5.89.1.2	VertexPositionNormalTexture() [2/3]	347

5.89.1.3	VertexPositionNormalTexture() [3/3]	348
5.89.1.4	~VertexPositionNormalTexture()	348
5.89.2	Member Function Documentation	348
5.89.2.1	operator=()	348
5.89.3	Member Data Documentation	348
5.89.3.1	input_element_desc	348
5.89.3.2	n	349
5.89.3.3	nb_input_elements	349
5.89.3.4	p	349
5.89.3.5	tex	349
5.90	mage::VertexPositionTexture Struct Reference	349
5.90.1	Constructor & Destructor Documentation	350
5.90.1.1	VertexPositionTexture() [1/3]	350
5.90.1.2	VertexPositionTexture() [2/3]	350
5.90.1.3	VertexPositionTexture() [3/3]	350
5.90.1.4	~VertexPositionTexture()	350
5.90.2	Member Function Documentation	351
5.90.2.1	operator=()	351
5.90.3	Member Data Documentation	351
5.90.3.1	input_element_desc	351
5.90.3.2	nb_input_elements	351
5.90.3.3	p	351
5.90.3.4	tex	351
5.91	mage::VertexPositionTextureTexture Struct Reference	352
5.91.1	Constructor & Destructor Documentation	352
5.91.1.1	VertexPositionTextureTexture() [1/3]	352
5.91.1.2	VertexPositionTextureTexture() [2/3]	352
5.91.1.3	VertexPositionTextureTexture() [3/3]	353
5.91.1.4	~VertexPositionTextureTexture()	353
5.91.2	Member Function Documentation	353

5.91.2.1	<code>operator=()</code>	353
5.91.3	Member Data Documentation	353
5.91.3.1	<code>input_element_desc</code>	353
5.91.3.2	<code>nb_input_elements</code>	354
5.91.3.3	<code>p</code>	354
5.91.3.4	<code>tex1</code>	354
5.91.3.5	<code>tex2</code>	354
5.92	<code>mage::VertexShader</code> Class Reference	354
5.92.1	Constructor & Destructor Documentation	355
5.92.1.1	<code>VertexShader()</code> [1/2]	355
5.92.1.2	<code>~VertexShader()</code>	355
5.92.1.3	<code>VertexShader()</code> [2/2]	355
5.92.2	Member Function Documentation	355
5.92.2.1	<code>InitializeShader()</code>	355
5.92.2.2	<code>operator=()</code>	355
5.92.2.3	<code>Render()</code>	356
5.92.3	Member Data Documentation	356
5.92.3.1	<code>m_vertex_layout</code>	356
5.92.3.2	<code>m_vertex_shader</code>	356
5.93	<code>mage::ViewFrustum</code> Class Reference	356
5.93.1	Constructor & Destructor Documentation	356
5.93.1.1	<code>ViewFrustum()</code> [1/2]	356
5.93.1.2	<code>ViewFrustum()</code> [2/2]	357
5.93.1.3	<code>~ViewFrustum()</code>	357
5.93.2	Member Function Documentation	357
5.93.2.1	<code>Encloses()</code>	357
5.93.2.2	<code>operator=()</code>	357
5.93.2.3	<code>Overlaps()</code> [1/2]	357
5.93.2.4	<code>Overlaps()</code> [2/2]	357
5.93.3	Member Data Documentation	357

5.93.3.1	<code>m_planes</code>	357
5.94	<code>mage::VSReader</code> Class Reference	358
5.94.1	Constructor & Destructor Documentation	358
5.94.1.1	<code>VSReader()</code> [1/2]	358
5.94.1.2	<code>~VSReader()</code>	359
5.94.1.3	<code>VSReader()</code> [2/2]	359
5.94.2	Member Function Documentation	359
5.94.2.1	<code>operator=()</code>	359
5.94.2.2	<code>ReadLine()</code>	359
5.94.2.3	<code>ReadVSBool()</code>	359
5.94.2.4	<code>ReadVSColor()</code>	359
5.94.2.5	<code>ReadVSFloat()</code>	359
5.94.2.6	<code>ReadVSFloat2()</code>	359
5.94.2.7	<code>ReadVSFloat3()</code>	359
5.94.2.8	<code>ReadVSFloat4()</code>	360
5.94.2.9	<code>ReadVSInt()</code>	360
5.94.2.10	<code>ReadVSInt2()</code>	360
5.94.2.11	<code>ReadVSInt3()</code>	360
5.94.2.12	<code>ReadVSString()</code>	360
5.94.2.13	<code>ReadVSUnknown()</code>	360
5.94.3	Member Data Documentation	360
5.94.3.1	<code>m_variable_buffer</code>	360
5.95	<code>mage::VSWriter</code> Class Reference	360
5.95.1	Constructor & Destructor Documentation	361
5.95.1.1	<code>VSWriter()</code> [1/2]	361
5.95.1.2	<code>~VSWriter()</code>	361
5.95.1.3	<code>VSWriter()</code> [2/2]	361
5.95.2	Member Function Documentation	361
5.95.2.1	<code>operator=()</code>	361
5.95.2.2	<code>Write()</code>	361

5.95.3	Member Data Documentation	362
5.95.3.1	m_variable_buffer	362
5.96	mage::World Class Reference	362
5.96.1	Constructor & Destructor Documentation	363
5.96.1.1	World() [1/2]	363
5.96.1.2	~World()	363
5.96.1.3	World() [2/2]	363
5.96.2	Member Function Documentation	363
5.96.2.1	AddLight()	363
5.96.2.2	AddModel()	363
5.96.2.3	GetLight()	363
5.96.2.4	GetModel()	363
5.96.2.5	GetNumberOfLights()	363
5.96.2.6	GetNumberOfModels()	364
5.96.2.7	HasLight() [1/2]	364
5.96.2.8	HasLight() [2/2]	364
5.96.2.9	HasModel() [1/2]	364
5.96.2.10	HasModel() [2/2]	364
5.96.2.11	LightsBegin() [1/2]	364
5.96.2.12	LightsBegin() [2/2]	364
5.96.2.13	LightsEnd() [1/2]	364
5.96.2.14	LightsEnd() [2/2]	364
5.96.2.15	ModelsBegin() [1/2]	364
5.96.2.16	ModelsBegin() [2/2]	365
5.96.2.17	ModelsEnd() [1/2]	365
5.96.2.18	ModelsEnd() [2/2]	365
5.96.2.19	operator=()	365
5.96.2.20	RemoveAllLights()	365
5.96.2.21	RemoveAllModels()	365
5.96.2.22	RemoveLight() [1/2]	365

5.96.2.23 RemoveLight() [2/2]	365
5.96.2.24 RemoveModel() [1/2]	365
5.96.2.25 RemoveModel() [2/2]	366
5.96.2.26 Render()	366
5.96.3 Member Data Documentation	366
5.96.3.1 m_lights	366
5.96.3.2 m_models	366
5.97 mage::WorldObject Class Reference	366
5.97.1 Constructor & Destructor Documentation	367
5.97.1.1 WorldObject() [1/2]	367
5.97.1.2 WorldObject() [2/2]	367
5.97.1.3 ~WorldObject()	367
5.97.2 Member Function Documentation	367
5.97.2.1 AddChildTransform()	367
5.97.2.2 Clone()	367
5.97.2.3 GetName()	367
5.97.2.4 GetTransform()	367
5.97.2.5 operator=()	368
5.97.2.6 SetName()	368
5.97.3 Member Data Documentation	368
5.97.3.1 m_name	368
5.97.3.2 m_transform	368
5.98 mage::Writer Class Reference	368
5.98.1 Constructor & Destructor Documentation	369
5.98.1.1 Writer() [1/2]	369
5.98.1.2 ~Writer()	369
5.98.1.3 Writer() [2/2]	369
5.98.2 Member Function Documentation	369
5.98.2.1 GetFilename()	369
5.98.2.2 operator=()	369

5.98.2.3	Write() [1/3]	369
5.98.2.4	Write() [2/3]	370
5.98.2.5	Write() [3/3]	370
5.98.2.6	WriteLine()	370
5.98.2.7	WriteToFile()	370
5.98.3	Member Data Documentation	370
5.98.3.1	m_file	370
5.98.3.2	m_fname	370
5.99	mage::XYZSpectrum Struct Reference	370
5.99.1	Constructor & Destructor Documentation	371
5.99.1.1	XYZSpectrum() [1/5]	371
5.99.1.2	XYZSpectrum() [2/5]	371
5.99.1.3	XYZSpectrum() [3/5]	371
5.99.1.4	XYZSpectrum() [4/5]	371
5.99.1.5	XYZSpectrum() [5/5]	371
5.99.1.6	~XYZSpectrum()	371
5.99.2	Member Function Documentation	371
5.99.2.1	operator=()	371

Chapter 1

Namespace Index

1.1 Namespace List

Here is a list of all namespaces with brief descriptions:

mage	11
--------------------------------	----

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

mage::AABB	71
mage::Variable::AbstractValue	78
mage::Variable::Value< T >	320
mage::BehaviorScript	80
mage::BigEndianBinaryReader	83
mage::FontReader	136
mage::BinaryReader	85
mage::BS	89
mage::CartesianAxesSystem	100
mage::CartesianCoordinateSystem	104
mage::CombinedShader	108
mage::ConditionVariable	110
mage::DDS_HEADER	113
mage::DDS_HEADER_DXT10	115
mage::DDS_PIXELFORMAT	116
mage::DeviceEnumeration	117
mage::EngineSetup	133
mage::Glyph	137
mage::GlyphLessThan	140
mage::HandleCloser	141
mage::IdGenerator	141
mage::LineReader	153
mage::MTLReader	198
mage::OBJReader< VertexT >	208
mage::VSReader	358
mage::Loadable	160
mage::Engine	127
mage::InputManager	143
mage::Keyboard	146
mage::MainWindow	164
mage::Mouse	193
mage::Renderer	233
mage::LoggingConfiguration	162
mage::Material	168

mage::MaterialBuffer	172
mage::MemoryArena	172
mage::Mesh	176
mage::MeshDescriptor< VertexT >	180
mage::ModelOutput< VertexT >	189
mage::ModelPart	192
mage::Mutex	202
mage::MutexLock	204
mage::OBJReader< VertexT >::OBJComparatorXMUINT3	207
mage::ProgressReporter	224
mage::ReadWriteMutex	227
mage::ReadWriteMutexLock	231
mage::RenderingDevice	241
mage::Resource	245
mage::ModelDescriptor	187
mage::PixelShader	219
mage::EmptyPixelShader	124
mage::LambertianPixelShader	150
mage::SpriteFont	263
mage::Texture	285
mage::VariableScript	327
mage::VertexShader	354
mage::EmptyVertexShader	125
mage::LambertianVertexShader	152
mage::ResourceFactory	247
mage::ResourceManager< T >	249
mage::Scene	254
mage::Semaphore	259
mage::ShadedMaterial	261
mage::SpriteBatch	263
mage::SpriteFontDescriptor	266
mage::SpriteFontOutput	267
mage::SpriteTransform	269
mage::Timer	287
mage::Transform	290
mage::TransformBuffer	317
mage::Variable	322
mage::VertexPosition	332
mage::VertexPositionColor	334
mage::VertexPositionColorTexture	337
mage::VertexPositionNormal	339
mage::VertexPositionNormalColor	342
mage::VertexPositionNormalColorTexture	344
mage::VertexPositionNormalTexture	347
mage::VertexPositionTexture	349
mage::VertexPositionTextureTexture	352
mage::ViewFrustum	356
mage::World	362
mage::WorldObject	366
mage::Camera	94
mage::OrthographicCamera	212
mage::PerspectiveCamera	215
mage::Model	184
mage::MeshModel	182
mage::SubModel	283
mage::PointLight	222
mage::Writer	368

mage::VSWriter	360
XMFLOAT2	
mage::UV	319
XMFLOAT3	
mage::Direction3	123
mage::Normal3	206
mage::Point3	220
mage::RGBSpectrum	253
mage::XYZSpectrum	370
XMFLOAT4	
mage::Color	107

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

mage::AABB	71
mage::Variable::AbstractValue	78
mage::BehaviorScript	80
mage::BigEndianBinaryReader	83
mage::BinaryReader	85
mage::BS	89
mage::Camera	94
mage::CartesianAxesSystem	100
mage::CartesianCoordinateSystem	104
mage::Color	107
mage::CombinedShader	108
mage::ConditionVariable	110
mage::DDS_HEADER	113
mage::DDS_HEADER_DXT10	115
mage::DDS_PIXELFORMAT	116
mage::DeviceEnumeration	117
mage::Direction3	123
mage::EmptyPixelShader	124
mage::EmptyVertexShader	125
mage::Engine	127
mage::EngineSetup	133
mage::FontReader	136
mage::Glyph	137
mage::GlyphLessThan	140
mage::HandleCloser	141
mage::IdGenerator	141
mage::InputManager	143
mage::Keyboard	146
mage::LambertianPixelShader	150
mage::LambertianVertexShader	152
mage::LineReader	153
mage::Loadable	160
mage::LoggingConfiguration	162
mage::MainWindow	164
mage::Material	168

mage::MaterialBuffer	172
mage::MemoryArena	172
mage::Mesh	176
mage::MeshDescriptor< VertexT >	180
mage::MeshModel	182
mage::Model	184
mage::ModelDescriptor	187
mage::ModelOutput< VertexT >	189
mage::ModelPart	192
mage::Mouse	193
mage::MTLReader	198
mage::Mutex	202
mage::MutexLock	204
mage::Normal3	206
mage::OBJReader< VertexT >::OBJComparatorXMUINT3	207
mage::OBJReader< VertexT >	208
mage::OrthographicCamera	212
mage::PerspectiveCamera	215
mage::PixelShader	219
mage::Point3	220
mage::PointLight	222
mage::ProgressReporter	224
mage::ReadWriteMutex	227
mage::ReadWriteMutexLock	231
mage::Renderer	233
mage::RenderingDevice	241
mage::Resource	245
mage::ResourceFactory	247
mage::ResourceManager< T >	249
mage::RGBSpectrum	253
mage::Scene	254
mage::Semaphore	259
mage::ShadedMaterial	261
mage::SpriteBatch	263
mage::SpriteFont	263
mage::SpriteFontDescriptor	266
mage::SpriteFontOutput	267
mage::SpriteTransform	269
mage::SubModel	283
mage::Texture	285
mage::Timer	287
mage::Transform	290
mage::TransformBuffer	317
mage::UV	319
mage::Variable::Value< T >	320
mage::Variable	322
mage::VariableScript	327
mage::VertexPosition	332
mage::VertexPositionColor	334
mage::VertexPositionColorTexture	337
mage::VertexPositionNormal	339
mage::VertexPositionNormalColor	342
mage::VertexPositionNormalColorTexture	344
mage::VertexPositionNormalTexture	347
mage::VertexPositionTexture	349
mage::VertexPositionTextureTexture	352
mage::VertexShader	354
mage::ViewFrustum	356

mage::VSReader	358
mage::VSWriter	360
mage::World	362
mage::WorldObject	366
mage::Writer	368
mage::XYZSpectrum	370

Chapter 4

Namespace Documentation

4.1 mage Namespace Reference

Classes

- struct [AABB](#)
- class [BehaviorScript](#)
- class [BigEndianBinaryReader](#)
- class [BinaryReader](#)
- struct [BS](#)
- class [Camera](#)
- struct [CartesianAxesSystem](#)
- struct [CartesianCoordinateSystem](#)
- struct [Color](#)
- struct [CombinedShader](#)
- class [ConditionVariable](#)
- struct [DDS_HEADER](#)
- struct [DDS_HEADER_DXT10](#)
- struct [DDS_PIXELFORMAT](#)
- class [DeviceEnumeration](#)
- struct [Direction3](#)
- class [EmptyPixelShader](#)
- class [EmptyVertexShader](#)
- class [Engine](#)
- struct [EngineSetup](#)
- class [FontReader](#)
- struct [Glyph](#)
- struct [GlyphLessThan](#)
- struct [HandleCloser](#)
- struct [IdGenerator](#)
- class [InputManager](#)
- class [Keyboard](#)
- class [LambertianPixelShader](#)
- class [LambertianVertexShader](#)
- class [LineReader](#)
- class [Loadable](#)
- struct [LoggingConfiguration](#)
- class [MainWindow](#)

- struct [Material](#)
- struct [MaterialBuffer](#)
- class [MemoryArena](#)
- class [Mesh](#)
- struct [MeshDescriptor](#)
- class [MeshModel](#)
- class [Model](#)
- class [ModelDescriptor](#)
- struct [ModelOutput](#)
- struct [ModelPart](#)
- class [Mouse](#)
- class [MTLReader](#)
- class [Mutex](#)
- struct [MutexLock](#)
- struct [Normal3](#)
- class [OBJReader](#)
- class [OrthographicCamera](#)
- class [PerspectiveCamera](#)
- class [PixelShader](#)
- struct [Point3](#)
- class [PointLight](#)
- class [ProgressReporter](#)
- class [ReadWriteMutex](#)
- struct [ReadWriteMutexLock](#)
- class [Renderer](#)
- class [RenderingDevice](#)
- class [Resource](#)
- class [ResourceFactory](#)
- class [ResourceManager](#)
- struct [RGBSpectrum](#)
- class [Scene](#)
- class [Semaphore](#)
- struct [ShadedMaterial](#)
- class [SpriteBatch](#)
- class [SpriteFont](#)
- struct [SpriteFontDescriptor](#)
- struct [SpriteFontOutput](#)
- struct [SpriteTransform](#)
- class [SubModel](#)
- class [Texture](#)
- class [Timer](#)
- struct [Transform](#)
- struct [TransformBuffer](#)
- struct [UV](#)
- struct [Variable](#)
- class [VariableScript](#)
- struct [VertexPosition](#)
- struct [VertexPositionColor](#)
- struct [VertexPositionColorTexture](#)
- struct [VertexPositionNormal](#)
- struct [VertexPositionNormalColor](#)
- struct [VertexPositionNormalColorTexture](#)
- struct [VertexPositionNormalTexture](#)
- struct [VertexPositionTexture](#)
- struct [VertexPositionTextureTexture](#)

- class [VertexShader](#)
- class [ViewFrustum](#)
- class [VSReader](#)
- class [VSWriter](#)
- class [World](#)
- class [WorldObject](#)
- class [Writer](#)
- struct [XYZSpectrum](#)

Typedefs

- `template<typename T >`
using [UniquePtr](#) = `std::unique_ptr< T >`
- `template<typename T >`
using [SharedPtr](#) = `std::shared_ptr< T >`
- `template<typename T >`
using [ComPtr](#) = `Microsoft::WRL::ComPtr< T >`
- `typedef std::unique_ptr< void, HandleCloser > UniqueHandle`
- `typedef SharedPtr< void > SharedHandle`
- `typedef XMINT2 int2`
- `typedef XMINT3 int3`
- `typedef XMFLOAT2 float2`
- `typedef XMFLOAT3 float3`
- `typedef XMFLOAT4 float4`
- `typedef XMFLOAT4 color`

Enumerations

- enum [ReadWriteMutexLockType](#) { [READ](#), [WRITE](#) }
- enum [VariableType](#) {
 [BoolType](#), [IntType](#), [Int2Type](#), [Int3Type](#),
 [FloatType](#), [Float2Type](#), [Float3Type](#), [Float4Type](#),
 [ColorType](#), [StringType](#), [UnknownType](#) }
- enum [SpriteEffects](#) { [SpriteEffects_None](#) = 0, [SpriteEffects_FlipHorizontally](#) = 1, [SpriteEffects_FlipVertically](#) = 2, [SpriteEffects_FlipBoth](#) = [SpriteEffects_FlipHorizontally](#) | [SpriteEffects_FlipVertically](#) }
- enum [TokenResult](#) { [valid_token](#), [no_token](#), [invalid_token](#) }
- enum [DDS_MISC_FLAGS2](#) { [DDS_MISC_FLAGS2_ALPHA_MODE_MASK](#) = 0x7L }
- enum [DDS_ALPHA_MODE](#) {
 [DDS_ALPHA_MODE_UNKNOWN](#) = 0, [DDS_ALPHA_MODE_STRAIGHT](#) = 1, [DDS_ALPHA_MODE_PREMULTIPLIED](#) = 2, [DDS_ALPHA_MODE_OPAQUE](#) = 3,
 [DDS_ALPHA_MODE_CUSTOM](#) = 4 }

Functions

- HRESULT [ReadBinaryFile](#) (const wchar_t *fname, [UniquePtr](#)< uint8_t[] > &data, size_t *size)
- `template<typename ValueT >`
const ValueT * [BytesBigEndianToValue](#) (const uint8_t *bytes)
- int8_t [BytesBigEndianToInt8](#) (const uint8_t *bytes)
- uint8_t [BytesBigEndianToUInt8](#) (const uint8_t *bytes)
- int16_t [BytesBigEndianToInt16](#) (const uint8_t *bytes)
- uint16_t [BytesBigEndianToUInt16](#) (const uint8_t *bytes)
- int32_t [BytesBigEndianToInt32](#) (const uint8_t *bytes)

- [uint32_t BytesBigEndianToUInt32](#) (const uint8_t *bytes)
- [int64_t BytesBigEndianToInt64](#) (const uint8_t *bytes)
- [uint64_t BytesBigEndianToUInt64](#) (const uint8_t *bytes)
- [float BytesBigEndianToFloat](#) (const uint8_t *bytes)
- [double BytesBigEndianToDouble](#) (const uint8_t *bytes)
- [int8_t BytesLittleEndianToInt8](#) (const uint8_t *bytes)
- [uint8_t BytesLittleEndianToUInt8](#) (const uint8_t *bytes)
- [int16_t BytesLittleEndianToInt16](#) (const uint8_t *bytes)
- [uint16_t BytesLittleEndianToUInt16](#) (const uint8_t *bytes)
- [int32_t BytesLittleEndianToInt32](#) (const uint8_t *bytes)
- [uint32_t BytesLittleEndianToUInt32](#) (const uint8_t *bytes)
- [int64_t BytesLittleEndianToInt64](#) (const uint8_t *bytes)
- [uint64_t BytesLittleEndianToUInt64](#) (const uint8_t *bytes)
- [float BytesLittleEndianToFloat](#) (const uint8_t *bytes)
- [double BytesLittleEndianToDouble](#) (const uint8_t *bytes)
- [int8_t BytesToInt8](#) (const uint8_t *bytes)
- [uint8_t BytesToUInt8](#) (const uint8_t *bytes)
- [int16_t BytesToInt16](#) (const uint8_t *bytes, bool big_endian)
- [uint16_t BytesToUInt16](#) (const uint8_t *bytes, bool big_endian)
- [int32_t BytesToInt32](#) (const uint8_t *bytes, bool big_endian)
- [uint32_t BytesToUInt32](#) (const uint8_t *bytes, bool big_endian)
- [int64_t BytesToInt64](#) (const uint8_t *bytes, bool big_endian)
- [uint64_t BytesToUInt64](#) (const uint8_t *bytes, bool big_endian)
- [float BytesToFloat](#) (const uint8_t *bytes, bool big_endian)
- [double BytesToDouble](#) (const uint8_t *bytes, bool big_endian)
- [template<typename ContainerT, typename PredicateT>](#)
void [Removelf](#) (ContainerT &container, const PredicateT &predicate)
- [template<typename ContainerT>](#)
void [RemoveAndDestructAllElements](#) (ContainerT &container)
- [template<typename ContainerT>](#)
void [RemoveAndDestructAllSecondElements](#) (ContainerT &container)
- void [PrintConsoleHeader](#) ()
- string [GetFilename](#) (const string &path, const string &name)
- wstring [GetFilename](#) (const wstring &path, const wstring &name)
- string [GetFileExtension](#) (const string &fname)
- wstring [GetFileExtension](#) (const wstring &fname)
- string [GetFileName](#) (const string &fname)
- wstring [GetFileName](#) (const wstring &fname)
- string [GetPathName](#) (const string &fname)
- wstring [GetPathName](#) (const wstring &fname)
- static const char * [FindWordEnd](#) (const char *buffer)
- static void [ProcessError](#) (const char *format, const va_list args, const string &error_type, int error_disposition)
- void [Debug](#) (const char *format,...)
- void [Info](#) (const char *format,...)
- void [Warning](#) (const char *format,...)
- void [Error](#) (const char *format,...)
- void [Fatal](#) (const char *format,...)
- [uint16_t ConsoleWidth](#) ()
- HRESULT [InitializeConsole](#) ()
- HRESULT [ImportMaterialFromFile](#) (const wstring &fname, vector< [Material](#) > &material_buffer)
- HRESULT [ImportMTLMaterialFromFile](#) (const wstring &fname, vector< [Material](#) > &material_buffer)
- [AABB Union](#) (const [AABB](#) &aabb, const [Point3](#) &point)
- [AABB Union](#) (const [AABB](#) &aabb1, const [AABB](#) &aabb2)
- [AABB Overlap](#) (const [AABB](#) &aabb1, const [AABB](#) &aabb2)
- [AABB OverlapStrict](#) (const [AABB](#) &aabb1, const [AABB](#) &aabb2)

- ostream & [operator<<](#) (ostream &os, const XMFLOAT2 &v)
- ostream & [operator<<](#) (ostream &os, const XMFLOAT3 &v)
- ostream & [operator<<](#) (ostream &os, const XMFLOAT4 &v)
- [UV InvertHandness](#) (const [UV](#) &uv)
- [Point3 InvertHandness](#) (const [Point3](#) &point)
- [Direction3 InvertHandness](#) (const [Direction3](#) &direction)
- [Normal3 InvertHandness](#) (const [Normal3](#) &normal)
- void * [AllocAligned](#) (size_t size)
- void [FreeAligned](#) (void *ptr)
- void [HandleDeleter](#) (HANDLE handle)
- HANDLE [SafeHandle](#) (HANDLE handle)
- [SharedHandle CreateSharedHandle](#) (HANDLE handle)
- template<typename VertexT >
HRESULT [ImportOBJMeshFromFile](#) (const wstring &fname, [ModelOutput](#)< VertexT > &model_output, const [MeshDescriptor](#)< VertexT > &mesh_desc=[MeshDescriptor](#)< VertexT >())
- [RenderingDevice GetModelRenderingDevice](#) ()
- [ResourceFactory & GetModelResourceFactory](#) ()
- template<typename VertexT >
[SharedPtr](#)< [ModelDescriptor](#) > [CreateModelDescriptor](#) (const wstring &fname, const [MeshDescriptor](#)< VertexT > &desc)
- template<typename VertexT >
HRESULT [LoadModelFromFile](#) (const wstring &fname, [ModelOutput](#)< VertexT > &model_output, const [MeshDescriptor](#)< VertexT > &mesh_desc=[MeshDescriptor](#)< VertexT >())
- template<typename T >
T * [AtomicCompareAndSwapPointer](#) (T **destination, T *exchange, T *comparand)
- int32_t [AtomicAdd](#) (AtomicInt32 *addend, int32_t value)
- int32_t [AtomicCompareAndSwap](#) (AtomicInt32 *destination, int32_t exchange, int32_t comparand)
- float [AtomicAdd](#) (volatile float *addend, float value)
- size_t [NumberOfSystemCores](#) ()
- INT_PTR CALLBACK [SettingsDialogProcDelegate](#) (HWND hwndDlg, UINT uMsg, WPARAM wParam, LPARAM lParam)
- bool [RejectDisplayMode](#) (const DXGI_MODE_DESC1 *display_mode_desc)
- size_t [BitsPerPixel](#) (DXGI_FORMAT format)
- DXGI_FORMAT [ConvertToSRGB](#) (DXGI_FORMAT format)
- [RenderingDevice GetRenderingDevice](#) ()
- [ResourceFactory & GetResourceFactory](#) ()
- [SharedPtr](#)< [VariableScript](#) > [CreateVariableScript](#) (const wstring &fname, bool import)
- HRESULT [ImportVariableScriptFromFile](#) (const wstring &fname, vector< [Variable](#) * > &variable_buffer)
- HRESULT [ExportVariableScriptToFile](#) (const wstring &fname, const vector< [Variable](#) * > &variable_buffer)
- HRESULT [ImportVSFromFile](#) (const wstring &fname, vector< [Variable](#) * > &variable_buffer)
- HRESULT [ExportVSToFile](#) (const wstring &fname, const vector< [Variable](#) * > &variable_buffer)
- [CombinedShader CreateLambertianShader](#) ()
- HRESULT [CompileShaderFromFile](#) (const wstring &fname, const string &entry_point, const string &shader_target, ID3DBlob **output_blob)
- HRESULT [ImportFontFromFile](#) (const wstring &fname, const [RenderingDevice](#) &device, [SpriteFontOutput](#) &output, const [SpriteFontDescriptor](#) &desc)
- HRESULT [ImportSpriteFontFromFile](#) (const wstring &fname, const [RenderingDevice](#) &device, [SpriteFontOutput](#) &output, const [SpriteFontDescriptor](#) &desc)
- const char * [str_escape_first](#) (const char *str, char c)
- char * [str_escape_first](#) (char *str, char c)
- const wchar_t * [str_escape_first](#) (const wchar_t *str, wchar_t c)
- wchar_t * [str_escape_first](#) (wchar_t *str, wchar_t c)
- char * [str_gets](#) (char *str, int num, const char **input)
- wchar_t * [str_gets](#) (wchar_t *str, int num, const wchar_t **input)
- wchar_t * [str_convert](#) (const char *str)

- [char * str_convert](#) (const wchar_t *str)
- [wstring str_convert](#) (const string &str)
- [string str_convert](#) (const wstring &str)
- [bool str_equals](#) (const char *str1, const char *str2)
- [bool str_equals](#) (const wchar_t *str1, const wchar_t *str2)
- [bool str_contains](#) (const char *str1, const char *str2)
- [bool str_contains](#) (const wchar_t *str1, const wchar_t *str2)
- [bool str_contains](#) (const char *str, char c)
- [bool str_contains](#) (const wchar_t *str, wchar_t c)
- [TokenResult StringToBool](#) (const char *str, bool &result)
- [TokenResult StringToInt8](#) (const char *str, int8_t &result)
- [TokenResult StringToUInt8](#) (const char *str, uint8_t &result)
- [TokenResult StringToInt16](#) (const char *str, int16_t &result)
- [TokenResult StringToUInt16](#) (const char *str, uint16_t &result)
- [TokenResult StringToInt32](#) (const char *str, int32_t &result)
- [TokenResult StringToUInt32](#) (const char *str, uint32_t &result)
- [TokenResult StringToInt64](#) (const char *str, int64_t &result)
- [TokenResult StringToUInt64](#) (const char *str, uint64_t &result)
- [TokenResult StringToFloat](#) (const char *str, float &result)
- [TokenResult StringToDouble](#) (const char *str, double &result)
- [TokenResult StringToBool](#) (const char *begin, const char *end, bool &result)
- [TokenResult StringToInt8](#) (const char *begin, const char *end, int8_t &result)
- [TokenResult StringToUInt8](#) (const char *begin, const char *end, uint8_t &result)
- [TokenResult StringToInt16](#) (const char *begin, const char *end, int16_t &result)
- [TokenResult StringToUInt16](#) (const char *begin, const char *end, uint16_t &result)
- [TokenResult StringToInt32](#) (const char *begin, const char *end, int32_t &result)
- [TokenResult StringToUInt32](#) (const char *begin, const char *end, uint32_t &result)
- [TokenResult StringToInt64](#) (const char *begin, const char *end, int64_t &result)
- [TokenResult StringToUInt64](#) (const char *begin, const char *end, uint64_t &result)
- [TokenResult StringToFloat](#) (const char *begin, const char *end, float &result)
- [TokenResult StringToDouble](#) (const char *begin, const char *end, double &result)
- [TokenResult StringPrefixToInt8](#) (const char *str, int8_t &result)
- [TokenResult StringPrefixToUInt8](#) (const char *str, uint8_t &result)
- [TokenResult StringPrefixToInt16](#) (const char *str, int16_t &result)
- [TokenResult StringPrefixToUInt16](#) (const char *str, uint16_t &result)
- [TokenResult StringPrefixToInt32](#) (const char *str, int32_t &result)
- [TokenResult StringPrefixToUInt32](#) (const char *str, uint32_t &result)
- [TokenResult StringPrefixToInt64](#) (const char *str, int64_t &result)
- [TokenResult StringPrefixToUInt64](#) (const char *str, uint64_t &result)
- [TokenResult StringPrefixToFloat](#) (const char *str, float &result)
- [TokenResult StringPrefixToDouble](#) (const char *str, double &result)
- [TokenResult ReadChars](#) (char *str, char **context, char **result, const char *delimiters)
- [TokenResult ReadString](#) (char *str, char **context, string &result, const char *delimiters)
- [TokenResult ReadQuotedString](#) (char *str, char **context, string &result, const char *delimiters)
- [TokenResult ReadBool](#) (char *str, char **context, bool &result, const char *delimiters)
- [TokenResult ReadInt8](#) (char *str, char **context, int8_t &result, const char *delimiters)
- [TokenResult ReadUInt8](#) (char *str, char **context, uint8_t &result, const char *delimiters)
- [TokenResult ReadInt16](#) (char *str, char **context, int16_t &result, const char *delimiters)
- [TokenResult ReadUInt16](#) (char *str, char **context, uint16_t &result, const char *delimiters)
- [TokenResult ReadInt32](#) (char *str, char **context, int32_t &result, const char *delimiters)
- [TokenResult ReadUInt32](#) (char *str, char **context, uint32_t &result, const char *delimiters)
- [TokenResult ReadInt64](#) (char *str, char **context, int64_t &result, const char *delimiters)
- [TokenResult ReadUInt64](#) (char *str, char **context, uint64_t &result, const char *delimiters)
- [TokenResult ReadFloat](#) (char *str, char **context, float &result, const char *delimiters)
- [TokenResult ReadDouble](#) (char *str, char **context, double &result, const char *delimiters)

- [TokenResult ReadFloat2](#) (char *str, char **context, XMFLOAT2 &result, const char *delimiters)
- [TokenResult ReadFloat3](#) (char *str, char **context, XMFLOAT3 &result, const char *delimiters)
- [TokenResult ReadFloat4](#) (char *str, char **context, XMFLOAT4 &result, const char *delimiters)
- [TokenResult HasChars](#) (const char *str, const char *delimiters)
- [TokenResult HasString](#) (const char *str, const char *delimiters)
- [TokenResult HasQuotedString](#) (const char *str, const char *delimiters)
- [TokenResult HasBool](#) (const char *str, const char *delimiters)
- [TokenResult HasInt8](#) (const char *str, const char *delimiters)
- [TokenResult HasUInt8](#) (const char *str, const char *delimiters)
- [TokenResult HasInt16](#) (const char *str, const char *delimiters)
- [TokenResult HasUInt16](#) (const char *str, const char *delimiters)
- [TokenResult HasInt32](#) (const char *str, const char *delimiters)
- [TokenResult HasUInt32](#) (const char *str, const char *delimiters)
- [TokenResult HasInt64](#) (const char *str, const char *delimiters)
- [TokenResult HasUInt64](#) (const char *str, const char *delimiters)
- [TokenResult HasFloat](#) (const char *str, const char *delimiters)
- [TokenResult HasDouble](#) (const char *str, const char *delimiters)
- char * [SkipDelimiters](#) (char *str, const char *delimiters)
- const char * [SkipDelimiters](#) (const char *str, const char *delimiters)
- char * [GotoDelimiters](#) (char *str, const char *delimiters)
- const char * [GotoDelimiters](#) (const char *str, const char *delimiters)
- template<UINT TNameLength>
void [SetDebugObjectName](#) (_In_ ID3D11DeviceChild *resource, _In_ const char(&name)[TNameLength])
- static HRESULT [LoadTextureDataFromFile](#) (_In_z_ const wchar_t *file_name, std::unique_ptr< uint8_t[] > &dds_data, [DDS_HEADER](#) **header, uint8_t **bit_data, size_t *bit_size)
- static void [GetSurfaceInfo](#) (_In_ size_t width, _In_ size_t height, _In_ DXGI_FORMAT fmt, _Out_opt_ size_t *out_nb_bytes, _Out_opt_ size_t *out_row_bytes, _Out_opt_ size_t *out_nb_rows)
- static DXGI_FORMAT [GetDXGIFormat](#) (const [DDS_PIXELFORMAT](#) &ddpf)
- static DXGI_FORMAT [MakeSRGB](#) (_In_ DXGI_FORMAT format)
- static HRESULT [FillInitData](#) (_In_ size_t width, _In_ size_t height, _In_ size_t depth, _In_ size_t mip_count, _In_ size_t array_size, _In_ DXGI_FORMAT format, _In_ size_t maxsize, _In_ size_t bit_size, _In_reads_bytes_(bit_size) const uint8_t *bit_data, _Out_size_t &twidht, _Out_size_t &theight, _Out_size_t &tdepth, _Out_size_t &skip_mip, _Out_writes_(mip_count * array_size) D3D11_SUBRESOURCE_DATA *init_data)
- static HRESULT [CreateD3DResources](#) (_In_ const [RenderingDevice](#) &device, _In_ uint32_t res_dim, _In_ size_t width, _In_ size_t height, _In_ size_t depth, _In_ size_t mip_count, _In_ size_t array_size, _In_ DXGI_FORMAT format, _In_ D3D11_USAGE usage, _In_ uint32_t bindFlags, _In_ uint32_t cpu_access_flags, _In_ uint32_t misc_flags, _In_ bool forceSRGB, _In_ bool is_cube_map, _In_reads_opt_(mip_count * array_size) D3D11_SUBRESOURCE_DATA *init_data, _Outptr_opt_ ID3D11Resource **texture, _Outptr_opt_ ID3D11ShaderResourceView **texture_view)
- static HRESULT [CreateTextureFromDDS](#) (_In_ const [RenderingDevice](#) &device, _In_opt_ ID3D11DeviceContext *d3dContext, _In_ const [DDS_HEADER](#) *header, _In_reads_bytes_(bit_size) const uint8_t *bit_data, _In_ size_t bit_size, _In_ size_t maxsize, _In_ D3D11_USAGE usage, _In_ uint32_t bindFlags, _In_ uint32_t cpu_access_flags, _In_ uint32_t misc_flags, _In_ bool forceSRGB, _Outptr_opt_ ID3D11Resource **texture, _Outptr_opt_ ID3D11ShaderResourceView **texture_view)
- static [DDS_ALPHA_MODE](#) [GetAlphaMode](#) (_In_ const [DDS_HEADER](#) *header)
- _Use_decl_annotations_ HRESULT [CreateDDSTextureFromMemory](#) (const [RenderingDevice](#) &device, const uint8_t *dds_data, size_t dds_dataSize, ID3D11Resource **texture, ID3D11ShaderResourceView **texture_view, size_t maxsize, [DDS_ALPHA_MODE](#) *alpha_mode)
- _Use_decl_annotations_ HRESULT [CreateDDSTextureFromMemory](#) (const [RenderingDevice](#) &device, ID3D11DeviceContext *d3dContext, const uint8_t *dds_data, size_t dds_dataSize, ID3D11Resource **texture, ID3D11ShaderResourceView **texture_view, size_t maxsize, [DDS_ALPHA_MODE](#) *alpha_mode)
- _Use_decl_annotations_ HRESULT [CreateDDSTextureFromMemoryEx](#) (const [RenderingDevice](#) &device, const uint8_t *dds_data, size_t dds_dataSize, size_t maxsize, D3D11_USAGE usage, uint32_t bindFlags, uint32_t cpu_access_flags, uint32_t misc_flags, bool forceSRGB, ID3D11Resource **texture, ID3D11ShaderResourceView **texture_view, [DDS_ALPHA_MODE](#) *alpha_mode)

- `_Use_decl_annotations_ HRESULT CreateDDSTextureFromMemoryEx` (const [RenderingDevice](#) &device, `ID3D11DeviceContext *d3dContext`, const `uint8_t *dds_data`, `size_t dds_dataSize`, `size_t maxsize`, `D3D11_USAGE` usage, `uint32_t bindFlags`, `uint32_t cpu_access_flags`, `uint32_t misc_flags`, `bool forceSRGB`, `ID3D11Resource **texture`, `ID3D11ShaderResourceView **texture_view`, `DDS_ALPHA_MODE` *alpha_mode)
- `_Use_decl_annotations_ HRESULT CreateDDSTextureFromFile` (const [RenderingDevice](#) &device, const `wchar_t *file_name`, `ID3D11Resource **texture`, `ID3D11ShaderResourceView **texture_view`, `size_t maxsize`, `DDS_ALPHA_MODE` *alpha_mode)
- `_Use_decl_annotations_ HRESULT CreateDDSTextureFromFile` (const [RenderingDevice](#) &device, `ID3D11DeviceContext *d3dContext`, const `wchar_t *file_name`, `ID3D11Resource **texture`, `ID3D11ShaderResourceView **texture_view`, `size_t maxsize`, `DDS_ALPHA_MODE` *alpha_mode)
- `_Use_decl_annotations_ HRESULT CreateDDSTextureFromFileEx` (const [RenderingDevice](#) &device, const `wchar_t *file_name`, `size_t maxsize`, `D3D11_USAGE` usage, `uint32_t bindFlags`, `uint32_t cpu_access_flags`, `uint32_t misc_flags`, `bool forceSRGB`, `ID3D11Resource **texture`, `ID3D11ShaderResourceView **texture_view`, `DDS_ALPHA_MODE` *alpha_mode)
- `_Use_decl_annotations_ HRESULT CreateDDSTextureFromFileEx` (const [RenderingDevice](#) &device, `ID3D11DeviceContext *d3dContext`, const `wchar_t *file_name`, `size_t maxsize`, `D3D11_USAGE` usage, `uint32_t bindFlags`, `uint32_t cpu_access_flags`, `uint32_t misc_flags`, `bool forceSRGB`, `ID3D11Resource **texture`, `ID3D11ShaderResourceView **texture_view`, `DDS_ALPHA_MODE` *alpha_mode)
- `HRESULT CreateDDSTextureFromMemory` (`_In_` const [RenderingDevice](#) &device, `_In_reads_bytes_`(`dds_dataSize`) const `uint8_t *dds_data`, `_In_` `size_t dds_dataSize`, `_Outptr_opt_` `ID3D11Resource **texture`, `_Outptr_opt_` `ID3D11ShaderResourceView **texture_view`, `_In_` `size_t maxsize=0`, `_Out_opt_` `DDS_ALPHA_MODE` *alpha_mode=nullptr)
- `HRESULT CreateDDSTextureFromFile` (`_In_` const [RenderingDevice](#) &device, `_In_z_` const `wchar_t *szFileName`, `_Outptr_opt_` `ID3D11Resource **texture`, `_Outptr_opt_` `ID3D11ShaderResourceView **texture_view`, `_In_` `size_t maxsize=0`, `_Out_opt_` `DDS_ALPHA_MODE` *alpha_mode=nullptr)
- `HRESULT CreateDDSTextureFromMemory` (`_In_` const [RenderingDevice](#) &device, `_In_opt_` `ID3D11DeviceContext *d3dContext`, `_In_reads_bytes_`(`dds_dataSize`) const `uint8_t *dds_data`, `_In_` `size_t dds_dataSize`, `_Outptr_opt_` `ID3D11Resource **texture`, `_Outptr_opt_` `ID3D11ShaderResourceView **texture_view`, `_In_` `size_t maxsize=0`, `_Out_opt_` `DDS_ALPHA_MODE` *alpha_mode=nullptr)
- `HRESULT CreateDDSTextureFromFile` (`_In_` const [RenderingDevice](#) &device, `_In_opt_` `ID3D11DeviceContext *d3dContext`, `_In_z_` const `wchar_t *szFileName`, `_Outptr_opt_` `ID3D11Resource **texture`, `_Outptr_opt_` `ID3D11ShaderResourceView **texture_view`, `_In_` `size_t maxsize=0`, `_Out_opt_` `DDS_ALPHA_MODE` *alpha_mode=nullptr)
- `HRESULT CreateDDSTextureFromMemoryEx` (`_In_` const [RenderingDevice](#) &device, `_In_reads_bytes_`(`dds_dataSize`) const `uint8_t *dds_data`, `_In_` `size_t dds_dataSize`, `_In_` `size_t maxsize`, `_In_` `D3D11_USAGE` usage, `_In_` `uint32_t bindFlags`, `_In_` `uint32_t cpu_access_flags`, `_In_` `uint32_t misc_flags`, `_In_` `bool forceSRGB`, `_Outptr_opt_` `ID3D11Resource **texture`, `_Outptr_opt_` `ID3D11ShaderResourceView **texture_view`, `_Out_opt_` `DDS_ALPHA_MODE` *alpha_mode=nullptr)
- `HRESULT CreateDDSTextureFromFileEx` (`_In_` const [RenderingDevice](#) &device, `_In_z_` const `wchar_t *szFileName`, `_In_` `size_t maxsize`, `_In_` `D3D11_USAGE` usage, `_In_` `uint32_t bindFlags`, `_In_` `uint32_t cpu_access_flags`, `_In_` `uint32_t misc_flags`, `_In_` `bool forceSRGB`, `_Outptr_opt_` `ID3D11Resource **texture`, `_Outptr_opt_` `ID3D11ShaderResourceView **texture_view`, `_Out_opt_` `DDS_ALPHA_MODE` *alpha_mode=nullptr)
- `HRESULT CreateDDSTextureFromMemoryEx` (`_In_` const [RenderingDevice](#) &device, `_In_opt_` `ID3D11DeviceContext *d3dContext`, `_In_reads_bytes_`(`dds_dataSize`) const `uint8_t *dds_data`, `_In_` `size_t dds_dataSize`, `_In_` `size_t maxsize`, `_In_` `D3D11_USAGE` usage, `_In_` `uint32_t bindFlags`, `_In_` `uint32_t cpu_access_flags`, `_In_` `uint32_t misc_flags`, `_In_` `bool forceSRGB`, `_Outptr_opt_` `ID3D11Resource **texture`, `_Outptr_opt_` `ID3D11ShaderResourceView **texture_view`, `_Out_opt_` `DDS_ALPHA_MODE` *alpha_mode=nullptr)
- `HRESULT CreateDDSTextureFromFileEx` (`_In_` const [RenderingDevice](#) &device, `_In_opt_` `ID3D11DeviceContext *d3dContext`, `_In_z_` const `wchar_t *szFileName`, `_In_` `size_t maxsize`, `_In_` `D3D11_USAGE` usage, `_In_` `uint32_t bindFlags`, `_In_` `uint32_t cpu_access_flags`, `_In_` `uint32_t misc_flags`, `_In_` `bool forceSRGB`, `_Outptr_opt_` `ID3D11Resource **texture`, `_Outptr_opt_` `ID3D11ShaderResourceView **texture_view`, `_Out_opt_` `DDS_ALPHA_MODE` *alpha_mode=nullptr)
- `SharedPtr< Texture > CreateTexture` (const `wstring &fname`)
- `HRESULT ImportTextureFromFile` (const `wstring &fname`, const [RenderingDevice](#) &device, `ID3D11ShaderResourceView **texture_resource_view`)

- void [ComboBoxAdd](#) (HWND dialog, int id, const void *data, const wchar_t *desc)
- void [ComboBoxSelect](#) (HWND dialog, int id, int index)
- void [ComboBoxSelect](#) (HWND dialog, int id, const void *data)
- const void * [ComboBoxSelected](#) (HWND dialog, int id)
- bool [ComboBoxSomethingSelected](#) (HWND dialog, int id)
- int [ComboBoxCount](#) (HWND dialog, int id)
- bool [ComboBoxContains](#) (HWND dialog, int id, const wchar_t *desc)
- LRESULT CALLBACK [MainWindowProc](#) (HWND hWnd, UINT msg, WPARAM wParam, LPARAM lParam)

Variables

- [LoggingConfiguration](#) [g_logging_configuration](#)
- [Engine](#) * [g_engine](#) = nullptr
- [DeviceEnumeration](#) * [g_device_enumeration](#) = nullptr
- const D3D_FEATURE_LEVEL [g_feature_levels](#) []
- const DXGI_FORMAT [g_pixel_formats](#) []
- const uint32_t [DDS_MAGIC](#) = 0x20534444

4.1.1 Typedef Documentation

4.1.1.1 color

```
typedef XMFLOAT4 mage::color
```

4.1.1.2 ComPtr

```
template<typename T >
using mage::ComPtr = typedef Microsoft::WRL::ComPtr< T >
```

4.1.1.3 float2

```
typedef XMFLOAT2 mage::float2
```

4.1.1.4 float3

```
typedef XMFLOAT3 mage::float3
```

4.1.1.5 float4

```
typedef XMFLOAT4 mage::float4
```

4.1.1.6 int2

```
typedef XMINT2 mage::int2
```

4.1.1.7 int3

```
typedef XMINT3 mage::int3
```

4.1.1.8 SharedHandle

```
typedef SharedPtr< void > mage::SharedHandle
```

4.1.1.9 SharedPtr

```
template<typename T >
using mage::SharedPtr = typedef std::shared_ptr< T >
```

4.1.1.10 UniqueHandle

```
typedef std::unique_ptr< void, HandleCloser > mage::UniqueHandle
```

4.1.1.11 UniquePtr

```
template<typename T >
using mage::UniquePtr = typedef std::unique_ptr< T >
```

4.1.2 Enumeration Type Documentation

4.1.2.1 DDS_ALPHA_MODE

```
enum mage::DDS_ALPHA_MODE
```

Enumerator

DDS_ALPHA_MODE_UNKNOWN	
DDS_ALPHA_MODE_STRAIGHT	
DDS_ALPHA_MODE_PREMULTIPLIED	
DDS_ALPHA_MODE_OPAQUE	
DDS_ALPHA_MODE_CUSTOM	

4.1.2.2 DDS_MISC_FLAGS2

```
enum mage::DDS_MISC_FLAGS2
```

Enumerator

DDS_MISC_FLAGS2_ALPHA_MODE_MASK	
---------------------------------	--

4.1.2.3 ReadWriteMutexLockType

```
enum mage::ReadWriteMutexLockType
```

Type of read write mutex locks.

Enumerator

READ	
WRITE	

4.1.2.4 SpriteEffects

```
enum mage::SpriteEffects
```

Enumerator

SpriteEffects_None	
SpriteEffects_FlipHorizontally	
SpriteEffects_FlipVertically	
SpriteEffects_FlipBoth	

4.1.2.5 TokenResult

```
enum mage::TokenResult
```

Enumerator

valid_token	
no_token	
invalid_token	

4.1.2.6 VariableType

```
enum mage::VariableType
```

Enumeration of variable types.

Enumerator

BoolType	
IntType	
Int2Type	
Int3Type	
FloatType	
Float2Type	

Enumerator

Float3Type	
Float4Type	
ColorType	
StringType	
UnknownType	

4.1.3 Function Documentation

4.1.3.1 AllocAligned()

```
T * mage::AllocAligned (
    size_t count )
```

Allocates memory on an alignment boundary of 64 bytes of the given size.

Parameters

in	size	The requested size in bytes to allocate in memory.
----	------	--

Returns

`nullptr` if the allocation failed.

A pointer to the memory block that was allocated. The pointer is a multiple of the alignment of 64 bytes.

Allocates memory on an alignment boundary of 64 bytes.

Template Parameters

T	The type of objects to allocate in memory.
---	--

Parameters

in	count	The number of objects of type T to allocate in memory.
----	-------	--

Returns

`nullptr` if the allocation failed.

A pointer to the memory block that was allocated. The pointer is a multiple of the alignment of 64 bytes.

4.1.3.2 AtomicAdd() [1/2]

```
int32_t mage::AtomicAdd (
    AtomicInt32 * addend,
    int32_t value )
```

Performs an atomic addition operation on the specified values.

Parameters

<i>in, out</i>	<i>addend</i>	A pointer to the first operand. This value will be replaced with the result of the operation.
<i>in</i>	<i>value</i>	The second operand.

Returns

The function returns the result of the operation.

4.1.3.3 AtomicAdd() [2/2]

```
float mage::AtomicAdd (  
    volatile float * addend,  
    float value )
```

Performs an atomic addition operation on the specified values.

Parameters

<i>in, out</i>	<i>addend</i>	A pointer to the first operand. This value will be replaced with the result of the operation.
<i>in</i>	<i>value</i>	The second operand.

Returns

The function returns the result of the operation.

4.1.3.4 AtomicCompareAndSwap()

```
int32_t mage::AtomicCompareAndSwap (  
    AtomicInt32 * destination,  
    int32_t exchange,  
    int32_t comparand )
```

Performs an atomic compare-and-exchange operation on the specified values. The function compares the original value against a given comparand value and exchanges the original value with a given exchange value in case of equality.

Parameters

<i>in, out</i>	<i>destination</i>	
<i>in</i>	<i>exchange</i>	The exchange value.
<i>in</i>	<i>comparand</i>	The value to compare to <i>destination</i> .

Returns

The function returns the initial value of *destination*.

4.1.3.5 AtomicCompareAndSwapPointer()

```
template<typename T >
T* mage::AtomicCompareAndSwapPointer (
    T ** destination,
    T * exchange,
    T * comparand )
```

Performs an atomic compare-and-exchange operation on the specified pointers. The function compares the original pointer against a given comparand pointer and exchanges the original pointer with a given exchange pointer in case of equality.

Parameters

in, out	<i>destination</i>	
in	<i>exchange</i>	The exchange pointer.
in	<i>comparand</i>	The pointer to compare to <i>destination</i> .

Returns

The function returns the initial pointer of *destination*.

4.1.3.6 BitsPerPixel()

```
size_t mage::BitsPerPixel (
    DXGI_FORMAT format )
```

Returns the number of bits per pixel of the given format.

Returns

The number of bits per pixel of the given format.

4.1.3.7 BytesBigEndianToDouble()

```
double mage::BytesBigEndianToDouble (
    const uint8_t * bytes )
```

4.1.3.8 BytesBigEndianToFloat()

```
float mage::BytesBigEndianToFloat (
    const uint8_t * bytes )
```

4.1.3.9 BytesBigEndianToInt16()

```
int16_t mage::BytesBigEndianToInt16 (
    const uint8_t * bytes )
```

4.1.3.10 BytesBigEndianToInt32()

```
int32_t mage::BytesBigEndianToInt32 (
    const uint8_t * bytes )
```

4.1.3.11 BytesBigEndianToInt64()

```
int64_t mage::BytesBigEndianToInt64 (
    const uint8_t * bytes )
```

4.1.3.12 BytesBigEndianToInt8()

```
int8_t mage::BytesBigEndianToInt8 (
    const uint8_t * bytes )
```

4.1.3.13 BytesBigEndianToUInt16()

```
uint16_t mage::BytesBigEndianToUInt16 (
    const uint8_t * bytes )
```

4.1.3.14 BytesBigEndianToUInt32()

```
uint32_t mage::BytesBigEndianToUInt32 (
    const uint8_t * bytes )
```

4.1.3.15 BytesBigEndianToUInt64()

```
uint64_t mage::BytesBigEndianToUInt64 (
    const uint8_t * bytes )
```

4.1.3.16 BytesBigEndianToUInt8()

```
uint8_t mage::BytesBigEndianToUInt8 (
    const uint8_t * bytes )
```

4.1.3.17 BytesBigEndianToValue()

```
template<typename ValueT >
const ValueT* mage::BytesBigEndianToValue (
    const uint8_t * bytes )
```

4.1.3.18 BytesLittleEndianToDouble()

```
double mage::BytesLittleEndianToDouble (
    const uint8_t * bytes )
```

4.1.3.19 BytesLittleEndianToFloat()

```
float mage::BytesLittleEndianToFloat (
    const uint8_t * bytes )
```

4.1.3.20 BytesLittleEndianToInt16()

```
int16_t mage::BytesLittleEndianToInt16 (
    const uint8_t * bytes )
```

4.1.3.21 BytesLittleEndianToInt32()

```
int32_t mage::BytesLittleEndianToInt32 (
    const uint8_t * bytes )
```

4.1.3.22 BytesLittleEndianToInt64()

```
int64_t mage::BytesLittleEndianToInt64 (
    const uint8_t * bytes )
```

4.1.3.23 BytesLittleEndianToInt8()

```
int8_t mage::BytesLittleEndianToInt8 (
    const uint8_t * bytes )
```

4.1.3.24 BytesLittleEndianToUInt16()

```
uint16_t mage::BytesLittleEndianToUInt16 (
    const uint8_t * bytes )
```

4.1.3.25 BytesLittleEndianToUInt32()

```
uint32_t mage::BytesLittleEndianToUInt32 (
    const uint8_t * bytes )
```

4.1.3.26 BytesLittleEndianToUInt64()

```
uint64_t mage::BytesLittleEndianToUInt64 (
    const uint8_t * bytes )
```

4.1.3.27 BytesLittleEndianToUInt8()

```
uint8_t mage::BytesLittleEndianToUInt8 (
    const uint8_t * bytes )
```


4.1.3.28 BytesToDouble()

```
double mage::BytesToDouble (
    const uint8_t * bytes,
    bool big_endian )
```

4.1.3.29 BytesToFloat()

```
float mage::BytesToFloat (
    const uint8_t * bytes,
    bool big_endian )
```

4.1.3.30 BytesToInt16()

```
int16_t mage::BytesToInt16 (
    const uint8_t * bytes,
    bool big_endian )
```

4.1.3.31 BytesToInt32()

```
int32_t mage::BytesToInt32 (
    const uint8_t * bytes,
    bool big_endian )
```

4.1.3.32 BytesToInt64()

```
int64_t mage::BytesToInt64 (
    const uint8_t * bytes,
    bool big_endian )
```

4.1.3.33 BytesToInt8()

```
int8_t mage::BytesToInt8 (
    const uint8_t * bytes )
```

4.1.3.34 BytesToUInt16()

```
uint16_t mage::BytesToUInt16 (
    const uint8_t * bytes,
    bool big_endian )
```

4.1.3.35 BytesToUInt32()

```
uint32_t mage::BytesToUInt32 (
    const uint8_t * bytes,
    bool big_endian )
```

4.1.3.36 BytesToUInt64()

```
uint64_t mage::BytesToUInt64 (
    const uint8_t * bytes,
    bool big_endian )
```

4.1.3.37 BytesToUInt8()

```
uint8_t mage::BytesToUInt8 (
    const uint8_t * bytes )
```

4.1.3.38 ComboBoxAdd()

```
void mage::ComboBoxAdd (
    HWND dialog,
    int id,
    const void * data,
    const wchar_t * desc )
```

Adds an item associated with the given data and described with the given descriptor to a combo box.

Parameters

in	<i>dialog</i>	A handle to the dialog box that contains the control.
in	<i>id</i>	The identifier of the control to be retrieved.
in	<i>data</i>	A pointer to the data of the item to add.
in	<i>desc</i>	The description of the item to add.

4.1.3.39 ComboBoxContains()

```
bool mage::ComboBoxContains (
    HWND dialog,
    int id,
    const wchar_t * desc )
```

Checks whether a combo box contains the given descriptor.

Parameters

in	<i>dialog</i>	A handle to the dialog box that contains the control.
in	<i>id</i>	The identifier of the control to be retrieved.
in	<i>desc</i>	The string description to check.

Returns

`true` if the given description is contained in the combo box. `false` otherwise.

4.1.3.40 ComboBoxCount()

```
int mage::ComboBoxCount (
    HWND dialog,
    int id )
```

Returns the number of items in a combo box.

Parameters

in	<i>dialog</i>	A handle to the dialog box that contains the control.
in	<i>id</i>	The identifier of the control to be retrieved.

Returns

The number of items of a combo box.

4.1.3.41 ComboBoxSelect() [1/2]

```
void mage::ComboBoxSelect (
    HWND dialog,
    int id,
    int index )
```

Selects the item at the given index in a combo box.

Parameters

in	<i>dialog</i>	A handle to the dialog box that contains the control.
in	<i>id</i>	The identifier of the control to be retrieved.
in	<i>index</i>	The index of the item.

4.1.3.42 ComboBoxSelect() [2/2]

```
void mage::ComboBoxSelect (
    HWND dialog,
    int id,
    const void * data )
```

Selects the item associated with the given data in a combo box.

Parameters

in	<i>dialog</i>	A handle to the dialog box that contains the control.
in	<i>id</i>	The identifier of the control to be retrieved.
in	<i>data</i>	A pointer to the data of the item.

4.1.3.43 ComboBoxSelected()

```
const void * mage::ComboBoxSelected (
    HWND dialog,
    int id )
```

Returns the data associated with the selected item in a combo box.

Parameters

in	<i>dialog</i>	A handle to the dialog box that contains the control.
in	<i>id</i>	The identifier of the control to be retrieved.

Returns

`nullptr` if the combo box has no items.

A pointer to the data associated with the selected item in the combo box.

4.1.3.44 ComboBoxSomethingSelected()

```
bool mage::ComboBoxSomethingSelected (
    HWND dialog,
    int id )
```

Checks whether a valid item is selected in a combo box.

Parameters

in	<i>dialog</i>	A handle to the dialog box that contains the control.
in	<i>id</i>	The identifier of the control to be retrieved.

Returns

`true` if a valid item is selected in the combo box. `false` otherwise.

4.1.3.45 CompileShaderFromFile()

```
HRESULT mage::CompileShaderFromFile (
    const wstring & fname,
    const string & entry_point,
    const string & shader_target,
    ID3DBlob ** output_blob )
```

Compiles Microsoft High Level Shader Language (HLSL) code into bytecode for a given shader target.

Parameters

in	<i>fname</i>	A pointer to a constant null-terminated string that contains the name of the file that contains the shader code.
----	--------------	--

Parameters

in	<i>entry_point</i>	A pointer to a constant null-terminated string that contains the name of the shader entry point function where shader execution begins.
in	<i>shader_target</i>	A pointer to a constant null-terminated string that specifies the shader target or set of shader features to compile against.
out	<i>output_blob</i>	A pointer to a variable that receives a pointer to the ID3DBlob interface that you can use to access the compiled code.

4.1.3.46 ConsoleWidth()

```
uint16_t mage::ConsoleWidth ( )
```

Returns the fixed console width.

Returns

The fixed console width.

4.1.3.47 ConvertToSRGB()

```
DXGI_FORMAT mage::ConvertToSRGB (
    DXGI_FORMAT format )
```

Converts the given format to an SRGB format.

Returns

The converted format.

4.1.3.48 Created3DResources()

```
static HRESULT mage::Created3DResources (
    _In_ const RenderingDevice & device,
    _In_ uint32_t res_dim,
    _In_ size_t width,
    _In_ size_t height,
    _In_ size_t depth,
    _In_ size_t mip_count,
    _In_ size_t array_size,
    _In_ DXGI_FORMAT format,
    _In_ D3D11_USAGE usage,
    _In_ uint32_t bindFlags,
    _In_ uint32_t cpu_access_flags,
    _In_ uint32_t misc_flags,
    _In_ bool forceSRGB,
    _In_ bool is_cube_map,
    _In_reads_opt_(mip_count * array_size) D3D11_SUBRESOURCE_DATA * init_data,
    _Outptr_opt_ ID3D11Resource ** texture,
    _Outptr_opt_ ID3D11ShaderResourceView ** texture_view ) [static]
```

4.1.3.49 CreateDDSTextureFromFile() [1/4]

```
HRESULT mage::CreateDDSTextureFromFile (
    _In_ const RenderingDevice & device,
    _In_z_ const wchar_t * szFileName,
    _Outptr_opt_ ID3D11Resource ** texture,
    _Outptr_opt_ ID3D11ShaderResourceView ** texture_view,
    _In_ size_t maxsize = 0,
    _Out_opt_ DDS_ALPHA_MODE * alpha_mode = nullptr )
```

4.1.3.50 CreateDDSTextureFromFile() [2/4]

```
HRESULT mage::CreateDDSTextureFromFile (
    _In_ const RenderingDevice & device,
    _In_opt_ ID3D11DeviceContext * d3dContext,
    _In_z_ const wchar_t * szFileName,
    _Outptr_opt_ ID3D11Resource ** texture,
    _Outptr_opt_ ID3D11ShaderResourceView ** texture_view,
    _In_ size_t maxsize = 0,
    _Out_opt_ DDS_ALPHA_MODE * alpha_mode = nullptr )
```

4.1.3.51 CreateDDSTextureFromFile() [3/4]

```
_Use_decl_annotations_ HRESULT mage::CreateDDSTextureFromFile (
    const RenderingDevice & device,
    const wchar_t * file_name,
    ID3D11Resource ** texture,
    ID3D11ShaderResourceView ** texture_view,
    size_t maxsize,
    DDS_ALPHA_MODE * alpha_mode )
```

4.1.3.52 CreateDDSTextureFromFile() [4/4]

```
_Use_decl_annotations_ HRESULT mage::CreateDDSTextureFromFile (
    const RenderingDevice & device,
    ID3D11DeviceContext * d3dContext,
    const wchar_t * file_name,
    ID3D11Resource ** texture,
    ID3D11ShaderResourceView ** texture_view,
    size_t maxsize,
    DDS_ALPHA_MODE * alpha_mode )
```

4.1.3.53 CreateDDSTextureFromFileEx() [1/4]

```
HRESULT mage::CreateDDSTextureFromFileEx (
    _In_ const RenderingDevice & device,
    _In_z_ const wchar_t * szFileName,
    _In_ size_t maxsize,
    _In_ D3D11_USAGE usage,
    _In_ uint32_t bindFlags,
    _In_ uint32_t cpu_access_flags,
    _In_ uint32_t misc_flags,
    _In_ bool forceSRGB,
    _Outptr_opt_ ID3D11Resource ** texture,
    _Outptr_opt_ ID3D11ShaderResourceView ** texture_view,
    _Out_opt_ DDS_ALPHA_MODE * alpha_mode = nullptr )
```

4.1.3.54 CreateDDSTextureFromFileEx() [2/4]

```
HRESULT mage::CreateDDSTextureFromFileEx (
    _In_ const RenderingDevice & device,
    _In_opt_ ID3D11DeviceContext * d3dContext,
    _In_z_ const wchar_t * szFileName,
    _In_ size_t maxsize,
    _In_ D3D11_USAGE usage,
    _In_ uint32_t bindFlags,
    _In_ uint32_t cpu_access_flags,
    _In_ uint32_t misc_flags,
    _In_ bool forceSRGB,
    _Outptr_opt_ ID3D11Resource ** texture,
    _Outptr_opt_ ID3D11ShaderResourceView ** texture_view,
    _Out_opt_ DDS_ALPHA_MODE * alpha_mode = nullptr )
```

4.1.3.55 CreateDDSTextureFromFileEx() [3/4]

```
_Use_decl_annotations_ HRESULT mage::CreateDDSTextureFromFileEx (
    const RenderingDevice & device,
    const wchar_t * file_name,
    size_t maxsize,
    D3D11_USAGE usage,
    uint32_t bindFlags,
    uint32_t cpu_access_flags,
    uint32_t misc_flags,
    bool forceSRGB,
    ID3D11Resource ** texture,
    ID3D11ShaderResourceView ** texture_view,
    DDS_ALPHA_MODE * alpha_mode )
```

4.1.3.56 CreateDDSTextureFromFileEx() [4/4]

```
_Use_decl_annotations_ HRESULT mage::CreateDDSTextureFromFileEx (
    const RenderingDevice & device,
    ID3D11DeviceContext * d3dContext,
    const wchar_t * file_name,
    size_t maxsize,
    D3D11_USAGE usage,
    uint32_t bindFlags,
    uint32_t cpu_access_flags,
    uint32_t misc_flags,
    bool forceSRGB,
    ID3D11Resource ** texture,
    ID3D11ShaderResourceView ** texture_view,
    DDS_ALPHA_MODE * alpha_mode )
```

4.1.3.57 CreateDDSTextureFromMemory() [1/4]

```
HRESULT mage::CreateDDSTextureFromMemory (
    _In_ const RenderingDevice & device,
    _In_reads_bytes_(dds_dataSize) const uint8_t * dds_data,
    _In_ size_t dds_dataSize,
    _Outptr_opt_ ID3D11Resource ** texture,
    _Outptr_opt_ ID3D11ShaderResourceView ** texture_view,
    _In_ size_t maxsize = 0,
    _Out_opt_ DDS_ALPHA_MODE * alpha_mode = nullptr )
```

4.1.3.58 CreateDDSTextureFromMemory() [2/4]

```

HRESULT mage::CreateDDSTextureFromMemory (
    _In_ const RenderingDevice & device,
    _In_opt_ ID3D11DeviceContext * d3dContext,
    _In_reads_bytes_(dds_dataSize) const uint8_t * dds_data,
    _In_ size_t dds_dataSize,
    _Outptr_opt_ ID3D11Resource ** texture,
    _Outptr_opt_ ID3D11ShaderResourceView ** texture_view,
    _In_ size_t maxsize = 0,
    _Out_opt_ DDS_ALPHA_MODE * alpha_mode = nullptr )

```

4.1.3.59 CreateDDSTextureFromMemory() [3/4]

```

_Use_decl_annotations_ HRESULT mage::CreateDDSTextureFromMemory (
    const RenderingDevice & device,
    const uint8_t * dds_data,
    size_t dds_dataSize,
    ID3D11Resource ** texture,
    ID3D11ShaderResourceView ** texture_view,
    size_t maxsize,
    DDS_ALPHA_MODE * alpha_mode )

```

4.1.3.60 CreateDDSTextureFromMemory() [4/4]

```

_Use_decl_annotations_ HRESULT mage::CreateDDSTextureFromMemory (
    const RenderingDevice & device,
    ID3D11DeviceContext * d3dContext,
    const uint8_t * dds_data,
    size_t dds_dataSize,
    ID3D11Resource ** texture,
    ID3D11ShaderResourceView ** texture_view,
    size_t maxsize,
    DDS_ALPHA_MODE * alpha_mode )

```

4.1.3.61 CreateDDSTextureFromMemoryEx() [1/4]

```

HRESULT mage::CreateDDSTextureFromMemoryEx (
    _In_ const RenderingDevice & device,
    _In_reads_bytes_(dds_dataSize) const uint8_t * dds_data,
    _In_ size_t dds_dataSize,
    _In_ size_t maxsize,
    _In_ D3D11_USAGE usage,
    _In_ uint32_t bindFlags,
    _In_ uint32_t cpu_access_flags,
    _In_ uint32_t misc_flags,
    _In_ bool forceSRGB,
    _Outptr_opt_ ID3D11Resource ** texture,
    _Outptr_opt_ ID3D11ShaderResourceView ** texture_view,
    _Out_opt_ DDS_ALPHA_MODE * alpha_mode = nullptr )

```


4.1.3.62 CreateDDSTextureFromMemoryEx() [2/4]

```

HRESULT mage::CreateDDSTextureFromMemoryEx (
    _In_ const RenderingDevice & device,
    _In_opt_ ID3D11DeviceContext * d3dContext,
    _In_reads_bytes_(dds_dataSize) const uint8_t * dds_data,
    _In_ size_t dds_dataSize,
    _In_ size_t maxsize,
    _In_ D3D11_USAGE usage,
    _In_ uint32_t bindFlags,
    _In_ uint32_t cpu_access_flags,
    _In_ uint32_t misc_flags,
    _In_ bool forceSRGB,
    _Outptr_opt_ ID3D11Resource ** texture,
    _Outptr_opt_ ID3D11ShaderResourceView ** texture_view,
    _Out_opt_ DDS_ALPHA_MODE * alpha_mode = nullptr )

```

4.1.3.63 CreateDDSTextureFromMemoryEx() [3/4]

```

_Use_decl_annotations_ HRESULT mage::CreateDDSTextureFromMemoryEx (
    const RenderingDevice & device,
    const uint8_t * dds_data,
    size_t dds_dataSize,
    size_t maxsize,
    D3D11_USAGE usage,
    uint32_t bindFlags,
    uint32_t cpu_access_flags,
    uint32_t misc_flags,
    bool forceSRGB,
    ID3D11Resource ** texture,
    ID3D11ShaderResourceView ** texture_view,
    DDS_ALPHA_MODE * alpha_mode )

```

4.1.3.64 CreateDDSTextureFromMemoryEx() [4/4]

```

_Use_decl_annotations_ HRESULT mage::CreateDDSTextureFromMemoryEx (
    const RenderingDevice & device,
    ID3D11DeviceContext * d3dContext,
    const uint8_t * dds_data,
    size_t dds_dataSize,
    size_t maxsize,
    D3D11_USAGE usage,
    uint32_t bindFlags,
    uint32_t cpu_access_flags,
    uint32_t misc_flags,
    bool forceSRGB,
    ID3D11Resource ** texture,
    ID3D11ShaderResourceView ** texture_view,
    DDS_ALPHA_MODE * alpha_mode )

```

4.1.3.65 CreateLambertianShader()

```

CombinedShader mage::CreateLambertianShader ( )

```

4.1.3.66 CreateModelDescriptor()

```
template<typename VertexT >
SharedPtr< ModelDescriptor > mage::CreateModelDescriptor (
    const wstring & fname,
    const MeshDescriptor< VertexT > & desc )
```

4.1.3.67 CreateSharedHandle()

```
SharedHandle mage::CreateSharedHandle (
    HANDLE handle )
```

4.1.3.68 CreateTexture()

```
SharedPtr< Texture > mage::CreateTexture (
    const wstring & fname )
```

4.1.3.69 CreateTextureFromDDS()

```
static HRESULT mage::CreateTextureFromDDS (
    _In_ const RenderingDevice & device,
    _In_opt_ ID3D11DeviceContext * d3dContext,
    _In_ const DDS_HEADER * header,
    _In_reads_bytes_(bit_size) const uint8_t * bit_data,
    _In_ size_t bit_size,
    _In_ size_t maxsize,
    _In_ D3D11_USAGE usage,
    _In_ uint32_t bindFlags,
    _In_ uint32_t cpu_access_flags,
    _In_ uint32_t misc_flags,
    _In_ bool forceSRGB,
    _Outptr_opt_ ID3D11Resource ** texture,
    _Outptr_opt_ ID3D11ShaderResourceView ** texture_view ) [static]
```

4.1.3.70 CreateVariableScript()

```
SharedPtr< VariableScript > mage::CreateVariableScript (
    const wstring & fname,
    bool import = true )
```

Creates a variable script.

Parameters

in	<i>fname</i>	A reference to the filename of the variable script.
in	<i>import</i>	Flag indicating whether the variables of the variable script need to be imported.

Returns

A pointer to the variable script.

4.1.3.71 Debug()

```
void mage::Debug (
    const char * format,
    ... )
```

Notifies a debug message.

A debug message is associated with generally useful information to log only in debug builds.

Parameters

in	<i>format</i>	Pointer to the message format.
----	---------------	--------------------------------

4.1.3.72 Error()

```
void mage::Error (
    const char * format,
    ... )
```

Notifies an error message.

An error message is associated with any error which is fatal to the operation, but not the service or application.

Parameters

in	<i>format</i>	Pointer to the message format.
----	---------------	--------------------------------

4.1.3.73 ExportVariableScriptToFile()

```
HRESULT mage::ExportVariableScriptToFile (
    const wstring & fname,
    const vector< Variable *> & variable_buffer )
```

Exports the given variables to the given file.

Parameters

in	<i>fname</i>	A reference to the filename.
in	<i>variable_buffer</i>	A reference to a vector containing the variables.

Returns

A success/error value.

4.1.3.74 ExportVSToFile()

```
HRESULT mage::ExportVSToFile (
    const wstring & fname,
    const vector< Variable *> & variable_buffer )
```

Exports the given variables to the given VS file.

Parameters

in	<i>fname</i>	A reference to the VS filename.
in	<i>variable_buffer</i>	A reference to a vector containing the variables.

Returns

A success/error value.

4.1.3.75 Fatal()

```
void mage::Fatal (
    const char * format,
    ... )
```

Notifies a fatal message.

A fatal message is associated with any error that is forcing a shutdown of the service or application to prevent data loss (or further data loss).

Parameters

in	<i>format</i>	Pointer to the message format.
----	---------------	--------------------------------

4.1.3.76 FillInitData()

```
static HRESULT mage::FillInitData (
    _In_ size_t width,
    _In_ size_t height,
    _In_ size_t depth,
    _In_ size_t mip_count,
    _In_ size_t array_size,
    _In_ DXGI_FORMAT format,
    _In_ size_t maxsize,
    _In_ size_t bit_size,
    _In_reads_bytes_(bit_size) const uint8_t * bit_data,
    _Out_ size_t & twidth,
    _Out_ size_t & theight,
    _Out_ size_t & tdepth,
    _Out_ size_t & skip_mip,
    _Out_writes_(mip_count * array_size) D3D11_SUBRESOURCE_DATA * init_data ) [static]
```

4.1.3.77 FindWordEnd()

```
static const char* mage::FindWordEnd (
    const char * buffer ) [static]
```

Finds the end of a word.

Parameters

in	<i>buffer</i>	A pointer to the first character.
----	---------------	-----------------------------------

Returns

A pointer to the end of the word. (i.e. pointer to a space or null-terminating character)

4.1.3.78 FreeAligned()

```
void mage::FreeAligned (
    void * ptr )
```

Frees a block of memory that was allocated with [mage::AllocAligned\(size_t\)](#) or [mage::AllocAligned<T>\(size_t\)](#).

Parameters

in	<i>ptr</i>	A pointer to the memory block that was allocated.
----	------------	---

4.1.3.79 GetAlphaMode()

```
static DDS_ALPHA_MODE mage::GetAlphaMode (
    _In_ const DDS_HEADER * header ) [static]
```

4.1.3.80 GetDXGIFormat()

```
static DXGI_FORMAT mage::GetDXGIFormat (
    const DDS_PIXELFORMAT & ddpf ) [static]
```

4.1.3.81 GetFileExtension() [1/2]

```
string mage::GetFileExtension (
    const string & fname )
```

Returns the extension of the given file.

Parameters

in	<i>fname</i>	A reference to the filename of the file.
----	--------------	--

Returns

The extension of the given file.

4.1.3.82 GetFileExtension() [2/2]

```
wstring mage::GetFileExtension (  
    const wstring & fname )
```

Returns the extension of the given file.

Parameters

in	<i>fname</i>	A reference to the filename of the file.
----	--------------	--

Returns

The extension of the given file.

4.1.3.83 GetFilename() [1/2]

```
string mage::GetFilename (  
    const string & path,  
    const string & name )
```

Returns the filename of the given file.

Parameters

in	<i>path</i>	A reference to the path of the file.
in	<i>name</i>	A reference to the name of the file.

Returns

The filename of the given file.

4.1.3.84 GetFilename() [2/2]

```
wstring mage::GetFilename (  
    const wstring & path,  
    const wstring & name )
```

Returns the filename of the given file.

Parameters

in	<i>path</i>	A reference to the path of the file.
in	<i>name</i>	A reference to the name of the file.

Returns

The filename of the given file.

4.1.3.85 GetFileName() [1/2]

```
string mage::GetFileName (
    const string & fname )
```

Returns the name of the given file.

Parameters

in	<i>fname</i>	A reference to the filename of the file.
----	--------------	--

Returns

The name of the given file.

4.1.3.86 GetFileName() [2/2]

```
wstring mage::GetFileName (
    const wstring & fname )
```

Returns the name of the given file.

Parameters

in	<i>fname</i>	A reference to the filename of the file.
----	--------------	--

Returns

The name of the given file.

4.1.3.87 GetModelRenderingDevice()

```
RenderingDevice mage::GetModelRenderingDevice ( )
```

4.1.3.88 GetModelResourceFactory()

```
ResourceFactory& mage::GetModelResourceFactory ( )
```

4.1.3.89 GetPathName() [1/2]

```
string mage::GetPathName (
    const string & fname )
```

Returns the path of the given file.

Parameters

in	<i>fname</i>	A reference to the filename of the file.
-----------	---------------------	--

Returns

The path of the given file.

4.1.3.90 GetPathName() [2/2]

```
wstring mage::GetPathName (
    const wstring & fname )
```

Returns the path of the given file.

Parameters

in	<i>fname</i>	A reference to the filename of the file.
-----------	---------------------	--

Returns

The path of the given file.

4.1.3.91 GetRenderingDevice()

```
RenderingDevice mage::GetRenderingDevice ( )
```

4.1.3.92 GetResourceFactory()

```
ResourceFactory & mage::GetResourceFactory ( )
```

4.1.3.93 GetSurfaceInfo()

```
static void mage::GetSurfaceInfo (
    _In_ size_t width,
    _In_ size_t height,
    _In_ DXGI_FORMAT fmt,
    _Out_opt_ size_t * out_nb_bytes,
    _Out_opt_ size_t * out_row_bytes,
    _Out_opt_ size_t * out_nb_rows ) [static]
```

4.1.3.94 GotoDelimiters() [1/2]

```
char * mage::GotoDelimiters (
    char * str,
    const char * delimiters )
```


4.1.3.95 GotoDelimiters() [2/2]

```
const char * mage::GotoDelimiters (
    const char * str,
    const char * delimiters )
```

4.1.3.96 HandleDeleter()

```
void mage::HandleDeleter (
    HANDLE handle )
```

4.1.3.97 HasBool()

```
TokenResult mage::HasBool (
    const char * str,
    const char * delimiters )
```

4.1.3.98 HasChars()

```
TokenResult mage::HasChars (
    const char * str,
    const char * delimiters )
```

4.1.3.99 HasDouble()

```
TokenResult mage::HasDouble (
    const char * str,
    const char * delimiters )
```

4.1.3.100 HasFloat()

```
TokenResult mage::HasFloat (
    const char * str,
    const char * delimiters )
```

4.1.3.101 HasInt16()

```
TokenResult mage::HasInt16 (
    const char * str,
    const char * delimiters )
```

4.1.3.102 HasInt32()

```
TokenResult mage::HasInt32 (
    const char * str,
    const char * delimiters )
```

4.1.3.103 HasInt64()

```
TokenResult mage::HasInt64 (
    const char * str,
    const char * delimiters )
```

4.1.3.104 HasInt8()

```
TokenResult mage::HasInt8 (
    const char * str,
    const char * delimiters )
```

4.1.3.105 HasQuotedString()

```
TokenResult mage::HasQuotedString (
    const char * str,
    const char * delimiters )
```

4.1.3.106 HasString()

```
TokenResult mage::HasString (
    const char * str,
    const char * delimiters )
```

4.1.3.107 HasUInt16()

```
TokenResult mage::HasUInt16 (
    const char * str,
    const char * delimiters )
```

4.1.3.108 HasUInt32()

```
TokenResult mage::HasUInt32 (
    const char * str,
    const char * delimiters )
```

4.1.3.109 HasUInt64()

```
TokenResult mage::HasUInt64 (
    const char * str,
    const char * delimiters )
```

4.1.3.110 HasUInt8()

```
TokenResult mage::HasUInt8 (
    const char * str,
    const char * delimiters )
```

4.1.3.111 ImportFontFromFile()

```
HRESULT mage::ImportFontFromFile (
    const wstring & fname,
    const RenderingDevice & device,
    SpriteFontOutput & output,
    const SpriteFontDescriptor & desc )
```

4.1.3.112 ImportMaterialFromFile()

```
HRESULT mage::ImportMaterialFromFile (
    const wstring & fname,
    vector< Material > & material_buffer )
```

Imports the materials from the given file.

Parameters

in	<i>fname</i>	A reference to the filename.
out	<i>material_buffer</i>	A reference to the empty material buffer.

Returns

A success/error value.

4.1.3.113 ImportMTLMaterialFromFile()

```
HRESULT mage::ImportMTLMaterialFromFile (
    const wstring & fname,
    vector< Material > & material_buffer )
```

Imports the materials from the given MTL file.

Parameters

in	<i>fname</i>	A reference to the MTL filename.
out	<i>material_buffer</i>	A reference to the empty material buffer.

Returns

A success/error value.

4.1.3.114 ImportOBJMeshFromFile()

```
template<typename VertexT >
HRESULT mage::ImportOBJMeshFromFile (
    const wstring & fname,
```

```
ModelOutput< VertexT > & model_output,  
const MeshDescriptor< VertexT > & mesh_desc = MeshDescriptor< VertexT > () )
```

Imports a mesh from an OBJ file.

Template Parameters

<i>VertexT</i>	The vertex type.
----------------	------------------

Parameters

in	<i>fname</i>	A reference to the OBJ filename.
in, out	<i>model_output</i>	A reference to the model output.
in	<i>mesh_desc</i>	A reference to the mesh descriptor.

Returns

A success/error value.

4.1.3.115 ImportSpriteFontFromFile()

```
HRESULT mage::ImportSpriteFontFromFile (
    const wstring & fname,
    const RenderingDevice & device,
    SpriteFontOutput & output,
    const SpriteFontDescriptor & desc )
```

4.1.3.116 ImportTextureFromFile()

```
HRESULT mage::ImportTextureFromFile (
    const wstring & fname,
    const RenderingDevice & device,
    ID3D11ShaderResourceView ** texture_resource_view )
```

Imports the texture from the given file.

Parameters

in	<i>fname</i>	A reference to the filename.
in	<i>device</i>	A reference to the rendering device.
out	<i>texture_resource_view</i>	A pointer to a pointer to a shader resource view.

Returns

A success/error value.

4.1.3.117 ImportVariableScriptFromFile()

```
HRESULT mage::ImportVariableScriptFromFile (
    const wstring & fname,
    vector< Variable *> & variable_buffer )
```

Imports the variables from the given file.

Parameters

in	<i>fname</i>	A reference to the filename.
in, out	<i>variable_buffer</i>	A reference to a vector containing the variables.

Returns

A success/error value.

4.1.3.118 ImportVSFromFile()

```
HRESULT mage::ImportVSFromFile (
    const wstring & fname,
    vector< Variable *> & variable_buffer )
```

Imports the variables from the given VS file.

Parameters

in	<i>fname</i>	A reference to the VS filename.
in, out	<i>variable_buffer</i>	A reference to a vector containing the variables.

Returns

A success/error value.

4.1.3.119 Info()

```
void mage::Info (
    const char * format,
    ... )
```

Notifies an info message.

An info message is associated with generally useful information to log.

Parameters

in	<i>format</i>	Pointer to the message format.
----	---------------	--------------------------------

4.1.3.120 InitializeConsole()

```
HRESULT mage::InitializeConsole ( )
```

Allocates a console to this engine for basic io and redirects stdin, stdout and stderr to the allocated console.

Returns

A success/error value.

4.1.3.121 InvertHandness() [1/4]

```
UV mage::InvertHandness (
    const UV & uv )
```

4.1.3.122 InvertHandness() [2/4]

```
Point3 mage::InvertHandness (
    const Point3 & point )
```

4.1.3.123 InvertHandness() [3/4]

```
Direction3 mage::InvertHandness (
    const Direction3 & direction )
```

4.1.3.124 InvertHandness() [4/4]

```
Normal3 mage::InvertHandness (
    const Normal3 & normal )
```

4.1.3.125 LoadModelFromFile()

```
template<typename VertexT >
HRESULT mage::LoadModelFromFile (
    const wstring & fname,
    ModelOutput< VertexT > & model_output,
    const MeshDescriptor< VertexT > & mesh_desc = MeshDescriptor< VertexT >() )
```

Loads a mesh from file.

Template Parameters

<i>VertexT</i>	The vertex type.
----------------	------------------

Parameters

in	<i>fname</i>	A reference to the filename.
in, out	<i>model_output</i>	A reference to the model output.
in	<i>mesh_desc</i>	A reference to the mesh descriptor.

Returns

A success/error value.

4.1.3.126 LoadTextureDataFromFile()

```
static HRESULT mage::LoadTextureDataFromFile (
    _In_z_ const wchar_t * file_name,
    std::unique_ptr< uint8_t[] > & dds_data,
    DDS_HEADER ** header,
    uint8_t ** bit_data,
    size_t * bit_size ) [static]
```

4.1.3.127 MainWindowProc()

```
LRESULT CALLBACK mage::MainWindowProc (
    HWND hWnd,
    UINT msg,
    WPARAM wParam,
    LPARAM lParam )
```

The application-defined function that processes messages sent to the engine window. The WindowProc type defines a pointer to this callback function.

Parameters

in	<i>hWnd</i>	A handle to the window.
in	<i>msg</i>	The message.
in	<i>wParam</i>	Additional message information. The contents of this parameter depend on the value of <i>msg</i> .
in	<i>lParam</i>	Additional message information. The contents of this parameter depend on the value of <i>msg</i> .

Returns

The return value is the result of the message processing and depends on the message sent.

4.1.3.128 MakeSRGB()

```
static DXGI_FORMAT mage::MakeSRGB (
    _In_ DXGI_FORMAT format ) [static]
```

4.1.3.129 NumberOfSystemCores()

```
size_t mage::NumberOfSystemCores ( )
```

Returns the number of system cores (i.e. logical processors).

Returns

The number of system cores (i.e. logical processors).

4.1.3.130 `operator<<()` [1/3]

```
ostream& mage::operator<< (
    ostream & os,
    const XMFLOAT2 & v )
```

4.1.3.131 `operator<<()` [2/3]

```
ostream& mage::operator<< (
    ostream & os,
    const XMFLOAT3 & v )
```

4.1.3.132 `operator<<()` [3/3]

```
ostream& mage::operator<< (
    ostream & os,
    const XMFLOAT4 & v )
```

4.1.3.133 `Overlap()`

```
AABB mage::Overlap (
    const AABB & aabb1,
    const AABB & aabb2 )
```

Returns the overlap [AABB](#) of the two given AABBs.

Parameters

in	<i>aabb1</i>	A reference to the first AABB .
in	<i>aabb2</i>	A reference to the second AABB .

Returns

The identity [AABB](#) in case of no overlap.

The overlap [AABB](#) of *aabb1* and *aabb2*.

4.1.3.134 `OverlapStrict()`

```
AABB mage::OverlapStrict (
    const AABB & aabb1,
    const AABB & aabb2 )
```

Returns the strict overlap [AABB](#) of the two given AABBs.

Parameters

in	<i>aabb1</i>	A reference to the first AABB .
in	<i>aabb2</i>	A reference to the second AABB .

Returns

The identity [AABB](#) in case of no strict overlap.
 The strict overlap [AABB](#) of *aabb1* and *aabb2*.

4.1.3.135 PrintConsoleHeader()

```
void mage::PrintConsoleHeader ( )
```

Prints the header of the engine to the console.

4.1.3.136 ProcessError()

```
static void mage::ProcessError (
    const char * format,
    const va_list args,
    const string & error_type,
    int error_disposition ) [static]
```

Process the given error.

Parameters

in	<i>format</i>	The format of the error string.
in	<i>args</i>	The arguments of the format string.
in	<i>error_type</i>	The type of the error.
in	<i>error_disposition</i>	Disposition of the error.

4.1.3.137 ReadBinaryFile()

```
HRESULT mage::ReadBinaryFile (
    const wchar_t * fname,
    UniquePtr< uint8_t[] > & data,
    size_t * size )
```

4.1.3.138 ReadBool()

```
TokenResult mage::ReadBool (
    char * str,
    char ** context,
    bool & result,
    const char * delimiters )
```

4.1.3.139 ReadChars()

```
TokenResult mage::ReadChars (
    char * str,
    char ** context,
    char ** result,
    const char * delimiters )
```

4.1.3.140 ReadDouble()

```
TokenResult mage::ReadDouble (
    char * str,
    char ** context,
    double & result,
    const char * delimiters )
```

4.1.3.141 ReadFloat()

```
TokenResult mage::ReadFloat (
    char * str,
    char ** context,
    float & result,
    const char * delimiters )
```

4.1.3.142 ReadFloat2()

```
TokenResult mage::ReadFloat2 (
    char * str,
    char ** context,
    XMFLOAT2 & result,
    const char * delimiters )
```

4.1.3.143 ReadFloat3()

```
TokenResult mage::ReadFloat3 (
    char * str,
    char ** context,
    XMFLOAT3 & result,
    const char * delimiters )
```

4.1.3.144 ReadFloat4()

```
TokenResult mage::ReadFloat4 (
    char * str,
    char ** context,
    XMFLOAT4 & result,
    const char * delimiters )
```

4.1.3.145 ReadInt16()

```
TokenResult mage::ReadInt16 (
    char * str,
    char ** context,
    int16_t & result,
    const char * delimiters )
```

4.1.3.146 ReadInt32()

```
TokenResult mage::ReadInt32 (
    char * str,
    char ** context,
    int32_t & result,
    const char * delimiters )
```

4.1.3.147 ReadInt64()

```
TokenResult mage::ReadInt64 (
    char * str,
    char ** context,
    int64_t & result,
    const char * delimiters )
```

4.1.3.148 ReadInt8()

```
TokenResult mage::ReadInt8 (
    char * str,
    char ** context,
    int8_t & result,
    const char * delimiters )
```

4.1.3.149 ReadQuotedString()

```
TokenResult mage::ReadQuotedString (
    char * str,
    char ** context,
    string & result,
    const char * delimiters )
```

4.1.3.150 ReadString()

```
TokenResult mage::ReadString (
    char * str,
    char ** context,
    string & result,
    const char * delimiters )
```

4.1.3.151 ReadUInt16()

```
TokenResult mage::ReadUInt16 (
    char * str,
    char ** context,
    uint16_t & result,
    const char * delimiters )
```

4.1.3.152 ReadUInt32()

```
TokenResult mage::ReadUInt32 (
    char * str,
    char ** context,
    uint32_t & result,
    const char * delimiters )
```

4.1.3.153 ReadUInt64()

```
TokenResult mage::ReadUInt64 (
    char * str,
    char ** context,
    uint64_t & result,
    const char * delimiters )
```

4.1.3.154 ReadUInt8()

```
TokenResult mage::ReadUInt8 (
    char * str,
    char ** context,
    uint8_t & result,
    const char * delimiters )
```

4.1.3.155 RejectDisplayMode()

```
bool mage::RejectDisplayMode (
    const DXGI_MODE_DESC1 * display_mode_desc )
```

Checks whether the given display mode needs to be rejected for the engine.

Parameters

in	<i>display_mode_desc</i>	A pointer to a display mode descriptor.
----	--------------------------	---

Returns

`true` if the given display mode needs to be rejected for the engine. `false` otherwise.

4.1.3.156 RemoveAndDestructAllElements()

```
template<typename ContainerT >
void mage::RemoveAndDestructAllElements (
    ContainerT & container )
```

Removes and destructs all the elements from the given container.

Template Parameters

<i>ContainerT</i>	The type of container.
-------------------	------------------------

Parameters

in	<i>container</i>	A reference to the container.
----	------------------	-------------------------------

4.1.3.157 RemoveAndDestructAllSecondElements()

```
template<typename ContainerT >
void mage::RemoveAndDestructAllSecondElements (
    ContainerT & container )
```

Removes and destructs all the second elements from the given container.

Template Parameters

<i>ContainerT</i>	The type of container.
-------------------	------------------------

Parameters

in	<i>container</i>	A reference to the container.
----	------------------	-------------------------------

4.1.3.158 RemoveIf()

```
template<typename ContainerT , typename PredicateT >
void mage::RemoveIf (
    ContainerT & container,
    const PredicateT & predicate )
```

Removes from the given container all the elements that compare equal to the given predicate. This reduces the container size by the number of elements removed.

Template Parameters

<i>ContainerT</i>	The type of container.
<i>PredicateT</i>	The type of predicate.

Parameters

in	<i>container</i>	A reference to the container.
in	<i>predicate</i>	A reference to the predicate.

4.1.3.159 SafeHandle()

```
HANDLE mage::SafeHandle (
    HANDLE handle )
```

4.1.3.160 SetDebugObjectName()

```
template<UINT TNameLength>
void mage::SetDebugObjectName (
    _In_ ID3DllDeviceChild * resource,
    _In_ const char(&) name[TNameLength] )
```

4.1.3.161 SettingsDialogProcDelegate()

```
INT_PTR CALLBACK mage::SettingsDialogProcDelegate (
    HWND hwndDlg,
    UINT uMsg,
    WPARAM wParam,
    LPARAM lParam )
```

Engine-defined callback function used with the CreateDialog for device enumeration.

Parameters

in	<i>hwndDlg</i>	A handle to the dialog box.
in	<i>uMsg</i>	The message.
in	<i>wParam</i>	Additional message-specific information.
in	<i>lParam</i>	Additional message-specific information.

Returns

true if *uMsg* is processed. false otherwise.

4.1.3.162 SkipDelimiters() [1/2]

```
char * mage::SkipDelimiters (
    char * str,
    const char * delimiters )
```

4.1.3.163 SkipDelimiters() [2/2]

```
const char * mage::SkipDelimiters (
    const char * str,
    const char * delimiters )
```

4.1.3.164 `str_contains()` [1/4]

```
bool mage::str_contains (
    const char * str1,
    const char * str2 )
```

Checks whether the first given string contains the second given string.

Parameters

in	<i>str1</i>	A pointer to the string to be scanned.
in	<i>str2</i>	A pointer to the string containing the sequence of characters to match.

Returns

`true` if *str1* contains a substring *str2*. `false` otherwise.

4.1.3.165 `str_contains()` [2/4]

```
bool mage::str_contains (
    const wchar_t * str1,
    const wchar_t * str2 )
```

Checks whether the first given string contains the second given string.

Parameters

in	<i>str1</i>	A pointer to the string to be scanned.
in	<i>str2</i>	A pointer to the string containing the sequence of characters to match.

Returns

`true` if *str1* contains a substring *str2*. `false` otherwise.

4.1.3.166 `str_contains()` [3/4]

```
bool mage::str_contains (
    const char * str,
    char c )
```

Checks whether the first given string contains the given character.

Parameters

in	<i>str</i>	A pointer to the string to be scanned.
in	<i>c</i>	The character to match.

Returns

`true` if *str* contains a *c*. `false` otherwise.

4.1.3.167 `str_contains()` [4/4]

```
bool mage::str_contains (
    const wchar_t * str,
    wchar_t c )
```

Checks whether the first given string contains the given character.

Parameters

in	<i>str</i>	A pointer to the string to be scanned.
in	<i>c</i>	The character to match.

Returns

true if *str* contains a *c*. false otherwise.

4.1.3.168 str_convert() [1/4]

```
wchar_t * mage::str_convert (
    const char * str )
```

Converts the given ANSI string to a Wide string.

Parameters

in	<i>str</i>	A pointer to the string to copy.
----	------------	----------------------------------

Returns

A pointer to the copy.

4.1.3.169 str_convert() [2/4]

```
char * mage::str_convert (
    const wchar_t * str )
```

Converts the given Wide string to an ANSI string.

Parameters

in	<i>str</i>	A pointer to the string to copy.
----	------------	----------------------------------

Returns

A pointer to the copy.

4.1.3.170 str_convert() [3/4]

```
wstring mage::str_convert (
    const string & str )
```

Converts the given ANSI string to a Wide string.

Parameters

in	<i>str</i>	A reference to the string to copy.
----	------------	------------------------------------

Returns

The copy.

4.1.3.171 `str_convert()` [4/4]

```
string mage::str_convert (
    const wstring & str )
```

Converts the given Wide string to an ANSI string.

Parameters

in	<i>str</i>	A reference to the string to copy.
----	------------	------------------------------------

Returns

The copy.

4.1.3.172 `str_equals()` [1/2]

```
bool mage::str_equals (
    const char * str1,
    const char * str2 )
```

Checks whether the given strings are equal.

Parameters

in	<i>str1</i>	A pointer to the first string.
in	<i>str2</i>	A pointer to the second string.

Returns

true if *str1* is equal to *str2*. false otherwise.

4.1.3.173 `str_equals()` [2/2]

```
bool mage::str_equals (
    const wchar_t * str1,
    const wchar_t * str2 )
```

Checks whether the given strings are equal.

Parameters

in	<i>str1</i>	A pointer to the first string.
in	<i>str2</i>	A pointer to the second string.

Returns

true if *str1* is equal to *str2*. false otherwise.

4.1.3.174 str_escape_first() [1/4]

```
const char * mage::str_escape_first (
    const char * str,
    char c )
```

Finds the first occurrence of the given character in the given string neglecting the usage of the given character in a custom escape sequence.

Parameters

in	<i>str</i>	A pointer to the string to be scanned.
in	<i>c</i>	The character to match.

Returns

nullptr if *str* does not contain *c*.
A pointer to the first occurrence of *c* in *str*.

4.1.3.175 str_escape_first() [2/4]

```
char * mage::str_escape_first (
    char * str,
    char c )
```

Finds the first occurrence of the given character in the given string neglecting the usage of the given character in a custom escape sequence.

Parameters

in	<i>str</i>	A pointer to the string to be scanned.
in	<i>c</i>	The character to match.

Returns

nullptr if *str* does not contain *c*.
A pointer to the first occurrence of *c* in *str*.

4.1.3.176 `str_escape_first()` [3/4]

```
const wchar_t * mage::str_escape_first (
    const wchar_t * str,
    wchar_t c )
```

Finds the first occurrence of the given character in the given string neglecting the usage of the given character in a custom escape sequence.

Parameters

in	<i>str</i>	A pointer to the string to be scanned.
in	<i>c</i>	The character to match.

Returns

`nullptr` if *str* does not contain *c*.
A pointer to the first occurrence of *c* in *str*.

4.1.3.177 `str_escape_first()` [4/4]

```
wchar_t * mage::str_escape_first (
    wchar_t * str,
    wchar_t c )
```

Finds the first occurrence of the given character in the given string neglecting the usage of the given character in a custom escape sequence.

Parameters

in	<i>str</i>	A pointer to the string to be scanned.
in	<i>c</i>	The character to match.

Returns

`nullptr` if *str* does not contain *c*.
A pointer to the first occurrence of *c* in *str*.

4.1.3.178 `str_gets()` [1/2]

```
char * mage::str_gets (
    char * str,
    int num,
    const char ** input )
```

Reads characters from the given input string and stores them as a C string into *str* until (num-1) characters have been read or either a newline or the end-of-file is reached, whichever happens first.

A newline character makes `sgets` stop reading, but it is considered a valid character by the function and included in the string copied to *str*.

A terminating null character is automatically appended after the characters copied to *str*.

Parameters

in	<i>str</i>	A pointer to the string to copy to.
in	<i>num</i>	Maximum number of characters to be copied into <i>str</i> (including the terminating null-character).
in	<i>input</i>	A pointer to a pointer to the input string.

Note

The `sgets` function is the string variant of `fgets`.

4.1.3.179 `str_gets()` [2/2]

```
wchar_t * mage::str_gets (
    wchar_t * str,
    int num,
    const wchar_t ** input )
```

Reads characters from the given input string and stores them as a C string into *str* until (num-1) characters have been read or either a newline or the end-of-file is reached, whichever happens first.

A newline character makes `sgets` stop reading, but it is considered a valid character by the function and included in the string copied to *str*.

A terminating null character is automatically appended after the characters copied to *str*.

Parameters

in	<i>str</i>	A pointer to the string to copy to.
in	<i>num</i>	Maximum number of characters to be copied into <i>str</i> (including the terminating null-character).
in	<i>input</i>	A pointer to a pointer to the input string.

Note

The `sgets` function is the string variant of `fgets`.

4.1.3.180 `StringPrefixToDouble()`

```
TokenResult mage::StringPrefixToDouble (
    const char * str,
    double & result )
```

4.1.3.181 `StringPrefixToFloat()`

```
TokenResult mage::StringPrefixToFloat (
    const char * str,
    float & result )
```

4.1.3.182 StringPrefixToInt16()

```
TokenResult mage::StringPrefixToInt16 (
    const char * str,
    int16_t & result )
```

4.1.3.183 StringPrefixToInt32()

```
TokenResult mage::StringPrefixToInt32 (
    const char * str,
    int32_t & result )
```

4.1.3.184 StringPrefixToInt64()

```
TokenResult mage::StringPrefixToInt64 (
    const char * str,
    int64_t & result )
```

4.1.3.185 StringPrefixToInt8()

```
TokenResult mage::StringPrefixToInt8 (
    const char * str,
    int8_t & result )
```

4.1.3.186 StringPrefixToUInt16()

```
TokenResult mage::StringPrefixToUInt16 (
    const char * str,
    uint16_t & result )
```

4.1.3.187 StringPrefixToUInt32()

```
TokenResult mage::StringPrefixToUInt32 (
    const char * str,
    uint32_t & result )
```

4.1.3.188 StringPrefixToUInt64()

```
TokenResult mage::StringPrefixToUInt64 (
    const char * str,
    uint64_t & result )
```

4.1.3.189 StringPrefixToUInt8()

```
TokenResult mage::StringPrefixToUInt8 (
    const char * str,
    uint8_t & result )
```

4.1.3.190 StringToBool() [1/2]

```
TokenResult mage::StringToBool (
    const char * str,
    bool & result )
```

4.1.3.191 StringToBool() [2/2]

```
TokenResult mage::StringToBool (
    const char * begin,
    const char * end,
    bool & result )
```

4.1.3.192 StringToDouble() [1/2]

```
TokenResult mage::StringToDouble (
    const char * str,
    double & result )
```

4.1.3.193 StringToDouble() [2/2]

```
TokenResult mage::StringToDouble (
    const char * begin,
    const char * end,
    double & result )
```

4.1.3.194 StringToFloat() [1/2]

```
TokenResult mage::StringToFloat (
    const char * str,
    float & result )
```

4.1.3.195 StringToFloat() [2/2]

```
TokenResult mage::StringToFloat (
    const char * begin,
    const char * end,
    float & result )
```

4.1.3.196 StringToInt16() [1/2]

```
TokenResult mage::StringToInt16 (
    const char * str,
    int16_t & result )
```


4.1.3.197 StringToInt16() [2/2]

```
TokenResult mage::StringToInt16 (  
    const char * begin,  
    const char * end,  
    int16_t & result )
```

4.1.3.198 StringToInt32() [1/2]

```
TokenResult mage::StringToInt32 (  
    const char * str,  
    int32_t & result )
```

4.1.3.199 StringToInt32() [2/2]

```
TokenResult mage::StringToInt32 (  
    const char * begin,  
    const char * end,  
    int32_t & result )
```

4.1.3.200 StringToInt64() [1/2]

```
TokenResult mage::StringToInt64 (  
    const char * str,  
    int64_t & result )
```

4.1.3.201 StringToInt64() [2/2]

```
TokenResult mage::StringToInt64 (  
    const char * begin,  
    const char * end,  
    int64_t & result )
```

4.1.3.202 StringToInt8() [1/2]

```
TokenResult mage::StringToInt8 (  
    const char * str,  
    int8_t & result )
```

4.1.3.203 StringToInt8() [2/2]

```
TokenResult mage::StringToInt8 (  
    const char * begin,  
    const char * end,  
    int8_t & result )
```

4.1.3.204 StringToUInt16() [1/2]

```
TokenResult mage::StringToUInt16 (
    const char * str,
    uint16_t & result )
```

4.1.3.205 StringToUInt16() [2/2]

```
TokenResult mage::StringToUInt16 (
    const char * begin,
    const char * end,
    uint16_t & result )
```

4.1.3.206 StringToUInt32() [1/2]

```
TokenResult mage::StringToUInt32 (
    const char * str,
    uint32_t & result )
```

4.1.3.207 StringToUInt32() [2/2]

```
TokenResult mage::StringToUInt32 (
    const char * begin,
    const char * end,
    uint32_t & result )
```

4.1.3.208 StringToUInt64() [1/2]

```
TokenResult mage::StringToUInt64 (
    const char * str,
    uint64_t & result )
```

4.1.3.209 StringToUInt64() [2/2]

```
TokenResult mage::StringToUInt64 (
    const char * begin,
    const char * end,
    uint64_t & result )
```

4.1.3.210 StringToUInt8() [1/2]

```
TokenResult mage::StringToUInt8 (
    const char * str,
    uint8_t & result )
```

4.1.3.211 StringToUInt8() [2/2]

```
TokenResult mage::StringToUInt8 (
    const char * begin,
    const char * end,
    uint8_t & result )
```

4.1.3.212 Union() [1/2]

```
AABB mage::Union (
    const AABB & aabb,
    const Point3 & point )
```

Returns the union [AABB](#) of the given [AABB](#) and the given point.

Parameters

in	<i>aabb</i>	A reference to the AABB .
in	<i>point</i>	A reference to the point.

Returns

The union [AABB](#) of *aabb* and *point*.

4.1.3.213 Union() [2/2]

```
AABB mage::Union (
    const AABB & aabb1,
    const AABB & aabb2 )
```

Returns the union [AABB](#) of the two given AABBs.

Parameters

in	<i>aabb1</i>	A reference to the first AABB .
in	<i>aabb2</i>	A reference to the second AABB .

Returns

The union [AABB](#) of *aabb1* and *aabb2*.

4.1.3.214 Warning()

```
void mage::Warning (
    const char * format,
    ... )
```

Notifies a warning message.

A warning message is associated with anything that can potentially cause application oddities.

Parameters

in	<i>format</i>	Pointer to the message format.
----	---------------	--------------------------------

4.1.4 Variable Documentation

4.1.4.1 DDS_MAGIC

```
const uint32_t mage::DDS_MAGIC = 0x20534444
```

4.1.4.2 g_device_enumeration

```
DeviceEnumeration * mage::g_device_enumeration = nullptr
```

A (global) pointer to the device enumeration.

4.1.4.3 g_engine

```
Engine * mage::g_engine = nullptr
```

The engine used by the user.

4.1.4.4 g_feature_levels

```
const D3D_FEATURE_LEVEL mage::g_feature_levels[ ]
```

Initial value:

```
= {
    D3D_FEATURE_LEVEL_11_1,
    D3D_FEATURE_LEVEL_11_0
}
```

The supported feature levels.

4.1.4.5 g_logging_configuration

```
LoggingConfiguration mage::g_logging_configuration
```

The logging configuration defined by the user and used by the engine.

4.1.4.6 g_pixel_formats

```
const DXGI_FORMAT mage::g_pixel_formats[ ]
```

Initial value:

```
= {
    DXGI_FORMAT_B5G5R5A1_UNORM,
    DXGI_FORMAT_B5G6R5_UNORM,
    DXGI_FORMAT_B8G8R8X8_UNORM,
    DXGI_FORMAT_B8G8R8A8_UNORM,
    DXGI_FORMAT_R10G10B10A2_UNORM,
}
```

The allowed pixel formats.

Chapter 5

Class Documentation

5.1 `mage::AABB` Struct Reference

```
#include <bounding_volume.hpp>
```

Public Member Functions

- `AABB ()`
- `AABB (const Point3 &p)`
- `AABB (const Point3 &p_min, const Point3 &p_max)`
- `AABB (const AABB &aabb)=default`
- `AABB (const BS &bs)`
- `~AABB ()=default`
- `AABB & operator= (const AABB &aabb)=default`
- `bool Encloses (const Point3 &point) const`
- `bool EnclosesStrict (const Point3 &point) const`
- `bool Encloses (const AABB &aabb) const`
- `bool EnclosesStrict (const AABB &aabb) const`
- `bool Encloses (const BS &bs) const`
- `bool EnclosesStrict (const BS &bs) const`
- `bool EnclosedBy (const XMFLOAT4 *planes, size_t nb_planes) const`
- `bool EnclosedStrictBy (const XMFLOAT4 *planes, size_t nb_planes) const`
- `bool Overlaps (const AABB &aabb) const`
- `bool OverlapsStrict (const AABB &aabb) const`
- `Point3 Centroid () const`
- `Direction3 Diagonal () const`

Public Attributes

- `Point3 p_min`
- `Point3 p_max`

5.1.1 Detailed Description

A struct of Axis-Aligned Bounding Boxes (AABBs).

5.1.2 Constructor & Destructor Documentation

5.1.2.1 `AABB()` [1/5]

```
mage::AABB::AABB ( )
```

Constructs an (identity) [AABB](#).

5.1.2.2 `AABB()` [2/5]

```
mage::AABB::AABB (
    const Point3 & p ) [explicit]
```

Constructs an [AABB](#) of the given point.

Parameters

in	<i>p</i>	A reference to the point.
----	----------	---------------------------

5.1.2.3 `AABB()` [3/5]

```
mage::AABB::AABB (
    const Point3 & p_min,
    const Point3 & p_max )
```

Constructs an [AABB](#) of the given extents.

Precondition

p_min is entrywise smaller or equal to *p_max*.

Parameters

in	<i>p_min</i>	A reference to the minimum extents.
in	<i>p_max</i>	A reference to the maximum extents.

5.1.2.4 `AABB()` [4/5]

```
mage::AABB::AABB (
    const AABB & aabb ) [default]
```

Constructs an [AABB](#) from the given [AABB](#).

Parameters

in	<i>aabb</i>	A reference to the AABB .
----	-------------	---

5.1.2.5 AABB() [5/5]

```
mage::AABB::AABB (
    const BS & bs ) [explicit]
```

Constructs an [AABB](#) of the given [BS](#).

Parameters

in	<i>bs</i>	A reference to the BS .
----	-----------	---

5.1.2.6 ~AABB()

```
mage::AABB::~~AABB ( ) [default]
```

Destructs this [AABB](#).

5.1.3 Member Function Documentation

5.1.3.1 Centroid()

```
Point3 mage::AABB::Centroid ( ) const
```

Returns the centroid of this [AABB](#).

Returns

The centroid of this [AABB](#).

5.1.3.2 Diagonal()

```
Direction3 mage::AABB::Diagonal ( ) const
```

Returns the diagonal of this [AABB](#).

Returns

The diagonal of this [AABB](#).

5.1.3.3 EnclosedBy()

```
bool mage::AABB::EnclosedBy (
    const XMFLLOAT4 * planes,
    size_t nb_planes ) const
```

Checks whether this [AABB](#) is completely enclosed by the given (closed) volume.

Parameters

in	<i>planes</i>	A pointer to the planes of the volume. (each plane's coefficients are represented as a XMFLOAT4)
in	<i>nb_planes</i>	The number of planes.

Returns

`true` if this [AABB](#) is completely enclosed by *planes*. `false` otherwise.

5.1.3.4 EnclosedStrictBy()

```
bool mage::AABB::EnclosedStrictBy (
    const XMFLOAT4 * planes,
    size_t nb_planes ) const
```

Checks whether this [AABB](#) is completely, strictly enclosed by the given (closed) volume.

Parameters

in	<i>planes</i>	A pointer to the planes of the volume. (each plane's coefficients are represented as a XMFLOAT4)
in	<i>nb_planes</i>	The number of planes.

Returns

`true` if this [AABB](#) is completely, stricly enclosed by *planes*. `false` otherwise.

5.1.3.5 Encloses() [1/3]

```
bool mage::AABB::Encloses (
    const Point3 & point ) const
```

Checks whether this [AABB](#) completely encloses the given point.

Parameters

in	<i>point</i>	A reference to the point.
----	--------------	---------------------------

Returns

`true` if this [AABB](#) completely encloses *point*. `false` otherwise.

5.1.3.6 Encloses() [2/3]

```
bool mage::AABB::Encloses (
    const AABB & aabb ) const
```


Checks whether this [AABB](#) completely encloses the given [AABB](#).

Parameters

in	<i>aabb</i>	A reference to the AABB .
----	-------------	---

Returns

`true` if this [AABB](#) completely encloses *aabb*. `false` otherwise.

5.1.3.7 Encloses() [3/3]

```
bool mage::AABB::Encloses (
    const BS & bs ) const
```

Checks whether this [AABB](#) completely encloses the given [BS](#).

Parameters

in	<i>bs</i>	A reference to the BS .
----	-----------	---

Returns

`true` if this [AABB](#) completely encloses *bs*. `false` otherwise.

5.1.3.8 EnclosesStrict() [1/3]

```
bool mage::AABB::EnclosesStrict (
    const Point3 & point ) const
```

Checks whether this [AABB](#) completely, strictly encloses the given point.

Parameters

in	<i>point</i>	A reference to the point.
----	--------------	---------------------------

Returns

`true` if this [AABB](#) completely, strictly encloses *point*. `false` otherwise.

5.1.3.9 EnclosesStrict() [2/3]

```
bool mage::AABB::EnclosesStrict (
    const AABB & aabb ) const
```

Checks whether this [AABB](#) completely, strictly encloses the given [AABB](#).

Parameters

in	<i>aabb</i>	A reference to the AABB .
----	-------------	---

Returns

`true` if this [AABB](#) completely, strictly encloses *aabb*. `false` otherwise.

5.1.3.10 EnclosesStrict() [3/3]

```
bool mage::AABB::EnclosesStrict (
    const BS & bs ) const
```

Checks whether this [AABB](#) completely, strictly encloses the given [BS](#).

Parameters

in	<i>bs</i>	A reference to the BS .
----	-----------	---

Returns

`true` if this [AABB](#) completely, strictly encloses *bs*. `false` otherwise.

5.1.3.11 operator=()

```
AABB& mage::AABB::operator= (
    const AABB & aabb ) [default]
```

Copies the given [AABB](#) to this [AABB](#).

Parameters

in	<i>aabb</i>	A reference to the AABB to copy from.
----	-------------	---

Returns

A reference to the copy of the given [AABB](#) (i.e. this [AABB](#)).

5.1.3.12 Overlaps()

```
bool mage::AABB::Overlaps (
    const AABB & aabb ) const
```

Checks whether this [AABB](#) overlaps the given [AABB](#).

Parameters

in	<i>aabb</i>	A reference to the AABB .
----	-------------	---

Returns

`true` if this [AABB](#) overlaps *aabb*. `false` otherwise.

5.1.3.13 OverlapsStrict()

```
bool mage::AABB::OverlapsStrict (
    const AABB & aabb ) const
```

Checks whether this [AABB](#) strictly overlaps the given [AABB](#).

Parameters

in	<i>aabb</i>	A reference to the AABB .
----	-------------	---

Returns

`true` if this [AABB](#) strictly overlaps *aabb*. `false` otherwise.

5.1.4 Member Data Documentation**5.1.4.1 p_max**

```
Point3 mage::AABB::p_max
```

The maximum extents of this [AABB](#).

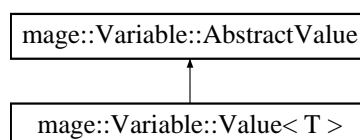
5.1.4.2 p_min

```
Point3 mage::AABB::p_min
```

The minimum extents of this [AABB](#).

5.2 mage::Variable::AbstractValue Struct Reference

Inheritance diagram for `mage::Variable::AbstractValue`:



Public Member Functions

- virtual `~AbstractValue()`=default
- virtual const void * `GetValue()` const =0

Protected Member Functions

- `AbstractValue()`=default
- `AbstractValue(const AbstractValue &abstract_value)`=default

Private Member Functions

- `AbstractValue & operator= (const AbstractValue &abstract_value)`=delete

5.2.1 Detailed Description

A struct of immutable abstract values.

Note

This is an example of the Type Erasure pattern for templates. We need to keep the original type to ensure the right destructor can be called in case of non-primitive types.

5.2.2 Constructor & Destructor Documentation

5.2.2.1 ~AbstractValue()

```
virtual mage::Variable::AbstractValue::~~AbstractValue ( ) [virtual], [default]
```

Destructs this value.

5.2.2.2 AbstractValue() [1/2]

```
mage::Variable::AbstractValue::AbstractValue ( ) [protected], [default]
```

Constructs an abstract value.

5.2.2.3 AbstractValue() [2/2]

```
mage::Variable::AbstractValue::AbstractValue (
    const AbstractValue & abstract_value ) [protected], [default]
```

Constructs an abstract value from the given abstract value.

Parameters

in	<i>abstract_value</i>	A reference to the abstract value.
----	-----------------------	------------------------------------

5.2.3 Member Function Documentation

5.2.3.1 GetValue()

```
virtual const void* mage::Variable::AbstractValue::GetValue ( ) const [pure virtual]
```

Returns the value of this value.

Returns

A pointer to the value of this value.

Implemented in [mage::Variable::Value< T >](#).

5.2.3.2 operator=()

```
AbstractValue& mage::Variable::AbstractValue::operator= (
    const AbstractValue & abstract_value ) [private], [delete]
```

Copies the given abstract value to this abstract value.

Parameters

in	<i>abstract_value</i>	A reference to the abstract value to copy from.
----	-----------------------	---

Returns

A reference to the copy of the given abstract value (i.e. this abstract value).

5.3 mage::BehaviorScript Class Reference

```
#include <behavior_script.hpp>
```

Public Member Functions

- [BehaviorScript](#) ()=default
- [~BehaviorScript](#) ()=default
- const string & [GetName](#) () const
- void [SetName](#) (const string &name)
- virtual void [Load](#) ()
- virtual void [Update](#) (double elapsed_time, const [Scene](#) &scene)=0
- virtual void [Close](#) ()

Private Member Functions

- [BehaviorScript](#) (const [BehaviorScript](#) &script)=delete
- [BehaviorScript](#) & [operator=](#) (const [BehaviorScript](#) &script)=delete

Private Attributes

- string `m_name`

5.3.1 Detailed Description

A class of behavior scripts.

5.3.2 Constructor & Destructor Documentation

5.3.2.1 BehaviorScript() [1/2]

```
mage::BehaviorScript::BehaviorScript ( ) [default]
```

Constructs a behavior script.

5.3.2.2 ~BehaviorScript()

```
mage::BehaviorScript::~~BehaviorScript ( ) [default]
```

Destructs this behavior script.

5.3.2.3 BehaviorScript() [2/2]

```
mage::BehaviorScript::BehaviorScript (
    const BehaviorScript & script ) [private], [delete]
```

Constructs a behavior script from the given behavior script.

Parameters

<code>in</code>	<code>script</code>	A reference to the behavior script.
-----------------	---------------------	-------------------------------------

5.3.3 Member Function Documentation

5.3.3.1 Close()

```
virtual void mage::BehaviorScript::Close ( ) [virtual]
```

Closes this behavior script. Allows this behavior script to preform any post-processing destruction.

5.3.3.2 GetName()

```
const string& mage::BehaviorScript::GetName ( ) const
```

5.3.3.3 Load()

```
virtual void mage::BehaviorScript::Load ( ) [virtual]
```

Loads this behavior script. Allows this behavior script to preform any pre-processing construction.

5.3.3.4 operator=()

```
BehaviorScript& mage::BehaviorScript::operator= (
    const BehaviorScript & script ) [private], [delete]
```

Copies the given behavior script to this behavior script.

Parameters

in	<i>script</i>	A reference to the behavior script to copy from.
----	---------------	--

Returns

A reference to the copy of the given behavior script (i.e. this behavior script).

5.3.3.5 SetName()

```
void mage::BehaviorScript::SetName (
    const string & name )
```

5.3.3.6 Update()

```
virtual void mage::BehaviorScript::Update (
    double elapsed_time,
    const Scene & scene ) [pure virtual]
```

Updates this behavior script.

Parameters

in	<i>elapsed_time</i>	The elapsed time since the previous update.
in	<i>scene</i>	A reference to the current scene.

5.3.4 Member Data Documentation

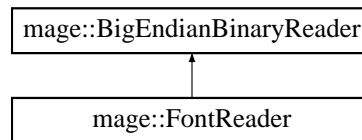
5.3.4.1 m_name

```
string mage::BehaviorScript::m_name [private]
```


5.4 mage::BigEndianBinaryReader Class Reference

```
#include <binary_reader.hpp>
```

Inheritance diagram for mage::BigEndianBinaryReader:



Public Member Functions

- [BigEndianBinaryReader](#) ()
- virtual [~BigEndianBinaryReader](#) ()=default
- HRESULT [ReadFromFile](#) (const wstring &fname)
- HRESULT [ReadFromMemory](#) (const uint8_t *input, size_t size)
- const wstring & [GetFilename](#) () const

Protected Member Functions

- virtual HRESULT [Read](#) ()=0
- bool [HasCharsLeft](#) () const
- template<typename ValueT >
const ValueT & [ReadValue](#) ()
- template<typename ValueT >
const ValueT * [ReadValueArray](#) (size_t size)

Private Member Functions

- [BigEndianBinaryReader](#) (const [BigEndianBinaryReader](#) &reader)=delete
- [BigEndianBinaryReader](#) & [operator=](#) (const [BigEndianBinaryReader](#) &reader)=delete

Private Attributes

- wstring [m_fname](#)
- const uint8_t * [m_pos](#)
- const uint8_t * [m_end](#)
- [UniquePtr](#)< uint8_t[] > [m_data](#)

5.4.1 Constructor & Destructor Documentation

5.4.1.1 BigEndianBinaryReader() [1/2]

```
mage::BigEndianBinaryReader::BigEndianBinaryReader ( )
```

5.4.1.2 ~BigEndianBinaryReader()

```
virtual mage::BigEndianBinaryReader::~~BigEndianBinaryReader ( ) [virtual], [default]
```

5.4.1.3 BigEndianBinaryReader() [2/2]

```
mage::BigEndianBinaryReader::BigEndianBinaryReader (
    const BigEndianBinaryReader & reader ) [private], [delete]
```

5.4.2 Member Function Documentation

5.4.2.1 GetFilename()

```
const wstring& mage::BigEndianBinaryReader::GetFilename ( ) const
```

5.4.2.2 HasCharsLeft()

```
bool mage::BigEndianBinaryReader::HasCharsLeft ( ) const [protected]
```

5.4.2.3 operator=()

```
BigEndianBinaryReader& mage::BigEndianBinaryReader::operator= (
    const BigEndianBinaryReader & reader ) [private], [delete]
```

5.4.2.4 Read()

```
virtual HRESULT mage::BigEndianBinaryReader::Read ( ) [protected], [pure virtual]
```

Implemented in [mage::FontReader](#).

5.4.2.5 ReadFromFile()

```
HRESULT mage::BigEndianBinaryReader::ReadFromFile (
    const wstring & fname )
```

5.4.2.6 ReadFromMemory()

```
HRESULT mage::BigEndianBinaryReader::ReadFromMemory (
    const uint8_t * input,
    size_t size )
```

5.4.2.7 ReadValue()

```
template<typename ValueT >
const ValueT& mage::BigEndianBinaryReader::ReadValue ( ) [protected]
```

5.4.2.8 ReadValueArray()

```
template<typename ValueT >
const ValueT* mage::BigEndianBinaryReader::ReadValueArray (
    size_t size ) [protected]
```

5.4.3 Member Data Documentation

5.4.3.1 m_data

```
UniquePtr< uint8_t[] > mage::BigEndianBinaryReader::m_data [private]
```

5.4.3.2 m_end

```
const uint8_t* mage::BigEndianBinaryReader::m_end [private]
```

5.4.3.3 m_fname

```
wstring mage::BigEndianBinaryReader::m_fname [private]
```

5.4.3.4 m_pos

```
const uint8_t* mage::BigEndianBinaryReader::m_pos [private]
```

5.5 mage::BinaryReader Class Reference

```
#include <binary_reader.hpp>
```

Public Member Functions

- [BinaryReader](#) ()
- virtual [~BinaryReader](#) ()=default
- HRESULT [ReadFromFile](#) (const wstring &fname, bool big_endian)
- HRESULT [ReadFromMemory](#) (const uint8_t *input, size_t size, bool big_endian)
- const wstring & [GetFilename](#) () const

Protected Member Functions

- virtual HRESULT [Read](#) ()=0
- bool [HasCharsLeft](#) () const
- const char * [ReadChars](#) (size_t size)
- int8_t [ReadInt8](#) ()
- uint8_t [ReadUInt8](#) ()
- int16_t [ReadInt16](#) ()
- uint16_t [ReadUInt16](#) ()
- int32_t [ReadInt32](#) ()
- uint32_t [ReadUInt32](#) ()
- int64_t [ReadInt64](#) ()
- uint64_t [ReadUInt64](#) ()
- float [ReadFloat](#) ()
- double [ReadDouble](#) ()

Private Member Functions

- [BinaryReader](#) (const [BinaryReader](#) &reader)=delete
- [BinaryReader](#) & [operator=](#) (const [BinaryReader](#) &reader)=delete

Private Attributes

- wstring [m_fname](#)
- bool [m_big_endian](#)
- const uint8_t * [m_pos](#)
- const uint8_t * [m_end](#)
- [UniquePtr](#)< uint8_t[] > [m_data](#)

5.5.1 Constructor & Destructor Documentation

5.5.1.1 [BinaryReader](#)() [1/2]

```
mage::BinaryReader::BinaryReader ( )
```

5.5.1.2 [~BinaryReader](#)()

```
virtual mage::BinaryReader::~~BinaryReader ( ) [virtual], [default]
```

5.5.1.3 [BinaryReader](#)() [2/2]

```
mage::BinaryReader::BinaryReader (
    const BinaryReader & reader ) [private], [delete]
```

5.5.2 Member Function Documentation

5.5.2.1 GetFilename()

```
const wstring& mage::BinaryReader::GetFilename ( ) const
```

5.5.2.2 HasCharsLeft()

```
bool mage::BinaryReader::HasCharsLeft ( ) const [protected]
```

5.5.2.3 operator=()

```
BinaryReader& mage::BinaryReader::operator= (
    const BinaryReader & reader ) [private], [delete]
```

5.5.2.4 Read()

```
virtual HRESULT mage::BinaryReader::Read ( ) [protected], [pure virtual]
```

5.5.2.5 ReadChars()

```
const char * mage::BinaryReader::ReadChars (
    size_t size ) [protected]
```

5.5.2.6 ReadDouble()

```
double mage::BinaryReader::ReadDouble ( ) [protected]
```

5.5.2.7 ReadFloat()

```
float mage::BinaryReader::ReadFloat ( ) [protected]
```

5.5.2.8 ReadFromFile()

```
HRESULT mage::BinaryReader::ReadFromFile (
    const wstring & fname,
    bool big_endian )
```

5.5.2.9 ReadFromMemory()

```
HRESULT mage::BinaryReader::ReadFromMemory (
    const uint8_t * input,
    size_t size,
    bool big_endian )
```

5.5.2.10 ReadInt16()

```
int16_t mage::BinaryReader::ReadInt16 ( ) [protected]
```

5.5.2.11 ReadInt32()

```
int32_t mage::BinaryReader::ReadInt32 ( ) [protected]
```

5.5.2.12 ReadInt64()

```
int64_t mage::BinaryReader::ReadInt64 ( ) [protected]
```

5.5.2.13 ReadInt8()

```
int8_t mage::BinaryReader::ReadInt8 ( ) [protected]
```

5.5.2.14 ReadUInt16()

```
uint16_t mage::BinaryReader::ReadUInt16 ( ) [protected]
```

5.5.2.15 ReadUInt32()

```
uint32_t mage::BinaryReader::ReadUInt32 ( ) [protected]
```

5.5.2.16 ReadUInt64()

```
uint64_t mage::BinaryReader::ReadUInt64 ( ) [protected]
```

5.5.2.17 ReadUInt8()

```
uint8_t mage::BinaryReader::ReadUInt8 ( ) [protected]
```

5.5.3 Member Data Documentation

5.5.3.1 m_big_endian

```
bool mage::BinaryReader::m_big_endian [private]
```

5.5.3.2 m_data

```
UniquePtr< uint8_t[ ] > mage::BinaryReader::m_data [private]
```

5.5.3.3 m_end

```
const uint8_t* mage::BinaryReader::m_end [private]
```

5.5.3.4 m_fname

```
wstring mage::BinaryReader::m_fname [private]
```

5.5.3.5 m_pos

```
const uint8_t* mage::BinaryReader::m_pos [private]
```

5.6 mage::BS Struct Reference

```
#include <bounding_volume.hpp>
```

Public Member Functions

- [BS](#) ()
- [BS](#) (const [Point3](#) &p)
- [BS](#) (const [Point3](#) &p, float r)
- [BS](#) (const [AABB](#) &aabb)
- [BS](#) (const [BS](#) &bs)=default
- [~BS](#) ()=default
- [BS & operator=](#) (const [BS](#) &bs)=default
- bool [Encloses](#) (const [Point3](#) &point) const
- bool [EnclosesStrict](#) (const [Point3](#) &point) const
- bool [Encloses](#) (const [AABB](#) &aabb) const
- bool [EnclosesStrict](#) (const [AABB](#) &aabb) const
- bool [Encloses](#) (const [BS](#) &bs) const
- bool [EnclosesStrict](#) (const [BS](#) &bs) const
- bool [EnclosedBy](#) (const XMFLOAT4 *planes, size_t nb_planes) const
- bool [EnclosedStrictBy](#) (const XMFLOAT4 *planes, size_t nb_planes) const
- [Point3 Centroid](#) () const

Public Attributes

- [Point3](#) p
- float r

5.6.1 Detailed Description

A struct of Bounding Spheres ([BS](#)).

5.6.2 Constructor & Destructor Documentation

5.6.2.1 BS() [1/5]

```
mage::BS::BS ( )
```

Constructs a [BS](#).

5.6.2.2 BS() [2/5]

```
mage::BS::BS (
    const Point3 & p ) [explicit]
```

Constructs a [BS](#) of the given point.

Parameters

in	<i>p</i>	A reference to the point.
----	----------	---------------------------

5.6.2.3 BS() [3/5]

```
mage::BS::BS (
    const Point3 & p,
    float r )
```

Constructs a [BS](#).

Parameters

in	<i>p</i>	A reference to the position.
in	<i>r</i>	The radius.

5.6.2.4 BS() [4/5]

```
mage::BS::BS (
    const AABB & aabb ) [explicit]
```

Constructs a [BS](#) from the given [AABB](#).

Parameters

in	<i>aabb</i>	A reference to the aabb.
----	-------------	--------------------------

5.6.2.5 BS() [5/5]

```
mage::BS::BS (
```



```
const BS & bs ) [default]
```

Constructs a [BS](#) from the given [BS](#).

Parameters

in	<i>bs</i>	A reference to the bs.
----	-----------	------------------------

5.6.2.6 ~BS()

```
mage::BS::~~BS ( ) [default]
```

Destructs this [BS](#).

5.6.3 Member Function Documentation

5.6.3.1 Centroid()

```
Point3 mage::BS::Centroid ( ) const
```

Returns the centroid of this [AABB](#).

Returns

The centroid of this [AABB](#).

5.6.3.2 EnclosedBy()

```
bool mage::BS::EnclosedBy (
    const XMFLOAT4 * planes,
    size_t nb_planes ) const
```

Checks whether this [BS](#) completely encloses the given (closed) volume.

Parameters

in	<i>planes</i>	A pointer to the planes of the volume. (each plane's coefficients are represented as a XMFLOAT4)
in	<i>nb_planes</i>	The number of planes.

Returns

`true` if this [BS](#) completely encloses *planes*. `false` otherwise.

5.6.3.3 EnclosedStrictBy()

```
bool mage::BS::EnclosedStrictBy (
```

```
const XMFLOAT4 * planes,
size_t nb_planes ) const
```

Checks whether this [BS](#) completely, strictly encloses the given (closed) volume.

Parameters

in	<i>planes</i>	A pointer to the planes of the volume. (each plane's coefficients are represented as a XMFLOAT4)
in	<i>nb_planes</i>	The number of planes.

Returns

`true` if this [BS](#) completely, stricly encloses *planes*. `false` otherwise.

5.6.3.4 Encloses() [1/3]

```
bool mage::BS::Encloses (
    const Point3 & point ) const
```

Checks whether this [BS](#) completely encloses the given point.

Parameters

in	<i>point</i>	A reference to the point.
----	--------------	---------------------------

Returns

`true` if this [BS](#) completely encloses *point*. `false` otherwise.

5.6.3.5 Encloses() [2/3]

```
bool mage::BS::Encloses (
    const AABB & aabb ) const
```

Checks whether this [BS](#) completely encloses the given [AABB](#).

Parameters

in	<i>aabb</i>	A reference to the AABB .
----	-------------	---

Returns

`true` if this [BS](#) completely encloses *aabb*. `false` otherwise.

5.6.3.6 Encloses() [3/3]

```
bool mage::BS::Encloses (
    const BS & bs ) const
```

Checks whether this [BS](#) completely encloses the given [BS](#).

Parameters

in	<i>bs</i>	A reference to the BS .
----	-----------	---

Returns

`true` if this [BS](#) completely encloses *bs*. `false` otherwise.

5.6.3.7 EnclosesStrict() [1/3]

```
bool mage::BS::EnclosesStrict (
    const Point3 & point ) const
```

Checks whether this [BS](#) completely, strictly encloses the given point.

Parameters

in	<i>point</i>	A reference to the point.
----	--------------	---------------------------

Returns

`true` if this [BS](#) completely, strictly encloses *point*. `false` otherwise.

5.6.3.8 EnclosesStrict() [2/3]

```
bool mage::BS::EnclosesStrict (
    const AABB & aabb ) const
```

Checks whether this [BS](#) completely, strictly encloses the given [AABB](#).

Parameters

in	<i>aabb</i>	A reference to the AABB .
----	-------------	---

Returns

`true` if this [BS](#) completely, strictly encloses *aabb*. `false` otherwise.

5.6.3.9 EnclosesStrict() [3/3]

```
bool mage::BS::EnclosesStrict (
    const BS & bs ) const
```

Checks whether this [BS](#) completely, strictly encloses the given [BS](#).

Parameters

in	<i>bs</i>	A reference to the BS .
----	-----------	---

Returns

`true` if this [BS](#) completely, strictly encloses *bs*. `false` otherwise.

5.6.3.10 operator=()

```
BS& mage::BS::operator= (
    const BS & bs ) [default]
```

Copies the given [BS](#) to this [BS](#).

Parameters

in	<i>bs</i>	A reference to the BS to copy from.
----	-----------	---

Returns

A reference to the copy of the given [BS](#) (i.e. this [BS](#)).

5.6.4 Member Data Documentation**5.6.4.1 p**

```
Point3 mage::BS::p
```

The position of this [BS](#).

5.6.4.2 r

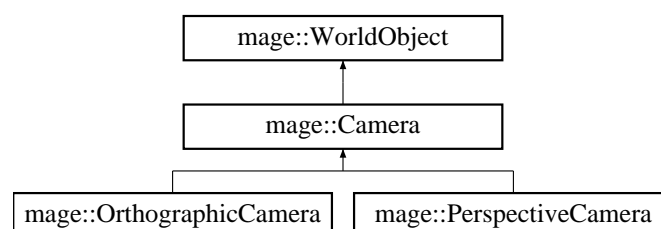
```
float mage::BS::r
```

The radius of this [BS](#).

5.7 mage::Camera Class Reference

```
#include <camera.hpp>
```

Inheritance diagram for `mage::Camera`:



Public Member Functions

- virtual `~Camera()` = default
- `Camera & operator=` (const `Camera` &camera)
- virtual `Camera * Clone()` const = 0
- float `GetWidth()` const
- `Camera & SetWidth` (float width)
- float `GetHeight()` const
- `Camera & SetHeight` (float height)
- `Camera & SetWidthAndHeight` (float width, float height)
- float `GetNearZ()` const
- `Camera & SetNearZ` (float near_z)
- float `GetFarZ()` const
- `Camera & SetFarZ` (float far_z)
- `Camera & SetNearAndFarZ` (float near_z, float far_z)
- virtual XMMATRIX `GetViewToProjectionMatrix()` const = 0

Protected Member Functions

- `Camera` (const string &name, float width, float height, float near_z=MAGE_DEFAULT_CAMERA_NEAR_Z, float far_z=MAGE_DEFAULT_CAMERA_FAR_Z)
- `Camera` (const `Camera` &camera)

Private Attributes

- float `m_width`
- float `m_height`
- float `m_near_z`
- float `m_far_z`

5.7.1 Detailed Description

A class of camera.

5.7.2 Constructor & Destructor Documentation

5.7.2.1 `~Camera()`

```
virtual mage::Camera::~~Camera ( ) [virtual], [default]
```

Destructs this camera.

5.7.2.2 `Camera()` [1/2]

```
mage::Camera::Camera (
    const string & name,
    float width,
    float height,
    float near_z = MAGE_DEFAULT_CAMERA_NEAR_Z,
    float far_z = MAGE_DEFAULT_CAMERA_FAR_Z ) [protected]
```

Constructs a camera.

Parameters

in	<i>name</i>	A reference to the name of the camera.
in	<i>width</i>	The width.
in	<i>height</i>	The height.
in	<i>near_z</i>	The position of the near z-plane.
in	<i>far_z</i>	The position of the far z-plane.

5.7.2.3 Camera() [2/2]

```
mage::Camera::Camera (
    const Camera & camera ) [protected]
```

Constructs a camera from the given camera.

Parameters

in	<i>camera</i>	The camera.
----	---------------	-------------

5.7.3 Member Function Documentation**5.7.3.1 Clone()**

```
virtual Camera* mage::Camera::Clone ( ) const [pure virtual]
```

Clones this camera.

Returns

A pointer to the clone of this camera.

Implemented in [mage::PerspectiveCamera](#), and [mage::OrthographicCamera](#).

5.7.3.2 GetFarZ()

```
float mage::Camera::GetFarZ ( ) const
```

Returns the position of the far z-plane of this camera.

Returns

The position of the far z-plane of this camera.

5.7.3.3 `GetHeight()`

```
float mage::Camera::GetHeight ( ) const
```

Returns the height of this camera.

Returns

The height of this camera.

5.7.3.4 `GetNearZ()`

```
float mage::Camera::GetNearZ ( ) const
```

Returns the position of the near z-plane of this camera.

Returns

The position of the near z-plane of this camera.

5.7.3.5 `GetViewToProjectionMatrix()`

```
virtual XMMATRIX mage::Camera::GetViewToProjectionMatrix ( ) const [pure virtual]
```

Returns the view-to-projection matrix of this camera.

Returns

The view-to-projection matrix of this camera.

Implemented in [mage::PerspectiveCamera](#), and [mage::OrthographicCamera](#).

5.7.3.6 `GetWidth()`

```
float mage::Camera::GetWidth ( ) const
```

Returns the width of this camera.

Returns

The width of this camera.

5.7.3.7 `operator=()`

```
Camera& mage::Camera::operator= (
    const Camera & camera )
```

Copies the given camera to this camera.

Parameters

in	<i>camera</i>	The camera.
----	---------------	-------------

5.7.3.8 SetFarZ()

```
Camera& mage::Camera::SetFarZ (
    float far_z )
```

Sets the position of the far z-plane of this camera to the given value.

Parameters

in	<i>far</i> ↔ <i>_z</i>	The position of the far z-plane.
----	---------------------------	----------------------------------

Returns

A reference to this camera.

5.7.3.9 SetHeight()

```
Camera& mage::Camera::SetHeight (
    float height )
```

Sets the height of this camera to the given value.

Parameters

in	<i>height</i>	The height.
----	---------------	-------------

Returns

A reference to this camera.

5.7.3.10 SetNearAndFarZ()

```
Camera& mage::Camera::SetNearAndFarZ (
    float near_z,
    float far_z )
```

Sets the position of the near and far z-plane of this camera to the given values.

Parameters

in	<i>near</i> ↔ <i>_z</i>	The position of the near z-plane.
in	<i>far_z</i>	The position of the far z-plane.

Returns

A reference to this camera.

5.7.3.11 SetNearZ()

```
Camera& mage::Camera::SetNearZ (
    float near_z )
```

Sets the position of the near z-plane of this camera to the given value.

Parameters

in	<i>near_z</i>	The position of the near z-plane.
----	---------------	-----------------------------------

Returns

A reference to this camera.

5.7.3.12 SetWidth()

```
Camera& mage::Camera::SetWidth (
    float width )
```

Sets the width of this camera to the given value.

Parameters

in	<i>width</i>	The width.
----	--------------	------------

Returns

A reference to this camera.

5.7.3.13 SetWidthAndHeight()

```
Camera& mage::Camera::SetWidthAndHeight (
    float width,
    float height )
```

Sets the width and height of this camera to the given values.

Parameters

in	<i>width</i>	The width.
in	<i>height</i>	The height.

Returns

A reference to this camera.

5.7.4 Member Data Documentation

5.7.4.1 m_far_z

```
float mage::Camera::m_far_z [private]
```

The position of the far z-plane.

5.7.4.2 m_height

```
float mage::Camera::m_height [private]
```

The height of this camera.

5.7.4.3 m_near_z

```
float mage::Camera::m_near_z [private]
```

The position of the near z-plane.

5.7.4.4 m_width

```
float mage::Camera::m_width [private]
```

The width of this camera.

5.8 mage::CartesianAxesSystem Struct Reference

```
#include <coordinate_system.hpp>
```

Public Member Functions

- [CartesianAxesSystem](#) ()
- [CartesianAxesSystem](#) (const XMVECTOR &x)
- [CartesianAxesSystem](#) (const XMVECTOR &x, const XMVECTOR &y)
- [CartesianAxesSystem](#) (const XMVECTOR &x, const XMVECTOR &y, const XMVECTOR &z)
- [CartesianAxesSystem](#) (const [CartesianAxesSystem](#) &axes)=default
- [~CartesianAxesSystem](#) ()=default
- [CartesianAxesSystem](#) & [operator=](#) (const [CartesianAxesSystem](#) &axes)=default
- XMVECTOR [GetAxisX](#) () const
- XMVECTOR [GetAxisY](#) () const
- XMVECTOR [GetAxisZ](#) () const

Private Attributes

- XMVECTOR [m_x](#)
- XMVECTOR [m_y](#)
- XMVECTOR [m_z](#)

5.8.1 Detailed Description

A struct of Cartesian axes systems.

5.8.2 Constructor & Destructor Documentation

5.8.2.1 CartesianAxesSystem() [1/5]

```
mage::CartesianAxesSystem::CartesianAxesSystem ( )
```

Constructs a Cartesian axes system.

5.8.2.2 CartesianAxesSystem() [2/5]

```
mage::CartesianAxesSystem::CartesianAxesSystem (
    const XMVECTOR & x )
```

Constructs a Cartesian axes system from the given axes.

Precondition

The given axis is normalized.

Parameters

in	<i>x</i>	The x-axis.
----	----------	-------------

5.8.2.3 CartesianAxesSystem() [3/5]

```
mage::CartesianAxesSystem::CartesianAxesSystem (
    const XMVECTOR & x,
    const XMVECTOR & y )
```

Constructs a Cartesian axes system from the given axes.

Precondition

The given axes are orthonormal.

Parameters

in	x	The x-axis.
in	y	The y-axis.

5.8.2.4 CartesianAxesSystem() [4/5]

```
mage::CartesianAxesSystem::CartesianAxesSystem (
    const XMVECTOR & x,
    const XMVECTOR & y,
    const XMVECTOR & z )
```

Constructs a Cartesian axes system from the given axes.

Precondition

The given axes are orthonormal.

Parameters

in	x	The x-axis.
in	y	The y-axis.
in	z	The z-axis.

5.8.2.5 CartesianAxesSystem() [5/5]

```
mage::CartesianAxesSystem::CartesianAxesSystem (
    const CartesianAxesSystem & axes ) [default]
```

Constructs a Cartesian axes system from the given Cartesian axes system.

Parameters

in	<i>axes</i>	The Cartesian axes system.
----	-------------	----------------------------

5.8.2.6 ~CartesianAxesSystem()

```
mage::CartesianAxesSystem::~~CartesianAxesSystem ( ) [default]
```

Destructs this Cartesian axes system.

5.8.3 Member Function Documentation**5.8.3.1 GetAxisX()**

```
XMVECTOR mage::CartesianAxesSystem::GetAxisX ( ) const
```

Returns the x-axis of this Cartesian axes system.

Returns

The x-axis of this Cartesian axes system.

5.8.3.2 GetAxisY()

```
XMVECTOR mage::CartesianAxesSystem::GetAxisY ( ) const
```

Returns the y-axis of this Cartesian axes system.

Returns

The y-axis of this Cartesian axes system.

5.8.3.3 GetAxisZ()

```
XMVECTOR mage::CartesianAxesSystem::GetAxisZ ( ) const
```

Returns the z-axis of this Cartesian axes system.

Returns

The z-axis of this Cartesian axes system.

5.8.3.4 operator=()

```
CartesianAxesSystem& mage::CartesianAxesSystem::operator= (
    const CartesianAxesSystem & axes ) [default]
```

Copies the given Cartesian axes system to this Cartesian axes system.

Parameters

in	axes	The Cartesian axes system to copy from.
----	------	---

Returns

A reference to the copy of the given Cartesian axes system (i.e. this Cartesian axes system).

5.8.4 Member Data Documentation**5.8.4.1 m_x**

```
XMVECTOR mage::CartesianAxesSystem::m_x [private]
```

The x-axis of this Cartesian axes system.

5.8.4.2 m_y

```
XMVECTOR mage::CartesianAxesSystem::m_y [private]
```

The y-axis of this Cartesian axes system.

5.8.4.3 m_z

```
XMVECTOR mage::CartesianAxesSystem::m_z [private]
```

The z-axis of this Cartesian axes system.

5.9 mage::CartesianCoordinateSystem Struct Reference

```
#include <coordinate_system.hpp>
```

Public Member Functions

- [CartesianCoordinateSystem](#) (const [CartesianAxesSystem](#) &axes)
- [CartesianCoordinateSystem](#) (const XMVECTOR &o, const [CartesianAxesSystem](#) &axes)
- [CartesianCoordinateSystem](#) (const [CartesianCoordinateSystem](#) &coordinate_system)=default
- [~CartesianCoordinateSystem](#) ()=default
- [CartesianCoordinateSystem](#) & [operator=](#) (const [CartesianCoordinateSystem](#) &coordinate_system)=default
- XMVECTOR [GetOrigin](#) () const
- XMVECTOR [GetAxisX](#) () const
- XMVECTOR [GetAxisY](#) () const
- XMVECTOR [GetAxisZ](#) () const
- [CartesianAxesSystem](#) [GetAxes](#) () const

Private Attributes

- XMVECTOR [m_o](#)
- [CartesianAxesSystem](#) [m_axes](#)

5.9.1 Detailed Description

A struct of Cartesian coordinate systems.

5.9.2 Constructor & Destructor Documentation

5.9.2.1 CartesianCoordinateSystem() [1/3]

```
mage::CartesianCoordinateSystem::CartesianCoordinateSystem (
    const CartesianAxesSystem & axes ) [explicit]
```

Constructs a Cartesian coordinate system from the given Cartesian axes system.

Parameters

in	<i>axes</i>	The Cartesian axes system.
----	-------------	----------------------------

5.9.2.2 CartesianCoordinateSystem() [2/3]

```
mage::CartesianCoordinateSystem::CartesianCoordinateSystem (
    const XMVECTOR & o,
    const CartesianAxesSystem & axes )
```

Constructs a Cartesian coordinate system from the given origin and Cartesian axes system.

Parameters

in	<i>o</i>	The origin.
in	<i>axes</i>	The Cartesian axes system.

5.9.2.3 CartesianCoordinateSystem() [3/3]

```
mage::CartesianCoordinateSystem::CartesianCoordinateSystem (
    const CartesianCoordinateSystem & coordinate_system ) [default]
```

Constructs a Cartesian coordinate system from the given Cartesian coordinate system.

Parameters

in	<i>coordinate_system</i>	The Cartesian coordinate system.
----	--------------------------	----------------------------------

5.9.2.4 ~CartesianCoordinateSystem()

```
mage::CartesianCoordinateSystem::~~CartesianCoordinateSystem ( ) [default]
```

Destructs this Cartesian coordinate system.

5.9.3 Member Function Documentation

5.9.3.1 GetAxes()

```
CartesianAxesSystem mage::CartesianCoordinateSystem::GetAxes ( ) const
```

Returns the axes of this Cartesian coordinate system.

Returns

The Cartesian axes system of this Cartesian coordinate system.

5.9.3.2 GetAxisX()

```
XMVECTOR mage::CartesianCoordinateSystem::GetAxisX ( ) const
```

Returns the x-axis of this Cartesian coordinate system.

Returns

The x-axis of this Cartesian coordinate system.

5.9.3.3 GetAxisY()

```
XMVECTOR mage::CartesianCoordinateSystem::GetAxisY ( ) const
```

Returns the y-axis of this Cartesian coordinate system.

Returns

The y-axis of this Cartesian coordinate system.

5.9.3.4 GetAxisZ()

```
XMVECTOR mage::CartesianCoordinateSystem::GetAxisZ ( ) const
```

Returns the z-axis of this Cartesian coordinate system.

Returns

The z-axis of this Cartesian coordinate system.

5.9.3.5 GetOrigin()

```
XMVECTOR mage::CartesianCoordinateSystem::GetOrigin ( ) const
```

Returns the origin of this Cartesian coordinate system.

Returns

The origin of this Cartesian coordinate system.

5.9.3.6 operator=()

```
CartesianCoordinateSystem& mage::CartesianCoordinateSystem::operator= (
    const CartesianCoordinateSystem & coordinate_system ) [default]
```

Copies the given Cartesian coordinate system to this Cartesian coordinate system.

Parameters

in	<i>coordinate_system</i>	The Cartesian coordinate system to copy from.
----	--------------------------	---

Returns

A reference to the copy of the given Cartesian coordinate system (i.e. this Cartesian coordinate system).

5.9.4 Member Data Documentation

5.9.4.1 m_axes

`CartesianAxesSystem` `mage::CartesianCoordinateSystem::m_axes` [private]

The Cartesian axes system of this Cartesian coordinate system.

5.9.4.2 m_o

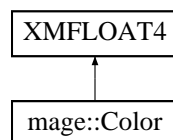
`XMVECTOR` `mage::CartesianCoordinateSystem::m_o` [private]

The origin of this Cartesian coordinate system.

5.10 mage::Color Struct Reference

```
#include <math.hpp>
```

Inheritance diagram for `mage::Color`:



Public Member Functions

- `Color()`
- `Color(float x, float y, float z, float w)`
- `Color(const Color &color)`
- `Color(const XMVECTOR &vector)`
- `~Color()`=default
- `Color & operator= (const Color &color)`

5.10.1 Constructor & Destructor Documentation

5.10.1.1 Color() [1/4]

```
mage::Color::Color ( )
```

5.10.1.2 Color() [2/4]

```
mage::Color::Color (
    float x,
    float y,
    float z,
    float w )
```

5.10.1.3 Color() [3/4]

```
mage::Color::Color (
    const Color & color )
```

5.10.1.4 Color() [4/4]

```
mage::Color::Color (
    const XMFLOAT4 & vector ) [explicit]
```

5.10.1.5 ~Color()

```
mage::Color::~~Color ( ) [default]
```

5.10.2 Member Function Documentation**5.10.2.1 operator=()**

```
Color& mage::Color::operator= (
    const Color & color )
```

5.11 mage::CombinedShader Struct Reference

```
#include <shader.hpp>
```

Public Member Functions

- [CombinedShader](#) ([SharedPtr](#)< [VertexShader](#) > vertex_shader, [SharedPtr](#)< [PixelShader](#) > pixel_shader)
- [CombinedShader](#) (const [CombinedShader](#) &shader)=default
- [~CombinedShader](#) ()=default
- [CombinedShader](#) & operator= (const [CombinedShader](#) &shader)=default
- [SharedPtr](#)< [VertexShader](#) > [GetVertexShader](#) () const
- void [SetVertexShader](#) ([SharedPtr](#)< [VertexShader](#) > vertex_shader)
- [SharedPtr](#)< [PixelShader](#) > [GetPixelShader](#) () const
- void [SetPixelShader](#) ([SharedPtr](#)< [PixelShader](#) > pixel_shader)
- void [Render](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [Material](#) &material, const [World](#) &world, const [TransformBuffer](#) &transform_buffer)

Private Attributes

- [SharedPtr< VertexShader > m_vertex_shader](#)
- [SharedPtr< PixelShader > m_pixel_shader](#)

5.11.1 Constructor & Destructor Documentation

5.11.1.1 CombinedShader() [1/2]

```
mage::CombinedShader::CombinedShader (
    SharedPtr< VertexShader > vertex_shader,
    SharedPtr< PixelShader > pixel_shader )
```

5.11.1.2 CombinedShader() [2/2]

```
mage::CombinedShader::CombinedShader (
    const CombinedShader & shader ) [default]
```

5.11.1.3 ~CombinedShader()

```
mage::CombinedShader::~CombinedShader ( ) [default]
```

5.11.2 Member Function Documentation

5.11.2.1 GetPixelShader()

```
SharedPtr< PixelShader > mage::CombinedShader::GetPixelShader ( ) const
```

5.11.2.2 GetVertexShader()

```
SharedPtr< VertexShader > mage::CombinedShader::GetVertexShader ( ) const
```

5.11.2.3 operator=()

```
CombinedShader& mage::CombinedShader::operator= (
    const CombinedShader & shader ) [default]
```

5.11.2.4 Render()

```
void mage::CombinedShader::Render (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const Material & material,
    const World & world,
    const TransformBuffer & transform_buffer )
```

5.11.2.5 SetPixelShader()

```
void mage::CombinedShader::SetPixelShader (
    SharedPtr< PixelShader > pixel_shader )
```

5.11.2.6 SetVertexShader()

```
void mage::CombinedShader::SetVertexShader (
    SharedPtr< VertexShader > vertex_shader )
```

5.11.3 Member Data Documentation

5.11.3.1 m_pixel_shader

```
SharedPtr< PixelShader > mage::CombinedShader::m_pixel_shader [private]
```

5.11.3.2 m_vertex_shader

```
SharedPtr< VertexShader > mage::CombinedShader::m_vertex_shader [private]
```

5.12 mage::ConditionVariable Class Reference

```
#include <lock.hpp>
```

Public Member Functions

- [ConditionVariable](#) ()
- [~ConditionVariable](#) ()
- void [Lock](#) ()
- void [Unlock](#) ()
- void [Wait](#) ()
- void [Signal](#) ()

Private Types

- enum { [SIGNAL](#) = 0, [BROADCAST](#) = 1, [NUM_EVENTS](#) = 2 }

Private Member Functions

- [ConditionVariable](#) (const [ConditionVariable](#) &condition_variable)=delete
- [ConditionVariable](#) & [operator=](#) (const [ConditionVariable](#) &condition_variable)=delete

Private Attributes

- uint32_t [m_nb_waiters](#)
- CRITICAL_SECTION [m_nb_waiters_mutex](#)
- CRITICAL_SECTION [m_condition_mutex](#)
- HANDLE [m_events](#) [[NUM_EVENTS](#)]

5.12.1 Detailed Description

A class of condition variables.

5.12.2 Member Enumeration Documentation

5.12.2.1 anonymous enum

anonymous enum [private]

Type of events (indices).

Enumerator

SIGNAL	
BROADCAST	
NUM_EVENTS	

5.12.3 Constructor & Destructor Documentation

5.12.3.1 ConditionVariable() [1/2]

```
mage::ConditionVariable::ConditionVariable ( )
```

Constructs a condition variable.

5.12.3.2 ~ConditionVariable()

```
mage::ConditionVariable::~~ConditionVariable ( )
```

Destructs this condition variable.

5.12.3.3 ConditionVariable() [2/2]

```
mage::ConditionVariable::ConditionVariable (
    const ConditionVariable & condition_variable ) [private], [delete]
```

Constructs a condition variable from the given condition variable.

Parameters

in	<i>condition_variable</i>	A reference to a condition variable.
----	---------------------------	--------------------------------------

5.12.4 Member Function Documentation**5.12.4.1 Lock()**

```
void mage::ConditionVariable::Lock ( )
```

Locks this condition variable.

5.12.4.2 operator=()

```
ConditionVariable& mage::ConditionVariable::operator= (
    const ConditionVariable & condition_variable ) [private], [delete]
```

Copies the given condition variable to this condition variable.

Parameters

in	<i>condition_variable</i>	A reference to a condition variable.
----	---------------------------	--------------------------------------

Returns

A reference to the copy of the given condition variable (i.e. this condition variable)

5.12.4.3 Signal()

```
void mage::ConditionVariable::Signal ( )
```

Signal a condition change.

5.12.4.4 Unlock()

```
void mage::ConditionVariable::Unlock ( )
```

Unlocks this condition variable.

5.12.4.5 Wait()

```
void mage::ConditionVariable::Wait ( )
```

Wait for a signal indicating a condition change.

5.12.5 Member Data Documentation

5.12.5.1 m_condition_mutex

CRITICAL_SECTION mage::ConditionVariable::m_condition_mutex [private]

The critical section object for the mutex guarding the condition of this condition variable.

5.12.5.2 m_events

HANDLE mage::ConditionVariable::m_events[[NUM_EVENTS](#)] [private]

Signal and broadcast event handles of this condition variable.

5.12.5.3 m_nb_waiters

uint32_t mage::ConditionVariable::m_nb_waiters [private]

The number of waiters of this condition variable.

5.12.5.4 m_nb_waiters_mutex

CRITICAL_SECTION mage::ConditionVariable::m_nb_waiters_mutex [private]

The critical section object for the mutex guarding m_nb_waiters of this condition variable.

5.13 mage::DDS_HEADER Struct Reference

Public Attributes

- uint32_t [size](#)
- uint32_t [flags](#)
- uint32_t [height](#)
- uint32_t [width](#)
- uint32_t [pitch_or_linear_size](#)
- uint32_t [depth](#)
- uint32_t [mip_map_count](#)
- uint32_t [reserved1](#) [11]
- [DDS_PIXELFORMAT](#) [ddspf](#)
- uint32_t [caps](#)
- uint32_t [caps2](#)
- uint32_t [caps3](#)
- uint32_t [caps4](#)
- uint32_t [reserved2](#)

5.13.1 Member Data Documentation

5.13.1.1 caps

`uint32_t mage::DDS_HEADER::caps`

5.13.1.2 caps2

`uint32_t mage::DDS_HEADER::caps2`

5.13.1.3 caps3

`uint32_t mage::DDS_HEADER::caps3`

5.13.1.4 caps4

`uint32_t mage::DDS_HEADER::caps4`

5.13.1.5 ddspf

`DDS_PIXELFORMAT mage::DDS_HEADER::ddspf`

5.13.1.6 depth

`uint32_t mage::DDS_HEADER::depth`

5.13.1.7 flags

`uint32_t mage::DDS_HEADER::flags`

5.13.1.8 height

`uint32_t mage::DDS_HEADER::height`

5.13.1.9 mip_map_count

`uint32_t mage::DDS_HEADER::mip_map_count`

5.13.1.10 pitch_or_linear_size

`uint32_t mage::DDS_HEADER::pitch_or_linear_size`

5.13.1.11 reserved1

```
uint32_t mage::DDS_HEADER::reserved1[11]
```

5.13.1.12 reserved2

```
uint32_t mage::DDS_HEADER::reserved2
```

5.13.1.13 size

```
uint32_t mage::DDS_HEADER::size
```

5.13.1.14 width

```
uint32_t mage::DDS_HEADER::width
```

5.14 mage::DDS_HEADER_DXT10 Struct Reference

Public Attributes

- DXGI_FORMAT [dxgi_format](#)
- uint32_t [resource_dimension](#)
- uint32_t [misc_flag](#)
- uint32_t [array_size](#)
- uint32_t [misc_flags2](#)

5.14.1 Member Data Documentation

5.14.1.1 array_size

```
uint32_t mage::DDS_HEADER_DXT10::array_size
```

5.14.1.2 dxgi_format

```
DXGI_FORMAT mage::DDS_HEADER_DXT10::dxgi_format
```

5.14.1.3 misc_flag

```
uint32_t mage::DDS_HEADER_DXT10::misc_flag
```

5.14.1.4 misc_flags2

```
uint32_t mage::DDS_HEADER_DXT10::misc_flags2
```

5.14.1.5 resource_dimension

```
uint32_t mage::DDS_HEADER_DXT10::resource_dimension
```

5.15 mage::DDS_PIXELFORMAT Struct Reference

Public Attributes

- uint32_t [size](#)
- uint32_t [flags](#)
- uint32_t [fourCC](#)
- uint32_t [RGBBitCount](#)
- uint32_t [RBitMask](#)
- uint32_t [GBitMask](#)
- uint32_t [BBitMask](#)
- uint32_t [ABitMask](#)

5.15.1 Member Data Documentation

5.15.1.1 ABitMask

```
uint32_t mage::DDS_PIXELFORMAT::ABitMask
```

5.15.1.2 BBitMask

```
uint32_t mage::DDS_PIXELFORMAT::BBitMask
```

5.15.1.3 flags

```
uint32_t mage::DDS_PIXELFORMAT::flags
```

5.15.1.4 fourCC

```
uint32_t mage::DDS_PIXELFORMAT::fourCC
```

5.15.1.5 GBitMask

```
uint32_t mage::DDS_PIXELFORMAT::GBitMask
```

5.15.1.6 RBitMask

```
uint32_t mage::DDS_PIXELFORMAT::RBitMask
```

5.15.1.7 RGBBitCount

```
uint32_t mage::DDS_PIXELFORMAT::RGBBitCount
```

5.15.1.8 size

```
uint32_t mage::DDS_PIXELFORMAT::size
```

5.16 mage::DeviceEnumeration Class Reference

```
#include <device_enumeration.hpp>
```

Public Member Functions

- [ComPtr](#)< IDXGIAdapter2 > [GetAdapter](#) () const
- [ComPtr](#)< DXGIOutput2 > [GetOutput](#) () const
- const DXGI_MODE_DESC1 * [GetDisplayMode](#) () const
- bool [IsWindowed](#) () const
- bool [IsFullScreen](#) () const
- bool [IsVSynced](#) () const

Private Member Functions

- [DeviceEnumeration](#) ()
- [~DeviceEnumeration](#) ()=default
- [DeviceEnumeration](#) (const [DeviceEnumeration](#) &device_enumeration)=delete
- [DeviceEnumeration](#) & [operator=](#) (const [DeviceEnumeration](#) &device_enumeration)=delete
- HRESULT [InitializeAdapterAndOutput](#) ()
- HRESULT [InitializeDisplayModes](#) ()
- HRESULT [Enumerate](#) ()
- INT_PTR [SettingsDialogProc](#) (HWND hwndDlg, UINT uMsg, WPARAM wParam, LPARAM lParam)

Private Attributes

- [ComPtr](#)< IDXGIAdapter2 > [m_adapter](#)
- [ComPtr](#)< DXGIOutput2 > [m_output](#)
- [UniquePtr](#)< [VariableScript](#) > [m_settings_script](#)
- list< DXGI_MODE_DESC1 > [m_display_modes](#)
- const DXGI_MODE_DESC1 * [m_selected_display_mode](#)
- bool [m_windowed](#)
- bool [m_vsync](#)

Friends

- class [Engine](#)
- INT_PTR CALLBACK [SettingsDialogProcDelegate](#) (HWND hwndDlg, UINT uMsg, WPARAM wParam, LPARAM lParam)

5.16.1 Detailed Description

A device enumeration.

5.16.2 Constructor & Destructor Documentation

5.16.2.1 DeviceEnumeration() [1/2]

```
mage::DeviceEnumeration::DeviceEnumeration ( ) [private]
```

Constructs a device enumeration.

5.16.2.2 ~DeviceEnumeration()

```
mage::DeviceEnumeration::~~DeviceEnumeration ( ) [private], [default]
```

Destructs this device enumeration.

5.16.2.3 DeviceEnumeration() [2/2]

```
mage::DeviceEnumeration::DeviceEnumeration (
    const DeviceEnumeration & device_enumeration ) [private], [delete]
```

Constructs a device enumeration from the given device enumeration.

Parameters

in	<i>device_enumeration</i>	A reference to a device enumeration.
----	---------------------------	--------------------------------------

5.16.3 Member Function Documentation

5.16.3.1 Enumerate()

```
HRESULT mage::DeviceEnumeration::Enumerate ( ) [private]
```

Enumerates the available display modes on the adapter output of the physical adapter with the most dedicated video memory.

Returns

A success/error value.

5.16.3.2 GetAdapter()

```
ComPtr< IDXGIAdapter2 > mage::DeviceEnumeration::GetAdapter ( ) const
```

Returns the adapter.

Returns

A pointer to the adapter.

5.16.3.3 GetDisplayMode()

```
const DXGI_MODE_DESC1* mage::DeviceEnumeration::GetDisplayMode ( ) const
```

Returns the selected display mode by the user.

Returns

A pointer to the selected display mode.

5.16.3.4 GetOutput()

```
ComPtr< IDXGIOutput2 > mage::DeviceEnumeration::GetOutput ( ) const
```

Returns the output.

Returns

A pointer to the output.

5.16.3.5 InitializeAdapterAndOutput()

```
HRESULT mage::DeviceEnumeration::InitializeAdapterAndOutput ( ) [private]
```

Initializes the adapter and the output of this device enumeration.

Returns

A success/error value.

5.16.3.6 InitializeDisplayModes()

```
HRESULT mage::DeviceEnumeration::InitializeDisplayModes ( ) [private]
```

Initializes the display modes of this device enumeration.

Returns

A success/error value.

5.16.3.7 IsFullScreen()

```
bool mage::DeviceEnumeration::IsFullScreen ( ) const
```

Checks whether the application should run in full screen mode.

Returns

`true` if the application should run in full screen mode. `false` otherwise.

5.16.3.8 IsVSynced()

```
bool mage::DeviceEnumeration::IsVSynced ( ) const
```

Checks whether v-sync should be enabled.

Returns

`true` if v-sync should be enabled. `false` otherwise.

5.16.3.9 IsWindowed()

```
bool mage::DeviceEnumeration::IsWindowed ( ) const
```

Checks whether the application should run in windowed mode.

Returns

`true` if the application should run in windowed mode. `false` otherwise.

5.16.3.10 operator=()

```
DeviceEnumeration& mage::DeviceEnumeration::operator= (
    const DeviceEnumeration & device_enumeration ) [private], [delete]
```

Copies the given device enumeration to this device enumeration.

Parameters

in	<i>device_enumeration</i>	A reference to a device enumeration.
----	---------------------------	--------------------------------------

Returns

A reference to the copy of the given device enumeration (i.e. this device enumeration).

5.16.3.11 SettingsDialogProc()

```
INT_PTR mage::DeviceEnumeration::SettingsDialogProc (
    HWND hwndDlg,
    UINT uMsg,
    WPARAM wParam,
    LPARAM lParam ) [private]
```

Engine-defined callback function used with the CreateDialog for device enumeration.

Parameters

in	<i>hwndDlg</i>	A handle to the dialog box.
in	<i>uMsg</i>	The message.
in	<i>wParam</i>	Additional message-specific information.
in	<i>lParam</i>	Additional message-specific information.

Returns

`true` if *uMsg* is processed. `false` otherwise.

5.16.4 Friends And Related Function Documentation

5.16.4.1 Engine

```
friend class Engine [friend]
```

5.16.4.2 SettingsDialogProcDelegate

```
INT_PTR CALLBACK SettingsDialogProcDelegate (
    HWND hwndDlg,
    UINT uMsg,
    WPARAM wParam,
    LPARAM lParam ) [friend]
```

Engine-defined callback function used with the CreateDialog for device enumeration.

Parameters

in	<i>hwndDlg</i>	A handle to the dialog box.
in	<i>uMsg</i>	The message.
in	<i>wParam</i>	Additional message-specific information.
in	<i>lParam</i>	Additional message-specific information.

Returns

`true` if *uMsg* is processed. `false` otherwise.

5.16.5 Member Data Documentation

5.16.5.1 m_adapter

```
ComPtr< IDXGIAdapter2 > m_age::DeviceEnumeration::m_adapter [private]
```

A pointer to the adapter (or video card).

5.16.5.2 m_display_modes

```
list< DXGI_MODE_DESC1 > m_age::DeviceEnumeration::m_display_modes [private]
```

The linked list of enumerated display modes.

5.16.5.3 m_output

```
ComPtr< IDXGIOutput2 > m_age::DeviceEnumeration::m_output [private]
```

A pointer to the output.

5.16.5.4 m_selected_display_mode

```
const DXGI_MODE_DESC1* m_age::DeviceEnumeration::m_selected_display_mode [private]
```

A pointer to the selected display mode by the user.

5.16.5.5 m_settings_script

```
UniquePtr< VariableScript > m_age::DeviceEnumeration::m_settings_script [private]
```

A pointer to the script which stores the device configuration.

5.16.5.6 m_vsync

```
bool m_age::DeviceEnumeration::m_vsync [private]
```

Flag indicating whether v-sync should be enabled.

5.16.5.7 m_windowed

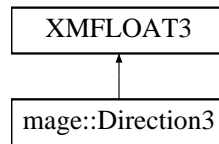
```
bool m_age::DeviceEnumeration::m_windowed [private]
```

Flag indicating whether the application should run in windowed mode.

5.17 mage::Direction3 Struct Reference

```
#include <math.hpp>
```

Inheritance diagram for mage::Direction3:



Public Member Functions

- [Direction3](#) ()
- [Direction3](#) (float x, float y, float z)
- [Direction3](#) (const [Direction3](#) &direction)
- [Direction3](#) (const [Point3](#) &point)
- [Direction3](#) (const [Normal3](#) &normal)
- [Direction3](#) (const XMFLOAT3 &vector)
- [~Direction3](#) ()=default
- [Direction3](#) & [operator=](#) (const [Direction3](#) &direction)

5.17.1 Constructor & Destructor Documentation

5.17.1.1 [Direction3\(\)](#) [1/6]

```
mage::Direction3::Direction3 ( )
```

5.17.1.2 [Direction3\(\)](#) [2/6]

```
mage::Direction3::Direction3 (
    float x,
    float y,
    float z )
```

5.17.1.3 [Direction3\(\)](#) [3/6]

```
mage::Direction3::Direction3 (
    const Direction3 & direction )
```

5.17.1.4 [Direction3\(\)](#) [4/6]

```
mage::Direction3::Direction3 (
    const Point3 & point ) [explicit]
```

5.17.1.5 Direction3() [5/6]

```
mage::Direction3::Direction3 (
    const Normal3 & normal )
```

5.17.1.6 Direction3() [6/6]

```
mage::Direction3::Direction3 (
    const XMFLOAT3 & vector ) [explicit]
```

5.17.1.7 ~Direction3()

```
mage::Direction3::~~Direction3 ( ) [default]
```

5.17.2 Member Function Documentation

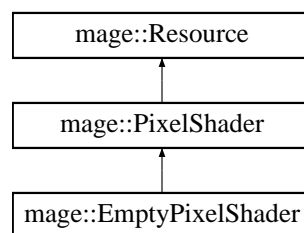
5.17.2.1 operator=()

```
Direction3& mage::Direction3::operator= (
    const Direction3 & direction )
```

5.18 mage::EmptyPixelShader Class Reference

```
#include <empty_shader.hpp>
```

Inheritance diagram for mage::EmptyPixelShader:



Public Member Functions

- [EmptyPixelShader](#) (const [RenderingDevice](#) &device, const wstring &fname)
- virtual [~EmptyPixelShader](#) ()=default
- virtual void [Render](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [Material](#) &material, const [World](#) &world) const override

Private Member Functions

- [EmptyPixelShader](#) (const [EmptyPixelShader](#) &pixel_shader)=delete
- [EmptyPixelShader](#) & [operator=](#) (const [EmptyPixelShader](#) &pixel_shader)=delete

Additional Inherited Members

5.18.1 Constructor & Destructor Documentation

5.18.1.1 EmptyPixelShader() [1/2]

```
mage::EmptyPixelShader::EmptyPixelShader (
    const RenderingDevice & device,
    const wstring & fname )
```

5.18.1.2 ~EmptyPixelShader()

```
virtual mage::EmptyPixelShader::~EmptyPixelShader ( ) [virtual], [default]
```

5.18.1.3 EmptyPixelShader() [2/2]

```
mage::EmptyPixelShader::EmptyPixelShader (
    const EmptyPixelShader & pixel_shader ) [private], [delete]
```

5.18.2 Member Function Documentation

5.18.2.1 operator=()

```
EmptyPixelShader& mage::EmptyPixelShader::operator= (
    const EmptyPixelShader & pixel_shader ) [private], [delete]
```

5.18.2.2 Render()

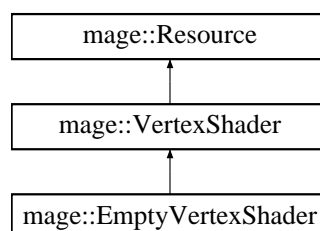
```
void mage::EmptyPixelShader::Render (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const Material & material,
    const World & world ) const [override], [virtual]
```

Implements [mage::PixelShader](#).

5.19 mage::EmptyVertexShader Class Reference

```
#include <empty_shader.hpp>
```

Inheritance diagram for mage::EmptyVertexShader:



Public Member Functions

- [EmptyVertexShader](#) (const [RenderingDevice](#) &device, const wstring &fname, const D3D11_INPUT_ELEMENT_DESC *input_element_desc, uint32_t nb_input_elements)
- virtual [~EmptyVertexShader](#) ()=default
- virtual void [Render](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [Material](#) &material, const [World](#) &world, const [TransformBuffer](#) &transform_buffer) const override

Private Member Functions

- [EmptyVertexShader](#) (const [EmptyVertexShader](#) &vertex_shader)=delete
- [EmptyVertexShader](#) & operator= (const [EmptyVertexShader](#) &vertex_shader)=delete

Additional Inherited Members

5.19.1 Constructor & Destructor Documentation

5.19.1.1 EmptyVertexShader() [1/2]

```
mage::EmptyVertexShader::EmptyVertexShader (
    const RenderingDevice & device,
    const wstring & fname,
    const D3D11_INPUT_ELEMENT_DESC * input_element_desc,
    uint32_t nb_input_elements )
```

5.19.1.2 ~EmptyVertexShader()

```
virtual mage::EmptyVertexShader::~~EmptyVertexShader ( ) [virtual], [default]
```

5.19.1.3 EmptyVertexShader() [2/2]

```
mage::EmptyVertexShader::EmptyVertexShader (
    const EmptyVertexShader & vertex_shader ) [private], [delete]
```

5.19.2 Member Function Documentation

5.19.2.1 operator=()

```
EmptyVertexShader& mage::EmptyVertexShader::operator= (
    const EmptyVertexShader & vertex_shader ) [private], [delete]
```

5.19.2.2 Render()

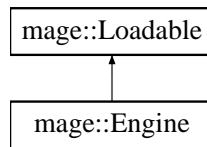
```
void mage::EmptyVertexShader::Render (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const Material & material,
    const World & world,
    const TransformBuffer & transform_buffer ) const [override], [virtual]
```

Implements [mage::VertexShader](#).

5.20 mage::Engine Class Reference

```
#include <engine.hpp>
```

Inheritance diagram for mage::Engine:



Public Member Functions

- [Engine](#) (const [EngineSetup](#) &setup)
- virtual [~Engine](#) ()
- void [Run](#) (int nCmdShow=SW_NORMAL)
- const [MainWindow](#) & [GetMainWindow](#) () const
- void [SetDeactiveFlag](#) (bool deactive)
- [Renderer](#) & [GetRenderer](#) () const
- void [SetModeSwitchFlag](#) (bool mode_switch)
- const [InputManager](#) & [GetInputManager](#) () const
- [ResourceFactory](#) & [GetResourceFactory](#) () const
- void [SetScene](#) ([SharedPtr](#)< [Scene](#) > scene)

Private Member Functions

- [Engine](#) (const [Engine](#) &engine)=delete
- [Engine](#) & [operator=](#) (const [Engine](#) &engine)=delete
- HRESULT [InitializeSystems](#) (const [EngineSetup](#) &setup)
- bool [IsDeactive](#) () const
- bool [ModeSwitch](#) () const

Private Attributes

- [UniquePtr](#)< [MainWindow](#) > [m_main_window](#)
- bool [m_deactive](#)
- [UniquePtr](#)< [Renderer](#) > [m_renderer](#)
- bool [m_mode_switch](#)
- [UniquePtr](#)< [InputManager](#) > [m_input_manager](#)
- [UniquePtr](#)< [ResourceFactory](#) > [m_resource_factory](#)
- [SharedPtr](#)< [Scene](#) > [m_scene](#)

Additional Inherited Members

5.20.1 Detailed Description

A class of engines.

5.20.2 Constructor & Destructor Documentation

5.20.2.1 Engine() [1/2]

```
mage::Engine::Engine (
    const EngineSetup & setup )
```

Constructs an engine from the given engine setup.

Parameters

in	<i>setup</i>	A reference to an engine setup.
----	--------------	---------------------------------

5.20.2.2 ~Engine()

```
mage::Engine::~~Engine ( ) [virtual]
```

Destructs this engine.

5.20.2.3 Engine() [2/2]

```
mage::Engine::Engine (
    const Engine & engine ) [private], [delete]
```

Constructs an engine from the given engine.

Parameters

in	<i>engine</i>	A reference to the engine.
----	---------------	----------------------------

5.20.3 Member Function Documentation

5.20.3.1 GetInputManager()

```
const InputManager& mage::Engine::GetInputManager ( ) const
```

Returns the input manager of this engine.

Returns

A reference to the input manager of this engine.

5.20.3.2 GetMainWindow()

```
const MainWindow& mage::Engine::GetMainWindow ( ) const
```

Returns the main window of this engine.

Returns

A reference to the main window of this engine.

5.20.3.3 GetRenderer()

```
Renderer& mage::Engine::GetRenderer ( ) const
```

Returns the renderer of this engine.

Returns

A reference to the renderer of this engine.

5.20.3.4 GetResourceFactory()

```
ResourceFactory& mage::Engine::GetResourceFactory ( ) const
```

Returns the resource factory of this engine.

Returns

A reference to the resource factory of this engine.

5.20.3.5 InitializeSystems()

```
HRESULT mage::Engine::InitializeSystems (
    const EngineSetup & setup ) [private]
```

Initializes the different systems of this engine.

Parameters

in	<i>setup</i>	A reference to an engine setup.
----	--------------	---------------------------------

Returns

A success/error value.

5.20.3.6 IsDeactive()

```
bool mage::Engine::IsDeactive ( ) const [private]
```

Checks whether this engine is deactive.

Returns

true if this engine is deactive. false otherwise.

5.20.3.7 ModeSwitch()

```
bool mage::Engine::ModeSwitch ( ) const [private]
```

Checks whether this engine should switch modes.

Returns

`true` if this engine should switch modes. `false` otherwise.

5.20.3.8 operator=()

```
Engine& mage::Engine::operator= (
    const Engine & engine ) [private], [delete]
```

Copies the given engine to this engine.

Parameters

in	<i>engine</i>	A reference to the engine to copy from.
----	---------------	---

Returns

A reference to the copy of the given engine (i.e. this engine).

5.20.3.9 Run()

```
void mage::Engine::Run (
    int nCmdShow = SW_NORMAL )
```

Runs this engine.

Parameters

in	<i>nCmdShow</i>	Controls how the engine window is to be shown.
----	-----------------	--

5.20.3.10 SetDeactiveFlag()

```
void mage::Engine::SetDeactiveFlag (
    bool deactive )
```

Sets the deactive flag of this engine to the given value.

Parameters

in	<i>deactive</i>	The new value for the deactive flag.
----	-----------------	--------------------------------------

5.20.3.11 SetModeSwitchFlag()

```
void mage::Engine::SetModeSwitchFlag (
    bool mode_switch )
```

Sets the mode switch flag of this engine to the given value.

Parameters

in	<i>mode_switch</i>	The new value for the mode switch flag.
----	--------------------	---

5.20.3.12 SetScene()

```
void mage::Engine::SetScene (
    SharedPtr< Scene > scene )
```

Sets the scene of this engine to the given scene.

Returns

A pointer to the scene to set.

5.20.4 Member Data Documentation

5.20.4.1 m_deactive

```
bool mage::Engine::m_deactive [private]
```

Flag indicating whether the application is active or not.

5.20.4.2 m_input_manager

```
SharedPtr< InputManager > mage::Engine::m_input_manager [private]
```

A pointer to the input manager of this engine.

5.20.4.3 m_main_window

```
SharedPtr< MainWindow > mage::Engine::m_main_window [private]
```

A pointer to the main window of this engine.

5.20.4.4 m_mode_switch

```
bool mage::Engine::m_mode_switch [private]
```

Flag indicating whether the application should switch between full screen and windowed mode.

5.20.4.5 m_renderer

```
UniquePtr< Renderer > mage::Engine::m_renderer [private]
```

A pointer to the renderer of this engine.

5.20.4.6 m_resource_factory

```
UniquePtr< ResourceFactory > mage::Engine::m_resource_factory [private]
```

A pointer to the resource factory of this engine.

5.20.4.7 m_scene

```
SharedPtr< Scene > mage::Engine::m_scene [private]
```

The current scene of this engine.

5.21 mage::EngineSetup Struct Reference

```
#include <engine_setup.hpp>
```

Public Member Functions

- virtual `~EngineSetup()`=default
- const wstring & `GetApplicationName()` const
- HINSTANCE `GetApplicationHinstance()` const
- virtual `SharedPtr< Scene > CreateScene()` const =0

Protected Member Functions

- `EngineSetup` (HINSTANCE hinstance=nullptr, const wstring &name=MAGE_DEFAULT_APPLICATION_NAME)
- `EngineSetup` (const `EngineSetup` &setup)=default

Private Member Functions

- `EngineSetup` & `operator=` (const `EngineSetup` &setup)=delete

Private Attributes

- HINSTANCE `m_hinstance`
- const wstring `m_name`

5.21.1 Detailed Description

A struct of engine setups.

5.21.2 Constructor & Destructor Documentation

5.21.2.1 `~EngineSetup()`

```
virtual mage::EngineSetup::~EngineSetup ( ) [virtual], [default]
```

Destructs this engine setup.

5.21.2.2 `EngineSetup()` [1/2]

```
mage::EngineSetup::EngineSetup (
    HINSTANCE hinstance = nullptr,
    const wstring & name = MAGE_DEFAULT_APPLICATION_NAME ) [protected]
```

Constructs an engine setup.

Parameters

in	<i>hinstance</i>	The application instance handle of the application.
in	<i>name</i>	A reference to the name of the application.

5.21.2.3 `EngineSetup()` [2/2]

```
mage::EngineSetup::EngineSetup (
    const EngineSetup & setup ) [protected], [default]
```

Constructs an engine setup from the given engine setup.

Parameters

in	<i>setup</i>	A reference to the engine setup.
----	--------------	----------------------------------

5.21.3 Member Function Documentation

5.21.3.1 `CreateScene()`

```
virtual SharedPtr< Scene > mage::EngineSetup::CreateScene ( ) const [pure virtual]
```

Creates the first scene of the application.

Returns

A pointer to the first scene of the application.

5.21.3.2 GetApplicationHinstance()

```
HINSTANCE mage::EngineSetup::GetApplicationHinstance ( ) const
```

Returns the application instance handle of the application.

Returns

The application instance handle of the application.

5.21.3.3 GetApplicationName()

```
const wstring& mage::EngineSetup::GetApplicationName ( ) const
```

Returns the name of the application.

Returns

A reference to the name of the application.

5.21.3.4 operator=()

```
EngineSetup& mage::EngineSetup::operator= (
    const EngineSetup & setup ) [private], [delete]
```

Copies the given engine setup to this engine setup.

Parameters

in	<i>setup</i>	A reference to the engine setup to copy from.
----	--------------	---

Returns

A reference to the copy of the given engine setup (i.e. this engine setup).

5.21.4 Member Data Documentation

5.21.4.1 m_hinstance

```
HINSTANCE mage::EngineSetup::m_hinstance [private]
```

Application instance handle.

5.21.4.2 m_name

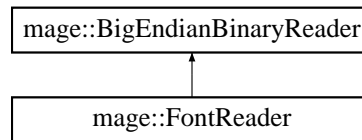
```
const wstring mage::EngineSetup::m_name [private]
```

Name of the application.

5.22 mage::FontReader Class Reference

```
#include <font_reader.hpp>
```

Inheritance diagram for mage::FontReader:



Public Member Functions

- [FontReader](#) (const [RenderingDevice](#) &device, [SpriteFontOutput](#) &output, const [SpriteFontDescriptor](#) &desc)
- virtual [~FontReader](#) ()=default
- virtual HRESULT [Read](#) () override

Protected Member Functions

- bool [IsHeaderValid](#) ()
- HRESULT [ReadTexture](#) ()

Private Member Functions

- [FontReader](#) (const [FontReader](#) &reader)=delete
- [FontReader](#) & [operator=](#) (const [FontReader](#) &reader)=delete

Private Attributes

- const [RenderingDevice](#) & [m_device](#)
- [SpriteFontOutput](#) & [m_output](#)
- const [SpriteFontDescriptor](#) & [m_desc](#)

5.22.1 Constructor & Destructor Documentation

5.22.1.1 FontReader() [1/2]

```

mage::FontReader::FontReader (
    const RenderingDevice & device,
    SpriteFontOutput & output,
    const SpriteFontDescriptor & desc )
  
```

5.22.1.2 ~FontReader()

```
virtual mage::FontReader::~~FontReader ( ) [virtual], [default]
```

5.22.1.3 FontReader() [2/2]

```
mage::FontReader::FontReader (
    const FontReader & reader ) [private], [delete]
```

5.22.2 Member Function Documentation

5.22.2.1 IsHeaderValid()

```
bool mage::FontReader::IsHeaderValid ( ) [protected]
```

5.22.2.2 operator=()

```
FontReader& mage::FontReader::operator= (
    const FontReader & reader ) [private], [delete]
```

5.22.2.3 Read()

```
HRESULT mage::FontReader::Read ( ) [override], [virtual]
```

Implements [mage::BigEndianBinaryReader](#).

5.22.2.4 ReadTexture()

```
HRESULT mage::FontReader::ReadTexture ( ) [protected]
```

5.22.3 Member Data Documentation

5.22.3.1 m_desc

```
const SpriteFontDescriptor& mage::FontReader::m_desc [private]
```

5.22.3.2 m_device

```
const RenderingDevice& mage::FontReader::m_device [private]
```

5.22.3.3 m_output

```
SpriteFontOutput& mage::FontReader::m_output [private]
```

5.23 mage::Glyph Struct Reference

```
#include <glyph.hpp>
```

Public Member Functions

- [Glyph](#) ()=default
- [Glyph](#) (const [Glyph](#) &glyph)=default
- [~Glyph](#) ()=default
- [Glyph](#) & [operator=](#) (const [Glyph](#) &glyph)=default
- bool [operator<](#) (const [Glyph](#) &glyph) const
- bool [operator<](#) (wchar_t character) const

Public Attributes

- uint32_t [m_character](#)
- RECT [m_sub_rectangle](#)
- union {
 - struct {
 - float [m_offset_x](#)
 - float [m_offset_y](#)
 - float [m_offsets](#) [2]
- };
- float [m_advance_x](#)

5.23.1 Constructor & Destructor Documentation

5.23.1.1 [Glyph\(\)](#) [1/2]

```
mage::Glyph::Glyph ( ) [default]
```

5.23.1.2 [Glyph\(\)](#) [2/2]

```
mage::Glyph::Glyph (
    const Glyph & glyph ) [default]
```

5.23.1.3 [~Glyph\(\)](#)

```
mage::Glyph::~~Glyph ( ) [default]
```

5.23.2 Member Function Documentation

5.23.2.1 [operator<\(\)](#) [1/2]

```
bool mage::Glyph::operator< (
    const Glyph & glyph ) const
```


5.23.2.2 operator<() [2/2]

```
bool mage::Glyph::operator< (
    wchar_t character ) const
```

5.23.2.3 operator=()

```
Glyph& mage::Glyph::operator= (
    const Glyph & glyph ) [default]
```

5.23.3 Member Data Documentation

5.23.3.1 "@2

```
union { ... }
```

5.23.3.2 m_advance_x

```
float mage::Glyph::m_advance_x
```

5.23.3.3 m_character

```
uint32_t mage::Glyph::m_character
```

5.23.3.4 m_offset_x

```
float mage::Glyph::m_offset_x
```

5.23.3.5 m_offset_y

```
float mage::Glyph::m_offset_y
```

5.23.3.6 m_offsets

```
float mage::Glyph::m_offsets[2]
```

5.23.3.7 m_sub_rectangle

```
RECT mage::Glyph::m_sub_rectangle
```

5.24 mage::GlyphLessThan Struct Reference

Public Member Functions

- [GlyphLessThan](#) ()=default
- [GlyphLessThan](#) (const [GlyphLessThan](#) &comparator)=default
- [~GlyphLessThan](#) ()=default
- [GlyphLessThan](#) & [operator=](#) (const [GlyphLessThan](#) &comparator)=default
- bool [operator\(\)](#) (const [Glyph](#) &left, const [Glyph](#) &right)
- bool [operator\(\)](#) (const [Glyph](#) &left, wchar_t right)
- bool [operator\(\)](#) (wchar_t left, const [Glyph](#) &right)

5.24.1 Constructor & Destructor Documentation

5.24.1.1 GlyphLessThan() [1/2]

```
mage::GlyphLessThan::GlyphLessThan ( ) [default]
```

5.24.1.2 GlyphLessThan() [2/2]

```
mage::GlyphLessThan::GlyphLessThan (
    const GlyphLessThan & comparator ) [default]
```

5.24.1.3 ~GlyphLessThan()

```
mage::GlyphLessThan::~~GlyphLessThan ( ) [default]
```

5.24.2 Member Function Documentation

5.24.2.1 operator>() [1/3]

```
bool mage::GlyphLessThan::operator() (
    const Glyph & left,
    const Glyph & right )
```

5.24.2.2 operator>() [2/3]

```
bool mage::GlyphLessThan::operator() (
    const Glyph & left,
    wchar_t right )
```

5.24.2.3 operator>() [3/3]

```
bool mage::GlyphLessThan::operator() (
    wchar_t left,
    const Glyph & right )
```

5.24.2.4 operator=()

```
GlyphLessThan& mage::GlyphLessThan::operator= (
    const GlyphLessThan & comparator ) [default]
```

5.25 mage::HandleCloser Struct Reference

```
#include <memory.hpp>
```

Public Member Functions

- void [operator\(\)](#) (HANDLE handle)

5.25.1 Member Function Documentation

5.25.1.1 operator()()

```
void mage::HandleCloser::operator() (
    HANDLE handle )
```

5.26 mage::IdGenerator Struct Reference

```
#include <id_generator.hpp>
```

Public Member Functions

- [IdGenerator](#) (uint32_t first_id=0)
- virtual [~IdGenerator](#) ()=default
- uint32_t [GetNextId](#) ()

Private Member Functions

- [IdGenerator](#) (const [IdGenerator](#) &id_generator)=delete
- [IdGenerator](#) & [operator=](#) (const [IdGenerator](#) &id_generator)=delete

Private Attributes

- AtomicInt32 [m_current_id](#)

5.26.1 Detailed Description

A struct of id generators.

5.26.2 Constructor & Destructor Documentation

5.26.2.1 IdGenerator() [1/2]

```
mage::IdGenerator::IdGenerator (
    uint32_t first_id = 0 )
```

Constructs an id generator.

Parameters

in	<i>first_id</i>	The first id of this id_generator
----	-----------------	-----------------------------------

5.26.2.2 ~IdGenerator()

```
virtual mage::IdGenerator::~~IdGenerator ( ) [virtual], [default]
```

Destructs this id generator.

5.26.2.3 IdGenerator() [2/2]

```
mage::IdGenerator::IdGenerator (
    const IdGenerator & id_generator ) [private], [delete]
```

Constructs an id generator from the given id generator.

Parameters

in	<i>id_generator</i>	The id generator.
----	---------------------	-------------------

5.26.3 Member Function Documentation

5.26.3.1 GetNextId()

```
uint32_t mage::IdGenerator::GetNextId ( )
```

Returns the next id of this id generator.

Returns

The next id of this id generator.

5.26.3.2 operator=()

```
IdGenerator& mage::IdGenerator::operator= (
    const IdGenerator & id_generator ) [private], [delete]
```

Copies the given id generator to this id generator.

Parameters

in	<i>id_generator</i>	The id generator to copy from.
----	---------------------	--------------------------------

Returns

A reference to the copy of the given id generator (i.e. this id generator).

5.26.4 Member Data Documentation**5.26.4.1 m_current_id**

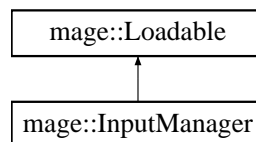
```
AtomicInt32 mage::IdGenerator::m_current_id [private]
```

The current id of this id generator.

5.27 mage::InputManager Class Reference

```
#include <input_manager.hpp>
```

Inheritance diagram for mage::InputManager:

**Public Member Functions**

- [InputManager](#) (HWND hwnd)
- virtual [~InputManager](#) ()=default
- void [Update](#) ()
- HWND [GetHandle](#) () const
- const [Keyboard](#) & [GetKeyboard](#) () const
- const [Mouse](#) & [GetMouse](#) () const

Private Member Functions

- [InputManager](#) (const [InputManager](#) &input_manager)=delete
- [InputManager](#) & [operator=](#) (const [InputManager](#) &input_manager)=delete
- HRESULT [InitializeDI](#) ()
- HRESULT [InitializeInputSystems](#) ()

Private Attributes

- HWND [m_hwindow](#)
- [ComPtr](#)< [IDirectInput8](#) > [m_di](#)
- [UniquePtr](#)< [Keyboard](#) > [m_keyboard](#)
- [UniquePtr](#)< [Mouse](#) > [m_mouse](#)

Additional Inherited Members

5.27.1 Detailed Description

A class of input managers.

5.27.2 Constructor & Destructor Documentation

5.27.2.1 InputManager() [1/2]

```
mage::InputManager::InputManager (
    HWND hwindow )
```

Constructs an input manager for the given window handle.

Parameters

in	<i>hwindow</i>	The handle of the parent window.
----	----------------	----------------------------------

5.27.2.2 ~InputManager()

```
virtual mage::InputManager::~~InputManager ( ) [virtual], [default]
```

Destructs this input manager.

5.27.2.3 InputManager() [2/2]

```
mage::InputManager::InputManager (
    const InputManager & input_manager ) [private], [delete]
```

Constructs an input manager from the given input manager.

Parameters

in	<i>input_manager</i>	A reference to the input manager.
----	----------------------	-----------------------------------

5.27.3 Member Function Documentation

5.27.3.1 GetHandle()

```
HWND mage::InputManager::GetHandle ( ) const
```

Returns the window handle of this input manager.

Returns

The window handle of this input manager.

5.27.3.2 GetKeyboard()

```
const Keyboard& mage::InputManager::GetKeyboard ( ) const
```

Returns the keyboard of this input manager.

Returns

A reference to the keyboard of this input manager.

5.27.3.3 GetMouse()

```
const Mouse& mage::InputManager::GetMouse ( ) const
```

Returns the mouse of this input manager.

Returns

A reference to the mouse of this input manager.

5.27.3.4 InitializeDI()

```
HRESULT mage::InputManager::InitializeDI ( ) [private]
```

Initializes the DirectInput object of this input manager.

Returns

A success/error value.

5.27.3.5 InitializeInputSystems()

```
HRESULT mage::InputManager::InitializeInputSystems ( ) [private]
```

Initializes the different input systems of this input manager.

5.27.3.6 operator=()

```
InputManager& mage::InputManager::operator= (
    const InputManager & input_manager ) [private], [delete]
```

Copies the given input manager to this input manager.

Parameters

in	<i>input_manager</i>	A reference to the input manager to copy from.
----	----------------------	--

Returns

A reference to the copy of the given input manager (i.e. this input manager).

5.27.3.7 Update()

```
void mage::InputManager::Update ( )
```

Updates the state of the input systems of this input manager.

5.27.4 Member Data Documentation**5.27.4.1 m_di**

```
ComPtr< IDirectInput8 > mage::InputManager::m_di [private]
```

The DirectInput object of this input manager.

The methods of the IDirectInput8 interface are used to enumerate, create, and retrieve the status of Microsoft DirectInput device.

5.27.4.2 m_hwindow

```
HWND mage::InputManager::m_hwindow [private]
```

The handle of the parent window.

5.27.4.3 m_keyboard

```
UniquePtr< Keyboard > mage::InputManager::m_keyboard [private]
```

A pointer to the keyboard of this input manager.

5.27.4.4 m_mouse

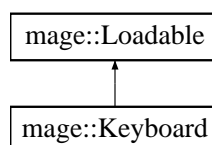
```
UniquePtr< Mouse > mage::InputManager::m_mouse [private]
```

A pointer to the mouse of this input manager.

5.28 mage::Keyboard Class Reference

```
#include <keyboard.hpp>
```

Inheritance diagram for mage::Keyboard:



Public Member Functions

- [Keyboard](#) (HWND *hwindow*, [ComPtr](#)< [IDirectInput8](#) > *di*)
- virtual [~Keyboard](#) ()=default
- void [Update](#) ()
- HWND [GetHandle](#) () const
- bool [GetKeyPress](#) (unsigned char *key*, bool *ignore_press_stamp*=false) const

Private Member Functions

- [Keyboard](#) (const [Keyboard](#) &*keyboard*)=delete
- [Keyboard](#) & [operator=](#) (const [Keyboard](#) &*keyboard*)=delete
- HRESULT [InitializeKeyboard](#) ([ComPtr](#)< [IDirectInput8](#) > *di*)

Private Attributes

- HWND [m_hwindow](#)
- [ComPtr](#)< [IDirectInputDevice8](#) > [m_keyboard](#)
- uint64_t [m_press_stamp](#)
- unsigned char [m_key_state](#) [256]
- uint64_t [m_key_press_stamp](#) [256]

Additional Inherited Members

5.28.1 Detailed Description

A class of keyboards.

5.28.2 Constructor & Destructor Documentation

5.28.2.1 [Keyboard\(\)](#) [1/2]

```
mage::Keyboard::Keyboard (
    HWND hwindow,
    ComPtr< IDirectInput8 > di )
```

Constructs a keyboard.

Parameters

in	<i>hwindow</i>	The handle of the parent window.
in	<i>di</i>	A pointer to a direct input object.

5.28.2.2 [~Keyboard\(\)](#)

```
virtual mage::Keyboard::~Keyboard ( ) [virtual], [default]
```

Destructs this keyboard.

5.28.2.3 Keyboard() [2/2]

```
mage::Keyboard::Keyboard (
    const Keyboard & keyboard ) [private], [delete]
```

Constructs a keyboard from the given keyboard.

Parameters

in	<i>keyboard</i>	A reference to the keyboard.
----	-----------------	------------------------------

5.28.3 Member Function Documentation

5.28.3.1 GetHandle()

```
HWND mage::Keyboard::GetHandle ( ) const
```

Returns the window handle of this keyboard.

Returns

The window handle of this keyboard.

5.28.3.2 GetKeyPress()

```
bool mage::Keyboard::GetKeyPress (
    unsigned char key,
    bool ignore_press_stamp = false ) const
```

Checks whether the given key of this keyboard is pressed.

Parameters

in	<i>key</i>	The key.
in	<i>ignore_press_stamp</i>	Flag indicating whether press stamps should be ignored. Consistent presses will return false when using the press stamp.

Returns

true if the given key of this keyboard is pressed. false otherwise.

5.28.3.3 InitializeKeyboard()

```
HRESULT mage::Keyboard::InitializeKeyboard (
    ComPtr< IDirectInput8 > di ) [private]
```

Initializes the keyboard device of this keyboard.

Parameters

<i>in</i>	<i>di</i>	A pointer to a direct input object.
-----------	-----------	-------------------------------------

Returns

A success/error value.

5.28.3.4 operator=()

```
Keyboard& mage::Keyboard::operator= (
    const Keyboard & keyboard ) [private], [delete]
```

Copies the given keyboard to this keyboard.

Parameters

<i>in</i>	<i>keyboard</i>	A reference to the keyboard to copy from.
-----------	-----------------	---

Returns

A reference to the copy of the given keyboard (i.e. this keyboard).

5.28.3.5 Update()

```
void mage::Keyboard::Update ( )
```

Updates the state of this keyboard.

5.28.4 Member Data Documentation

5.28.4.1 m_hwindow

```
HWND mage::Keyboard::m_hwindow [private]
```

The handle of the parent window.

5.28.4.2 m_key_press_stamp

```
uint64_t mage::Keyboard::m_key_press_stamp[256] [mutable], [private]
```

Stamps the keys pressed in the last frame of this keyboard.

5.28.4.3 m_key_state

```
unsigned char mage::Keyboard::m_key_state[256] [private]
```

State of the keys of this keyboard.

5.28.4.4 m_keyboard

```
ComPtr< IDirectInputDevice8 > mage::Keyboard::m_keyboard [private]
```

The DirectInput keyboard device of this keyboard.

The methods of the IDirectInputDevice8 interface are used to gain and release access to Microsoft DirectInput devices, manage device properties and information, set behavior, perform initialization, create and play force-feedback effects, and invoke a device's control panel.

5.28.4.5 m_press_stamp

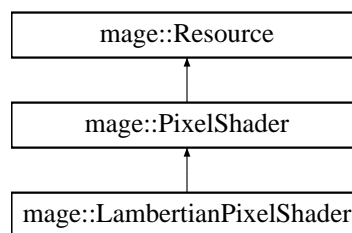
```
uint64_t mage::Keyboard::m_press_stamp [private]
```

The current press stamp (incremented every frame).

5.29 mage::LambertianPixelShader Class Reference

```
#include <lambertian_shader.hpp>
```

Inheritance diagram for mage::LambertianPixelShader:



Public Member Functions

- [LambertianPixelShader](#) (const [RenderingDevice](#) &device)
- virtual [~LambertianPixelShader](#) ()=default
- virtual void [Render](#) ([ComPtr](#)< [ID3D11DeviceContext2](#) > device_context, const [Material](#) &material, const [World](#) &world) const override

Private Member Functions

- [LambertianPixelShader](#) (const [LambertianPixelShader](#) &pixel_shader)=delete
- [LambertianPixelShader](#) & [operator=](#) (const [LambertianPixelShader](#) &pixel_shader)=delete

Private Attributes

- [ComPtr< ID3D11Buffer > m_cb_material](#)
- [ComPtr< ID3D11SamplerState > m_sampler](#)

Additional Inherited Members

5.29.1 Constructor & Destructor Documentation

5.29.1.1 LambertianPixelShader() [1/2]

```
mage::LambertianPixelShader::LambertianPixelShader (
    const RenderingDevice & device )
```

5.29.1.2 ~LambertianPixelShader()

```
virtual mage::LambertianPixelShader::~~LambertianPixelShader ( ) [virtual], [default]
```

5.29.1.3 LambertianPixelShader() [2/2]

```
mage::LambertianPixelShader::LambertianPixelShader (
    const LambertianPixelShader & pixel_shader ) [private], [delete]
```

5.29.2 Member Function Documentation

5.29.2.1 operator=()

```
LambertianPixelShader& mage::LambertianPixelShader::operator= (
    const LambertianPixelShader & pixel_shader ) [private], [delete]
```

5.29.2.2 Render()

```
void mage::LambertianPixelShader::Render (
    ComPtr< ID3D11DeviceContext2 > device\_context,
    const Material & material,
    const World & world ) const [override], [virtual]
```

Implements [mage::PixelShader](#).

5.29.3 Member Data Documentation

5.29.3.1 m_cb_material

```
ComPtr< ID3D11Buffer > mage::LambertianPixelShader::m\_cb\_material [private]
```

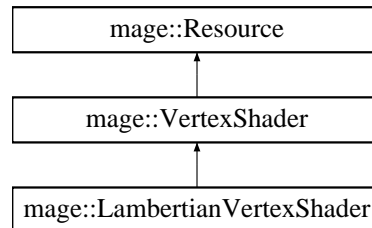
5.29.3.2 m_sampler

```
ComPtr< ID3D11SamplerState > mage::LambertianPixelShader::m_sampler [private]
```

5.30 mage::LambertianVertexShader Class Reference

```
#include <lambertian_shader.hpp>
```

Inheritance diagram for mage::LambertianVertexShader:



Public Member Functions

- [LambertianVertexShader](#) (const [RenderingDevice](#) &device)
- virtual [~LambertianVertexShader](#) ()=default
- virtual void [Render](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [Material](#) &material, const [World](#) &world, const [TransformBuffer](#) &transform_buffer) const override

Private Member Functions

- [LambertianVertexShader](#) (const [LambertianVertexShader](#) &vertex_shader)=delete
- [LambertianVertexShader](#) & operator= (const [LambertianVertexShader](#) &vertex_shader)=delete

Private Attributes

- [ComPtr](#)< ID3D11Buffer > [m_cb_transform](#)

Additional Inherited Members

5.30.1 Constructor & Destructor Documentation

5.30.1.1 LambertianVertexShader() [1/2]

```
mage::LambertianVertexShader::LambertianVertexShader (
    const RenderingDevice & device )
```

5.30.1.2 ~LambertianVertexShader()

```
virtual mage::LambertianVertexShader::~~LambertianVertexShader ( ) [virtual], [default]
```

5.30.1.3 LambertianVertexShader() [2/2]

```
mage::LambertianVertexShader::LambertianVertexShader (
    const LambertianVertexShader & vertex_shader ) [private], [delete]
```

5.30.2 Member Function Documentation

5.30.2.1 operator=()

```
LambertianVertexShader& mage::LambertianVertexShader::operator= (
    const LambertianVertexShader & vertex_shader ) [private], [delete]
```

5.30.2.2 Render()

```
void mage::LambertianVertexShader::Render (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const Material & material,
    const World & world,
    const TransformBuffer & transform_buffer ) const [override], [virtual]
```

Implements [mage::VertexShader](#).

5.30.3 Member Data Documentation

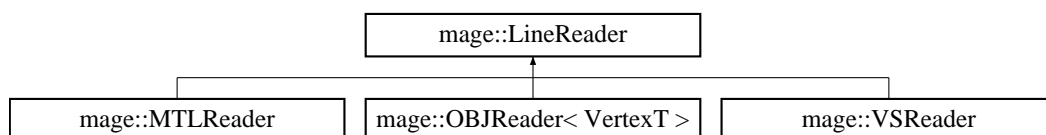
5.30.3.1 m_cb_transform

```
ComPtr< ID3D11Buffer > mage::LambertianVertexShader::m_cb_transform [private]
```

5.31 mage::LineReader Class Reference

```
#include <line_reader.hpp>
```

Inheritance diagram for mage::LineReader:



Public Member Functions

- [LineReader](#) ()
- virtual [~LineReader](#) ()=default
- HRESULT [ReadFromFile](#) (const wstring &fname, const string &delimiters=MAGE_DEFAULT_DELIMITERS)
- HRESULT [ReadFromMemory](#) (const char *input, const string &delimiters=MAGE_DEFAULT_DELIMITERS)
- const wstring & [GetFilename](#) () const
- const string & [GetDelimiters](#) () const

Protected Member Functions

- const uint32_t [GetCurrentLineNumber](#) () const
- virtual HRESULT [Preprocess](#) ()
- virtual HRESULT [ReadLine](#) (char *line)=0
- virtual HRESULT [Postprocess](#) ()
- void [ReadLineRemaining](#) ()
- const char * [ReadChars](#) ()
- string [ReadString](#) ()
- string [ReadQuotedString](#) ()
- bool [ReadBool](#) ()
- int8_t [ReadInt8](#) ()
- uint8_t [ReadUInt8](#) ()
- int16_t [ReadInt16](#) ()
- uint16_t [ReadUInt16](#) ()
- int32_t [ReadInt32](#) ()
- uint32_t [ReadUInt32](#) ()
- int64_t [ReadInt64](#) ()
- uint64_t [ReadUInt64](#) ()
- float [ReadFloat](#) ()
- double [ReadDouble](#) ()
- XMFLOAT2 [ReadFloat2](#) ()
- XMFLOAT3 [ReadFloat3](#) ()
- XMFLOAT4 [ReadFloat4](#) ()
- bool [HasChars](#) () const
- bool [HasString](#) () const
- bool [HasQuotedString](#) () const
- bool [HasBool](#) () const
- bool [HasInt8](#) () const
- bool [HasUInt8](#) () const
- bool [HasInt16](#) () const
- bool [HasUInt16](#) () const
- bool [HasInt32](#) () const
- bool [HasUInt32](#) () const
- bool [HasInt64](#) () const
- bool [HasUInt64](#) () const
- bool [HasFloat](#) () const
- bool [HasDouble](#) () const

Protected Attributes

- char * [m_context](#)

Private Member Functions

- [LineReader](#) (const [LineReader](#) &reader)=delete
- [LineReader](#) & [operator=](#) (const [LineReader](#) &reader)=delete

Private Attributes

- wstring [m_fname](#)
- string [m_delimiters](#)
- uint32_t [m_line_number](#)

5.31.1 Constructor & Destructor Documentation

5.31.1.1 LineReader() [1/2]

```
mage::LineReader::LineReader ( )
```

5.31.1.2 ~LineReader()

```
virtual mage::LineReader::~~LineReader ( ) [virtual], [default]
```

5.31.1.3 LineReader() [2/2]

```
mage::LineReader::LineReader (
    const LineReader & reader ) [private], [delete]
```

5.31.2 Member Function Documentation

5.31.2.1 GetCurrentLineNumber()

```
const uint32_t mage::LineReader::GetCurrentLineNumber ( ) const [protected]
```

5.31.2.2 GetDelimiters()

```
const string& mage::LineReader::GetDelimiters ( ) const
```

5.31.2.3 GetFilename()

```
const wstring& mage::LineReader::GetFilename ( ) const
```

5.31.2.4 HasBool()

```
bool mage::LineReader::HasBool ( ) const [protected]
```

5.31.2.5 HasChars()

```
bool mage::LineReader::HasChars ( ) const [protected]
```

5.31.2.6 HasDouble()

```
bool mage::LineReader::HasDouble ( ) const [protected]
```

5.31.2.7 HasFloat()

```
bool mage::LineReader::HasFloat ( ) const [protected]
```

5.31.2.8 HasInt16()

```
bool mage::LineReader::HasInt16 ( ) const [protected]
```

5.31.2.9 HasInt32()

```
bool mage::LineReader::HasInt32 ( ) const [protected]
```

5.31.2.10 HasInt64()

```
bool mage::LineReader::HasInt64 ( ) const [protected]
```

5.31.2.11 HasInt8()

```
bool mage::LineReader::HasInt8 ( ) const [protected]
```

5.31.2.12 HasQuotedString()

```
bool mage::LineReader::HasQuotedString ( ) const [protected]
```

5.31.2.13 HasString()

```
bool mage::LineReader::HasString ( ) const [protected]
```

5.31.2.14 HasUInt16()

```
bool mage::LineReader::HasUInt16 ( ) const [protected]
```

5.31.2.15 HasUInt32()

```
bool mage::LineReader::HasUInt32 ( ) const [protected]
```

5.31.2.16 HasUInt64()

```
bool mage::LineReader::HasUInt64 ( ) const [protected]
```

5.31.2.17 `HasUInt8()`

```
bool mage::LineReader::HasUInt8 ( ) const [protected]
```

5.31.2.18 `operator=()`

```
LineReader& mage::LineReader::operator= (
    const LineReader & reader ) [private], [delete]
```

5.31.2.19 `Postprocess()`

```
HRESULT mage::LineReader::Postprocess ( ) [protected], [virtual]
```

Reimplemented in [mage::OBJReader< VertexT >](#).

5.31.2.20 `Preprocess()`

```
HRESULT mage::LineReader::Preprocess ( ) [protected], [virtual]
```

Reimplemented in [mage::OBJReader< VertexT >](#).

5.31.2.21 `ReadBool()`

```
bool mage::LineReader::ReadBool ( ) [protected]
```

5.31.2.22 `ReadChars()`

```
const char * mage::LineReader::ReadChars ( ) [protected]
```

5.31.2.23 `ReadDouble()`

```
double mage::LineReader::ReadDouble ( ) [protected]
```

5.31.2.24 `ReadFloat()`

```
float mage::LineReader::ReadFloat ( ) [protected]
```

5.31.2.25 `ReadFloat2()`

```
XMFLOAT2 mage::LineReader::ReadFloat2 ( ) [protected]
```

5.31.2.26 ReadFloat3()

```
XMFLOAT3 mage::LineReader::ReadFloat3 ( ) [protected]
```

5.31.2.27 ReadFloat4()

```
XMFLOAT4 mage::LineReader::ReadFloat4 ( ) [protected]
```

5.31.2.28 ReadFromFile()

```
HRESULT mage::LineReader::ReadFromFile (
    const wstring & fname,
    const string & delimiters = MAGE_DEFAULT_DELIMITERS )
```

5.31.2.29 ReadFromMemory()

```
HRESULT mage::LineReader::ReadFromMemory (
    const char * input,
    const string & delimiters = MAGE_DEFAULT_DELIMITERS )
```

5.31.2.30 ReadInt16()

```
int16_t mage::LineReader::ReadInt16 ( ) [protected]
```

5.31.2.31 ReadInt32()

```
int32_t mage::LineReader::ReadInt32 ( ) [protected]
```

5.31.2.32 ReadInt64()

```
int64_t mage::LineReader::ReadInt64 ( ) [protected]
```

5.31.2.33 ReadInt8()

```
int8_t mage::LineReader::ReadInt8 ( ) [protected]
```

5.31.2.34 ReadLine()

```
virtual HRESULT mage::LineReader::ReadLine (
    char * line ) [protected], [pure virtual]
```

Implemented in [mage::OBJReader< VertexT >](#), [mage::MTLReader](#), and [mage::VSReader](#).

5.31.2.35 ReadLineRemaining()

```
void mage::LineReader::ReadLineRemaining ( ) [protected]
```

5.31.2.36 ReadQuotedString()

```
string mage::LineReader::ReadQuotedString ( ) [protected]
```

5.31.2.37 ReadString()

```
string mage::LineReader::ReadString ( ) [protected]
```

5.31.2.38 ReadUInt16()

```
uint16_t mage::LineReader::ReadUInt16 ( ) [protected]
```

5.31.2.39 ReadUInt32()

```
uint32_t mage::LineReader::ReadUInt32 ( ) [protected]
```

5.31.2.40 ReadUInt64()

```
uint64_t mage::LineReader::ReadUInt64 ( ) [protected]
```

5.31.2.41 ReadUInt8()

```
uint8_t mage::LineReader::ReadUInt8 ( ) [protected]
```

5.31.3 Member Data Documentation

5.31.3.1 m_context

```
char* mage::LineReader::m_context [protected]
```

5.31.3.2 m_delimiters

```
string mage::LineReader::m_delimiters [private]
```

5.31.3.3 m_fname

```
wstring mage::LineReader::m_fname [private]
```

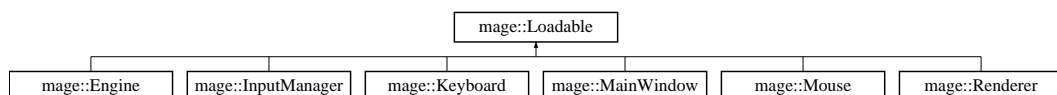
5.31.3.4 m_line_number

```
uint32_t mage::LineReader::m_line_number [private]
```

5.32 mage::Loadable Class Reference

```
#include <loadable.hpp>
```

Inheritance diagram for mage::Loadable:



Public Member Functions

- bool [isLoading](#) () const

Protected Member Functions

- [Loadable](#) (bool loaded=false)
- [Loadable](#) (const [Loadable](#) &loadable)=default
- virtual [~Loadable](#) ()=default
- [Loadable](#) & [operator=](#) (const [Loadable](#) &loadable)=default
- void [SetLoaded](#) (bool loaded=true)

Private Attributes

- bool [m_loaded](#)

5.32.1 Detailed Description

A class of loadables.

5.32.2 Constructor & Destructor Documentation

5.32.2.1 Loadable() [1/2]

```
mage::Loadable::Loadable (
    bool loaded = false ) [protected]
```

Constructs a loadable.

Parameters

in	<i>loaded</i>	Flag indicating wether the loadable is loaded.
----	---------------	--

5.32.2.2 Loadable() [2/2]

```
mage::Loadable::Loadable (
    const Loadable & loadable ) [protected], [default]
```

Constructs a loadable from the given loadable.

Parameters

in	<i>loadable</i>	A reference to the loadable.
----	-----------------	------------------------------

5.32.2.3 ~Loadable()

```
virtual mage::Loadable::~~Loadable ( ) [protected], [virtual], [default]
```

Destructs this loadable.

5.32.3 Member Function Documentation

5.32.3.1 IsLoaded()

```
bool mage::Loadable::IsLoaded ( ) const
```

Checks wether this loadable is loaded.

Returns

true if this loadable is loaded. false otherwise.

5.32.3.2 operator=()

```
Loadable& mage::Loadable::operator= (
    const Loadable & loadable ) [protected], [default]
```

Copies the given loadable to this loadable.

Parameters

in	<i>loadable</i>	A reference to the loadable to copy from.
----	-----------------	---

Returns

A reference to the copy of the given loadable (i.e. this loadable).

5.32.3.3 SetLoaded()

```
void mage::Loadable::SetLoaded (
    bool loaded = true ) [protected]
```

Set the state of this loadable to the given value.

Parameters

in	<i>loaded</i>	Flag indicating wether this loadable is loaded.
----	---------------	---

5.32.4 Member Data Documentation**5.32.4.1 m_loaded**

```
bool mage::Loadable::m_loaded [private]
```

Flag indicating wether this loadable is loaded.

5.33 mage::LoggingConfiguration Struct Reference

```
#include <logging.hpp>
```

Public Member Functions

- [LoggingConfiguration](#) ()
- [LoggingConfiguration](#) (const [LoggingConfiguration](#) &logging_configuration)=default
- [~LoggingConfiguration](#) ()=default
- [LoggingConfiguration](#) & operator= (const [LoggingConfiguration](#) &logging_configuration)=default
- bool [IsQuiet](#) () const
- bool [IsVerbose](#) () const

Private Attributes

- bool [m_quiet](#)
- bool [m_verbose](#)

5.33.1 Detailed Description

A struct of logging configurations of the engine processing.

5.33.2 Constructor & Destructor Documentation

5.33.2.1 LoggingConfiguration() [1/2]

```
mage::LoggingConfiguration::LoggingConfiguration ( )
```

Constructs a new logging configuration.

5.33.2.2 LoggingConfiguration() [2/2]

```
mage::LoggingConfiguration::LoggingConfiguration (
    const LoggingConfiguration & logging_configuration ) [default]
```

Constructs a logging configuration from the given logging configuration.

Parameters

in	<i>logging_configuration</i>	A reference to the logging configuration.
----	------------------------------	---

5.33.2.3 ~LoggingConfiguration()

```
mage::LoggingConfiguration::~~LoggingConfiguration ( ) [default]
```

Destructs this logging configuration.

5.33.3 Member Function Documentation

5.33.3.1 IsQuiet()

```
bool mage::LoggingConfiguration::IsQuiet ( ) const
```

Checks whether the logging of the engine processing is quiet.

Returns

`true` if the logging of the engine processing is quiet. `false` otherwise.

5.33.3.2 IsVerbose()

```
bool mage::LoggingConfiguration::IsVerbose ( ) const
```

Checks wheter the logging of the engine processing is verbose.

Returns

`true` if the logging of the engine processing is verbose. `false` otherwise.

5.33.3.3 operator=()

```
LoggingConfiguration& mage::LoggingConfiguration::operator= (
    const LoggingConfiguration & logging_configuration ) [default]
```

Copies the given logging configuration to this logging configuration.

Parameters

in	<i>logging_configuration</i>	A reference to the logging configuration to copy from.
----	------------------------------	--

Returns

A reference to the copy of the given logging configuration (i.e. this logging configuration).

5.33.4 Member Data Documentation**5.33.4.1 m_quiet**

```
bool mage::LoggingConfiguration::m_quiet [private]
```

Flag indicating the logging of the engine processing is quiet.

5.33.4.2 m_verbose

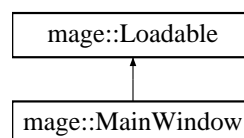
```
bool mage::LoggingConfiguration::m_verbose [private]
```

Flag indicating the logging of the engine processing is verbose.

5.34 mage::MainWindow Class Reference

```
#include <main_window.hpp>
```

Inheritance diagram for mage::MainWindow:

**Public Member Functions**

- [MainWindow](#) (HINSTANCE hinstance, const wstring &name, LONG width, LONG height)
- virtual [~MainWindow](#) ()
- bool [Show](#) (int nCmdShow)
- HINSTANCE [GetHinstance](#) () const
- HWND [GetHandle](#) () const
- const wstring & [GetName](#) () const

Private Member Functions

- [MainWindow](#) (const [MainWindow](#) &main_window)=delete
- [MainWindow](#) & [operator=](#) (const [MainWindow](#) &main_window)=delete
- HRESULT [InitializeWindow](#) (LONG width, LONG height)
- HRESULT [InitializeWindow](#) (RECT rectangle)
- HRESULT [UninitializeWindow](#) ()

Private Attributes

- HINSTANCE [m_hinstance](#)
- HWND [m_hwindow](#)
- const wstring [m_name](#)

Additional Inherited Members

5.34.1 Detailed Description

A class of main windows.

5.34.2 Constructor & Destructor Documentation

5.34.2.1 MainWindow() [1/2]

```
mage::MainWindow::MainWindow (
    HINSTANCE hinstance,
    const wstring & name,
    LONG width,
    LONG height )
```

Constructs a main window.

Parameters

in	<i>hinstance</i>	The application instance handle.
in	<i>name</i>	A reference to the name of the application.
in	<i>width</i>	The width of the window.
in	<i>height</i>	The height of the window.

5.34.2.2 ~MainWindow()

```
mage::MainWindow::~MainWindow ( ) [virtual]
```

Destructs this main window.

5.34.2.3 MainWindow() [2/2]

```
mage::MainWindow::MainWindow (
    const MainWindow & main_window ) [private], [delete]
```

Constructs a main window from the given main window.

Parameters

in	<i>main_window</i>	A reference to the main window.
----	--------------------	---------------------------------

5.34.3 Member Function Documentation

5.34.3.1 GetHandle()

```
HWND mage::MainWindow::GetHandle ( ) const
```

Returns the window handle of this main window.

Returns

The window handle of this main window.

5.34.3.2 GetHinstance()

```
HINSTANCE mage::MainWindow::GetHinstance ( ) const
```

Returns the application instance handle of this main window.

Returns

The application instance handle of this main window.

5.34.3.3 GetName()

```
const wstring& mage::MainWindow::GetName ( ) const
```

Returns the name of this main window.

Returns

The name of this main window.

5.34.3.4 InitializeWindow() [1/2]

```
HRESULT mage::MainWindow::InitializeWindow (
    LONG width,
    LONG height ) [private]
```

Initializes the engine window of this main window.

Parameters

in	<i>width</i>	The width of the client rectangle of the window.
in	<i>height</i>	The height of the client rectangle of the window.

Returns

A success/error value.

5.34.3.5 InitializeWindow() [2/2]

```
HRESULT mage::MainWindow::InitializeWindow (  
    RECT rectangle ) [private]
```

Initializes the engine window of this main window.

Parameters

in	<i>rectangle</i>	The client rectangle of the window.
----	------------------	-------------------------------------

Returns

A success/error value.

5.34.3.6 operator=()

```
MainWindow& mage::MainWindow::operator= (  
    const MainWindow & main_window ) [private], [delete]
```

Copies the given main window to this main window.

Parameters

in	<i>main_window</i>	A reference to the main window to copy from.
----	--------------------	--

Returns

A reference to the copy of the given main window (i.e. this main window).

5.34.3.7 Show()

```
bool mage::MainWindow::Show (  
    int nCmdShow )
```

Sets the specified window's show state of this main window.

Parameters

<code>in</code>	<code>nCmdShow</code>	Controls how this window is to be shown.
-----------------	-----------------------	--

Returns

`true` if the window was previously visible. `false` otherwise.

5.34.3.8 UninitializeWindow()

```
HRESULT mage::MainWindow::UninitializeWindow ( ) [private]
```

Unitializes the engine window of this main window.

Returns

A success/error value.

5.34.4 Member Data Documentation**5.34.4.1 m_hinstance**

```
HINSTANCE mage::MainWindow::m_hinstance [private]
```

Application instance handle.

5.34.4.2 m_hwindow

```
HWND mage::MainWindow::m_hwindow [private]
```

The handle of the parent window.

5.34.4.3 m_name

```
const wstring mage::MainWindow::m_name [private]
```

The name of this main window.

5.35 mage::Material Struct Reference

```
#include <material.hpp>
```

Public Member Functions

- [Material](#) (const string &name, float specular_exponent=0.0f, float dissolve=1.0f, float index_of_refraction=1.0f)
- [Material](#) (const [Material](#) &material)=default
- [~Material](#) ()=default
- [Material & operator=](#) (const [Material](#) &material)=default

Public Attributes

- string [m_name](#)
- [RGBSpectrum](#) [m_transmission_filter](#)
- [RGBSpectrum](#) [m_ambient_reflectivity](#)
- [SharedPtr< Texture >](#) [m_ambient_reflectivity_texture](#)
- [RGBSpectrum](#) [m_diffuse_reflectivity](#)
- [SharedPtr< Texture >](#) [m_diffuse_reflectivity_texture](#)
- [RGBSpectrum](#) [m_specular_reflectivity](#)
- [SharedPtr< Texture >](#) [m_specular_reflectivity_texture](#)
- float [m_specular_exponent](#)
- [SharedPtr< Texture >](#) [m_specular_exponent_texture](#)
- float [m_dissolve](#)
- [SharedPtr< Texture >](#) [m_dissolve_texture](#)
- float [m_index_of_refraction](#)
- [SharedPtr< Texture >](#) [m_decals_texture](#)
- [SharedPtr< Texture >](#) [m_displacement_texture](#)
- [SharedPtr< Texture >](#) [m_bump_texture](#)

5.35.1 Constructor & Destructor Documentation

5.35.1.1 [Material\(\)](#) [1/2]

```
mage::Material::Material (
    const string & name,
    float specular_exponent = 0.0f,
    float dissolve = 1.0f,
    float index_of_refraction = 1.0f )
```

5.35.1.2 [Material\(\)](#) [2/2]

```
mage::Material::Material (
    const Material & material ) [default]
```

5.35.1.3 [~Material\(\)](#)

```
mage::Material::~~Material ( ) [default]
```

5.35.2 Member Function Documentation

5.35.2.1 operator=()

```
Material& mage::Material::operator= (  
    const Material & material ) [default]
```

5.35.3 Member Data Documentation

5.35.3.1 m_ambient_reflectivity

```
RGBSpectrum mage::Material::m_ambient_reflectivity
```

The ambient reflectivity of this material.

5.35.3.2 m_ambient_reflectivity_texture

```
SharedPtr< Texture > mage::Material::m_ambient_reflectivity_texture
```

The ambient reflectivity texture of this material.

5.35.3.3 m_bump_texture

```
SharedPtr< Texture > mage::Material::m_bump_texture
```

The bump texture of this material.

5.35.3.4 m_decals_texture

```
SharedPtr< Texture > mage::Material::m_decals_texture
```

The decal texture of this material.

5.35.3.5 m_diffuse_reflectivity

```
RGBSpectrum mage::Material::m_diffuse_reflectivity
```

The diffuse reflectivity of this material.

5.35.3.6 m_diffuse_reflectivity_texture

```
SharedPtr< Texture > mage::Material::m_diffuse_reflectivity_texture
```

The diffuse reflectivity texture of this material.

5.35.3.7 m_displacement_texture

```
SharedPtr< Texture > mage::Material::m_displacement_texture
```

The displacement texture of this material.

5.35.3.8 m_dissolve

```
float mage::Material::m_dissolve
```

The amount this material dissolves into the background.

A factor of 1.0 is fully opaque. A factor of 0.0 is fully dissolved (completely transparent).

Unlike a real transparent material, the dissolve does not depend upon material thickness nor does it have any spectral character.

5.35.3.9 m_dissolve_texture

```
SharedPtr< Texture > mage::Material::m_dissolve_texture
```

The dissolve texture of this material.

5.35.3.10 m_index_of_refraction

```
float mage::Material::m_index_of_refraction
```

The index of refraction (optical density) of this material.

5.35.3.11 m_name

```
string mage::Material::m_name
```

The name of this material.

5.35.3.12 m_specular_exponent

```
float mage::Material::m_specular_exponent
```

The specular exponent (surface roughness) of this material.

A high exponent results in a tight, concentrated highlight. Values normally range from 0 to 1000.

5.35.3.13 m_specular_exponent_texture

```
SharedPtr< Texture > mage::Material::m_specular_exponent_texture
```

The specular exponent texture of this material.

5.35.3.14 m_specular_reflectivity

`RGB Spectrum m_age::Material::m_specular_reflectivity`

The specular reflectivity of this material.

5.35.3.15 m_specular_reflectivity_texture

`SharedPtr< Texture > m_age::Material::m_specular_reflectivity_texture`

The specular reflectivity texture of this material.

5.35.3.16 m_transmission_filter

`RGB Spectrum m_age::Material::m_transmission_filter`

The transmission filter of this material.

Any light passing through the material is filtered by the transmission filter, which only allows the specific colors to pass through.

5.36 m_age::MaterialBuffer Struct Reference

Public Attributes

- `XMVECTOR x`

5.36.1 Member Data Documentation

5.36.1.1 x

`XMVECTOR m_age::MaterialBuffer::x`

5.37 m_age::MemoryArena Class Reference

```
#include <memory_arena.hpp>
```

Public Member Functions

- `MemoryArena (size_t block_size=32768)`
- `virtual ~MemoryArena ()`
- `size_t GetBlockSize () const`
- `size_t GetCurrentBlockSize () const`
- `size_t GetTotalBlockSize () const`
- `char * GetCurrentBlockPtr () const`
- `void Reset ()`
- `void * Alloc (size_t size)`
- `template<typename T > T * Alloc (size_t count=1, bool initialization=true)`

Private Member Functions

- [MemoryArena](#) (const [MemoryArena](#) &arena)=delete
- [MemoryArena](#) & operator= (const [MemoryArena](#) &arena)=delete

Private Attributes

- const size_t [m_block_size](#)
- size_t [m_current_block_pos](#)
- pair< size_t, char *> [m_current_block](#)
- list< pair< size_t, char *> > [m_used_blocks](#)
- list< pair< size_t, char *> > [m_available_blocks](#)

5.37.1 Detailed Description

A class of memory arena's.

5.37.2 Constructor & Destructor Documentation

5.37.2.1 MemoryArena() [1/2]

```
mage::MemoryArena::MemoryArena (
    size_t block_size = 32768 )
```

Constructs a memory arena with given block size.

Parameters

in	<i>block_size</i>	The maximum block size in bytes.
----	-------------------	----------------------------------

5.37.2.2 ~MemoryArena()

```
mage::MemoryArena::~MemoryArena ( ) [virtual]
```

Destructs the given memory arena.

5.37.2.3 MemoryArena() [2/2]

```
mage::MemoryArena::MemoryArena (
    const MemoryArena & arena ) [private], [delete]
```

Constructs a memory arena from the given memory arena.

Parameters

in	<i>arena</i>	The memory arena.
----	--------------	-------------------

5.37.3 Member Function Documentation

5.37.3.1 Alloc() [1/2]

```
void * mage::MemoryArena::Alloc (
    size_t size )
```

Allocates a block of memory of the given size.

Parameters

in	<i>size</i>	The requested size in bytes to allocate in memory.
----	-------------	--

Returns

`nullptr` if the allocation failed.
A pointer to the memory block that was allocated.

5.37.3.2 Alloc() [2/2]

```
template<typename T >
T* mage::MemoryArena::Alloc (
    size_t count = 1,
    bool initialization = true )
```

Allocates a block of memory.

Template Parameters

<i>T</i>	The type of objects to allocate in memory.
----------	--

Parameters

in	<i>count</i>	The number of objects of type <code>T</code> to allocate in memory.
in	<i>initialization</i>	Flag indicating whether the objects need to be initialized (i.e. the constructor needs to be called).

Returns

`nullptr` if the allocation failed.
A pointer to the memory block that was allocated.

Note

The objects will be constructed with their default empty constructor.

5.37.3.3 GetBlockSize()

```
size_t mage::MemoryArena::GetBlockSize ( ) const
```

Returns the maximum block size of this memory arena.

Returns

The maximum block size of this memory arena.

5.37.3.4 GetCurrentBlockPtr()

```
char* mage::MemoryArena::GetCurrentBlockPtr ( ) const
```

Returns a pointer to the current block of this memory arena.

Returns

A pointer to the current block of this memory arena.

5.37.3.5 GetCurrentBlockSize()

```
size_t mage::MemoryArena::GetCurrentBlockSize ( ) const
```

Returns the block size (in bytes) of the current block of this memory arena.

Returns

The block size (in bytes) of the current block of this memory arena.

5.37.3.6 GetTotalBlockSize()

```
size_t mage::MemoryArena::GetTotalBlockSize ( ) const
```

Returns the block size (in bytes) of all blocks of this memory arena.

Returns

The block size (in bytes) of all blocks of this memory arena.

5.37.3.7 operator=()

```
MemoryArena& mage::MemoryArena::operator= (
    const MemoryArena & arena ) [private], [delete]
```

Copies the given memory arena to this memory arena.

Parameters

in	<i>arena</i>	The memory arena.
----	--------------	-------------------

5.37.3.8 Reset()

```
void mage::MemoryArena::Reset ( )
```

Resets this memory arena.

5.37.4 Member Data Documentation**5.37.4.1 m_available_blocks**

```
list< pair< size_t, char * > > mage::MemoryArena::m_available_blocks [private]
```

Pointers to the available blocks of this memory arena.

5.37.4.2 m_block_size

```
const size_t mage::MemoryArena::m_block_size [private]
```

The fixed block size of this memory arena.

5.37.4.3 m_current_block

```
pair< size_t, char * > mage::MemoryArena::m_current_block [private]
```

A pointer to the current block of this memory arena.

5.37.4.4 m_current_block_pos

```
size_t mage::MemoryArena::m_current_block_pos [private]
```

The current block position of this memory arena.

5.37.4.5 m_used_blocks

```
list< pair< size_t, char * > > mage::MemoryArena::m_used_blocks [private]
```

Pointers to the used blocks of this memory arena.

5.38 mage::Mesh Class Reference

```
#include <mesh.hpp>
```

Public Member Functions

- `template<typename VertexT >`
`Mesh` (const `RenderingDevice` &device, const `VertexT` *vertices, `size_t` nb_vertices, const `uint32_t` *indices, `size_t` nb_indices)
- `template<typename VertexT >`
`Mesh` (const `RenderingDevice` &device, const `vector`< `VertexT` > &vertices, const `vector`< `uint32_t` > &indices)
- `virtual ~Mesh ()=default`
- `size_t` `GetNumberOfVertices` () const
- `size_t` `GetNumberOfIndices` () const
- `void` `Render` (`ComPtr`< `ID3D11DeviceContext2` > device_context) const

Private Member Functions

- `Mesh` (const `Mesh` &mesh)=delete
- `Mesh` & `operator=` (const `Mesh` &mesh)=delete

Private Attributes

- `size_t` `m_vertex_size`
- `size_t` `m_nb_vertices`
- `size_t` `m_nb_indices`
- `ComPtr`< `ID3D11Buffer` > `m_vertex_buffer`
- `ComPtr`< `ID3D11Buffer` > `m_index_buffer`

5.38.1 Detailed Description

A class of indexed meshes.

5.38.2 Constructor & Destructor Documentation

5.38.2.1 `Mesh()` [1/3]

```
template<typename VertexT >
mage::Mesh::Mesh (
    const RenderingDevice & device,
    const VertexT * vertices,
    size_t nb_vertices,
    const uint32_t * indices,
    size_t nb_indices )
```

Constructs a mesh.

Precondition

vertices may not be equal to `nullptr`
indices may not be equal to `nullptr`

Template Parameters

<i>VertexT</i>	The vertex type.
----------------	------------------

Parameters

in	<i>device</i>	A reference to the rendering device.
in	<i>vertices</i>	A pointer to an array of vertices.
in	<i>nb_vertices</i>	The number of vertices.
in	<i>indices</i>	A pointer to an array of indices.
in	<i>nb_indices</i>	The number of indices.

5.38.2.2 Mesh() [2/3]

```
template<typename VertexT >
mage::Mesh::Mesh (
    const RenderingDevice & device,
    const vector< VertexT > & vertices,
    const vector< uint32_t > & indices )
```

Constructs a mesh.

Precondition

The number of vertices must be greater than zero.
The number of indices must be greater than zero.

Template Parameters

<i>VertexT</i>	The vertex type.
----------------	------------------

Parameters

in	<i>device</i>	A reference to the rendering device.
in	<i>vertices</i>	A reference to a vector of vertices.
in	<i>indices</i>	A reference to a vector of indices.
in	<i>device</i>	A pointer to an D3D11 device.

5.38.2.3 ~Mesh()

```
virtual mage::Mesh::~Mesh ( ) [virtual], [default]
```

Destructs this mesh.

5.38.2.4 Mesh() [3/3]

```
mage::Mesh::Mesh (
    const Mesh & mesh ) [private], [delete]
```

Constructs a mesh from the given mesh.

Parameters

in	<i>mesh</i>	A reference to the mesh.
----	-------------	--------------------------

5.38.3 Member Function Documentation

5.38.3.1 GetNumberOfIndices()

```
size_t mage::Mesh::GetNumberOfIndices ( ) const
```

Returns the number of indices of this mesh.

Returns

The number of indices of this mesh.

5.38.3.2 GetNumberOfVertices()

```
size_t mage::Mesh::GetNumberOfVertices ( ) const
```

Returns the number of vertices of this mesh.

Returns

The number of vertices of this mesh.

5.38.3.3 operator=()

```
Mesh& mage::Mesh::operator= (
    const Mesh & mesh ) [private], [delete]
```

Copies the given mesh to this mesh.

Parameters

in	<i>mesh</i>	A reference to the mesh to copy from.
----	-------------	---------------------------------------

Returns

A reference to the copy of the given mesh (i.e. this mesh).

5.38.3.4 Render()

```
void mage::Mesh::Render (
    ComPtr< ID3D11DeviceContext2 > device_context ) const
```

5.38.4 Member Data Documentation**5.38.4.1 m_index_buffer**

```
ComPtr< ID3D11Buffer > mage::Mesh::m_index_buffer [private]
```

A pointer to the index buffer of this mesh.

5.38.4.2 m_nb_indices

```
size_t mage::Mesh::m_nb_indices [private]
```

The number of indices of this mesh.

5.38.4.3 m_nb_vertices

```
size_t mage::Mesh::m_nb_vertices [private]
```

The number of vertices of this mesh.

5.38.4.4 m_vertex_buffer

```
ComPtr< ID3D11Buffer > mage::Mesh::m_vertex_buffer [private]
```

A pointer to the vertex buffer of this mesh.

5.38.4.5 m_vertex_size

```
size_t mage::Mesh::m_vertex_size [private]
```

The size of the vertices of this mesh.

5.39 mage::MeshDescriptor< VertexT > Struct Template Reference

```
#include <mesh_descriptor.hpp>
```

Public Member Functions

- [MeshDescriptor](#) (bool invert_handedness=false, bool clockwise_order=true)
- [MeshDescriptor](#) (const [MeshDescriptor](#)< VertexT > &desc)=default
- [~MeshDescriptor](#) ()=default
- [MeshDescriptor & operator=](#) (const [MeshDescriptor](#)< VertexT > &desc)=default
- bool [InvertHandness](#) () const
- bool [ClockwiseOrder](#) () const

Private Attributes

- bool [m_invert_handedness](#)
- bool [m_clockwise_order](#)

5.39.1 Constructor & Destructor Documentation

5.39.1.1 MeshDescriptor() [1/2]

```
template<typename VertexT>
mage::MeshDescriptor< VertexT >::MeshDescriptor (
    bool invert_handedness = false,
    bool clockwise_order = true )
```

Constructs a mesh descriptor.

Parameters

in	<i>invert_handedness</i>	Flag indicating whether the handedness of the coordinate system of the mesh should be inverted.
in	<i>clockwise_order</i>	Flag indicating whether the vertices of triangles should be in clockwise order.

5.39.1.2 MeshDescriptor() [2/2]

```
template<typename VertexT>
mage::MeshDescriptor< VertexT >::MeshDescriptor (
    const MeshDescriptor< VertexT > & desc ) [default]
```

5.39.1.3 ~MeshDescriptor()

```
template<typename VertexT>
mage::MeshDescriptor< VertexT >::~~MeshDescriptor ( ) [default]
```

5.39.2 Member Function Documentation

5.39.2.1 ClockwiseOrder()

```
template<typename VertexT>
bool mage::MeshDescriptor< VertexT >::ClockwiseOrder ( ) const
```

5.39.2.2 InvertHandness()

```
template<typename VertexT>
bool mage::MeshDescriptor< VertexT >::InvertHandness ( ) const
```

5.39.2.3 operator=()

```
template<typename VertexT>
MeshDescriptor& mage::MeshDescriptor< VertexT >::operator= (
    const MeshDescriptor< VertexT > & desc ) [default]
```

5.39.3 Member Data Documentation

5.39.3.1 m_clockwise_order

```
template<typename VertexT>
bool mage::MeshDescriptor< VertexT >::m_clockwise_order [private]
```

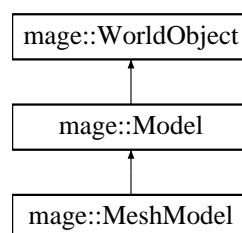
5.39.3.2 m_invert_handedness

```
template<typename VertexT>
bool mage::MeshDescriptor< VertexT >::m_invert_handedness [private]
```

5.40 mage::MeshModel Class Reference

```
#include <meshmodel.hpp>
```

Inheritance diagram for mage::MeshModel:



Public Member Functions

- [MeshModel](#) (const string &name, const [ModelDescriptor](#) &desc, const [CombinedShader](#) &shader)
- [MeshModel](#) (const [MeshModel](#) &model)
- virtual [~MeshModel](#) ()=default
- virtual [MeshModel](#) * [Clone](#) () const override
- const [Mesh](#) & [GetMesh](#) () const

Protected Member Functions

- virtual void [RenderModel](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [World](#) &world, const [TransformBuffer](#) &transform_buffer) const override

Private Member Functions

- [MeshModel](#) & [operator=](#) (const [MeshModel](#) &model)=delete
- HRESULT [InitializeModel](#) (const [ModelDescriptor](#) &desc, const [CombinedShader](#) &shader)

Private Attributes

- [SharedPtr](#)< [Mesh](#) > m_mesh

5.40.1 Constructor & Destructor Documentation

5.40.1.1 MeshModel() [1/2]

```
mage::MeshModel::MeshModel (
    const string & name,
    const ModelDescriptor & desc,
    const CombinedShader & shader )
```

5.40.1.2 MeshModel() [2/2]

```
mage::MeshModel::MeshModel (
    const MeshModel & model )
```

5.40.1.3 ~MeshModel()

```
virtual mage::MeshModel::~~MeshModel ( ) [virtual], [default]
```

5.40.2 Member Function Documentation

5.40.2.1 Clone()

```
virtual MeshModel* mage::MeshModel::Clone ( ) const [override], [virtual]
```

Implements [mage::Model](#).

5.40.2.2 GetMesh()

```
const Mesh& mage::MeshModel::GetMesh ( ) const
```

5.40.2.3 InitializeModel()

```
HRESULT mage::MeshModel::InitializeModel (
    const ModelDescriptor & desc,
    const CombinedShader & shader ) [private]
```

5.40.2.4 operator=()

```
MeshModel& mage::MeshModel::operator= (
    const MeshModel & model ) [private], [delete]
```

5.40.2.5 RenderModel()

```
virtual void mage::MeshModel::RenderModel (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const World & world,
    const TransformBuffer & transform_buffer ) const [override], [protected], [virtual]
```

Implements [mage::Model](#).

5.40.3 Member Data Documentation

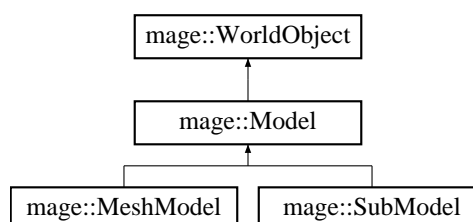
5.40.3.1 m_mesh

```
SharedPtr< Mesh > mage::MeshModel::m_mesh [private]
```

5.41 mage::Model Class Reference

```
#include <model.hpp>
```

Inheritance diagram for `mage::Model`:



Public Member Functions

- virtual [~Model](#) ()
- virtual [Model](#) * [Clone](#) () const =0
- void [Render](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [World](#) &world, const [TransformBuffer](#) &transform_buffer) const
- set< [SubModel](#) * >::iterator [SubModelsBegin](#) ()
- set< [SubModel](#) * >::iterator [SubModelsEnd](#) ()
- set< [SubModel](#) * >::const_iterator [SubModelsBegin](#) () const
- set< [SubModel](#) * >::const_iterator [SubModelsEnd](#) () const
- size_t [GetNumberOfSubModels](#) () const
- [SubModel](#) * [GetSubModel](#) (const string &name) const
- bool [HasSubModel](#) (const string &name) const
- void [AddSubModel](#) ([SubModel](#) *submodel)

Protected Member Functions

- [Model](#) (const string &name)
- [Model](#) (const [Model](#) &model)
- virtual void [RenderModel](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [World](#) &world, const [TransformBuffer](#) &transform_buffer) const =0

Private Member Functions

- [Model](#) & [operator=](#) (const [Model](#) &model)=delete
- void [RenderSubModels](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [World](#) &world, const [TransformBuffer](#) &transform_buffer) const

Private Attributes

- set< [SubModel](#) *, std::less<> > [m_submodels](#)

5.41.1 Detailed Description

A class of models.

5.41.2 Constructor & Destructor Documentation

5.41.2.1 ~Model()

```
virtual mage::Model::~~Model ( ) [virtual]
```

5.41.2.2 Model() [1/2]

```
mage::Model::Model (
    const string & name ) [protected]
```

5.41.2.3 Model() [2/2]

```
mage::Model::Model (
    const Model & model ) [protected]
```

5.41.3 Member Function Documentation

5.41.3.1 AddSubModel()

```
void mage::Model::AddSubModel (
    SubModel * submodel )
```

5.41.3.2 Clone()

```
virtual Model* mage::Model::Clone ( ) const [pure virtual]
```

Implemented in [mage::SubModel](#), and [mage::MeshModel](#).

5.41.3.3 GetNumberOfSubModels()

```
size_t mage::Model::GetNumberOfSubModels ( ) const
```

5.41.3.4 GetSubModel()

```
SubModel * mage::Model::GetSubModel (
    const string & name ) const
```

5.41.3.5 HasSubModel()

```
bool mage::Model::HasSubModel (
    const string & name ) const
```

5.41.3.6 operator=()

```
Model& mage::Model::operator= (
    const Model & model ) [private], [delete]
```

5.41.3.7 Render()

```
void mage::Model::Render (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const World & world,
    const TransformBuffer & transform_buffer ) const
```


5.41.3.8 RenderModel()

```
virtual void mage::Model::RenderModel (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const World & world,
    const TransformBuffer & transform_buffer ) const [protected], [pure virtual]
```

Implemented in [mage::SubModel](#), and [mage::MeshModel](#).

5.41.3.9 RenderSubModels()

```
void mage::Model::RenderSubModels (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const World & world,
    const TransformBuffer & transform_buffer ) const [private]
```

5.41.3.10 SubModelsBegin() [1/2]

```
set< SubModel * >::iterator mage::Model::SubModelsBegin ( )
```

5.41.3.11 SubModelsBegin() [2/2]

```
set< SubModel * >::const_iterator mage::Model::SubModelsBegin ( ) const
```

5.41.3.12 SubModelsEnd() [1/2]

```
set< SubModel * >::iterator mage::Model::SubModelsEnd ( )
```

5.41.3.13 SubModelsEnd() [2/2]

```
set< SubModel * >::const_iterator mage::Model::SubModelsEnd ( ) const
```

5.41.4 Member Data Documentation

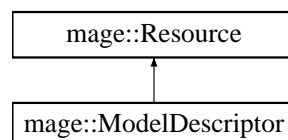
5.41.4.1 m_submodels

```
set< SubModel *, std::less<> > mage::Model::m_submodels [private]
```

5.42 mage::ModelDescriptor Class Reference

```
#include <model_descriptor.hpp>
```

Inheritance diagram for `mage::ModelDescriptor`:



Public Member Functions

- `template<typename VertexT >`
`ModelDescriptor` (const `RenderingDevice` &device, const `wstring` &fname, const `MeshDescriptor`< `VertexT` > &desc=`MeshDescriptor`< `VertexT` >())
- `virtual ~ModelDescriptor ()`
- `SharedPtr< Mesh > GetMesh () const`
- `vector< Material >::const_iterator MaterialsBegin () const`
- `vector< Material >::const_iterator MaterialsEnd () const`
- `vector< ModelPart >::const_iterator ModelPartsBegin () const`
- `vector< ModelPart >::const_iterator ModelPartsEnd () const`

Private Member Functions

- `ModelDescriptor` (const `ModelDescriptor` &desc)=delete
- `ModelDescriptor` & operator= (const `ModelDescriptor` &desc)=delete

Private Attributes

- `SharedPtr< Mesh > m_mesh`
- `vector< Material > m_materials`
- `vector< ModelPart > m_model_parts`

5.42.1 Constructor & Destructor Documentation

5.42.1.1 `ModelDescriptor()` [1/2]

```
template<typename VertexT >
mage::ModelDescriptor::ModelDescriptor (
    const RenderingDevice & device,
    const wstring & fname,
    const MeshDescriptor< VertexT > & desc = MeshDescriptor< VertexT >() )
```

5.42.1.2 `~ModelDescriptor()`

```
virtual mage::ModelDescriptor::~~ModelDescriptor ( ) [virtual]
```

5.42.1.3 `ModelDescriptor()` [2/2]

```
mage::ModelDescriptor::ModelDescriptor (
    const ModelDescriptor & desc ) [private], [delete]
```

5.42.2 Member Function Documentation

5.42.2.1 `GetMesh()`

```
SharedPtr< Mesh > mage::ModelDescriptor::GetMesh ( ) const
```

5.42.2.2 MaterialsBegin()

```
vector< Material >::const_iterator mage::ModelDescriptor::MaterialsBegin ( ) const
```

5.42.2.3 MaterialsEnd()

```
vector< Material >::const_iterator mage::ModelDescriptor::MaterialsEnd ( ) const
```

5.42.2.4 ModelPartsBegin()

```
vector< ModelPart >::const_iterator mage::ModelDescriptor::ModelPartsBegin ( ) const
```

5.42.2.5 ModelPartsEnd()

```
vector< ModelPart >::const_iterator mage::ModelDescriptor::ModelPartsEnd ( ) const
```

5.42.2.6 operator=()

```
ModelDescriptor& mage::ModelDescriptor::operator= (
    const ModelDescriptor & desc ) [private], [delete]
```

5.42.3 Member Data Documentation

5.42.3.1 m_materials

```
vector< Material > mage::ModelDescriptor::m_materials [private]
```

5.42.3.2 m_mesh

```
SharedPtr< Mesh > mage::ModelDescriptor::m_mesh [private]
```

5.42.3.3 m_model_parts

```
vector< ModelPart > mage::ModelDescriptor::m_model_parts [private]
```

5.43 mage::ModelOutput< VertexT > Struct Template Reference

```
#include <model_output.hpp>
```

Public Member Functions

- [ModelOutput](#) ()=default
- [~ModelOutput](#) ()=default
- bool [HasModelPart](#) (const string &child)
- void [StartModelPart](#) (const string &child, const string &parent=MAGE_MODEL_PART_DEFAULT_PARENT)
- void [SetMaterial](#) (const string &material)
- void [EndModelPart](#) ()

Public Attributes

- vector< VertexT > [vertex_buffer](#)
- vector< uint32_t > [index_buffer](#)
- vector< [Material](#) > [material_buffer](#)
- vector< [ModelPart](#) > [model_parts](#)

Private Member Functions

- [ModelOutput](#) (const [ModelOutput](#)< VertexT > &output)=delete
- [ModelOutput](#)< VertexT > & [operator=](#) ([ModelOutput](#)< VertexT > &output)=delete

5.43.1 Constructor & Destructor Documentation

5.43.1.1 [ModelOutput](#)() [1/2]

```
template<typename VertexT>
mage::ModelOutput< VertexT >::ModelOutput ( ) [default]
```

5.43.1.2 [~ModelOutput](#)()

```
template<typename VertexT>
mage::ModelOutput< VertexT >::~~ModelOutput ( ) [default]
```

5.43.1.3 [ModelOutput](#)() [2/2]

```
template<typename VertexT>
mage::ModelOutput< VertexT >::ModelOutput (
    const ModelOutput< VertexT > & output ) [private], [delete]
```

5.43.2 Member Function Documentation

5.43.2.1 [EndModelPart](#)()

```
template<typename VertexT>
void mage::ModelOutput< VertexT >::EndModelPart ( )
```

5.43.2.2 HasModelPart()

```
template<typename VertexT>
bool mage::ModelOutput< VertexT >::HasModelPart (
    const string & child )
```

5.43.2.3 operator=()

```
template<typename VertexT>
ModelOutput< VertexT >& mage::ModelOutput< VertexT >::operator= (
    ModelOutput< VertexT > & output ) [private], [delete]
```

5.43.2.4 SetMaterial()

```
template<typename VertexT>
void mage::ModelOutput< VertexT >::SetMaterial (
    const string & material )
```

5.43.2.5 StartModelPart()

```
template<typename VertexT>
void mage::ModelOutput< VertexT >::StartModelPart (
    const string & child,
    const string & parent = MAGE_MODEL_PART_DEFAULT_PARENT )
```

5.43.3 Member Data Documentation

5.43.3.1 index_buffer

```
template<typename VertexT>
vector< uint32_t > mage::ModelOutput< VertexT >::index_buffer
```

5.43.3.2 material_buffer

```
template<typename VertexT>
vector< Material > mage::ModelOutput< VertexT >::material_buffer
```

5.43.3.3 model_parts

```
template<typename VertexT>
vector< ModelPart > mage::ModelOutput< VertexT >::model_parts
```

5.43.3.4 vertex_buffer

```
template<typename VertexT>
vector< VertexT > mage::ModelOutput< VertexT >::vertex_buffer
```

5.44 mage::ModelPart Struct Reference

```
#include <model_output.hpp>
```

Public Member Functions

- [ModelPart](#) (const string &[child](#)=MAGE_MODEL_PART_DEFAULT_CHILD, const string &[parent](#)=MAGE_MODEL_PART_DEFAULT_PARENT, uint32_t [start_index](#)=0, uint32_t [nb_indices](#)=0, const string &[material](#)=MAGE_MODEL_PART_DEFAULT_MATERIAL)
- [ModelPart](#) (const [ModelPart](#) &[model_part](#))=default
- [~ModelPart](#) ()=default
- [ModelPart](#) & [operator=](#) ([ModelPart](#) &[model_part](#))=default

Public Attributes

- string [child](#)
- string [parent](#)
- string [material](#)
- uint32_t [start_index](#)
- uint32_t [nb_indices](#)

5.44.1 Constructor & Destructor Documentation

5.44.1.1 ModelPart() [1/2]

```
mage::ModelPart::ModelPart (
    const string & child = MAGE_MODEL_PART_DEFAULT_CHILD,
    const string & parent = MAGE_MODEL_PART_DEFAULT_PARENT,
    uint32_t start_index = 0,
    uint32_t nb_indices = 0,
    const string & material = MAGE_MODEL_PART_DEFAULT_MATERIAL )
```

5.44.1.2 ModelPart() [2/2]

```
mage::ModelPart::ModelPart (
    const ModelPart & model_part ) [default]
```

5.44.1.3 ~ModelPart()

```
mage::ModelPart::~~ModelPart ( ) [default]
```

5.44.2 Member Function Documentation

5.44.2.1 operator=()

```
ModelPart& mage::ModelPart::operator= (
    ModelPart & model_part ) [default]
```

5.44.3 Member Data Documentation

5.44.3.1 child

```
string mage::ModelPart::child
```

5.44.3.2 material

```
string mage::ModelPart::material
```

5.44.3.3 nb_indices

```
uint32_t mage::ModelPart::nb_indices
```

5.44.3.4 parent

```
string mage::ModelPart::parent
```

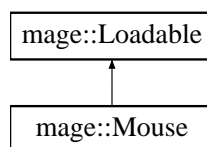
5.44.3.5 start_index

```
uint32_t mage::ModelPart::start_index
```

5.45 mage::Mouse Class Reference

```
#include <mouse.hpp>
```

Inheritance diagram for mage::Mouse:



Public Member Functions

- [Mouse](#) (HWND hwnd, [ComPtr](#)< IDirectInput8 > di)
- virtual [~Mouse](#) ()=default
- void [Update](#) ()
- HWND [GetHandle](#) () const
- bool [GetMouseButtonPress](#) (char mouse_button, bool ignore_press_stamp=false) const
- long [GetPosX](#) () const
- long [GetPosY](#) () const
- long [GetDeltaX](#) () const
- long [GetDeltaY](#) () const
- long [GetDeltaWheel](#) () const

Private Member Functions

- [Mouse](#) (const [Mouse](#) &mouse)=delete
- [Mouse](#) & [operator=](#) (const [Mouse](#) &mouse)=delete
- HRESULT [InitializeMouse](#) ([ComPtr](#)< IDirectInput8 > di)

Private Attributes

- HWND [m_hwindow](#)
- [ComPtr](#)< IDirectInputDevice8 > [m_mouse](#)
- uint64_t [m_press_stamp](#)
- DIMOUSESTATE [m_mouse_state](#)
- uint64_t [m_mouse_button_press_stamp](#) [3]
- POINT [m_mouse_position](#)

Additional Inherited Members

5.45.1 Detailed Description

A class of mouses.

5.45.2 Constructor & Destructor Documentation

5.45.2.1 [Mouse\(\)](#) [1/2]

```
mage::Mouse::Mouse (
    HWND hwindow,
    ComPtr< IDirectInput8 > di )
```

Constructs a mouse.

Parameters

in	<i>hwindow</i>	The handle of the parent window.
in	<i>di</i>	A pointer to a direct input object.

5.45.2.2 [~Mouse\(\)](#)

```
virtual mage::Mouse::~~Mouse ( ) [virtual], [default]
```

Destructs this mouse.

5.45.2.3 [Mouse\(\)](#) [2/2]

```
mage::Mouse::Mouse (
    const Mouse & mouse ) [private], [delete]
```

Constructs a mouse from the given mouse.

Parameters

in	<i>mouse</i>	A reference to the mouse.
----	--------------	---------------------------

5.45.3 Member Function Documentation

5.45.3.1 GetDeltaWheel()

```
long mage::Mouse::GetDeltaWheel ( ) const
```

Returns the change in this mouse's scroll wheel.

Returns

The change in this mouse's scroll wheel.

5.45.3.2 GetDeltaX()

```
long mage::Mouse::GetDeltaX ( ) const
```

Returns the change in this mouse's horizontal coordinate.

Returns

The change in this mouse's horizontal coordinate.

5.45.3.3 GetDeltaY()

```
long mage::Mouse::GetDeltaY ( ) const
```

Returns the change in this mouse's vertical coordinate.

Returns

The change in this mouse's vertical coordinate.

5.45.3.4 GetHandle()

```
HWND mage::Mouse::GetHandle ( ) const
```

Returns the window handle of this mouse.

Returns

The window handle of this mouse.

5.45.3.5 GetMouseButtonPress()

```
bool mage::Mouse::GetMouseButtonPress (
    char mouse_button,
    bool ignore_press_stamp = false ) const
```

Checks whether the given mouse button of this mouse is pressed.

Parameters

in	<i>mouse_button</i>	The mouse button.
in	<i>ignore_press_stamp</i>	Flag indicating whether press stamps should be ignored. Consistent presses will return false when using the press stamp.

Returns

true if the given mouse button is pressed. false otherwise.

5.45.3.6 GetPosX()

```
long mage::Mouse::GetPosX ( ) const
```

Returns the horizontal position of this mouse.

Returns

The horizontal position of this mouse.

5.45.3.7 GetPosY()

```
long mage::Mouse::GetPosY ( ) const
```

Returns the vertical position of this mouse.

Returns

The vertical position of this mouse.

5.45.3.8 InitializeMouse()

```
HRESULT mage::Mouse::InitializeMouse (
    ComPtr< IDirectInput8 > di ) [private]
```

Initializes the mouse device of this mouse.

Parameters

in	<i>di</i>	A pointer to a direct input object.
----	-----------	-------------------------------------

Returns

A success/error value.

5.45.3.9 operator=()

```
Mouse& mage::Mouse::operator= (
    const Mouse & mouse ) [private], [delete]
```

Copies the given mouse to this mouse.

Parameters

in	<i>mouse</i>	A reference to the mouse to copy from.
----	--------------	--

Returns

A reference to the copy of the given mouse (i.e. this mouse).

5.45.3.10 Update()

```
void mage::Mouse::Update ( )
```

Updates the state of this mouse.

5.45.4 Member Data Documentation

5.45.4.1 m_hwindow

```
HWND mage::Mouse::m_hwindow [private]
```

The handle of the parent window.

5.45.4.2 m_mouse

```
ComPtr< IDirectInputDevice8 > mage::Mouse::m_mouse [private]
```

DirectInput mouse device of this mouse.

The methods of the IDirectInputDevice8 interface are used to gain and release access to Microsoft DirectInput devices, manage device properties and information, set behavior, perform initialization, create and play force-feedback effects, and invoke a device's control panel.

5.45.4.3 m_mouse_button_press_stamp

```
uint64_t mage::Mouse::m_mouse_button_press_stamp[3] [mutable], [private]
```

Stamps the mouse buttons pressed in the last frame of this mouse.

5.45.4.4 m_mouse_position

```
POINT mage::Mouse::m_mouse_position [private]
```

The position of the mouse cursor on the screen of this mouse.

5.45.4.5 m_mouse_state

```
DIMOUSESTATE mage::Mouse::m_mouse_state [private]
```

State of the mouse buttons of this mouse.

Describes the state of a mouse device that has up to four buttons, or another device that is being accessed as if it were a mouse device.

5.45.4.6 m_press_stamp

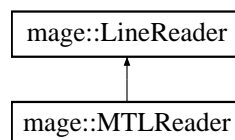
```
uint64_t mage::Mouse::m_press_stamp [private]
```

The current press stamp (incremented every frame).

5.46 mage::MTLReader Class Reference

```
#include <mtl_reader.hpp>
```

Inheritance diagram for mage::MTLReader:



Public Member Functions

- [MTLReader](#) (vector< [Material](#) > &material_buffer)
- virtual [~MTLReader](#) ()=default

Protected Member Functions

- virtual HRESULT [ReadLine](#) (char *line) override
- void [ReadMTLMaterialName](#) ()
- void [ReadMTLTransmissionFilter](#) ()
- void [ReadMTLAmbientReflectivity](#) ()
- void [ReadMTLDiffuseReflectivity](#) ()
- void [ReadMTLSpecularReflectivity](#) ()
- void [ReadMTLSpecularExponent](#) ()
- void [ReadMTLDissolve](#) ()
- void [ReadMTLOpticalDensity](#) ()
- void [ReadMTLAmbientReflectivityTexture](#) ()
- void [ReadMTLDiffuseReflectivityTexture](#) ()
- void [ReadMTLSpecularReflectivityTexture](#) ()
- void [ReadMTLSpecularExponentTexture](#) ()
- void [ReadMTLDissolveTexture](#) ()
- void [ReadMTLDecalTexture](#) ()
- void [ReadMTLDisplacementTexture](#) ()
- void [ReadMTLBumpTexture](#) ()
- [RGBSpectrum](#) [ReadMTLSpectrum](#) ()
- [SharedPtr< Texture >](#) [ReadMTLTexture](#) ()

Private Member Functions

- [MTLReader](#) (const [MTLReader](#) &reader)=delete
- [MTLReader](#) & [operator=](#) (const [MTLReader](#) &reader)=delete

Private Attributes

- vector< [Material](#) > & [m_material_buffer](#)

Additional Inherited Members

5.46.1 Constructor & Destructor Documentation

5.46.1.1 MTLReader() [1/2]

```
mage::MTLReader::MTLReader (
    vector< Material > & material\_buffer )
```

5.46.1.2 ~MTLReader()

```
virtual mage::MTLReader::~~MTLReader ( ) [virtual], [default]
```

5.46.1.3 MTLReader() [2/2]

```
mage::MTLReader::MTLReader (
    const MTLReader & reader ) [private], [delete]
```

5.46.2 Member Function Documentation

5.46.2.1 operator=()

```
MTLReader& mage::MTLReader::operator= (
    const MTLReader & reader ) [private], [delete]
```

5.46.2.2 ReadLine()

```
HRESULT mage::MTLReader::ReadLine (
    char * line ) [override], [protected], [virtual]
```

Implements [mage::LineReader](#).

5.46.2.3 ReadMTLAmbientReflectivity()

```
void mage::MTLReader::ReadMTLAmbientReflectivity ( ) [protected]
```

5.46.2.4 ReadMTLAmbientReflectivityTexture()

```
void mage::MTLReader::ReadMTLAmbientReflectivityTexture ( ) [protected]
```

5.46.2.5 ReadMTLBumpTexture()

```
void mage::MTLReader::ReadMTLBumpTexture ( ) [protected]
```

5.46.2.6 ReadMTLDecalTexture()

```
void mage::MTLReader::ReadMTLDecalTexture ( ) [protected]
```

5.46.2.7 ReadMTLDiffuseReflectivity()

```
void mage::MTLReader::ReadMTLDiffuseReflectivity ( ) [protected]
```

5.46.2.8 ReadMTLDiffuseReflectivityTexture()

```
void mage::MTLReader::ReadMTLDiffuseReflectivityTexture ( ) [protected]
```

5.46.2.9 ReadMTLDisplacementTexture()

```
void mage::MTLReader::ReadMTLDisplacementTexture ( ) [protected]
```

5.46.2.10 ReadMTLDissolve()

```
void mage::MTLReader::ReadMTLDissolve ( ) [protected]
```

5.46.2.11 ReadMTLDissolveTexture()

```
void mage::MTLReader::ReadMTLDissolveTexture ( ) [protected]
```

5.46.2.12 ReadMTLMaterialName()

```
void mage::MTLReader::ReadMTLMaterialName ( ) [protected]
```

5.46.2.13 ReadMTLOpticalDensity()

```
void mage::MTLReader::ReadMTLOpticalDensity ( ) [protected]
```

5.46.2.14 ReadMTLSpectrum()

```
RGBSpectrum mage::MTLReader::ReadMTLSpectrum ( ) [protected]
```

5.46.2.15 ReadMTLSpecularExponent()

```
void mage::MTLReader::ReadMTLSpecularExponent ( ) [protected]
```

5.46.2.16 ReadMTLSpecularExponentTexture()

```
void mage::MTLReader::ReadMTLSpecularExponentTexture ( ) [protected]
```

5.46.2.17 ReadMTLSpecularReflectivity()

```
void mage::MTLReader::ReadMTLSpecularReflectivity ( ) [protected]
```

5.46.2.18 ReadMTLSpecularReflectivityTexture()

```
void mage::MTLReader::ReadMTLSpecularReflectivityTexture ( ) [protected]
```

5.46.2.19 ReadMTLTexture()

```
SharedPtr< Texture > mage::MTLReader::ReadMTLTexture ( ) [protected]
```

5.46.2.20 ReadMTLTransmissionFilter()

```
void mage::MTLReader::ReadMTLTransmissionFilter ( ) [protected]
```

5.46.3 Member Data Documentation

5.46.3.1 m_material_buffer

```
vector< Material >& mage::MTLReader::m_material_buffer [private]
```

5.47 mage::Mutex Class Reference

```
#include <lock.hpp>
```

Static Public Member Functions

- static [Mutex](#) * [Create](#) ()
- static void [Destroy](#) ([Mutex](#) *mutex)

Private Member Functions

- [Mutex](#) ()
- [Mutex](#) (const [Mutex](#) &mutex)=delete
- [~Mutex](#) ()
- [Mutex](#) & [operator=](#) (const [Mutex](#) &mutex)=delete

Private Attributes

- CRITICAL_SECTION [m_critical_section](#)

Friends

- struct [MutexLock](#)

5.47.1 Detailed Description

A class of mutexes.

5.47.2 Constructor & Destructor Documentation

5.47.2.1 [Mutex](#)() [1/2]

```
mage::Mutex::Mutex ( ) [private]
```

Constructs a mutex.

5.47.2.2 [Mutex](#)() [2/2]

```
mage::Mutex::Mutex (
    const Mutex & mutex ) [private], [delete]
```

Constructs a mutex from the given mutex.

Parameters

in	<i>mutex</i>	A reference to a mutex.
----	--------------	-------------------------

5.47.2.3 ~Mutex()

```
mage::Mutex::~Mutex ( ) [private]
```

Destructs this mutex.

5.47.3 Member Function Documentation

5.47.3.1 Create()

```
static Mutex\* mage::Mutex::Create ( ) [static]
```

Creates a mutex.

5.47.3.2 Destroy()

```
static void mage::Mutex::Destroy (
    Mutex * mutex ) [static]
```

Destroys a given mutex.

Parameters

in	<i>mutex</i>	The mutex to destroy.
----	--------------	-----------------------

5.47.3.3 operator=()

```
Mutex& mage::Mutex::operator= (
    const Mutex & mutex ) [private], [delete]
```

Copies the given mutex to this mutex.

Parameters

in	<i>mutex</i>	A reference to a mutex.
----	--------------	-------------------------

Returns

A reference to the copy of the given mutex (i.e. this mutex).

5.47.4 Friends And Related Function Documentation

5.47.4.1 MutexLock

```
friend struct MutexLock [friend]
```

5.47.5 Member Data Documentation

5.47.5.1 m_critical_section

```
CRITICAL_SECTION mage::Mutex::m_critical_section [private]
```

The critical section object of this mutex.

5.48 mage::MutexLock Struct Reference

```
#include <lock.hpp>
```

Public Member Functions

- [MutexLock](#) ([Mutex](#) &mutex)
- [~MutexLock](#) ()

Private Member Functions

- [MutexLock](#) (const [MutexLock](#) &mutex_lock)=delete
- [MutexLock](#) & [operator=](#) (const [MutexLock](#) &mutex_lock)=delete

Private Attributes

- [Mutex](#) & [m_mutex](#)

5.48.1 Detailed Description

A struct of mutex locks.

5.48.2 Constructor & Destructor Documentation

5.48.2.1 MutexLock() [1/2]

```
mage::MutexLock::MutexLock (  
    Mutex & mutex )
```

Constructs a mutex lock for the given mutex.

Parameters

in	<i>mutex</i>	A reference to a mutex.
----	--------------	-------------------------

5.48.2.2 `~MutexLock()`

```
mage::MutexLock::~~MutexLock ( )
```

Destructs this mutex lock.

5.48.2.3 `MutexLock()` [2/2]

```
mage::MutexLock::MutexLock (
    const MutexLock & mutex_lock ) [private], [delete]
```

Constructs a mutex lock from the given mutex lock.

Parameters

in	<i>mutex_lock</i>	A reference to a mutex lock.
----	-------------------	------------------------------

5.48.3 Member Function Documentation

5.48.3.1 `operator=()`

```
MutexLock& mage::MutexLock::operator= (
    const MutexLock & mutex_lock ) [private], [delete]
```

Copies the given mutex lock to this mutex lock.

Parameters

in	<i>mutex_lock</i>	A reference to a mutex lock.
----	-------------------	------------------------------

Returns

A reference to the copy of the given mutex lock (i.e. this mutex lock)

5.48.4 Member Data Documentation

5.48.4.1 `m_mutex`

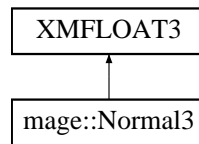
```
Mutex& mage::MutexLock::m_mutex [private]
```

The mutex of this mutex lock.

5.49 mage::Normal3 Struct Reference

```
#include <math.hpp>
```

Inheritance diagram for `mage::Normal3`:



Public Member Functions

- [Normal3](#) ()
- [Normal3](#) (float x, float y, float z)
- [Normal3](#) (const [Normal3](#) &normal)
- [Normal3](#) (const [Point3](#) &point)
- [Normal3](#) (const [Direction3](#) &direction)
- [Normal3](#) (const XMFLOAT3 &vector)
- [~Normal3](#) ()=default
- [Normal3](#) & [operator=](#) (const [Normal3](#) &normal)

5.49.1 Constructor & Destructor Documentation

5.49.1.1 Normal3() [1/6]

```
mage::Normal3::Normal3 ( )
```

5.49.1.2 Normal3() [2/6]

```
mage::Normal3::Normal3 (
    float x,
    float y,
    float z )
```

5.49.1.3 Normal3() [3/6]

```
mage::Normal3::Normal3 (
    const Normal3 & normal )
```

5.49.1.4 Normal3() [4/6]

```
mage::Normal3::Normal3 (
    const Point3 & point ) [explicit]
```

5.49.1.5 Normal3() [5/6]

```
mage::Normal3::Normal3 (
    const Direction3 & direction ) [explicit]
```

5.49.1.6 Normal3() [6/6]

```
mage::Normal3::Normal3 (
    const XMFLOAT3 & vector ) [explicit]
```

5.49.1.7 ~Normal3()

```
mage::Normal3::~~Normal3 ( ) [default]
```

5.49.2 Member Function Documentation

5.49.2.1 operator=()

```
Normal3& mage::Normal3::operator= (
    const Normal3 & normal )
```

5.50 mage::OBJReader< VertexT >::OBJComparatorXMUINT3 Struct Reference

Public Member Functions

- bool [operator\(\)](#) (const XMUINT3 &a, const XMUINT3 &b) const

5.50.1 Detailed Description

```
template<typename VertexT>
struct mage::OBJReader< VertexT >::OBJComparatorXMUINT3
```

A struct of XMUINT3 comparators for OBJ vertex indices.

5.50.2 Member Function Documentation

5.50.2.1 operator>()

```
template<typename VertexT>
bool mage::OBJReader< VertexT >::OBJComparatorXMUINT3::operator() (
    const XMUINT3 & a,
    const XMUINT3 & b ) const
```

Compares the two given XMUINT3 vectors against each other.

Parameters

in	<i>a</i>	A reference to the first vector.
in	<i>b</i>	A reference to the second vector.

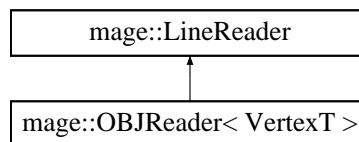
Returns

`true` if the *a* is smaller than *b*. `false` otherwise.

5.51 mage::OBJReader< VertexT > Class Template Reference

```
#include <obj_reader.hpp>
```

Inheritance diagram for mage::OBJReader< VertexT >:



Classes

- struct [OBJComparatorXMUINT3](#)

Public Member Functions

- [OBJReader](#) ([ModelOutput](#)< VertexT > &model_output, const [MeshDescriptor](#)< VertexT > &mesh_desc)
- virtual [~OBJReader](#) ()=default

Protected Member Functions

- virtual HRESULT [Preprocess](#) () override
- virtual HRESULT [ReadLine](#) (char *line) override
- virtual HRESULT [Postprocess](#) () override
- void [ReadOBJMaterialLibrary](#) ()
- void [ReadOBJMaterialUse](#) ()
- void [ReadOBJGroup](#) ()
- void [ReadOBJObject](#) ()
- void [ReadOBJVertex](#) ()
- void [ReadOBJVertexTexture](#) ()
- void [ReadOBJVertexNormal](#) ()
- void [ReadOBJTriangleFace](#) ()
- [Point3](#) [ReadOBJVertexCoordinates](#) ()
- [Normal3](#) [ReadOBJVertexNormalCoordinates](#) ()
- [UV](#) [ReadOBJVertexTextureCoordinates](#) ()
- XMUINT3 [ReadOBJVertexIndices](#) ()
- VertexT [ConstructVertex](#) (const XMUINT3 &vertex_indices)

Private Member Functions

- [OBJReader](#) (const [OBJReader](#) &reader)=delete
- [OBJReader](#) & [operator=](#) (const [OBJReader](#) &reader)=delete

Private Attributes

- vector< [Point3](#) > [m_vertex_coordinates](#)
- vector< [UV](#) > [m_vertex_texture_coordinates](#)
- vector< [Normal3](#) > [m_vertex_normal_coordinates](#)
- map< XMUINT3, uint32_t, [OBJComparatorXMUINT3](#) > [m_mapping](#)
- [ModelOutput](#)< VertexT > & [m_model_output](#)
- const [MeshDescriptor](#)< VertexT > & [m_mesh_desc](#)

Additional Inherited Members

5.51.1 Constructor & Destructor Documentation

5.51.1.1 OBJReader() [1/2]

```
template<typename VertexT>
mage::OBJReader< VertexT >::OBJReader (
    ModelOutput< VertexT > & model_output,
    const MeshDescriptor< VertexT > & mesh_desc )
```

5.51.1.2 ~OBJReader()

```
template<typename VertexT>
virtual mage::OBJReader< VertexT >::~~OBJReader ( ) [virtual], [default]
```

5.51.1.3 OBJReader() [2/2]

```
template<typename VertexT>
mage::OBJReader< VertexT >::OBJReader (
    const OBJReader< VertexT > & reader ) [private], [delete]
```

5.51.2 Member Function Documentation

5.51.2.1 ConstructVertex()

```
template<typename VertexT>
VertexT mage::OBJReader< VertexT >::ConstructVertex (
    const XMUINT3 & vertex_indices ) [protected]
```

5.51.2.2 operator=()

```
template<typename VertexT>
OBJReader& mage::OBJReader< VertexT >::operator= (
    const OBJReader< VertexT > & reader ) [private], [delete]
```

5.51.2.3 Postprocess()

```
template<typename VertexT>
virtual HRESULT mage::OBJReader< VertexT >::Postprocess ( ) [override], [protected], [virtual]
```

Reimplemented from [mage::LineReader](#).

5.51.2.4 Preprocess()

```
template<typename VertexT>
virtual HRESULT mage::OBJReader< VertexT >::Preprocess ( ) [override], [protected], [virtual]
```

Reimplemented from [mage::LineReader](#).

5.51.2.5 ReadLine()

```
template<typename VertexT>
virtual HRESULT mage::OBJReader< VertexT >::ReadLine (
    char * line ) [override], [protected], [virtual]
```

Implements [mage::LineReader](#).

5.51.2.6 ReadOBJGroup()

```
template<typename VertexT>
void mage::OBJReader< VertexT >::ReadOBJGroup ( ) [protected]
```

5.51.2.7 ReadOBJMaterialLibrary()

```
template<typename VertexT>
void mage::OBJReader< VertexT >::ReadOBJMaterialLibrary ( ) [protected]
```

5.51.2.8 ReadOBJMaterialUse()

```
template<typename VertexT>
void mage::OBJReader< VertexT >::ReadOBJMaterialUse ( ) [protected]
```

5.51.2.9 ReadOBJObject()

```
template<typename VertexT>
void mage::OBJReader< VertexT >::ReadOBJObject ( ) [protected]
```


5.51.2.10 `ReadOBJTriangleFace()`

```
template<typename VertexT>
void mage::OBJReader< VertexT >::ReadOBJTriangleFace ( ) [protected]
```

5.51.2.11 `ReadOBJVertex()`

```
template<typename VertexT>
void mage::OBJReader< VertexT >::ReadOBJVertex ( ) [protected]
```

5.51.2.12 `ReadOBJVertexCoordinates()`

```
template<typename VertexT>
Point3 mage::OBJReader< VertexT >::ReadOBJVertexCoordinates ( ) [protected]
```

5.51.2.13 `ReadOBJVertexIndices()`

```
template<typename VertexT>
XMUINT3 mage::OBJReader< VertexT >::ReadOBJVertexIndices ( ) [protected]
```

5.51.2.14 `ReadOBJVertexNormal()`

```
template<typename VertexT>
void mage::OBJReader< VertexT >::ReadOBJVertexNormal ( ) [protected]
```

5.51.2.15 `ReadOBJVertexNormalCoordinates()`

```
template<typename VertexT>
Normal3 mage::OBJReader< VertexT >::ReadOBJVertexNormalCoordinates ( ) [protected]
```

5.51.2.16 `ReadOBJVertexTexture()`

```
template<typename VertexT>
void mage::OBJReader< VertexT >::ReadOBJVertexTexture ( ) [protected]
```

5.51.2.17 `ReadOBJVertexTextureCoordinates()`

```
template<typename VertexT>
UV mage::OBJReader< VertexT >::ReadOBJVertexTextureCoordinates ( ) [protected]
```

5.51.3 Member Data Documentation

5.51.3.1 m_mapping

```
template<typename VertexT>
map< XMUINT3, uint32_t, OBJComparatorXMUINT3 > mage::OBJReader< VertexT >::m_mapping [private]
```

5.51.3.2 m_mesh_desc

```
template<typename VertexT>
const MeshDescriptor< VertexT >& mage::OBJReader< VertexT >::m_mesh_desc [private]
```

5.51.3.3 m_model_output

```
template<typename VertexT>
ModelOutput< VertexT >& mage::OBJReader< VertexT >::m_model_output [private]
```

5.51.3.4 m_vertex_coordinates

```
template<typename VertexT>
vector< Point3 > mage::OBJReader< VertexT >::m_vertex_coordinates [private]
```

5.51.3.5 m_vertex_normal_coordinates

```
template<typename VertexT>
vector< Normal3 > mage::OBJReader< VertexT >::m_vertex_normal_coordinates [private]
```

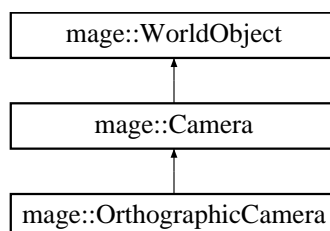
5.51.3.6 m_vertex_texture_coordinates

```
template<typename VertexT>
vector< UV > mage::OBJReader< VertexT >::m_vertex_texture_coordinates [private]
```

5.52 mage::OrthographicCamera Class Reference

```
#include <orthographic_camera.hpp>
```

Inheritance diagram for mage::OrthographicCamera:



Private Member Functions

- [OrthographicCamera](#) (const string &name, float width, float height, float near_z=MAGE_DEFAULT_CAMERA_NEAR_Z, float far_z=MAGE_DEFAULT_CAMERA_FAR_Z)
- [OrthographicCamera](#) (const [OrthographicCamera](#) &camera)
- virtual [~OrthographicCamera](#) ()=default
- [OrthographicCamera](#) & operator= (const [OrthographicCamera](#) &orthographic_camera)
- virtual [OrthographicCamera](#) * Clone () const override
- virtual XMMATRIX [GetViewToProjectionMatrix](#) () const override
- void [SetViewToProjectionMatrix](#) (float width, float height, float near_z=MAGE_DEFAULT_CAMERA_NEAR_Z, float far_z=MAGE_DEFAULT_CAMERA_FAR_Z)

Additional Inherited Members

5.52.1 Detailed Description

A class of orthographic cameras.

5.52.2 Constructor & Destructor Documentation

5.52.2.1 OrthographicCamera() [1/2]

```
mage::OrthographicCamera::OrthographicCamera (
    const string & name,
    float width,
    float height,
    float near_z = MAGE_DEFAULT_CAMERA_NEAR_Z,
    float far_z = MAGE_DEFAULT_CAMERA_FAR_Z ) [private]
```

Constructs an orthographic camera.

Parameters

in	<i>name</i>	A reference to the name of the orthographic camera.
in	<i>width</i>	The width.
in	<i>height</i>	The height.
in	<i>near_z</i>	The position of the near z-plane.
in	<i>far_z</i>	The position of the far z-plane.

5.52.2.2 OrthographicCamera() [2/2]

```
mage::OrthographicCamera::OrthographicCamera (
    const OrthographicCamera & camera ) [private]
```

Constructs an orthographic camera from the given orthographic camera.

Parameters

in	<i>camera</i>	A reference to the orthographic camera.
----	---------------	---

5.52.2.3 ~OrthographicCamera()

```
virtual mage::OrthographicCamera::~~OrthographicCamera ( ) [private], [virtual], [default]
```

Destructs this orthographic camera.

5.52.3 Member Function Documentation

5.52.3.1 Clone()

```
virtual OrthographicCamera* mage::OrthographicCamera::Clone ( ) const [override], [private], [virtual]
```

Clones this orthographic camera.

Returns

A pointer to the clone of this orthographic camera.

Implements [mage::Camera](#).

5.52.3.2 GetViewToProjectionMatrix()

```
virtual XMMATRIX mage::OrthographicCamera::GetViewToProjectionMatrix ( ) const [override], [private], [virtual]
```

Returns the view-to-projection matrix of this orthographic camera.

Returns

The view-to-projection matrix of this orthographic camera.

Implements [mage::Camera](#).

5.52.3.3 operator=()

```
OrthographicCamera& mage::OrthographicCamera::operator= (
    const OrthographicCamera & orthographic_camera ) [private]
```

Copies the given orthographic camera to this orthographic camera.

Parameters

in	<i>orthographic_camera</i>	The orthographic camera.
----	----------------------------	--------------------------

5.52.3.4 SetViewToProjectionMatrix()

```
void mage::OrthographicCamera::SetViewToProjectionMatrix (
    float width,
    float height,
    float near_z = MAGE_DEFAULT_CAMERA_NEAR_Z,
    float far_z = MAGE_DEFAULT_CAMERA_FAR_Z ) [private]
```

Sets the view-to-projection matrix of this orthographic camera.

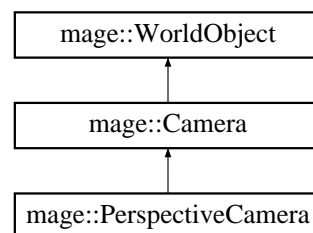
Parameters

in	<i>width</i>	The width.
in	<i>height</i>	The height.
in	<i>near_z</i>	The position of the near z-plane.
in	<i>far_z</i>	The position of the far z-plane.

5.53 mage::PerspectiveCamera Class Reference

```
#include <perspective_camera.hpp>
```

Inheritance diagram for mage::PerspectiveCamera:



Public Member Functions

- [PerspectiveCamera](#) (const string &name, float width, float height, float fov_y=MAGE_DEFAULT_CAMERA_FOV_Y, float near_z=MAGE_DEFAULT_CAMERA_NEAR_Z, float far_z=MAGE_DEFAULT_CAMERA_FAR_Z)
- [PerspectiveCamera](#) (const [PerspectiveCamera](#) &camera)
- virtual [~PerspectiveCamera](#) ()=default
- [PerspectiveCamera](#) & operator= (const [PerspectiveCamera](#) &perspective_camera)
- virtual [PerspectiveCamera](#) * [Clone](#) () const override
- float [GetFOVY](#) () const
- [Camera](#) & [SetFOVY](#) (float fov_y)
- float [GetAspectRatio](#) () const
- virtual XMMATRIX [GetViewToProjectionMatrix](#) () const override
- void [SetViewToProjectionMatrix](#) (float width, float height, float fov_y=MAGE_DEFAULT_CAMERA_FOV_Y, float near_z=MAGE_DEFAULT_CAMERA_NEAR_Z, float far_z=MAGE_DEFAULT_CAMERA_FAR_Z)

Private Attributes

- float `m_fov_y`

Additional Inherited Members

5.53.1 Detailed Description

A class of perspective camera.

5.53.2 Constructor & Destructor Documentation

5.53.2.1 `PerspectiveCamera()` [1/2]

```
mage::PerspectiveCamera::PerspectiveCamera (
    const string & name,
    float width,
    float height,
    float fov_y = MAGE_DEFAULT_CAMERA_FOV_Y,
    float near_z = MAGE_DEFAULT_CAMERA_NEAR_Z,
    float far_z = MAGE_DEFAULT_CAMERA_FAR_Z )
```

Constructs a perspective camera.

Parameters

in	<i>name</i>	A reference to the name of the perspective camera.
in	<i>width</i>	The width.
in	<i>height</i>	The height.
in	<i>fov_y</i>	The vertical field-of-view.
in	<i>near_z</i>	The position of the near z-plane.
in	<i>far_z</i>	The position of the far z-plane.

5.53.2.2 `PerspectiveCamera()` [2/2]

```
mage::PerspectiveCamera::PerspectiveCamera (
    const PerspectiveCamera & camera )
```

Constructs a perspective camera from the given perspective camera.

Parameters

in	<i>camera</i>	A reference to the perspective camera.
----	---------------	--

5.53.2.3 `~PerspectiveCamera()`

```
virtual mage::PerspectiveCamera::~PerspectiveCamera ( ) [virtual], [default]
```

Destructs this perspective camera.

5.53.3 Member Function Documentation

5.53.3.1 `Clone()`

```
virtual PerspectiveCamera* mage::PerspectiveCamera::Clone ( ) const [override], [virtual]
```

Clones this perspective camera.

Returns

A pointer to the clone of this perspective camera.

Implements [mage::Camera](#).

5.53.3.2 `GetAspectRatio()`

```
float mage::PerspectiveCamera::GetAspectRatio ( ) const
```

Returns the aspect ratio of this perspective camera.

Returns

The aspect ratio of this perspective camera.

5.53.3.3 `GetFOVY()`

```
float mage::PerspectiveCamera::GetFOVY ( ) const
```

Returns the vertical field-of-view of this perspective camera.

Returns

The vertical field-of-view of this perspective camera.

5.53.3.4 `GetViewToProjectionMatrix()`

```
virtual XMMATRIX mage::PerspectiveCamera::GetViewToProjectionMatrix ( ) const [override],  
[virtual]
```

Returns the view-to-projection matrix of this perspective camera.

Returns

The view-to-projection matrix of this perspective camera.

Implements [mage::Camera](#).

5.53.3.5 `operator=()`

```
PerspectiveCamera& mage::PerspectiveCamera::operator= (  
    const PerspectiveCamera & perspective_camera )
```

Copies the given perspective camera to this perspective camera.

Parameters

in	<i>perspective_camera</i>	The perspective camera.
----	---------------------------	-------------------------

5.53.3.6 SetFOVY()

```
Camera& mage::PerspectiveCamera::SetFOVY (
    float fov_y )
```

Sets the vertical field-of-view of this perspective camera to the given value.

Parameters

in	<i>fov_y</i>	The vertical field-of-view.
----	--------------	-----------------------------

Returns

A reference to this perspective camera.

5.53.3.7 SetViewToProjectionMatrix()

```
void mage::PerspectiveCamera::SetViewToProjectionMatrix (
    float width,
    float height,
    float fov_y = MAGE_DEFAULT_CAMERA_FOV_Y,
    float near_z = MAGE_DEFAULT_CAMERA_NEAR_Z,
    float far_z = MAGE_DEFAULT_CAMERA_FAR_Z )
```

Sets the view-to-projection matrix of this perspective camera.

Parameters

in	<i>width</i>	The width.
in	<i>height</i>	The height.
in	<i>fov_y</i>	The vertical field-of-view.
in	<i>near_z</i>	The position of the near z-plane.
in	<i>far_z</i>	The position of the far z-plane.

5.53.4 Member Data Documentation**5.53.4.1 m_fov_y**

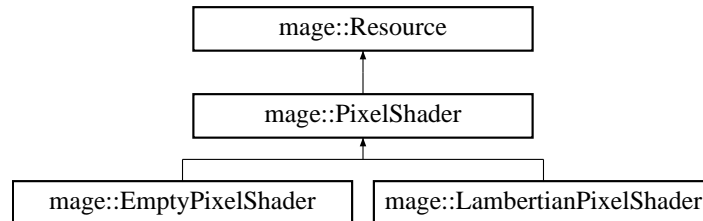
```
float mage::PerspectiveCamera::m_fov_y [private]
```

The vertical field-of-view of this perspective camera.

5.54 mage::PixelShader Class Reference

```
#include <shader.hpp>
```

Inheritance diagram for mage::PixelShader:



Public Member Functions

- [PixelShader](#) (const [RenderingDevice](#) &device, const wstring &fname)
- virtual [~PixelShader](#) ()=default
- virtual void [Render](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [Material](#) &material, const [World](#) &world) const =0

Protected Attributes

- [ComPtr](#)< ID3D11PixelShader > [m_pixel_shader](#)

Private Member Functions

- [PixelShader](#) (const [PixelShader](#) &pixel_shader)=delete
- [PixelShader](#) & [operator=](#) (const [PixelShader](#) &pixel_shader)=delete
- HRESULT [InitializeShader](#) (const [RenderingDevice](#) &device)

5.54.1 Constructor & Destructor Documentation

5.54.1.1 PixelShader() [1/2]

```
mage::PixelShader::PixelShader (
    const RenderingDevice & device,
    const wstring & fname )
```

5.54.1.2 ~PixelShader()

```
virtual mage::PixelShader::~~PixelShader ( ) [virtual], [default]
```

5.54.1.3 PixelShader() [2/2]

```
mage::PixelShader::PixelShader (
    const PixelShader & pixel_shader ) [private], [delete]
```

5.54.2 Member Function Documentation

5.54.2.1 InitializeShader()

```
HRESULT mage::PixelShader::InitializeShader (
    const RenderingDevice & device ) [private]
```

5.54.2.2 operator=()

```
PixelShader& mage::PixelShader::operator= (
    const PixelShader & pixel_shader ) [private], [delete]
```

5.54.2.3 Render()

```
virtual void mage::PixelShader::Render (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const Material & material,
    const World & world ) const [pure virtual]
```

Implemented in [mage::LambertianPixelShader](#), and [mage::EmptyPixelShader](#).

5.54.3 Member Data Documentation

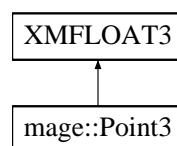
5.54.3.1 m_pixel_shader

```
ComPtr< ID3D11PixelShader > mage::PixelShader::m_pixel_shader [protected]
```

5.55 mage::Point3 Struct Reference

```
#include <math.hpp>
```

Inheritance diagram for `mage::Point3`:



Public Member Functions

- [Point3](#) ()
- [Point3](#) (float x, float y, float z)
- [Point3](#) (const [Point3](#) &point)
- [Point3](#) (const [Direction3](#) &direction)
- [Point3](#) (const [Normal3](#) &normal)
- [Point3](#) (const XMFLOAT3 &vector)
- [~Point3](#) ()=default
- [Point3](#) & [operator=](#) (const [Point3](#) &point)

5.55.1 Constructor & Destructor Documentation

5.55.1.1 Point3() [1/6]

```
mage::Point3::Point3 ( )
```

5.55.1.2 Point3() [2/6]

```
mage::Point3::Point3 (
    float x,
    float y,
    float z )
```

5.55.1.3 Point3() [3/6]

```
mage::Point3::Point3 (
    const Point3 & point )
```

5.55.1.4 Point3() [4/6]

```
mage::Point3::Point3 (
    const Direction3 & direction ) [explicit]
```

5.55.1.5 Point3() [5/6]

```
mage::Point3::Point3 (
    const Normal3 & normal ) [explicit]
```

5.55.1.6 Point3() [6/6]

```
mage::Point3::Point3 (
    const XMFLOAT3 & vector ) [explicit]
```

5.55.1.7 ~Point3()

```
mage::Point3::~~Point3 ( ) [default]
```

5.55.2 Member Function Documentation

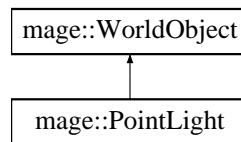
5.55.2.1 operator=()

```
Point3& mage::Point3::operator= (
    const Point3 & point )
```

5.56 mage::PointLight Class Reference

```
#include <point_light.hpp>
```

Inheritance diagram for mage::PointLight:



Public Member Functions

- [PointLight](#) (const string name, float radius, const [RGBSpectrum](#) &intensity)
- [PointLight](#) (const [PointLight](#) &light)
- virtual [~PointLight](#) ()=default
- [PointLight](#) & [operator=](#) (const [PointLight](#) &light)
- virtual [PointLight](#) * [Clone](#) () const
- float [GetRadius](#) () const
- void [SetRadius](#) (float radius)
- [RGBSpectrum](#) [GetIntensity](#) () const
- void [SetIntensity](#) (const [RGBSpectrum](#) &intensity)

Private Attributes

- string [m_name](#)
- [SharedPtr](#)< [Transform](#) > [m_transform](#)
- float [m_radius](#)
- [RGBSpectrum](#) [m_intensity](#)

Additional Inherited Members

5.56.1 Constructor & Destructor Documentation

5.56.1.1 PointLight() [1/2]

```
mage::PointLight::PointLight (
    const string name,
    float radius,
    const RGBSpectrum & intensity )
```

5.56.1.2 PointLight() [2/2]

```
mage::PointLight::PointLight (
    const PointLight & light )
```

5.56.1.3 ~PointLight()

```
virtual mage::PointLight::~~PointLight ( ) [virtual], [default]
```

5.56.2 Member Function Documentation

5.56.2.1 Clone()

```
virtual PointLight* mage::PointLight::Clone ( ) const [virtual]
```

5.56.2.2 GetIntensity()

```
RGBSpectrum mage::PointLight::GetIntensity ( ) const
```

5.56.2.3 GetRadius()

```
float mage::PointLight::GetRadius ( ) const
```

5.56.2.4 operator=()

```
PointLight& mage::PointLight::operator= (
    const PointLight & light )
```

5.56.2.5 SetIntensity()

```
void mage::PointLight::SetIntensity (
    const RGBSpectrum & intensity )
```

5.56.2.6 SetRadius()

```
void mage::PointLight::SetRadius (
    float radius )
```

5.56.3 Member Data Documentation

5.56.3.1 m_intensity

```
RGBSpectrum mage::PointLight::m_intensity [private]
```

The intensity of this point light.

5.56.3.2 m_name

```
string mage::PointLight::m_name [private]
```

The name of this point light.

5.56.3.3 m_radius

```
float mage::PointLight::m_radius [private]
```

The radius of this point light.

5.56.3.4 m_transform

```
SharedPtr< Transform > mage::PointLight::m_transform [private]
```

The transform of this point light.

5.57 mage::ProgressReporter Class Reference

```
#include <progress_reporter.hpp>
```

Public Member Functions

- [ProgressReporter](#) (const string &title, uint32_t nb_work, char plus_char='+', uint32_t bar_length=0)
- virtual [~ProgressReporter](#) ()
- void [Update](#) (uint32_t nb_work=1)
- void [Done](#) ()

Protected Attributes

- const uint32_t [m_nb_work_total](#)
- uint32_t [m_nb_work_done](#)
- uint32_t [m_nb_plusses_total](#)
- uint32_t [m_nb_plusses_printed](#)
- [UniquePtr](#)< [Timer](#) > [m_timer](#)
- FILE * [m_fout](#)
- const char [m_plus_char](#)
- char * [m_buffer](#)
- char * [m_current_pos](#)
- [Mutex](#) * [m_mutex](#)

Private Member Functions

- [ProgressReporter](#) (const [ProgressReporter](#) &progress_reporter)=delete
- [ProgressReporter](#) & [operator=](#) (const [ProgressReporter](#) &progress_reporter)=delete

5.57.1 Detailed Description

A class of progress reporters.

5.57.2 Constructor & Destructor Documentation

5.57.2.1 ProgressReporter() [1/2]

```
mage::ProgressReporter::ProgressReporter (
    const string & title,
    uint32_t nb_work,
    char plus_char = '+',
    uint32_t bar_length = 0 )
```

Constructs a progress reporter.

Parameters

in	<i>title</i>	A reference to the title.
in	<i>nb_work</i>	The total number of work units.
in	<i>plus_char</i>	The character representing a work unit that is already done.
in	<i>bar_length</i>	The length of the progress bar. If 0 the default length will be chosen.

5.57.2.2 ~ProgressReporter()

```
mage::ProgressReporter::~~ProgressReporter ( ) [virtual]
```

Destructs this progress reporter.

5.57.2.3 ProgressReporter() [2/2]

```
mage::ProgressReporter::ProgressReporter (
    const ProgressReporter & progress_reporter ) [private], [delete]
```

Constructs a progress reporter from the given progress reporter.

Parameters

in	<i>progress_reporter</i>	A reference to the progress reporter.
----	--------------------------	---------------------------------------

5.57.3 Member Function Documentation

5.57.3.1 Done()

```
void mage::ProgressReporter::Done ( )
```

Finishes this progress reporter.

5.57.3.2 operator=()

```
ProgressReporter& mage::ProgressReporter::operator= (
    const ProgressReporter & progress_reporter ) [private], [delete]
```

Copies the given progress reporter to this progress reporter.

Parameters

in	<i>progress_reporter</i>	A reference to the progress reporter to copy from.
----	--------------------------	--

Returns

A reference to the copy of the given progress reporter (i.e. this progress reporter).

5.57.3.3 Update()

```
void mage::ProgressReporter::Update (
    uint32_t nb_work = 1 )
```

Updates this progress reporter.

Parameters

in	<i>nb_work</i>	The number of work units that are done.
----	----------------	---

5.57.4 Member Data Documentation

5.57.4.1 m_buffer

```
char* mage::ProgressReporter::m_buffer [protected]
```

The output buffer of this progress reporter.

5.57.4.2 m_current_pos

```
char* mage::ProgressReporter::m_current_pos [protected]
```

The current (output) position of this progress reporter.

5.57.4.3 m_fout

```
FILE* mage::ProgressReporter::m_fout [protected]
```

The output file stream of this progress reporter.

5.57.4.4 m_mutex

```
Mutex* mage::ProgressReporter::m_mutex [protected]
```

The mutex needed for updating this progress reporter.

5.57.4.5 m_nb_plusses_printed

```
uint32_t mage::ProgressReporter::m_nb_plusses_printed [protected]
```

The total number of plusses that are already outputted.

5.57.4.6 m_nb_plusses_total

```
uint32_t mage::ProgressReporter::m_nb_plusses_total [protected]
```

The total number of plusses that need to be outputted.

5.57.4.7 m_nb_work_done

```
uint32_t mage::ProgressReporter::m_nb_work_done [protected]
```

The number of work units that are already done.

5.57.4.8 m_nb_work_total

```
const uint32_t mage::ProgressReporter::m_nb_work_total [protected]
```

The total number of work units that need to be done.

5.57.4.9 m_plus_char

```
const char mage::ProgressReporter::m_plus_char [protected]
```

The character representing a work unit that is already done.

5.57.4.10 m_timer

```
UniquePtr< Timer > mage::ProgressReporter::m_timer [protected]
```

The timer of this progress reporter.

5.58 mage::ReadWriteMutex Class Reference

```
#include <lock.hpp>
```

Static Public Member Functions

- static [ReadWriteMutex](#) * [Create](#) ()
- static void [Destroy](#) ([ReadWriteMutex](#) *mutex)

Private Member Functions

- [ReadWriteMutex](#) ()
- [ReadWriteMutex](#) (const [ReadWriteMutex](#) &mutex)=delete
- [~ReadWriteMutex](#) ()
- [ReadWriteMutex](#) & [operator=](#) (const [ReadWriteMutex](#) &mutex)=delete
- void [AcquireRead](#) ()
- void [ReleaseRead](#) ()
- void [AcquireWrite](#) ()
- void [ReleaseWrite](#) ()

Private Attributes

- LONG [m_nb_writers_waiting](#)
- LONG [m_nb_readers_waiting](#)
- DWORD [m_active_writer_readers](#)
- HANDLE [m_ready_to_read_handle](#)
- HANDLE [m_ready_to_write_handle](#)
- CRITICAL_SECTION [m_critical_section](#)

Friends

- struct [ReadWriteMutexLock](#)

5.58.1 Detailed Description

A class of read write mutexes.

5.58.2 Constructor & Destructor Documentation

5.58.2.1 [ReadWriteMutex\(\)](#) [1/2]

```
mage::ReadWriteMutex::ReadWriteMutex ( ) [private]
```

Constructs a read write mutex.

5.58.2.2 [ReadWriteMutex\(\)](#) [2/2]

```
mage::ReadWriteMutex::ReadWriteMutex (
    const ReadWriteMutex & mutex ) [private], [delete]
```

Constructs a read write mutex from the given read write mutex.

Parameters

in	<i>mutex</i>	The read write mutex.
----	--------------	-----------------------

5.58.2.3 ~ReadWriteMutex()

```
mage::ReadWriteMutex::~~ReadWriteMutex ( ) [private]
```

Destructs this read write mutex.

5.58.3 Member Function Documentation

5.58.3.1 AcquireRead()

```
void mage::ReadWriteMutex::AcquireRead ( ) [private]
```

Acquires a read.

5.58.3.2 AcquireWrite()

```
void mage::ReadWriteMutex::AcquireWrite ( ) [private]
```

Acquires a write.

5.58.3.3 Create()

```
static ReadWriteMutex\* mage::ReadWriteMutex::Create ( ) [static]
```

Creates a mutex.

5.58.3.4 Destroy()

```
static void mage::ReadWriteMutex::Destroy (
    ReadWriteMutex * mutex ) [static]
```

Destroys a given read write mutex.

Parameters

in	<i>mutex</i>	The read write mutex to destroy.
----	--------------	----------------------------------

5.58.3.5 operator=()

```
ReadWriteMutex& mage::ReadWriteMutex::operator= (
```

```
const ReadWriteMutex & mutex ) [private], [delete]
```

Copies the given read write mutex to this read write mutex.

Parameters

in	<i>mutex</i>	A reference to a read write mutex.
----	--------------	------------------------------------

Returns

A reference to the copy of *mutex*.

5.58.3.6 ReleaseRead()

```
void mage::ReadWriteMutex::ReleaseRead ( ) [private]
```

Release a read.

5.58.3.7 ReleaseWrite()

```
void mage::ReadWriteMutex::ReleaseWrite ( ) [private]
```

Release a write.

5.58.4 Friends And Related Function Documentation

5.58.4.1 ReadWriteMutexLock

```
friend struct ReadWriteMutexLock [friend]
```

5.58.5 Member Data Documentation

5.58.5.1 m_active_writer_readers

```
DWORD mage::ReadWriteMutex::m_active_writer_readers [private]
```

The active group of this read write mutex lock.

HIWORD is the flag indicating a writer is active. LOWORD is the number of active readers.

5.58.5.2 m_critical_section

```
CRITICAL_SECTION mage::ReadWriteMutex::m_critical_section [private]
```

The critical section object of this read write mutex.

5.58.5.3 `m_nb_readers_waiting`

`LONG mage::ReadWriteMutex::m_nb_readers_waiting` [private]

The number of readers waiting for this read write mutex lock.

5.58.5.4 `m_nb_writers_waiting`

`LONG mage::ReadWriteMutex::m_nb_writers_waiting` [private]

The number of writers waiting for this read write mutex lock.

5.58.5.5 `m_ready_to_read_handle`

`HANDLE mage::ReadWriteMutex::m_ready_to_read_handle` [private]

The handle of this read write mutex lock if ready for reading.

5.58.5.6 `m_ready_to_write_handle`

`HANDLE mage::ReadWriteMutex::m_ready_to_write_handle` [private]

The handle of this read write mutex lock if ready for writing.

5.59 `mage::ReadWriteMutexLock` Struct Reference

```
#include <lock.hpp>
```

Public Member Functions

- [ReadWriteMutexLock](#) ([ReadWriteMutex](#) &mutex, [ReadWriteMutexLockType](#) lock_type)
- [~ReadWriteMutexLock](#) ()
- void [UpgradeToWrite](#) ()
- void [DowngradeToRead](#) ()

Private Member Functions

- [ReadWriteMutexLock](#) (const [ReadWriteMutexLock](#) &mutex_lock)=delete
- [ReadWriteMutexLock](#) & operator= (const [ReadWriteMutexLock](#) &mutex_lock)=delete

Private Attributes

- [ReadWriteMutexLockType](#) m_type
- [ReadWriteMutex](#) & m_mutex

5.59.1 Detailed Description

A struct of read write mutex locks.

5.59.2 Constructor & Destructor Documentation

5.59.2.1 ReadWriteMutexLock() [1/2]

```
mage::ReadWriteMutexLock::ReadWriteMutexLock (
    ReadWriteMutex & mutex,
    ReadWriteMutexLockType lock_type )
```

Constructs a read write mutex lock for the given read write mutex and lock type.

Parameters

in	<i>mutex</i>	A reference to a read write mutex.
in	<i>lock_type</i>	The lock type.

5.59.2.2 ~ReadWriteMutexLock()

```
mage::ReadWriteMutexLock::~~ReadWriteMutexLock ( )
```

Destructs this read write mutex lock.

5.59.2.3 ReadWriteMutexLock() [2/2]

```
mage::ReadWriteMutexLock::ReadWriteMutexLock (
    const ReadWriteMutexLock & mutex_lock ) [private], [delete]
```

Constructs a read write mutex lock from the given read write mutex lock.

Parameters

in	<i>mutex_lock</i>	A reference to a read write mutex lock.
----	-------------------	---

5.59.3 Member Function Documentation

5.59.3.1 DowngradeToRead()

```
void mage::ReadWriteMutexLock::DowngradeToRead ( )
```

Downgrades this read write lock to read.

5.59.3.2 operator=()

```
ReadWriteMutexLock& mage::ReadWriteMutexLock::operator= (
    const ReadWriteMutexLock & mutex_lock ) [private], [delete]
```

Copies the given read write mutex lock to this read write mutex lock.

Parameters

in	<i>mutex_lock</i>	A reference to a read write mutex lock.
----	-------------------	---

Returns

A reference to the copy of the given mutex lock (i.e. this mutex lock).

5.59.3.3 UpgradeToWrite()

```
void mage::ReadWriteMutexLock::UpgradeToWrite ( )
```

Upgrades this read write lock to write.

5.59.4 Member Data Documentation

5.59.4.1 m_mutex

```
ReadWriteMutex& mage::ReadWriteMutexLock::m_mutex [private]
```

The read write mutex of this read write mutex lock.

5.59.4.2 m_type

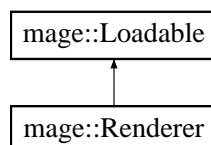
```
ReadWriteMutexLockType mage::ReadWriteMutexLock::m_type [private]
```

The lock type of this read write mutex lock.

5.60 mage::Renderer Class Reference

```
#include <renderer.hpp>
```

Inheritance diagram for mage::Renderer:



Public Member Functions

- [Renderer](#) (HWND hwnd)
- virtual [~Renderer](#) ()
- HWND [GetHandle](#) () const
- uint32_t [GetWidth](#) () const
- uint32_t [GetHeight](#) () const
- [RenderingDevice](#) [GetDevice](#) () const
- [ComPtr](#)< ID3D11DeviceContext2 > [GetDeviceContext](#) () const
- bool [IsWindowed](#) () const
- bool [IsFullScreen](#) () const
- bool [LostMode](#) () const
- void [SwitchMode](#) (bool toggle)
- void [StartSolidRasterizer](#) ()
- void [StartWireframeRasterizer](#) ()
- void [StartFrame](#) () const
- void [EndFrame](#) () const

Private Member Functions

- [Renderer](#) (const [Renderer](#) &renderer)=delete
- [Renderer](#) & [operator=](#) (const [Renderer](#) &renderer)=delete
- HRESULT [InitializeRenderer](#) ()
- HRESULT [UnitalizeRenderer](#) ()
- HRESULT [SetupDevice](#) ()
- HRESULT [SetupSwapChain](#) ()
- HRESULT [SetupRenderTargetView](#) ()
- HRESULT [SetupDepthStencilView](#) ()
- HRESULT [SetupRasterizerStates](#) ()
- HRESULT [SetupViewPort](#) () const

Private Attributes

- HWND [m_hwindow](#)
- bool [m_fullscreen](#)
- DXGI_MODE_DESC1 [m_display_mode](#)
- D3D_FEATURE_LEVEL [m_feature_level](#)
- [ComPtr](#)< ID3D11Device2 > [m_device2](#)
- [ComPtr](#)< ID3D11DeviceContext2 > [m_device_context2](#)
- [ComPtr](#)< IDXGISwapChain2 > [m_swap_chain2](#)
- [ComPtr](#)< ID3D11RenderTargetView > [m_render_target_view](#)
- [ComPtr](#)< ID3D11Texture2D > [m_depth_stencil](#)
- [ComPtr](#)< ID3D11DepthStencilView > [m_depth_stencil_view](#)
- [ComPtr](#)< ID3D11RasterizerState1 > [m_solid_rasterizer_state](#)
- [ComPtr](#)< ID3D11RasterizerState1 > [m_wireframe_rasterizer_state](#)

Additional Inherited Members

5.60.1 Detailed Description

A class of renderers.

5.60.2 Constructor & Destructor Documentation

5.60.2.1 `Renderer()` [1/2]

```
mage::Renderer::Renderer (
    HWND hwindow )
```

Constructs a renderer.

Parameters

in	<i>hwindow</i>	The main window handle.
----	----------------	-------------------------

5.60.2.2 `~Renderer()`

```
mage::Renderer::~~Renderer ( ) [virtual]
```

Destructs this renderer.

5.60.2.3 `Renderer()` [2/2]

```
mage::Renderer::Renderer (
    const Renderer & renderer ) [private], [delete]
```

Constructs a renderer from the given renderer.

Parameters

in	<i>renderer</i>	A reference to a renderer.
----	-----------------	----------------------------

5.60.3 Member Function Documentation

5.60.3.1 `EndFrame()`

```
void mage::Renderer::EndFrame ( ) const
```

Ends the rendering of the current frame.

5.60.3.2 `GetDevice()`

```
RenderingDevice mage::Renderer::GetDevice ( ) const
```

Returns the device of this renderer.

Returns

The device of this renderer.

5.60.3.3 GetDeviceContext()

```
ComPtr< ID3D11DeviceContext2 > mage::Renderer::GetDeviceContext ( ) const
```

Returns the device context of this renderer.

Returns

A pointer to the device context of this renderer.

5.60.3.4 GetHandle()

```
HWND mage::Renderer::GetHandle ( ) const
```

Returns the window handle of this renderer.

Returns

The window handle of this renderer.

5.60.3.5 GetHeight()

```
uint32_t mage::Renderer::GetHeight ( ) const
```

Returns the height in pixels of the display of this renderer.

Returns

The height in pixels of the display of this renderer.

5.60.3.6 GetWidth()

```
uint32_t mage::Renderer::GetWidth ( ) const
```

Returns the width in pixels of the display of this renderer.

Returns

The width in pixels of the display of this renderer.

5.60.3.7 InitializeRenderer()

```
HRESULT mage::Renderer::InitializeRenderer ( ) [private]
```

Initializes this renderer.

Returns

A success/error value.

5.60.3.8 IsFullScreen()

```
bool mage::Renderer::IsFullScreen ( ) const
```

Checks whether this renderer renders in full screen mode.

Returns

`true` if this renderer renders in full screen mode. `false` otherwise.

5.60.3.9 IsWindowed()

```
bool mage::Renderer::IsWindowed ( ) const
```

Checks whether this renderer renders in windowed mode.

Returns

`true` if this renderer renders in windowed mode. `false` otherwise.

5.60.3.10 LostMode()

```
bool mage::Renderer::LostMode ( ) const
```

Checks whether this renderer lost its mode, i.e. the current mode of this renderer differs from the current mode of its swap chain (due to for example ALT + TAB).

5.60.3.11 operator=()

```
Renderer& mage::Renderer::operator= (
    const Renderer & renderer ) [private], [delete]
```

Copies the given renderer to this renderer.

Parameters

in	<i>renderer</i>	A reference to a renderer.
----	-----------------	----------------------------

Returns

A reference to the copy of the given renderer (i.e. this renderer).

5.60.3.12 SetupDepthStencilView()

```
HRESULT mage::Renderer::SetupDepthStencilView ( ) [private]
```

Sets up the depth stencil view of this renderer.

Returns

A success/error value.

5.60.3.13 SetupDevice()

```
HRESULT mage::Renderer::SetupDevice ( ) [private]
```

Setup the D3D11 device and context of this renderer.

Returns

A success/error value.

5.60.3.14 SetupRasterizerStates()

```
HRESULT mage::Renderer::SetupRasterizerStates ( ) [private]
```

Sets up the rasterizer states of this renderer.

Returns

A success/error value.

5.60.3.15 SetupRenderTargetView()

```
HRESULT mage::Renderer::SetupRenderTargetView ( ) [private]
```

Sets up the render target view of this renderer.

Returns

A success/error value.

5.60.3.16 SetupSwapChain()

```
HRESULT mage::Renderer::SetupSwapChain ( ) [private]
```

Sets up the swap chain of this renderer.

Returns

A success/error value.

5.60.3.17 SetupViewPort()

```
HRESULT mage::Renderer::SetupViewPort ( ) const [private]
```

Sets up and binds the viewport of this renderer to the graphics pipeline.

Returns

A success/error value.

5.60.3.18 StartFrame()

```
void mage::Renderer::StartFrame ( ) const
```

Starts the rendering of the current frame.

5.60.3.19 StartSolidRasterizer()

```
void mage::Renderer::StartSolidRasterizer ( )
```

Start the solid rasterizer of this renderer.

5.60.3.20 StartWireframeRasterizer()

```
void mage::Renderer::StartWireframeRasterizer ( )
```

Start the wireframe rasterizer of this renderer.

5.60.3.21 SwitchMode()

```
void mage::Renderer::SwitchMode (
    bool toggle )
```

Recreates the swap chain buffers and switches the mode of this renderer. Windowed mode is switched to full screen mode and vice versa.

Returns

toggle If `true` only the swap chain buffers will be recreated to match the current mode of the swap chain and no mode switch will occur. If `false` both the swap chain buffers will be replaced and a mode switch will occur.

5.60.3.22 UnitalizeRenderer()

```
HRESULT mage::Renderer::UnitalizeRenderer ( ) [private]
```

Uninitializes this renderer.

Returns

A success/error value.

5.60.4 Member Data Documentation

5.60.4.1 m_depth_stencil

`ComPtr< ID3D11Texture2D > m_renderer::m_depth_stencil [private]`

5.60.4.2 m_depth_stencil_view

`ComPtr< ID3D11DepthStencilView > m_renderer::m_depth_stencil_view [private]`

5.60.4.3 m_device2

`ComPtr< ID3D11Device2 > m_renderer::m_device2 [private]`

5.60.4.4 m_device_context2

`ComPtr< ID3D11DeviceContext2 > m_renderer::m_device_context2 [private]`

5.60.4.5 m_display_mode

`DXGI_MODE_DESC1 m_renderer::m_display_mode [private]`

5.60.4.6 m_feature_level

`D3D_FEATURE_LEVEL m_renderer::m_feature_level [private]`

5.60.4.7 m_fullscreen

`bool m_renderer::m_fullscreen [private]`

A flag indicating whether this renderer uses a full screen mode (if `true`) or a windowed mode (if `false`).

5.60.4.8 m_hwindow

`HWND m_renderer::m_hwindow [private]`

The handle of the parent window.

5.60.4.9 m_render_target_view

`ComPtr< ID3D11RenderTargetView > m_renderer::m_render_target_view [private]`

5.60.4.10 m_solid_rasterizer_state

```
ComPtr< ID3D11RasterizerState1 > mage::Renderer::m_solid_rasterizer_state [private]
```

5.60.4.11 m_swap_chain2

```
ComPtr< IDXGISwapChain2 > mage::Renderer::m_swap_chain2 [private]
```

5.60.4.12 m_wireframe_rasterizer_state

```
ComPtr< ID3D11RasterizerState1 > mage::Renderer::m_wireframe_rasterizer_state [private]
```

5.61 mage::RenderingDevice Class Reference

```
#include <rendering_device.hpp>
```

Public Member Functions

- [RenderingDevice](#) ()=default
- [RenderingDevice](#) (ComPtr< ID3D11Device2 > device)
- [RenderingDevice](#) (const [RenderingDevice](#) &device)=default
- [~RenderingDevice](#) ()=default
- [RenderingDevice](#) & operator= (const [RenderingDevice](#) &device)=default
- D3D_FEATURE_LEVEL [GetFeatureLevel](#) () const
- HRESULT [CheckFormatSupport](#) (DXGI_FORMAT format, UINT *format_support) const
- HRESULT [CreateBuffer](#) (const D3D11_BUFFER_DESC *desc, const D3D11_SUBRESOURCE_DATA *init_data, ID3D11Buffer **buffer) const
- template<typename VertexT >
 HRESULT [CreateVertexBuffer](#) (ID3D11Buffer **buffer, const VertexT *vertices, size_t nb_vertices) const
- template<typename IndexT >
 HRESULT [CreateIndexBuffer](#) (ID3D11Buffer **buffer, const IndexT *indices, size_t nb_indices) const
- template<typename BufferT >
 HRESULT [CreateConstantBuffer](#) (ID3D11Buffer **buffer) const
- HRESULT [CreateTexture1D](#) (const D3D11_TEXTURE1D_DESC *desc, const D3D11_SUBRESOURCE_DATA *init_data, ID3D11Texture1D **texture) const
- HRESULT [CreateTexture2D](#) (const D3D11_TEXTURE2D_DESC *desc, const D3D11_SUBRESOURCE_DATA *init_data, ID3D11Texture2D **texture) const
- HRESULT [CreateTexture3D](#) (const D3D11_TEXTURE3D_DESC *desc, const D3D11_SUBRESOURCE_DATA *init_data, ID3D11Texture3D **texture) const
- HRESULT [CreateShaderResourceView](#) (ID3D11Resource *resource, const D3D11_SHADER_RESOURCE_VIEW_DESC *desc, ID3D11ShaderResourceView **shader_resource_view) const
- HRESULT [CreateVertexShader](#) (ID3D11VertexShader **shader, ComPtr< ID3DBlob > shader_blob) const
- HRESULT [CreatePixelShader](#) (ID3D11PixelShader **shader, ComPtr< ID3DBlob > shader_blob) const
- HRESULT [CreateVertexInputLayout](#) (ID3D11InputLayout **input_layout, ComPtr< ID3DBlob > shader_blob, const D3D11_INPUT_ELEMENT_DESC *input_element_desc, uint32_t nb_input_elements) const
- HRESULT [CreateSamplerState](#) (const D3D11_SAMPLER_DESC *desc, ID3D11SamplerState **sampler_state) const
- HRESULT [CreateLinearSamplerState](#) (ID3D11SamplerState **sampler_state) const

Private Attributes

- [ComPtr< ID3D11Device2 > m_device](#)

5.61.1 Constructor & Destructor Documentation

5.61.1.1 RenderingDevice() [1/3]

```
mage::RenderingDevice::RenderingDevice ( ) [default]
```

5.61.1.2 RenderingDevice() [2/3]

```
mage::RenderingDevice::RenderingDevice (
    ComPtr< ID3D11Device2 > device )
```

5.61.1.3 RenderingDevice() [3/3]

```
mage::RenderingDevice::RenderingDevice (
    const RenderingDevice & device ) [default]
```

5.61.1.4 ~RenderingDevice()

```
mage::RenderingDevice::~~RenderingDevice ( ) [default]
```

5.61.2 Member Function Documentation

5.61.2.1 CheckFormatSupport()

```
HRESULT mage::RenderingDevice::CheckFormatSupport (
    DXGI_FORMAT format,
    UINT * format_support ) const
```

5.61.2.2 CreateBuffer()

```
HRESULT mage::RenderingDevice::CreateBuffer (
    const D3D11_BUFFER_DESC * desc,
    const D3D11_SUBRESOURCE_DATA * init_data,
    ID3D11Buffer ** buffer ) const
```

5.61.2.3 CreateConstantBuffer()

```
template<typename BufferT >
HRESULT mage::RenderingDevice::CreateConstantBuffer (
    ID3D11Buffer ** buffer ) const
```


5.61.2.4 CreateIndexBuffer()

```
template<typename IndexT >
HRESULT mage::RenderingDevice::CreateIndexBuffer (
    ID3D11Buffer ** buffer,
    const IndexT * indices,
    size_t nb_indices ) const
```

5.61.2.5 CreateLinearSamplerState()

```
HRESULT mage::RenderingDevice::CreateLinearSamplerState (
    ID3D11SamplerState ** sampler_state ) const
```

5.61.2.6 CreatePixelShader()

```
HRESULT mage::RenderingDevice::CreatePixelShader (
    ID3D11PixelShader ** shader,
    ComPtr< ID3DBlob > shader_blob ) const
```

5.61.2.7 CreateSamplerState()

```
HRESULT mage::RenderingDevice::CreateSamplerState (
    const D3D11_SAMPLER_DESC * desc,
    ID3D11SamplerState ** sampler_state ) const
```

5.61.2.8 CreateShaderResourceView()

```
HRESULT mage::RenderingDevice::CreateShaderResourceView (
    ID3D11Resource * resource,
    const D3D11_SHADER_RESOURCE_VIEW_DESC * desc,
    ID3D11ShaderResourceView ** shader_resource_view ) const
```

5.61.2.9 CreateTexture1D()

```
HRESULT mage::RenderingDevice::CreateTexture1D (
    const D3D11_TEXTURE1D_DESC * desc,
    const D3D11_SUBRESOURCE_DATA * init_data,
    ID3D11Texture1D ** texture ) const
```

5.61.2.10 CreateTexture2D()

```
HRESULT mage::RenderingDevice::CreateTexture2D (
    const D3D11_TEXTURE2D_DESC * desc,
    const D3D11_SUBRESOURCE_DATA * init_data,
    ID3D11Texture2D ** texture ) const
```

5.61.2.11 CreateTexture3D()

```
HRESULT mage::RenderingDevice::CreateTexture3D (
    const D3D11_TEXTURE3D_DESC * desc,
    const D3D11_SUBRESOURCE_DATA * init_data,
    ID3D11Texture3D ** texture ) const
```

5.61.2.12 CreateVertexBuffer()

```
template<typename VertexT >
HRESULT mage::RenderingDevice::CreateVertexBuffer (
    ID3D11Buffer ** buffer,
    const VertexT * vertices,
    size_t nb_vertices ) const
```

5.61.2.13 CreateVertexInputLayout()

```
HRESULT mage::RenderingDevice::CreateVertexInputLayout (
    ID3D11InputLayout ** input_layout,
    ComPtr< ID3DBlob > shader_blob,
    const D3D11_INPUT_ELEMENT_DESC * input_element_desc,
    uint32_t nb_input_elements ) const
```

5.61.2.14 CreateVertexShader()

```
HRESULT mage::RenderingDevice::CreateVertexShader (
    ID3D11VertexShader ** shader,
    ComPtr< ID3DBlob > shader_blob ) const
```

5.61.2.15 GetFeatureLevel()

```
D3D_FEATURE_LEVEL mage::RenderingDevice::GetFeatureLevel ( ) const
```

5.61.2.16 operator=()

```
RenderingDevice& mage::RenderingDevice::operator= (
    const RenderingDevice & device ) [default]
```

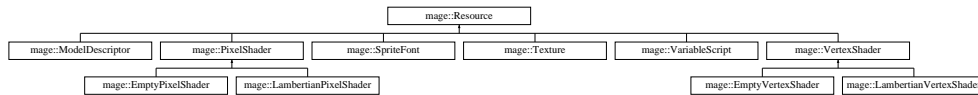
5.61.3 Member Data Documentation**5.61.3.1 m_device**

```
ComPtr< ID3D11Device2 > mage::RenderingDevice::m_device [private]
```

5.62 mage::Resource Class Reference

```
#include <resource.hpp>
```

Inheritance diagram for mage::Resource:



Public Member Functions

- [Resource](#) (const wstring &fname)
- [Resource](#) (const [Resource](#) &resource)=default
- virtual [~Resource](#) ()=default
- const wstring [GetFilename](#) () const
- const wstring [GetName](#) () const
- const wstring [GetPath](#) () const

Private Member Functions

- [Resource](#) & [operator=](#) (const [Resource](#) &resource)=delete

Private Attributes

- const wstring [m_fname](#)

5.62.1 Detailed Description

A class of resources.

5.62.2 Constructor & Destructor Documentation

5.62.2.1 Resource() [1/2]

```
mage::Resource::Resource (
    const wstring & fname )
```

Constructs a resource with a given filename.

Parameters

in	<i>fname</i>	A reference to the filename.
----	--------------	------------------------------

5.62.2.2 Resource() [2/2]

```
mage::Resource::Resource (
    const Resource & resource ) [default]
```

Constructs a resource from the given resource.

Parameters

in	<i>resource</i>	A reference to the resource.
----	-----------------	------------------------------

5.62.2.3 ~Resource()

```
virtual mage::Resource::~~Resource ( ) [virtual], [default]
```

Destructs this resource.

5.62.3 Member Function Documentation

5.62.3.1 GetFilename()

```
const wstring mage::Resource::GetFilename ( ) const
```

Returns the filename of this resource.

Returns

The filename of this resource.

5.62.3.2 GetName()

```
const wstring mage::Resource::GetName ( ) const
```

Returns the name of this resource.

Returns

The name of this resource.

5.62.3.3 GetPath()

```
const wstring mage::Resource::GetPath ( ) const
```

Returns the path of this resource.

Returns

The path of this resource.

5.62.3.4 operator=()

```
Resource& mage::Resource::operator= (
    const Resource & resource ) [private], [delete]
```

Copies the given resource to this resource.

Parameters

in	<i>resource</i>	A reference to the resource to copy from.
----	-----------------	---

Returns

A reference to the copy of the given resource (i.e. this resource).

5.62.4 Member Data Documentation

5.62.4.1 m_fname

```
const wstring mage::Resource::m_fname [private]
```

The name of this resource.

5.63 mage::ResourceFactory Class Reference

```
#include <resource_factory.hpp>
```

Public Member Functions

- [ResourceFactory](#) ()
- virtual [~ResourceFactory](#) ()=default
- template<typename VertexT >
[SharedPtr](#)< [ModelDescriptor](#) > [CreateModelDescriptor](#) (const wstring &fname, const [RenderingDevice](#) &device, const [MeshDescriptor](#)< VertexT > &desc)
- [SharedPtr](#)< [VertexShader](#) > [CreateLambertianVertexShader](#) (const [RenderingDevice](#) &device)
- [SharedPtr](#)< [PixelShader](#) > [CreateLambertianPixelShader](#) (const [RenderingDevice](#) &device)
- [SharedPtr](#)< [Texture](#) > [CreateTexture](#) (const [RenderingDevice](#) &device, const wstring &fname)
- [SharedPtr](#)< [VariableScript](#) > [CreateVariableScript](#) (const wstring &fname, bool import)

Private Member Functions

- [ResourceFactory](#) (const [ResourceFactory](#) &resource_factory)=delete
- [ResourceFactory](#) & operator= (const [ResourceFactory](#) &resource_factory)=delete

Private Attributes

- [UniquePtr](#)< [ResourceManager](#)< [ModelDescriptor](#) > > m_model_descriptor_resource_manager
- [UniquePtr](#)< [ResourceManager](#)< [VertexShader](#) > > m_vertex_shader_resource_manager
- [UniquePtr](#)< [ResourceManager](#)< [PixelShader](#) > > m_pixel_shader_resource_manager
- [UniquePtr](#)< [ResourceManager](#)< [Texture](#) > > m_texture_resource_manager
- [UniquePtr](#)< [ResourceManager](#)< [VariableScript](#) > > m_variable_script_resource_manager

5.63.1 Constructor & Destructor Documentation

5.63.1.1 ResourceFactory() [1/2]

```
mage::ResourceFactory::ResourceFactory ( )
```

5.63.1.2 ~ResourceFactory()

```
virtual mage::ResourceFactory::~~ResourceFactory ( ) [virtual], [default]
```

5.63.1.3 ResourceFactory() [2/2]

```
mage::ResourceFactory::ResourceFactory (
    const ResourceFactory & resource_factory ) [private], [delete]
```

5.63.2 Member Function Documentation

5.63.2.1 CreateLambertianPixelShader()

```
SharedPtr< PixelShader > mage::ResourceFactory::CreateLambertianPixelShader (
    const RenderingDevice & device )
```

5.63.2.2 CreateLambertianVertexShader()

```
SharedPtr< VertexShader > mage::ResourceFactory::CreateLambertianVertexShader (
    const RenderingDevice & device )
```

5.63.2.3 CreateModelDescriptor()

```
template<typename VertexT >
SharedPtr< ModelDescriptor > mage::ResourceFactory::CreateModelDescriptor (
    const wstring & fname,
    const RenderingDevice & device,
    const MeshDescriptor< VertexT > & desc )
```

5.63.2.4 CreateTexture()

```
SharedPtr< Texture > mage::ResourceFactory::CreateTexture (
    const RenderingDevice & device,
    const wstring & fname )
```

5.63.2.5 CreateVariableScript()

```
SharedPtr< VariableScript > mage::ResourceFactory::CreateVariableScript (
    const wstring & fname,
    bool import )
```

5.63.2.6 operator=()

```
ResourceFactory& mage::ResourceFactory::operator= (
    const ResourceFactory & resource_factory ) [private], [delete]
```

5.63.3 Member Data Documentation

5.63.3.1 m_model_descriptor_resource_manager

```
UniquePtr< ResourceManager< ModelDescriptor > > mage::ResourceFactory::m_model_descriptor_↵
resource_manager [private]
```

5.63.3.2 m_pixel_shader_resource_manager

```
UniquePtr< ResourceManager< PixelShader > > mage::ResourceFactory::m_pixel_shader_resource_↵
manager [private]
```

5.63.3.3 m_texture_resource_manager

```
UniquePtr< ResourceManager< Texture > > mage::ResourceFactory::m_texture_resource_manager
[private]
```

5.63.3.4 m_variable_script_resource_manager

```
UniquePtr< ResourceManager< VariableScript > > mage::ResourceFactory::m_variable_script_↵
resource_manager [private]
```

5.63.3.5 m_vertex_shader_resource_manager

```
UniquePtr< ResourceManager< VertexShader > > mage::ResourceFactory::m_vertex_shader_resource_↵
_manager [private]
```

5.64 mage::ResourceManager< T > Class Template Reference

```
#include <resource_manager.hpp>
```

Public Member Functions

- [ResourceManager](#) ()=default
- virtual [~ResourceManager](#) ()=default
- bool [ContainsResource](#) (const wstring &fname) const
- size_t [GetNumberbOfResources](#) () const
- void [AddResource](#) (SharedPtr< T > resource)
- void [RemoveResource](#) (const wstring &fname)
- void [RemoveResource](#) (SharedPtr< T > resource)
- void [RemoveAllResources](#) ()
- SharedPtr< T > [GetResource](#) (const wstring &fname) const

Private Member Functions

- [ResourceManager](#) (const [ResourceManager](#) &resource_manager)=delete
- [ResourceManager](#) & operator= (const [ResourceManager](#) &resource_manager)=delete

Private Attributes

- map< wstring, [SharedPtr](#)< T > > [m_resources](#)

5.64.1 Detailed Description

```
template<typename T>
class mage::ResourceManager< T >
```

A class of resource managers.

Template Parameters

<i>T</i>	The type of resources.
----------	------------------------

5.64.2 Constructor & Destructor Documentation

5.64.2.1 ResourceManager() [1/2]

```
template<typename T >
mage::ResourceManager< T >::ResourceManager ( ) [default]
```

Constructs a resource manager.

5.64.2.2 ~ResourceManager()

```
template<typename T >
virtual mage::ResourceManager< T >::~~ResourceManager ( ) [virtual], [default]
```

Destructs this resource manager.

5.64.2.3 ResourceManager() [2/2]

```
template<typename T >
mage::ResourceManager< T >::ResourceManager (
    const ResourceManager< T > & resource_manager ) [private], [delete]
```

Constructs a resource manager from the given resource manager.

Parameters

in	<i>resource_manager</i>	A reference to the resource manager.
----	-------------------------	--------------------------------------

5.64.3 Member Function Documentation

5.64.3.1 AddResource()

```
template<typename T >
void mage::ResourceManager< T >::AddResource (
    SharedPtr< T > resource )
```

Adds the given resource to this resource manager.

Parameters

in	<i>resource</i>	A pointer to the resource.
----	-----------------	----------------------------

5.64.3.2 ContainsResource()

```
template<typename T >
bool mage::ResourceManager< T >::ContainsResource (
    const wstring & fname ) const
```

Checks whether this resource manager contains the given resource.

Parameters

in	<i>fname</i>	A reference to the filename of the resource.
----	--------------	--

Returns

`true` if this resource manager contains the given resource. `false` otherwise.

5.64.3.3 GetNumberbOfResources()

```
template<typename T >
size_t mage::ResourceManager< T >::GetNumberbOfResources ( ) const
```

Returns the number of resources of this resource manager.

Returns

The number of resources of this resource manager.

5.64.3.4 GetResource()

```
template<typename T >
SharedPtr< T > mage::ResourceManager< T >::GetResource (
    const wstring & fname ) const
```

Returns the given resource of this resource manager.

Parameters

in	<i>fname</i>	A reference to the filename of the resource.
----	--------------	--

Returns

nullptr if the resource is not present.
A pointer to the resource.

5.64.3.5 operator=()

```
template<typename T >
ResourceManager& mage::ResourceManager< T >::operator= (
    const ResourceManager< T > & resource_manager ) [private], [delete]
```

Copies the given resource manager to this resource manager.

Parameters

in	<i>resource_manager</i>	A reference to the resource manager to copy from.
----	-------------------------	---

Returns

A reference to the copy of the given resource manager (i.e. this resource manager).

5.64.3.6 RemoveAllResources()

```
template<typename T >
void mage::ResourceManager< T >::RemoveAllResources ( )
```

Removes all resources from this resource manager.

5.64.3.7 RemoveResource() [1/2]

```
template<typename T >
void mage::ResourceManager< T >::RemoveResource (
    const wstring & fname )
```

Removes the given resource from this resource manager.

Parameters

in	<i>fname</i>	A reference to the filename of the resource.
----	--------------	--

5.64.3.8 RemoveResource() [2/2]

```
template<typename T >
void mage::ResourceManager< T >::RemoveResource (
    SharedPtr< T > resource )
```

Removes the given resource from this resource manager.

Parameters

in	<i>resource</i>	A pointer to the resource.
----	-----------------	----------------------------

5.64.4 Member Data Documentation

5.64.4.1 m_resources

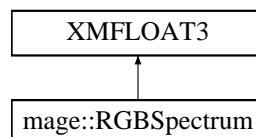
```
template<typename T >
map< wstring, SharedPtr< T > > mage::ResourceManager< T >::m_resources [private]
```

The map containing the resources of this resource manager as value and their file names as key.

5.65 mage::RGBSpectrum Struct Reference

```
#include <spectrum.hpp>
```

Inheritance diagram for mage::RGBSpectrum:



Public Member Functions

- [RGBSpectrum](#) ()
- [RGBSpectrum](#) (float r, float g, float b)
- [RGBSpectrum](#) (const [RGBSpectrum](#) &rgb)
- [RGBSpectrum](#) (const [XYZSpectrum](#) &xyz)
- [RGBSpectrum](#) (const XMFLOAT3 &vector)
- [~RGBSpectrum](#) ()=default
- [RGBSpectrum](#) & [operator=](#) (const [RGBSpectrum](#) &rgb)

5.65.1 Constructor & Destructor Documentation

5.65.1.1 RGBSpectrum() [1/5]

```
mage::RGBSpectrum::RGBSpectrum ( )
```

5.65.1.2 RGBSpectrum() [2/5]

```
mage::RGBSpectrum::RGBSpectrum (
    float r,
    float g,
    float b )
```

5.65.1.3 RGBSpectrum() [3/5]

```
mage::RGBSpectrum::RGBSpectrum (
    const RGBSpectrum & rgb )
```

5.65.1.4 RGBSpectrum() [4/5]

```
mage::RGBSpectrum::RGBSpectrum (
    const XYZSpectrum & xyz )
```

5.65.1.5 RGBSpectrum() [5/5]

```
mage::RGBSpectrum::RGBSpectrum (
    const XMFLOAT3 & vector ) [explicit]
```

5.65.1.6 ~RGBSpectrum()

```
mage::RGBSpectrum::~~RGBSpectrum ( ) [default]
```

5.65.2 Member Function Documentation

5.65.2.1 operator=()

```
RGBSpectrum& mage::RGBSpectrum::operator= (
    const RGBSpectrum & rgb )
```

5.66 mage::Scene Class Reference

```
#include <scene.hpp>
```

Public Member Functions

- `~Scene()`=default
- `const string & GetName()` const
- `void SetName(const string &name)`
- `Camera & GetCamera()` const
- `void SetCamera(SharedPtr< Camera > camera)`
- `World & GetWorld()` const
- `set< SharedPtr< BehaviorScript > >::iterator ScriptsBegin()`
- `set< SharedPtr< BehaviorScript > >::iterator ScriptsEnd()`
- `set< SharedPtr< BehaviorScript > >::const_iterator ScriptsBegin()` const
- `set< SharedPtr< BehaviorScript > >::const_iterator ScriptsEnd()` const
- `size_t GetNumberOfScripts()` const
- `SharedPtr< BehaviorScript > GetScript(const string &name)` const
- `bool HasScript(const string &name)` const
- `bool HasScript(const SharedPtr< BehaviorScript > script)` const
- `void AddScript(SharedPtr< BehaviorScript > script, bool load=false)`
- `void RemoveScript(const string &name, bool close=false)`
- `void RemoveScript(SharedPtr< BehaviorScript > script, bool close=false)`
- `void RemoveAllScripts(bool close=false)`
- `virtual void Load()`
- `void Update(double elapsed_time)`
- `void Render(ComPtr< ID3D11DeviceContext2 > device_context)`
- `virtual void Close()`

Protected Member Functions

- `Scene(const string &name)`

Private Member Functions

- `Scene(const Scene &scene)=delete`
- `Scene & operator=(const Scene &scene)=delete`

Private Attributes

- `string m_name`
- `SharedPtr< Camera > m_camera`
- `SharedPtr< World > m_world`
- `set< SharedPtr< BehaviorScript >, std::less<> > m_scripts`

5.66.1 Constructor & Destructor Documentation

5.66.1.1 ~Scene()

```
mage::Scene::~Scene ( ) [default]
```

5.66.1.2 Scene() [1/2]

```
mage::Scene::Scene (
    const string & name ) [protected]
```

5.66.1.3 Scene() [2/2]

```
mage::Scene::Scene (
    const Scene & scene ) [private], [delete]
```

5.66.2 Member Function Documentation

5.66.2.1 AddScript()

```
void mage::Scene::AddScript (
    SharedPtr< BehaviorScript > script,
    bool load = false )
```

5.66.2.2 Close()

```
void mage::Scene::Close ( ) [virtual]
```

Closes this scene. Allows this scene to preform any post-processing destruction.

5.66.2.3 GetCamera()

```
Camera& mage::Scene::GetCamera ( ) const
```

5.66.2.4 GetName()

```
const string& mage::Scene::GetName ( ) const
```

5.66.2.5 GetNumberOfScripts()

```
size_t mage::Scene::GetNumberOfScripts ( ) const
```

5.66.2.6 GetScript()

```
SharedPtr< BehaviorScript > mage::Scene::GetScript (
    const string & name ) const
```

5.66.2.7 GetWorld()

```
World& mage::Scene::GetWorld ( ) const
```

5.66.2.8 HasScript() [1/2]

```
bool mage::Scene::HasScript (
    const string & name ) const
```

5.66.2.9 HasScript() [2/2]

```
bool mage::Scene::HasScript (
    const SharedPtr< BehaviorScript > script ) const
```

5.66.2.10 Load()

```
void mage::Scene::Load ( ) [virtual]
```

Loads this scene. Allows this scene to preform any pre-processing construction.

5.66.2.11 operator=()

```
Scene& mage::Scene::operator= (
    const Scene & scene ) [private], [delete]
```

5.66.2.12 RemoveAllScripts()

```
void mage::Scene::RemoveAllScripts (
    bool close = false )
```

5.66.2.13 RemoveScript() [1/2]

```
void mage::Scene::RemoveScript (
    const string & name,
    bool close = false )
```

5.66.2.14 RemoveScript() [2/2]

```
void mage::Scene::RemoveScript (
    SharedPtr< BehaviorScript > script,
    bool close = false )
```

5.66.2.15 Render()

```
void mage::Scene::Render (
    ComPtr< ID3D11DeviceContext2 > device_context )
```

Renders this scene.

Parameters

in	<i>device_context</i>	A pointer to the device context.
----	-----------------------	----------------------------------

5.66.2.16 ScriptsBegin() [1/2]

```
set< SharedPtr< BehaviorScript > >::iterator mage::Scene::ScriptsBegin ( )
```

5.66.2.17 ScriptsBegin() [2/2]

```
set< SharedPtr< BehaviorScript > >::const_iterator mage::Scene::ScriptsBegin ( ) const
```

5.66.2.18 ScriptsEnd() [1/2]

```
set< SharedPtr< BehaviorScript > >::iterator mage::Scene::ScriptsEnd ( )
```

5.66.2.19 ScriptsEnd() [2/2]

```
set< SharedPtr< BehaviorScript > >::const_iterator mage::Scene::ScriptsEnd ( ) const
```

5.66.2.20 SetCamera()

```
void mage::Scene::SetCamera (
    SharedPtr< Camera > camera )
```

5.66.2.21 SetName()

```
void mage::Scene::SetName (
    const string & name )
```

5.66.2.22 Update()

```
void mage::Scene::Update (
    double elapsed_time )
```

Updates this scene.

Parameters

in	<i>elapsed_time</i>	The elapsed time since the previous update.
----	---------------------	---

5.66.3 Member Data Documentation

5.66.3.1 m_camera

```
SharedPtr< Camera > mage::Scene::m_camera [private]
```

5.66.3.2 m_name

```
string mage::Scene::m_name [private]
```

5.66.3.3 m_scripts

```
set< SharedPtr< BehaviorScript >, std::less<> > mage::Scene::m_scripts [private]
```

5.66.3.4 m_world

```
SharedPtr< World > mage::Scene::m_world [private]
```

5.67 mage::Semaphore Class Reference

```
#include <lock.hpp>
```

Public Member Functions

- Semaphore ()
- ~Semaphore ()
- void Post (uint32_t count=1)
- void Wait ()
- bool TryWait ()

Private Member Functions

- Semaphore (const Semaphore &semaphore)=delete
- Semaphore & operator= (const Semaphore &semaphore)=delete

Private Attributes

- HANDLE m_handle

5.67.1 Detailed Description

A class of semaphores.

5.67.2 Constructor & Destructor Documentation

5.67.2.1 Semaphore() [1/2]

```
mage::Semaphore::Semaphore ( )
```

Constructs a semaphore.

5.67.2.2 ~Semaphore()

```
mage::Semaphore::~~Semaphore ( )
```

Destructs this semaphore.

5.67.2.3 Semaphore() [2/2]

```
mage::Semaphore::Semaphore (
    const Semaphore & semaphore ) [private], [delete]
```

Constructs a semaphore from the given semaphore.

Parameters

in	<i>semaphore</i>	A reference to a semaphore.
----	------------------	-----------------------------

5.67.3 Member Function Documentation

5.67.3.1 operator=()

```
Semaphore& mage::Semaphore::operator= (
    const Semaphore & semaphore ) [private], [delete]
```

Copies the given semaphore to this semaphore.

Parameters

in	<i>semaphore</i>	A reference to a semaphore.
----	------------------	-----------------------------

Returns

A reference to the copy of the given semaphore (i.e. this semaphore)

5.67.3.2 Post()

```
void mage::Semaphore::Post (
    uint32_t count = 1 )
```

Increments the value of this semaphore variable by the given value.

The process executing wait is blocked until the value of the semaphore is greater or equal to 1.

Parameters

<code>in</code>	<code>count</code>	The increment value.
-----------------	--------------------	----------------------

5.67.3.3 TryWait()

```
bool mage::Semaphore::TryWait ( )
```

Checks whether waiting for this semaphore would be necessary.

Returns

`true` if waiting for this semaphore would be necessary. `false` otherwise.

5.67.3.4 Wait()

```
void mage::Semaphore::Wait ( )
```

Decrements the value of this semaphore variable by one.

If the initial value of the semaphore is negative, the waiting queue is not empty and thus one blocked process can be transferred to the ready queue.

5.67.4 Member Data Documentation

5.67.4.1 `m_handle`

```
HANDLE mage::Semaphore::m_handle [private]
```

The handle of this semaphore.

5.68 `mage::ShadedMaterial` Struct Reference

```
#include <shaded_material.hpp>
```

Public Member Functions

- `ShadedMaterial` (const `CombinedShader` &shader, const `Material` &material)
- `ShadedMaterial` (const `ShadedMaterial` &shaded_material)=default
- `~ShadedMaterial` ()=default
- `ShadedMaterial` & `operator=` (const `ShadedMaterial` &shaded_material)=default
- void `Render` (`ComPtr`< `ID3D11DeviceContext2` > device_context, const `World` &world, const `TransformBuffer` &transform_buffer)
- `Material` & `GetMaterial` ()
- const `Material` & `GetMaterial` () const
- `CombinedShader` & `GetShader` ()
- const `CombinedShader` & `GetShader` () const

Private Attributes

- [CombinedShader m_shader](#)
- [Material m_material](#)

5.68.1 Constructor & Destructor Documentation

5.68.1.1 ShadedMaterial() [1/2]

```
mage::ShadedMaterial::ShadedMaterial (
    const CombinedShader & shader,
    const Material & material )
```

5.68.1.2 ShadedMaterial() [2/2]

```
mage::ShadedMaterial::ShadedMaterial (
    const ShadedMaterial & shaded_material ) [default]
```

5.68.1.3 ~ShadedMaterial()

```
mage::ShadedMaterial::~~ShadedMaterial ( ) [default]
```

5.68.2 Member Function Documentation

5.68.2.1 GetMaterial() [1/2]

```
Material& mage::ShadedMaterial::GetMaterial ( )
```

5.68.2.2 GetMaterial() [2/2]

```
const Material& mage::ShadedMaterial::GetMaterial ( ) const
```

5.68.2.3 GetShader() [1/2]

```
CombinedShader& mage::ShadedMaterial::GetShader ( )
```

5.68.2.4 GetShader() [2/2]

```
const CombinedShader& mage::ShadedMaterial::GetShader ( ) const
```

5.68.2.5 operator=()

```
ShadedMaterial& mage::ShadedMaterial::operator= (
    const ShadedMaterial & shaded_material ) [default]
```

5.68.2.6 Render()

```
void mage::ShadedMaterial::Render (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const World & world,
    const TransformBuffer & transform_buffer )
```

5.68.3 Member Data Documentation

5.68.3.1 m_material

```
Material mage::ShadedMaterial::m_material [private]
```

5.68.3.2 m_shader

```
CombinedShader mage::ShadedMaterial::m_shader [private]
```

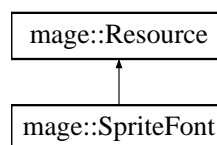
5.69 mage::SpriteBatch Class Reference

```
#include <sprite_batch.hpp>
```

5.70 mage::SpriteFont Class Reference

```
#include <sprite_font.hpp>
```

Inheritance diagram for mage::SpriteFont:



Public Member Functions

- [SpriteFont](#) (const [RenderingDevice](#) &device, const wstring &fname, const [SpriteFontDescriptor](#) &desc)
- virtual [~SpriteFont](#) ()=default
- void [DrawString](#) ([SpriteBatch](#) &sprite_batch, const wchar_t *text, const [SpriteTransform](#) &transform, XMVECTOR color=Colors::White, [SpriteEffects](#) effects=[SpriteEffects_None](#), float layer_depth=0.0f) const
- XMVECTOR [MeasureString](#) (const wchar_t *text) const
- RECT [MeasureDrawBounds](#) (const wchar_t *text, const XMFLOAT2 &position) const
- float [GetLineSpacing](#) () const
- void [SetLineSpacing](#) (float spacing)
- wchar_t [GetDefaultCharacter](#) () const
- void [SetDefaultCharacter](#) (wchar_t character)
- bool [ContainsCharacter](#) (wchar_t character) const
- const [Glyph](#) * [GetGlyph](#) (wchar_t character) const

Private Member Functions

- [SpriteFont](#) (const [SpriteFont](#) &font)=delete
- [SpriteFont](#) & [operator=](#) (const [SpriteFont](#) &font)=delete
- HRESULT [InitializeSpriteFont](#) (const [SpriteFontOutput](#) &output)

Private Attributes

- [ComPtr](#)< ID3D11ShaderResourceView > [m_texture](#)
- [vector](#)< [Glyph](#) > [m_glyphs](#)
- const [Glyph](#) * [m_default_glyph](#)
- float [m_line_spacing](#)

5.70.1 Constructor & Destructor Documentation

5.70.1.1 [SpriteFont\(\)](#) [1/2]

```
mage::SpriteFont::SpriteFont (
    const RenderingDevice & device,
    const wstring & fname,
    const SpriteFontDescriptor & desc )
```

5.70.1.2 [~SpriteFont\(\)](#)

```
virtual mage::SpriteFont::~~SpriteFont ( ) [virtual], [default]
```

5.70.1.3 [SpriteFont\(\)](#) [2/2]

```
mage::SpriteFont::SpriteFont (
    const SpriteFont & font ) [private], [delete]
```

5.70.2 Member Function Documentation

5.70.2.1 [ContainsCharacter\(\)](#)

```
bool mage::SpriteFont::ContainsCharacter (
    wchar_t character ) const
```

5.70.2.2 [DrawString\(\)](#)

```
void mage::SpriteFont::DrawString (
    SpriteBatch & sprite_batch,
    const wchar_t * text,
    const SpriteTransform & transform,
    XMVECTOR color = Colors::White,
    SpriteEffects effects = SpriteEffects\_None,
    float layer_depth = 0.0f ) const
```

5.70.2.3 GetDefaultCharacter()

```
wchar_t mage::SpriteFont::GetDefaultCharacter ( ) const
```

5.70.2.4 GetGlyph()

```
const Glyph * mage::SpriteFont::GetGlyph (
    wchar_t character ) const
```

5.70.2.5 GetLineSpacing()

```
float mage::SpriteFont::GetLineSpacing ( ) const
```

5.70.2.6 InitializeSpriteFont()

```
HRESULT mage::SpriteFont::InitializeSpriteFont (
    const SpriteFontOutput & output ) [private]
```

5.70.2.7 MeasureDrawBounds()

```
RECT mage::SpriteFont::MeasureDrawBounds (
    const wchar_t * text,
    const XMFLOAT2 & position ) const
```

5.70.2.8 MeasureString()

```
XMVECTOR mage::SpriteFont::MeasureString (
    const wchar_t * text ) const
```

5.70.2.9 operator=()

```
SpriteFont& mage::SpriteFont::operator= (
    const SpriteFont & font ) [private], [delete]
```

5.70.2.10 SetDefaultCharacter()

```
void mage::SpriteFont::SetDefaultCharacter (
    wchar_t character )
```

5.70.2.11 SetLineSpacing()

```
void mage::SpriteFont::SetLineSpacing (
    float spacing )
```

5.70.3 Member Data Documentation

5.70.3.1 m_default_glyph

```
const Glyph* mage::SpriteFont::m_default_glyph [private]
```

5.70.3.2 m_glyphs

```
vector< Glyph > mage::SpriteFont::m_glyphs [private]
```

5.70.3.3 m_line_spacing

```
float mage::SpriteFont::m_line_spacing [private]
```

5.70.3.4 m_texture

```
ComPtr< ID3D11ShaderResourceView > mage::SpriteFont::m_texture [private]
```

5.71 mage::SpriteFontDescriptor Struct Reference

```
#include <sprite_font_descriptor.hpp>
```

Public Member Functions

- [SpriteFontDescriptor](#) (bool force_srgb=false)
- [SpriteFontDescriptor](#) (const [SpriteFontDescriptor](#) &desc)=default
- [~SpriteFontDescriptor](#) ()=default
- [SpriteFontDescriptor](#) & operator= (const [SpriteFontDescriptor](#) &desc)=default
- bool [ForceSRGB](#) () const

Private Attributes

- bool [m_force_srgb](#)

5.71.1 Constructor & Destructor Documentation

5.71.1.1 SpriteFontDescriptor() [1/2]

```
mage::SpriteFontDescriptor::SpriteFontDescriptor (
    bool force_srgb = false )
```


5.71.1.2 SpriteFontDescriptor() [2/2]

```
mage::SpriteFontDescriptor::SpriteFontDescriptor (
    const SpriteFontDescriptor & desc ) [default]
```

5.71.1.3 ~SpriteFontDescriptor()

```
mage::SpriteFontDescriptor::~~SpriteFontDescriptor ( ) [default]
```

5.71.2 Member Function Documentation

5.71.2.1 ForceSRGB()

```
bool mage::SpriteFontDescriptor::ForceSRGB ( ) const
```

5.71.2.2 operator=()

```
SpriteFontDescriptor& mage::SpriteFontDescriptor::operator= (
    const SpriteFontDescriptor & desc ) [default]
```

5.71.3 Member Data Documentation

5.71.3.1 m_force_srgb

```
bool mage::SpriteFontDescriptor::m_force_srgb [private]
```

5.72 mage::SpriteFontOutput Struct Reference

```
#include <sprite_font_output.hpp>
```

Public Member Functions

- [SpriteFontOutput](#) ()=default
- [~SpriteFontOutput](#) ()=default

Public Attributes

- [ComPtr](#)< ID3D11ShaderResourceView > [m_texture](#)
- [vector](#)< [Glyph](#) > [m_glyphs](#)
- [wchar_t](#) [m_default_character](#)
- [float](#) [m_line_spacing](#)

Private Member Functions

- [SpriteFontOutput](#) (const [SpriteFontOutput](#) &output)=delete
- [SpriteFontOutput](#) & operator= ([SpriteFontOutput](#) &output)=delete

5.72.1 Constructor & Destructor Documentation

5.72.1.1 [SpriteFontOutput](#)() [1/2]

```
mage::SpriteFontOutput::SpriteFontOutput ( ) [default]
```

5.72.1.2 ~[SpriteFontOutput](#)()

```
mage::SpriteFontOutput::~~SpriteFontOutput ( ) [default]
```

5.72.1.3 [SpriteFontOutput](#)() [2/2]

```
mage::SpriteFontOutput::SpriteFontOutput (
    const SpriteFontOutput & output ) [private], [delete]
```

5.72.2 Member Function Documentation

5.72.2.1 operator=()

```
SpriteFontOutput& mage::SpriteFontOutput::operator= (
    SpriteFontOutput & output ) [private], [delete]
```

5.72.3 Member Data Documentation

5.72.3.1 [m_default_character](#)

```
wchar_t mage::SpriteFontOutput::m_default_character
```

5.72.3.2 [m_glyphs](#)

```
vector< Glyph > mage::SpriteFontOutput::m_glyphs
```

5.72.3.3 [m_line_spacing](#)

```
float mage::SpriteFontOutput::m_line_spacing
```

5.72.3.4 m_texture

```
ComPtr< ID3D11ShaderResourceView > mage::SpriteFontOutput::m_texture
```

5.73 mage::SpriteTransform Struct Reference

```
#include <sprite_transform.hpp>
```

Public Member Functions

- [SpriteTransform](#) (const XMFLOAT2 &translation={ 0.0f, 0.0f }, const XMFLOAT2 &rotation={ 0.0f, 0.0f }, const XMFLOAT2 &rotation_origin={ 0.0f, 0.0f }, const XMFLOAT2 &scale={ 1.0f, 1.0f })
- [SpriteTransform](#) (const [SpriteTransform](#) &transform)=default
- [~SpriteTransform](#) ()=default
- [SpriteTransform & operator=](#) (const [SpriteTransform](#) &transform)=default
- void [SetComponents](#) (const XMFLOAT2 &translation, const XMFLOAT2 &rotation, const XMFLOAT2 &rotation_origin, const XMFLOAT2 &scale)
- void [SetTranslationX](#) (float x)
- void [SetTranslationY](#) (float y)
- void [SetTranslation](#) (float x, float y)
- void [SetTranslation](#) (const XMFLOAT2 &translation)
- void [AddTranslationX](#) (float x)
- void [AddTranslationY](#) (float y)
- void [AddTranslation](#) (float x, float y)
- void [AddTranslation](#) (const XMFLOAT2 &translation)
- float [GetTranslationX](#) () const
- float [GetTranslationY](#) () const
- XMFLOAT2 [GetTranslation](#) () const
- void [SetRotationX](#) (float x)
- void [SetRotationY](#) (float y)
- void [SetRotation](#) (float x, float y)
- void [SetRotation](#) (const XMFLOAT2 &rotation)
- void [AddRotationX](#) (float x)
- void [AddRotationY](#) (float y)
- void [AddRotation](#) (float x, float y)
- void [AddRotation](#) (const XMFLOAT2 &rotation)
- float [GetRotationX](#) () const
- float [GetRotationY](#) () const
- XMFLOAT2 [GetRotation](#) () const
- void [SetRotationOriginX](#) (float x)
- void [SetRotationOriginY](#) (float y)
- void [SetRotationOrigin](#) (float x, float y)
- void [SetRotationOrigin](#) (const XMFLOAT2 &rotation_origin)
- void [AddRotationOriginX](#) (float x)
- void [AddRotationOriginY](#) (float y)
- void [AddRotationOrigin](#) (float x, float y)
- void [AddRotationOrigin](#) (const XMFLOAT2 &rotation_origin)
- float [GetRotationOriginX](#) () const
- float [GetRotationOriginY](#) () const
- XMFLOAT2 [GetRotationOrigin](#) () const
- void [SetScaleX](#) (float x)

- void [SetScaleY](#) (float y)
- void [SetScale](#) (float x, float y)
- void [SetScale](#) (const XMFLOAT2 &scale)
- void [AddScaleX](#) (float x)
- void [AddScaleY](#) (float y)
- void [AddScale](#) (float x, float y)
- void [AddScale](#) (const XMFLOAT2 &scale)
- float [GetScaleX](#) () const
- float [GetScaleY](#) () const
- XMFLOAT2 [GetScale](#) () const

Private Attributes

- XMFLOAT2 [m_translation](#)
- XMFLOAT2 [m_rotation](#)
- XMFLOAT2 [m_rotation_origin](#)
- XMFLOAT2 [m_scale](#)

5.73.1 Detailed Description

A struct of transforms.

5.73.2 Constructor & Destructor Documentation

5.73.2.1 [SpriteTransform\(\)](#) [1/2]

```
mage::SpriteTransform::SpriteTransform (
    const XMFLOAT2 & translation = { 0.0f, 0.0f },
    const XMFLOAT2 & rotation = { 0.0f, 0.0f },
    const XMFLOAT2 & rotation_origin = { 0.0f, 0.0f },
    const XMFLOAT2 & scale = { 1.0f, 1.0f } )
```

Constructs a sprite transform from the given translation, rotation, rotation origin and scale component.

Parameters

in	<i>translation</i>	A reference to the translation component.
in	<i>rotation</i>	A reference to the rotation component.
in	<i>rotation_origin</i>	A reference to the rotation component.
in	<i>scale</i>	A reference to the scale component.

5.73.2.2 [SpriteTransform\(\)](#) [2/2]

```
mage::SpriteTransform::SpriteTransform (
    const SpriteTransform & transform ) [default]
```

Constructs a sprite transform from the given sprite transform.

Parameters

in	<i>transform</i>	The sprite transform.
----	------------------	-----------------------

5.73.2.3 ~SpriteTransform()

```
mage::SpriteTransform::~SpriteTransform ( ) [default]
```

Destructs this sprite transform.

5.73.3 Member Function Documentation

5.73.3.1 AddRotation() [1/2]

```
void mage::SpriteTransform::AddRotation (
    float x,
    float y )
```

Adds the given rotation component to the rotation component of this sprite transform.

Parameters

in	<i>x</i>	The x-value of the rotation component to add.
in	<i>y</i>	The y-value of the rotation component to add.

5.73.3.2 AddRotation() [2/2]

```
void mage::SpriteTransform::AddRotation (
    const XMFLOAT2 & rotation )
```

Adds the given rotation component to the rotation component of this sprite transform.

Parameters

in	<i>rotation</i>	A reference to the rotation component to add.
----	-----------------	---

5.73.3.3 AddRotationOrigin() [1/2]

```
void mage::SpriteTransform::AddRotationOrigin (
    float x,
    float y )
```

Adds the given rotation origin to the rotation origin of this sprite transform.

Parameters

in	<i>x</i>	The x-value of the rotation origin to add.
in	<i>y</i>	The y-value of the rotation origin to add.

5.73.3.4 AddRotationOrigin() [2/2]

```
void mage::SpriteTransform::AddRotationOrigin (
    const XMFLOAT2 & rotation_origin )
```

Adds the given rotation origin to the rotation origin of this sprite transform.

Parameters

in	<i>rotation_origin</i>	A reference to the rotation origin to add.
----	------------------------	--

5.73.3.5 AddRotationOriginX()

```
void mage::SpriteTransform::AddRotationOriginX (
    float x )
```

Adds the given x-value to the rotation origin of this sprite transform.

Parameters

in	<i>x</i>	The x-value of the rotation origin to add.
----	----------	--

5.73.3.6 AddRotationOriginY()

```
void mage::SpriteTransform::AddRotationOriginY (
    float y )
```

Adds the given y-value to the rotation origin of this sprite transform.

Parameters

in	<i>y</i>	The y-value of the rotation origin to add.
----	----------	--

5.73.3.7 AddRotationX()

```
void mage::SpriteTransform::AddRotationX (
    float x )
```

Adds the given x-value to the rotation component of this sprite transform.

Parameters

in	<i>x</i>	The x-value of the rotation component to add.
----	----------	---

5.73.3.8 AddRotationY()

```
void mage::SpriteTransform::AddRotationY (
    float y )
```

Adds the given y-value to the rotation component of this sprite transform.

Parameters

in	<i>y</i>	The y-value of the rotation component to add.
----	----------	---

5.73.3.9 AddScale() [1/2]

```
void mage::SpriteTransform::AddScale (
    float x,
    float y )
```

Adds the given scale component to the scale component of this sprite transform.

Parameters

in	<i>x</i>	The x-value of the scale component to add.
in	<i>y</i>	The y-value of the scale component to add.

5.73.3.10 AddScale() [2/2]

```
void mage::SpriteTransform::AddScale (
    const XMFLOAT2 & scale )
```

Adds the given scale component to the scale component of this sprite transform.

Parameters

in	<i>scale</i>	A reference to the scale component to add.
----	--------------	--

5.73.3.11 AddScaleX()

```
void mage::SpriteTransform::AddScaleX (
    float x )
```

Adds the given x-value to the scale component of this sprite transform.

Parameters

in	<i>x</i>	The x-value of the scale component to add.
----	----------	--

5.73.3.12 AddScaleY()

```
void mage::SpriteTransform::AddScaleY (
    float y )
```

Adds the given y-value to the scale component of this sprite transform.

Parameters

in	<i>y</i>	The y-value of the scale component to add.
----	----------	--

5.73.3.13 AddTranslation() [1/2]

```
void mage::SpriteTransform::AddTranslation (
    float x,
    float y )
```

Adds the given translation component to the translation component of this sprite transform.

Parameters

in	<i>x</i>	The x-value of the translation component to add.
in	<i>y</i>	The y-value of the translation component to add.

5.73.3.14 AddTranslation() [2/2]

```
void mage::SpriteTransform::AddTranslation (
    const XMFLOAT2 & translation )
```

Adds the given translation component to the translation component of this sprite transform.

Parameters

in	<i>translation</i>	A reference to the translation component to add.
----	--------------------	--

5.73.3.15 AddTranslationX()

```
void mage::SpriteTransform::AddTranslationX (
    float x )
```

Adds the given x-value to the translation component of this sprite transform.

Parameters

in	x	The x-value of the translation component to add.
----	---	--

5.73.3.16 AddTranslationY()

```
void mage::SpriteTransform::AddTranslationY (
    float y )
```

Adds the given y-value to the translation component of this sprite transform.

Parameters

in	y	The y-value of the translation component to add.
----	---	--

5.73.3.17 GetRotation()

```
XMFLOAT2 mage::SpriteTransform::GetRotation ( ) const
```

Returns the rotation component of this sprite transform.

Returns

The rotation component of this sprite transform.

5.73.3.18 GetRotationOrigin()

```
XMFLOAT2 mage::SpriteTransform::GetRotationOrigin ( ) const
```

Returns the rotation origin of this sprite transform.

Returns

The rotation origin of this sprite transform.

5.73.3.19 GetRotationOriginX()

```
float mage::SpriteTransform::GetRotationOriginX ( ) const
```

Returns the x-value of the rotation origin of this sprite transform.

Returns

The x-value of the rotation origin of this sprite transform.

5.73.3.20 GetRotationOriginY()

```
float mage::SpriteTransform::GetRotationOriginY ( ) const
```

Returns the y-value of the rotation origin of this sprite transform.

Returns

The y-value of the rotation origin of this sprite transform.

5.73.3.21 GetRotationX()

```
float mage::SpriteTransform::GetRotationX ( ) const
```

Returns the x-value of the rotation component of this sprite transform.

Returns

The x-value of the rotation component of this sprite transform.

5.73.3.22 GetRotationY()

```
float mage::SpriteTransform::GetRotationY ( ) const
```

Returns the y-value of the rotation component of this sprite transform.

Returns

The y-value of the rotation component of this sprite transform.

5.73.3.23 GetScale()

```
XMFLLOAT2 mage::SpriteTransform::GetScale ( ) const
```

Returns the scale component of this sprite transform.

Returns

The scale component of this sprite transform.

5.73.3.24 GetScaleX()

```
float mage::SpriteTransform::GetScaleX ( ) const
```

Returns the x-value of the scale component of this sprite transform.

Returns

The x-value of the scale component of this sprite transform.

5.73.3.25 GetScaleY()

```
float mage::SpriteTransform::GetScaleY ( ) const
```

Returns the y-value of the scale component of this sprite transform.

Returns

The y-value of the scale component of this sprite transform.

5.73.3.26 GetTranslation()

```
XMFLLOAT2 mage::SpriteTransform::GetTranslation ( ) const
```

Returns the translation component of this sprite transform.

Returns

The translation component of this sprite transform.

5.73.3.27 GetTranslationX()

```
float mage::SpriteTransform::GetTranslationX ( ) const
```

Returns the x-value of the translation component of this sprite transform.

Returns

The x-value of the translation component of this sprite transform.

5.73.3.28 GetTranslationY()

```
float mage::SpriteTransform::GetTranslationY ( ) const
```

Returns the y-value of the translation component of this sprite transform.

Returns

The y-value of the translation component of this sprite transform.

5.73.3.29 operator=()

```
SpriteTransform& mage::SpriteTransform::operator= (
    const SpriteTransform & transform ) [default]
```

Copies the given sprite transform to this sprite transform.

Parameters

in	<i>transform</i>	The sprite transform to copy from.
----	------------------	------------------------------------

Returns

A reference to the copy of the given sprite transform (i.e. this sprite transform).

5.73.3.30 SetComponents()

```
void mage::SpriteTransform::SetComponents (
    const XMFLOAT2 & translation,
    const XMFLOAT2 & rotation,
    const XMFLOAT2 & rotation_origin,
    const XMFLOAT2 & scale )
```

Sets the translation, rotation, scale component of this sprite transform to the given components.

Parameters

in	<i>translation</i>	A reference to the translation component.
in	<i>rotation</i>	A reference to the rotation component.
in	<i>rotation_origin</i>	A reference to the rotation component.
in	<i>scale</i>	A reference to the scale component.

5.73.3.31 SetRotation() [1/2]

```
void mage::SpriteTransform::SetRotation (
    float x,
    float y )
```

Sets the rotation component of this sprite transform to the given rotation component.

Parameters

in	<i>x</i>	The x-value of the rotation component.
in	<i>y</i>	The y-value of the rotation component.

5.73.3.32 SetRotation() [2/2]

```
void mage::SpriteTransform::SetRotation (
    const XMFLOAT2 & rotation )
```

Sets the rotation component of this sprite transform to the given rotation component.

Parameters

in	<i>rotation</i>	A reference to the rotation component.
----	-----------------	--

5.73.3.33 SetRotationOrigin() [1/2]

```
void mage::SpriteTransform::SetRotationOrigin (
    float x,
    float y )
```

Sets the rotation origin of this sprite transform to the given rotation origin.

Parameters

in	<i>x</i>	The x-value of the rotation origin.
in	<i>y</i>	The y-value of the rotation origin.

5.73.3.34 SetRotationOrigin() [2/2]

```
void mage::SpriteTransform::SetRotationOrigin (
    const XMFLOAT2 & rotation_origin )
```

Sets the rotation origin of this sprite transform to the given rotation origin.

Parameters

in	<i>rotation_origin</i>	A reference to the rotation origin.
----	------------------------	-------------------------------------

5.73.3.35 SetRotationOriginX()

```
void mage::SpriteTransform::SetRotationOriginX (
    float x )
```

Sets the x-value of the rotation origin of this sprite transform to the given value.

Parameters

in	<i>x</i>	The x-value of the rotation origin.
----	----------	-------------------------------------

5.73.3.36 SetRotationOriginY()

```
void mage::SpriteTransform::SetRotationOriginY (
    float y )
```

Sets the y-value of the rotation origin of this sprite transform to the given value.

Parameters

in	<i>y</i>	The y-value of the rotation origin.
----	----------	-------------------------------------

5.73.3.37 SetRotationX()

```
void mage::SpriteTransform::SetRotationX (
    float x )
```

Sets the x-value of the rotation component of this sprite transform to the given value.

Parameters

in	<i>x</i>	The x-value of the rotation component.
----	----------	--

5.73.3.38 SetRotationY()

```
void mage::SpriteTransform::SetRotationY (
    float y )
```

Sets the y-value of the rotation component of this sprite transform to the given value.

Parameters

in	<i>y</i>	The y-value of the rotation component.
----	----------	--

5.73.3.39 SetScale() [1/2]

```
void mage::SpriteTransform::SetScale (
    float x,
    float y )
```

Sets the scale component of this sprite transform to the given scale component.

Parameters

in	<i>x</i>	The x-value of the scale component.
in	<i>y</i>	The y-value of the scale component.

5.73.3.40 SetScale() [2/2]

```
void mage::SpriteTransform::SetScale (
    const XMFLOAT2 & scale )
```

Sets the scale component of this sprite transform to the given scale component.

Parameters

in	<i>scale</i>	A reference to the scale component.
----	--------------	-------------------------------------

5.73.3.41 SetScaleX()

```
void mage::SpriteTransform::SetScaleX (
    float x )
```

Sets the x-value of the scale component of this sprite transform to the given value.

Parameters

in	<i>x</i>	The x-value of the scale component.
----	----------	-------------------------------------

5.73.3.42 SetScaleY()

```
void mage::SpriteTransform::SetScaleY (
    float y )
```

Sets the y-value of the scale component of this sprite transform to the given value.

Parameters

in	<i>y</i>	The y-value of the scale component.
----	----------	-------------------------------------

5.73.3.43 SetTranslation() [1/2]

```
void mage::SpriteTransform::SetTranslation (
    float x,
    float y )
```

Sets the translation component of this sprite transform to the given translation component.

Parameters

in	<i>x</i>	The x-value of the translation component.
in	<i>y</i>	The y-value of the translation component.

5.73.3.44 SetTranslation() [2/2]

```
void mage::SpriteTransform::SetTranslation (
    const XMFLOAT2 & translation )
```

Sets the translation component of this sprite transform to the given translation component.

Parameters

in	<i>translation</i>	A reference to the translation component.
----	--------------------	---

5.73.3.45 SetTranslationX()

```
void mage::SpriteTransform::SetTranslationX (
    float x )
```

Sets the x-value of the translation component of this sprite transform to the given value.

Parameters

in	<i>x</i>	The x-value of the translation component.
----	----------	---

5.73.3.46 SetTranslationY()

```
void mage::SpriteTransform::SetTranslationY (
    float y )
```

Sets the y-value of the translation component of this sprite transform to the given value.

Parameters

in	<i>y</i>	The y-value of the translation component.
----	----------	---

5.73.4 Member Data Documentation**5.73.4.1 m_rotation**

```
XMFLOAT2 mage::SpriteTransform::m_rotation [private]
```

The rotation component (in radians) of this sprite transform.

5.73.4.2 m_rotation_origin

```
XMFLOAT2 mage::SpriteTransform::m_rotation_origin [private]
```

The rotation origin of this sprite transform.

5.73.4.3 m_scale

```
XMFLOAT2 mage::SpriteTransform::m_scale [private]
```

The scale component of this sprite transform.

5.73.4.4 m_translation

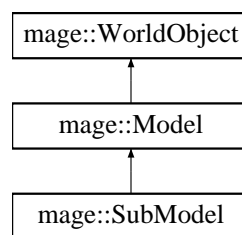
```
XMFLOAT2 mage::SpriteTransform::m_translation [private]
```

The translation component of this sprite transform.

5.74 mage::SubModel Class Reference

```
#include <model.hpp>
```

Inheritance diagram for mage::SubModel:



Public Member Functions

- [SubModel](#) (const string &name, size_t start_index, size_t nb_indices, const [ShadedMaterial](#) &material)
- [SubModel](#) (const [SubModel](#) &submodel)
- virtual [~SubModel](#) ()
- virtual [SubModel](#) * [Clone](#) () const
- size_t [GetStartIndex](#) () const
- size_t [GetNumberOfIndices](#) () const
- [Material](#) & [GetMaterial](#) () const

Protected Member Functions

- virtual void [RenderModel](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [World](#) &world, const [TransformBuffer](#) &transform_buffer) const override

Private Member Functions

- [SubModel](#) & [operator=](#) (const [SubModel](#) &submodel)=delete

Private Attributes

- const size_t [m_start_index](#)
- const size_t [m_nb_indices](#)
- [ShadedMaterial](#) * [m_material](#)

5.74.1 Detailed Description

A class of submodels.

5.74.2 Constructor & Destructor Documentation

5.74.2.1 SubModel() [1/2]

```
mage::SubModel::SubModel (
    const string & name,
    size_t start_index,
    size_t nb_indices,
    const ShadedMaterial & material )
```

5.74.2.2 SubModel() [2/2]

```
mage::SubModel::SubModel (
    const SubModel & submodel )
```

5.74.2.3 ~SubModel()

```
virtual mage::SubModel::~~SubModel ( ) [virtual]
```

5.74.3 Member Function Documentation

5.74.3.1 Clone()

```
virtual SubModel* mage::SubModel::Clone ( ) const [virtual]
```

Implements [mage::Model](#).

5.74.3.2 GetMaterial()

```
Material& mage::SubModel::GetMaterial ( ) const
```

5.74.3.3 GetNumberOfIndices()

```
size_t mage::SubModel::GetNumberOfIndices ( ) const
```

5.74.3.4 GetStartIndex()

```
size_t mage::SubModel::GetStartIndex ( ) const
```

5.74.3.5 operator=()

```
SubModel& mage::SubModel::operator= (
    const SubModel & submodel ) [private], [delete]
```

5.74.3.6 RenderModel()

```
virtual void mage::SubModel::RenderModel (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const World & world,
    const TransformBuffer & transform_buffer ) const [override], [protected], [virtual]
```

Implements [mage::Model](#).

5.74.4 Member Data Documentation

5.74.4.1 m_material

```
ShadedMaterial* mage::SubModel::m_material [private]
```

5.74.4.2 m_nb_indices

```
const size_t mage::SubModel::m_nb_indices [private]
```

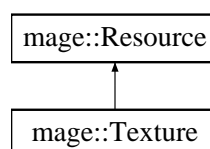
5.74.4.3 m_start_index

```
const size_t mage::SubModel::m_start_index [private]
```

5.75 mage::Texture Class Reference

```
#include <texture.hpp>
```

Inheritance diagram for `mage::Texture`:



Public Member Functions

- [Texture](#) (const [RenderingDevice](#) &device, const wstring &fname)
- virtual [~Texture](#) ()=default
- [ComPtr< ID3D11ShaderResourceView > GetTextureResourceView](#) () const

Private Member Functions

- [Texture](#) (const [Texture](#) &texture)=delete
- [Texture](#) & [operator=](#) (const [Texture](#) &texture)=delete

Private Attributes

- [ComPtr](#)< ID3D11ShaderResourceView > [m_texture_resource_view](#)

5.75.1 Constructor & Destructor Documentation

5.75.1.1 [Texture\(\)](#) [1/2]

```
mage::Texture::Texture (
    const RenderingDevice & device,
    const wstring & fname )
```

5.75.1.2 [~Texture\(\)](#)

```
virtual mage::Texture::~~Texture ( ) [virtual], [default]
```

5.75.1.3 [Texture\(\)](#) [2/2]

```
mage::Texture::Texture (
    const Texture & texture ) [private], [delete]
```

5.75.2 Member Function Documentation

5.75.2.1 [GetTextureResourceView\(\)](#)

```
ComPtr< ID3D11ShaderResourceView > mage::Texture::GetTextureResourceView ( ) const
```

5.75.2.2 [operator=\(\)](#)

```
Texture& mage::Texture::operator= (
    const Texture & texture ) [private], [delete]
```

5.75.3 Member Data Documentation

5.75.3.1 [m_texture_resource_view](#)

```
ComPtr< ID3D11ShaderResourceView > mage::Texture::m_texture_resource_view [private]
```

5.76 `mage::Timer` Class Reference

```
#include <timer.hpp>
```

Public Member Functions

- `Timer` ()
- `Timer` (const `Timer` &timer)=default
- virtual `~Timer` ()=default
- `Timer` & `operator=` (const `Timer` &timer)=default
- void `Start` ()
- void `Stop` ()
- void `Reset` ()
- void `Restart` ()
- double `Time` ()

Protected Member Functions

- double `time` ()

Protected Attributes

- double `m_time0`
- double `m_elapsed`
- bool `m_running`
- LARGE_INTEGER `m_performance_counter`
- LARGE_INTEGER `m_performance_frequency`
- double `m_performance_period`

5.76.1 Detailed Description

A class of (high precision) timers.

5.76.2 Constructor & Destructor Documentation

5.76.2.1 `Timer()` [1/2]

```
mage::Timer::Timer ( )
```

Constructs a timer.

5.76.2.2 `Timer()` [2/2]

```
mage::Timer::Timer (
    const Timer & timer ) [default]
```

Constructs a timer from the given timer.

Parameters

in	<i>timer</i>	A reference to the timer.
----	--------------	---------------------------

5.76.2.3 ~Timer()

```
virtual mage::Timer::~~Timer ( ) [virtual], [default]
```

Destructs this timer.

5.76.3 Member Function Documentation**5.76.3.1 operator=()**

```
Timer& mage::Timer::operator= (
    const Timer & timer ) [default]
```

Copies the given timer to this timer.

Parameters

in	<i>timer</i>	A reference to the timer to copy from.
----	--------------	--

Returns

A reference to the copy of the given timer (i.e. this timer).

5.76.3.2 Reset()

```
void mage::Timer::Reset ( )
```

Resets this timer.

5.76.3.3 Restart()

```
void mage::Timer::Restart ( )
```

Restarts this timer.

5.76.3.4 Start()

```
void mage::Timer::Start ( )
```

Starts this timer.

5.76.3.5 `Stop()`

```
void mage::Timer::Stop ( )
```

Stops this timer.

5.76.3.6 `Time()`

```
double mage::Timer::Time ( )
```

Returns the elapsed time of this timer.

Returns

The elapsed time of this timer.

5.76.3.7 `time()`

```
double mage::Timer::time ( ) [protected]
```

Returns the time of this timer.

Returns

The time of this timer.

Note

This member method encapsulates the counter/frequency processing.

5.76.4 Member Data Documentation

5.76.4.1 `m_elapsed`

```
double mage::Timer::m_elapsed [protected]
```

The elapsed time of this timer.

5.76.4.2 `m_performance_counter`

```
LARGE_INTEGER mage::Timer::m_performance_counter [protected]
```

The counter of this timer.

5.76.4.3 `m_performance_frequency`

```
LARGE_INTEGER mage::Timer::m_performance_frequency [protected]
```

The frequency of this timer.

5.76.4.4 m_performance_period

```
double mage::Timer::m_performance_period [protected]
```

The period of this timer.

5.76.4.5 m_running

```
bool mage::Timer::m_running [protected]
```

Flag indicating whether this timer is running.

5.76.4.6 m_time0

```
double mage::Timer::m_time0 [protected]
```

The initial time stamp of this timer.

5.77 mage::Transform Struct Reference

```
#include <transform.hpp>
```

Public Member Functions

- [Transform](#) (const XMFLOAT3 &translation={ 0.0f, 0.0f, 0.0f }, const XMFLOAT3 &rotation={ 0.0f, 0.0f, 0.0f }, const XMFLOAT3 &scale={ 1.0f, 1.0f, 1.0f })
- [Transform](#) (const [Transform](#) &transform)
- [~Transform](#) ()
- [Transform](#) & [operator=](#) (const [Transform](#) &transform)
- void [SetComponents](#) (const XMFLOAT3 &translation, const XMFLOAT3 &rotation, const XMFLOAT3 &scale)
- void [SetComponents](#) (const [Transform](#) &transform)
- void [SetTranslationX](#) (float x)
- void [SetTranslationY](#) (float y)
- void [SetTranslationZ](#) (float z)
- void [SetTranslation](#) (float x, float y, float z)
- void [SetTranslation](#) (const XMFLOAT3 &translation)
- void [AddTranslationX](#) (float x)
- void [AddTranslationY](#) (float y)
- void [AddTranslationZ](#) (float z)
- void [AddTranslation](#) (float x, float y, float z)
- void [AddTranslation](#) (const XMFLOAT3 &translation)
- float [GetTranslationX](#) () const
- float [GetTranslationY](#) () const
- float [GetTranslationZ](#) () const
- XMFLOAT3 [GetTranslation](#) () const
- XMMATRIX [GetTranslationMatrix](#) () const
- void [SetRotationX](#) (float x)
- void [SetRotationY](#) (float y)
- void [SetRotationZ](#) (float z)

- void [SetRotation](#) (float x, float y, float z)
- void [SetRotation](#) (const XMFLOAT3 &rotation)
- void [SetRotationAroundDirection](#) (const XMVECTOR &normal, float angle)
- void [AddRotationX](#) (float x)
- void [AddRotationY](#) (float y)
- void [AddRotationZ](#) (float z)
- void [AddRotation](#) (float x, float y, float z)
- void [AddRotation](#) (const XMFLOAT3 &rotation)
- float [GetRotationX](#) () const
- float [GetRotationY](#) () const
- float [GetRotationZ](#) () const
- XMFLOAT3 [GetRotation](#) () const
- XMMATRIX [GetRotationMatrix](#) () const
- void [SetScaleX](#) (float x)
- void [SetScaleY](#) (float y)
- void [SetScaleZ](#) (float z)
- void [SetScale](#) (float x, float y, float z)
- void [SetScale](#) (const XMFLOAT3 &scale)
- void [AddScaleX](#) (float x)
- void [AddScaleY](#) (float y)
- void [AddScaleZ](#) (float z)
- void [AddScale](#) (float x, float y, float z)
- void [AddScale](#) (const XMFLOAT3 &scale)
- float [GetScaleX](#) () const
- float [GetScaleY](#) () const
- float [GetScaleZ](#) () const
- XMFLOAT3 [GetScale](#) () const
- XMMATRIX [GetScaleMatrix](#) () const
- XMVECTOR [GetObjectOrigin](#) () const
- XMVECTOR [GetObjectAxisX](#) () const
- XMVECTOR [GetObjectAxisY](#) () const
- XMVECTOR [GetObjectAxisZ](#) () const
- [CartesianAxesSystem](#) [GetObjectAxes](#) () const
- [CartesianCoordinateSystem](#) [GetObjectCoordinateSystem](#) () const
- XMVECTOR [GetParentOrigin](#) () const
- XMVECTOR [GetParentAxisX](#) () const
- XMVECTOR [GetParentAxisY](#) () const
- XMVECTOR [GetParentAxisZ](#) () const
- [CartesianAxesSystem](#) [GetParentAxes](#) () const
- [CartesianCoordinateSystem](#) [GetParentCoordinateSystem](#) () const
- XMVECTOR [GetWorldOrigin](#) () const
- XMVECTOR [GetWorldAxisX](#) () const
- XMVECTOR [GetWorldAxisY](#) () const
- XMVECTOR [GetWorldAxisZ](#) () const
- [CartesianAxesSystem](#) [GetWorldAxes](#) () const
- [CartesianCoordinateSystem](#) [GetWorldCoordinateSystem](#) () const
- XMVECTOR [GetObjectEye](#) () const
- XMVECTOR [GetObjectLeft](#) () const
- XMVECTOR [GetObjectUp](#) () const
- XMVECTOR [GetObjectForward](#) () const
- XMVECTOR [GetWorldEye](#) () const
- XMVECTOR [GetWorldLeft](#) () const
- XMVECTOR [GetWorldUp](#) () const
- XMVECTOR [GetWorldForward](#) () const
- XMMATRIX [GetParentToObjectMatrix](#) () const

- XMMATRIX [GetObjectToParentMatrix](#) () const
- XMMATRIX [GetWorldToObjectMatrix](#) () const
- XMMATRIX [GetObjectToWorldMatrix](#) () const
- XMMATRIX [GetWorldToViewMatrix](#) () const
- XMVECTOR [TransformParentToObject](#) (const XMVECTOR &vector) const
- XMVECTOR [TransformObjectToParent](#) (const XMVECTOR &vector) const
- XMVECTOR [TransformWorldToObject](#) (const XMVECTOR &vector) const
- XMVECTOR [TransformObjectToWorld](#) (const XMVECTOR &vector) const
- bool [ContainsChild](#) (const [SharedPtr](#)< [Transform](#) > child) const
- void [AddChild](#) ([SharedPtr](#)< [Transform](#) > child)
- void [RemoveChild](#) ([SharedPtr](#)< [Transform](#) > child)
- void [RemoveAllChilds](#) ()
- size_t [GetNumberOfChilds](#) () const
- set< [SharedPtr](#)< [Transform](#) > >::iterator [begin](#) ()
- set< [SharedPtr](#)< [Transform](#) > >::iterator [end](#) ()
- set< [SharedPtr](#)< [Transform](#) > >::const_iterator [cbegin](#) () const
- set< [SharedPtr](#)< [Transform](#) > >::const_iterator [cend](#) () const

Private Member Functions

- XMMATRIX [GetInverseTranslationMatrix](#) () const
- XMMATRIX [GetInverseRotationMatrix](#) () const
- XMMATRIX [GetInverseScaleMatrix](#) () const
- XMVECTOR [TransformObjectToParentDirection](#) (const XMVECTOR &direction) const
- void [Update](#) ()
- void [Update](#) (const XMMATRIX &world_to_parent, const XMMATRIX &parent_to_world)

Private Attributes

- XMFLOAT3 [m_translation](#)
- XMFLOAT3 [m_rotation](#)
- XMFLOAT3 [m_scale](#)
- XMMATRIX [m_world_to_object](#)
- XMMATRIX [m_object_to_world](#)
- XMMATRIX [m_world_to_parent](#)
- XMMATRIX [m_parent_to_world](#)
- set< [SharedPtr](#)< [Transform](#) >, std::less<> > [m_childs](#)

5.77.1 Detailed Description

A struct of transforms.

5.77.2 Constructor & Destructor Documentation

5.77.2.1 Transform() [1/2]

```
mage::Transform::Transform (
    const XMFLOAT3 & translation = { 0.0f, 0.0f, 0.0f },
    const XMFLOAT3 & rotation = { 0.0f, 0.0f, 0.0f },
    const XMFLOAT3 & scale = { 1.0f, 1.0f, 1.0f } )
```

Constructs a transform from the given translation, rotation and scale component.

Parameters

in	<i>translation</i>	A reference to the translation component.
in	<i>rotation</i>	A reference to the rotation component.
in	<i>scale</i>	A reference to the scale component.

5.77.2.2 Transform() [2/2]

```
mage::Transform::Transform (
    const Transform & transform )
```

Constructs a transform from the components of the given transform.

Parameters

in	<i>transform</i>	The transform.
----	------------------	----------------

5.77.2.3 ~Transform()

```
mage::Transform::~~Transform ( )
```

Destructs this transform.

5.77.3 Member Function Documentation

5.77.3.1 AddChild()

```
void mage::Transform::AddChild (
    SharedPtr< Transform > child )
```

Adds the given child transform to the child transforms of this transform.

Precondition

child may not refer to `nullptr`.
child may not refer to `this`.

Parameters

in	<i>child</i>	A pointer to the child transform.
----	--------------	-----------------------------------

5.77.3.2 AddRotation() [1/2]

```
void mage::Transform::AddRotation (
    float x,
```

```
float y,
float z )
```

Adds the given rotation component to the rotation component of this transform.

Parameters

in	<i>x</i>	The x-value of the rotation component to add.
in	<i>y</i>	The y-value of the rotation component to add.
in	<i>z</i>	The z-value of the rotation component to add.

5.77.3.3 AddRotation() [2/2]

```
void mage::Transform::AddRotation (
    const XMFLOAT3 & rotation )
```

Adds the given rotation component to the rotation component of this transform.

Parameters

in	<i>rotation</i>	A reference to the rotation component to add.
----	-----------------	---

5.77.3.4 AddRotationX()

```
void mage::Transform::AddRotationX (
    float x )
```

Adds the given x-value to the rotation component of this transform.

Parameters

in	<i>x</i>	The x-value of the rotation component to add.
----	----------	---

5.77.3.5 AddRotationY()

```
void mage::Transform::AddRotationY (
    float y )
```

Adds the given y-value to the rotation component of this transform.

Parameters

in	<i>y</i>	The y-value of the rotation component to add.
----	----------	---

5.77.3.6 AddRotationZ()

```
void mage::Transform::AddRotationZ (
    float z )
```

Adds the given z-value to the rotation component of this transform.

Parameters

in	z	The z-value of the rotation component to add.
----	---	---

5.77.3.7 AddScale() [1/2]

```
void mage::Transform::AddScale (
    float x,
    float y,
    float z )
```

Adds the given scale component to the scale component of this transform.

Parameters

in	x	The x-value of the scale component to add.
in	y	The y-value of the scale component to add.
in	z	The z-value of the scale component to add.

5.77.3.8 AddScale() [2/2]

```
void mage::Transform::AddScale (
    const XMFLOAT3 & scale )
```

Adds the given scale component to the scale component of this transform.

Parameters

in	scale	A reference to the scale component to add.
----	-------	--

5.77.3.9 AddScaleX()

```
void mage::Transform::AddScaleX (
    float x )
```

Adds the given x-value to the scale component of this transform.

Parameters

in	x	The x-value of the scale component to add.
----	---	--

5.77.3.10 AddScaleY()

```
void mage::Transform::AddScaleY (
    float y )
```

Adds the given y-value to the scale component of this transform.

Parameters

in	<i>y</i>	The y-value of the scale component to add.
----	----------	--

5.77.3.11 AddScaleZ()

```
void mage::Transform::AddScaleZ (
    float z )
```

Adds the given z-value to the scale component of this transform.

Parameters

in	<i>z</i>	The z-value of the scale component to add.
----	----------	--

5.77.3.12 AddTranslation() [1/2]

```
void mage::Transform::AddTranslation (
    float x,
    float y,
    float z )
```

Adds the given translation component to the translation component of this transform.

Parameters

in	<i>x</i>	The x-value of the translation component to add.
in	<i>y</i>	The y-value of the translation component to add.
in	<i>z</i>	The z-value of the translation component to add.

5.77.3.13 AddTranslation() [2/2]

```
void mage::Transform::AddTranslation (
    const XMFLOAT3 & translation )
```

Adds the given translation component to the translation component of this transform.

Parameters

in	<i>translation</i>	A reference to the translation component to add.
----	--------------------	--

5.77.3.14 AddTranslationX()

```
void mage::Transform::AddTranslationX (
    float x )
```

Adds the given x-value to the translation component of this transform.

Parameters

in	x	The x-value of the translation component to add.
----	---	--

5.77.3.15 AddTranslationY()

```
void mage::Transform::AddTranslationY (
    float y )
```

Adds the given y-value to the translation component of this transform.

Parameters

in	y	The y-value of the translation component to add.
----	---	--

5.77.3.16 AddTranslationZ()

```
void mage::Transform::AddTranslationZ (
    float z )
```

Adds the given z-value to the translation component of this transform.

Parameters

in	z	The z-value of the translation component to add.
----	---	--

5.77.3.17 begin()

```
set< SharedPtr< Transform > >::iterator mage::Transform::begin ( )
```

Returns an iterator to the beginning of the childs of this transform.

Returns

An iterator to the beginning of the childs of this transform.

5.77.3.18 cbegin()

```
set< SharedPtr< Transform > >::const_iterator mage::Transform::cbegin ( ) const
```

Returns a constant iterator to the beginning of the childs of this transform.

Returns

A constant iterator to the beginning of the childs of this transform.

5.77.3.19 cend()

```
set< SharedPtr< Transform > >::const_iterator mage::Transform::cend ( ) const
```

Returns a constant iterator to the end of the childs of this transform.

Returns

A constant iterator to the end of the childs of this transform.

5.77.3.20 ContainsChild()

```
bool mage::Transform::ContainsChild (
    const SharedPtr< Transform > child ) const
```

Checks whether this transform contains the given transform as a child transform.

Returns

`true` if this transform contains the given transform as a child transform. `false` otherwise.

5.77.3.21 end()

```
set< SharedPtr< Transform > >::iterator mage::Transform::end ( )
```

Returns an iterator to the end of the childs of this transform.

Returns

An iterator to the end of the childs of this transform.

5.77.3.22 GetInverseRotationMatrix()

```
XMMATRIX mage::Transform::GetInverseRotationMatrix ( ) const [private]
```

Returns the inverse rotation matrix of this transform.

Returns

The inverse rotation matrix of this transform.

5.77.3.23 GetInverseScaleMatrix()

```
XMMATRIX mage::Transform::GetInverseScaleMatrix ( ) const [private]
```

Returns the inverse scale matrix of this transform.

Returns

The inverse scale matrix of this transform.

5.77.3.24 GetInverseTranslationMatrix()

```
XMMATRIX mage::Transform::GetInverseTranslationMatrix ( ) const [private]
```

Returns the inverse translation matrix of this transform.

Returns

The inverse translation matrix of this transform.

5.77.3.25 GetNumberOfChilds()

```
size_t mage::Transform::GetNumberOfChilds ( ) const
```

Returns the total number of child transforms of this transform.

Returns

The total number of child transforms of this transform.

5.77.3.26 GetObjectAxes()

```
CartesianAxesSystem mage::Transform::GetObjectAxes ( ) const
```

Returns the local Cartesian axes system of this transform in object space coordinates.

Returns

The local Cartesian axes system of this transform expressed in object space coordinates.

5.77.3.27 GetObjectAxisX()

```
XMVECTOR mage::Transform::GetObjectAxisX ( ) const
```

Returns the direction of the local x-axis of this transform expressed in object space coordinates.

Returns

The direction of the local x-axis of this transform expressed in object space coordinates.

5.77.3.28 `GetObjectAxisY()`

```
XMVECTOR mage::Transform::GetObjectAxisY ( ) const
```

Returns the direction of the local y-axis of this transform expressed in object space coordinates.

Returns

The direction of the local y-axis of this transform expressed in object space coordinates.

5.77.3.29 `GetObjectAxisZ()`

```
XMVECTOR mage::Transform::GetObjectAxisZ ( ) const
```

Returns the direction of the local z-axis of this transform expressed in object space coordinates.

Returns

The direction of the local z-axis of this transform expressed in object space coordinates.

5.77.3.30 `GetObjectCoordinateSystem()`

```
CartesianCoordinateSystem mage::Transform::GetObjectCoordinateSystem ( ) const
```

Returns the local Cartesian coordinate system of this transform in object space coordinates.

Returns

The local Cartesian coordinate system of this transform expressed in object space coordinates.

5.77.3.31 `GetObjectEye()`

```
XMVECTOR mage::Transform::GetObjectEye ( ) const
```

Returns the local eye position of this transform expressed in object space coordinates.

Returns

The local eye position of this transform expressed in object space coordinates.

5.77.3.32 `GetObjectForward()`

```
XMVECTOR mage::Transform::GetObjectForward ( ) const
```

Returns the local forward direction of this transform expressed in object space coordinates.

Returns

The local forward direction of this transform expressed in object space coordinates.

5.77.3.33 GetObjectLeft()

```
XMVECTOR mage::Transform::GetObjectLeft ( ) const
```

Returns the local left direction of this transform expressed in object space coordinates.

Returns

The local left direction of this transform expressed in object space coordinates.

5.77.3.34 GetObjectOrigin()

```
XMVECTOR mage::Transform::GetObjectOrigin ( ) const
```

Returns the position of the local origin of this transform expressed in object space coordinates.

Returns

The position of the local origin of this transform expressed in object space coordinates.

5.77.3.35 GetObjectToParentMatrix()

```
XMMATRIX mage::Transform::GetObjectToParentMatrix ( ) const
```

Returns the object-to-parent matrix of this transform.

Returns

The object-to-parent matrix of this transform.

5.77.3.36 GetObjectToWorldMatrix()

```
XMMATRIX mage::Transform::GetObjectToWorldMatrix ( ) const
```

Returns the object-to-world matrix of this transform.

Returns

The object-to-world matrix of this transform.

5.77.3.37 GetObjectUp()

```
XMVECTOR mage::Transform::GetObjectUp ( ) const
```

Returns the local up direction of this transform expressed in object space coordinates.

Returns

The local up direction of this transform expressed in object space coordinates.

5.77.3.38 GetParentAxes()

```
CartesianAxesSystem mage::Transform::GetParentAxes ( ) const
```

Returns the local Cartesian axes system of this transform expressed in parent space coordinates.

Returns

The local Cartesian axes system of this transform expressed in parent space coordinates.

5.77.3.39 GetParentAxisX()

```
XMVECTOR mage::Transform::GetParentAxisX ( ) const
```

Returns the direction of the local x-axis of this transform expressed in parent space coordinates.

Returns

The direction of the local x-axis of this transform expressed in parent space coordinates.

5.77.3.40 GetParentAxisY()

```
XMVECTOR mage::Transform::GetParentAxisY ( ) const
```

Returns the direction of the local y-axis of this transform expressed in parent space coordinates.

Returns

The direction of the local y-axis of this transform expressed in parent space coordinates.

5.77.3.41 GetParentAxisZ()

```
XMVECTOR mage::Transform::GetParentAxisZ ( ) const
```

Returns the direction of the local z-axis of this transform expressed in parent space coordinates.

Returns

The direction of the local z-axis of this transform expressed in parent space coordinates.

5.77.3.42 GetParentCoordinateSystem()

```
CartesianCoordinateSystem mage::Transform::GetParentCoordinateSystem ( ) const
```

Returns the local Cartesian coordinate system of this transform in parent space coordinates.

Returns

The local Cartesian coordinate system of this transform expressed in parent space coordinates.

5.77.3.43 GetParentOrigin()

```
XMVECTOR mage::Transform::GetParentOrigin ( ) const
```

Returns the position of the local origin of this transform expressed in parent space coordinates.

Returns

The position of the local origin of this transform expressed in parent space coordinates.

5.77.3.44 GetParentToObjectMatrix()

```
XMMATRIX mage::Transform::GetParentToObjectMatrix ( ) const
```

Returns the parent-to-object matrix of this transform.

Returns

The parent-to-object matrix of this transform.

5.77.3.45 GetRotation()

```
XMFLOAT3 mage::Transform::GetRotation ( ) const
```

Returns the rotation component of this transform.

Returns

The rotation component of this transform.

5.77.3.46 GetRotationMatrix()

```
XMMATRIX mage::Transform::GetRotationMatrix ( ) const
```

Returns the rotation matrix of this transform.

Returns

The rotation matrix of this transform.

5.77.3.47 GetRotationX()

```
float mage::Transform::GetRotationX ( ) const
```

Returns the x-value of the rotation component of this transform.

Returns

The x-value of the rotation component of this transform.

5.77.3.48 GetRotationY()

```
float mage::Transform::GetRotationY ( ) const
```

Returns the y-value of the rotation component of this transform.

Returns

The y-value of the rotation component of this transform.

5.77.3.49 GetRotationZ()

```
float mage::Transform::GetRotationZ ( ) const
```

Returns the z-value of the rotation component of this transform.

Returns

The z-value of the rotation component of this transform.

5.77.3.50 GetScale()

```
XMFLOAT3 mage::Transform::GetScale ( ) const
```

Returns the scale component of this transform.

Returns

The scale component of this transform.

5.77.3.51 GetScaleMatrix()

```
XMMATRIX mage::Transform::GetScaleMatrix ( ) const
```

Returns the scale matrix of this transform.

Returns

The scale matrix of this transform.

5.77.3.52 GetScaleX()

```
float mage::Transform::GetScaleX ( ) const
```

Returns the x-value of the scale component of this transform.

Returns

The x-value of the scale component of this transform.

5.77.3.53 GetScaleY()

```
float mage::Transform::GetScaleY ( ) const
```

Returns the y-value of the scale component of this transform.

Returns

The y-value of the scale component of this transform.

5.77.3.54 GetScaleZ()

```
float mage::Transform::GetScaleZ ( ) const
```

Returns the z-value of the scale component of this transform.

Returns

The z-value of the scale component of this transform.

5.77.3.55 GetTranslation()

```
XMFLOAT3 mage::Transform::GetTranslation ( ) const
```

Returns the translation component of this transform.

Returns

The translation component of this transform.

5.77.3.56 GetTranslationMatrix()

```
XMATRIX mage::Transform::GetTranslationMatrix ( ) const
```

Returns the translation matrix of this transform.

Returns

The translation matrix of this transform.

5.77.3.57 GetTranslationX()

```
float mage::Transform::GetTranslationX ( ) const
```

Returns the x-value of the translation component of this transform.

Returns

The x-value of the translation component of this transform.

5.77.3.58 GetTranslationY()

```
float mage::Transform::GetTranslationY ( ) const
```

Returns the y-value of the translation component of this transform.

Returns

The y-value of the translation component of this transform.

5.77.3.59 GetTranslationZ()

```
float mage::Transform::GetTranslationZ ( ) const
```

Returns the z-value of the translation component of this transform.

Returns

The z-value of the translation component of this transform.

5.77.3.60 GetWorldAxes()

```
CartesianAxesSystem mage::Transform::GetWorldAxes ( ) const
```

Returns the local Cartesian axes system of this transform expressed in world space coordinates.

Returns

The local Cartesian axes system of this transform expressed in world space coordinates.

5.77.3.61 GetWorldAxisX()

```
XMVECTOR mage::Transform::GetWorldAxisX ( ) const
```

Returns the direction of the local x-axis of this transform expressed in world space coordinates.

Returns

The direction of the local x-axis of this transform expressed in world space coordinates.

5.77.3.62 GetWorldAxisY()

```
XMVECTOR mage::Transform::GetWorldAxisY ( ) const
```

Returns the direction of the local y-axis of this transform expressed in world space coordinates.

Returns

The direction of the local y-axis of this transform expressed in world space coordinates.

5.77.3.63 GetWorldAxisZ()

```
XMVECTOR mage::Transform::GetWorldAxisZ ( ) const
```

Returns the direction of the local z-axis of this transform expressed in world space coordinates.

Returns

The direction of the local z-axis of this transform expressed in world space coordinates.

5.77.3.64 GetWorldCoordinateSystem()

```
CartesianCoordinateSystem mage::Transform::GetWorldCoordinateSystem ( ) const
```

Returns the local Cartesian coordinate system of this transform in world space coordinates.

Returns

The local Cartesian coordinate system of this transform expressed in world space coordinates.

5.77.3.65 GetWorldEye()

```
XMVECTOR mage::Transform::GetWorldEye ( ) const
```

Returns the local eye position of this transform expressed in world space coordinates.

Returns

The local eye position of this transform expressed in world space coordinates.

5.77.3.66 GetWorldForward()

```
XMVECTOR mage::Transform::GetWorldForward ( ) const
```

Returns the local forward direction of this transform expressed in world space coordinates.

Returns

The local forward direction of this transform expressed in world space coordinates.

5.77.3.67 GetWorldLeft()

```
XMVECTOR mage::Transform::GetWorldLeft ( ) const
```

Returns the local left direction of this transform expressed in world space coordinates.

Returns

The local left direction of this transform expressed in world space coordinates.

5.77.3.68 GetWorldOrigin()

```
XMVECTOR mage::Transform::GetWorldOrigin ( ) const
```

Returns the position of the local origin of this transform expressed in world space coordinates.

Returns

The position of the local origin of this transform expressed in world space coordinates.

5.77.3.69 GetWorldToObjectMatrix()

```
XMMATRIX mage::Transform::GetWorldToObjectMatrix ( ) const
```

Returns the world-to-object matrix of this transform.

Returns

The world-to-object matrix of this transform.

5.77.3.70 GetWorldToViewMatrix()

```
XMMATRIX mage::Transform::GetWorldToViewMatrix ( ) const
```

Returns the parent-to-view matrix of this transform.

Returns

The parent-to-view matrix of this transform.

Note

Transforms for cameras should not contain scaling components.

5.77.3.71 GetWorldUp()

```
XMVECTOR mage::Transform::GetWorldUp ( ) const
```

Returns the local up direction of this transform expressed in world space coordinates.

Returns

The local up direction of this transform expressed in world space coordinates.

5.77.3.72 operator=()

```
Transform& mage::Transform::operator= (
    const Transform & transform )
```

Copies the components of the given transform to this transform.

Parameters

in	<i>transform</i>	The transform to copy from.
----	------------------	-----------------------------

Returns

A reference to the copy of the given transform (i.e. this transform).

5.77.3.73 RemoveAllChilds()

```
void mage::Transform::RemoveAllChilds ( )
```

Removes and destructs all child transforms of this transform.

5.77.3.74 RemoveChild()

```
void mage::Transform::RemoveChild (
    SharedPtr< Transform > child )
```

Removes the given child transform from the child transforms of this transform.

Parameters

in	<i>child</i>	A pointer to the child transform.
----	--------------	-----------------------------------

5.77.3.75 SetComponents() [1/2]

```
void mage::Transform::SetComponents (
    const XMFLOAT3 & translation,
    const XMFLOAT3 & rotation,
    const XMFLOAT3 & scale )
```

Sets the translation, rotation, scale component of this transform to the given components.

Parameters

in	<i>translation</i>	A reference to the translation component.
in	<i>rotation</i>	A reference to the rotation component.
in	<i>scale</i>	A reference to the scale component.

5.77.3.76 SetComponents() [2/2]

```
void mage::Transform::SetComponents (
    const Transform & transform )
```

Sets the translation, rotation, scale component of this transform to the components of the given transform..

Parameters

in	<i>transform</i>	A reference to the transform.
----	------------------	-------------------------------

5.77.3.77 SetRotation() [1/2]

```
void mage::Transform::SetRotation (
    float x,
    float y,
    float z )
```

Sets the rotation component of this transform to the given rotation component.

Parameters

in	<i>x</i>	The x-value of the rotation component.
in	<i>y</i>	The y-value of the rotation component.
in	<i>z</i>	The z-value of the rotation component.

5.77.3.78 SetRotation() [2/2]

```
void mage::Transform::SetRotation (
    const XMFLOAT3 & rotation )
```

Sets the rotation component of this transform to the given rotation component.

Parameters

in	<i>rotation</i>	A reference to the rotation component.
----	-----------------	--

5.77.3.79 SetRotationAroundDirection()

```
void mage::Transform::SetRotationAroundDirection (
    const XMVECTOR & normal,
    float angle )
```

Sets the rotation component to a rotation of the given angle around the given normal.

Parameters

in	<i>normal</i>	A reference to the normal.
in	<i>angle</i>	The angle.

5.77.3.80 SetRotationX()

```
void mage::Transform::SetRotationX (
```

```
float x )
```

Sets the x-value of the rotation component of this transform to the given value.

Parameters

in	x	The x-value of the rotation component.
----	---	--

5.77.3.81 SetRotationY()

```
void mage::Transform::SetRotationY (  
    float y )
```

Sets the y-value of the rotation component of this transform to the given value.

Parameters

in	y	The y-value of the rotation component.
----	---	--

5.77.3.82 SetRotationZ()

```
void mage::Transform::SetRotationZ (  
    float z )
```

Sets the z-value of the rotation component of this transform to the given value.

Parameters

in	z	The z-value of the rotation component.
----	---	--

5.77.3.83 SetScale() [1/2]

```
void mage::Transform::SetScale (  
    float x,  
    float y,  
    float z )
```

Sets the scale component of this transform to the given scale component.

Parameters

in	x	The x-value of the scale component.
in	y	The y-value of the scale component.
in	z	The z-value of the scale component.

5.77.3.84 SetScale() [2/2]

```
void mage::Transform::SetScale (
    const XMFLOAT3 & scale )
```

Sets the scale component of this transform to the given scale component.

Parameters

in	<i>scale</i>	A reference to the scale component.
----	--------------	-------------------------------------

5.77.3.85 SetScaleX()

```
void mage::Transform::SetScaleX (
    float x )
```

Sets the x-value of the scale component of this transform to the given value.

Parameters

in	<i>x</i>	The x-value of the scale component.
----	----------	-------------------------------------

5.77.3.86 SetScaleY()

```
void mage::Transform::SetScaleY (
    float y )
```

Sets the y-value of the scale component of this transform to the given value.

Parameters

in	<i>y</i>	The y-value of the scale component.
----	----------	-------------------------------------

5.77.3.87 SetScaleZ()

```
void mage::Transform::SetScaleZ (
    float z )
```

Sets the z-value of the scale component of this transform to the given value.

Parameters

in	<i>z</i>	The z-value of the scale component.
----	----------	-------------------------------------

5.77.3.88 SetTranslation() [1/2]

```
void mage::Transform::SetTranslation (
    float x,
    float y,
    float z )
```

Sets the translation component of this transform to the given translation component.

Parameters

in	<i>x</i>	The x-value of the translation component.
in	<i>y</i>	The y-value of the translation component.
in	<i>z</i>	The z-value of the translation component.

5.77.3.89 SetTranslation() [2/2]

```
void mage::Transform::SetTranslation (
    const XMFLOAT3 & translation )
```

Sets the translation component of this transform to the given translation component.

Parameters

in	<i>translation</i>	A reference to the translation component.
----	--------------------	---

5.77.3.90 SetTranslationX()

```
void mage::Transform::SetTranslationX (
    float x )
```

Sets the x-value of the translation component of this transform to the given value.

Parameters

in	<i>x</i>	The x-value of the translation component.
----	----------	---

5.77.3.91 SetTranslationY()

```
void mage::Transform::SetTranslationY (
    float y )
```

Sets the y-value of the translation component of this transform to the given value.

Parameters

in	<i>y</i>	The y-value of the translation component.
----	----------	---

5.77.3.92 SetTranslationZ()

```
void mage::Transform::SetTranslationZ (
    float z )
```

Sets the z-value of the translation component of this transform to the given value.

Parameters

in	z	The z-value of the translation component.
----	---	---

5.77.3.93 TransformObjectToParent()

```
XMVECTOR mage::Transform::TransformObjectToParent (
    const XMVECTOR & vector ) const
```

Transforms the given vector expressed in object space coordinates to parent space coordinates.

Parameters

in	<i>vector</i>	A reference to the vector expressed in object space coordinates.
----	---------------	--

Returns

The transformed vector expressed in parent space coordinates.

5.77.3.94 TransformObjectToParentDirection()

```
XMVECTOR mage::Transform::TransformObjectToParentDirection (
    const XMVECTOR & direction ) const [private]
```

Transforms the given direction expressed in object space coordinates to parent space coordinates.

Parameters

in	<i>direction</i>	A reference to the direction expressed in object space coordinates.
----	------------------	---

Returns

The transformed (normalized) direction expressed in parent space coordinates.

5.77.3.95 TransformObjectToWorld()

```
XMVECTOR mage::Transform::TransformObjectToWorld (
    const XMVECTOR & vector ) const
```

Transforms the given vector expressed in object space coordinates to world space coordinates.

Parameters

in	<i>vector</i>	A reference to the vector expressed in object space coordinates.
----	---------------	--

Returns

The transformed vector expressed in world space coordinates.

5.77.3.96 TransformParentToObject()

```
XMVECTOR mage::Transform::TransformParentToObject (
    const XMVECTOR & vector ) const
```

Transforms the given vector expressed in parent space coordinates to object space coordinates.

Parameters

in	<i>vector</i>	A reference to the vector expressed in parent space coordinates.
----	---------------	--

Returns

The transformed vector expressed in object space coordinates.

5.77.3.97 TransformWorldToObject()

```
XMVECTOR mage::Transform::TransformWorldToObject (
    const XMVECTOR & vector ) const
```

Transforms the given vector expressed in world space coordinates to object space coordinates.

Parameters

in	<i>vector</i>	A reference to the vector expressed in world space coordinates.
----	---------------	---

Returns

The transformed vector expressed in object space coordinates.

5.77.3.98 Update() [1/2]

```
void mage::Transform::Update ( ) [private]
```

Updates the world-to-object and object-to-world matrices, and updates all the childs of this transform.

5.77.3.99 Update() [2/2]

```
void mage::Transform::Update (
    const XMMATRIX & world_to_parent,
    const XMMATRIX & parent_to_world ) [private]
```

Updates the world-to-object and object-to-world matrices, and updates the world-to-parent and parent-to-world matrices of this transform based on the given world-to-parent and parent-to-world matrices of this transform.

Parameters

in	<i>world_to_parent</i>	A reference to the world-to-parent matrix.
in	<i>parent_to_world</i>	A reference to the parent-to-world matrix.

5.77.4 Member Data Documentation**5.77.4.1 m_childs**

```
set< SharedPtr< Transform >, std::less<> > mage::Transform::m_childs [private]
```

A set containing the child transforms of this transform.

5.77.4.2 m_object_to_world

```
XMMATRIX mage::Transform::m_object_to_world [private]
```

The object-to-world matrix of this transform.

5.77.4.3 m_parent_to_world

```
XMMATRIX mage::Transform::m_parent_to_world [private]
```

The parent-to-world matrix of this transform.

5.77.4.4 m_rotation

```
XMFLOAT3 mage::Transform::m_rotation [private]
```

The rotation component (in radians) of this transform.

5.77.4.5 m_scale

```
XMFLOAT3 mage::Transform::m_scale [private]
```

The scale component of this transform.

5.77.4.6 m_translation

```
XMFLOAT3 mage::Transform::m_translation [private]
```

The translation component of this transform.

5.77.4.7 m_world_to_object

```
XMMATRIX mage::Transform::m_world_to_object [private]
```

The world-to-object matrix of this transform.

5.77.4.8 m_world_to_parent

```
XMMATRIX mage::Transform::m_world_to_parent [private]
```

The world-to-parent matrix of this transform.

5.78 mage::TransformBuffer Struct Reference

```
#include <transform_buffer.hpp>
```

Public Member Functions

- [TransformBuffer](#) (const [Camera](#) &camera)
- [TransformBuffer](#) (const [TransformBuffer](#) &buffer)=default
- [~TransformBuffer](#) ()=default
- [TransformBuffer](#) & [operator=](#) (const [TransformBuffer](#) &buffer)=default
- void [SetModelToWorld](#) (const XMMATRIX &model_to_world) const

Private Attributes

- XMMATRIX [m_model_to_world](#)
- XMMATRIX [m_world_to_view](#)
- XMMATRIX [m_world_to_view_inverse_transpose](#)
- XMMATRIX [m_view_to_projection](#)

5.78.1 Constructor & Destructor Documentation

5.78.1.1 TransformBuffer() [1/2]

```
mage::TransformBuffer::TransformBuffer (
    const Camera & camera )
```

5.78.1.2 TransformBuffer() [2/2]

```
mage::TransformBuffer::TransformBuffer (
    const TransformBuffer & buffer ) [default]
```

5.78.1.3 ~TransformBuffer()

```
mage::TransformBuffer::~~TransformBuffer ( ) [default]
```

5.78.2 Member Function Documentation

5.78.2.1 operator=()

```
TransformBuffer& mage::TransformBuffer::operator= (
    const TransformBuffer & buffer ) [default]
```

5.78.2.2 SetModelToWorld()

```
void mage::TransformBuffer::SetModelToWorld (
    const XMATRIX & model_to_world ) const
```

5.78.3 Member Data Documentation

5.78.3.1 m_model_to_world

```
XMATRIX mage::TransformBuffer::m_model_to_world [mutable], [private]
```

5.78.3.2 m_view_to_projection

```
XMATRIX mage::TransformBuffer::m_view_to_projection [private]
```

5.78.3.3 m_world_to_view

```
XMATRIX mage::TransformBuffer::m_world_to_view [private]
```

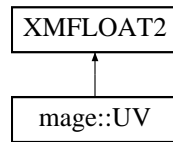
5.78.3.4 m_world_to_view_inverse_transpose

```
XMATRIX mage::TransformBuffer::m_world_to_view_inverse_transpose [private]
```

5.79 mage::UV Struct Reference

```
#include <math.hpp>
```

Inheritance diagram for mage::UV:



Public Member Functions

- [UV](#) ()
- [UV](#) (float x, float y)
- [UV](#) (const [UV](#) &uv)
- [UV](#) (const XMFLOAT2 &vector)
- [~UV](#) ()=default
- [UV](#) & [operator=](#) (const [UV](#) &uv)

5.79.1 Constructor & Destructor Documentation

5.79.1.1 [UV](#)() [1/4]

```
mage::UV::UV ( )
```

5.79.1.2 [UV](#)() [2/4]

```
mage::UV::UV (
    float x,
    float y )
```

5.79.1.3 [UV](#)() [3/4]

```
mage::UV::UV (
    const UV & uv )
```

5.79.1.4 [UV](#)() [4/4]

```
mage::UV::UV (
    const XMFLOAT2 & vector ) [explicit]
```

5.79.1.5 [~UV](#)()

```
mage::UV::~~UV ( ) [default]
```

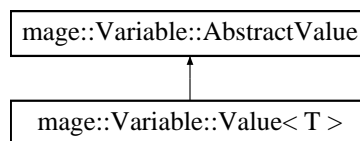
5.79.2 Member Function Documentation

5.79.2.1 operator=()

```
UV& mage::UV::operator= (
    const UV & uv )
```

5.80 mage::Variable::Value< T > Struct Template Reference

Inheritance diagram for mage::Variable::Value< T >:



Public Member Functions

- [Value](#) (const T *value)
- virtual [~Value](#) ()
- virtual const void * [GetValue](#) () const override

Private Member Functions

- [Value](#) (const [Value](#) &value)
- [Value](#) & [operator=](#) (const [Value](#) &value)=delete

Private Attributes

- const T * [m_value](#)

Additional Inherited Members

5.80.1 Detailed Description

```
template<typename T>
struct mage::Variable::Value< T >
```

A struct of immutable values.

Template Parameters

<i>T</i>	The type of the value.
----------	------------------------

5.80.2 Constructor & Destructor Documentation

5.80.2.1 `Value()` [1/2]

```
template<typename T >
mage::Variable::Value< T >::Value (
    const T * value )
```

Constructs a value.

Parameters

in	<i>value</i>	A pointer to the value.
----	--------------	-------------------------

5.80.2.2 `~Value()`

```
template<typename T >
virtual mage::Variable::Value< T >::~~Value ( ) [virtual]
```

Destructs this value.

5.80.2.3 `Value()` [2/2]

```
template<typename T >
mage::Variable::Value< T >::Value (
    const Value< T > & value ) [private]
```

Constructs a value from the given value.

Parameters

in	<i>value</i>	A reference to the value.
----	--------------	---------------------------

5.80.3 Member Function Documentation

5.80.3.1 `GetValue()`

```
template<typename T >
virtual const void* mage::Variable::Value< T >::GetValue ( ) const [override], [virtual]
```

Returns the value of this value.

Returns

A pointer to the value of this value.

Implements `mage::Variable::AbstractValue`.

5.80.3.2 operator=()

```
template<typename T >
Value& mage::Variable::Value< T >::operator= (
    const Value< T > & value ) [private], [delete]
```

Copies the given value to this value.

Parameters

in	<i>value</i>	A reference to the value to copy from.
----	--------------	--

Returns

A reference to the copy of the given value (i.e. this value).

5.80.4 Member Data Documentation

5.80.4.1 m_value

```
template<typename T >
const T* mage::Variable::Value< T >::m_value [private]
```

A pointer to the value of this value.

5.81 mage::Variable Struct Reference

```
#include <variable.hpp>
```

Classes

- struct [AbstractValue](#)
- struct [Value](#)

Public Member Functions

- template<typename T >
 [Variable](#) ([VariableType](#) type, const string &name, const T *value)
- [~Variable](#) ()
- bool [operator==](#) (const [Variable](#) &variable) const
- bool [operator!=](#) (const [Variable](#) &variable) const
- const string & [GetName](#) () const
- const [VariableType](#) & [GetType](#) () const
- const void * [GetValue](#) () const
- template<typename T >
 void [SetValue](#) (const T *value)

Private Member Functions

- [Variable](#) (const [Variable](#) &variable)=delete
- [Variable](#) & [operator=](#) (const [Variable](#) &variable)=delete

Private Attributes

- const string [m_name](#)
- const [VariableType](#) [m_type](#)
- const [AbstractValue](#) * [m_value](#)

5.81.1 Detailed Description

A struct of (immutable) variables.

5.81.2 Constructor & Destructor Documentation

5.81.2.1 [Variable\(\)](#) [1/2]

```
template<typename T >
mage::Variable::Variable (
    VariableType type,
    const string & name,
    const T * value )
```

Constructs a variable.

Template Parameters

<i>T</i>	The (storage) type of the value.
----------	----------------------------------

Parameters

in	<i>type</i>	The (scripting) type of the value.
in	<i>name</i>	The name.
in	<i>value</i>	A pointer to the value.

5.81.2.2 [~Variable\(\)](#)

```
mage::Variable::~~Variable ( )
```

Destructs this variable.

5.81.2.3 [Variable\(\)](#) [2/2]

```
mage::Variable::Variable (
    const Variable & variable ) [private], [delete]
```

Constructs a variable from the given variable.

Parameters

in	<i>variable</i>	A reference to the variable.
----	-----------------	------------------------------

5.81.3 Member Function Documentation

5.81.3.1 GetName()

```
const string& mage::Variable::GetName ( ) const
```

Returns the name of this variable.

Returns

A reference to the name of this variable.

5.81.3.2 GetType()

```
const VariableType& mage::Variable::GetType ( ) const
```

Returns the scripting type of this value.

Returns

The type of this value.

5.81.3.3 GetValue()

```
const void* mage::Variable::GetValue ( ) const
```

Returns the value of this variable.

Returns

A pointer to the value of this variable.

5.81.3.4 operator!=(())

```
bool mage::Variable::operator!= (
    const Variable & variable ) const
```

Checks whether the given variable is not equal to this variable.

Parameters

in	<i>variable</i>	A reference to the variable to compare with.
----	-----------------	--

Returns

`true` if and only if this variable and *variable* have not the same name. `false` otherwise.

5.81.3.5 operator=()

```
Variable& mage::Variable::operator= (
    const Variable & variable ) [private], [delete]
```

Copies the given variable to this variable.

Parameters

in	<i>variable</i>	A reference to the variable to copy from.
----	-----------------	---

Returns

A reference to the copy of the given variable (i.e. this variable).

5.81.3.6 operator==()

```
bool mage::Variable::operator== (
    const Variable & variable ) const
```

Checks whether the given variable is equal to this variable.

Parameters

in	<i>variable</i>	A reference to the variable to compare with.
----	-----------------	--

Returns

`true` if and only if this variable and *variable* have the same name. `false` otherwise.

5.81.3.7 SetValue()

```
template<typename T >
void mage::Variable::SetValue (
    const T * value )
```

Sets the value of this variable.

Template Parameters

<i>T</i>	The (storage) type of the value.
----------	----------------------------------

Parameters

in	value	A pointer to the value.
----	-------	-------------------------

5.81.4 Member Data Documentation

5.81.4.1 m_name

```
const string mage::Variable::m_name [private]
```

The name of this variable.

5.81.4.2 m_type

```
const VariableType mage::Variable::m_type [private]
```

The type of this value.

Note

It is not possible to use typeid(T).name() since this assumes a bijection between the scripting types and the storage types, which is not the case. Thus the type needs to be stored explicitly.

5.81.4.3 m_value

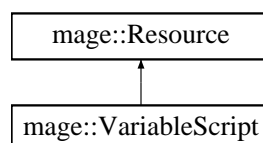
```
const AbstractValue* mage::Variable::m_value [private]
```

A pointer to the value of this variable.

5.82 mage::VariableScript Class Reference

```
#include <variable_script.hpp>
```

Inheritance diagram for mage::VariableScript:



Public Member Functions

- [VariableScript](#) (const wstring &fname, bool import=true)
- virtual [~VariableScript](#) ()
- HRESULT [ImportScript](#) (const wstring &fname=L"")
- HRESULT [ExportScript](#) (const wstring &fname=L"")
- bool [IsEmpty](#) () const
- size_t [GetNumberOfVariables](#) () const
- template<typename T >
void [AddVariable](#) (const string &name, [VariableType](#) type, const T *value)
- void [RemoveVariable](#) (const string &name)
- void [RemoveAllVariables](#) ()
- template<typename T >
const T * [GetValueOfVariable](#) (const string &name) const
- template<typename T >
void [SetValueOfVariable](#) (const string &name, const T *value)

Private Member Functions

- [VariableScript](#) (const [VariableScript](#) &variable_script)=delete
- [VariableScript](#) & [operator=](#) (const [VariableScript](#) &variable_script)=delete

Private Attributes

- map< string, [Variable](#) *> [m_variables](#)

5.82.1 Detailed Description

A class of variable scripts.

5.82.2 Constructor & Destructor Documentation

5.82.2.1 [VariableScript](#)() [1/2]

```
mage::VariableScript::VariableScript (
    const wstring & fname,
    bool import = true )
```

Constructs a variable script.

Parameters

in	<i>fname</i>	A reference to the filename of the variable script.
in	<i>import</i>	Flag indicating whether the variables of the variable script need to be imported.

5.82.2.2 ~VariableScript()

```
mage::VariableScript::~~VariableScript ( ) [virtual]
```

Destruct this variable script.

5.82.2.3 VariableScript() [2/2]

```
mage::VariableScript::VariableScript (
    const VariableScript & variable_script ) [private], [delete]
```

Constructs a variable script from the given variable script.

Parameters

in	<i>variable_script</i>	A reference to the variable script.
----	------------------------	-------------------------------------

5.82.3 Member Function Documentation

5.82.3.1 AddVariable()

```
template<typename T >
void mage::VariableScript::AddVariable (
    const string & name,
    VariableType type,
    const T * value )
```

Adds the given variable to this variable script.

Precondition

No variable with the name *name* exists in this variable script.

Template Parameters

<i>T</i>	The type of the value.
----------	------------------------

Parameters

in	<i>name</i>	The name of the variable.
in	<i>type</i>	The type of the variable.
in	<i>value</i>	A pointer to the value of the variable.

5.82.3.2 ExportScript()

```
HRESULT mage::VariableScript::ExportScript (
    const wstring & fname = L"" )
```

Exports this variable script to the file with the given filename. If the filename is not specified the associated filename of this variable script is used.

Parameters

in	<i>fname</i>	A reference to the filename.
----	--------------	------------------------------

Returns

A success/error value.

5.82.3.3 GetNumberOfVariables()

```
size_t mage::VariableScript::GetNumberOfVariables ( ) const
```

Returns the number of variables in this variable script.

Returns

The number of variables in this variable script.

5.82.3.4 GetValueOfVariable()

```
template<typename T >
const T* mage::VariableScript::GetValueOfVariable (
    const string & name ) const
```

Returns the value of the given variable in this variable script.

Template Parameters

<i>T</i>	The type of the value.
----------	------------------------

Parameters

in	<i>name</i>	The name of the variable.
----	-------------	---------------------------

Returns

`nullptr` if no variable with the name *name* exists in this variable script.
A pointer to the value of the variable.

5.82.3.5 ImportScript()

```
HRESULT mage::VariableScript::ImportScript (
    const wstring & fname = L"" )
```

Imports this variable script from the file with the given filename. If the filename is not specified the associated filename of this variable script is used.

Parameters

in	<i>fname</i>	A reference to the filename.
----	--------------	------------------------------

Returns

A success/error value.

5.82.3.6 IsEmpty()

```
bool mage::VariableScript::IsEmpty ( ) const
```

Checks wether this variable script is empty.

Returns

true if this variable script is empty. false otherwise.

5.82.3.7 operator=()

```
VariableScript& mage::VariableScript::operator= (
    const VariableScript & variable_script ) [private], [delete]
```

Copies the given variable script to this variable script.

Parameters

in	<i>variable_script</i>	A reference to the variable script to copy from.
----	------------------------	--

Returns

A reference to the copy of the given variable script (i.e. this variable script).

5.82.3.8 RemoveAllVariables()

```
void mage::VariableScript::RemoveAllVariables ( )
```

Removes and destructs all variables from this variable script.

5.82.3.9 RemoveVariable()

```
void mage::VariableScript::RemoveVariable (
    const string & name )
```

Removes and destructs the given variable from this variable script.

Parameters

in	<i>name</i>	The name of the variable.
----	-------------	---------------------------

5.82.3.10 SetValueOfVariable()

```
template<typename T >
void mage::VariableScript::SetValueOfVariable (
    const string & name,
    const T * value )
```

Sets the value of the given variable in this variable script.

Template Parameters

<i>T</i>	The type of the value.
----------	------------------------

Parameters

in	<i>name</i>	The name of the variable.
in	<i>value</i>	A pointer to the value of the variable.

Note

Nothing happens if no variable with the name *name* exists in this variable script.

5.82.4 Member Data Documentation

5.82.4.1 m_variables

```
map< string, Variable * > mage::VariableScript::m_variables [private]
```

Linked list containing the variables in this variable script.

5.83 mage::VertexPosition Struct Reference

```
#include <vertex.hpp>
```

Public Member Functions

- [VertexPosition](#) ()=default
- [VertexPosition](#) (const [Point3](#) &p)
- [VertexPosition](#) (const [VertexPosition](#) &vertex)=default
- [~VertexPosition](#) ()=default
- [VertexPosition](#) & [operator=](#) (const [VertexPosition](#) &vertex)=default

Public Attributes

- [Point3](#) *p*

Static Public Attributes

- static const uint32_t [nb_input_elements](#) = 1
- static const D3D11_INPUT_ELEMENT_DESC [input_element_desc](#) [[nb_input_elements](#)]

5.83.1 Constructor & Destructor Documentation

5.83.1.1 VertexPosition() [1/3]

```
mage::VertexPosition::VertexPosition ( ) [default]
```

Constructs a vertex.

5.83.1.2 VertexPosition() [2/3]

```
mage::VertexPosition::VertexPosition (
    const Point3 & p )
```

Constructs a vertex.

Parameters

in	<i>p</i>	A reference to the position of the vertex.
----	----------	--

5.83.1.3 VertexPosition() [3/3]

```
mage::VertexPosition::VertexPosition (
    const VertexPosition & vertex ) [default]
```

Constructs a vertex from the given vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

5.83.1.4 ~VertexPosition()

```
mage::VertexPosition::~~VertexPosition ( ) [default]
```

Destructs this vertex.

5.83.2 Member Function Documentation

5.83.2.1 operator=()

```
VertexPosition& mage::VertexPosition::operator= (
    const VertexPosition & vertex ) [default]
```

Copies the given vertex to this vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

Returns

A reference to the copy of the given vertex (i.e. this vertex).

5.83.3 Member Data Documentation

5.83.3.1 input_element_desc

```
const D3D11_INPUT_ELEMENT_DESC mage::VertexPosition::input_element_desc [static]
```

Initial value:

```
= {
    { MAGE_VERTEX_SEMANTIC_NAME_POSITION, 0, DXGI_FORMAT_R32G32B32_FLOAT,    0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 }
}
```

The input element descriptor of a vertex.

5.83.3.2 nb_input_elements

```
const uint32_t mage::VertexPosition::nb_input_elements = 1 [static]
```

The number of elements in the input element descriptor of a vertex.

5.83.3.3 p

```
Point3 mage::VertexPosition::p
```

The position of this vertex.

5.84 mage::VertexPositionColor Struct Reference

```
#include <vertex.hpp>
```

Public Member Functions

- [VertexPositionColor](#) ()=default
- [VertexPositionColor](#) (const [Point3](#) &p, const [Color](#) &c)
- [VertexPositionColor](#) (const [VertexPositionColor](#) &vertex)=default
- [~VertexPositionColor](#) ()=default
- [VertexPositionColor](#) & [operator=](#) (const [VertexPositionColor](#) &vertex)=default

Public Attributes

- [Point3](#) p
- [Color](#) c

Static Public Attributes

- static const uint32_t [nb_input_elements](#) = 2
- static const D3D11_INPUT_ELEMENT_DESC [input_element_desc](#) [[nb_input_elements](#)]

5.84.1 Constructor & Destructor Documentation

5.84.1.1 [VertexPositionColor](#)() [1/3]

```
mage::VertexPositionColor::VertexPositionColor ( ) [default]
```

Constructs a vertex.

5.84.1.2 [VertexPositionColor](#)() [2/3]

```
mage::VertexPositionColor::VertexPositionColor (
    const Point3 & p,
    const Color & c )
```

Constructs a vertex.

Parameters

in	<i>p</i>	A reference to the position of the vertex.
in	<i>c</i>	A reference to the color of the vertex.

5.84.1.3 [VertexPositionColor](#)() [3/3]

```
mage::VertexPositionColor::VertexPositionColor (
    const VertexPositionColor & vertex ) [default]
```

Constructs a vertex from the given vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

5.84.1.4 ~VertexPositionColor()

```
mage::VertexPositionColor::~~VertexPositionColor ( ) [default]
```

Destructs this vertex.

5.84.2 Member Function Documentation**5.84.2.1 operator=()**

```
VertexPositionColor& mage::VertexPositionColor::operator= (
    const VertexPositionColor & vertex ) [default]
```

Copies the given vertex to this vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

Returns

A reference to the copy of the given vertex (i.e. this vertex).

5.84.3 Member Data Documentation**5.84.3.1 c**

```
Color mage::VertexPositionColor::c
```

The color of this vertex.

5.84.3.2 input_element_desc

```
const D3D11_INPUT_ELEMENT_DESC mage::VertexPositionColor::input_element_desc [static]
```

Initial value:

```
= {
    { MAGE_VERTEX_SEMANTIC_NAME_POSITION, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_COLOR, 0, DXGI_FORMAT_R32G32B32A32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 }
}
```

The input element descriptor of a vertex.

5.84.3.3 nb_input_elements

```
const uint32_t mage::VertexPositionColor::nb_input_elements = 2 [static]
```

The number of elements in the input element descriptor of a vertex.

5.84.3.4 p

```
Point3 mage::VertexPositionColor::p
```

The position of this vertex.

5.85 mage::VertexPositionColorTexture Struct Reference

```
#include <vertex.hpp>
```

Public Member Functions

- [VertexPositionColorTexture](#) ()=default
- [VertexPositionColorTexture](#) (const [Point3](#) &p, const [Color](#) &c, const [UV](#) &tex)
- [VertexPositionColorTexture](#) (const [VertexPositionColorTexture](#) &vertex)=default
- [~VertexPositionColorTexture](#) ()=default
- [VertexPositionColorTexture](#) & operator= (const [VertexPositionColorTexture](#) &vertex)=default

Public Attributes

- [Point3](#) p
- [Color](#) c
- [UV](#) tex

Static Public Attributes

- static const uint32_t [nb_input_elements](#) = 3
- static const D3D11_INPUT_ELEMENT_DESC [input_element_desc](#) [[nb_input_elements](#)]

5.85.1 Constructor & Destructor Documentation

5.85.1.1 VertexPositionColorTexture() [1/3]

```
mage::VertexPositionColorTexture::VertexPositionColorTexture ( ) [default]
```

Constructs a vertex.

5.85.1.2 VertexPositionColorTexture() [2/3]

```
mage::VertexPositionColorTexture::VertexPositionColorTexture (
    const Point3 & p,
    const Color & c,
    const UV & tex )
```

Constructs a vertex.

Parameters

in	<i>p</i>	A reference to the position of the vertex.
in	<i>c</i>	A reference to the color of the vertex.
in	<i>tex</i>	A reference to the texture coordinates of the vertex.

5.85.1.3 VertexPositionColorTexture() [3/3]

```
mage::VertexPositionColorTexture::VertexPositionColorTexture (
    const VertexPositionColorTexture & vertex ) [default]
```

Constructs a vertex from the given vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

5.85.1.4 ~VertexPositionColorTexture()

```
mage::VertexPositionColorTexture::~~VertexPositionColorTexture ( ) [default]
```

Destructs this vertex.

5.85.2 Member Function Documentation

5.85.2.1 operator=()

```
VertexPositionColorTexture& mage::VertexPositionColorTexture::operator= (
    const VertexPositionColorTexture & vertex ) [default]
```

Copies the given vertex to this vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

Returns

A reference to the copy of the given vertex (i.e. this vertex).

5.85.3 Member Data Documentation

5.85.3.1 c

```
Color mage::VertexPositionColorTexture::c
```

The color of this vertex.

5.85.3.2 input_element_desc

```
const D3D11_INPUT_ELEMENT_DESC mage::VertexPositionColorTexture::input_element_desc [static]
```

Initial value:

```
= {
    { MAGE_VERTEX_SEMANTIC_NAME_POSITION, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_COLOR, 0, DXGI_FORMAT_R32G32B32A32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_TEXTURE, 0, DXGI_FORMAT_R32G32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 }
}
```

The input element descriptor of a vertex.

5.85.3.3 nb_input_elements

```
const uint32_t mage::VertexPositionColorTexture::nb_input_elements = 3 [static]
```

The number of elements in the input element descriptor of a vertex.

5.85.3.4 p

```
Point3 mage::VertexPositionColorTexture::p
```

The position of this vertex.

5.85.3.5 tex

```
UV mage::VertexPositionColorTexture::tex
```

The texture coordinates of this vertex.

5.86 mage::VertexPositionNormal Struct Reference

```
#include <vertex.hpp>
```

Public Member Functions

- [VertexPositionNormal](#) ()=default
- [VertexPositionNormal](#) (const [Point3](#) &p, const [Normal3](#) &n)
- [VertexPositionNormal](#) (const [VertexPositionNormal](#) &vertex)=default
- [~VertexPositionNormal](#) ()=default
- [VertexPositionNormal](#) & operator= (const [VertexPositionNormal](#) &vertex)=default

Public Attributes

- [Point3](#) *p*
- [Normal3](#) *n*

Static Public Attributes

- static const uint32_t [nb_input_elements](#) = 2
- static const D3D11_INPUT_ELEMENT_DESC [input_element_desc](#) [[nb_input_elements](#)]

5.86.1 Constructor & Destructor Documentation

5.86.1.1 VertexPositionNormal() [1/3]

```
mage::VertexPositionNormal::VertexPositionNormal ( ) [default]
```

Constructs a vertex.

5.86.1.2 VertexPositionNormal() [2/3]

```
mage::VertexPositionNormal::VertexPositionNormal (
    const Point3 & p,
    const Normal3 & n )
```

Constructs a vertex.

Parameters

in	<i>p</i>	A reference to the position of the vertex.
in	<i>n</i>	A reference to the normal of the vertex.

5.86.1.3 VertexPositionNormal() [3/3]

```
mage::VertexPositionNormal::VertexPositionNormal (
    const VertexPositionNormal & vertex ) [default]
```

Constructs a vertex from the given vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

5.86.1.4 ~VertexPositionNormal()

```
mage::VertexPositionNormal::~~VertexPositionNormal ( ) [default]
```

Destructs this vertex.

5.86.2 Member Function Documentation

5.86.2.1 operator=()

```
VertexPositionNormal& mage::VertexPositionNormal::operator= (
    const VertexPositionNormal & vertex ) [default]
```

Copies the given vertex to this vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

Returns

A reference to the copy of the given vertex (i.e. this vertex).

5.86.3 Member Data Documentation

5.86.3.1 input_element_desc

```
const D3D11_INPUT_ELEMENT_DESC mage::VertexPositionNormal::input_element_desc [static]
```

Initial value:

```
= {
    { MAGE_VERTEX_SEMANTIC_NAME_POSITION, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_NORMAL, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 }
}
```

The input element descriptor of a vertex.

5.86.3.2 n

```
Normal3 mage::VertexPositionNormal::n
```

The normal of this vertex.

5.86.3.3 nb_input_elements

```
const uint32_t mage::VertexPositionNormal::nb_input_elements = 2 [static]
```

The number of elements in the input element descriptor of a vertex.

5.86.3.4 p

```
Point3 mage::VertexPositionNormal::p
```

The position of this vertex.

5.87 mage::VertexPositionNormalColors Struct Reference

```
#include <vertex.hpp>
```

Public Member Functions

- [VertexPositionNormalColors](#) ()=default
- [VertexPositionNormalColors](#) (const [Point3](#) &p, const [Normal3](#) &n, const [Color](#) &c)
- [VertexPositionNormalColors](#) (const [VertexPositionNormalColors](#) &vertex)=default
- [~VertexPositionNormalColors](#) ()=default
- [VertexPositionNormalColors](#) & operator= (const [VertexPositionNormalColors](#) &vertex)=default

Public Attributes

- [Point3](#) p
- [Normal3](#) n
- [Color](#) c

Static Public Attributes

- static const uint32_t [nb_input_elements](#) = 3
- static const D3D11_INPUT_ELEMENT_DESC [input_element_desc](#) [[nb_input_elements](#)]

5.87.1 Constructor & Destructor Documentation

5.87.1.1 VertexPositionNormalColors() [1/3]

```
mage::VertexPositionNormalColors::VertexPositionNormalColors ( ) [default]
```

Constructs a vertex.

5.87.1.2 VertexPositionNormalColors() [2/3]

```
mage::VertexPositionNormalColors::VertexPositionNormalColors (
    const Point3 & p,
    const Normal3 & n,
    const Color & c )
```

Constructs a vertex.

Parameters

in	<i>p</i>	A reference to the position of the vertex.
in	<i>n</i>	A reference to the normal of the vertex.
in	<i>c</i>	A reference to the color of the vertex.

5.87.1.3 VertexPositionNormalColor() [3/3]

```
mage::VertexPositionNormalColor::VertexPositionNormalColor (
    const VertexPositionNormalColor & vertex ) [default]
```

Constructs a vertex from the given vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

5.87.1.4 ~VertexPositionNormalColor()

```
mage::VertexPositionNormalColor::~~VertexPositionNormalColor ( ) [default]
```

Destructs this vertex.

5.87.2 Member Function Documentation

5.87.2.1 operator=()

```
VertexPositionNormalColor& mage::VertexPositionNormalColor::operator= (
    const VertexPositionNormalColor & vertex ) [default]
```

Copies the given vertex to this vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

Returns

A reference to the copy of the given vertex (i.e. this vertex).

5.87.3 Member Data Documentation

5.87.3.1 c

```
Color mage::VertexPositionNormalColor::c
```

The color of this vertex.

5.87.3.2 input_element_desc

```
const D3D11_INPUT_ELEMENT_DESC mage::VertexPositionNormalColor::input_element_desc [static]
```

Initial value:

```
= {
    { MAGE_VERTEX_SEMANTIC_NAME_POSITION, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_NORMAL, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_COLOR, 0, DXGI_FORMAT_R32G32B32A32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 }
}
```

The input element descriptor of a vertex.

5.87.3.3 n

```
Normal3 mage::VertexPositionNormalColors::n
```

The normal of this vertex.

5.87.3.4 nb_input_elements

```
const uint32_t mage::VertexPositionNormalColors::nb_input_elements = 3 [static]
```

The number of elements in the input element descriptor of a vertex.

5.87.3.5 p

```
Point3 mage::VertexPositionNormalColors::p
```

The position of this vertex.

5.88 mage::VertexPositionNormalColorsTexture Struct Reference

```
#include <vertex.hpp>
```

Public Member Functions

- [VertexPositionNormalColorsTexture](#) ()=default
- [VertexPositionNormalColorsTexture](#) (const [Point3](#) &p, const [Normal3](#) &n, const [Color](#) &c, const [UV](#) &tex)
- [VertexPositionNormalColorsTexture](#) (const [VertexPositionNormalColorsTexture](#) &vertex)=default
- [~VertexPositionNormalColorsTexture](#) ()=default
- [VertexPositionNormalColorsTexture](#) & operator= (const [VertexPositionNormalColorsTexture](#) &vertex)=default

Public Attributes

- [Point3](#) p
- [Normal3](#) n
- [Color](#) c
- [UV](#) tex

Static Public Attributes

- static const int `nb_input_elements` = 4
- static const D3D11_INPUT_ELEMENT_DESC `input_element_desc` [`nb_input_elements`]

5.88.1 Constructor & Destructor Documentation

5.88.1.1 VertexPositionNormalColorTexture() [1/3]

```
mage::VertexPositionNormalColorTexture::VertexPositionNormalColorTexture ( ) [default]
```

Constructs a vertex.

5.88.1.2 VertexPositionNormalColorTexture() [2/3]

```
mage::VertexPositionNormalColorTexture::VertexPositionNormalColorTexture (
    const Point3 & p,
    const Normal3 & n,
    const Color & c,
    const UV & tex )
```

Constructs a vertex.

Parameters

in	<i>p</i>	A reference to the position of the vertex.
in	<i>n</i>	A reference to the normal of the vertex.
in	<i>c</i>	A reference to the color of the vertex.
in	<i>tex</i>	A reference to the texture coordinates of the vertex.

5.88.1.3 VertexPositionNormalColorTexture() [3/3]

```
mage::VertexPositionNormalColorTexture::VertexPositionNormalColorTexture (
    const VertexPositionNormalColorTexture & vertex ) [default]
```

Constructs a vertex from the given vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

5.88.1.4 ~VertexPositionNormalColorTexture()

```
mage::VertexPositionNormalColorTexture::~~VertexPositionNormalColorTexture ( ) [default]
```

Destructs this vertex.

5.88.2 Member Function Documentation

5.88.2.1 operator=()

```
VertexPositionNormalColorTexture& mage::VertexPositionNormalColorTexture::operator= (
    const VertexPositionNormalColorTexture & vertex ) [default]
```

Copies the given vertex to this vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

Returns

A reference to the copy of the given vertex (i.e. this vertex).

5.88.3 Member Data Documentation

5.88.3.1 c

```
Color mage::VertexPositionNormalColorTexture::c
```

The color of this vertex.

5.88.3.2 input_element_desc

```
const D3D11_INPUT_ELEMENT_DESC mage::VertexPositionNormalColorTexture::input_element_desc
[static]
```

Initial value:

```
= {
    { MAGE_VERTEX_SEMANTIC_NAME_POSITION, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_NORMAL, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_COLOR, 0, DXGI_FORMAT_R32G32B32A32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_TEXTURE, 0, DXGI_FORMAT_R32G32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 }
}
```

The input element descriptor of a vertex.

5.88.3.3 n

```
Normal3 mage::VertexPositionNormalColorTexture::n
```

The normal of this vertex.

5.88.3.4 nb_input_elements

```
const int mage::VertexPositionNormalTexture::nb_input_elements = 4 [static]
```

The number of elements in the input element descriptor of a vertex.

5.88.3.5 p

```
Point3 mage::VertexPositionNormalTexture::p
```

The position of this vertex.

5.88.3.6 tex

```
UV mage::VertexPositionNormalTexture::tex
```

The texture coordinates of this vertex.

5.89 mage::VertexPositionNormalTexture Struct Reference

```
#include <vertex.hpp>
```

Public Member Functions

- [VertexPositionNormalTexture](#) ()=default
- [VertexPositionNormalTexture](#) (const [Point3](#) &p, const [Normal3](#) &n, const [UV](#) &tex)
- [VertexPositionNormalTexture](#) (const [VertexPositionNormalTexture](#) &vertex)=default
- [~VertexPositionNormalTexture](#) ()=default
- [VertexPositionNormalTexture](#) & operator= (const [VertexPositionNormalTexture](#) &vertex)=default

Public Attributes

- [Point3](#) p
- [Normal3](#) n
- [UV](#) tex

Static Public Attributes

- static const uint32_t [nb_input_elements](#) = 3
- static const D3D11_INPUT_ELEMENT_DESC [input_element_desc](#) [[nb_input_elements](#)]

5.89.1 Constructor & Destructor Documentation

5.89.1.1 VertexPositionNormalTexture() [1/3]

```
mage::VertexPositionNormalTexture::VertexPositionNormalTexture ( ) [default]
```

Constructs a vertex.

5.89.1.2 VertexPositionNormalTexture() [2/3]

```
mage::VertexPositionNormalTexture::VertexPositionNormalTexture (
    const Point3 & p,
    const Normal3 & n,
    const UV & tex )
```

Constructs a vertex.

Parameters

in	p	A reference to the position of the vertex.
in	n	A reference to the normal of the vertex.
in	tex	A reference to the texture coordinates of the vertex.

5.89.1.3 VertexPositionNormalTexture() [3/3]

```
mage::VertexPositionNormalTexture::VertexPositionNormalTexture (
    const VertexPositionNormalTexture & vertex ) [default]
```

Constructs a vertex from the given vertex.

Parameters

in	$vertex$	A reference to a vertex.
----	----------	--------------------------

5.89.1.4 ~VertexPositionNormalTexture()

```
mage::VertexPositionNormalTexture::~~VertexPositionNormalTexture ( ) [default]
```

Destructs this vertex.

5.89.2 Member Function Documentation

5.89.2.1 operator=()

```
VertexPositionNormalTexture& mage::VertexPositionNormalTexture::operator= (
    const VertexPositionNormalTexture & vertex ) [default]
```

Copies the given vertex to this vertex.

Parameters

in	$vertex$	A reference to a vertex.
----	----------	--------------------------

Returns

A reference to the copy of the given vertex (i.e. this vertex).

5.89.3 Member Data Documentation

5.89.3.1 input_element_desc

```
const D3D11_INPUT_ELEMENT_DESC mage::VertexPositionNormalTexture::input_element_desc [static]
```

Initial value:

```
= {
    { MAGE_VERTEX_SEMANTIC_NAME_POSITION, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_NORMAL, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_TEXTURE, 0, DXGI_FORMAT_R32G32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 }
}
```

The input element descriptor of a vertex.

5.89.3.2 n

```
Normal3 mage::VertexPositionNormalTexture::n
```

The normal of this vertex.

5.89.3.3 nb_input_elements

```
const uint32_t mage::VertexPositionNormalTexture::nb_input_elements = 3 [static]
```

The number of elements in the input element descriptor of a vertex.

5.89.3.4 p

```
Point3 mage::VertexPositionNormalTexture::p
```

The position of this vertex.

5.89.3.5 tex

```
UV mage::VertexPositionNormalTexture::tex
```

The texture coordinates of this vertex.

5.90 mage::VertexPositionTexture Struct Reference

```
#include <vertex.hpp>
```

Public Member Functions

- [VertexPositionTexture](#) ()=default
- [VertexPositionTexture](#) (const [Point3](#) &p, const [UV](#) &tex)
- [VertexPositionTexture](#) (const [VertexPositionTexture](#) &vertex)=default
- [~VertexPositionTexture](#) ()=default
- [VertexPositionTexture](#) & operator= (const [VertexPositionTexture](#) &vertex)=default

Public Attributes

- [Point3](#) *p*
- [UV](#) *tex*

Static Public Attributes

- static const uint32_t [nb_input_elements](#) = 2
- static const D3D11_INPUT_ELEMENT_DESC [input_element_desc](#) [[nb_input_elements](#)]

5.90.1 Constructor & Destructor Documentation

5.90.1.1 VertexPositionTexture() [1/3]

```
mage::VertexPositionTexture::VertexPositionTexture ( ) [default]
```

Constructs a vertex.

5.90.1.2 VertexPositionTexture() [2/3]

```
mage::VertexPositionTexture::VertexPositionTexture (
    const Point3 & p,
    const UV & tex )
```

Constructs a vertex.

Parameters

in	<i>p</i>	A reference to the position of the vertex.
in	<i>tex</i>	A reference to the texture coordinates of the vertex.

5.90.1.3 VertexPositionTexture() [3/3]

```
mage::VertexPositionTexture::VertexPositionTexture (
    const VertexPositionTexture & vertex ) [default]
```

Constructs a vertex from the given vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

5.90.1.4 ~VertexPositionTexture()

```
mage::VertexPositionTexture::~~VertexPositionTexture ( ) [default]
```

Destructs this vertex.

5.90.2 Member Function Documentation

5.90.2.1 operator=()

```
VertexPositionTexture& mage::VertexPositionTexture::operator= (
    const VertexPositionTexture & vertex ) [default]
```

Copies the given vertex to this vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

Returns

A reference to the copy of the given vertex (i.e. this vertex).

5.90.3 Member Data Documentation

5.90.3.1 input_element_desc

```
const D3D11_INPUT_ELEMENT_DESC mage::VertexPositionTexture::input_element_desc [static]
```

Initial value:

```
= {
    { MAGE_VERTEX_SEMANTIC_NAME_POSITION, 0, DXGI_FORMAT_R32G32B32_FLOAT,    0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_TEXTURE, 0, DXGI_FORMAT_R32G32_FLOAT,      0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 }
}
```

The input element descriptor of a vertex.

5.90.3.2 nb_input_elements

```
const uint32_t mage::VertexPositionTexture::nb_input_elements = 2 [static]
```

The number of elements in the input element descriptor of a vertex.

5.90.3.3 p

```
Point3 mage::VertexPositionTexture::p
```

The position of this vertex.

5.90.3.4 tex

```
UV mage::VertexPositionTexture::tex
```

The texture coordinates of this vertex.

5.91 mage::VertexPositionTextureTexture Struct Reference

```
#include <vertex.hpp>
```

Public Member Functions

- [VertexPositionTextureTexture](#) ()=default
- [VertexPositionTextureTexture](#) (const [Point3](#) &p, const [UV](#) &tex1, const [UV](#) &tex2)
- [VertexPositionTextureTexture](#) (const [VertexPositionTextureTexture](#) &vertex)=default
- [~VertexPositionTextureTexture](#) ()=default
- [VertexPositionTextureTexture](#) & operator= (const [VertexPositionTextureTexture](#) &vertex)=default

Public Attributes

- [Point3](#) p
- [UV](#) tex1
- [UV](#) tex2

Static Public Attributes

- static const int [nb_input_elements](#) = 3
- static const D3D11_INPUT_ELEMENT_DESC [input_element_desc](#) [[nb_input_elements](#)]

5.91.1 Constructor & Destructor Documentation

5.91.1.1 VertexPositionTextureTexture() [1/3]

```
mage::VertexPositionTextureTexture::VertexPositionTextureTexture ( ) [default]
```

Constructs a vertex.

5.91.1.2 VertexPositionTextureTexture() [2/3]

```
mage::VertexPositionTextureTexture::VertexPositionTextureTexture (
    const Point3 & p,
    const UV & tex1,
    const UV & tex2 )
```

Constructs a vertex.

Parameters

in	<i>p</i>	A reference to the position of the vertex.
in	<i>tex1</i>	A reference to the first texture coordinates of the vertex.
in	<i>tex2</i>	A reference to the second texture coordinates of the vertex.

5.91.1.3 VertexPositionTextureTexture() [3/3]

```
mage::VertexPositionTextureTexture::VertexPositionTextureTexture (
    const VertexPositionTextureTexture & vertex ) [default]
```

Constructs a vertex from the given vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

5.91.1.4 ~VertexPositionTextureTexture()

```
mage::VertexPositionTextureTexture::~~VertexPositionTextureTexture ( ) [default]
```

Destructs this vertex.

5.91.2 Member Function Documentation

5.91.2.1 operator=()

```
VertexPositionTextureTexture& mage::VertexPositionTextureTexture::operator= (
    const VertexPositionTextureTexture & vertex ) [default]
```

Copies the given vertex to this vertex.

Parameters

in	<i>vertex</i>	A reference to a vertex.
----	---------------	--------------------------

Returns

A reference to the copy of the given vertex (i.e. this vertex).

5.91.3 Member Data Documentation

5.91.3.1 input_element_desc

```
const D3D11_INPUT_ELEMENT_DESC mage::VertexPositionTextureTexture::input_element_desc [static]
```

Initial value:

```
= {
    { MAGE_VERTEX_SEMANTIC_NAME_POSITION, 0, DXGI_FORMAT_R32G32B32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_TEXTURE, 0, DXGI_FORMAT_R32G32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 },
    { MAGE_VERTEX_SEMANTIC_NAME_TEXTURE, 1, DXGI_FORMAT_R32G32_FLOAT, 0,
      D3D11_APPEND_ALIGNED_ELEMENT, D3D11_INPUT_PER_VERTEX_DATA, 0 }
}
```

The input element descriptor of a vertex.

5.91.3.2 nb_input_elements

```
const int mage::VertexPositionTextureTexture::nb_input_elements = 3 [static]
```

The number of elements in the input element descriptor of a vertex.

5.91.3.3 p

```
Point3 mage::VertexPositionTextureTexture::p
```

The position of this vertex.

5.91.3.4 tex1

```
UV mage::VertexPositionTextureTexture::tex1
```

The first texture coordinates of this vertex.

5.91.3.5 tex2

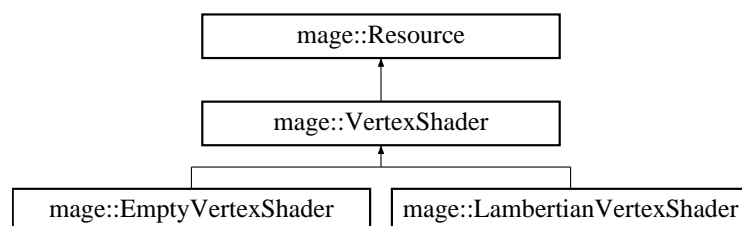
```
UV mage::VertexPositionTextureTexture::tex2
```

The second texture coordinates of this vertex.

5.92 mage::VertexShader Class Reference

```
#include <shader.hpp>
```

Inheritance diagram for mage::VertexShader:



Public Member Functions

- [VertexShader](#) (const [RenderingDevice](#) &device, const wstring &fname, const D3D11_INPUT_ELEMENT_DESC *input_element_desc, uint32_t nb_input_elements)
- virtual [~VertexShader](#) ()=default
- virtual void [Render](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [Material](#) &material, const [World](#) &world, const [TransformBuffer](#) &transform_buffer) const =0

Protected Attributes

- [ComPtr](#)< ID3D11VertexShader > [m_vertex_shader](#)
- [ComPtr](#)< ID3D11InputLayout > [m_vertex_layout](#)

Private Member Functions

- [VertexShader](#) (const [VertexShader](#) &vertex_shader)=delete
- [VertexShader](#) & [operator=](#) (const [VertexShader](#) &vertex_shader)=delete
- HRESULT [InitializeShader](#) (const [RenderingDevice](#) &device, const D3D11_INPUT_ELEMENT_DESC *input_element_desc, uint32_t nb_input_elements)

5.92.1 Constructor & Destructor Documentation

5.92.1.1 VertexShader() [1/2]

```
mage::VertexShader::VertexShader (
    const RenderingDevice & device,
    const wstring & fname,
    const D3D11_INPUT_ELEMENT_DESC * input_element_desc,
    uint32_t nb_input_elements )
```

5.92.1.2 ~VertexShader()

```
virtual mage::VertexShader::~~VertexShader ( ) [virtual], [default]
```

5.92.1.3 VertexShader() [2/2]

```
mage::VertexShader::VertexShader (
    const VertexShader & vertex_shader ) [private], [delete]
```

5.92.2 Member Function Documentation

5.92.2.1 InitializeShader()

```
HRESULT mage::VertexShader::InitializeShader (
    const RenderingDevice & device,
    const D3D11_INPUT_ELEMENT_DESC * input_element_desc,
    uint32_t nb_input_elements ) [private]
```

5.92.2.2 operator=()

```
VertexShader& mage::VertexShader::operator= (
    const VertexShader & vertex_shader ) [private], [delete]
```

5.92.2.3 Render()

```
virtual void mage::VertexShader::Render (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const Material & material,
    const World & world,
    const TransformBuffer & transform_buffer ) const [pure virtual]
```

Implemented in [mage::LambertianVertexShader](#), and [mage::EmptyVertexShader](#).

5.92.3 Member Data Documentation

5.92.3.1 m_vertex_layout

```
ComPtr< ID3D11InputLayout > mage::VertexShader::m_vertex_layout [protected]
```

5.92.3.2 m_vertex_shader

```
ComPtr< ID3D11VertexShader > mage::VertexShader::m_vertex_shader [protected]
```

5.93 mage::ViewFrustum Class Reference

```
#include <view_frustum.hpp>
```

Public Member Functions

- [ViewFrustum](#) (const [Camera](#) &camera)
- [ViewFrustum](#) (const [ViewFrustum](#) &view_frustum)=default
- [~ViewFrustum](#) ()=default
- [ViewFrustum](#) & operator= (const [ViewFrustum](#) &view_frustum)=default
- bool [Encloses](#) (const [Point3](#) &point) const
- bool [Overlaps](#) (const [Transform](#) &transform, const [BS](#) &bs) const
- bool [Overlaps](#) (const [Transform](#) &transform, const [AABB](#) &aabb) const

Private Attributes

- XMFLOAT4 [m_planes](#) [6]

5.93.1 Constructor & Destructor Documentation

5.93.1.1 ViewFrustum() [1/2]

```
mage::ViewFrustum::ViewFrustum (
    const Camera & camera )
```

5.93.1.2 ViewFrustum() [2/2]

```
mage::ViewFrustum::ViewFrustum (
    const ViewFrustum & view_frustum ) [default]
```

5.93.1.3 ~ViewFrustum()

```
mage::ViewFrustum::~ViewFrustum ( ) [default]
```

5.93.2 Member Function Documentation

5.93.2.1 Encloses()

```
bool mage::ViewFrustum::Encloses (
    const Point3 & point ) const
```

5.93.2.2 operator=()

```
ViewFrustum& mage::ViewFrustum::operator= (
    const ViewFrustum & view_frustum ) [default]
```

5.93.2.3 Overlaps() [1/2]

```
bool mage::ViewFrustum::Overlaps (
    const Transform & transform,
    const BS & bs ) const
```

5.93.2.4 Overlaps() [2/2]

```
bool mage::ViewFrustum::Overlaps (
    const Transform & transform,
    const AABB & aabb ) const
```

5.93.3 Member Data Documentation

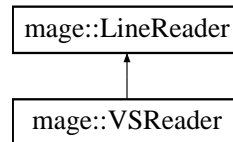
5.93.3.1 m_planes

```
XMFLOAT4 mage::ViewFrustum::m_planes[6] [private]
```

5.94 mage::VSReader Class Reference

```
#include <vs_reader.hpp>
```

Inheritance diagram for mage::VSReader:



Public Member Functions

- [VSReader](#) (vector< [Variable](#) * > &variable_buffer)
- virtual [~VSReader](#) ()=default

Protected Member Functions

- virtual HRESULT [ReadLine](#) (char *line) override
- void [ReadVSBool](#) ()
- void [ReadVSInt](#) ()
- void [ReadVSInt2](#) ()
- void [ReadVSInt3](#) ()
- void [ReadVSFloat](#) ()
- void [ReadVSFloat2](#) ()
- void [ReadVSFloat3](#) ()
- void [ReadVSFloat4](#) ()
- void [ReadVSColor](#) ()
- void [ReadVSString](#) ()
- void [ReadVSUnknown](#) ()

Private Member Functions

- [VSReader](#) (const [VSReader](#) &reader)=delete
- [VSReader](#) & [operator=](#) (const [VSReader](#) &reader)=delete

Private Attributes

- vector< [Variable](#) *> & [m_variable_buffer](#)

Additional Inherited Members

5.94.1 Constructor & Destructor Documentation

5.94.1.1 VSReader() [1/2]

```
mage::VSReader::VSReader (
    vector< Variable * > & variable_buffer )
```

5.94.1.2 ~VSReader()

```
virtual mage::VSReader::~VSReader ( ) [virtual], [default]
```

5.94.1.3 VSReader() [2/2]

```
mage::VSReader::VSReader (
    const VSReader & reader ) [private], [delete]
```

5.94.2 Member Function Documentation

5.94.2.1 operator=()

```
VSReader& mage::VSReader::operator= (
    const VSReader & reader ) [private], [delete]
```

5.94.2.2 ReadLine()

```
HRESULT mage::VSReader::ReadLine (
    char * line ) [override], [protected], [virtual]
```

Implements [mage::LineReader](#).

5.94.2.3 ReadVSBool()

```
void mage::VSReader::ReadVSBool ( ) [protected]
```

5.94.2.4 ReadVSColor()

```
void mage::VSReader::ReadVSColor ( ) [protected]
```

5.94.2.5 ReadVSFloat()

```
void mage::VSReader::ReadVSFloat ( ) [protected]
```

5.94.2.6 ReadVSFloat2()

```
void mage::VSReader::ReadVSFloat2 ( ) [protected]
```

5.94.2.7 ReadVSFloat3()

```
void mage::VSReader::ReadVSFloat3 ( ) [protected]
```

5.94.2.8 ReadVSFloat4()

```
void mage::VSReader::ReadVSFloat4 ( ) [protected]
```

5.94.2.9 ReadVSInt()

```
void mage::VSReader::ReadVSInt ( ) [protected]
```

5.94.2.10 ReadVSInt2()

```
void mage::VSReader::ReadVSInt2 ( ) [protected]
```

5.94.2.11 ReadVSInt3()

```
void mage::VSReader::ReadVSInt3 ( ) [protected]
```

5.94.2.12 ReadVSString()

```
void mage::VSReader::ReadVSString ( ) [protected]
```

5.94.2.13 ReadVSUnknown()

```
void mage::VSReader::ReadVSUnknown ( ) [protected]
```

5.94.3 Member Data Documentation

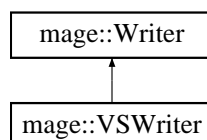
5.94.3.1 m_variable_buffer

```
vector< Variable * >& mage::VSReader::m_variable_buffer [private]
```

5.95 mage::VSWriter Class Reference

```
#include <vs_writer.hpp>
```

Inheritance diagram for mage::VSWriter:



Public Member Functions

- [VSWriter](#) (const vector< [Variable](#) * > &variable_buffer)
- virtual [~VSWriter](#) ()=default

Protected Member Functions

- virtual HRESULT [Write](#) () const override

Private Member Functions

- [VSWriter](#) (const [VSWriter](#) &reader)=delete
- [VSWriter](#) & [operator=](#) (const [VSWriter](#) &reader)=delete

Private Attributes

- const vector< [Variable](#) *> & [m_variable_buffer](#)

5.95.1 Constructor & Destructor Documentation

5.95.1.1 VSWriter() [1/2]

```
mage::VSWriter::VSWriter (
    const vector< Variable * > & variable_buffer )
```

5.95.1.2 ~VSWriter()

```
virtual mage::VSWriter::~~VSWriter ( ) [virtual], [default]
```

5.95.1.3 VSWriter() [2/2]

```
mage::VSWriter::VSWriter (
    const VSWriter & reader ) [private], [delete]
```

5.95.2 Member Function Documentation

5.95.2.1 operator=()

```
VSWriter& mage::VSWriter::operator= (
    const VSWriter & reader ) [private], [delete]
```

5.95.2.2 Write()

```
HRESULT mage::VSWriter::Write ( ) const [override], [protected], [virtual]
```

Implements [mage::Writer](#).

5.95.3 Member Data Documentation

5.95.3.1 m_variable_buffer

```
const vector< Variable * >& mage::VSWriter::m_variable_buffer [private]
```

5.96 mage::World Class Reference

```
#include <world.hpp>
```

Public Member Functions

- [World](#) ()=default
- virtual [~World](#) ()
- void [Render](#) ([ComPtr](#)< ID3D11DeviceContext2 > device_context, const [TransformBuffer](#) &transform_buffer)
- set< [SharedPtr](#)< [Model](#) > >::iterator [ModelsBegin](#) ()
- set< [SharedPtr](#)< [Model](#) > >::iterator [ModelsEnd](#) ()
- set< [SharedPtr](#)< [Model](#) > >::const_iterator [ModelsBegin](#) () const
- set< [SharedPtr](#)< [Model](#) > >::const_iterator [ModelsEnd](#) () const
- size_t [GetNumberOfModels](#) () const
- [SharedPtr](#)< [Model](#) > [GetModel](#) (const string &name) const
- bool [HasModel](#) (const string &name) const
- bool [HasModel](#) (const [SharedPtr](#)< [Model](#) > model) const
- void [AddModel](#) ([SharedPtr](#)< [Model](#) > model)
- void [RemoveModel](#) (const string &name)
- void [RemoveModel](#) ([SharedPtr](#)< [Model](#) > model)
- void [RemoveAllModels](#) ()
- set< [SharedPtr](#)< [PointLight](#) > >::iterator [LightsBegin](#) ()
- set< [SharedPtr](#)< [PointLight](#) > >::iterator [LightsEnd](#) ()
- set< [SharedPtr](#)< [PointLight](#) > >::const_iterator [LightsBegin](#) () const
- set< [SharedPtr](#)< [PointLight](#) > >::const_iterator [LightsEnd](#) () const
- size_t [GetNumberOfLights](#) () const
- [SharedPtr](#)< [PointLight](#) > [GetLight](#) (const string &name) const
- bool [HasLight](#) (const string &name) const
- bool [HasLight](#) (const [SharedPtr](#)< [PointLight](#) > light) const
- void [AddLight](#) ([SharedPtr](#)< [PointLight](#) > light)
- void [RemoveLight](#) (const string &name)
- void [RemoveLight](#) ([SharedPtr](#)< [PointLight](#) > light)
- void [RemoveAllLights](#) ()

Private Member Functions

- [World](#) (const [World](#) &world)=delete
- [World](#) & [operator=](#) (const [World](#) &world)=delete

Private Attributes

- set< [SharedPtr](#)< [Model](#) >, std::less<> > [m_models](#)
- set< [SharedPtr](#)< [PointLight](#) >, std::less<> > [m_lights](#)

5.96.1 Constructor & Destructor Documentation

5.96.1.1 World() [1/2]

```
mage::World::World ( ) [default]
```

5.96.1.2 ~World()

```
virtual mage::World::~~World ( ) [virtual]
```

5.96.1.3 World() [2/2]

```
mage::World::World (
    const World & world ) [private], [delete]
```

5.96.2 Member Function Documentation

5.96.2.1 AddLight()

```
void mage::World::AddLight (
    SharedPtr< PointLight > light )
```

5.96.2.2 AddModel()

```
void mage::World::AddModel (
    SharedPtr< Model > model )
```

5.96.2.3 GetLight()

```
SharedPtr< PointLight > mage::World::GetLight (
    const string & name ) const
```

5.96.2.4 GetModel()

```
SharedPtr< Model > mage::World::GetModel (
    const string & name ) const
```

5.96.2.5 GetNumberOfLights()

```
size_t mage::World::GetNumberOfLights ( ) const
```

5.96.2.6 GetNumberOfModels()

```
size_t mage::World::GetNumberOfModels ( ) const
```

5.96.2.7 HasLight() [1/2]

```
bool mage::World::HasLight (
    const string & name ) const
```

5.96.2.8 HasLight() [2/2]

```
bool mage::World::HasLight (
    const SharedPtr< PointLight > light ) const
```

5.96.2.9 HasModel() [1/2]

```
bool mage::World::HasModel (
    const string & name ) const
```

5.96.2.10 HasModel() [2/2]

```
bool mage::World::HasModel (
    const SharedPtr< Model > model ) const
```

5.96.2.11 LightsBegin() [1/2]

```
set< SharedPtr< PointLight > >::iterator mage::World::LightsBegin ( )
```

5.96.2.12 LightsBegin() [2/2]

```
set< SharedPtr< PointLight > >::const_iterator mage::World::LightsBegin ( ) const
```

5.96.2.13 LightsEnd() [1/2]

```
set< SharedPtr< PointLight > >::iterator mage::World::LightsEnd ( )
```

5.96.2.14 LightsEnd() [2/2]

```
set< SharedPtr< PointLight > >::const_iterator mage::World::LightsEnd ( ) const
```

5.96.2.15 ModelsBegin() [1/2]

```
set< SharedPtr< Model > >::iterator mage::World::ModelsBegin ( )
```

5.96.2.16 ModelsBegin() [2/2]

```
set< SharedPtr< Model > >::const_iterator mage::World::ModelsBegin ( ) const
```

5.96.2.17 ModelsEnd() [1/2]

```
set< SharedPtr< Model > >::iterator mage::World::ModelsEnd ( )
```

5.96.2.18 ModelsEnd() [2/2]

```
set< SharedPtr< Model > >::const_iterator mage::World::ModelsEnd ( ) const
```

5.96.2.19 operator=()

```
World& mage::World::operator= (
    const World & world ) [private], [delete]
```

5.96.2.20 RemoveAllLights()

```
void mage::World::RemoveAllLights ( )
```

5.96.2.21 RemoveAllModels()

```
void mage::World::RemoveAllModels ( )
```

5.96.2.22 RemoveLight() [1/2]

```
void mage::World::RemoveLight (
    const string & name )
```

5.96.2.23 RemoveLight() [2/2]

```
void mage::World::RemoveLight (
    SharedPtr< PointLight > light )
```

5.96.2.24 RemoveModel() [1/2]

```
void mage::World::RemoveModel (
    const string & name )
```

5.96.2.25 RemoveModel() [2/2]

```
void mage::World::RemoveModel (
    SharedPtr< Model > model )
```

5.96.2.26 Render()

```
void mage::World::Render (
    ComPtr< ID3D11DeviceContext2 > device_context,
    const TransformBuffer & transform_buffer )
```

5.96.3 Member Data Documentation

5.96.3.1 m_lights

```
set< SharedPtr< PointLight >, std::less<> > mage::World::m_lights [private]
```

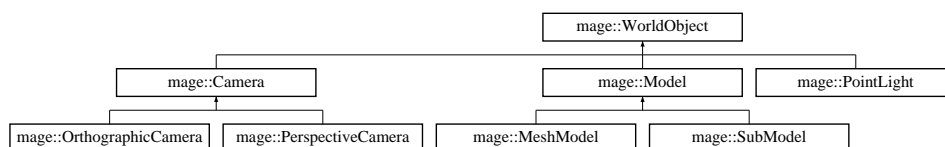
5.96.3.2 m_models

```
set< SharedPtr< Model >, std::less<> > mage::World::m_models [private]
```

5.97 mage::WorldObject Class Reference

```
#include <world_object.hpp>
```

Inheritance diagram for mage::WorldObject:



Public Member Functions

- [WorldObject](#) (const string &name)
- [WorldObject](#) (const [WorldObject](#) &world_object)
- virtual [~WorldObject](#) ()=default
- [WorldObject](#) & [operator=](#) (const [WorldObject](#) &world_object)
- [WorldObject](#) * [Clone](#) () const
- const string & [GetName](#) () const
- void [SetName](#) (const string &name)
- [Transform](#) & [GetTransform](#) () const

Protected Member Functions

- void [AddChildTransform](#) (const [WorldObject](#) &world_object) const

Private Attributes

- string [m_name](#)
- [SharedPtr](#)< [Transform](#) > [m_transform](#)

5.97.1 Constructor & Destructor Documentation

5.97.1.1 WorldObject() [1/2]

```
mage::WorldObject::WorldObject (
    const string & name )
```

5.97.1.2 WorldObject() [2/2]

```
mage::WorldObject::WorldObject (
    const WorldObject & world_object )
```

5.97.1.3 ~WorldObject()

```
virtual mage::WorldObject::~~WorldObject ( ) [virtual], [default]
```

5.97.2 Member Function Documentation

5.97.2.1 AddChildTransform()

```
void mage::WorldObject::AddChildTransform (
    const WorldObject & world_object ) const [protected]
```

5.97.2.2 Clone()

```
WorldObject* mage::WorldObject::Clone ( ) const
```

5.97.2.3 GetName()

```
const string& mage::WorldObject::GetName ( ) const
```

5.97.2.4 GetTransform()

```
Transform& mage::WorldObject::GetTransform ( ) const
```

5.97.2.5 operator=()

```
WorldObject& mage::WorldObject::operator= (
    const WorldObject & world_object )
```

5.97.2.6 SetName()

```
void mage::WorldObject::SetName (
    const string & name )
```

5.97.3 Member Data Documentation

5.97.3.1 m_name

```
string mage::WorldObject::m_name [private]
```

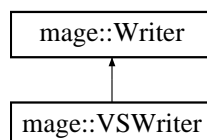
5.97.3.2 m_transform

```
SharedPtr< Transform > mage::WorldObject::m_transform [private]
```

5.98 mage::Writer Class Reference

```
#include <writer.hpp>
```

Inheritance diagram for mage::Writer:



Public Member Functions

- [Writer](#) ()
- virtual [~Writer](#) ()=default
- HRESULT [WriteToFile](#) (const wstring &fname)
- const wstring & [GetFilename](#) () const

Protected Member Functions

- virtual HRESULT [Write](#) () const =0
- void [Write](#) (char c) const
- void [Write](#) (const char *str) const
- void [WriteLine](#) (const char *str) const

Private Member Functions

- [Writer](#) (const [Writer](#) &reader)=delete
- [Writer](#) & [operator=](#) (const [Writer](#) &reader)=delete

Private Attributes

- FILE * [m_file](#)
- wstring [m_fname](#)

5.98.1 Constructor & Destructor Documentation

5.98.1.1 [Writer\(\)](#) [1/2]

```
mage::Writer::Writer ( )
```

5.98.1.2 [~Writer\(\)](#)

```
virtual mage::Writer::~Writer ( ) [virtual], [default]
```

5.98.1.3 [Writer\(\)](#) [2/2]

```
mage::Writer::Writer (
    const Writer & reader ) [private], [delete]
```

5.98.2 Member Function Documentation

5.98.2.1 [GetFilename\(\)](#)

```
const wstring& mage::Writer::GetFilename ( ) const
```

5.98.2.2 [operator=\(\)](#)

```
Writer& mage::Writer::operator= (
    const Writer & reader ) [private], [delete]
```

5.98.2.3 [Write\(\)](#) [1/3]

```
virtual HRESULT mage::Writer::Write ( ) const [protected], [pure virtual]
```

Implemented in [mage::VSWriter](#).

5.98.2.4 Write() [2/3]

```
void mage::Writer::Write (
    char c ) const    [protected]
```

5.98.2.5 Write() [3/3]

```
void mage::Writer::Write (
    const char * str ) const    [protected]
```

5.98.2.6 WriteLine()

```
void mage::Writer::WriteLine (
    const char * str ) const    [protected]
```

5.98.2.7 WriteToFile()

```
HRESULT mage::Writer::WriteToFile (
    const wstring & fname )
```

5.98.3 Member Data Documentation**5.98.3.1 m_file**

```
FILE* mage::Writer::m_file    [private]
```

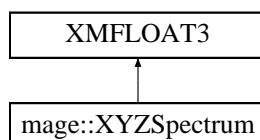
5.98.3.2 m_fname

```
wstring mage::Writer::m_fname    [private]
```

5.99 mage::XYZSpectrum Struct Reference

```
#include <spectrum.hpp>
```

Inheritance diagram for mage::XYZSpectrum:



Public Member Functions

- [XYZSpectrum](#) ()
- [XYZSpectrum](#) (float x, float y, float z)
- [XYZSpectrum](#) (const [XYZSpectrum](#) &xyz)
- [XYZSpectrum](#) (const [RGBSpectrum](#) &rgb)
- [XYZSpectrum](#) (const XMFLOAT3 &vector)
- [~XYZSpectrum](#) ()=default
- [XYZSpectrum](#) & [operator=](#) (const [XYZSpectrum](#) &xyz)

5.99.1 Constructor & Destructor Documentation

5.99.1.1 [XYZSpectrum](#)() [1/5]

```
mage::XYZSpectrum::XYZSpectrum ( )
```

5.99.1.2 [XYZSpectrum](#)() [2/5]

```
mage::XYZSpectrum::XYZSpectrum (
    float x,
    float y,
    float z )
```

5.99.1.3 [XYZSpectrum](#)() [3/5]

```
mage::XYZSpectrum::XYZSpectrum (
    const XYZSpectrum & xyz )
```

5.99.1.4 [XYZSpectrum](#)() [4/5]

```
mage::XYZSpectrum::XYZSpectrum (
    const RGBSpectrum & rgb )
```

5.99.1.5 [XYZSpectrum](#)() [5/5]

```
mage::XYZSpectrum::XYZSpectrum (
    const XMFLOAT3 & vector ) [explicit]
```

5.99.1.6 [~XYZSpectrum](#)()

```
mage::XYZSpectrum::~XYZSpectrum ( ) [default]
```

5.99.2 Member Function Documentation

5.99.2.1 [operator=](#)()

```
XYZSpectrum& mage::XYZSpectrum::operator= (
    const XYZSpectrum & xyz )
```

