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Workspace Recipes

The Workspace classes are in the **geoscript.workspace** package.

A Workspace is a collection of Layers. You can create, add, remove, and get Layers. There are many different kinds of Workspaces in GeoScript including Memory, PostGIS, Directory (for Shapefiles), GeoPackage, and many more.

Using Workspaces

Create a Workspace

```
Workspace workspace = new Workspace()
```

Create a Layer

```
Schema schema = new Schema("cities", [
        new Field("geom", "Point", "EPSG:4326"),
        new Field("id", "Integer"),
        new Field("name", "String")
])
Layer layer = workspace.create(schema)
println layer
```

```
cities
```

Check whether a Workspace has a Layer by name

```
boolean hasCities = workspace.has("cities")
println hasCities
```

```
true
```

Get a Layer from a Workspace

```
Layer citiesLayer = workspace.get('cities')
println citiesLayer
```

```
cities
```

Add a Layer to a Workspace

```
Schema statesSchema = new Schema("states", [
        new Field("geom", "Polygon", "EPSG:4326"),
        new Field("id", "Integer"),
        new Field("name", "String")
])
Layer statesLayer = new Layer("states", statesSchema)
workspace.add(statesLayer)
println workspace.has("states")
```

```
true
```

Get the names of all Layers in a Workspace

```
List<String> names = workspace.names
names.each { String name ->
    println name
}
```

```
H2
MBTiles with vector tiles
SQLite
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Properties
Directory of spatial files (shapefiles)
FlatGeobuf
Web Feature Server (NG)
Shapefile
PostGIS (JNDI)
Geobuf
PostGIS
GeoPackage
```

Remove a Layer from a Workspace

```
workspace.remove("cities")
println workspace.has('cities')
```

```
false
```

Close the Workspace when you are done

```
workspace.close()
```

Creating an in Memory Workspace

The empty Workspace constructor creates an in Memory Workspace. You can create a Layer by passing a name and a list of Fields. You can then remove the Layer by passing a reference to the Layer.

```
Workspace workspace = new Workspace()

Layer layer = workspace.create("cities", [
        new Field("geom", "Point", "EPSG:4326"),
        new Field("id", "Integer"),
        new Field("name", "String")
])
println layer

workspace.remove(layer)
println workspace.has(layer.name)
```

```
cities
false
```

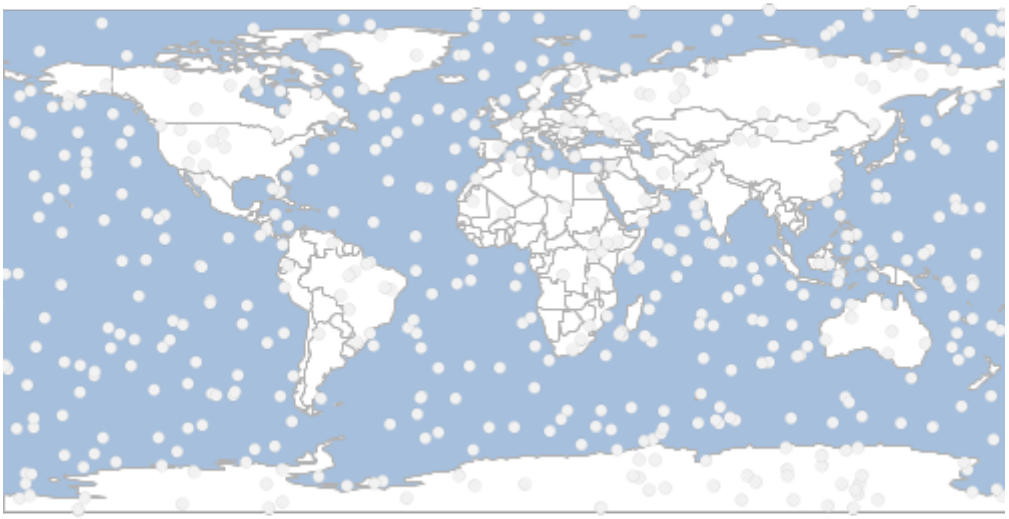
Add Layer's Features in Chunks

When adding a large Layer to a Workspace, you can add Features in chunks.

```
Workspace workspace = new Memory()
Layer layer = workspace.create("points", [
        new Field("geom", "Point", "EPSG:4326"),
        new Field("id", "Integer")
])
Bounds bounds = new Bounds(-180,-90, 180,90, "EPSG:4326")
Geometry.createRandomPoints(bounds.geometry, 500).geometries.eachWithIndex { Geometry
geom, int i ->
    layer.add([geom: geom, id: i])
}
println "Original Layer has ${layer.count} features."

Layer copyOfLayer = workspace.add(layer, "random points", 100)
println "Copied Layer has ${copyOfLayer.count} features."
```

```
Original Layer has 500 features.
Copied Layer has 500 features.
```



Using a Directory Workspace

A Directory Workspace is a directory of Shapefiles.

Create a Directory Workspace

```
Directory directory = new Directory("src/main/resources/data")
println directory.toString()
```

```
Directory[/home/runner/work/geoscript-groovy-cookbook/geoscript-groovy-
cookbook/src/main/resources/data]
```

View the Workspace's format

```
String format = directory.format
println format
```

```
Directory
```

View the Workspace's File

```
File file = directory.file
println file
```

```
/home/runner/work/geoscript-groovy-cookbook/geoscript-groovy-
cookbook/src/main/resources/data
```

View the Workspace's list of Layer names

```
List names = directory.names
names.each { String name ->
    println name
}
```

```
states
```

Get a Layer by name

```
Layer layer = directory.get("states")
int count = layer.count
println "Layer ${layer.name} has ${count} Features."
```

```
Layer states has 49 Features.
```

Close the Directory when done.

```
directory.close()
```

Investigating Workspaces

Get available Workspace names

```
List<String> names = Workspace.getWorkspaceNames()
names.each { String name ->
    println name
}
```

```
H2
MBTiles with vector tiles
SQLite
H2 (JNDI)
MySQL
MySQL (JNDI)
Properties
Directory of spatial files (shapefiles)
FlatGeobuf
Web Feature Server (NG)
Shapefile
PostGIS (JNDI)
Geobuf
PostGIS
GeoPackage
```

Get parameters for a Workspace

```
List<Map> parameters = Workspace.getWorkspaceParameters("GeoPackage")
parameters.each { Map param ->
    println "Parameter = ${param.key} Type = ${param.type} Required?
${param.required}"
}
```

```
Parameter = dbtype Type = java.lang.String Required? true
Parameter = database Type = java.io.File Required? true
Parameter = passwd Type = java.lang.String Required? false
Parameter = namespace Type = java.lang.String Required? false
Parameter = Expose primary keys Type = java.lang.Boolean Required? false
Parameter = fetch size Type = java.lang.Integer Required? false
Parameter = Batch insert size Type = java.lang.Integer Required? false
Parameter = Primary key metadata table Type = java.lang.String Required? false
Parameter = Session startup SQL Type = java.lang.String Required? false
Parameter = Session close-up SQL Type = java.lang.String Required? false
Parameter = Callback factory Type = java.lang.String Required? false
Parameter = read_only Type = java.lang.Boolean Required? false
Parameter = memory map size Type = java.lang.Integer Required? false
```

Creating Workspaces

Creating a Workspace from a connection string

You can create a Workspace from a connection string that contains paramters in key=value format with optional single quotes.

Create a Shapefile Workspace

```
String connectionString = "url='states.shp' 'create spatial index'=true"
Workspace workspace = Workspace.getWorkspace(connectionString)
```

Create a GeoPackage Workspace

```
connectionString = "dbtype=geopkg database=layers.gpkg"
workspace = Workspace.getWorkspace(connectionString)
```

Create a H2 Workspace

```
connectionString = "dbtype=h2 database=layers.db"
workspace = Workspace.getWorkspace(connectionString)
```

You can use the withWorkspace method to automatically handle closing the Workspace.

```
Workspace.withWorkspace("dbtype=geopkg database=src/main/resources/data.gpkg") {
Workspace workspace ->
    println workspace.format
    println "----------"
    workspace.names.each { String name ->
        println "${name} (${workspace.get(name).count})"
    }
}
```

```
GeoPackage
---------
countries (177)
graticules (27)
ocean (2)
places (243)
rivers (13)
states (51)
```

Creating a Workspace from a connection map

You can create a Workspace from a connection map that contains paramters.

Create a H2 Workspace

```
Map params = [dbtype: 'h2', database: 'test.db']
Workspace workspace = Workspace.getWorkspace(params)
```

Create a PostGIS Workspace

```
params = [
    dbtype: 'postgis',
    database: 'postgres',
    host: 'localhost',
    port: 5432,
    user: 'postgres',
    passwd: 'postgres'
]
workspace = Workspace.getWorkspace(params)
```

Create a GeoBuf Workspace

```
params = [file: 'layers.pbf', precision: 6, dimension:2]
workspace = Workspace.getWorkspace(params)
```

You can use the withWorkspace method to automatically handle closing the Workspace.

```
Workspace.withWorkspace([dbtype: 'geopkg', database: 'src/main/resources/data.gpkg'])
{ Workspace workspace ->
    println workspace.format
    println "----------"
    workspace.names.each { String name ->
        println "${name} (${workspace.get(name).count})"
    }
}
```

```
GeoPackage
---------
countries (177)
graticules (27)
ocean (2)
places (243)
rivers (13)
states (51)
```

Creating Directory Workspaces

Create a Directory Workspace from a directory name

```
Workspace workspace = new Directory("src/main/resources/shapefiles")
println workspace.format
println "---------"
workspace.names.each { String name ->
    println "${name} (${workspace.get(name).count})"
}
```

```
Directory
---------
ocean (2)
countries (177)
graticules (27)
```

Create a Directory Workspace from a File directory

```
Workspace workspace = new Directory(new File("src/main/resources/shapefiles"))
println workspace.format
println "---------"
workspace.names.each { String name ->
    println "${name} (${workspace.get(name).count})"
}
```

```
Directory
---------
ocean (2)
countries (177)
graticules (27)
```

Create a Directory Workspace from a URL

```
Directory directory = Directory.fromURL(
    new URL
("http://www.naturalearthdata.com/http//www.naturalearthdata.com/download/110m/cultura
l/ne_110m_admin_0_countries.zip"),
    new File("naturalearth")
)
println directory.format
println "---------"
directory.names.each { String name ->
    println "${name} (${directory.get(name).count})"
}
```

```
Directory
---------
ne_110m_admin_0_countries (177)
```

Creating GeoPackage Workspaces

Create a GeoPackage Workspace from a file name

```
Workspace workspace = new GeoPackage("src/main/resources/data.gpkg")
println workspace.format
println "----------"
workspace.names.each { String name ->
    println "${name} (${workspace.get(name).count})"
}
```

```
GeoPackage
----------
countries (177)
graticules (27)
ocean (2)
places (243)
rivers (13)
states (51)
```

Create a GeoPackage Workspace from a File

```
Workspace workspace = new GeoPackage(new File("src/main/resources/data.gpkg"))
println workspace.format
println "----------"
workspace.names.each { String name ->
    println "${name} (${workspace.get(name).count})"
}
```

```
GeoPackage
----------
countries (177)
graticules (27)
ocean (2)
places (243)
rivers (13)
states (51)
```

Creating H2 Workspaces

Create a H2 Workspace from a File

```
Workspace workspace = new H2(new File("src/main/resources/h2/data.db"))
println workspace.format
println "--"
workspace.names.each { String name ->
    println "${name} (${workspace.get(name).count})"
}
```

```
H2
--
LAYER_STYLES (0)
countries (177)
ocean (2)
places (326)
states (52)
```

Create a H2 Workspace with basic parameters

```
H2 h2 = new H2(
        "database",    ①
        "localhost",   ②
        "5421",        ③
        "geo",         ④
        "user",        ⑤
        "password"     ⑥
)
```

① Database name

② Host name

③ Port

④ User name

⑤ Password

Create a H2 Workspace with named parameters. Only the database name is required.

```
H2 h2 = new H2("database",
        "host": "localhost",
        "port": "5412",
        "schema": "geo",
        "user": "user",
        "password": "secret"
)
```

Creating Geobuf Workspaces

Create a Geobuf Workspace from a File

```
Workspace workspace = new Geobuf(new File("src/main/resources/geobuf"))
println workspace.format
println "------"
workspace.names.each { String name ->
    println "${name} (${workspace.get(name).count})"
}
```

```
Geobuf
------
places (326)
countries (177)
ocean (2)
```

Creating Flatgeobuf Workspaces

Create a Flatgeobuf Workspace from a File

```
Workspace workspace = new FlatGeobuf(new File("src/main/resources/flatgeobuf"))
println workspace.format
println "------"
workspace.names.each { String name ->
    println "${name} (${workspace.get(name).count})"
}
```

```
FlatGeobuf
------
ocean (2)
places (326)
countries (177)
```

Creating Property Workspaces

Create a Property Workspace from a File

```
Workspace workspace = new Property(new File("src/main/resources/property"))
println workspace.format
println "--------"
workspace.names.each { String name ->
    println "${name} (${workspace.get(name).count})"
}
```

```
Property
------
places (10)
circles (10)
```

Creating SQLite Workspaces

Create a SQLite Workspace from a File

```
Workspace workspace = new Sqlite(new File("src/main/resources/data.sqlite"))
println workspace.format
println "--------"
workspace.names.each { String name ->
    println "${name} (${workspace.get(name).count})"
}
```

```
Sqlite
------
countries (177)
ocean (2)
places (326)
rivers (460)
states (52)
```

Creating PostGIS Workspaces

Create a PostGIS Workspace with basic parameters

```
PostGIS postgis = new PostGIS(
        "database",    ①
        "localhost",   ②
        "5432",        ③
        "public",      ④
        "user",        ⑤
        "password"     ⑥
)
```

① Database name

② Host name

③ Port

④ Schema

⑤ User name

⑥ Password

Create a PostGIS Workspace with advanced parameters

```
PostGIS postgis = new PostGIS(
        "database",                   ①
        "localhost",                  ②
        "5432",                       ③
        "public",                     ④
        "user",                       ⑤
        "password",                   ⑥
        true,                         ⑦
        true,                         ⑧
        "OWNER geo TABLESPACE points" ⑨
)
```

① Database name

② Host name

③ Port

④ Schema

⑤ User name

⑥ Password

⑦ Estimated Extent

⑧ Create Database

⑨ Create Database Params

Create a PostGIS Workspace with named parameters. Only the database name is required.

```
PostGIS postgis = new PostGIS("database",
        "host": "localhost",
        "port": "5432",
        "schema": "public",
        "user": "user",
        "password": "secret",
        "estimatedExtent": false,
        "createDatabase": false,
        "createDatabaseParams": "OWNER geo TABLESPACE points"
)
```

Delete a PostGIS database.

```
PostGIS.deleteDatabase(
        "database",    ①
        "localhost",   ②
        "5432",        ③
        "user",        ④
        "password"     ⑤
)
```

① Database name

② Host name

③ Port

④ User name

⑤ Password

Delete a PostGIS database with named parameters. Only the database name is required.

```
PostGIS.deleteDatabase("database",
        "host": "localhost",
        "port": "5432",
        "user": "user",
        "password": "secret"
)
```

Creating MySQL Workspaces

Create a MySQL Workspace with basic parameters

```
MySQL mysql = new MySQL(
        "database",    ①
        "localhost",   ②
        "3306",        ③
        "user",        ④
        "password"     ⑤
)
```

① Database name

② Host name

③ Port

④ User name

⑤ Password

Create a MySQL Workspace with named parameters. Only the database name is required.

```
MySQL mysql = new MySQL("database",
        "host": "localhost",
        "port": "3306",
        "user": "user",
        "password": "secret"
)
```

Creating SpatiaLite Workspaces

The SpatiaLite Workspace requires GDAL and OGR to be installed with Java support.

Create a SpatiaLite Workspace with a File name

```
SpatiaLite spatialite = new SpatiaLite("db.sqlite")
```

Create a SpatiaLite Workspace with a File

```
File directory = new File("databases")
File file = new File("db.sqlite")
SpatiaLite spatialite = new SpatiaLite(file)
```

Creating WFS Workspaces

Create a WFS Workspace with a URL

```
WFS wfs = new WFS
("http://localhost:8080/geoserver/ows?service=wfs&version=1.1.0&request=GetCapabilitie
s")
```

Creating OGR Workspaces

The OGR Workspace requires GDAL and OGR to be installed with Java support.

On Ubuntu, you can install GDAL and OGR with the following commands:

```
sudo apt-get install gdal-bin

sudo apt-get install libgdal-java
```

Determine if OGR is available.

```
boolean isAvailable = OGR.isAvailable()
```

Get OGR Drivers.

```
Set<String> drivers = OGR.drivers
```

Get a Shapefile Workspace from OGR.

```
File file = new File("states.shp")
OGR ogr = new OGR("ESRI Shapefile", file.absolutePath)
```

Get a SQLite Workspace from OGR

```
File file = new File("states.sqlite")
OGR ogr = new OGR("SQLite", file.absolutePath)
```

Get a GeoJSON Workspace from OGR

```
File file = new File("states.json")
OGR ogr = new OGR("GeoJSON", file.absolutePath)
```

Database Workspace

SQL

Run SQL queries directly against Databse Workspace (PostGIS, MySQL, H2)

```
Database workspace = new H2(new File("src/main/resources/h2/data.db"))
Sql sql = workspace.sql
```

Count the number of results

```
int numberOfPlaces = sql.firstRow("SELECT COUNT(*) as count FROM \"places\"").get
("count") as int
println "# of Places = ${numberOfPlaces}"
```

```
# of Places = 326
```

Calculate statistics

```
GroovyRowResult result = sql.firstRow("SELECT MIN(ELEVATION) as min_elev,
MAX(ELEVATION) as max_elev, AVG(ELEVATION) as avg_elev FROM \"places\"")
println "Mininum Elevation = ${result.get('min_elev')}"
println "Maximum Elevation = ${result.get('max_elev')}"
println "Average Elevation = ${result.get('avg_elev')}"
```

```
Mininum Elevation = 0.0
Maximum Elevation = 2320.0
Average Elevation = 30.085889570552148
```

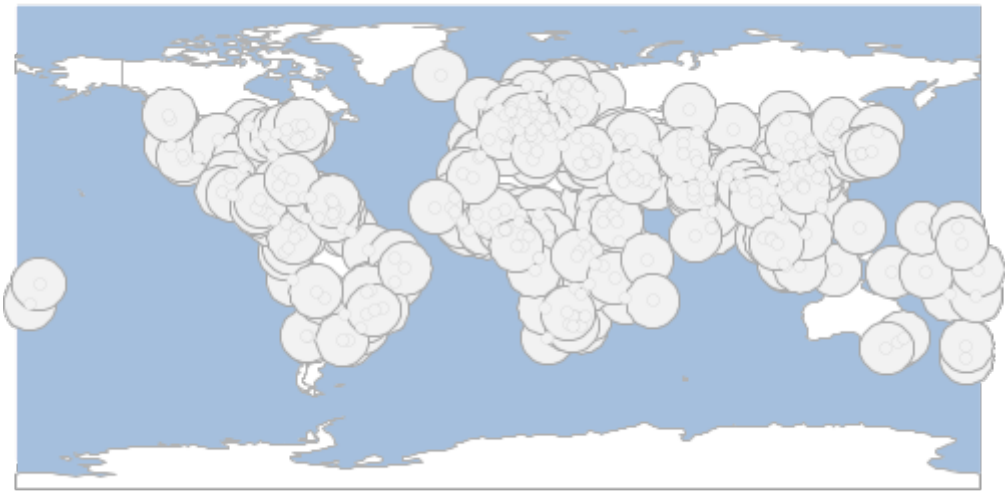
Select rows

```
List<String> names = []
sql.eachRow "SELECT TOP 10 \"NAME\" FROM \"places\" ORDER BY \"NAME\" DESC ", {
    names.add(it["NAME"])
}
names.each { String name ->
    println name
}
```

```
 Zürich
Zibo
Zhengzhou
Zagreb
Yerevan
Yaounde
Yamoussoukro
Xian
Wuhan
Windhoek
```

Execute spatial sql

```
Workspace memory = new Memory()
Layer layer = memory.create("places_polys", [new Field("buffer", "Polygon"), new
Field("name", "String")])
sql.eachRow "SELECT ST_Buffer(\"the_geom\", 10) as buffer, \"NAME\" as name FROM
\"places\"", {row ->
    Geometry poly = Geometry.fromWKB(row.buffer as byte[])
    layer.add([buffer: poly, name: row.NAME])
}
```



View

Create a new Layer from a SQL View

```
Database workspace = new H2(new File("src/main/resources/h2/data.db"))
Layer layer = workspace.createView(
        "megacities",                                                  ①
        "SELECT * FROM \"places\" WHERE \"MEGACITY\" = '%mega%'", ②
        new Field("the_geom","Point","EPSG:4326"),                     ③
        params: [['mega', '1']]                                        ④
)
boolean hasLayer1 = workspace.has("megacities")
println "Does layer exist? ${hasLayer1}"
```

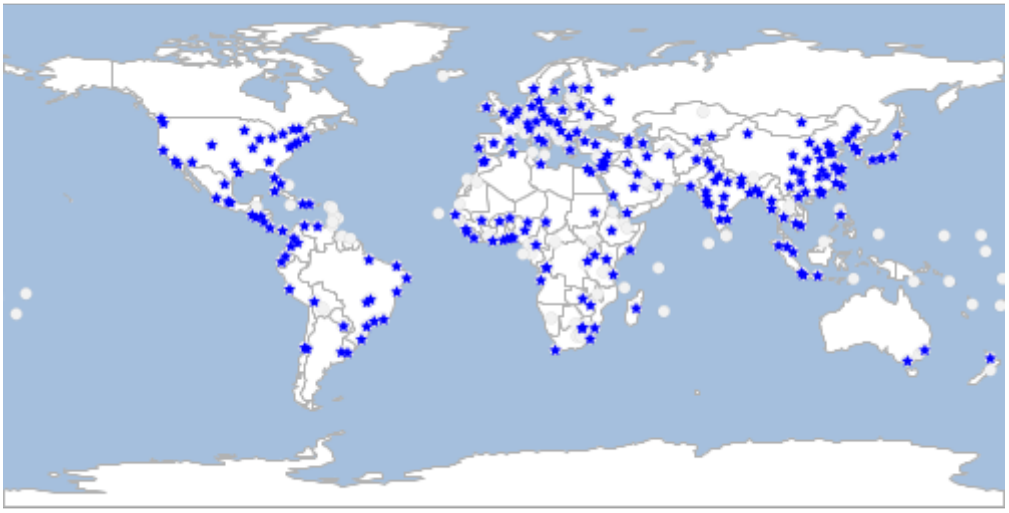
① The layer name

② The SQL Statement

③ The Geometry Field

④ Query Parameters

```
Does layer exist? true
```



Remove the new Layer created from a SQL View

```
workspace.deleteView("megacities")
boolean hasLayer2 = workspace.has("megacities")
println "Does layer exist? ${hasLayer2}"
```

```
Does layer exist? false
```

Index

Create an Index

```
Database workspace = new H2(new File("src/main/resources/h2/data.db"))
workspace.createIndex("places","name_idx","NAME",true)
workspace.createIndex("places","megacity_idx","MEGACITY",false)
workspace.createIndex("places","a3_idx", ["SOV_A3", "ADM0_A3"],false)
```

Get an Index

```
List<Map> indexes = workspace.getIndexes("places")
indexes.each { Map index ->
    println "Index name = ${index.name}, unique = ${index.unique}, attributes =
${index.attributes}"
}
```

```
Index name = PRIMARY_KEY_C, unique = true, attributes = [fid]
Index name = name_idx, unique = true, attributes = [NAME]
Index name = a3_idx, unique = false, attributes = [SOV_A3, ADM0_A3]
Index name = megacity_idx, unique = false, attributes = [MEGACITY]
```

Remove an Index

```
workspace.deleteIndex("places", "name_idx")
workspace.deleteIndex("places", "megacity_idx")
workspace.deleteIndex("places", "a3_idx")
```