Table of Contents

Layer Recipes

The Layer classes are in the **geoscript.layer** package.

A Layer is a collection of Features.

Getting a Layer's Properties

Get a Layer from a Workspace and it's name

```
Workspace workspace = new GeoPackage("src/main/resources/data.gpkg")
Layer layer = workspace.get("countries")
String name = layer.name
println "Name: ${name}"
```

```
Name: countries
```

The Layer's Format

```
String format = layer.format
println "Format: ${format}"
```

```
Format: GeoPackage
```

Count the number of Features

```
int count = layer.count
println "# of Features: ${count}"
```

```
# of Features: 177
```

Get the Layer's Projection

```
Projection proj = layer.proj
println "Projection: ${proj}"
```

```
Projection: EPSG:4326
```

Get the Bounds of the Layer

```
Bounds bounds = layer.bounds
println "Bounds: ${bounds}"
```

```
Bounds: (-179.99999999999997,-
90.00000000000003,180.00000000000014,83.64513000000002,EPSG:4326)
```

Getting a Layer's Features

Iterate over a Layer's Features

```
Workspace workspace = new GeoPackage("src/main/resources/data.gpkg")
Layer layer = workspace.get("states")
layer.eachFeature { Feature feature ->
    println feature["NAME_1"]
}
```

```
Minnesota
Montana
North Dakota
Hawaii
Idaho
Washington
Arizona
California
Colorado
Nevada
...
```

Iterate over a subset of a Layer's Features

```
Workspace workspace = new GeoPackage("src/main/resources/data.gpkg")
Layer layer = workspace.get("states")
layer.eachFeature("NAME_1 LIKE 'M%'") { Feature feature ->
    println feature["NAME_1"]
}
```

```
Minnesota
Montana
Missouri
Massachusetts
Mississippi
Maryland
Maine
Michigan
```

Iterate over a Layer's Features with parameters.

```
Workspace workspace = new GeoPackage("src/main/resources/data.gpkg")
Layer layer = workspace.get("states")
layer.eachFeature(sort: ["NAME_1"], start: 0, max: 5, fields: ["NAME_1"], filter:
"NAME_1 LIKE 'M%'") { Feature feature ->
    println feature["NAME_1"]
}
```

```
Maine
Maryland
Massachusetts
Michigan
Minnesota
```

Parameters

- filter: The Filter or Filter String to limit the Features. Defaults to null.
- sort: A List of Lists that define the sort order [[Field or Field name, "ASC" or "DESC"],...]. Not all Layers support sorting!
- max: The maximum number of Features to include
- start: The index of the record to start the cursor at. Together with maxFeatures this simulates paging. Not all Layers support the start index and paging!
- fields: A List of Fields or Field names to include. Used to select only a subset of Fields.

Read all Feature into a List

```
Workspace workspace = new GeoPackage("src/main/resources/data.gpkg")
Layer layer = workspace.get("states")
List<Feature> features = layer.features

println "# Features = ${features.size()}"
features.each { Feature feature ->
    println feature["NAME_1"]
}
```

```
# Features = 52
Minnesota
Montana
North Dakota
Hawaii
Idaho
Washington
Arizona
California
Colorado
Nevada
...
```

Collect values from a Layer's Features

```
Workspace workspace = new GeoPackage("src/main/resources/data.gpkg")
Layer layer = workspace.get("states")
List<String> names = layer.collectFromFeature { Feature f ->
    f["NAME_1"]
}.sort()

println "# Names = ${names.size()}"
names.each { String name ->
    println name
}
```

```
# Names = 52
Alabama
Alaska
Arizona
Arkansas
California
Colorado
Connecticut
Delaware
District of Columbia
Florida
...
```

Collect values from a Layer's Features with parameters.

```
Workspace workspace = new GeoPackage("src/main/resources/data.gpkg")
Layer layer = workspace.get("states")
List<String> names = layer.collectFromFeature(
    sort: ["NAME_1"],
    start: 0,
    max: 5,
    fields: ["NAME_1"],
    filter: "NAME_1 LIKE 'M%'") { Feature f ->
        f["NAME_1"]
    }

println "# Names = ${names.size()}"
names.each { String name ->
    println name
}
```

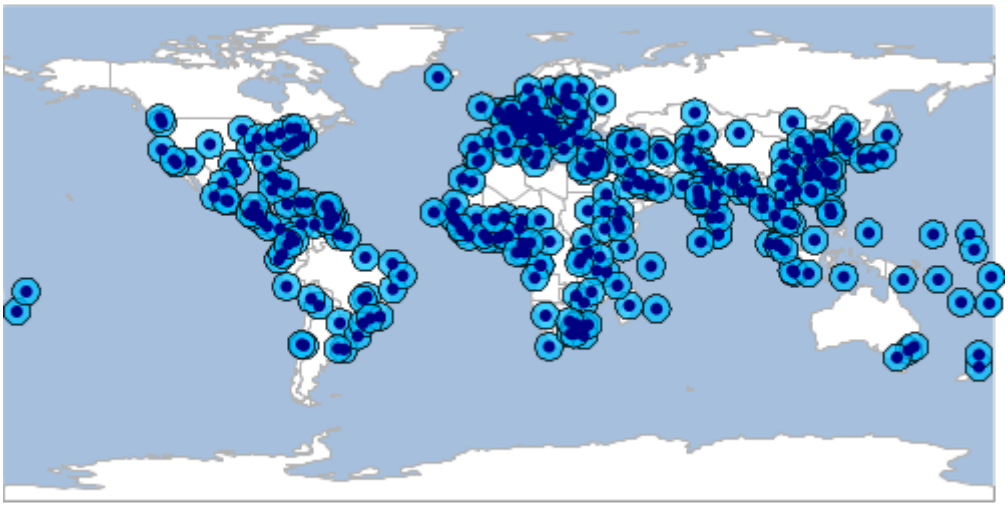
```
# Names = 5
Maine
Maryland
Massachusetts
Michigan
Minnesota
```

Geoprocessing

Buffer

Buffer a Layer of populated places

```
Workspace workspace = new GeoPackage(new File("src/main/resources/data.gpkg"))
Layer places = workspace.get("places")
Layer buffer = places.buffer(5)
```



Layer Algebra

GeoScript can do layer algebra. All of the examples below use Layer A (red) and Layer B (green).

Clip

Clip Layer A with Layer B

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Layer layerC = layerA.clip(layerB)
```

Clip Layer B with Layer A

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Workspace outWorkspace = new Directory("target")
Layer layerC = layerB.clip(layerA, outWorkspace: outWorkspace, outLayer: "ba_clip")
```

Erase

Erase Layer A with Layer B

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Layer layerC = layerA.erase(layerB)
```

Erase Layer B with Layer A

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Workspace outWorkspace = new Directory("target")
Layer layerC = layerB.erase(layerA, outWorkspace: outWorkspace, outLayer: "ba_erase")
```

Identity

Identity Layer A with Layer B

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Layer layerC = layerA.identity(layerB)
```

Identity Layer B with Layer A

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Workspace outWorkspace = new Directory("target")
Layer layerC = layerB.identity(layerA, outWorkspace: outWorkspace, outLayer:
"ba_identity")
```

Intersection

Intersection Layer A with Layer B

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Layer layerC = layerA.intersection(layerB)
```

Intersection Layer B with Layer A

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Workspace outWorkspace = new Directory("target")
Layer layerC = layerB.intersection(layerA, outWorkspace: outWorkspace, outLayer:
"ba_intersection")
```

Symmetric Difference

Symmetric Difference Layer A with Layer B

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Layer layerC = layerA.symDifference(layerB)
```

Symmetric Difference Layer B with Layer A

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Workspace outWorkspace = new Directory("target")
Layer layerC = layerB.symDifference(layerA, outWorkspace: outWorkspace, outLayer:
"ba_symdifference")
```

Update

Update Layer A with Layer B

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Layer layerC = layerA.update(layerB)
```

Update Layer B with Layer A

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Workspace outWorkspace = new Directory("target")
Layer layerC = layerB.update(layerA, outWorkspace: outWorkspace, outLayer:
"ba_update")
```

Union

Union Layer A with Layer B

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Layer layerC = layerA.union(layerB)
```

Union Layer B with Layer A

```
Workspace workspace = new GeoPackage(new File("src/main/resources/layeralgebra.gpkg"))
Layer layerA = workspace.get("a")
Layer layerB = workspace.get("b")
Workspace outWorkspace = new Directory("target")
Layer layerC = layerB.union(layerA, outWorkspace: outWorkspace, outLayer: "ba_union")
```

Reading and Writing Features

The Layer IO classes are in the **geoscript.layer.io** package.

Finding Layer Writer and Readers

List all Layer Writers

```
List<Writer> writers = Writers.list()
writers.each { Writer writer ->
    println writer.class.simpleName
}
```

```
CsvWriter
GeobufWriter
GeoJSONWriter
GeoRSSWriter
GmlWriter
GpxWriter
KmlWriter
MvtWriter
```

Find a Layer Writer

```
Workspace workspace = new Memory()
Schema schema = new Schema("cities", [
        new Field("geom", "Point", "EPSG:4326"),
        new Field("id", "Integer"),
        new Field("name", "String")
])
Layer layer = workspace.create(schema)
layer.add([
        geom: new Point(-122.3204, 47.6024),
        id: 1,
        name: "Seattle"
])
layer.add([
        geom: new Point(-122.48416, 47.2619),
        id: 2,
        name: "Tacoma"
])

Writer writer = Writers.find("csv")
String csv = writer.write(layer)
println csv
```

```
"geom:Point:EPSG:4326","id:Integer","name:String"
"POINT (-122.3204 47.6024)","1","Seattle"
"POINT (-122.48416 47.2619)","2","Tacoma"
```

List all Layer Readers

```
List<Reader> readers = Readers.list()
readers.each { Reader reader ->
    println reader.class.simpleName
}
```

```
CsvReader
GeobufReader
GeoJSONReader
GeoRSSReader
GmlReader
GpxReader
KmlReader
MvtReader
```

Find a Layer Reader

```
        Reader reader = Readers.find("csv")
        Layer layer = reader.read("""geom:Point:EPSG:4326","id:Integer","name:String"
"POINT (-122.3204 47.6024)","1","Seattle"
"POINT (-122.48416 47.2619)","2","Tacoma"
""")
        println "# features = ${layer.count}"
```

```
# features = 2
```

GeoJSON

Get GeoJSON String from a Layer

```
Workspace workspace = new Memory()
Schema schema = new Schema("cities", [
        new Field("geom", "Point", "EPSG:4326"),
        new Field("id", "Integer"),
        new Field("name", "String")
])
Layer layer = workspace.create(schema)
layer.add([
    geom: new Point(-122.3204, 47.6024),
    id: 1,
    name: "Seattle"
])
layer.add([
    geom: new Point(-122.48416, 47.2619),
    id: 2,
    name: "Tacoma"
])

String geojson = layer.toJSONString()
println geojson
```

```
{
    "type": "FeatureCollection",
    "features": [
        {
            "type": "Feature",
            "geometry": {
                "type": "Point",
                "coordinates": [
                    -122.3204,
                    47.6024
                ]
            },
            "properties": {
                "id": 1,
                "name": "Seattle"
            },
            "id": "fid--755504a7_160ed083fb5_-7cf9"
        },
        {
            "type": "Feature",
            "geometry": {
                "type": "Point",
                "coordinates": [
                    -122.4842,
                    47.2619
                ]
            },
            "properties": {
                "id": 2,
                "name": "Tacoma"
            },
            "id": "fid--755504a7_160ed083fb5_-7cf7"
        }
    ]
}
```


GeoBuf

Get GeoBuf String from a Layer

```
Workspace workspace = new Memory()
Schema schema = new Schema("cities", [
        new Field("geom", "Point", "EPSG:4326"),
        new Field("id", "Integer"),
        new Field("name", "String")
])
Layer layer = workspace.create(schema)
layer.add([
        geom: new Point(-122.3204, 47.6024),
        id: 1,
        name: "Seattle"
])
layer.add([
        geom: new Point(-122.48416, 47.2619),
        id: 2,
        name: "Tacoma"
])

String geobuf = layer.toGeobufString()
println geobuf
```

```
0a0269640a046e616d6510021806223d0a1d0a0c08001a089fd8d374c0ebb22d6a0218016a090a07536561
74746c650a1c0a0c08001a08ffd6e77498a3892d6a0218026a080a065461636f6d61
```

GML

Get GML String from a Layer

```
Workspace workspace = new Memory()
Schema schema = new Schema("cities", [
        new Field("geom", "Point", "EPSG:4326"),
        new Field("id", "Integer"),
        new Field("name", "String")
])
Layer layer = workspace.create(schema)
layer.add([
        geom: new Point(-122.3204, 47.6024),
        id: 1,
        name: "Seattle"
])
layer.add([
        geom: new Point(-122.48416, 47.2619),
        id: 2,
        name: "Tacoma"
])

String gml = layer.toGMLString()
println gml
```

```
<wfs:FeatureCollection xmlns:wfs="http://www.opengis.net/wfs">
  <gml:boundedBy xmlns:gml="http://www.opengis.net/gml">
    <gml:Box srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
      <gml:coord>
        <gml:X>
          -122.48416
        </gml:X>
        <gml:Y>
          47.2619
        </gml:Y>
      </gml:coord>
      <gml:coord>
        <gml:X>
          -122.3204
        </gml:X>
        <gml:Y>
          47.6024
        </gml:Y>
      </gml:coord>
    </gml:Box>
  </gml:boundedBy>
  <gml:featureMember xmlns:gml="http://www.opengis.net/gml">
    <gsf:cities xmlns:gsf="http://geoscript.org/feature" fid="fid--
755504a7_160ed083fb5_-7d33">
      <gml:name>
        Seattle
      </gml:name>
```

```
      <gsf:geom>
        <gml:Point>
          <gml:coord>
            <gml:X>
              -122.3204
            </gml:X>
            <gml:Y>
              47.6024
            </gml:Y>
          </gml:coord>
        </gml:Point>
      </gsf:geom>
      <gsf:id>
        1
      </gsf:id>
    </gsf:cities>
  </gml:featureMember>
  <gml:featureMember xmlns:gml="http://www.opengis.net/gml">
    <gsf:cities xmlns:gsf="http://geoscript.org/feature" fid="fid--
755504a7_160ed083fb5_-7d31">
      <gml:name>
        Tacoma
      </gml:name>
      <gsf:geom>
        <gml:Point>
          <gml:coord>
            <gml:X>
              -122.48416
            </gml:X>
            <gml:Y>
              47.2619
            </gml:Y>
          </gml:coord>
        </gml:Point>
      </gsf:geom>
      <gsf:id>
        2
      </gsf:id>
    </gsf:cities>
  </gml:featureMember>
</wfs:FeatureCollection>
```

KML

Get KML String from a Layer

```
Workspace workspace = new Memory()
Schema schema = new Schema("cities", [
        new Field("geom", "Point", "EPSG:4326"),
        new Field("id", "Integer"),
        new Field("name", "String")
])
Layer layer = workspace.create(schema)
layer.add([
    geom: new Point(-122.3204, 47.6024),
    id: 1,
    name: "Seattle"
])
layer.add([
    geom: new Point(-122.48416, 47.2619),
    id: 2,
    name: "Tacoma"
])

String kml = layer.toKMLString()
println kml
```

```
<kml:kml xmlns:kml="http://www.opengis.net/kml/2.2">
  <kml:Document>
    <kml:Folder>
      <kml:name>
        cities
      </kml:name>
      <kml:Schema kml:name="cities" kml:id="cities">
        <kml:SimpleField kml:name="id" kml:type="Integer"/>
        <kml:SimpleField kml:name="name" kml:type="String"/>
      </kml:Schema>
      <kml:Placemark>
        <kml:name>
          fid--755504a7_160ed083fb5_-7cfd
        </kml:name>
        <kml:Style>
          <kml:IconStyle>
            <kml:color>
              ff0000ff
            </kml:color>
          </kml:IconStyle>
        </kml:Style>
        <kml:ExtendedData>
          <kml:SchemaData kml:schemaUrl="#cities">
            <kml:SimpleData kml:name="id">
              1
            </kml:SimpleData>
            <kml:SimpleData kml:name="name">
```

```
            Seattle
          </kml:SimpleData>
        </kml:SchemaData>
      </kml:ExtendedData>
      <kml:Point>
        <kml:coordinates>
          -122.3204,47.6024
        </kml:coordinates>
      </kml:Point>
    </kml:Placemark>
    <kml:Placemark>
      <kml:name>
        fid--755504a7_160ed083fb5_-7cfb
      </kml:name>
      <kml:Style>
        <kml:IconStyle>
          <kml:color>
            ff0000ff
          </kml:color>
        </kml:IconStyle>
      </kml:Style>
      <kml:ExtendedData>
        <kml:SchemaData kml:schemaUrl="#cities">
          <kml:SimpleData kml:name="id">
            2
          </kml:SimpleData>
          <kml:SimpleData kml:name="name">
            Tacoma
          </kml:SimpleData>
        </kml:SchemaData>
      </kml:ExtendedData>
      <kml:Point>
        <kml:coordinates>
          -122.48416,47.2619
        </kml:coordinates>
      </kml:Point>
    </kml:Placemark>
  </kml:Folder>
 </kml:Document>
</kml:kml>
```