

Mapnik

- The Missing Manual -

Mapnik - The Missing Manual

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Preface

This is a brain dump of my experience with Mapnik, the map rendering library that powers OpenStreetMap and MapOSMatic, among other things.

The documentation source code for this "missing manual" is [available on GitHub](#) and is licensed under the [FreeBSD Documentation License](#).

Why yet another documentation project?

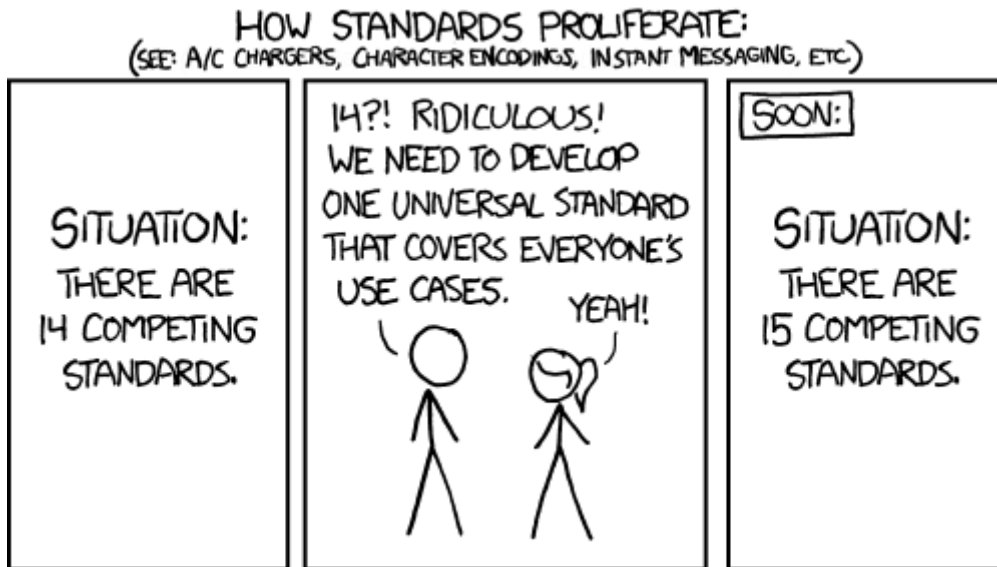


Figure 1. Image (c) Randall Munroe <https://imgs.xkcd.com/comics/standards.png>

There are different information sources that document certain aspects of Mapnik, but none are really complete, up to date, and easily understandable at the same time ...

Other existing documentation efforts for Mapnik are:

GitHub Wiki

The [Mapnik Wiki on GitHub](#) is a weird mix of end user and developer documentation that unfortunately is neither complete nor up to date.

It is also considered dead according to [GitHub issue #3543: "Cancel, abolish, destroy the Wiki"](#)

Sphinx Docs

The [Sphinx Docs](#) project was an attempt to create a Mapnik manual using the [Sphinx Documentation Generator](#), but this project unfortunately never really got anywhere and has seen no update for the last ten years now.

Doxygen

The mapnik source code contains structured comments from which API reference documentation can be generated using [Doxygen](#). [Generated output](#) can be found online, but is not necessarily fully up to date.

API reference

There is also [versioned API reference](#) documentation maintained outside of the main Mapnik source, in the separate [Mapnik Reference](#) project.

XML reference

There's a [XML reference PDF](#) created by David Eastcott, but it was written for Mapnik v0.7, while we're at v3.0.23 at the time of this writing, so it's really outdated by now.

NOTE | This list most likely isn't complete ...

Why still bother with Mapnik at all?

Even though its development has slowed down quite a bit in recent years, and client side vector tile rendering receives much more love these days, and even Mapnik XML style files are somewhat out of fashion in favor of writing styles using CartoCSS and then converting that to Mapnik XML automatically, there are still many open source Mapnik styles in use out there, especially the Openstreetmap Carto style used for the default Openstreetmap map tiles.

Also for rendering printable formats, which I'm especially interested in, the Mapnik/CairoGraphics tool chain still seems to be a better choice than the OpenGL based vector tile approaches.

The [MapOSMatic](#) instance that I'm running makes intensive use of Mapnik not only being able to render PNG tiles, but also bigger documents in both bitmap and vector formats. Especially the capability of rendering into a Cairo Graphics surface comes in handy for this.

Why AsciiDoc(tor)?

For someone like me, who comes from a DocBook background (I wrote and translated for the PHP manual, and implemented parts of its translation infrastructure, a long time ago, and also worked with a DocBook generated manual a lot in my MySQL days), AsciiDoc feels more "natural" than Markdown (which is more single document focussed and not really targeting whole books), or Sphinx to me.

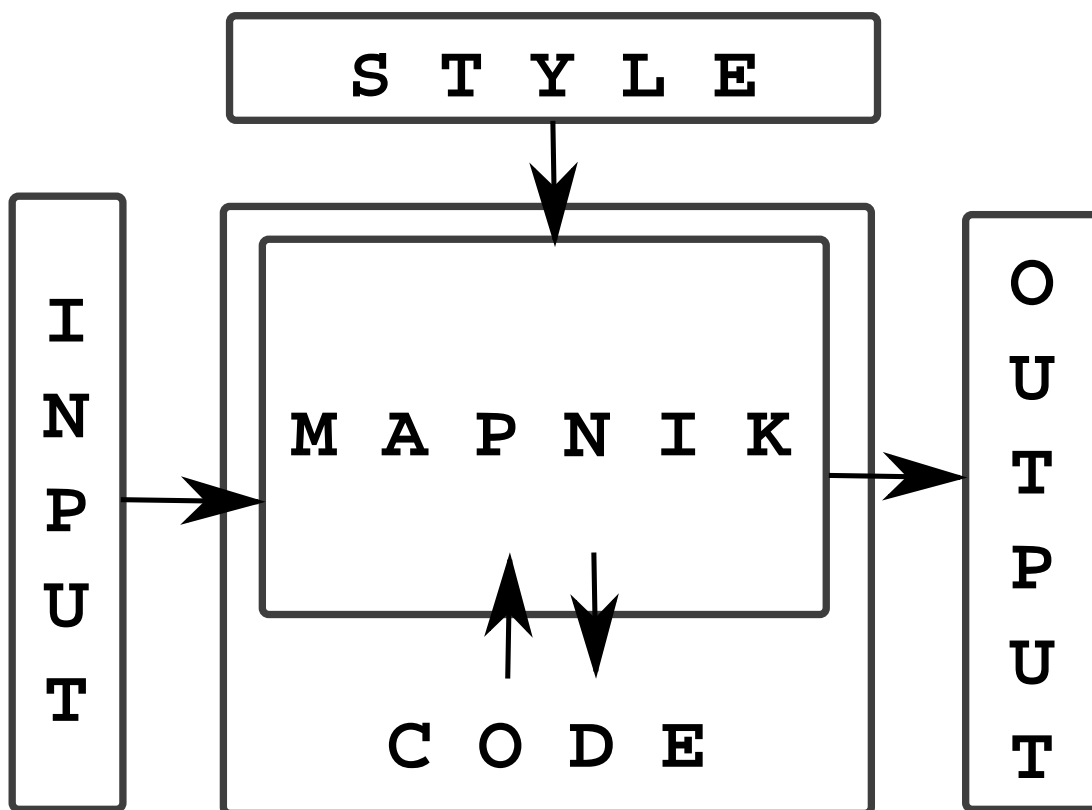
Chapter 1. Introduction

Mapnik is a Free Toolkit for developing mapping applications. It is written in modern C++ and has Python bindings that support fast-paced agile development. It can comfortably be used for both desktop map design and web development.

1.1. Concept

Mapnik is a library, not a complete application program. So it always to be linked to at least a minimum of application code that controls the library operations.

The data flow of Mapnik basically is that it reads geospatial data sources and applies presentation styles on the input that decide how to visually present specific geometry objects:



In a little more detailed view, starting bottom up from the output side, we have the following basic library objects:

- Symbolizers do the actual output, by taking a geometry and its extra properties and creating actual graphic output from that
- Filters decide what to actually pass to specific symbolizers instances for output
- Rules contain one or more filters
- Styles contain one or more rules
- Data sources provide actual geometry objects to process

- Layers combine a data source with one or more styles
- A map contains one or more layers

TODO: class diagram

All these objects can be created and configured directly in code, but the usual approach is to do so by specifying them in a XML style file which is then loaded as a whole into a Mapnik map object at run time.

In the most simple case the application program just creates a Mapnik Map object of a certain size, loads a XML style file, and renders this style into an output file, e.g. when using the Python Mapnik bindings:

Example 1. A minimal Mapnik source and style

Python API code:

```
#!/usr/bin/env /usr/bin/python3

import mapnik

map = mapnik.Map(600,300) # create a 600x300 pixel map

mapnik.load_map(map, 'points.xml') # load style file

map.zoom_all() # make sure all data is visible
map.zoom(-1.1) # zoom out a bit more to avoid clipping

mapnik.render_to_file(map, 'point.png', 'png') # render
```

Style file including inline data:

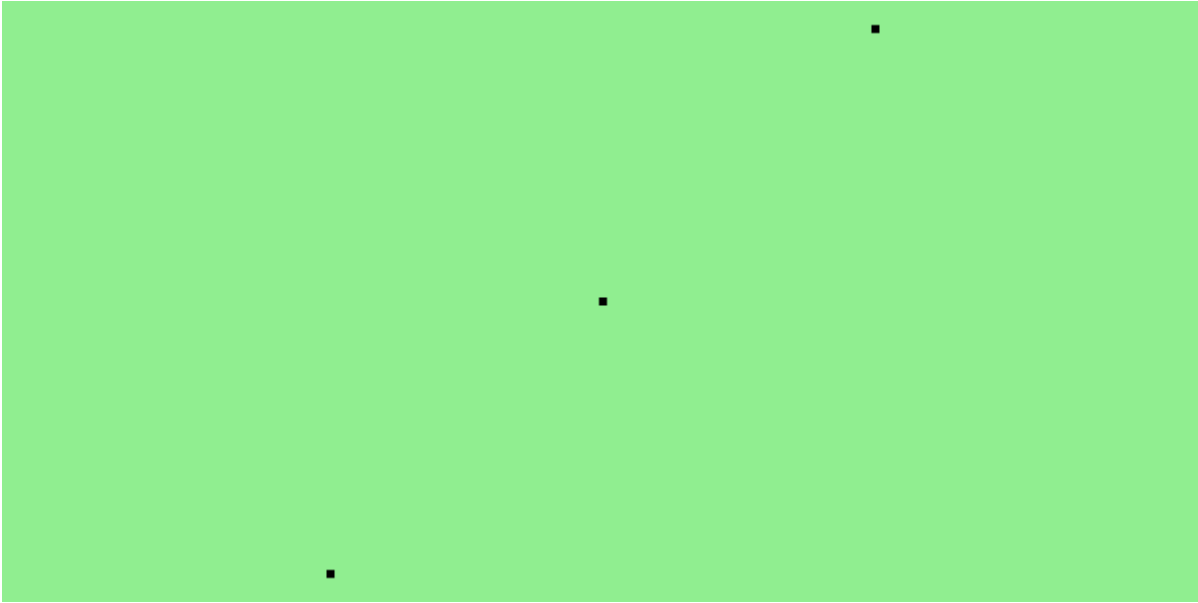
```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='lightgreen'>

  <Style name="style">
    <Rule>
      <PointSymbolizer/>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt
"POINT(10 10)"
"POINT(20 20)"
```

```
"POINT(30 30)"  
  </Parameter>  
  </Datasource>  
</Layer>  
  
</Map>
```

Result:



TODO: do the same with pure python and no separate style file

Chapter 2. Installation

How to install Mapnik ...

2.1. Linux

2.1.1. Debian / Ubuntu

TODO

2.1.2. Others

TODO

2.1.3. Python / PIP

TODO

2.2. Windows

TODO

2.3. MacOS

TODO

Chapter 3. Mapnik XML

NOTE

For now I'll only cover how to create styles using Mapnik XML style files. Documentation of other style file formats, like CartoCSS, or how to create styles purely programmatically using C++ or Python code, will have to wait until the XML format documentation is complete, or for someone else to volunteer doing this.

3.1. Map

This is the top level tag / object in a mapnik setup, it defines the map extent and global parameters / defaults.

TODO: contains ...

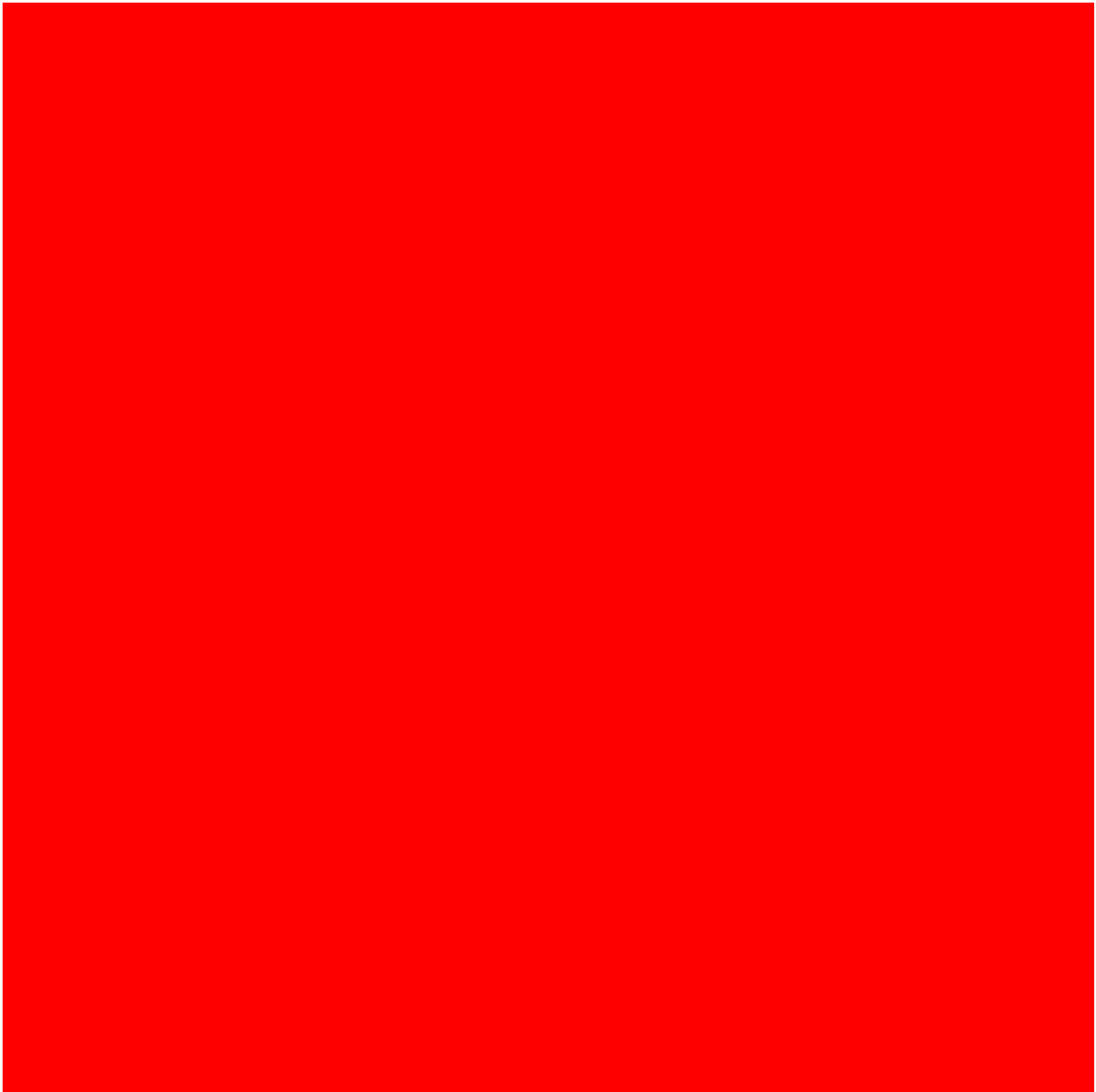
Table 1. Map Attributes

Attribute	Type	Default	Description
<code>base</code>	string	none	name of a <FileSource> to find the input file in
<code>background-color</code>	color	transparent	
<code>background-image</code>	file path	none	
<code>background-image-comp-op</code>	SVG composition	none	
<code>background-image-opacity</code>	float	1.0	
<code>srs</code>	proj4 projection	+proj=longlat +ellps=WGS84 +datum=WGS84 +no_defs	
<code>buffer-size</code>	float	0.0	
<code>maximum-extent</code>	4xfloat		
<code>font-directory</code>	directory path	none	
<code>minimum-version</code>	version string	none	
<code>paths-from-xml</code>	boolean	true	Whether relative paths are relative to the directory the XML file is in, or the current working directory.

3.1.1. `background-color` attribute

Example 2. Map background-color

```
<?xml version="1.0" encoding="utf-8"?>  
<Map background-color="red">  
</Map>
```

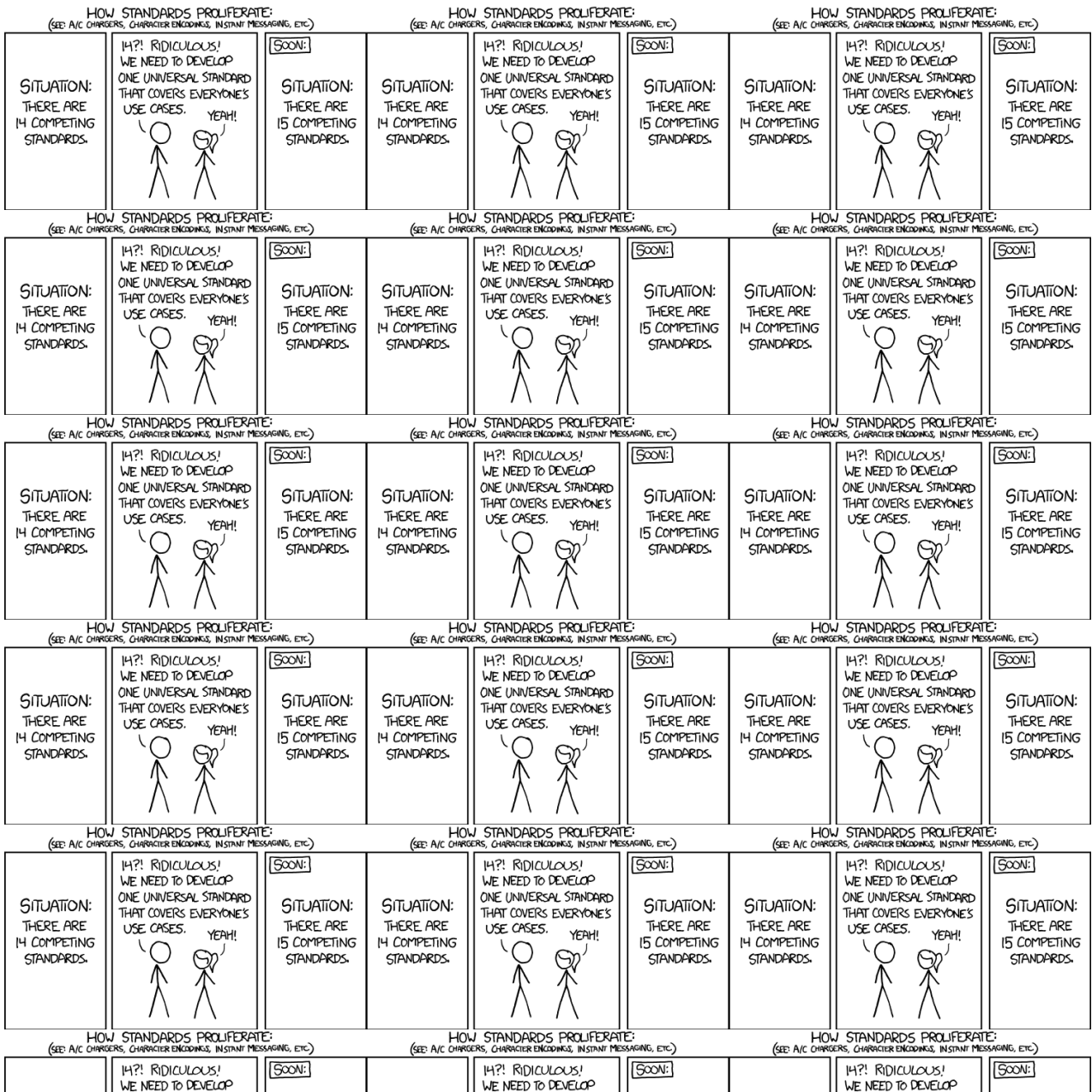


3.1.2. background-image attribute

Sets a background image for the map. The image is not scaled to the actual map output size, if the two sizes do not match it is either cropped or tiled.

Example 3. Map background-image

```
<?xml version="1.0" encoding="utf-8"?>  
<Map background-image="../images/xkcd-standards.png">
```



3.1.3. minimum-version attribute

Specifies the minimum Mapnik version needed to process this stylesheet.

Requires a three part version number, so 3.0.0 works but 3.0 or just 3 doesn't. (See also <https://github.com/mapnik/mapnik/issues/4369>)

TODO: wiki says it prints a warning only, but at least with the Python bindings it causes a hard runtime error instead.

Example 4. Map minimum-version

```
<?xml version="1.0" encoding="utf-8"?>  
<Map minimum-version="3.0.0">
```

```
</Map>
```

3.1.4. `paths-from-xml` attribute

Specifies whether relative file paths are relative to the top level Mapnik XML file (`true`) or the local directory (`false`). Defaults to `true`.

3.2. DataSource

A `<DataSource>` can appear in two places: as a named data source template under `<Map>` or as an actual data source in a `<Layer>`. A data source template can provide default values for actual layer data sources, e.g. when using a PostGIS database as data source a data source template can provide all the connection parameters, so that actual layer data sources only have to provide actual SQL queries.

Example:

```
<Map>
  <!-- Datasource template -->
  <DataSource name="gis">
    <Parameter name="type">postgis</Parameter>
    <Parameter name="host">gis-db</Parameter>
    <Parameter name="port">5432</Parameter>
    <Parameter name="dbname">gis</Parameter>
    <Parameter name="user">maposmatic</Parameter>
    <Parameter name="password">secret</Parameter>
  </DataSource>

  <!-- actual DataSource using the template above for default values -->
  <Layer name="layer-1">
    <DataSource base="gis">
      <Parameter name="table">
        SELECT ...
      </Parameter>
    </DataSource>
  </Layer>
</Map>
```

Mapnik supports several different kinds of data sources, and actually has a plugin interface for these, so that plugins for more data sources can be added "on the fly" without having to rebuild Mapnik itself.

The set of plugins that come with Mapnik itself are called core plugins. Some former core plugins that are no longer maintained, or never left experimental status, have been moved to a separate non-core plugins repository, and there is also a small number of plugins by outside contributors, which we will refer to as extra data sources below.

3.2.1. Core data sources

The core plugins are part of the mapnik source code itself, and usually available in all builds of the mapnik library. (TODO: add link to mapnik github).

CSV

The CSV plugin reads simple column separated data from a file when specified using the `file` parameter, or directly from the XML style file when using the `inline` parameter. In the later case all lines following the `inline` parameter tag will be read as CSV input until the closing parameter tag is reached. In case that the inline data contains `<`, `>` or `&` characters, you should enclose it in a `<![CDATA[...]]>` section to prevent the content from being interpreted as XML.

When giving a `file` path, this is taken as relative to the directory the style file is in, unless a `base` parameter is given. In that case a relative `file` path will be interpreted as relative to the directory path given in the `<FileSource>` of that base name.

Processing performance can be improved by creating an additional `.index` index file using the [\[mapnik-index\]](#) tool.

Example 5. CSV data source examples

```
<!-- read from file path/to/file.csv -->
<DataSource>
  <Parameter name="type">csv</Parameter>
  <Parameter name="file">path/to/file.csv</Parameter>
</DataSource>

<!-- read inline data -->
<DataSource>
  <Parameter name="type">csv</Parameter>
  <Parameter name="inline"><![CDATA[
lat,lon,text
52.0,8.5,"Bielefeld"
]]></Parameter>
</DataSource>
```

By default the CSV plugin tries to identify the field delimiter by looking at the first line of the file, checking for `,` `;` `|` and the `TAB` character. Whatever of these characters seen the most often is considered the separator character, unless you specify a different one with the `separator` Parameter explicitly, e.g: `<Parameter name="separator">;</Parameter>`.

In cases where the data does not contain a header line, one can be given as content of the `headers` parameter.

The default quoting and escape characters are `"` and `\`, but can be changed with the `quote` and `escape` parameters.

Line endings are auto detected, too, so files with DOS/Windows (`\r\n`), Linux/Unix (`\n`) or MacOS (`\r`)

style line endings are read correctly out of the box.

The CSV plugin assumes that the data it reads is UTF-8 encoded, a different encoding can be specified using the `encoding` parameter.

Column data can be referred to by the columns header name, using `[column_name]` placeholders in expressions. The following column names have a special meaning and are used to retrieve actual geometry data for a line:

`lat` or `latitude`

Point latitude

`lon`, `lng`, `long`, or `longitude`

Point longitude

`wkt`

Geometry data in Well Known Text format

`geojson`

Geometry data in GeoJSON format

So each input file either needs a `lat/lon` column pair, or either a `wkt` or `geojson` column to be used as a Mapnik data source.

When parsing the header line fails, or no geometry column(s) can be detected in it, the plugin will print a warning by default, and not return any data. When the `strict` parameter is set to `true`, style processing will be terminated completely by throwing a Mapnik exception.

Table 2. CSV data source parameters

Parameter	Type	Default	Description
<code>encoding</code>	string	utf-8	Text encoding used in the CSV data
<code>row_limit</code>	int	none	Read only this many data rows, ignore the rest.
<code>headers</code>	string	none	Header names if the file contains none on the first line
<code>strict</code>	boolean	false	Terminate Mapnik on hitting errors?
<code>quote</code>	char	"	Quote character used for string columns in the data
<code>escape</code>	char	\	TODO: does this even really exist?

Parameter	Type	Default	Description
separator	char	auto detected	Field separator, typically <code>,</code> <code>;</code> <code> </code> or <code>TAB</code>
extent	4xfloat	none	ignore data that is completely outside this extent bounding box
inline	text	none	CSV data to be read directly from the style file
file	file path	none	path of CSV file to read
base	string	none	name of a <code><FileSource></code> to find the input file in

TODO

- `.index` file support? See also `mapnik-index` utility
- NULL handling?

Gdal

Table 3. Gdal data source parameters

Parameter	Type	Default	Description
band			
base	string	none	name of a <code><FileSource></code> to find the input file in
extent			
file			
max_image_area			
nodata			
nodata_tolerance			
shared			

GeoJSON

While the GeoJSON format is also supported by the OGR input plugin, a direct native GeoJSON plugin was added for performance reasons for this more and more common format.

Processing performance can be improved by creating an additional `.index` index file using the [\[mapnik-index\]](#) tool.

Table 4. Geofjson data source parameters

Parameter	Type	Default	Description base
base	string	none	name of a <code><FileSource></code> to find the input file in
cache_features	boolean	true	
encoding	string	utf-8	Encoding used for textual informatin
file	file path	none	Path of a GeoJSON file to read for input.
inline	string	none	Inline GeoJSON data as part of the stylefile itself
num_features_to_query	int	5	How many features of a feature set to read up front to determine what property names exist in the data

Example 6. GeoJSON data source example

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>

  <Style name="style">
    <Rule>
      <PointSymbolizer file="symbols/[file]"/>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">geojson</Parameter>
      <Parameter name="inline"><![CDATA[
{
  "type": "FeatureCollection",
  "features": [
    {
      "type": "Feature",
      "properties": {
        "file": "dot.svg"
      },
      "geometry": {
        "type": "Point",
        "coordinates": [1, 1]
      }
    },
  ],
},
]]></Parameter>

```

```
{
  "type": "Feature",
  "properties": {
    "file": "bug.svg"
  },
  "geometry": {
    "type": "Point",
    "coordinates": [2, 1]
  }
}
]]></Parameter>
</Datasource>
</Layer>
</Map>
```



OGR

The OGR input plugin supports a large number of different vector formats via the GDAL/OGR library. For a complete list of supported formats see the [Vector Drivers](#) list in the GDAL documentation.

The OGR plugin is typically used for GPX—for which no special input plugin exists—and OSM data—for which it replaced the older OSM plugin that has now been moved to the [non-core-plugins](#) repository and is usually not included in Mapnik binary builds anymore. So we're going into details for these two data formats below only.

Table 5. OGR data source parameters

Parameter	Type	Default	Description
<code>base</code>	string	none	name of a <code><FileSource></code> to find the input file in
<code>driver</code>	string	auto detect	actual vector format driver to use
<code>encoding</code>	string	utf-8	
<code>extent</code>			
<code>file</code>	file path	none	path of input file to read
<code>inline</code>	string	none	inline vector file data to read directly from style file
<code>layer</code>	string	none	name of the input layer to actually process
<code>layer_by_index</code>	int	none	number of the input layer to actually process
<code>layer_by_sql</code>			
<code>string</code>	string	none	alias for <code>inline</code>

OGR GPX

The GPX backend reads GPX XML files and provides the contained data via the following five layers:

routes

Returns routes from the GPX files `<rte>` tags as lines. Each route is given an extra `route_id` attribute.

tracks

Returns tracks from the GPX files `<trk>/<trkseg>` tags as multilines. Each track is given an extra `track_id` attribute.

route_points

Returns `<trpt>` route points from all routes, with an extra `route_fid` filed referring to the `route_id` of the route that a point belongs to.

track_points

Returns `<trkpt>` track points from all tracks, with extra `track_fid` and `track_seg_id` attributes added.

waypoints

Returns a combination of all route and track points.

Any extra tags that a route, track or point may have, like `<name>` or `<ele>` (for elevation), can be accessed in filter expressions and symbolizers by name, e.g. as `[name]` or `[ele]`.

Example 7. OGR GPX data source example

Show a marker for all GPX points with a non-empty `<name>` tag.

```
<Style name="named_point">
  <Rule>
    <Filter>not ([name] = null or [name] = '')</Filter>
    <PointSymbolizer file="marker.svg"/>
    <TextSymbolizer face-name="DejaVu Sans Book" size="10" placement="point"
>[name]</TextSymbolizer>
  </Rule>
</Style>

<Layer>
  <StyleName>named_point</StyleName>
  <Datasource>
    <Parameter name="type">ogr</Parameter>
    <Parameter name="driver">gpx</Parameter>
    <Parameter name="file">file.gpx</Parameter>
    <Parameter name="layer">waypoints</Parameter>
  </Datasource>
</Layer>
```

For more details see the [original GDAL documentation for the GPX backend](#)

OGR OSM

The OGR plugin can read uncompressed [OSM XML](#) data and the more compact, but not human readable, [PBF format](#). File formats are auto detected when using the `.osm` or `.pbf` file extensions. When using files with other extensions, like e.g. `.xml` for OSM XML, the `driver` parameter needs to be set to `osm` explicitly.

The OSM backend provides data in the following five layers:

points

Nodes that have significant tags attached.

lines

Ways that are recognized as non-area.

multilinestrings

Relations that define a multilinestring (`type=multilinestring` or `type=route`).

multipolygons

Ways that are recognized as areas and relations that form a polygon or multipolygon (e.g. `type=multipolygon` or `type=boundary`)

other_relations

Relations that are not in `multilinestrings` or `multipolygons`

Example 8. OGR OSM data source example

```
<Datasource>
  <Parameter name="type">ogr</Parameter>
  <Parameter name="driver">osm</Parameter>
  <Parameter name="file">ways.osm</Parameter>
  <Parameter name="layer">lines</Parameter>
</Datasource>
```

While rendering OSM data directly can work out OK for small amounts of data the usually preferred way to present OSM data is to import it into PostGIS using either the `osm2pgsql` or `imposm` import tool first, and then to use the PostGIS Datasource. This requires some extra effort up front, but performs better on larger data sets, and allows for more sophisticated preprocessing of the OSM input data than the few fixed rules statically built into the OGR OSM backend.

For more details see the [original GDAL documentation for the OSM backend](#)

PgRaster

Table 6. PgRaster data source parameters

Parameter	Type	Default	Description
<code>autodetect_key_field</code>			
<code>band</code>			
<code>clip_rasters</code>			
<code>connect_timeout</code>			
<code>cursor_size</code>			
<code>dbname</code>			
<code>estimate_extent</code>			

Parameter	Type	Default	Description
extent			
extent_from_subquery			
host			
initial_size			
intersect_max_scale			
intersect_min_scale			
key_field			
password			
persist_connection			
port			
prescale_rasters			
raster_field			
raster_table			
row_limit			
srid			
table			
use_overviews			
user			

PostGIS

Table 7. PostGIS data source parameters

Parameter	Type	Default	Description
Connection parameters			
host	string	none	PostgreSQL server host name or address
port	string	none	PostgreSQL server port
user	string	none	Database user
password	string	none	Database user password
dbname	string	none	Name of database to use
connect_timeout	int	4	Connect timeout in seconds
persist_connection	boolean	true	Reuse connection for subsequent queries
Other parameters			

Parameter	Type	Default	Description
<code>autodetect_key_field</code>	boolean	false	Whether to auto detect primary key if none is given in <code>key_field</code>
<code>cursor_size</code>	int	0	Fetch this many features at a time, or all when zero.
<code>estimate_extent</code>	boolean	false	Try to estimate the extent from the data retrieved
<code>extent</code>	floatx4	none	Extent bounding box
<code>extent_from_subquery</code>	boolean	false	
<code>geometry_field</code>	string	none	The result field that the geometry to process is in. Auto detected when not given.
<code>geometry_table</code>	string	none	Name of table geometry is retrieved from. Auto detected when not given, but this may fail for complex queries.
<code>initial_size</code>	int	1	initial connection pool size
<code>intersect_min_field</code>	int	0	
<code>intersect_max_field</code>	int	0	
<code>key_field</code>	string	none	Primary key field of table geometry is retrieved from. Auto detected when not given and <code>autodetect_key_field</code> is true.
<code>key_field_as_attribute</code>	boolean	true	
<code>max_size</code>	int	10	Max. connection pool size
<code>max_async_connections</code>	int	1	Run that many queries in parallel, must be \leq <code>max_size</code>
<code>row_limit</code>	int	0	Only return this many features if > 0

Parameter	Type	Default	Description
<code>simplify_dp_preserve</code>	boolean	false	
<code>simplify_dp_ratio</code>	float	1/20	
<code>simplify_geometries</code>	boolean	false	
<code>simplify_prefiter</code>	float	0.0	
<code>simplify_snap_ratio</code>	float	1/40	
<code>srid</code>	int	0	SRID of returned features, auto detected when zero
<code>table</code>	string	none	Name of a table, or SQL query text
<code>twkb_rounding_adjustment</code>	float	0.0	
<code>twkb_encoding</code>	boolean	false	

Aside from the basic PostgreSQL connection parameters (`host`, `port`, `user`, `password`, `dbname`), you can also add additional [connection parameter keywords](#) in the `host` or `dbname` parameter (probably the others, too, but this I didn't test yet) for more fine grained connection control.

You can e.g. set a datasource specific application name with this:

```
<Parameter name='host'>localhost application_name=my_style</Parameter>
```

Or set a specific schema search path:

```
<Parameter name='host'>localhost options='-c search_path=foo,public'</Parameter>
```

Probably most important though, this allows for using SSL/TLS. In it's most basic form you'd just enforce SSL/TLS encryption being used:

```
<Parameter name='host'>localhost sslmode=require</Parameter>
```

The PostGIS datasource supports two different methods to return data to Mapnik: in regular well known binary (WKB) or — with PostGIS v2.2 or later — tiny well known binary (TWKB) format. This is controlled by the `twkb_encoding` option.

When using TWKB the `twkb_rounding_adjustment` parameter then controls the resolution the TWKB aims for. A value of 0.5 would lead to a coarseness of about one pixel, the default of 0.0 would be in the range of 0.05 to 0.2 pixels usually. This is done by using the `twkb_rounding_adjustment` parameter to calculate the `tolerance` parameter for `ST_Simplify()` and `ST_RemoveRepeatedPoints()`, and the `decimaldigits_xy` parameter for `ST_AsTWKB()`

When using WKB (the default), simplification can be controlled via `simplify_geometries`, `simplify_snap_ratio`, `simplify_dp_preserve`, `simplify_dp_ratio`, `simplify_prefilter`, `simplify_clip_resolution` parameters. (TODO: describe in more detail)

`simplify_clip_resolution` is use for both formats, and controls at what map scale geometries start getting clipped to the rendering window when non-zero.

The following special tokens can be used in SQL queries, and will be replaced b the actual mapnik values for the current render request:

!bbox!

the map bounding box

!scale_denominator!

the current scale denominator

!pixel_width!,!pixel_height!

width and height of pixels (TODO: depends on STR, is ° with latlon and meters with google mercator?)

Raster

Table 8. Raster data source parameters

Parameter	Type	Default	Description
<code>base</code>	string	none	name of a <code><FileSource></code> to find the input file in
<code>extent</code>			
<code>file</code>			
<code>format</code>			
<code>hix</code>			
<code>hiy</code>			
<code>lox</code>			
<code>loy</code>			
<code>multi</code>			
<code>tile_size</code>			
<code>tile_stride</code>			
<code>x_width</code>			
<code>y_width</code>			

Shape

The shape input plugin can read the [ESRI shapefile format](#). The OGR plugin also supports shapefiles, but the shape plugin has more direct support for this. It is also better maintained and tested.

Shapefiles are often used instead of databases for data that doesn't change that often, or where data available in a database requires some preprocessing. Common examples are boundaries, coastlines, and elevation countour lines.

OpenStreetMap or example provides land polygons, water polygons, coastlines, and antarctic ice sheet polygons and outlines as regularly updated shapefiles on the [OsmData Download Server](#). Due to the way large bodies of land and water are constructed by grouping individual coast line segments into polygon relations in OSM, there's always a risk of such lines not really being closed polygons. The OSM shapefiles are generated by extracting and aggregating the line segments data, and are only published when containing no unclosed polygons.

Another often used source of shapefiles is [Natural Earth](#), which provides public domain geo data for lots of physical and cultural features.

Shapefile processing performance can be increased by creating an index file using the [\[shapeindex\]](#) tool that is included in the Mapnik source code, and usually also in binary distribution pacakges.

Table 9. Shape data source parameters

Parameter	Type	Default	Description
file	file path	none	shapefile path, <code>.shp</code> extension is optional
base	string	none	name of a <code><FileSource></code> to find the input file in
encoding	string	utf-8	encoding used for text fields in the shapefile
row_limit	int	none	maximum number of rows to process

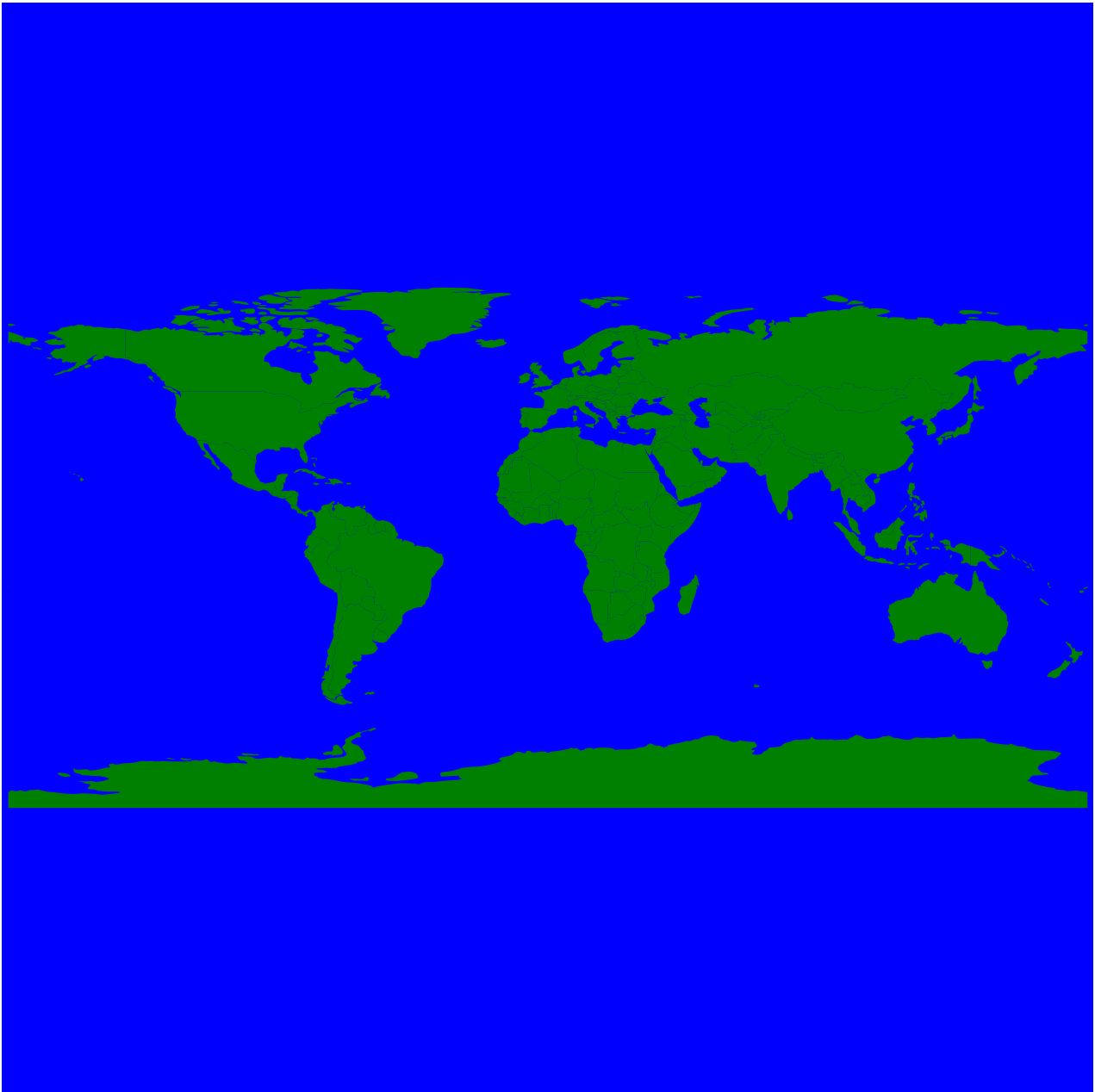
Example 9. Shape data source example

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='blue'>

  <Style name="countries">
    <Rule>
      <PolygonSymbolizer fill="green"/>
    </Rule>
  </Style>

  <Layer name="countries">
    <StyleName>countries</StyleName>
    <Datasource>
      <Parameter name="type">shape</Parameter>
      <Parameter name="file">data/world-countries.shp</Parameter>
    </Datasource>
  </Layer>
```

</Map>



SQLite

Table 10. SQLite data source parameters

Parameter	Type	Default	Description
<code>attachdb</code>			
<code>auto_index</code>			
<code>base</code>	string	none	name of a <code><FileSource></code> to find the input file in
<code>encoding</code>			
<code>extent</code>			
<code>fields</code>			

Parameter	Type	Default	Description
file			
geometry_field			
geometry_table			
index_table			
initdb			
key_field			
metadata			
row_limit			
row_offset			
table			
table_by_index			
use_spatial_index			
wkb_format			

TopoJson

Table 11. SQLite data source parameters

Parameter	Type	Default	Description
base	string	none	name of a <FileSource> to find the input file in
encoding			
file			
inline			

3.2.2. Non-core

The following plugins used to be part of the mapnik source, but have been moved to an [extra repository](#) as they are either no longer maintained, or still experimental. These are usually not part of a standard Mapnik installation.

Geos

Table 12. Geos data source parameters

Parameter	Type	Default	Description
encoding	string	utf-8	
extent			
field_data			
field_name			
gid			
wkt			

See also:

- <https://github.com/mapnik/mapnik/wiki/GEOS>

Kismet

An experimental plugin that reads WLAN location informatin from a Kismet instance.

Table 13. Kismet data source parameters

Parameter	Type	Default	Description
encoding	string	utf-8	Text encoding
extent			
host	string	none	Kinsmet server name or IP address
port	int	2501	Port that the Kismet process is listening on
srs	string		

See also:

<https://github.com/mapnik/mapnik/wiki/Kismet>

OCCI

Table 14. OCCI data source parameters

Parameter	Type	Default	Description
encoding			
estimate_extent			
extent			
fields			
geometry_field			
host			
initial_size			
max_size			
password			
row_limit			
row_prefetch			
srid			
table			
use_connection_pool			
user			
use_spatial_index			

Parameter	Type	Default	Description
<code>use_wkb</code>			

OSM

The OSM plugin is no longer maintained as the OGR plugin can read OSM data now, too, and unlike the OSM plugin not only supports the OSM XML format, but also the more compact PBF format. So the old OSM plugin is no longer considered a core plugin now.

Table 15. OSM data source parameters

Parameter	Type	Default	Description
<code>bbox</code>	4xfloat	none	no longer supported, see also <code>url</code>
<code>encoding</code>	string	utf-8	Encoding of text fields in the data file
<code>file</code>	file path	OSM XML data file to read	
<code>parser</code>	string	libxml	So far libxml is the only possible choice here
<code>url</code>	string	none	Fetching OSM data from an API url was discontinued in Mapnik v2.3

Python

The experimental python plugin allows for writing data sources using custom Python code.

Table 16. Python data source parameters

Parameter	Type	Default	Description
<code>encoding</code>	string	utf8	Text encoding used
<code>factory</code>	string	none	A Python callable that implements a data source

See also:

- <https://github.com/mapnik/mapnik/wiki/Python-Plugin>

Rasterlite

Table 17. Rasterlite data source parameters

Parameter	Type	Default	Description
base	string	none	name of a <code><FileSource></code> to find the input file in
file			
table			

3.2.3. Other data sources

The following data source plugins are not really part of the Mapnik project, even though some of them have their github repository under the mapnik project.

Hello World

The [Hello World plugin](#) is an example of the minimal code needed to implement an input plugin. It only ever returns a single point geometry located in the middle of the current map extent, with a single attribute named `key` and a constant value of `hello world!`.

GeoWave

Mongo

3.3. FileSource

A `<FileSource>` can be used as a child of `<Map>` to declare named directory paths that then can be referred to as `base` attribute in for files to read by data sources `file`, like e.g. the `CSV` and `GeoJSON` ones, and for symbolizers that are able to load image files, like e.g. `<PointSymbolizer>`, `<LinePatternSymbolizer>` etc.

Table 18. FileSource attributes

Attribute	Value	Default	Description
name	string	none	

Example 10. FileSource DataSource example

The actual file to be processed in the example below will be taken from `path/to/csv-data/file.csv`:

```
<Map>
  <FileSource name='csv-base'>path/to/csv-data</FileSource>
  [...]
  <DataSource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="base">csv-base</Parameter>
    <Parameter name="file">file.csv</Parameter>
  </DataSource>
  [...]
```

```
</Map>
```

Example 11. FileSource Symbolizer example

The actual symbol file being used in the example below will be taken from `path/to/symbols/symbol.svg`:

```
<Map>
  <FileSource name='symbols'>path/to/symbols</FileSource>
  [...]
  <PointSymbolizer base='symbols' file='symbol.svg' />
  [...]
</Map>
```

3.4. Font

Table 19. Font attributes

Attribute	Value	Default	Description
<code>face-name</code>	string	none	

3.5. FontSet

A `<FontSet>` contains a list of or more `` entries that are searched in the listed order when rendering characters. This way a style sheet can specify multiple alternative fonts for different platforms, or different language specific fonts.

Listed fonts that are not found on the system running Mapnik are simply ignored after generating a warning. Also when a certain character is not found in the first font the other fonts are searched in order until one supporting the character is found.

NOTE

Note that by default Mapnik only looks for fonts under one pre-configured directory and its subdirectories, e.g. `/usr/share/fonts/`. To also find fonts under other paths, you either need to add a `font-directory=...` attribute to your `<Map>` tag, or register additional font directories programmatically in your mapnik application before processing a stylesheet.

So when e.g. a map is to show both `<TextSymbolizer>` or `<ShieldSymbolizer>` using the `fontset_name` attribute.

Table 20. FontSet attributes

Attribute	Value	Default	Description
<code>name</code>	string	"<missing name>"	

Example 12. FontSet definition

```
<FontSet name="my-fonts">
  <Font face-name="Noto Sans Regular"/>
  <Font face-name="Noto Sans CJK JP Regular"/>
</FontSet>
```

3.6. Layer

A layer renders data from a data source using one or more styles.

Table 21. Layer attributes

Attribute	Value	Default	Description
<code>buffer-size</code>	float	0	
<code>cache-features</code>	bool	false	On layers with multiple styles: read features from data source only once and cache them in memory. Improves performance, but at the cost of using more memory, so off by default.
<code>clear-label-cache</code>	bool	false	Clear the placement cache from previous layers, so that texts, points and markers may overlap with those from previous layers.

Attribute	Value	Default	Description
group-by	string	none	On layers with multiple styles these styles are processed one by one in the given order by default. When giving a group-by property, feature elements will be sorted by this property, and styles will be processed in order for each distinct group value. E.g with group-by=z and z having values from -1 to 1, first all features with z=-1 will be processed using all styles, then all with z=0, and finally all with z=1.
minimum-scale-denominator	float	0	Minimum map scale above which this layer should be rendered.
maximum-extent	4x float		Maximum extent for which features should be processed.
maximum-scale-denominator	float	max. float	Maximum map scale up to which this layer should be rendered.
name	string	none	Name by which the layer can be referenced, e.g. for error messages.
queryable	bool	false	unused?
srs	proj4 srs string	+proj=longlat +ellps=WGS84 +datum=WGS84 +no_defs	Spatial reference system

Attribute	Value	Default	Description
<code>status</code>	boolean	true	Whether this layer should actually be processed or not. Caution: when set to <code>false</code> in XML the complete <code><Layer></code> will simply be skipped on reading the style file, and no layer object will be created for it. So you won't be able to enable such a layer with <code>Layer.setStatus(true)</code> using API code later.

Example 13. Layer

```

<Layer name="layer_1">
  <StyleName>style_1</StyleName>
  <StyleName>style_2</StyleName>

  <DataSource>
    [...]
  </DataSource>
</Layer>

```

3.7. Style

Styles contain a set of rendering rules to render data elements provided by a data source. Each style can contain one or more rules for rendering specific features.

Table 22. Style attributes

Attribute	Value	Default	Description
<code>comp-op</code>	SVG compositing		
<code>filter-mode</code>	"all", "first"	"all"	
<code>opacity</code>	float	1	
<code>image-filters-inflate</code>	boolean	false	
<code>image-filters</code>	string		
<code>direct-image-filters</code>	string		

3.8. Rule

A style rule filters data elements provided by a data source, and renders the matching elements using one or more symbolizers. Rules can also be limited to specific scale factor ranges only, e.g. to implement different zoom level styles.

Table 23. Rule attributes

Attribute	Value	Default	Description
<code>name</code>	string	none	

3.9. Filter

Filters specify on what data elements a rule should operate, by evaluating expressions. The expression language supports simple comparisons, logic, math, and regular expression matching.

There are also two special filters that do not evaluate expressions but depend on whether other previous filters in the style found a match:

`<ElseFilter>` matches if no other filter in a style matched so far, so it can be used as a fallback default.

`<AlsoFilter>` only matches if at least one previous filter in a style matched.

The `<Filter>` tag has no tag attributes.

3.9.1. Filter expressions

The filter expression language supports the following constants, operators, and functions. It also allows for referencing data element attributes by putting the attribute name in square brackets `[attribute]` and to change evaluation order by putting expression parts in regular round brackets `(...)`.

TODO: operator precedence TODO: regular expression match and replace

Constants

`true`

logical true

`false`

logical false

`pi`

3.14159...

`deg_to_rad`

0.01745... (pi/180)

rad_to_deg

57.295... (180/pi)

Operators

+

-

*

/

%

and, &&

or, ||

not, !

=, eq, is

!=, <>, neq

<, lt

<=, le

>, gt

>=, ge

...

Functions

sin(x)

Sinus

cos(x)

Cosinus

tan(x)

Tangens

atan(x)

Arc Tangens

exp(x)

e^x

log(x)

natural logarithm of x

pow(x, y=

x^y

abs(x)

positive absolute value of x

min(x,y)

minimum value

max(x,y)

maximum value

length(str)

string length

3.10. Symbolizers

Symbolizers do the actual rendering of map features. There are several different kinds of symbolizers that operate on point, line and polygon data objects to create visual representations on these. Below you will find detailed descriptions of the available symbolizers in alphabetical order.

NOTE

Right now all the symbolizer examples below show a complete XML style file. I'm considering to shorten these to just the actual symbolizer tag and the inline CSV data lines as the rest of these examples is actually redundant, to save some space, with hyperlinks to the actual full example files ...

3.10.1. PointSymbolizer

The point symbolizer draws a given image at a point position. When given a line or polygon as input the shape will be put at the middle of the line or center of the polygon.

If no image file is specified a small square is used as the default point image.

For putting symbols along a line or the edge of a polygon the MarkerSymbolizer is usually a better choice.

Table 24. PointSymbolizer Attributes

Attribute	Type	Default	Description
<code>file</code>	file path	none	
<code>base</code>	string	none	name of a <FileSource> to find the input file in
<code>allow-overlap</code>	bool	false	allow to paint over previous symbolizers output
<code>opacity</code>	float	1.0	
<code>placement</code>	string	centroid	Whether to place on a polygons centroid, which can actually be outside, or its interior
<code>ignore-placement</code>	bool	false	
<code>transform</code>	SVG transform	identity	
<code>comp-op</code>	Compositing	src-over	

file attribute

`file` refers to a SVG or PNG file to include as a symbol at the point position. The file can be given as a constant string, or as an expression, so files to display can be dynamically chosen from layer data.

By default `file` paths are either absolute or relative to the directory the main style file is in, but different directory paths can be set up using the <FileSource> tag and referenced by its `name` using the `base` attribute.

Example 14. PointSymbolizer file

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <PointSymbolizer allow-overlap="true" base="symbols" file="[file]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[file]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
```

```
wkt,file
"POINT(1 0)","dot.svg"
"POINT(2 0)","bug.svg"
  </Parameter>
</Datasource>
</Layer>

</Map>
```



opacity attribute

The **opacity** attribute defines how opaque or transparent a point symbol should be rendered. The value range is from **0.0** for completely transparent to **1.0** for completely opaque.

Example 15. PointSymbolizer opacity

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <PointSymbolizer base="symbols" file="dot.svg" opacity="[opacity]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[opacity]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
opacity,wkt
0.0,"POINT( 0 0)"
0.1,"POINT( 1 0)"
0.2,"POINT( 2 0)"
0.3,"POINT( 3 0)"
0.4,"POINT( 4 0)"
0.5,"POINT( 5 0)"
0.6,"POINT( 6 0)"
0.7,"POINT( 7 0)"
0.8,"POINT( 8 0)"
0.9,"POINT( 9 0)"
1.0,"POINT(10 0)"
      </Parameter>
    </Datasource>
  </Layer>

</Map>
```



base attribute

The **base** attribute defines which `<FileSource>` should be used as the base directory for a **file** symbol.

NOTE The **base** attribute only accepts constant strings, no expressions. So it can only be chosen dynamically by using `<Rule>/<Filter>` constructs.

Example 16. PointSymbolizer base

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="default">./symbols</FileSource>
  <FileSource name="red">./symbols/red</FileSource>
  <FileSource name="green">./symbols/green</FileSource>
  <FileSource name="blue">./symbols/blue</FileSource>
```

```

<Style name="style">
  <Rule>
    <Filter>[base] = "red"</Filter>
    <PointSymbolizer allow-overlap="true" file="bug.svg" base="red"/>
  </Rule>
  <Rule>
    <Filter>[base] = "blue"</Filter>
    <PointSymbolizer allow-overlap="true" file="bug.svg" base="blue"/>
  </Rule>
  <Rule>
    <Filter>[base] = "green"</Filter>
    <PointSymbolizer allow-overlap="true" file="bug.svg" base="green"/>
  </Rule>
  <Rule>
    <AlsoFilter />
    <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[base]</TextSymbolizer>
  </Rule>
  <Rule>
    <ElseFilter />
    <PointSymbolizer allow-overlap="true" file="bug.svg" base="default"/>
    <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
fill="red">"FileSource for base '"+[base]+' not found"</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,base
"POINT(0 0)","red"
"POINT(1 0)","blue"
"POINT(2 0)","green"
"POINT(4 0)","foobar"
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



allow-overlap attribute

The `allow-overlap` defines whether a point symbolizer may be drawn over previous output.

Example 17. PointSymbolizer allow-overlap

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <PolygonSymbolizer/>
      <TextSymbolizer face-name="DejaVu Sans Book">[caption]</TextSymbolizer>
      <PointSymbolizer allow-overlap="[allow-overlap]" base="symbols" opacity="
0.3" file="bug.svg"/>
    </Rule>
  </Style>
</Map>
```

```

    <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[allow-overlap]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,allow-overlap,caption
"POINT(0 0)",true,overlap
"POINT(1 0)",false,overlap
"POINT(3 0.2)",true,
"POINT(3.1 0)",true,
"POINT(4 0.2)",true,
"POINT(4.1 0)",false,
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



overlap
true



overlap
false



true
true



true
false

placement attribute

The **placement** attribute specifies where the point symbol should be placed on a polygon object. By default it is placed on the **centroid** of the polygons, but for a non-convex polygon this can actually place the symbol outside of the polygon itself. **interior** makes sure that the symbol is placed within the polygon in all cases.

Example 18. PointSymbolizer placement

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <PolygonSymbolizer/>
    </Rule>
  </Style>
</Map>
```



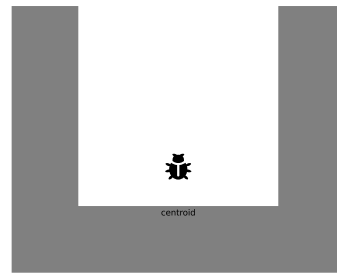
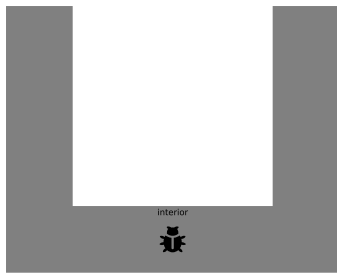
```

    <PointSymbolizer allow-overlap="true" placement="[placement]" base="symbols"
file="bug.svg"/>
    <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[placement]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,placement
"POLYGON(( 1 1, 6 1, 6 5, 5 5, 5 2, 2 2, 2 5, 1 5, 1 1))",interior
"POLYGON((11 1,16 1,16 5,15 5,15 2,12 2,12 5,11 5,11 1))",centroid
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



transform attribute

TODO: document SVG transformations

Example 19. PointSymbolizer scaling

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <PointSymbolizer base="symbols" file="bug.svg" transform="scale([scale])"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="40"
>[scale]+ "x"</TextSymbolizer>
    </Rule>
```

```
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
scale,wkt
0.5,"POINT( 0 0)"
1,"POINT( 1 0)"
2,"POINT( 2 0)"
    </Parameter>
  </Datasource>
</Layer>

</Map>
```



0.5x



1x



2x

Example 20. PointSymbolizer rotation

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <PointSymbolizer base="symbols" file="bug.svg" transform="rotate([rotate])
"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[rotate]+"°"</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
rotate,wkt
  0,"POINT( 0 0)"
  45,"POINT( 1 0)"
  90,"POINT( 2 0)"
  180,"POINT( 3 0)"
  270,"POINT( 4 0)"
      </Parameter>
    </Datasource>
  </Layer>

</Map>
```



comp-up attribute

TODO: document SVG compositing

Example 21. PointSymbolizer compositing

TODO

3.10.2. MarkersSymbolizer

The MarkersSymbolizer is similar to the PointSymbolizer, but has two advantages when used on a line or polygon: it can be drawn multiple times along a line automatically, and it's orientation is rotated according to the current direction of the line instead of always being upright.

Table 25. MarkersSymbolizer Attributes

Attribute	Type	Default	Description
<code>file</code>	file path	none	
<code>base</code>	string	none	name of a <code><FileSource></code> to find the input file in
<code>opacity</code>	float	1.0	Marker opacity for both fill and stroke
<code>fill-opacity</code>	float	1.0	Marker fill opacity
<code>stroke-opacity</code>	float	1.0	Marker stroke opacity (only for internal markers)
<code>stroke-width</code>	float	0.5	Marker stroke width (only for internal markers)
<code>marker-type</code>	string	none	One of builtin types "ellipse" or "arrow", deprecated, use <code>file="shape://ellipse"</code> or <code>shape://arrow</code> instead.
<code>multi-policy</code>	string	each	Where to put marker on multi part polygons: each, whole, largest
<code>width</code>	float	10	Marker symbol width in pixels
<code>height</code>	float	10	Marker symbol height in pixels
<code>placement</code>	string	point	Marker placement strategy: one of point, line, interior, vertex-first, vertex-last

Known Problems

TODO: incomplete

WARNING

The internal marker URIs like `shape://arrow` can't be used in combination with `base=...` as currently the base filesource also gets added in front of these special "files".

<https://github.com/mapnik/mapnik/issues/4183>[(Mapnik issue #4183)]

See also:

- [Mapnik Github Wiki](#)
- [Mapnik Reference](#)

MarkersSymbolizer Examples

Example 22. MarkersSymbolizer file

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <MarkersSymbolizer allow-overlap="true" base="symbols" file="[file]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[file]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,file
"POINT(0 0)", ""
"POINT(1 0)", "dot.svg"
"POINT(2 0)", "bug.svg"
      </Parameter>
    </Datasource>
  </Layer>
</Map>
```



Example 23. MarkersSymbolizer opacity

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <MarkersSymbolizer base="symbols" file="dot.svg" opacity="[opacity]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[opacity]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
```



```
<Datasource>
  <Parameter name="type">csv</Parameter>
  <Parameter name="inline">
opacity,wkt
0.0,"POINT( 0 0)"
0.1,"POINT( 1 0)"
0.2,"POINT( 2 0)"
0.3,"POINT( 3 0)"
0.4,"POINT( 4 0)"
0.5,"POINT( 5 0)"
0.6,"POINT( 6 0)"
0.7,"POINT( 7 0)"
0.8,"POINT( 8 0)"
0.9,"POINT( 9 0)"
1.0,"POINT(10 0)"
  </Parameter>
</Datasource>
</Layer>

</Map>
```



Example 24. *MarkersSymbolizer* stroke opacity

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <Style name="style">
    <Rule>
      <MarkersSymbolizer file="shape://ellipse" fill-opacity="0" stroke-width="1"
stroke="red" stroke-opacity="[opacity]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[opacity]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
```

```
<Parameter name="type">csv</Parameter>
<Parameter name="inline">
opacity,wkt
0.0,"POINT( 0 0)"
0.1,"POINT( 1 0)"
0.2,"POINT( 2 0)"
0.3,"POINT( 3 0)"
0.4,"POINT( 4 0)"
0.5,"POINT( 5 0)"
0.6,"POINT( 6 0)"
0.7,"POINT( 7 0)"
0.8,"POINT( 8 0)"
0.9,"POINT( 9 0)"
1.0,"POINT(10 0)"
</Parameter>
</Datasource>
</Layer>

</Map>
```



Example 25. *MarkersSymbolizer fill opacity*

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <Style name="style">
    <Rule>
      <MarkersSymbolizer file="shape://arrow" fill="blue" stroke-width="1" stroke
="red" fill-opacity="[opacity]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[opacity]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
```

```
<Parameter name="type">csv</Parameter>
<Parameter name="inline">
opacity,wkt
0.0,"POINT( 0 0)"
0.1,"POINT( 1 0)"
0.2,"POINT( 2 0)"
0.3,"POINT( 3 0)"
0.4,"POINT( 4 0)"
0.5,"POINT( 5 0)"
0.6,"POINT( 6 0)"
0.7,"POINT( 7 0)"
0.8,"POINT( 8 0)"
0.9,"POINT( 9 0)"
1.0,"POINT(10 0)"
</Parameter>
</Datasource>
</Layer>

</Map>
```



Example 26. MarkersSymbolizer placement

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

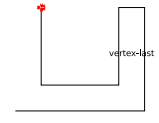
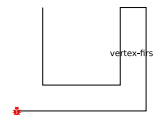
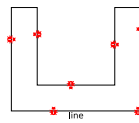
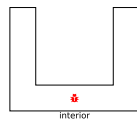
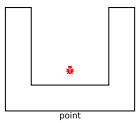
  <Style name="style">
    <Rule>
      <LineSymbolizer stroke="black"/>
      <MarkersSymbolizer allow-overlap="true" base="symbols" file="bug.svg"
placement="[placement]" width="10" height="10" fill="red"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[placement]</TextSymbolizer>
    </Rule>
  </Style>
</Map>
```

```

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,placement
"POLYGON(( 1 1, 6 1, 6 5, 5 5, 5 2, 2 2, 2 2, 2 5, 1 5, 1 1))",point
"POLYGON((11 1, 16 1, 16 5, 15 5, 15 2, 12 2, 12 5, 11 5, 11
1))",interior
"POLYGON((21 1, 26 1, 26 5, 25 5, 25 2, 22 2, 22 5, 21 5, 21 1))",line
"LINESTRING(31 1, 36 1, 36 5, 35 5, 35 2, 32 2, 32 5)",vertex-first
"LINESTRING(41 1, 46 1, 46 5, 45 5, 45 2, 42 2, 42 5)",vertex-last
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



Example 27. MarkersSymbolizer width and height

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <MarkersSymbolizer allow-overlap="true" base="symbols" file="bug.svg" width
=>[width]" height=">[height]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[width]</TextSymbolizer>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="30"
>[height]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,width,height
"POINT(0 0)",32,32
"POINT(1 0)",16,32
"POINT(2 0)",32,16
      </Parameter>
    </Datasource>
  </Layer>

</Map>
```




Example 28. MarkersSymbolizer multi policy

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <Style name="style">
    <Rule>
      <PolygonSymbolizer fill="lightgray"/>
      <LineSymbolizer stroke="black"/>
      <MarkersSymbolizer allow-overlap="true" file="shape://ellipse" multi-policy
      ="[placement]" width="10" height="10" fill="red"/>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
```

```

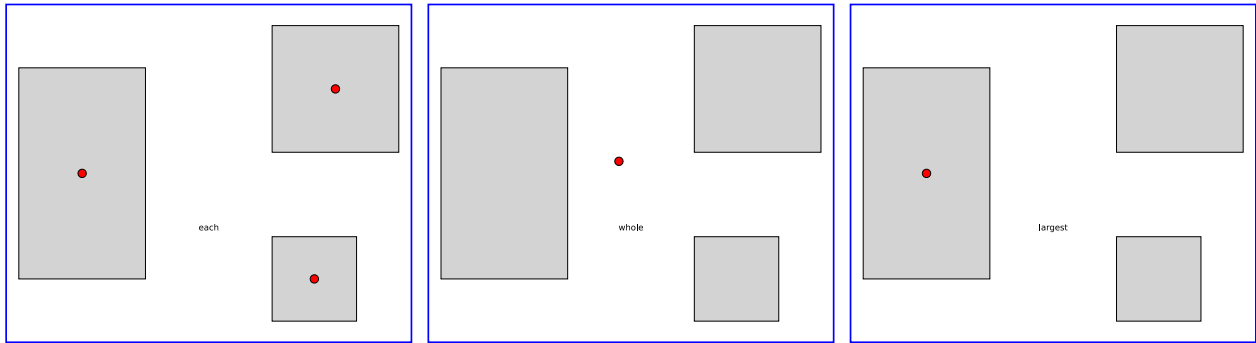
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,placement
"MULTIPOLYGON((( 30 20, 60 20, 60 70, 30 70, 30 20)),(( 90 10, 110 10, 110
30, 90 30, 90 10)),(( 90 50, 120 50, 120 80, 90 80, 90 50)))",each
"MULTIPOLYGON(((130 20,160 20,160 70,130 70,130 20)),((190 10, 210 10, 210
30,190 30,190 10)),((190 50, 220 50, 220 80,190 80,190 50)))",whole
"MULTIPOLYGON(((230 20,260 20,260 70,230 70,230 20)),((290 10, 310 10, 310
30,290 30,290 10)),((290 50, 320 50, 320 80,290 80,290 50)))",largest
    </Parameter>
  </Datasource>
</Layer>

<Style name="style2">
  <Rule>
    <LineSymbolizer stroke="blue" stroke-width="2"/>
    <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="60"
>[placement]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer2">
  <StyleName>style2</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,placement
"POLYGON(( 27 5, 123 5, 123 85, 27 85, 27 15))",each
"POLYGON((127 5, 223 5, 223 85, 127 85, 127 15))",whole
"POLYGON((227 5, 323 5, 323 85, 227 85, 227 15))",largest
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



3.10.3. LineSymbolizer

The LineSymbolizer specifies how to render linear geometries like lines and polygon outlines. Most of the LineSymbolizer attributes define stroke attributes of the line to draw, like color, width, how line joins and ends should look, and even dash patterns.

There are also some attributes that change the lines geometry itself, like offset, smooth and simplify.

Table 26. LineSymbolizer

Attribute	Value	Default	Description
clip	boolean	false	
comp-op	SVG compositing		
geometry-transform	SVG transform		
offset	float	0	
rasterize	full, fast	full	
smooth	0.0 - 1.0	1	
simplify	float	0	
simplify-algorithm	radial-distance, zhao-saalfeld, visvalingam-whyatt, douglas-peucker	radial-distance	
stroke	color	black	
stroke-dasharray	number list	none	
stroke-dashoffset	number list	none	experimental only
stroke-gamma	0.0 - 1.0	1	
stroke-gamma-method	power, linear, none, threshold, multiply	power	
stroke-linejoin	bevel, miter, miter-revert, round	miter	
stroke-linecap	butt, round, square	butt	
stroke-miterlimit	float	4	
stroke-opacity	0.0 - 1.0	1	
stroke-width	float	1	

TODO: * for miterlimit see e.g. <https://developer.mozilla.org/en-US/docs/Web/SVG/Attribute/stroke-miterlimit> for meterlimit description / visualization * for simplify-algorithm see e.g. https://i11www.itk.edu/_media/teaching/sommer2013/algokartografie/gruppe1.pdf

Example 29. LineSymbolizer smooth

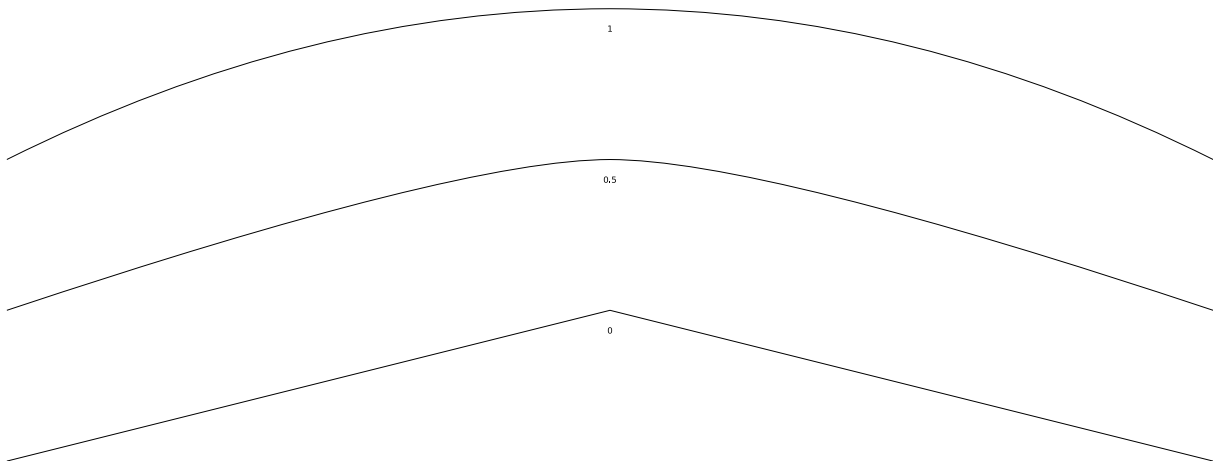
```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>

  <Style name="style">
    <Rule>
      <LineSymbolizer smooth="[smooth]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[smooth]</TextSymbolizer>
    </Rule>
```

```
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,smooth
"LINESTRING(10 10,50 20,90 10)",0.0
"LINESTRING(10 20,50 30,90 20)",0.5
"LINESTRING(10 30,50 40,90 30)",1.0
    </Parameter>
  </Datasource>
</Layer>

</Map>
```



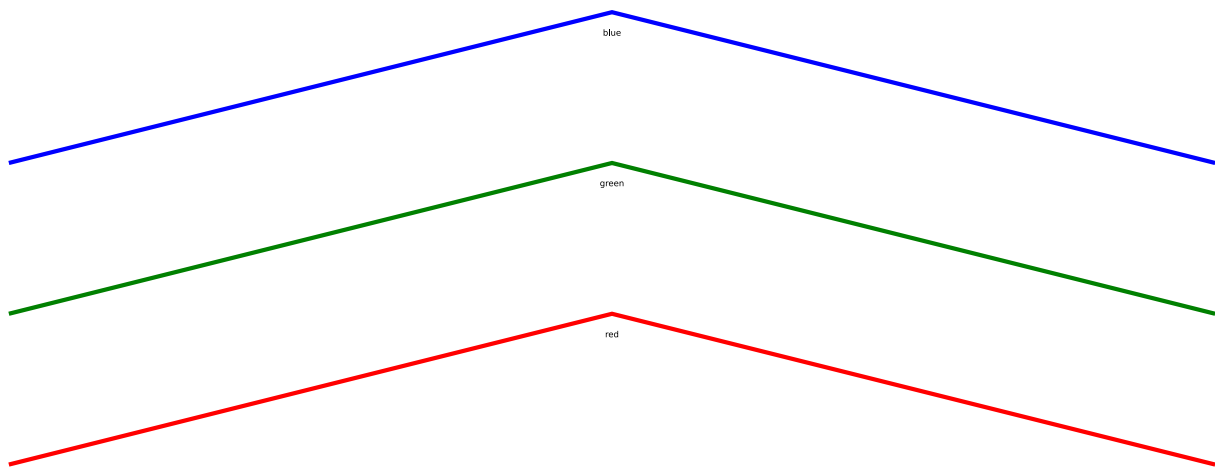
Example 30. LineSymbolizer stroke

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>

  <Style name="style">
    <Rule>
      <LineSymbolizer stroke="[stroke]" stroke-width="5"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[stroke]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,stroke
"LINESTRING(10 10,50 20,90 10)",red
"LINESTRING(10 20,50 30,90 20)",green
"LINESTRING(10 30,50 40,90 30)",blue
      </Parameter>
    </Datasource>
  </Layer>

</Map>
```



Example 31. LineSymbolizer dash array

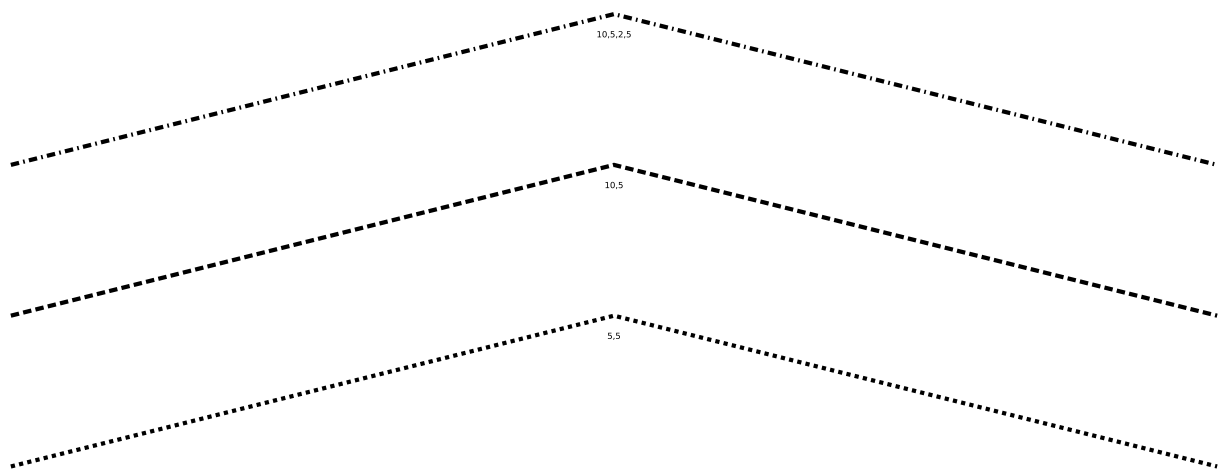
```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>

  <Style name="style">
    <Rule>
      <LineSymbolizer stroke-dasharray="[dash]" stroke-width="5"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[dash]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
```

```
<Parameter name="type">csv</Parameter>
<Parameter name="inline">
wkt,dash
"LINESTRING(10 10,50 20,90 10)", "5,5"
"LINESTRING(10 20,50 30,90 20)", "10,5"
"LINESTRING(10 30,50 40,90 30)", "10,5,2,5"
  </Parameter>
</Datasource>
</Layer>

</Map>
```



Example 32. LineSymbolizer stroke linejoin

TODO: prevent image clipping on top edge


```

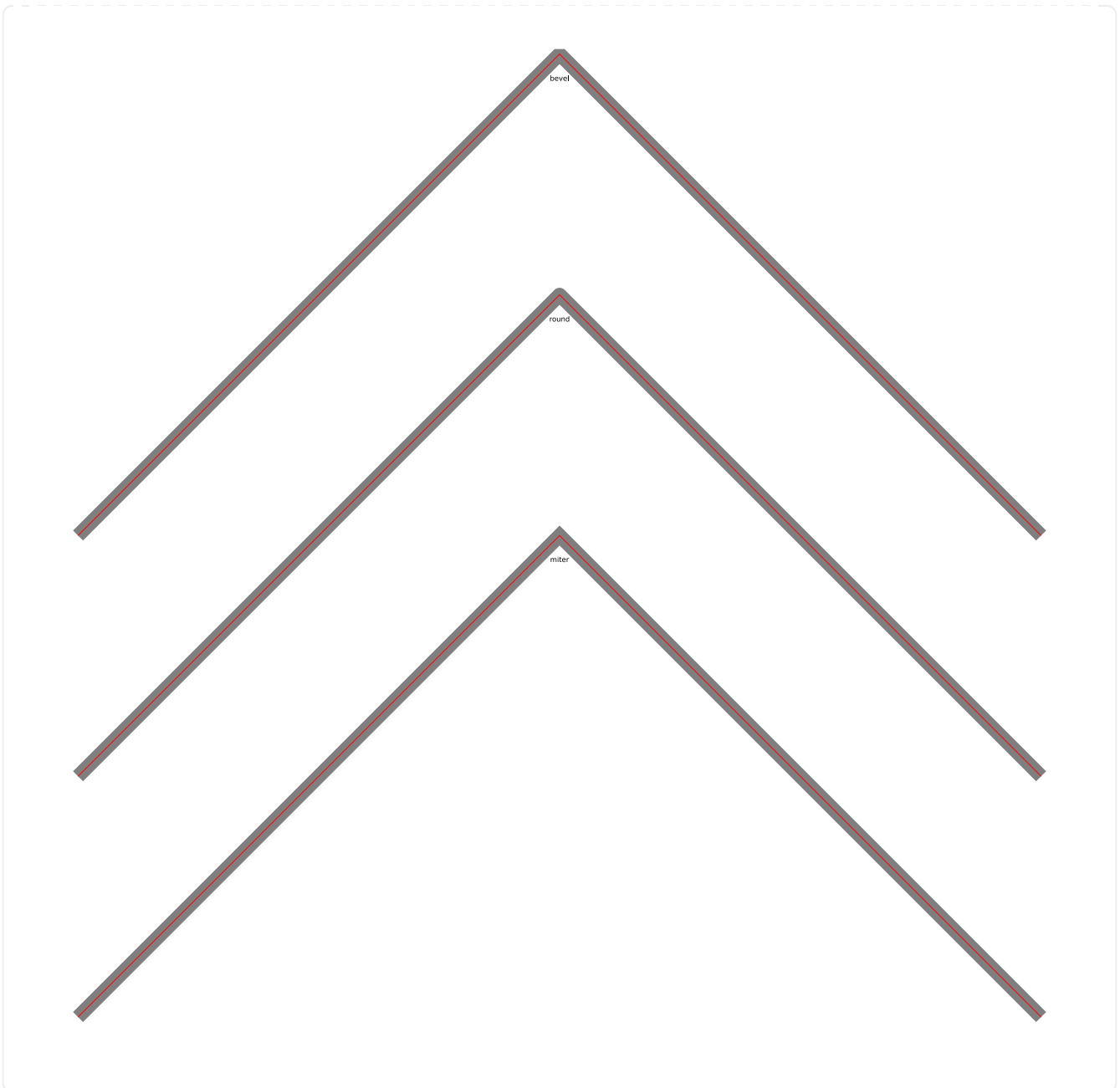
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>

  <Style name="style">
    <Rule>
      <LineStyle stroke="#7F7F7F" stroke-linejoin="[join]" stroke-width="20
"/>
      <LineStyle stroke="#FF0000" stroke-width="1"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="30"
>[join]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,join
"LINESTRING(30 30,50 50,70 30)",bevel
"LINESTRING(30 20,50 40,70 20)",round
"LINESTRING(30 10,50 30,70 10)",miter
      </Parameter>
    </Datasource>
  </Layer>

</Map>

```



Example 33. LineSymbolizer stroke linecap

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>

  <Style name="style">
    <Rule>
      <LineSymbolizer stroke="#7F7F7F" stroke-linecap="[cap]" stroke-width="20"/>
      <LineSymbolizer stroke="#FF0000" stroke-width="1"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[cap]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
```

```

<Datasource>
  <Parameter name="type">csv</Parameter>
  <Parameter name="inline">
wkt,cap
"LINESTRING(0 6,20 6)",but
"LINESTRING(0 3,20 3)",round
"LINESTRING(0 0,20 0)",square
  </Parameter>
</Datasource>
</Layer>

</Map>

```



Example 34. LineSymbolizer stroke miter limit

```
<?xml version="1.0" encoding="utf-8"?>
```

```

<!-- TODO: caption text -->
<Map background-color='white'>

  <Style name="style">
    <Rule>
      <LineSymbolizer stroke-linejoin="miter" stroke-width="10" stroke-miterlimit
="[m]" stroke="#7f7f7f"/>
      <LineSymbolizer stroke-width="1" stroke="#FF0000"/>
      <!-- <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true"
dy="20">[cap]</TextSymbolizer> -->
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,m1
"LINESTRING(10 10,20 30,30 10)",2
"LINESTRING(14 10,20 25,26 10)",2
"LINESTRING(18 10,20 18,22 10)",2
"LINESTRING(40 10,50 30,60 10)",2.5
"LINESTRING(44 10,50 25,56 10)",2.5
"LINESTRING(48 10,50 18,52 10)",2.5
"LINESTRING(70 10,80 30,90 10)",6
"LINESTRING(74 10,80 25,86 10)",6
"LINESTRING(78 10,80 18,82 10)",6
      </Parameter>
    </Datasource>
  </Layer>

</Map>

```



Example 35. LineSymbolizer stroke opacity

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>

  <Style name="style">
    <Rule>
      <LineSymbolizer stroke-opacity="[opacity]" stroke-width="5"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[opacity]</TextSymbolizer>
    </Rule>
  </Style>

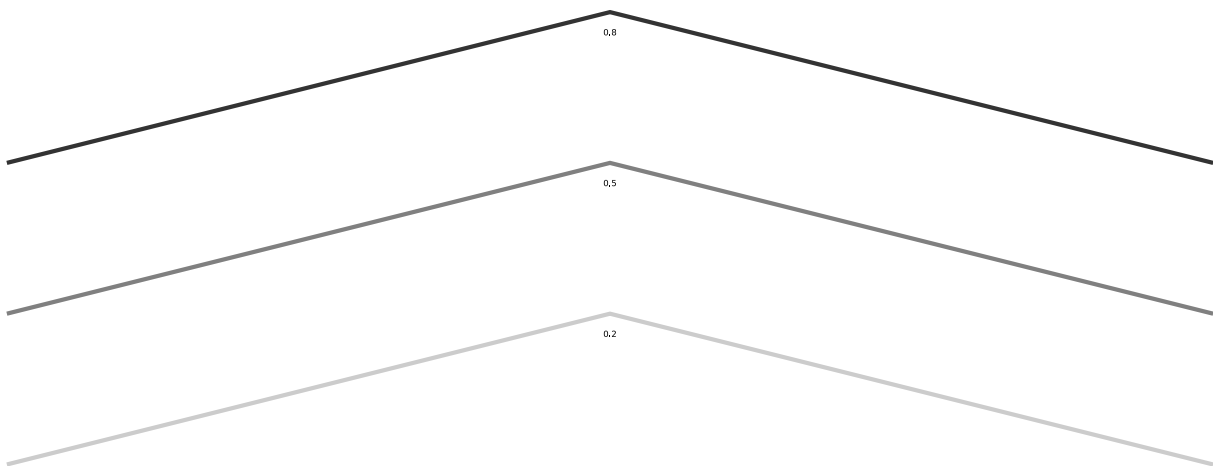
  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
```

```

    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,opacity
"LINESTRING(10 10,50 20,90 10)",0.2
"LINESTRING(10 20,50 30,90 20)",0.5
"LINESTRING(10 30,50 40,90 30)",0.8
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



Example 36. LineSymbolizer stroke width

```

<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>

```

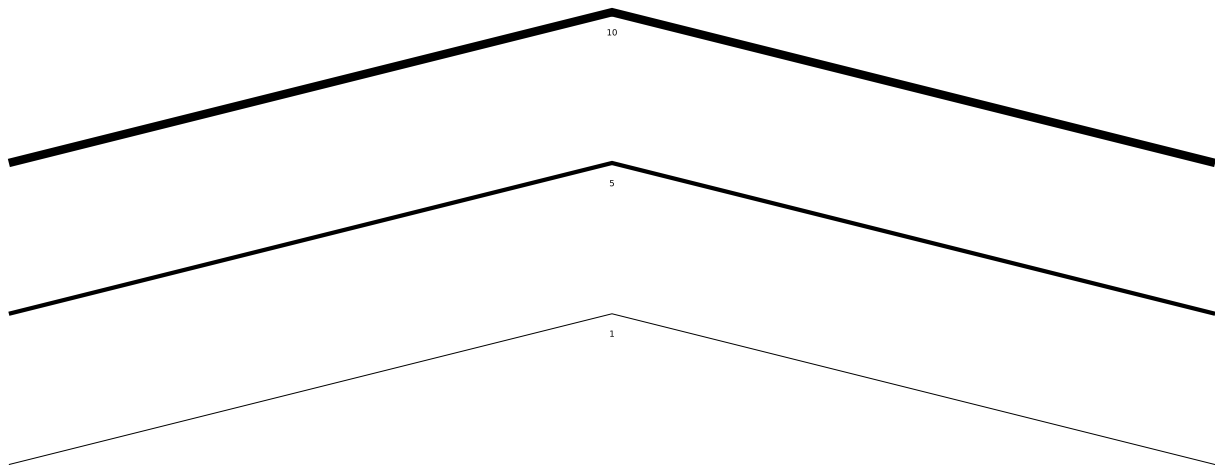
```

<Style name="style">
  <Rule>
    <LineSymbolizer stroke-width="[width]"/>
    <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[width]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,width
"LINESTRING(10 10,50 20,90 10)",1
"LINESTRING(10 20,50 30,90 20)",5
"LINESTRING(10 30,50 40,90 30)",10
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



Example 37. *LineStyle* offset

Note that unlike in other *LineStyle* examples this is three times the same geometry, but with different **offset**.

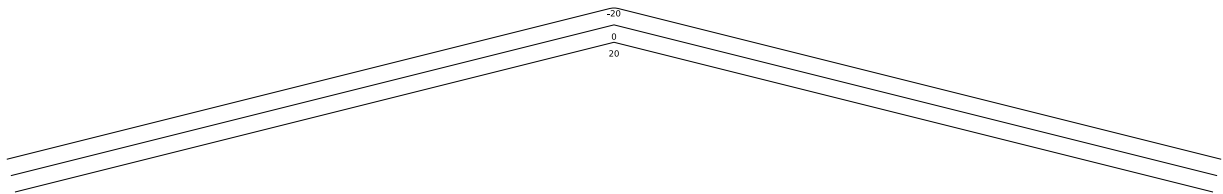
```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>

  <Style name="style">
    <Rule>
      <LineStyle offset="[offset]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy=
"[offset]+10">[offset]</TextSymbolizer>
    </Rule>
  </Style>
```



```
<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,offset
"LINESTRING(10 10,50 20,90 10)",20
"LINESTRING(10 10,50 20,90 10)",0
"LINESTRING(10 10,50 20,90 10)",-20
    </Parameter>
  </Datasource>
</Layer>

</Map>
```



See also:

- [LineSymbolier in Mapnik Wiki](#)
- [LineSymbolizer in Mapnik Reference](#)

TODO: gamma, gamma-method, dash-offset, miter-limit, clip, simplify, simplify-algorithm, rasterize, geometry-transform, comp-op

3.10.4. LinePatternSymbolizer

A LinePatternSymbolizer draws a given pattern image along a line, repeating the pattern as often as needed, and transforming it accordingly to follow the turns of the line.

WARNING

Even when giving the pattern as a SVG file, internally it will be converted to PNG before applying transformations to it to make it fit the line. So when creating SVG or PDF output, the result can still become a bit blurry when zooming in on LinePatternSymbolizer output.

Table 27. LinePatternSymbolizer Attributes

Attribute	Value	Default	Description
<code>file</code>	file path	none	Path to pattern file
<code>base</code>	string	none	name of a <FileSource> to find the input file in
<code>opacity</code>			
<code>offset</code>			
<code>transform</code>			

Example 38. LinePatternSymbolizer file

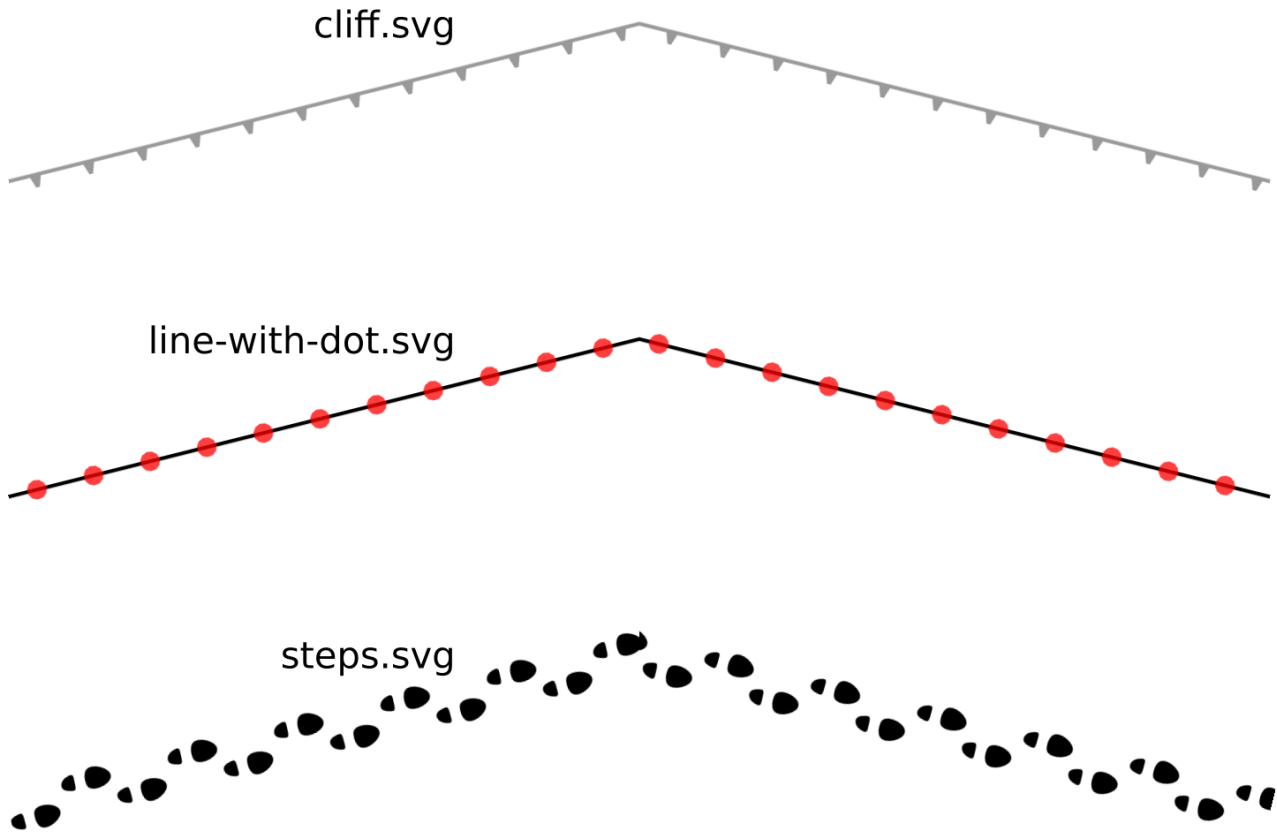
```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <LinePatternSymbolizer base="symbols" file="[file]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dx="-50"
>[file]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
```

```
wkt,file
"LINESTRING(10 50,50 60,90 50)",cliff.svg
"LINESTRING(10 30,50 40,90 30)",line-with-dot.svg
"LINESTRING(10 10,50 20,90 10)",steps.svg
  </Parameter>
</Datasource>
</Layer>

</Map>
```



Example 39. LinePatternSymbolizer base

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>
  <FileSource name="symbols">./symbols</FileSource>
  <FileSource name="red">./symbols/red</FileSource>
  <FileSource name="green">./symbols/green</FileSource>
  <FileSource name="blue">./symbols/blue</FileSource>

  <Style name="style">
    <Rule>
      <LinePatternSymbolizer base="red" file='steps.svg' /> <!-- TODO does not
evaluate [base] yet -->
      <PointSymbolizer base="symbols" file='steps.svg' transform='translate(0,5)
' />
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[base]</TextSymbolizer>
```

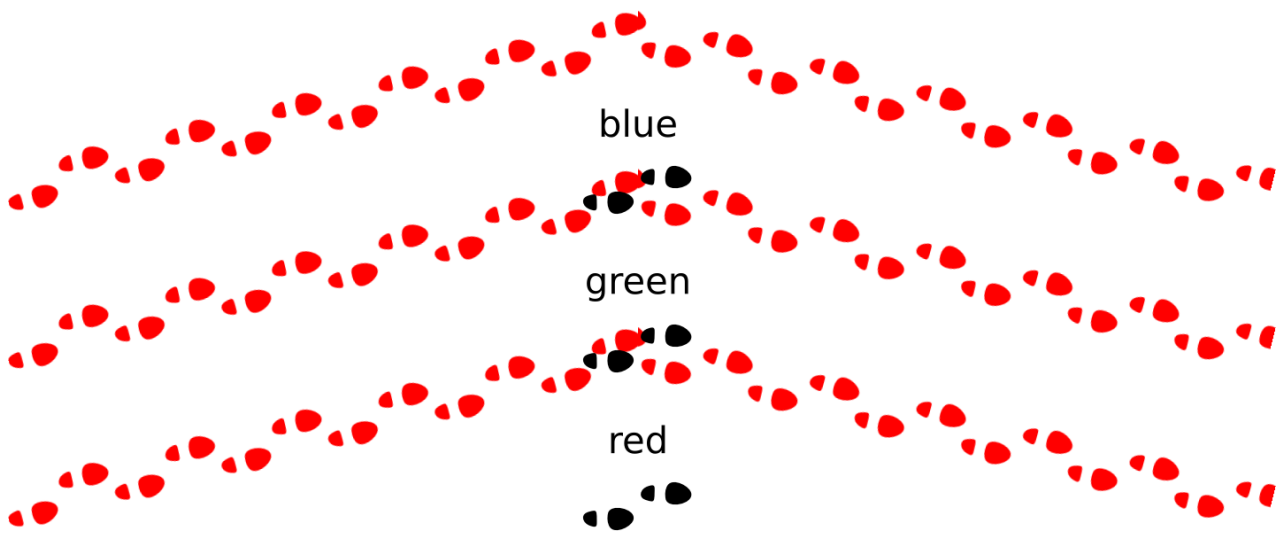
```

</Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,base
"LINESTRING(10 10,50 20,90 10)",red
"LINESTRING(10 20,50 30,90 20)",green
"LINESTRING(10 30,50 40,90 30)",blue
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



3.10.5. PolygonSymbolizer

Table 28. PolygonSymbolizer Attributes

Attribute	Value	Default	Description
fill	color	grey	
fill-opacity	float	1.0	
transform	SVG transformation	none	
comp-op	SVG composition	none	
gamma	float	1.0	
gamma-method	power, linear, none, threshold, multiply	power	
clip	boolean	false	
simplify	float	0.0	
simplify-algorithm	radial-distance, zhao-saalfeld, visvalingam-whyatt, douglas-peucker	radial-distance	
smooth	float	0.0	

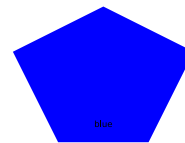
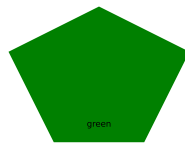
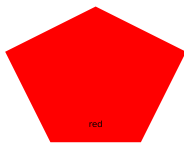
Example 40. PolygonSymbolizer fill

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

  <Style name="style">
    <Rule>
      <PolygonSymbolizer fill="[fill]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[fill]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,fill
"POLYGON(( 2 1, 1 3, 3 4, 5 3, 4 1, 2 1))",red
"POLYGON((12 1,11 3,13 4,15 3,14 1,12 1))",green
"POLYGON((22 1,21 3,23 4,25 3,24 1,22 1))",blue
      </Parameter>
    </Datasource>
  </Layer>

</Map>
```



Example 41. PolygonSymbolizer fill opacity

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

  <Style name="style">
    <Rule>
      <PolygonSymbolizer fill="black" fill-opacity="[opacity]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[opacity]</TextSymbolizer>
    </Rule>
  </Style>

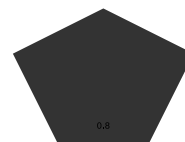
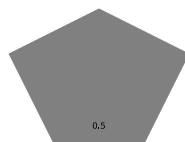
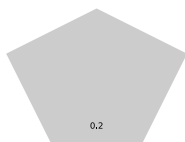
  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
```

```

<Parameter name="type">csv</Parameter>
<Parameter name="inline">
wkt,opacity
"POLYGON(( 2 1, 1 3, 3 4, 5 3, 4 1, 2 1))",0.2
"POLYGON((12 1,11 3,13 4,15 3,14 1,12 1))",0.5
"POLYGON((22 1,21 3,23 4,25 3,24 1,22 1))",0.8
  </Parameter>
</Datasource>
</Layer>

</Map>

```



Example 42. PolygonSymbolizer smooth

```

<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

```

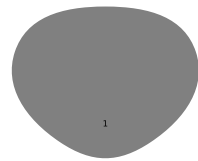
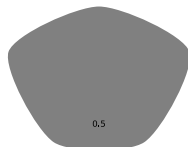
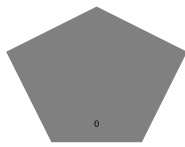
```

<Style name="style">
  <Rule>
    <PolygonSymbolizer smooth="[smooth]"/>
    <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[smooth]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,smooth
"POLYGON(( 2 1, 1 3, 3 4, 5 3, 4 1, 2 1))",0.0
"POLYGON((12 1,11 3,13 4,15 3,14 1,12 1))",0.5
"POLYGON((22 1,21 3,23 4,25 3,24 1,22 1))",1.0
    </Parameter>
  </Datasource>
</Layer>

</Map>

```

3.10.6. PolygonPatternSymbolizer

Table 29. PolygonPatternSymbolizer Attributes

Attribute	Value	Default	Description
file	file path	none	
base	string	none	name of a <FileSource> to find the input file in
alignment	gobal/local	global	Align image to polygon (local) or to map borders (global)
gamma	float	1.0	
gamma-method			
opacity	float	1.0	Filling opacity. May be somewhat transparent even at 1.0 if the fill pattern itself is not fully opaque.
clip			
simplify			
simplify-algorithm			
smooth	float	0.0	
transform	SVG Transform	none	Transformation is applied to the fill pattern
geometry-transform	SVG Transform	none	Transformation is applied to the polygon geometry itself
comp-op	SVG compositingg	none	

Example 43. PolygonPatternSymbolizer file

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols/</FileSource>

  <Style name="style">
    <Rule>
      <PolygonPatternSymbolizer base="symbols" file="[file]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[file]</TextSymbolizer>
    </Rule>
  </Style>

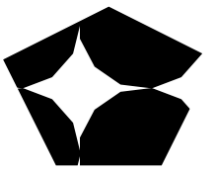
  <Layer name="layer">
    <StyleName>style</StyleName>
```

```

<Datasource>
  <Parameter name="type">csv</Parameter>
  <Parameter name="inline">
wkt,file
"POLYGON(( 2 1, 1 3, 3 4, 5 3, 4 1, 2 1))",dot.svg
"POLYGON((12 1,11 3,13 4,15 3,14 1,12 1))",steps.svg
"POLYGON((22 1,21 3,23 4,25 3,24 1,22 1))",bug.svg
  </Parameter>
</Datasource>
</Layer>

</Map>

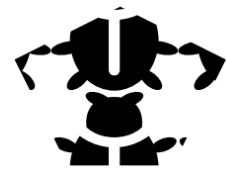
```



dot.svg



steps.svg



bug.svg

Example 44. PolygonPatternSymbolizer alignment

global alignment makes the fill pattern align across touching polygon borders, **local** alignment makes each filled polygon of the same shape look exactly the same.

```

<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols/</FileSource>

  <Style name="style">
    <Rule>
      <PolygonPatternSymbolizer base="symbols" file="checker-board.svg"
alignment="[align]"/>
      <LineSymbolizer stroke="black"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="false" dx="30"
dy="30">[align]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,align
"POLYGON(( 0 2, 1 3, 3 1, 2 0, 0 2))",global
"POLYGON(( 1 3, 2 4, 4 2, 3 1, 1 3))",global

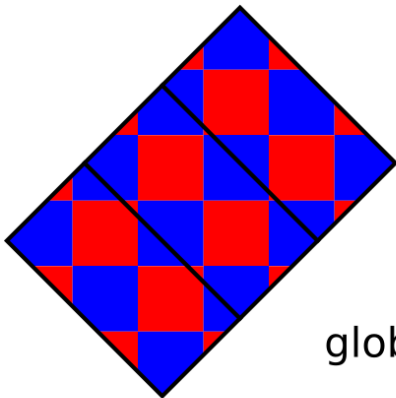
```

```

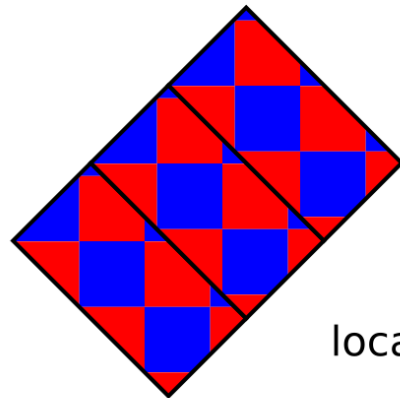
"POLYGON(( 2 4, 3 5, 5 3, 4 2, 2 4))",global
"POLYGON((10 2,11 3,13 1,12 0,10 2))",local
"POLYGON((11 3,12 4,14 2,13 1,11 3))",local
"POLYGON((12 4,13 5,15 3,14 2,12 4))",local
  </Parameter>
</Datasource>
</Layer>

</Map>

```



global
global
global



local
local
local

Example 45. PolygonPatternSymbolizer transform

```

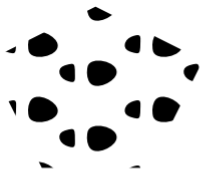
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols/</FileSource>

  <Style name="style">
    <Rule>
      <PolygonPatternSymbolizer base="symbols" file="steps.svg" transform=
"rotate([rotate])"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[rotate]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,rotate
"POLYGON(( 2 1, 1 3, 3 4, 5 3, 4 1, 2 1))",0
"POLYGON((12 1,11 3,13 4,15 3,14 1,12 1))",45
"POLYGON((22 1,21 3,23 4,25 3,24 1,22 1))",90
      </Parameter>
    </Datasource>
  </Layer>

```

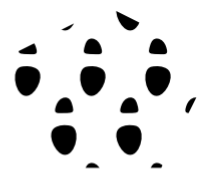
```
</Map>
```



0



45



90

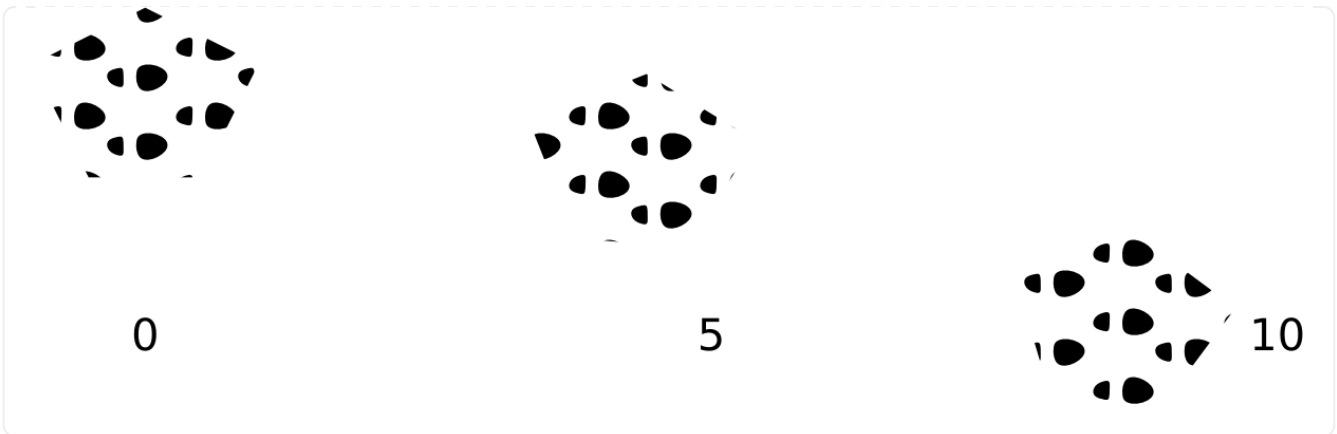
Example 46. *PolygonPatternSymbolizer geometry transform*

Unlike with `PointSymbolizer rotate()` does not seem to rotate around the geometry center, but around the map origin at `(0 0)` instead?

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols/</FileSource>

  <Style name="style">
    <Rule>
      <PolygonPatternSymbolizer base="symbols" file="steps.svg" geometry-
transform="rotate([rotate])"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[rotate]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,rotate
"POLYGON(( 2 1, 1 3, 3 4, 5 3, 4 1, 2 1))",0
"POLYGON((12 1,11 3,13 4,15 3,14 1,12 1))",5
"POLYGON((22 1,21 3,23 4,25 3,24 1,22 1))",10
      </Parameter>
    </Datasource>
  </Layer>
</Map>
```



TODO: gamma, gamma-method, clip, simplify, simplify-method, comp-op

3.10.7. RasterSymbolizer

TODO

3.10.8. TextSymbolizer

Table 30. TextSymbolizer specific Attributes

Attribute	Type	Default	Description
Text attributes			
face-name	string	none	Face name to use
fontset-name	string	none	FontSet name
size	float	10.0	Font size in pixels
fill	color	black	Text fill color
character-spacing	float	0.0	Additional space between characters in pixels
opacity	float	1.0	Text opacity
Wrap attributes			
line-spacing	float	0.0	Extra vertical space for multi line output in pixels
font-feature-settings	string	none	Comma separated list of OpenType typographic features
wrap-width	integer	none	Try to wrap text if it gets longer than this many pixels
wrap-before	boolean	false	Wrap before or after reaching wrap-width

Attribute	Type	Default	Description
<code>repeat-wrap-character</code>	boolean	false	Keep wrap character and repeat it on new line
<code>wrap-character</code>	string	none	Break text at this character only instead of using general unicode line break algorithm
Halo attributes			
<code>halo-fill</code>	color	white	Text halo color
<code>halo-opacity</code>	float	1.0	Text halo opacity
<code>halo-radius</code>	float	0.0	Text halo radius in pixels
<code>halo-rasterizer</code>	full, fast	full	Text halo rasterizing algorithm when using Agg renderer
<code>halo-comp-op</code>	string	src-over	Compositing operator to use for the halo
Placement attributes			
<code>allow-overlap</code>	bool	false	Allow text to overlap with other text or markers
<code>spacing</code>	integer	0	Spacing between text labels on lines if > 0 (in pixels?)
<code>placement</code>	string	point	One of <code>point</code> , <code>line</code> , <code>vertex</code> , <code>interior</code> , <code>grid</code> , <code>alternating-grid</code>
<code>grid-cell-width</code>	float	none	Horizontal spacing between grid cells when using <code>grid</code> or <code>alternating-grid</code> placement
<code>grid-cell-height</code>	float	none	Vertical spacing between grid cells when using <code>grid</code> or <code>alternating-grid</code> placement
<code>placement-type</code>	string	dummy	Algorithm to use to avoid text overlaps, one of <code>dummy</code> , <code>simple</code> , <code>list</code>

Attribute	Type	Default	Description
placements	string	none	If "placement-type" is set to "simple", use this "POSITIONS,[SIZES]" string. An example is text-placements: "E,NE,SE,W,NW,SW" (TODO: better explanation)
label-position-tolerance	float	spacing/2	Allow displacement by this many pixel with placement=line
max-char-angle-delta	float	22.5	Max. angle change between adjacent characters in degrees, to avoid placing text around sharp corners
avoid-edges	boolean	false	Avoid placing text near image edges
margin	float	none	Minimum distance from other text, shields or markers
repeat-distance	float	none	Minimum distance from other labels with same text content across geometries
minimum-padding	float	none	Minimum placement distance from image edges
minimum-path-length	float	none	Minimum length of lines or polygon boundings to place text on
force-odd-labels	boolean	false	Force an odd number of labels to be generated
displacement	2xfloat	(0.0,0.0)	Displace label by this many pixel horizontally/vertically
minimum-distance	float	?	?TODO?
largest-bbox-only	bool	?	?TODO?

Attribute	Type	Default	Description
<code>upright</code>	string	?	?TODO? one of auto, auto-down, left, left-only, right, right-only, up, down

Example 47. TextSymbolizer size

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

  <Style name="style">
    <Rule>
      <TextSymbolizer face-name="DejaVu Sans Book" size="[size]">"size
+[size]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,size
"POINT(0 0)",8
"POINT(1 0)",10
"POINT(2 0)",12
"POINT(3 0)",16
      </Parameter>
    </Datasource>
  </Layer>

</Map>
```

size 8

size 10

size 12

size 16

Example 48. TextSymbolizer text color fill

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

  <Style name="style">
    <Rule>
      <TextSymbolizer face-name="DejaVu Sans Book" size="12" fill="[fill]">
[fill]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
```

```

    <Parameter name="inline">
wkt,fill
"POINT(0 0)",black
"POINT(1 0)",red
"POINT(2 0)",green
"POINT(3 0)",blue
    </Parameter>
  </Datasource>
</Layer>

</Map>

```

black red green blue

Example 49. TextSymbolizer text opacity

```

<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

```

```
<Style name="style">
  <Rule>
    <TextSymbolizer face-name="DejaVu Sans Bold" size="24" fill="black" opacity
=[opacity]">[opacity]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,opacity
"POINT(0 0)",1.0
"POINT(1 0)",0.75
"POINT(2 0)",0.5
"POINT(3 0)",0.25
    </Parameter>
  </Datasource>
</Layer>

</Map>
```

1 **0.75** **0.5** **0.25**

Example 50. TextSymbolizer character spacing

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

  <Style name="style">
    <Rule>
      <TextSymbolizer face-name="DejaVu Sans Book" character-spacing="[spacing]"
>"spacing "+[spacing]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
```

```

    <Parameter name="inline">
wkt,spacing
"POINT(0 0)",0
"POINT(1 0)",1
"POINT(2 0)",2
"POINT(3 0)",3
    </Parameter>
  </Datasource>
</Layer>

</Map>

```

spacing 0

spacing 1

spacing 2

spacing 3

Example 51. TextSymbolizer line spacing

```

<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

```

```
<Style name="style">
  <Rule>
    <TextSymbolizer face-name="DejaVu Sans Book" line-spacing="[spacing]" wrap-
width="10">"line spacing "+[spacing]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,spacing
"POINT(0 0)",0
"POINT(1 0)",5
"POINT(2 0)",10
"POINT(3 0)",15
    </Parameter>
  </Datasource>
</Layer>

</Map>
```

line spacing 0 line spacing 5 line spacing 10 line spacing 15

Example 52. TextSymbolizer spacing

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>
  <Style name="style">
    <Rule>
      <LineSymbolizer stroke="lightblue" stroke-width="5"/>
      <TextSymbolizer spacing="[spacing]" face-name="DejaVu Sans Book" placement="line">[spacing]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
    </Datasource>
  </Layer>
</Map>
```

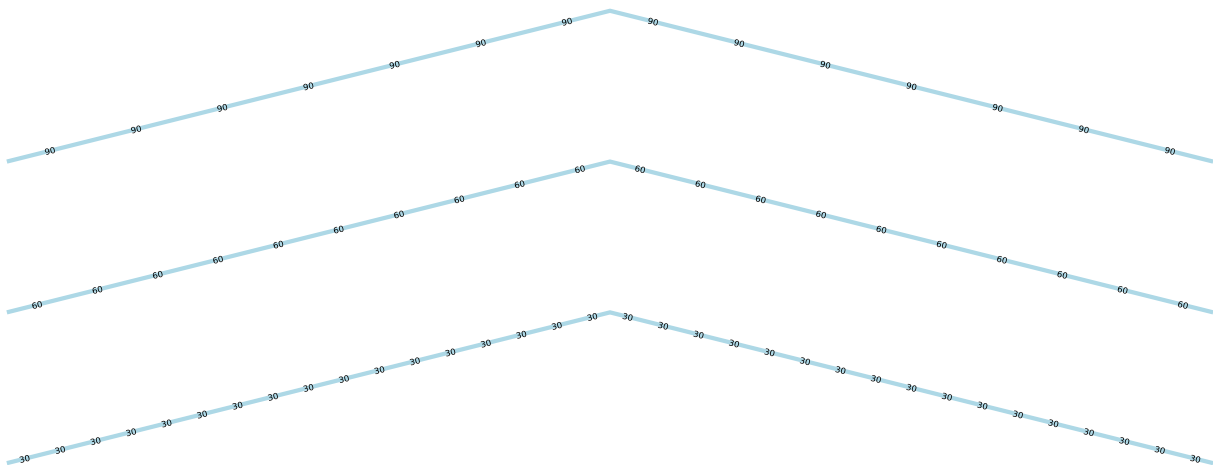


```

    <Parameter name="inline">
wkt,spacing
"LINESTRING(10 10,50 20,90 10)",30
"LINESTRING(10 20,50 30,90 20)",60
"LINESTRING(10 30,50 40,90 30)",90
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



Example 53. TextSymbolizer placement

placement Controls where the text is actually placed:

point

Places the text just once at the center of the geometry. In case of a polygon that may actually be outside of the polygon surface, depending on its shape

interior

Similar to `point`, but makes sure that the text is placed inside a polygon even if its center point is actually on its outside

line

When `spacing` is larger than zero the text is repeatedly printed along a line or a polygons outline with `spacing` pixels between texts

vertex

Tries to place the text on each vertex point of a line or a polygons outline

grid

When `grid-cell-width` and `grid-cell-height` are greater than zero the text is repeatedly printed into a polygons surface, using grid cells of the given width and height. Note that the text is not clipped at the border of the polygon, so some text may be printed slightly outside of the polygon surface.

alternating-grid

Similar to `grid`, but each second row is horizontally displaced by half of `grid-cell-width`

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

  <Style name="style">
    <Rule>
      <LineSymbolizer stroke="lightblue" stroke-width="5"/>
      <TextSymbolizer face-name="DejaVu Sans Book" placement="[placement]" grid-
cell-width="30" grid-cell-height="20" spacing="30">A1</TextSymbolizer>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[placement]</TextSymbolizer>
    </Rule>
  </Style>

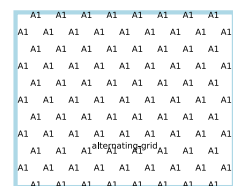
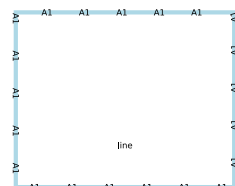
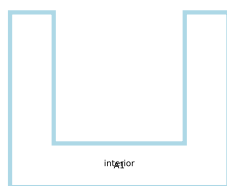
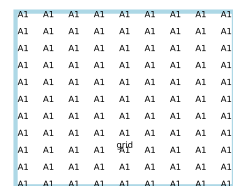
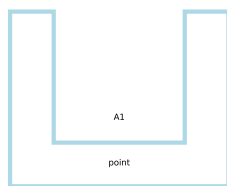
  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,placement
"POLYGON(( 1 1, 6 1, 6 5, 5 5, 5 2, 2 2, 2 5, 1 5, 1 1))",interior
"POLYGON((11 1,16 1,16 5,
           11 5,11 1))",line
"POLYGON((21 1,26 1,26 5,
           21 5,21 1))",alternating-grid
"POLYGON(( 1 11, 6 11, 6 15, 5 15, 5 12, 2 12, 2 15, 1 15, 1 11))",point
"POLYGON((11 11,16 11,16 15,
           11 15,11 11))",vertex
"POLYGON((21 11,26 11,26 15,
           21 15,21 11))",grid
```

```

</Parameter>
</Datasource>
</Layer>

</Map>

```



Example 54. TextSymbolizer grid width/height

```

<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

  <Style name="style">
    <Rule>
      <LineSymbolizer stroke="lightblue" stroke-width="5"/>
      <TextSymbolizer face-name="DejaVu Sans Book" placement="[placement]" grid-
cell-width="[width]" grid-cell-height="[height]" spacing="30">A1</TextSymbolizer>

```

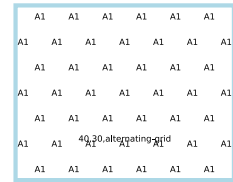
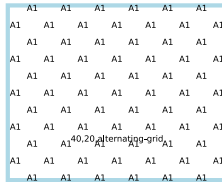
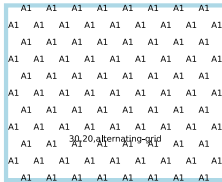
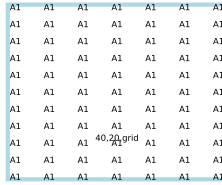
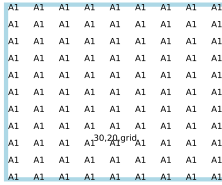
```

    <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[width]+","+[height]+","+[placement]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,width,height,placement
"POLYGON(( 1 1, 6 1, 6 5, 1 5, 1 1))",30,20,alternating-grid
"POLYGON((11 1,16 1,16 5,11 5,11 1))",40,20,alternating-grid
"POLYGON((21 1,26 1,26 5,21 5,21 1))",40,30,alternating-grid
"POLYGON(( 1 11, 6 11, 6 15, 1 15, 1 11))",30,20,grid
"POLYGON((11 11,16 11,16 15,11 15,11 11))",40,20,grid
"POLYGON((21 11,26 11,26 15,21 15,21 11))",40,30,grid
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



Example 55. TextSymbolizer minimum path length

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>
  <Style name="style">
    <Rule>
      <LineSymbolizer stroke="lightblue" stroke-width="5"/>
      <TextSymbolizer minimum-path-length="200" face-name="DejaVu Sans Book"
placement="line">A1</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
    </Datasource>
  </Layer>
</Map>
```

```
<Parameter name="inline">
wkt
"LINESTRING(10 10,20 10)"
"LINESTRING(10 20,30 20)"
"LINESTRING(10 30,40 30)"
</Parameter>
</Datasource>
</Layer>

</Map>
```



Example 56. TextSymbolizer text halo fill

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
```

```

<Style name="style">
  <Rule>
    <TextSymbolizer face-name="DejaVu Sans Bold" size="24" fill="black" halo-
fill="[fill]" halo-radius="1">[fill]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,fill
"POINT(0 0)",gray
"POINT(1 0)",red
"POINT(2 0)",green
"POINT(3 0)",blue
    </Parameter>
  </Datasource>
</Layer>

</Map>

```

gray **red** **green** **blue**

Example 57. TextSymbolizer text halo radius

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

  <Style name="style">
    <Rule>
      <TextSymbolizer face-name="DejaVu Sans Bold" size="24" fill="black" halo-
fill="red" halo-radius="[radius]">[radius]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
    </Datasource>
  </Layer>
</Map>
```



```
<Parameter name="inline">
wkt,radius
"POINT(0 0)",1
"POINT(1 0)",2
"POINT(2 0)",3
"POINT(3 0)",4
</Parameter>
</Datasource>
</Layer>

</Map>
```

1 **2** **3** **4**

Example 58. TextSymbolizer text halo opacity

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
```

```
<Style name="style">
  <Rule>
    <TextSymbolizer face-name="DejaVu Sans Bold" size="24" fill="black" halo-
fill="red" halo-radius="2" halo-opacity="[opacity]">[opacity]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,opacity
"POINT(0 0)",1.0
"POINT(1 0)",0.75
"POINT(2 0)",0.5
"POINT(3 0)",0.25
    </Parameter>
  </Datasource>
</Layer>

</Map>
```



1 0.75 0.5 0.25

3.10.9. ShieldSymbolizer

A shield symbolizer is basically a combination of a point and a text symbolizer, making sure that both image and text are always shown at the same position, and that collision rules apply to both together instead of individually. The name stems from the original use case to show highway shields.

ShieldSymbolizer inherits almost all attributes from the [TextSymbolizer](#), with a small number of additions and modifications.

Table 31. ShieldSymbolizer specific Attributes

Attribute	Type	Default	Description
<code>file</code>	file path	none	Shield image to use
<code>base</code>	string	none	name of a <FileSource> to find the input file in
<code>opacity</code>	float	1.0	Opacity to use for the shield image
<code>text-opacity</code>	float	1.0	Opacity to use for the shield text
<code>unlock-image</code>	boolean	false	<code>dx,dy</code> move image and text when <code>true</code> , text only when <code>false</code>
<code>dx</code>	float	0.0	Move text, and image if <code>unlock-image=false</code> , horizontally
<code>dy</code>	float	0.0	Move text, and image if <code>unlock-image=false</code> , vertically
<code>shield-dx</code>	float	0.0	Move image horizontally only
<code>shield-dy</code>	float	0.0	Move image vertically only
<code>transform</code>	SVG transformation	none	Transform image

/* name file face-name unlock-image size fill placement avoid-edges allow-overlap margin repeat-distance min-distance spacing min-padding label-position-tolerance wrap-width wrap-before wrap-character halo-fill halo-radius halo-rasterizer halo-transform halo-comp-op halo-opacity character-spacing line-spacing text-dx text-dy dx dy opacity horizontal-alignment vertical-alignment placement-type text-transform justify-alignment transform clip simplify simplify-algorithm smooth comp-op grid-cell-width grid-cell-height offset */

Example 59. ShieldSymbolizer spacing

`spacing` controls the distance between shields on a single line feature. When no spacing is given only a single shield will be attempted to be placed.

See also `repeat-distance`, which controls how far shields with the same text should be set apart in general, even when placed on different geometries.

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color='white'>
  <FileSource name="symbols">./symbols/</FileSource>

  <Style name="style">
```

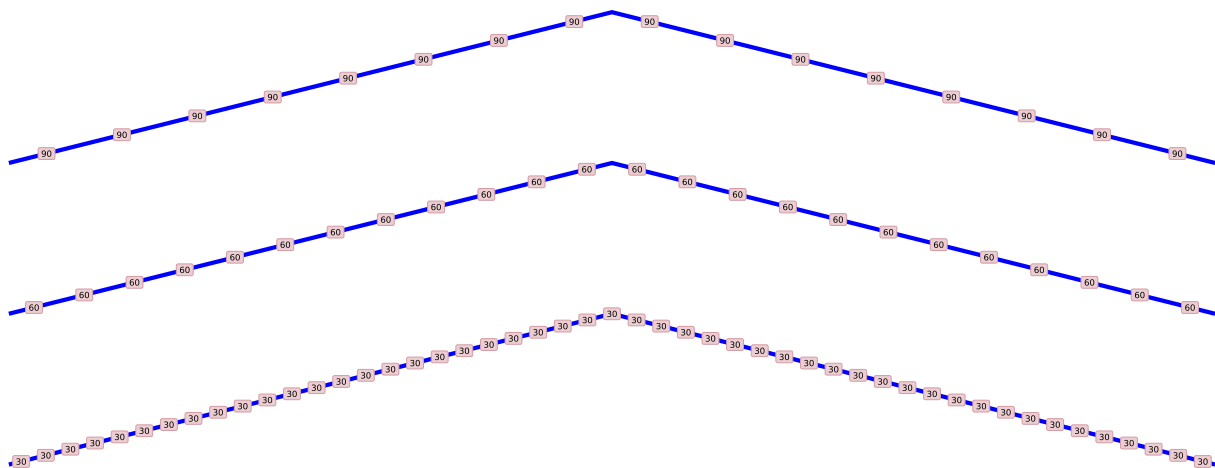
```

<Rule>
  <LineStyleSymbolizer stroke="blue" stroke-width="5"/>
  <ShieldSymbolizer spacing="[spacing]" base="symbols" file="motorway_2x1.svg"
face-name="DejaVu Sans Book" placement="line">[spacing]</ShieldSymbolizer>
</Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,spacing
"LINESTRING(10 10,50 20,90 10)",30
"LINESTRING(10 20,50 30,90 20)",60
"LINESTRING(10 30,50 40,90 30)",90
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



Example 60. ShieldSyzolizer placement

placement Controls where the shield is actually placed:

point

Places the shield just once at the center of the geometry. In case of a polygon that may actually be outside of the polygon surface, depending on its shape

interior

Similar to **point**, but makes sure that the shield is placed inside a polygon even if its center point is actually on its outside

line

When **spacing** is larger than zero the shield is repeatedly drawn along a line or a polygons outline with **spacing** pixels between shields

vertex

Tries to place the shield on each vertex point of a line or a polygons outline

grid

When `grid-cell-width` and `grid-cell-height` are greater than zero the shield is repeatedly drawn into a polygons surface, using grid cells of the given width and height. Note that the shield is not clipped at the border of the polygon, so some shield parts may be drawn slightly outside of the polygon surface.

alternating-grid

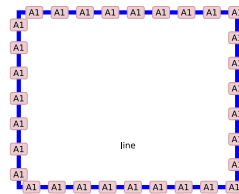
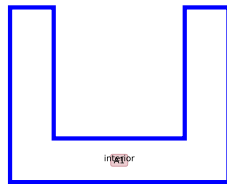
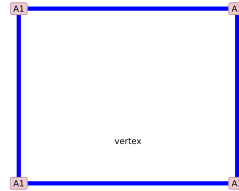
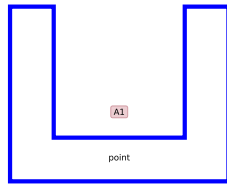
Similar to `grid`, but each second row is horizontally displaced by half of `grid-cell-width`

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <LineSymbolizer stroke="blue" stroke-width="5"/>
      <ShieldSymbolizer base="symbols" file="motorway_2x1.svg" face-name="DejaVu
Sans Book" placement="[placement]" grid-cell-width="30" grid-cell-height="20"
spacing="30">A1</ShieldSymbolizer>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[placement]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,placement
"POLYGON(( 1 1, 6 1, 6 5, 5 5, 5 2, 2 2, 2 5, 1 5, 1 1))",interior
"POLYGON((11 1,16 1,16 5, 11 5,11 1))",line
"POLYGON((21 1,26 1,26 5, 21 5,21 1))",alternating-grid
"POLYGON(( 1 11, 6 11, 6 15, 5 15, 5 12, 2 12, 2 15, 1 15, 1 11))",point
"POLYGON((11 11,16 11,16 15, 11 15,11 11))",vertex
"POLYGON((21 11,26 11,26 15, 21 15,21 11))",grid
      </Parameter>
    </Datasource>
  </Layer>

</Map>
```



Example 61. ShieldSymbolizer grid width/height

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <LineSymbolizer stroke="lightblue" stroke-width="5"/>
      <ShieldSymbolizer base="symbols" file="motorway_2x1.svg" face-name="DejaVu
Sans Book" placement="[placement]" grid-cell-width="[width]" grid-cell-height=
"[height]" spacing="30">A1</ShieldSymbolizer>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[width]+", "+[height]+", "+[placement]</TextSymbolizer>
    </Rule>
  </Style>
```

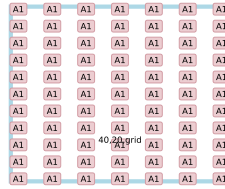


```

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,width,height,placement
"POLYGON(( 1 1, 6 1, 6 5, 1 5, 1 1))",30,20,alternating-grid
"POLYGON((11 1,16 1,16 5,11 5,11 1))",40,20,alternating-grid
"POLYGON((21 1,26 1,26 5,21 5,21 1))",40,30,alternating-grid
"POLYGON(( 1 11, 6 11, 6 15, 1 15, 1 11))",30,20,grid
"POLYGON((11 11,16 11,16 15,11 15,11 11))",40,20,grid
"POLYGON((21 11,26 11,26 15,21 15,21 11))",40,30,grid
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



3.10.10. BuildingSymbolizer

The `<BuildingSymbolizer>` renders polygons in a very simple pseudo-3D fashion. The given fill color is used for the "roof", while its individual red, green and blue values are multiplied by 0.8 to create a more darkened tone for the "walls"

Table 32. *BuildingSymbolizer* Attributes

Attribute	Value	Default
<code>fill</code>	CSS color	gray
<code>fill-opacity</code>	float	1.0
<code>height</code>	float	0

See also:

- [BuildingSymbolier in Mapnik Wiki](#)

- [BuildingSymbolizer in Mapnik Reference](#)

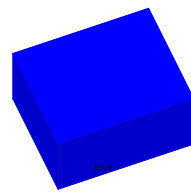
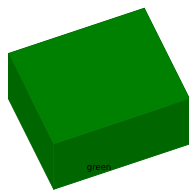
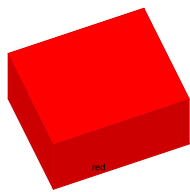
Example 62. BuildingSymbolizer fill

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

  <Style name="style">
    <Rule>
      <BuildingSymbolizer height="1" fill="[fill]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[fill]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,fill
"POLYGON(( 1 1, 4 2, 3 4, 0 3, 1 1))",red
"POLYGON((11 1,14 2,13 4,10 3,11 1))",green
"POLYGON((21 1,24 2,23 4,20 3,21 1))",blue
      </Parameter>
    </Datasource>
  </Layer>

</Map>
```



Example 63. BuildingSymbolizer fill opacity

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

  <Style name="style">
    <Rule>
      <BuildingSymbolizer height="1" fill="red" fill-opacity="[opacity]"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[opacity]</TextSymbolizer>
    </Rule>
  </Style>

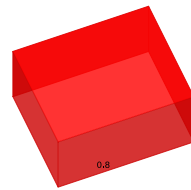
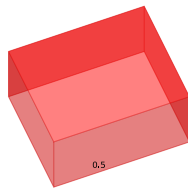
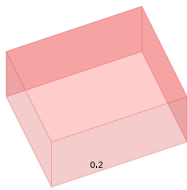
  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
```

```

    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,opacity
"POLYGON(( 1 1, 4 2, 3 4, 0 3, 1 1))",0.2
"POLYGON((11 1,14 2,13 4,10 3,11 1))",0.5
"POLYGON((21 1,24 2,23 4,20 3,21 1))",0.8
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



Example 64. BuildingSymbolizer height

```

<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">

```

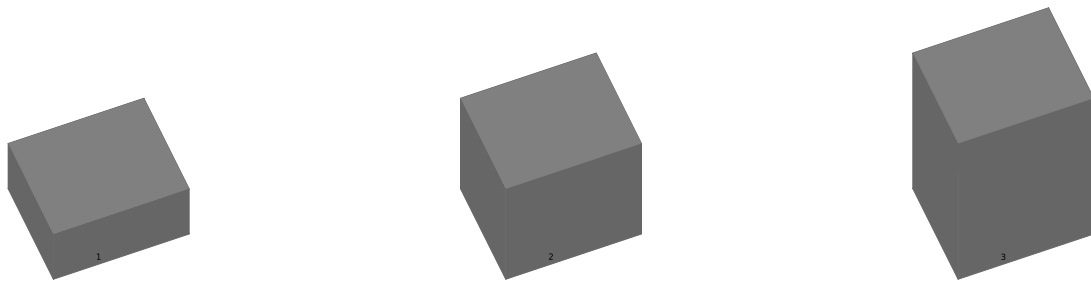
```

<Style name="style">
  <Rule>
    <BuildingSymbolizer height="[height]"/>
    <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="50"
>[height]</TextSymbolizer>
  </Rule>
</Style>

<Layer name="layer">
  <StyleName>style</StyleName>
  <Datasource>
    <Parameter name="type">csv</Parameter>
    <Parameter name="inline">
wkt,height
"POLYGON(( 1 1, 4 2, 3 4, 0 3, 1 1))",1
"POLYGON((11 1,14 2,13 4,10 3,11 1))",2
"POLYGON((21 1,24 2,23 4,20 3,21 1))",3
    </Parameter>
  </Datasource>
</Layer>

</Map>

```



3.10.11. GroupSymbolizer

3.10.12. DotSymbolizer

...TODO...

Table 33. DotSymbolizer Attributes

Attribute	Type	Default	Description
height	float	1.0	
width	float	1.0	
fill	color	gray	
opacity	float	1.0	
comp-op	string	src-over	

TODO: "dot=list" (see <http://mapnik.org/mapnik-reference/#3.0.22/dot>)

Example 65. DotSymbolizer width-height

```
<?xml version="1.0" encoding="utf-8"?>
<Map background-color="white">
  <FileSource name="symbols">./symbols</FileSource>

  <Style name="style">
    <Rule>
      <DotSymbolizer height="[height]" width="[width]" fill="red"/>
      <TextSymbolizer face-name="DejaVu Sans Book" allow-overlap="true" dy="20"
>[width]+", "+[height]</TextSymbolizer>
    </Rule>
  </Style>

  <Layer name="layer">
    <StyleName>style</StyleName>
    <Datasource>
      <Parameter name="type">csv</Parameter>
      <Parameter name="inline">
wkt,width,height
"POINT(0 0)",10,10
"POINT(1 0)",20,10
"POINT(2 0)",10,20
      </Parameter>
    </Datasource>
  </Layer>

</Map>
```


10.10

20.10

10.20

Chapter 4. Tools

4.1. Mapnik tools

4.1.1. mapnik-index

TODO - this is an almost undocumented tool meant to improve the processing of CSV and GeoJSON files somehow

4.1.2. shapeindex

TODO - this is an almost undocumented tool meant to improve the processing of shapefiles somehow

4.2. OpenStreetMap tools

While OpenStreetMap data files can be processed directly using the OGR `<Datasource>` this only really works out for rather small files / areas.

To cover larger areas, and especially the full planet, OSM data is usually pre-processed and stored in a database more suitable for processing by a renderer.

The two main tools used to do so are `osm2pgsql` and `imposm`, with the former one seeming to be the far more popular one by now.

4.2.1. osm2pgsql

`osm2pgsql` is used by many projects, including the OpenStreetMap Carto style used to generate the default map tiles on the OpenStreetMap website itself.

Databases imported by it are usually well suited for use in combination with the PostGIS data source plugin.

For details see: <https://osm2pgsql.org/>

4.2.2. imposm

See <https://imposm.org/>

4.3. Style tools

4.3.1. carto

`carto` is a tool that parses CartoCSS stylesheets and converts them into Mapnik XML.

Many OpenStreetMap styles these days are actually implemented using CartoCSS, and not the Mapnik XML syntax directly, including the OpenStreetMap Carto default style.

See also: <https://github.com/mapbox/carto>

4.3.2. Kosmtik

Kosmtik is a Javascript based graphical tool for developing CartoCSS stylesheets in a more "what you see is what you get" way than the classic approach to edit Mapnik XML or CartoCSS stylesheets directly with a text editor.

See also: <https://github.com/kosmtik/kosmtik>

Chapter 5. Compositing

TODO: extend OSM default style with a big single red dot marker, similar to [CartoCSS example page](#)

5.1. See also

- <https://github.com/mapnik/mapnik/wiki/Compositing>
- <https://carto.com/developers/styling/cartocss/#color-blending-values>
- <https://blog.mapbox.com/expanding-mapniks-cartographic-capabilities-c44af43c9bb8>

Chapter 6. Tips and Tricks

6.1. SVG and PDF document versions

When using default settings, CairoGraphics will create SVG version 1.1 output. This SVG version does not support all available composite operator choices (comp-op) though, and so for some comp-op values used in style sheets Cairo will fall back to bitmap rendering and you will end up with a SVG document that only contains one single image tag, and the actual rendered map being one large embedded bitmap image.

To prevent this you need to explicitly set the SVG version to produce to version 1.2:

```
surface.restrict_to_version(cairo.SVGVersion.VERSION_1_2);
```

Same for PDF, here you need to enforce the use of PDF version 1.5:

```
surface.restrict_to_version(cairo.PDFVersion.VERSION_1_5);
```

TODO: Cairo version dependency

6.2. Make SVG output a bit more editor friendly

SVG created by the CairoGraphics render backend is not really made for being post-processed by a vector graphics program like e.g. Inkscape. The generated SVG is completely unstructured and does not really contain any grouping or layers.

To make things even worse any text output is done by emitting single character glyphs. So when trying to post process SVG results by moving some label texts around, you need to take care of selecting every character individually.

The [Mapnik Group Text](#) tool by Ilya Zverev. It finds letters and their casing in the generated SVG, tries to find words they form, and then groups the letters per word so that you can easily move words as a whole instead of individual letters.

6.3. Simplify SVG

Mapnik only supports a subset of SVG when it comes to marker images so far.

When creating images with Inkscape, make sure to save your images as "Plain SVG", not "Inkscape SVG". Even with that some unsupported constructs may end up SVG files though.

The same is also true for SVG images from other sources.

When it comes to simple unknown attributes Mapnik will throw a warning, but the result will usually still come out OK. In other cases you may end up with weird looking results though. And even when everything looks fine in the end, the emitted warnings can still be annoying, and may

hide other, more important warnings.

TODO: simple script to resolve the most common cases.

Chapter 7. Resources

7.1. Mapnik styles

This is an (incomplete) list of styles for Mapnik that are available under an open source license. The list includes 'pure' Mapnik XML styles, and styles that can easily be converted to Mapnik XML, like those using CartoCSS.

Most Styles fall into two basic categories when it comes to their main data source, they either use derivations of the `osm2pgsql` schema used by the OpenStreetMap CartoCSS style, or customized `imposm` import schemas.

Most styles also use shapefiles for some of their layers, openly available shapefiles are list in the [Shapefiles](#) section.

Some styles are base map styles that aim at providing a full featured map, while others are only meant to be used to generated overlays that add some specific type of information on top of the output of another base style as an overlay.

Table 34. Mapnik Styles

Name	Type	Maintained	Language	Data source	License	Description
OpenStreetMap Carto	base	yes	Carto CSS	<code>osm2pgsql</code> , shapefiles	CC0	The current default OpenStreetMap style
Mapnik OSM	base	no	MapnikXML	<code>osm2pgsql</code> , shapefiles	?	Older OpenStreetMap style that was eventually replaced by OpenStreetMap Carto
Alternative Colors	base	yes	CartoCSS	<code>osm2pgsql</code> , shapefiles	CC0	Based on OSM Carto, but with an alternative color scheme
OpenArdenn e	base	yes	Carto CSS	<code>osm2pgsql</code> or <code>imposm</code> , shapefiles	CC-BY-SA	A topographic style focused on the Ardenne area in Belgium

Name	Type	Maintained	Language	Data source	License	Description
Belgian	base	yes	CartoCSS	osm2pgsql , shapefiles	CC0	Belgian variant of OSM Carto, also comes with all-dutch and all-french variants
Blossom	base	no	Carto CSS	osm2pgsql or imposm , shapefiles	BSD?	A low contrast style based on OSM Bright and Pandonia
CyclOSM	base	yes	Carto CSS	osm2pgsql , shapefiles	BSD	A map style focused on cyclists
French	base					
German	base	yes	Carto CSS	osm2pgsql , shapefiles	CC0	Based on OSM Carto, but using colors and symbols more common to German maps
HikeBike	base	no	Carto CSS	osm2pgsql , shapefiles	CC0	A map style focused on cyclists
Humanitarian	base	yes	Carto CSS			The Humanitarian OpenStreetMap style
MapQuest	base	no	Mapnik XML	osm2pgsql , shapefiles	MIT	Old MapQuest styles from around 2010
OpenRiverBoat	base	no	Carto CSS	osm2pgsql , shapefiles	WTFPL	A map for navigating waterways

Name	Type	Maintained	Language	Data source	License	Description
OsmBright	base	no?	Carto CSS	osm2pgsql or imposm , shapefiles	BSD	A rather low contrast style, meant to be used as base for own styles
Pandonia	base	no	Carto CSS	osm2pgsql , shapefiles	BSD?	A low contrast style based on OSM Bright, originally created by Flickr
Pencil	base	no	Carto CSS	Mapbox Studio	BSD	Artistic style looking like hand drawn with a pencil (a https://github.com/hholzgra/mapbox-studio-pencil/tree/dev-osm2pgsql fork using osm2pgsql db as data source exists)
PisteMap	base	no?	Mapnik XML	osm2pgsql , shapefiles	?	A style optimized for winter sports
RouteXL	base	yes?	Carto CSS	osm2pgsql or imposm , shapefiles	BSD	Another low contrast style based on OSM Bright

Name	Type	Maintained	Language	Data source	License	Description
Swiss	base	no	Carto CSS	osm2pgsql , shapefiles	CC-BY-SA	A style specific to Switzerland, based on OSM Bright
Toner	base	yes	Carto CSS	osm2pgsql , shapefiles	ISC	A high contrast pure black&white style, originally created by Stamen and now maintained by Geofabrik
Veloroad	base	yes?	Carto CSS	osm2pgsql , shapefiles	WTFPL	A style focussing on bike infrastructure in Russia
Space Station	base	no	Carto CSS	Mapbox Studio	BSD	Artistic style meant to look like space station surface (a https://github.com/hholzgra/mapbox-studio-space-station.tm2/tree/dev-osm2pgsql fork using osm2pgsql db as data source exists)

7.2. Shapefiles

Open/free shapefiles are available from multiple sources, including OpenStreetMap, Natural Earth, and others.

7.2.1. OpenStreetMap Data

[OpenStreetMap Data](#) provides some shapefiles generated from OpenStreetMap data on a regular basis. Compared to raw OSM data these contain data that has been checked for consistency. So when e.g. using the land polygon or water polygon shapefile you won't end up with all of Europe suddenly flooded due to a small coast segment temporarily missing.

7.2.2. OpenStreetMap Historical

OpenStreetMap still provides some [historical shapefiles](#) that are used by some older Mapnik styles. These files are no longer regenerated from current data, and should not be used when creating new styles. There are only kept around for historic backwards compatibility reasons.

7.2.3. Natural Earth

[Natural Earth](#) provides a lot of free vector and raster map data sets at 1:10m, 1:50m, and 1:110m scales. Data is divided in two general categories: physical and cultural, with lots of interesting and useful feature files below these categories.

All data provided by Natural Earth is in the public domain (CC0).

7.2.4. Geofabrik

[Geofabrik Downloads](#) do not only provide daily OSM data extracts for continents, countries, and regions, but also shapefiles with selected feature layers for most of these. When running small scale local applications, these can be an alternative to importing OSM data into a database server.

Chapter 8. Glossary

AGG

The [Anti-Grain Graphics library](#) used by default for bitmap (PNG, JPEG, ...) output.

Cairo

CairoGraphics

The [Cairo Graphics library](#) used for vector format output (SVG, PDF, PS) output by default, and also for bitmap output when explicitly requested.

Compositing

Compositing provides different ways to combine data to be drawn with already existing from drawing previous layers.

GDAL

[GDAL](#) is a library for processing various raster and vector geospatial data formats released by the [Open Source Geospatial Foundation](#) (OSGeo). The vector format support also runs under the name OGR for historical reasons.

GPS

Global Positioning System

GPX

GPS exchange format - an XML format to represent GPS data.

Harfbuzz

[Harfbuzz](#) is a Text rendering / shaping library used by Mapnik starting with V3.0

Imposm

[Imposm](#) is a tool to import OpenStreetMap data into a PostGIS database. (See also: [Osm2pgsql](#))

MapOSMatic

A web frontend and render backend to generate printable map posters and booklets using Mapnik, Python and Cairo Graphics

Opacity

Defines how opaque or transparent a feature should be. Values range from 0.0 for total transparency to 1.0 for total opacity.

OGR

The vector format related part of GDAL.

OSGeo

The [Open Source Geospatial Foundation](#)

osm2pgsql

[Osm2pgsql](#) is a tool to import OpenStreetMap data into a PostGIS database. It is part of the tool

chain used to generate the map tiles provided on openstreetmap.org. (see also: [Imposm](#))

PBF

Protocol Buffer Format - a file format for OSM data based on the [Google ProtoBuf library](#). PBF is a binary format not suitable for human reading, but very compact, with file sizes typically only almost half of bzip2 compressed OSM XML.

Symbolizer

A symbolizer describes how features appear on rendered maps.

SVG Transformations

SVG transformations allow to translate, scale, rotate or skew a shape, either by combining one or more individual operations, or by giving them as a transformation matrix right away.

Bibliography

Asorted articles

- [r:mapnik-wiki] [Mapnik Wiki](#)

Chapter 9. License

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