QGIS mapserver

USER MANUAL

Version 1.0

22.05.2009

Preface

This documentation was created in May 2009 and represents the state of QGIS mapserver at the time of May 22nd 2009. It is intended to guide first time users through the workflow of publishing and editing a web based map with QGIS mapserver. QGIS mapserver is a cartographically advanced mapserver published under the GPL license.

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1 Basics

1.1. Web Mapping

Web Mapping is as the name indicates a term for maps that are used over the internet. Web maps offer options that extend the usual visualisation of the geographic reality of analogue maps. With the possibility to enhance maps with further interactivity elements, navigation and orientation tools and the combination of different media as sound, visuals and movies, maps are more easily interpreted (Sieber, 2009).
Further advantages of web maps are the accessibility to the public and the augmented information content compared to analogue maps. Although the visualisation is still the main part of a web map, further functionalities are expected. Moreover, knowledge can be cross-linked and generate new knowledge. The actuality of a map is a further advantage of a web map compared to an analogue map, which however comes along with expectations by the public of actuality, correctness and reliability of the map (Dickmann, 2001).
A possible classification of web maps could look as follows:

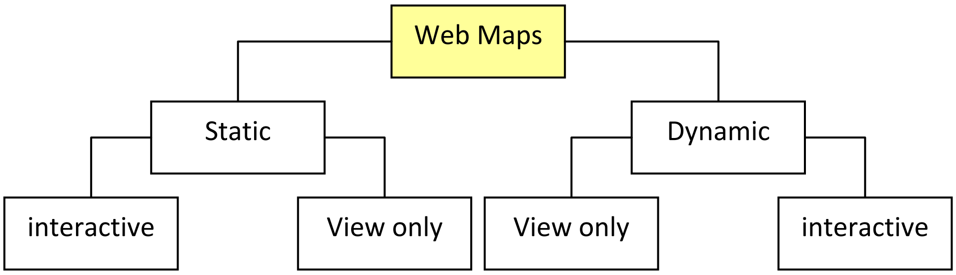


Figure 1: Map types (Kraak, 2001)

- Static maps are defined as maps that only show a map at one point in time.
- Dynamic maps are maps that show some kind of change, be it in space or time.
- View only maps have no interactive approach. For static maps this means that they consist of one single image. Dynamic maps show the changing attribute with aid of an animation or slide show. However, there is still no interaction possible.
- Interactive maps offer the possibility to interact with the map. This interaction can be in terms of navigation toolbars with panning and zooming options, different layer options or in dynamic maps in terms of animations (Cartouche, 2009).

In the last few years many web maps have been set up and now circulate in the internet. However, the potential of cartographic rules has not yet been exploited (Kraak, 2001). QGIS mapserver offers a great potential for cartographic applications. The following subchapters describe the basics for the creation of a web map.

1.1.1 Client-server architecture

Two basic architecture types can be distinguished in information technology. The first one is a local system where the user works with an operating system on which the application is directly executed. An example for this architecture is a Desktop GIS. The second architecture is the Client–Server-architecture where the client requests data or functionality from a server. In such architecture the server is passive and waits on requests from an active client. In case of a web map the map has to be provided by a server. The client consists of any web browser that sends a request to view the map or get information about it (Cartouche, 2009).

With this concept of the client-server architecture at hand two different kinds of web maps can be kept apart: server-sided web maps and client-sided web maps. Client and server are connected via the internet, they only understand HTML-messages. HTML is a markup language defined by the World Wide Web Consortium and is not extensible. So only predefined syntax can be used and understood and displayed by a web browser (W3, 2009). To display web maps a plugin has to be available which enables either the browser to display the received information or the server to translate the information into a browser-readable format. Examples for client-sided extensions are JavaScript or ActiveX controls. Examples for server-sided extensions are PHP, PERL or Java servlets (Dickmann, 2001).

1.1.2 OGC

The Open Geospatial Consortium consists of 382 governmental organisations, universities and companies with the aim to accelerate the development of interface specifications for geospatial data. The resulting standards are detailed interfaces and encodings that can be used to develop software which may be interoperable in the future. A document is only passed after all members have had the opportunity of commenting and discussing the standard. An unanimous resolution is aimed at for the sake of acceptance by all members. Further information can be found under www.opengeospatial.org (Reinhardt, 2004).

1.1.3 Web Map Service

WMS is a specification published by the OGC to standardize the exchange of geospatial data over the internet. It consists of an http interface which enables queries for one or more geo-coded map images from geospatial databases.

The three following basic operations are standardized:

- GetCapabilities: This operation returns metadata of the requested map.
- GetMap: This operation returns a map with defined referencing parameters, defined height and width of the map image, defined information and in a limited number of predefined styles.
- GetFeatureInfo: This operation is optional and returns information about features in the map.

The procedure of a WMS request has the following structure:

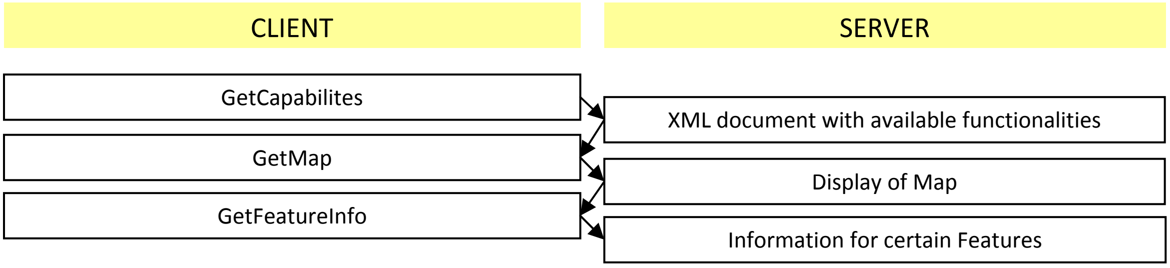

CLIENT
SERVER
GetCapabilites
GetMap
GetFeatureInfo
XML document with available functionalities
Display of Map
Information for certain Features

Figure 2: Structure of a WMS request

If the number and appearance of the predefined styles is not adequate the possibility of applying user-defined styles with the Styled Layer Descriptor as specified in chapter 1.1.5 *Styled Layer Descriptor* is available (WMS, 2006).

1.1.4 Map server

A map server is basically a server that is able to answer a WMS request. The following diagram shows its purpose:

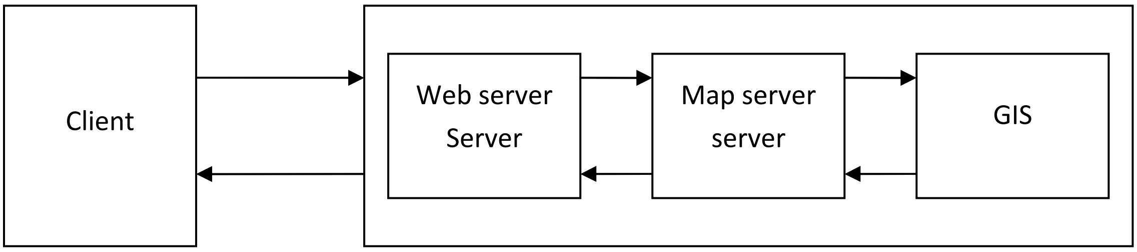


Figure 3: Client-Server-Architecture

A client requests functionality from a web server. A web server only comprehends HTML messages. So in case of geographical data or other complex data where the web server has to request data from a database, the web server passes the command to a map server (e.g. a Common Gateway Interface) which prepares the request for a geographical information system. A Common Gateway Interface (CGI) is a server-sided protocol used for the linking of a web server to another program. It is an interface used for the subsequent processing of an html request that allows a called program to respond to it.[1] These programs can be programmed in different programming languages. After the program handled the request, the CGI translates its results in an HTML message and forwards it to the web server. The web server receives the requested data in a readable format and displays the data in the client browser (Dickmann, 2001).
As an example the following request can be interpreted:

http://karlinapp.ethz.ch/fcgi-bin/qgis_wms_dir/europe/qgis_map_serv.fcgi?
SERVICE=WMS&REQUEST=GetMap&LAYERS=hillshade,cost&STYLES=default,default&BBOX=2164760,28423,
2600000,4000000&FORMAT=png&WIDTH=500&HEIGHT=500

[1] A variation of the CGI is a FastCGI. The main advantage of a FCGI is the ability to process several requests with only one transport connection whereas a CGI exits an application process after responding to a request (http://www.fastcgi.com/devkit/doc/fcgi-spec.html, 01.05.2009).

The path points to the executable program "qgis_map_serv.fcgi" via the HTTP protocol. The successive terms after the "?" and divided by "&" define the parameters that have to be processed with the called program.

1.1.5 Styled Layer Descriptor

For the display of user-defined styles the Styled Layer Descriptor (SLD) has to be used. It is a XML standard extending the WMS Implementation Specification released by the OGC. With it symbols and colours can be rendered as wished. Therefore it allows a focus on cartographic claims. In 2007 SLD was divided into Symbology Encoding (SE) and SLD profile. Symbology Encoding is independent from service descriptions so it can also be used for user-defined styling with other systems than services. SLD profile is the remaining part where the appliance of SE onto WMS layers is described (SE, 2006). Further extensions to the SLD-standards have been developed, e.g. for the symbolization of diagrams (Iosifescu, 2007).

1.2. GIS

Large amounts of data are most easily managed in databases. Data is stored in tables which hold attributes of importance. But how are geographical facts like the geometry or topology stored?
In case of geographical data there are databases, called geodatabases, which have special functions to store information so that it can be visualised in geographical information systems (GIS). A GIS is defined as a system which consists of hardware, software and data. In it all data with a relation to the earth's surface can be captured, visualised, managed, analysed and manipulated. Examples for such data are geological phenomena, the vegetation or constructions such as buildings or bridges (Reinhardt, 2009).
However, a GIS is not simply a mapping program. The main advantage of using a GIS and not a simple graphics program is the possibility to give a certain object a variety of attributes. By selecting this object all attributes become visible. Furthermore the ability to analyse and manipulate data exists. The queries below can all be answered with GIS functionality:

- What river is longer than 100 km?
- How many buildings are closer to a lake than to a mountain?
- What city is built on a hill that is higher than 500 meters above sea level?

Adding to this, data can be altered by applying a manipulation functionality. Examples are listed below:

- Erase all regions that are smaller than 2 km^2.
- Create a buffer around all rivers.

It is apparent that GIS are not only used in classical surveying or cadastral tasks. They are nowadays used in infrastructure or recycling offices, geological agencies, tourist informations and many more.
Examples for such geographical information systems are ArcGIS, Geomedia or QGIS.

1.2.1 Data formats

Geospatial data can be stored in two different ways: vector data or raster data.

Vector Data

Vector data can be explained with various objects that fill an empty space. These objects can be points, lines or polygons and can hold any number of attributes. An example for the use of such a data structure is a dataset which contains the geometrical place of buildings (Brovelli, 2008). There are three basic types of vector data distinguishable: points, lines and polygons.

Figure 4: Vector data

Raster Data

On the other hand, raster data are informations that cover every part of the relevant area. The area is divided into a regular grid with pixels. Each pixel can hold only one value, which is normally used for the visualisation. An example of usage is a digital terrain model or a JPEG image (Brovelli, 2008).

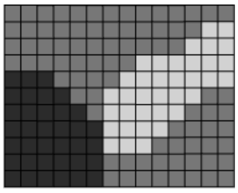


Figure 5: Raster image

2 What should I know about QGIS Mapserver?

- It is an open source WMS released under the GPL[2] license. Its sources are therefore freely accessible which allows all transparency possible.
- It is a FastCGI/CGI application written in C++.
- It allows the visualization and publication of maps on the internet, whether it be raster or vector data, according to cartographic rules.
- It allows the symbolization and management of geospatial data in a desktop version of QGIS. This is a user-friendly way of symbolizing data and allows the immediate visualization of the results. With the aid of a plugin the results are easily published even without fundamental programming or scripting knowledge.
- With the extension “diagram overlay” diagrams can be generated and therefore thematic information is easily published.

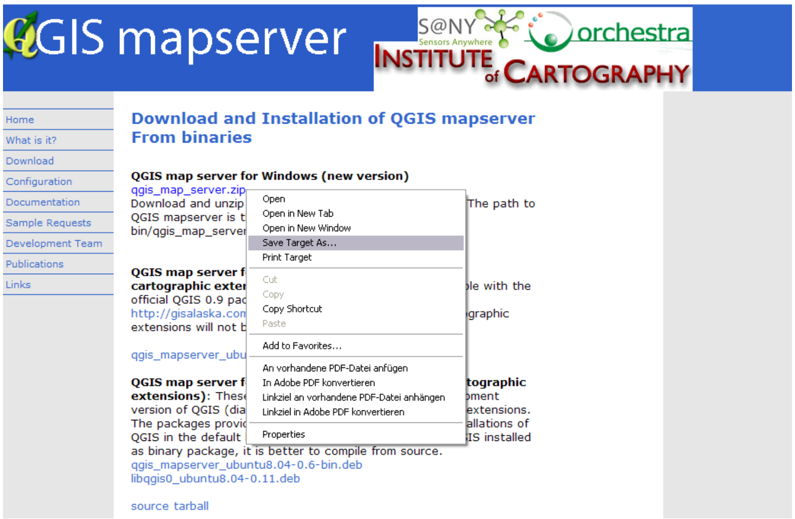
[2] The general public license (GPL) is a license which intends to guarantee the freedom of alternation and distribution of software (GNU, 2009). Please visit the official website at http://www.gnu.org/licenses/gpl.html for further information.

3 Installation of QGIS and QGIS Mapserver

3.1. Windows

All packages are available under http://karlinapp.ethz.ch/qgis_wms/download/index.html.

1. Prior to any installation of QGIS or QGIS mapserver a web server software has to be available or installed first. A good and easy to use choice for windows is wampserver which already supports the use of Apache, PHP and mySQL.[3]
2. Download the package "qgis_map_server.zip" and unzip it to the directory of the cgi-bin of your web server.



Download and Installation of QGIS mapserver
From binaries

QGIS map server for Windows (new version)
qgis_map_server.zip
Download and unzip The path to
QGIS mapserver is t
bin/qgis_map_server

QGIS map server f
cartographic exter le with the
official QGIS 0.9 pac
http://gisalaska.com graphic
extensions will not b

qgis_mapserver_ubu

QGIS map server f **tographic**
extensions): These pment
version of QGIS (dia extensions.
The packages provic allations of
QGIS in the default IS installed
as binary package, it is better to compile from source.
qgis_mapserver_ubuntu8.04-0.6-bin.deb
libqgis0_ubuntu8.04-0.11.deb

source tarball

Figure 6: Download of "qgis_map_server.zip"

If the package is unpacked in the right directory the directory tree should look as follows:

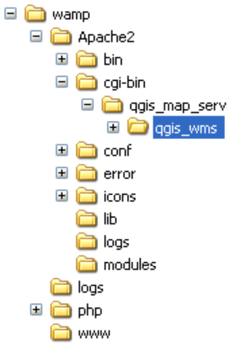
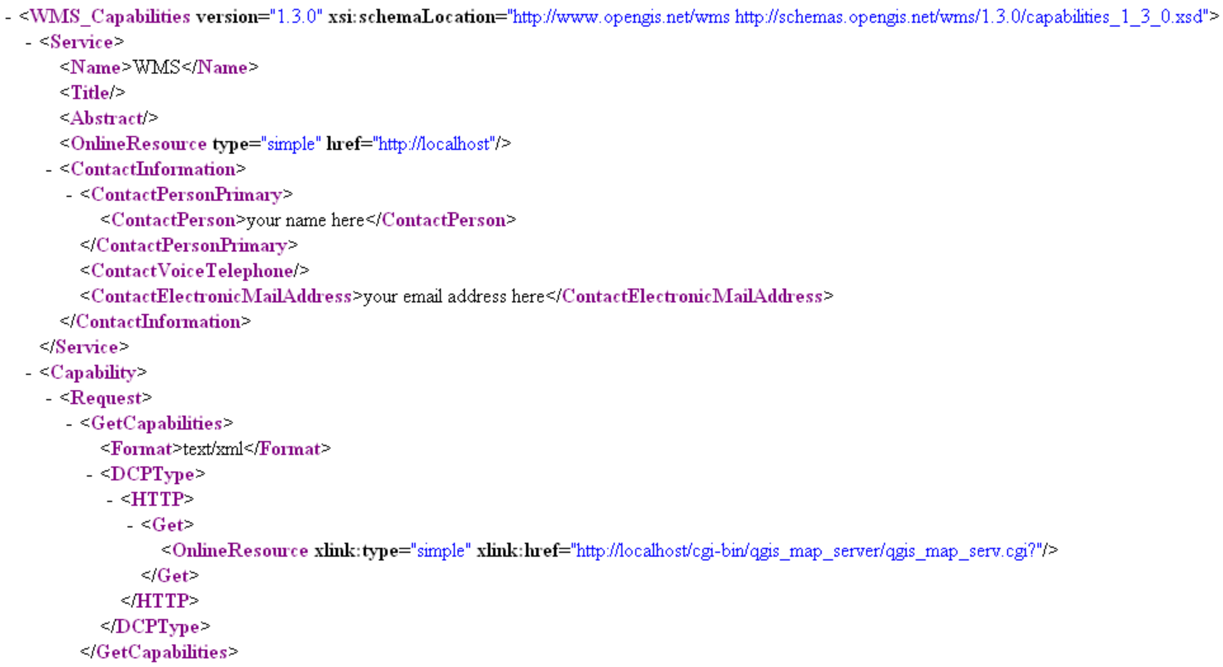


Figure 7: Folder structure in Windows

[3] http://www.wampserver.com/en/

3. Test if QGIS mapserver is installed properly by opening a web browser and typing in the following line:

   http://<path to your webserver>/cgi-bin/qgis_map_server/qgis_map_serv.cgi?
   SERVICE=WMS&REQUEST=GetCapabilities&Version=1.3.0
   The following lines should be displayed:



```
- <WMS_Capabilities version="1.3.0" xsi:schemaLocation="http://www.opengis.net/wms http://schemas.opengis.net/wms/1.3.0/capabilities_1_3_0.xsd">
  - <Service>
      <Name>WMS</Name>
      <Title/>
      <Abstract/>
      <OnlineResource type="simple" href="http://localhost"/>
    - <ContactInformation>
      - <ContactPersonPrimary>
          <ContactPerson>your name here</ContactPerson>
        </ContactPersonPrimary>
        <ContactVoiceTelephone/>
        <ContactElectronicMailAddress>your email address here</ContactElectronicMailAddress>
      </ContactInformation>
    </Service>
  - <Capability>
    - <Request>
      - <GetCapabilities>
          <Format>text/xml</Format>
        - <DCPType>
          - <HTTP>
            - <Get>
                <OnlineResource xlink:type="simple" xlink:href="http://localhost/cgi-bin/qgis_map_server/qgis_map_serv.cgi?"/>
              </Get>
            </HTTP>
          </DCPType>
        </GetCapabilities>
```

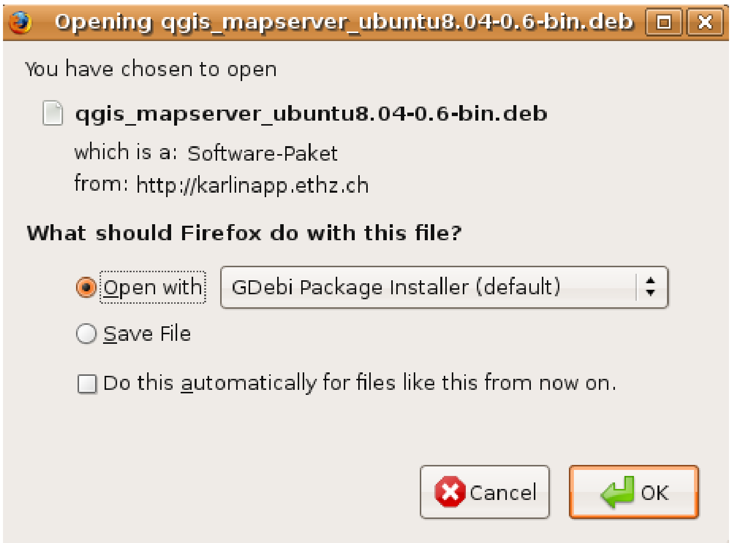
Figure 8: XML document with available functionalities

4. Download the package “QGISPublishToWeb.zip” and unzip it. In this package the necessary plugin “Publish to Web” is bundled with the QGIS 1.1 desktop version.

3.2. Linux

All packages are available under http://karlinapp.ethz.ch/qgis_wms/download/index.html.

1. Prior to any installation of QGIS or QGIS mapserver a web server software has to be downloaded. The commonly used open source server Apache can be downloaded under http://httpd.apache.org/download.cgi.
2. Download the packages “qgis_mapserver_ubuntu8.04-0.6-bin.deb“ and “libqgis0_ubuntu8.04-0.11.deb“.



You have chosen to open

qgis_mapserver_ubuntu8.04-0.6-bin.deb

which is a: Software-Paket

from: http://karlinapp.ethz.ch

What should Firefox do with this file?

● Open with GDebi Package Installer (default)

○ Save File

□ Do this automatically for files like this from now on.

Figure 9: Download of "qgis_mapserver_ubuntu8.04-0.6-bin.deb" and " "libqgis0_ubuntu8.04-0.11.deb"

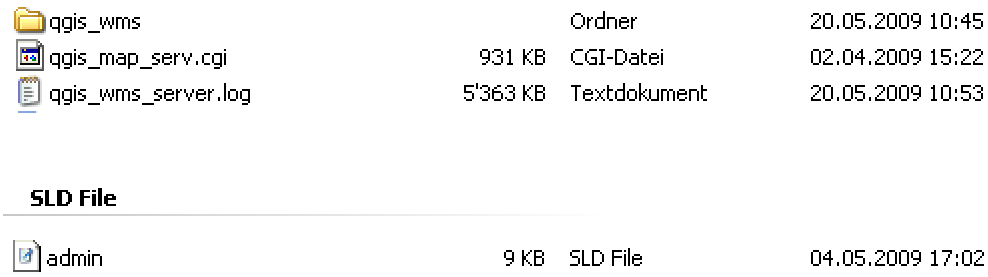
3. Double click on the packages in the download list.
4. Click on Install Packages.

3.3. Mac OS X

At the moment of the preparation of this documentation the packages for Mac OS X have not been available. Please check on http://karlinapp.ethz.ch/qgis_wms/download/index.html if they have been published.

4 Folder Structure of QGIS Mapserver

The basis for working with QGIS mapserver is to understand its file and folder structure. As explained in chapter 3 *Installation of QGIS and QGIS Mapserver* the main folder “qgis_map_server” is saved into the cgi-bin of the web server for Windows and into the fcgi-bin of the web server for Linux.
Inside this folder there are different libraries which are of no importance for simply using QGIS mapserver. Note however that there is a file called “qgis_map_serv.cgi” respectively “qgis_map_server.fcgi” for Linux which is the core element of QGIS mapserver. Another important file contained is called “admin.sld”. This is the configuration file based on SLD as described in chapter 1.1.5 *Styled Layer Descriptor*. Whenever a project according to chapter 5.5 *Data Publishing with QGIS Mapserver* is created a new folder will appear. Inside this folder a new „admin.sld“ file can be found. However, only the „admin.sld“ file inside the “qgis_map_server” folder can be published. So make sure to always copy the desired Layers into this folder.



qgis_wms		Ordner	20.05.2009 10:45
qgis_map_serv.cgi	931 KB	CGI-Datei	02.04.2009 15:22
qgis_wms_server.log	5'363 KB	Textdokument	20.05.2009 10:53
SLD File			
admin	9 KB	SLD File	04.05.2009 17:02

Figure 10: Basic contents of „qgis_map_server“ folder

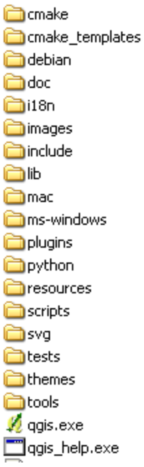
The second noticeable folder is called “qgis_wms”. It contains two folders called “Resources” and “lib”. Inside the “lib” folder there are libraries for different providers. An example is the “sosprovider.dll” which enables the linking to a sensor. These libraries may be extended.

5 Data Processing in QGIS

Some basic steps for the use of QGIS are described here, for further information please consult http://www.qgis.org/documentation.html.

5.1. Starting QGIS Desktop Version

The structure of the downloaded and unzipped package “QGISPublishtoWeb” looks as follows:



cmake
cmake_templates
debian
doc
i18n
images
include
lib
mac
ms-windows
plugins
python
resources
scripts
svg
tests
themes
tools
qgis.exe
qgis_help.exe

Figure 11: Structure of package “QGISPublishtoWeb”

Inside this package double click on the symbol “QGIS.exe” to start QGIS desktop version.

5.2. Manage Plugins

To activate plugins do the following steps:

1. On the menu toolbar click on “Plugins”:

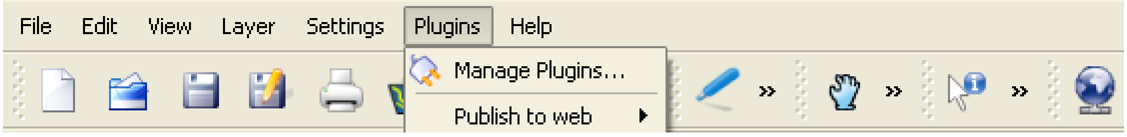
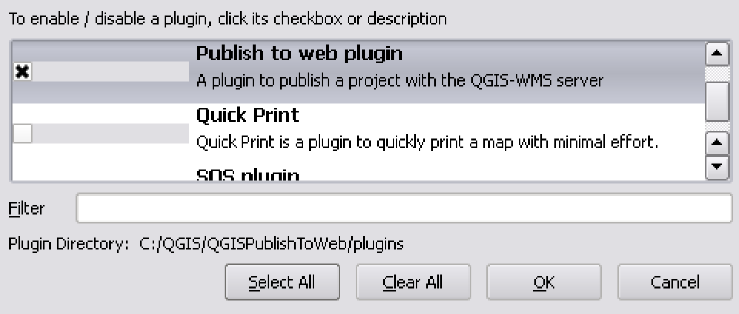


Figure 12: Publish to Web

2. Choose “Manage Plugins…”.



To enable / disable a plugin, click its checkbox or description

☒ **Publish to web plugin**
A plugin to publish a project with the QGIS-WMS server

□ **Quick Print**
Quick Print is a plugin to quickly print a map with minimal effort.

SOS plugin

Filter

Plugin Directory: C:/QGIS/QGISPublishToWeb/plugins

Figure 13: Plugin Manager

3. Choose “Publish to Web”, “SPIT” or any other plugin you wish to enable.
4. Click on OK.
5. If once again clicking on „Plugins“ in the toolbar new elements in the dropdown list should be visible:

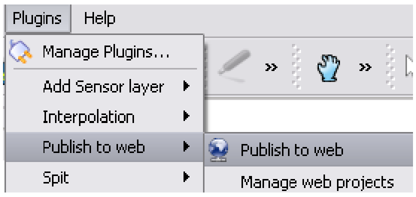


Figure 14: Plugins – Publish to Web

5.3. Shapefile in PostGIS Import Tool

For big amounts of data it is advisable to import all data into a geodatabase. The advantages are numerous; beside multiuser support, the performance is much higher if stored in a database. PostGIS is an open source database which supports geospatial data. It can be downloaded under http://postgis.refractions.net/. A plugin to import shapefiles directly into a PostGIS database is automatically included in the download package of QGIS mapserver.

Note: Before this plugin works it has to be enabled as described in chapter 5.2 *Manage Plugins*. To execute it do the following:

1. On the menu toolbar click on “Plugins” or the button :

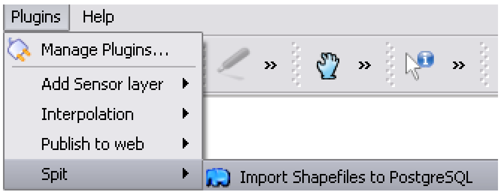
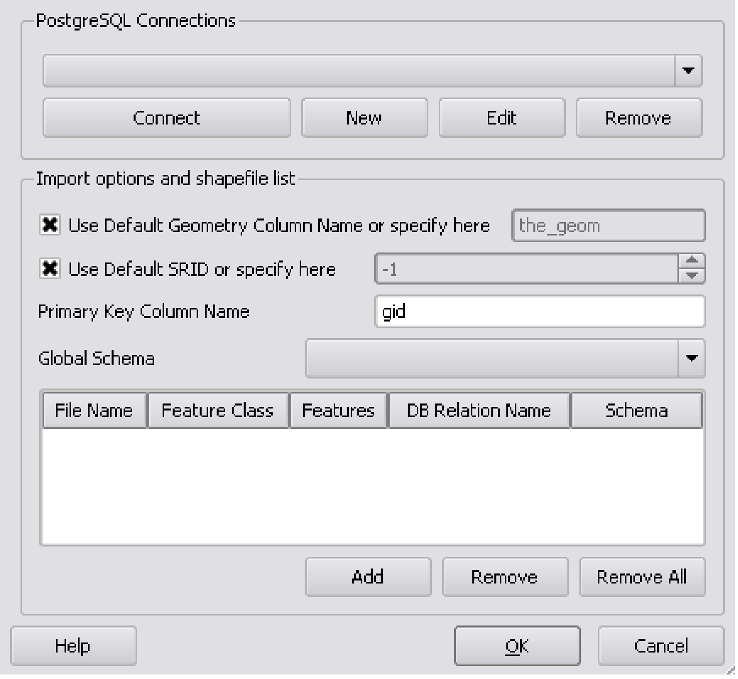


Figure 15: Plugins - SPIT

2. Choose “SPIT” → “Shapefile in PostGIS Import Tool”. The following window will open:



☒ Use Default Geometry Column Name or specify here: the_geom

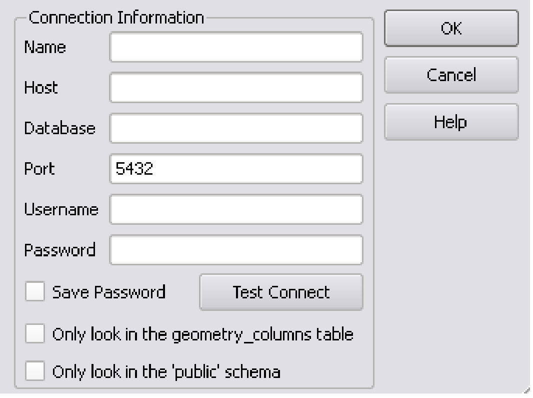
☒ Use Default SRID or specify here: -1

Primary Key Column Name: gid

Global Schema:

Figure 16: Shapefile to PostGIS Import Tool

3. To set up a PostGIS connection click on New. The following window will appear:



Name:

Host:

Database:

Port: 5432

Username:

Password:

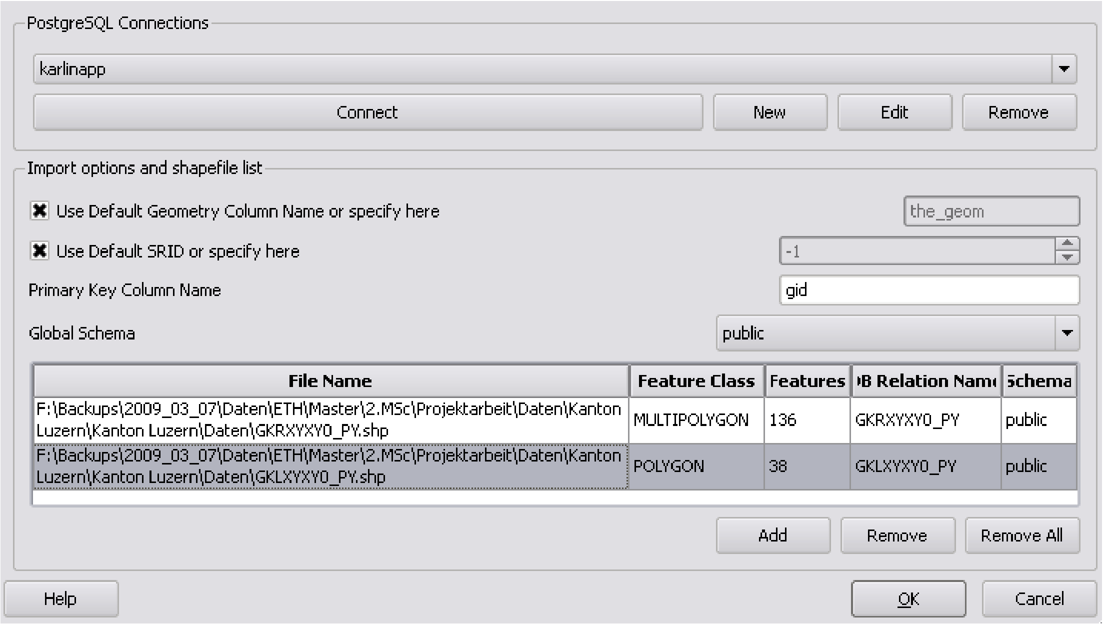
□ Save Password

□ Only look in the geometry_columns table

□ Only look in the 'public' schema

Figure 17: New PostGIS connection

4. Enter the name, host, database name, port, user name and password of your PostGIS database.
5. Click on Test connect.
6. A pop-up window will explain whether the connection was successful or not. If the connection failed please check your port, database and host. If it was successful click on OK.



PostgreSQL Connections: karlinapp

☒ Use Default Geometry Column Name or specify here: the_geom

☒ Use Default SRID or specify here: -1

Primary Key Column Name: gid

Global Schema: public

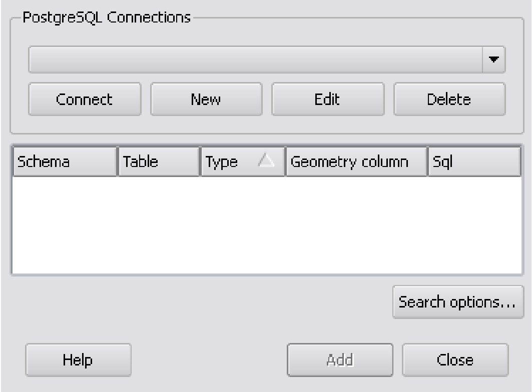
File Name	Feature Class	Features	B Relation Nam	Schema
F:\Backups\2009_03_07\Daten\ETH\Master\2.MSc\Projektarbeit\Daten\Kanton Luzern\Kanton Luzern\Daten\GKRXYXY0_PY.shp	MULTIPOLYGON	136	GKRXYXY0_PY	public
F:\Backups\2009_03_07\Daten\ETH\Master\2.MSc\Projektarbeit\Daten\Kanton Luzern\Kanton Luzern\Daten\GKLXYXY0_PY.shp	POLYGON	38	GKLXYXY0_PY	public

Figure 18: Add Shapefiles to PostgreSQL

7. In the window “Shapefile in PostGIS Import Tool” click on Add.
8. Choose the relevant shapefiles.
9. Click on OK.

As a result all shapefiles have been added to the geodatabase with the chosen name on the chosen host. To import data from that database do the following:

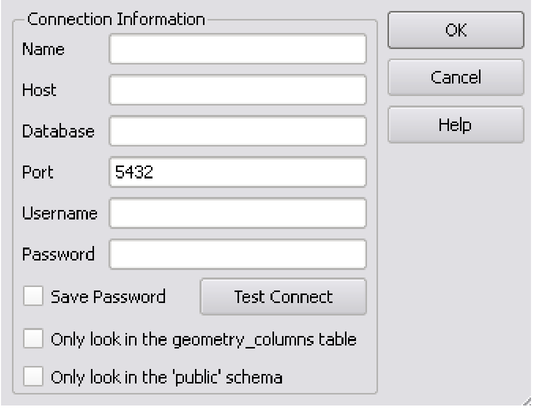
10. Click on the button or on “Layers” → “Add a PostGIS Layer…”. The following window will open:



Schema	Table	Type	Geometry column	Sql

Figure 19: Add PostGIS Table

11. Click on New to establish a connection to a database. “Shapefile in PostGIS Import Tool” according to chapter 5.3 *Shapefile in PostGIS Import Tool* will open.



Connection Information

Name

Host

Database

Port 5432

Username

Password

□ Save Password

□ Only look in the geometry_columns table

□ Only look in the 'public' schema

Figure 20: Connection Information

12. Select the relevant data.
13. Click on Add.

After all data have been loaded into QGIS the whole editing of it can be done.

5.4. Preparation of Data in QGIS

For more detailed description of editing tools in QGIS please visit http://www.qgis.org/documentation.html. For the property options of a specific layer double click on the layer in the Layers list or right click on the layer in the Layers list as shown in Figure 21.

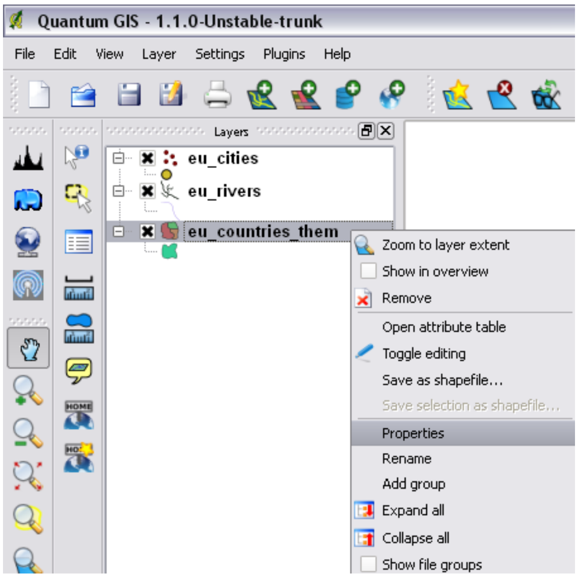
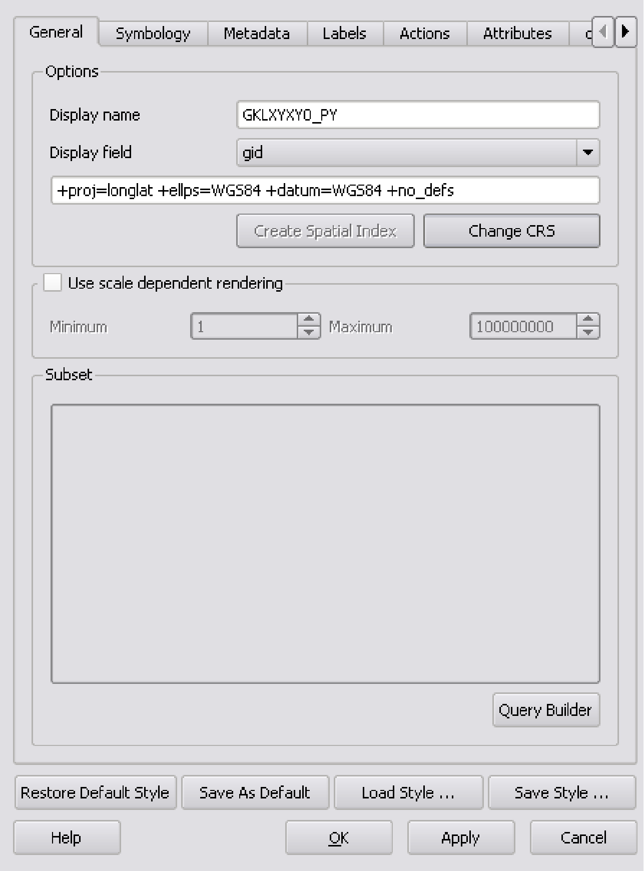


Figure 21: Properties of a layer

5.4.1 Changing the Coordinate Reference System

1. To change the reference frame of a project, choose the tab "General".



Display name: GKLXYXY0_PY

Display field: gid

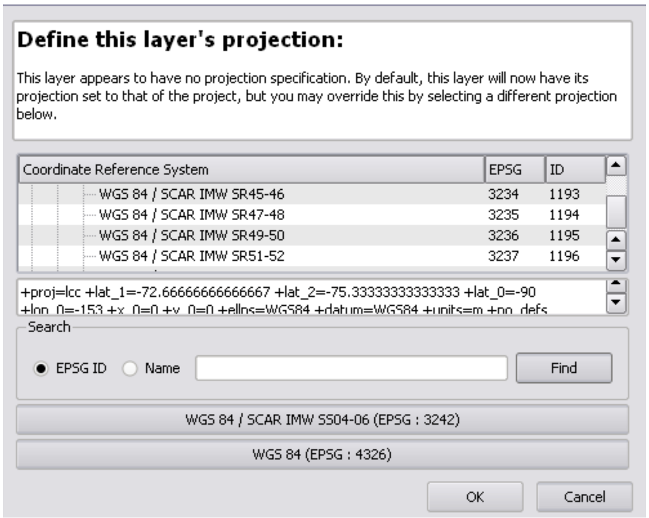
+proj=longlat +ellps=WGS84 +datum=WGS84 +no_defs

□ Use scale dependent rendering

Minimum: 1 Maximum: 100000000

Figure 22: Changing the CRS

2. Click on Change CRS. The following window will open:



Define this layer's projection:

This layer appears to have no projection specification. By default, this layer will now have its projection set to that of the project, but you may override this by selecting a different projection below.

Coordinate Reference System	EPSG	ID
WGS 84 / SCAR IMW SR45-46	3234	1193
WGS 84 / SCAR IMW SR47-48	3235	1194
WGS 84 / SCAR IMW SR49-50	3236	1195
WGS 84 / SCAR IMW SR51-52	3237	1196

```
+proj=lcc +lat_1=-72.66666666666667 +lat_2=-75.33333333333333 +lat_0=-90
+lon_0=-153 +x_0=0 +y_0=0 +ellps=WGS84 +datum=WGS84 +units=m +no_defs
```

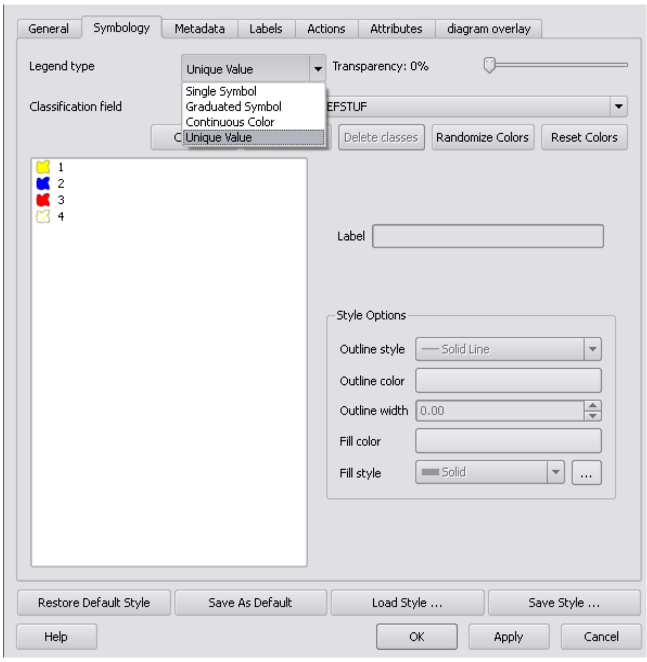
Search: ● EPSG ID ○ Name

Figure 23: Defining the projection

3. Choose the relevant coordinate reference system and click on OK.

5.4.2 Symbolization of Data

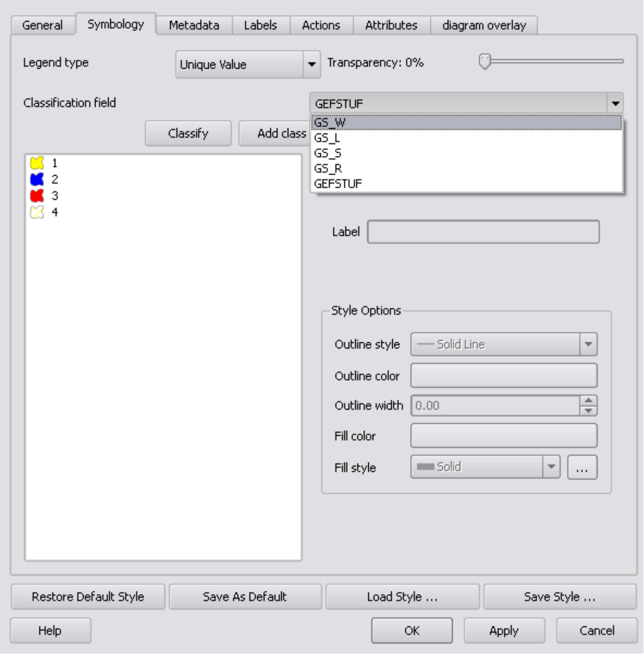
1. To symbolize data in QGIS desktop version select the tab “Symbology”. The following tab will open:



Legend type: Unique Value
Transparency: 0%
Classification field: GEFSTUF
Label:
Outline style: Solid Line
Outline color:
Outline width: 0.00
Fill color:
Fill style: Solid

Figure 24: Legend type

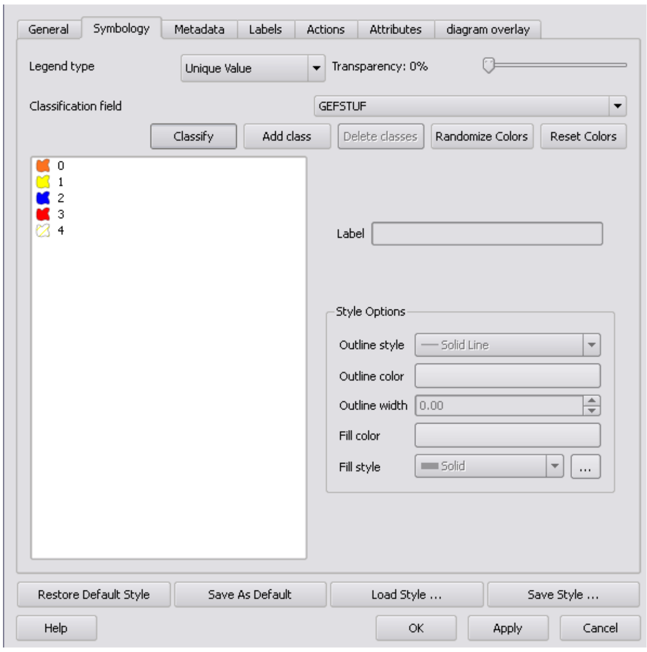
2. Choose the legend type. The following options are possible: Single symbol, graduated symbol, continuous color and unique value.
3. Choose the field which holds the data for the classification.



Legend type: Unique Value
Transparency: 0%
Classification field: GEFSTUF
Label:
Outline style: Solid Line
Outline color:
Outline width: 0.00
Fill color:
Fill style: Solid

Figure 25: Classification field

4. In case of the legend type unique graduated symbol or unique value click on Classify :



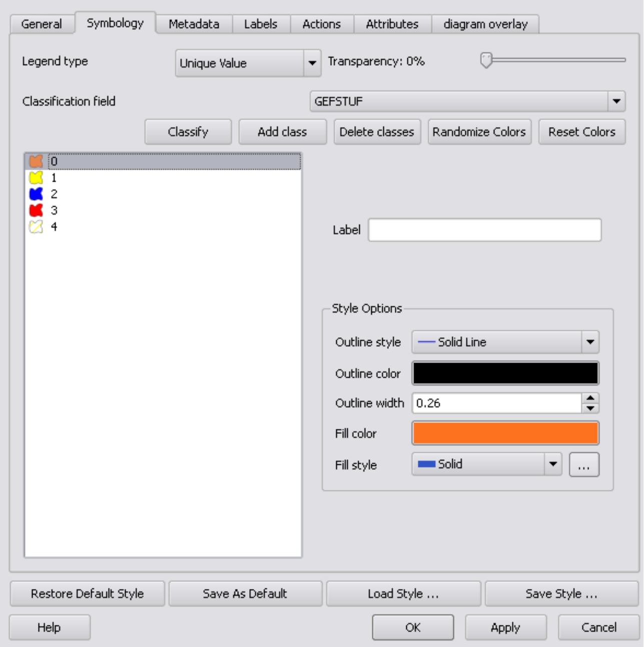
Legend type: Unique Value
Transparency: 0%
Classification field: GEFSTUF

0
1
2
3
4

Label:
Outline style: Solid Line
Outline color:
Outline width: 0.00
Fill color:
Fill style: Solid

Figure 26: Classify

5. To change the color of any value, click on the value and the color field beside "Fill Color".

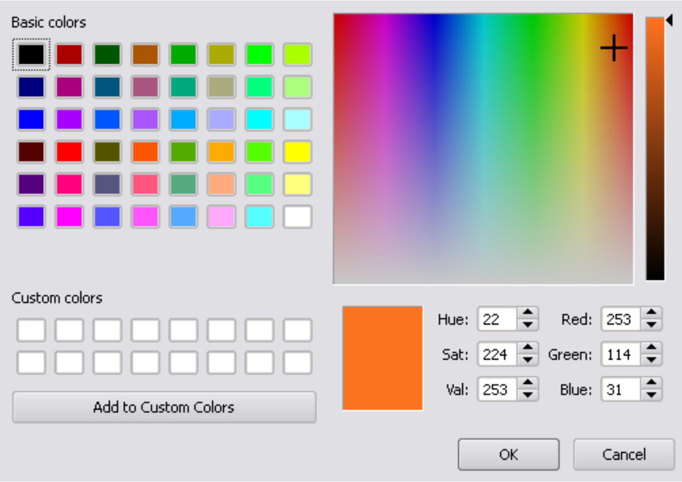


Legend type: Unique Value
Transparency: 0%
Classification field: GEFSTUF

0
1
2
3
4

Label:
Outline style: Solid Line
Outline color:
Outline width: 0.26
Fill color:
Fill style: Solid

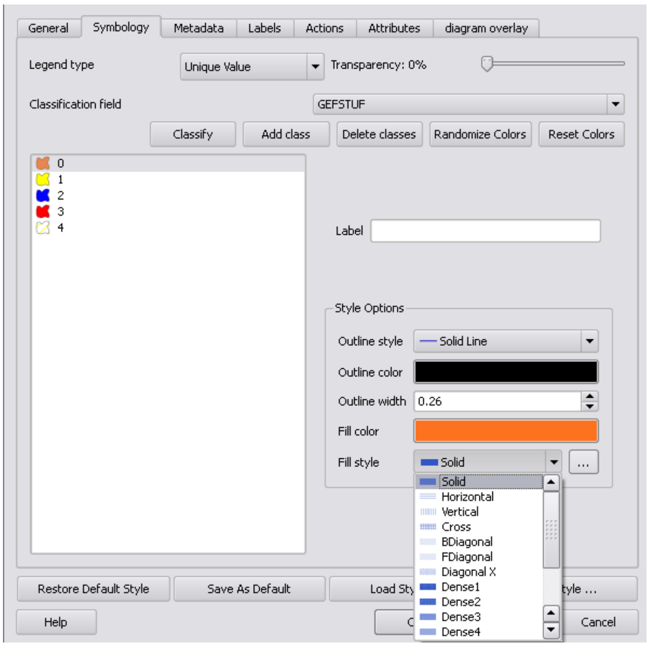
Figure 27: Changing the color



Hue: 22
Sat: 224
Val: 253
Red: 253
Green: 114
Blue: 31

Figure 28: Choosing the color

6. With “Fill style”, “Outline color” and “Outline style” further symbolization options are possible.



Legend type: Unique Value
Transparency: 0%
Classification field: GEFSTUF

0
1
2
3
4

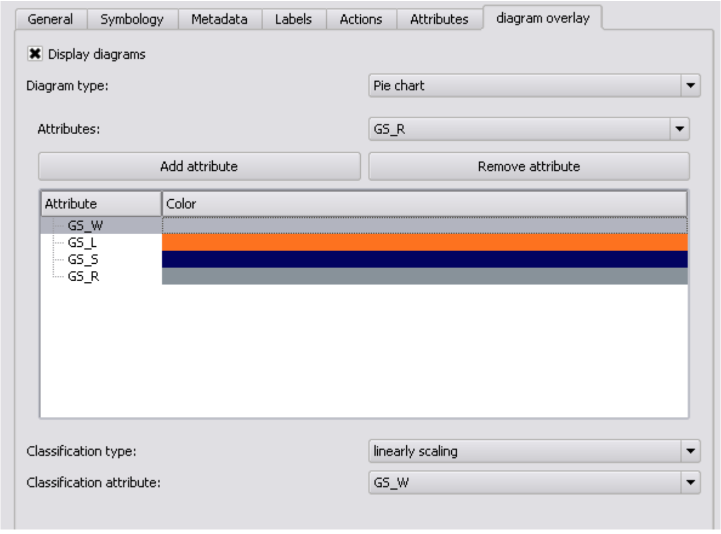
Outline style: Solid Line
Outline width: 0.26
Fill style: Solid

Figure 29: Fill style

5.4.3 *Diagram Overlay*

With this plugin diagrams can be generated in QGIS. Note that before this plugin works it has to be enabled as described in chapter 5.2 *Manage Plugins*. To execute it, do the following:

1. Double click on the layer in the Layers list which holds the data to be generated a diagram from. The following window will open:



☒ Display diagrams

Diagram type: Pie chart

Attributes: GS_R

Attribute	Color
GS_W	
GS_L	🟧
GS_S	🟦
GS_R	▨

Classification type: linearly scaling

Classification attribute: GS_W

Figure 30: Diagram Overlay

2. In the tab “diagram overlay” activate the “Display diagrams” checkbox.
3. Choose your diagram type and the classification type.
4. Add the attributes to be put into the diagram by selecting the attribute and clicking on Add attribute.
5. The colour of the attribute can be changed by double clicking on the current colour.
6. Choose the classification attribute. The diagram size will appear proportional to the value of that attribute. Click on OK to confirm.
7. In the layer property window (see **Error! Reference source not found.** *Diagram Overlay*) click on find maximum value for the program to find an appropriate size.
8. Choose your desired diagram size.
9. Click on Apply to preview your choices.
10. Click on OK.

5.5. Data Publishing with QGIS Mapserver

The “Publish to Web” plugin generates a file in a XML-schema called SLD (styled layer descriptor) which defines how the data is represented in the internet.

The generated file is the configuration file and is named “admin.sld”. Before publishing your data with the mentioned plugin the data has to be prepared in QGIS. After the data looks as you wish to have it seen on the web execute this plugin.

Note: Before this plugin works it has to be enabled as described in chapter 5.2 *Manage Plugins*.

1. In the menu toolbar in QGIS click on “Plugins” or on the button 🌐.

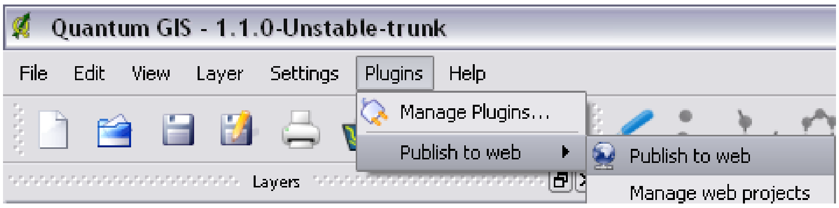
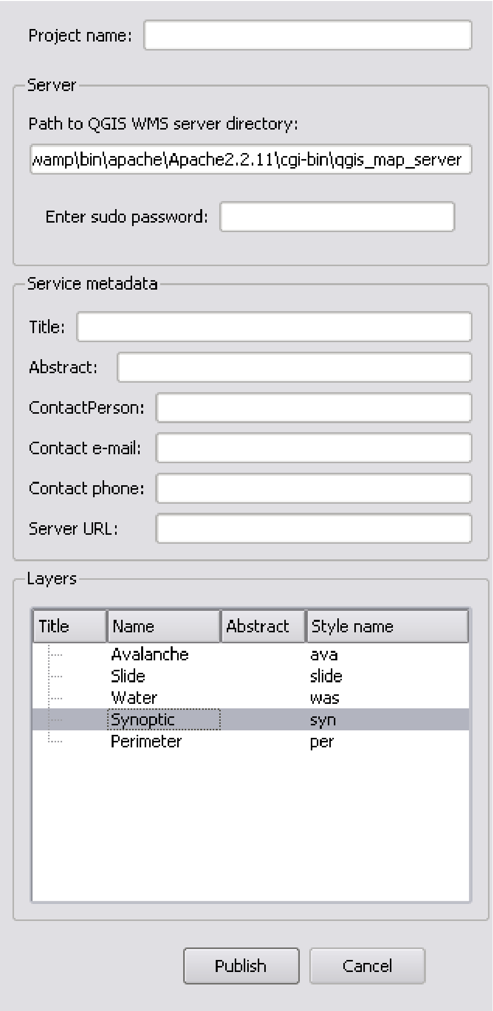


Figure 31: Opening the *Publish to Web* plugin

2. Choose “Publish to Web” → “Publish to Web”. The following window will open:



Path to QGIS WMS server directory: wamp\bin\apache\Apache2.2.11\cgi-bin\qgis_map_server

Title	Name	Abstract	Style name
	Avalanche		ava
	Slide		slide
	Water		was
	Synoptic		syn
	Perimeter		per

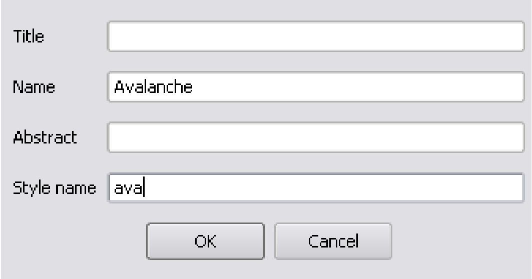
Figure 32: Publishing the project to web

3. Enter a project name, path to the endpoint of the server directory[4] and your password[5].

[4] The path to the endpoint of the mapserver will be as follows in Linux:
“<path to your web server>/fcgi-bin/qgis_map_server/ qgis_map_serv.fcgi?” and accordingly in Windows:
“<path to your web server>/cgi-bin/qgis_map_server/qgis_map_serv.cgi?”

[4] A password is only necessary when working with Linux.

4. Fill out the service metadata.
5. Double click on the individual layers. The following window will open:



Title

Name Avalanche

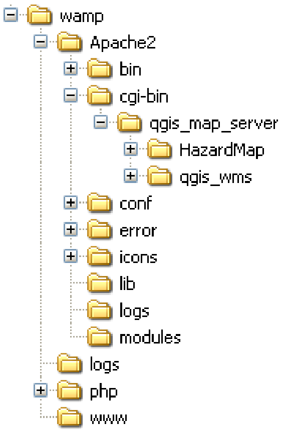
Abstract

Style name ava

Figure 33: Entering layer and style information

6. Change the name and style name to memorable names. They will be needed for further editing and have to be memorized. If desired give the Layer a Title and an abstract.
7. Click on OK.
8. Click on Publish.

After this procedure the plugin saves a folder with the project name to the path specified. This should look as follows:



```
wamp
  Apache2
    bin
    cgi-bin
      qgis_map_server
        HazardMap
        qgis_wms
    conf
    error
    icons
    lib
    logs
    modules
  logs
  php
  www
```

Figure 34: Folder structure after the creation of a map

Inside the newly created folder, in this example it is the folder "HazardMap", the file called "admin.sld" is saved. Opening this file shows a SLD document which defines the representation of the layers. An example of such a document can be found in 7 *Examples*. In chapter 5.6 *Editing an „admin.sld" file* the structure of the „admin.sld" file is explained. The published data can now be made visible with aid of a WMS client. A number of such clients is described in chapter 6 Clients.
If the style of the generated „admin.sld" file is the way it should be published, the „admin.sld" file has to be copied into the "q_gis_map_server" folder because only if the „admin.sld" file is in this position of the folder structure it is published.

5.6. Editing an „admin.sld“ file

5.6.1 Structure

As earlier mentioned the „admin.sld“ file is the heart of QGIS mapserver. All configurations are made with this file. Understanding how to edit this file leads to a variety of visualisation possibilities. For simple symbologies, such as plain fills of polygons or strokes, the file does not have to be edited manually. However, if more complex structures or individual patterns are intended to be visualised the „admin.sld“ file has to be edited manually. Examples of the editing are demonstrated in chapter 7 *Examples*.
The basic structure of an „admin.sld“ file is as follows:

<StyledLayerDescriptor>	Root element: start of sld-file
<UserLayer>	Start of layer
<Name></Name>	Name of layer
<Title></Title>	Title of layer
<Abstract></Abstract>	Description of layer
<HostedVDS/>	Data Source of layer
<UserStyle>	Start of style
<Name></Name>	Name of style
</UserStyle>	End of style
</UserLayer>	End of layer
</StyledLayerDescriptor>	End of .sld-file

Figure 35: Basic structure of an „admin.sld“ file

This structure is generated automatically when a project is created with the „Publish to Web“ plugin provided by QGIS mapserver. The succeeding example shows an „admin.sld“ file which defines a raster layer. For feature layers there are further definitions to be found:
Inside the <UserStyle> tag there is a number of subtabs. This may look as follows:

<UserStyle xmlns="http://www.opengis.net/sld">	Start of style
<Name xmlns="http://www.opengis.net/sld">Single Symbol</Name>	Name of style
<FeatureTypeStyle xmlns="http://www.opengis.net/sld">	Style for feature layer
<Rule xmlns="http://www.opengis.net/sld">	Start of rule
<PointSymbolizer xmlns="http://www.opengis.net/sld">	Symbolizing option
<Graphic xmlns="http://www.opengis.net/sld">	
<Mark xmlns="http://www.opengis.net/sld">	
<WellKnownName xmlns="http://www.opengis.net/sld">rectangle</WellKnownName>	
<Stroke xmlns="http://www.opengis.net/sld">	Definition of stroke
<CssParameter xmlns="http://www.opengis.net/sld" :name="stroke">#000000</CssParameter>	Definition of stroke color
<CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >0</CssParameter>	Definition of stroke-width
</Stroke>	
<Fill xmlns="http://www.opengis.net/sld">	Definition of fill
<CssParameter xmlns="http://www.opengis.net/sld" :name="fill" >#afa3a4</CssParameter>	Definition of fill color
</Fill>	End of fill
</Mark>	End of mark
<Size xmlns="http://www.opengis.net/sld">2.2</Size>	Definition of size
</Graphic>	End of graphic
</PointSymbolizer>	End of symbolizing option
</Rule>	End of rule
</FeatureTypeStyle>	End of feature layer style
</UserStyle>	End of style

Figure 36: Structure of the tag UserStyle

5.6.2 Symbolizers

Depending on whether the object to be displayed is a point, line, polygon, text or diagram different symbolizing options can be used:

<PointSymbolizer>	Point symbol
<LineSymbolizer>	Line symbol
<PolygonSymbolizer>	Polygon symbol
<TextSymbolizer>	Text Symbol
<DiagramSymbolizer>	Diagram symbol

Figure 37: Symbolizers

Within these symbolization options numerous definitions can be changed. A list of implemented options can be found in Appendix B *Definition of symbolizing options*. Note that not all standards as published by the OGC in Document # 05-078r4 are yet supported.

5.6.3 Filter Encoding

Another implementation is called filter encoding. With this the Filter Encoding Implementation Specifications published by the OGC are supported. Therefore symbolization depending on an attribute value is possible. For an example please consult chapter 7.1.4 *Filter Encoding*.

6 Clients

To display the prepared map in a web browser a framework client is needed. All described clients are open source products.

6.1. QGIS

QGIS desktop version is a WMS Client as well. The main advantage of using QGIS as a client is the easy and fast display of data without having to deal with source codes. However, it is a client-sided extension that has to be downloaded and unpacked first. If a map is to be published on the web, this client cannot be used.
To view maps with QGIS desktop version do the following:

1. On the menu toolbar click on "Layers" → "Add WMS Layer" or on the symbol
2. Click on New. The following window will open:

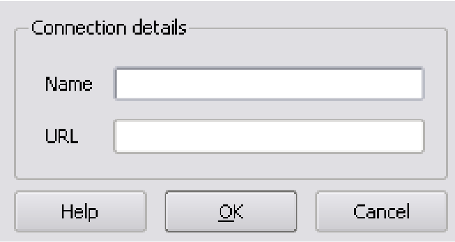
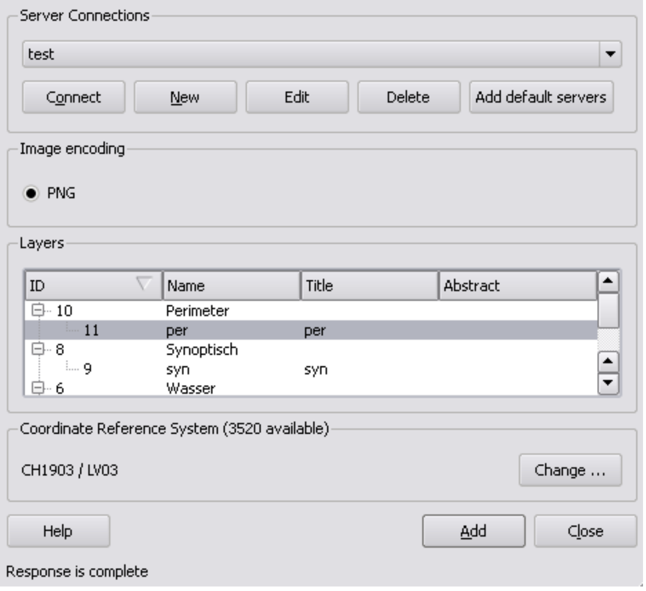


Figure 38: Create a new WMS connection

3. Insert a name for the connection and the URL to the WMS layer you wish to add. Click on OK.
4. In the following window click on Connect.



test

● PNG

ID	Name	Title	Abstract
⊟ 10	Perimeter		
11	per	per	
⊟ 8	Synoptisch		
9	syn	syn	
⊟ 6	Wasser		

CH1903 / LV03

Response is complete

Figure 39: Add Layer(s) from a server

5. Choose the desired layer by clicking on the + beside the layer, then choosing the User Style (in this example "per"). Choosing the User Style leads to the visualisation of the layer as described in the „admin.sld" file. If the layer itself is added (in this example "Perimeter") then the symbolization is not added. This means the layer will appear with default styling which is in black strokes without any fills.
6. Change the coordinate system if required by clicking on Change ... .
7. Clicking on Add completes the procedure.

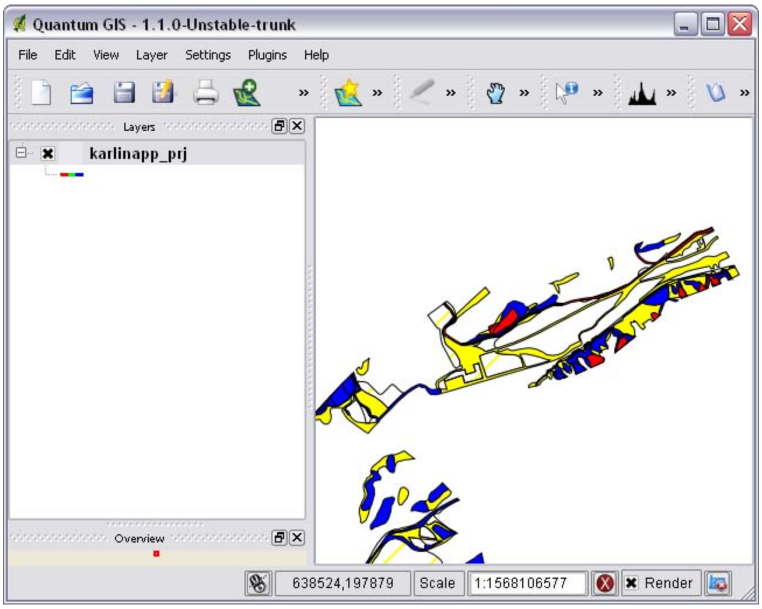
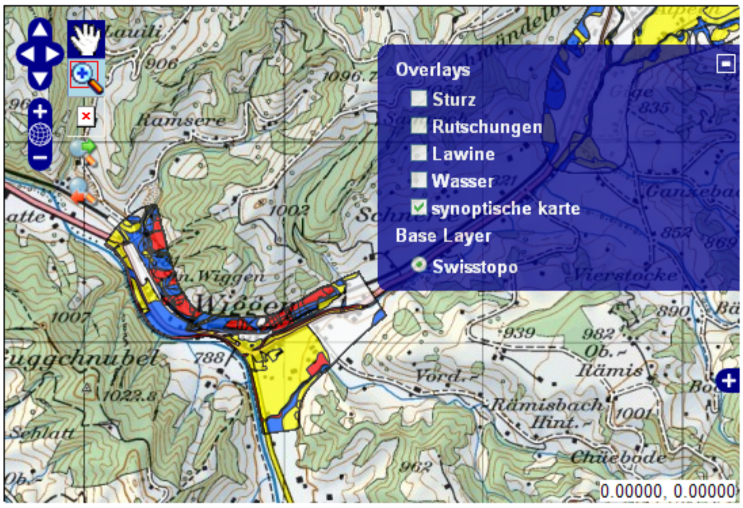


Figure 40: Example of a QGIS map

6.2. Open Layers

Open Layers is a free Javascript library which allows dynamic maps to be displayed in any web browser without any server-sided dependencies. It offers diverse widgets for easily implementing functions as zooming, panning or centering to any displayed map. OpenLayers offers an extensive gallery with examples for its utilization. For further information please visit http://openlayers.org/. An example of the integration of a map in Open Layers can be found in Appendix A *Example of the integration of an „admin.sld" file in OpenLayers*.



Overlays
- □ Sturz
- □ Rutschungen
- □ Lawine
- □ Wasser
- ☑ synoptische karte

Base Layer
- ● Swisstopo

Figure 41: Example of an Open Layers map

6.3. Carto.net

Carto.net is a framework client developed by the institute of cartography at the ETH Zurich. It is based on JavaScript and SVG and offers a list of widgets. For reasons of popularity of JavaScript the visualisation of the framework client has many options. The only disadvantage of this client is the rather short documentation of the product. Further information can be found on http://www.carto.net.

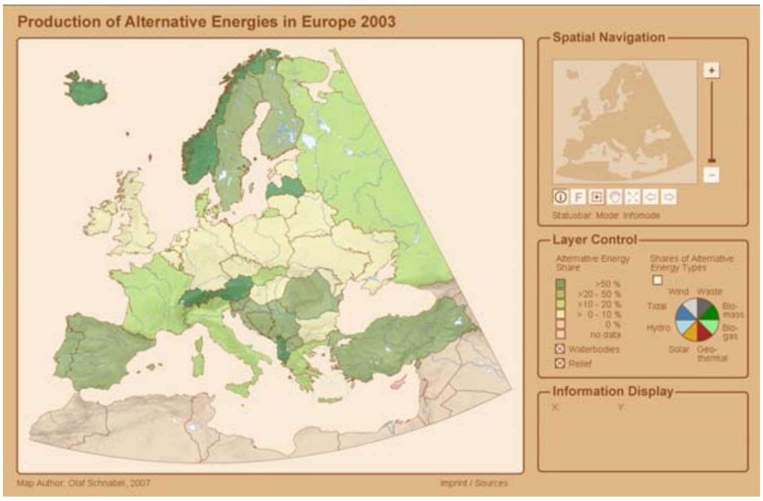


Figure 42: Example of a Cartonet map (CARTONET, 2009)

6.4. Map Bender

MapBender is programmed in PHP and JavaScript and supports PostGIS and MySQL databases. A great advantage of this client is the comprehensive documentation in a Wiki. It also offers many tools as zooming or panning . A further useful tool is the offering of authentication and authorization services. The following link provides detailed information about the product: http://www.mapbender.org.

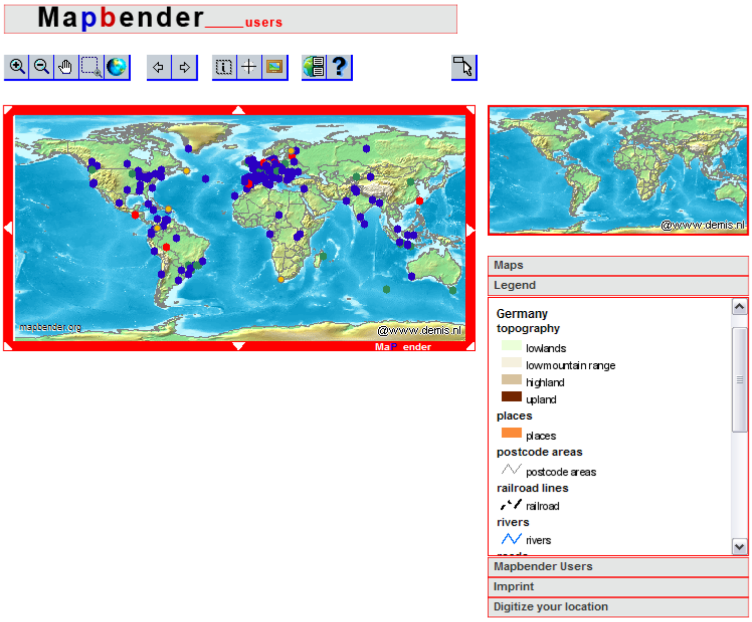


Figure 43: Example of a MapBender map (MapBender, 2009)

7 Examples

The following pages offer different examples of the creation of a web map for different data types. The used dataset is a generalized dataset which comprises of feature data (countries) that are derived from the CIA World DataBank II and a satellite image by NASA. Futhermore, a simple point and line layer are used. All data, intermediate results and definitive results can be found in the ZIP folder complementing this User Manual. If the data is used, make sure to change the path in the "HostedVDS" tag to the directory that contains the data.

The general workflow for the production of a web map is the following:

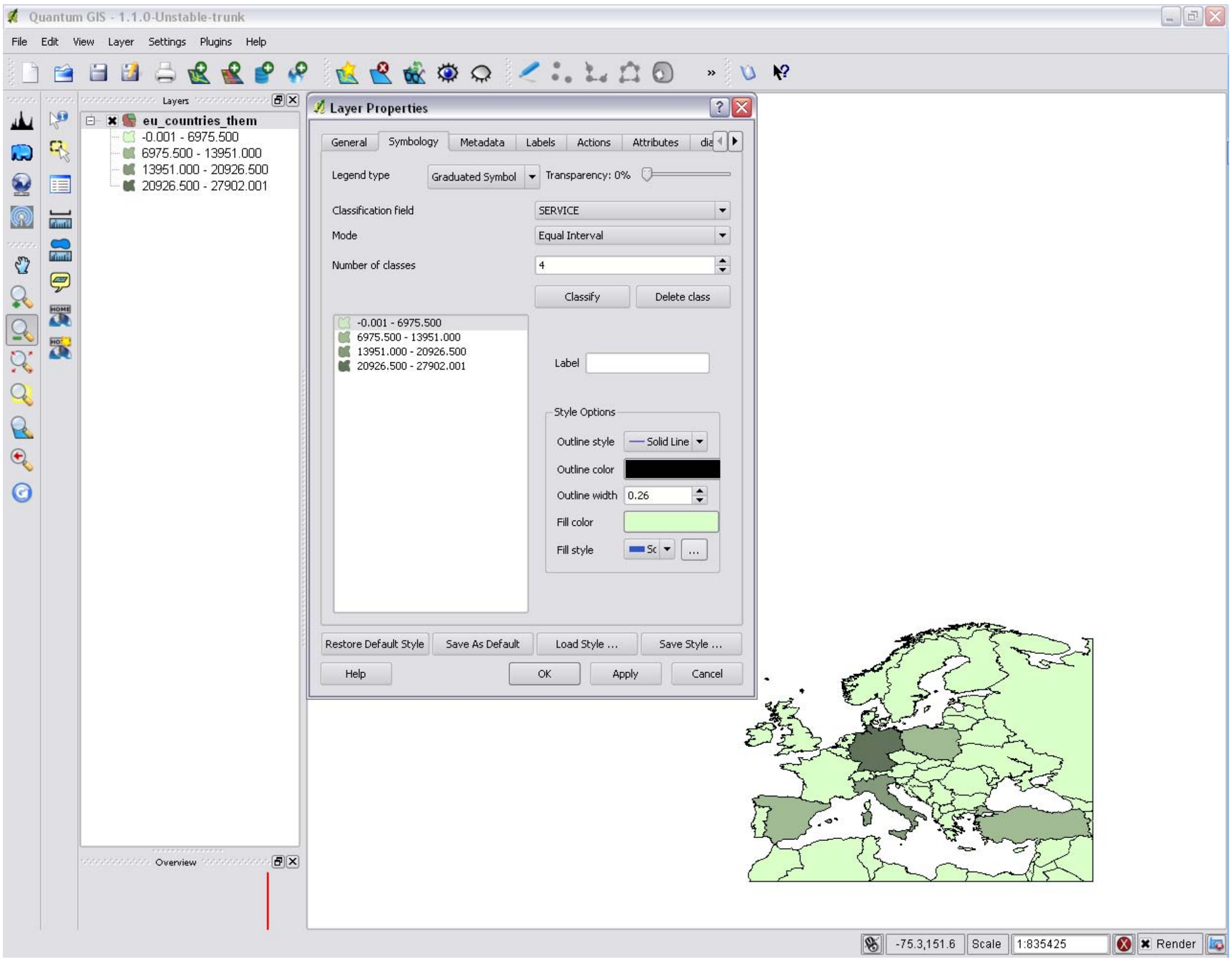
1.	Installation of a webserver	Chapter 3	*Installation of QGIS and QGIS Mapserver*
2.	Installation of QGIS mapserver	Chapter 3	*Installation of QGIS and QGIS Mapserver*
3.	Download of QGIS desktop version	Chapter 3	*Installation of QGIS and QGIS Mapserver*
4.	Data Processing in QGIS desktop version	Chapter 5	*Data Processing in QGIS*
5.	Publishing Data	Chapter 5.5	*Data Publishing with QGIS Mapserver*
6.	Editing the „admin.sld" file	Chapter 5.6	*Editing an „admin.sld" file*
7.	Integration of the map in a framework client	Chapter 6	*Clients*

All examples presume a completion of steps 1 to 3, which is the proper installation of a webserver and QGIS mapserver (see chapter 3 *Installation of QGIS and QGIS Mapserver*), opening QGIS desktop version (chapter 5.1 *Starting QGIS Desktop Version*), management of plugins (chapter 5.2 *Manage Plugins*) and the management of data (chapter 5.3 *Shapefile in PostGIS Import Tool*).

7.1. Polygon Symbolization

7.1.1 *Creation of an „admin.sld“ file for Polygons*

For this example the layer eu_countries is used. The data is processed in QGIS desktop version as described in chapter 5.4 *Preparation of Data in QGIS*. The symbolization properties have the following values:


Quantum GIS - 1.1.0-Unstable-trunk
File Edit View Layer Settings Plugins Help
Layers
Overview
Layer Properties
General Symbology Metadata Labels Actions Attributes dia
Classify Delete class
Restore Default Style Save As Default Load Style ... Save Style ...
Help OK Apply Cancel
-75.3,151.6 Scale 1:835425 Render

eu_countries_them
-0.001 - 6975.500
6975.500 - 13951.000
13951.000 - 20926.500
20926.500 - 27902.001

Legend type: Graduated Symbol
Transparency: 0%
Classification field: SERVICE
Mode: Equal Interval
Number of classes: 4

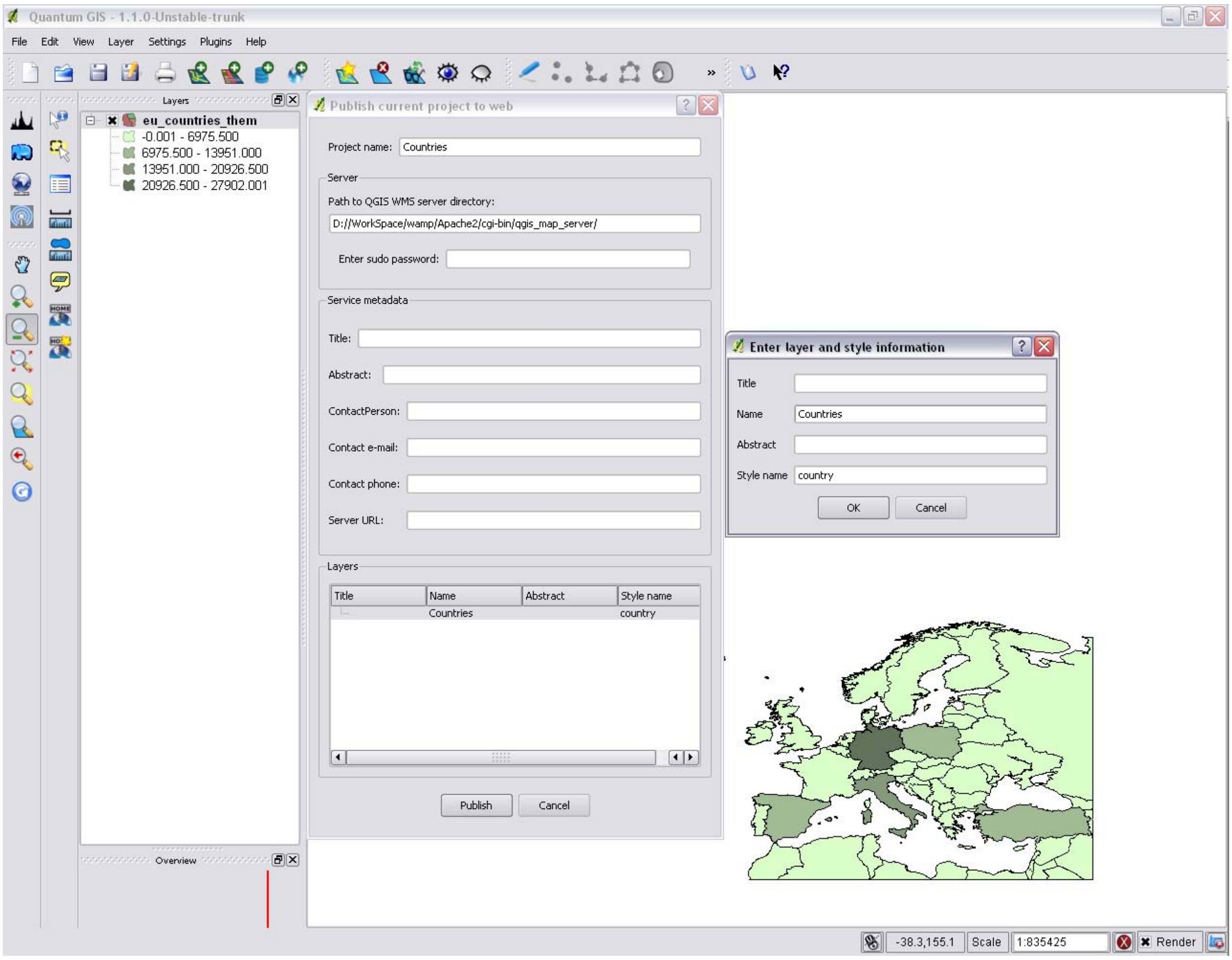
-0.001 - 6975.500
6975.500 - 13951.000
13951.000 - 20926.500
20926.500 - 27902.001

Label:

Style Options
Outline style: Solid Line
Outline color: ■
Outline width: 0.26
Fill color: 🟩
Fill style: So

Figure 44: Layer properties for polygon symbolization

With the plugin “Publish to Web” the SLD-file is automatically generated as described in chapter 5.5 *Data Publishing with QGIS Mapserver*. Absolutely required are the project name, the path to the server directory and an appropriate name and style name for the published layer.


Quantum GIS - 1.1.0-Unstable-trunk
File Edit View Layer Settings Plugins Help
Layers
Overview
Publish current project to web
Enter layer and style information
Publish
Cancel
OK
Cancel
Render

Layers:

- eu_countries_them
  - -0.001 - 6975.500
  - 6975.500 - 13951.000
  - 13951.000 - 20926.500
  - 20926.500 - 27902.001

Publish current project to web

Project name: Countries

Server

Path to QGIS WMS server directory: D://WorkSpace/wamp/Apache2/cgi-bin/qgis_map_server/

Enter sudo password:

Service metadata

Title:

Abstract:

ContactPerson:

Contact e-mail:

Contact phone:

Server URL:

Layers

Title	Name	Abstract	Style name
	Countries		country

Enter layer and style information

Title:

Name: Countries

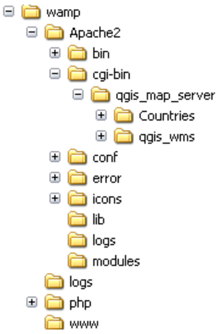
Abstract:

Style name: country

-38.3,155.1 Scale 1:835425

Figure 45: Publish to Web for polygon symbolization

As a result a new folder called “Countries” is created inside the “qgis_map_server” directory as seen in Figure 46.



```
wamp
  Apache2
    bin
    cgi-bin
      qgis_map_server
        Countries
        qgis_wms
    conf
    error
    icons
    lib
    logs
    modules
  logs
  php
  www
```

Figure 46: Folder structure for polygon symbolization

Inside this folder the file called “admin.sld” can be opened with any text editor. It will be structured as follows:

```
<StyledLayerDescriptor xmlns="http://www.opengis.net/sld" units="mm" >
 <UserLayer xmlns="http://www.opengis.net/sld">
```

```
<Name xmlns="http://www.opengis.net/sld">Countries</Name>
<Title xmlns="http://www.opengis.net/sld"></Title>
<Abstract xmlns="http://www.opengis.net/sld"></Abstract>
<HostedVDS xmlns="http://www.opengis.net/sld" providerType="ogr" uri="U:\user\geodata_eu\eu_countries_them.shp" />
<UserStyle xmlns="http://www.opengis.net/sld">
 <Name xmlns="http://www.opengis.net/sld">country</Name>
 <FeatureTypeStyle xmlns="http://www.opengis.net/sld">
  <Rule xmlns="http://www.opengis.net/sld">
   <Filter xmlns="http://www.opengis.net/ogc">
    <PropertyIsBetween xmlns="http://www.opengis.net/ogc">
     <PropertyName xmlns="http://www.opengis.net/ogc">SERVICE</PropertyName>
     <LowerBoundary xmlns="http://www.opengis.net/ogc">
      <Literal xmlns="http://www.opengis.net/ogc">-0.001</Literal>
     </LowerBoundary>
     <UpperBoundary xmlns="http://www.opengis.net/ogc">
      <Literal xmlns="http://www.opengis.net/ogc">6975.500</Literal>
     </UpperBoundary>
    </PropertyIsBetween>
   </Filter>
   <PolygonSymbolizer xmlns="http://www.opengis.net/sld">
    <Stroke xmlns="http://www.opengis.net/sld">
     <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#000000</CssParameter>
     <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >1</CssParameter>
    </Stroke>
    <Fill xmlns="http://www.opengis.net/sld">
     <CssParameter xmlns="http://www.opengis.net/sld" :name="fill" >#daffc9</CssParameter>
    </Fill>
   </PolygonSymbolizer>
  </Rule>
  <Rule xmlns="http://www.opengis.net/sld">
   <Filter xmlns="http://www.opengis.net/ogc">
    <PropertyIsBetween xmlns="http://www.opengis.net/ogc">
     <PropertyName xmlns="http://www.opengis.net/ogc">SERVICE</PropertyName>
     <LowerBoundary xmlns="http://www.opengis.net/ogc">
      <Literal xmlns="http://www.opengis.net/ogc">6975.500</Literal>
     </LowerBoundary>
     <UpperBoundary xmlns="http://www.opengis.net/ogc">
      <Literal xmlns="http://www.opengis.net/ogc">13951.000</Literal>
     </UpperBoundary>
    </PropertyIsBetween>
   </Filter>
   <PolygonSymbolizer xmlns="http://www.opengis.net/sld">
    <Stroke xmlns="http://www.opengis.net/sld">
     <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#000000</CssParameter>
     <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >1</CssParameter>
    </Stroke>
    <Fill xmlns="http://www.opengis.net/sld">
     <CssParameter xmlns="http://www.opengis.net/sld" :name="fill" >#a1bb94</CssParameter>
    </Fill>
   </PolygonSymbolizer>
  </Rule>
  <Rule xmlns="http://www.opengis.net/sld">
   <Filter xmlns="http://www.opengis.net/ogc">
    <PropertyIsBetween xmlns="http://www.opengis.net/ogc">
     <PropertyName xmlns="http://www.opengis.net/ogc">SERVICE</PropertyName>
     <LowerBoundary xmlns="http://www.opengis.net/ogc">
      <Literal xmlns="http://www.opengis.net/ogc">13951.000</Literal>
     </LowerBoundary>
     <UpperBoundary xmlns="http://www.opengis.net/ogc">
      <Literal xmlns="http://www.opengis.net/ogc">20926.500</Literal>
     </UpperBoundary>
```

```
        </PropertyIsBetween>
       </Filter>
       <PolygonSymbolizer xmlns="http://www.opengis.net/sld">
        <Stroke xmlns="http://www.opengis.net/sld">
         <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#000000</CssParameter>
         <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >1</CssParameter>
        </Stroke>
        <Fill xmlns="http://www.opengis.net/sld">
         <CssParameter xmlns="http://www.opengis.net/sld" :name="fill" >#869b7b</CssParameter>
        </Fill>
       </PolygonSymbolizer>
      </Rule>
      <Rule xmlns="http://www.opengis.net/sld">
       <Filter xmlns="http://www.opengis.net/ogc">
        <PropertyIsBetween xmlns="http://www.opengis.net/ogc">
         <PropertyName xmlns="http://www.opengis.net/ogc">SERVICE</PropertyName>
         <LowerBoundary xmlns="http://www.opengis.net/ogc">
          <Literal xmlns="http://www.opengis.net/ogc">20926.500</Literal>
         </LowerBoundary>
         <UpperBoundary xmlns="http://www.opengis.net/ogc">
          <Literal xmlns="http://www.opengis.net/ogc">27902.001</Literal>
         </UpperBoundary>
        </PropertyIsBetween>
       </Filter>
       <PolygonSymbolizer xmlns="http://www.opengis.net/sld">
        <Stroke xmlns="http://www.opengis.net/sld">
         <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#000000</CssParameter>
         <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >1</CssParameter>
        </Stroke>
        <Fill xmlns="http://www.opengis.net/sld">
         <CssParameter xmlns="http://www.opengis.net/sld" :name="fill" >#62735b</CssParameter>
        </Fill>
       </PolygonSymbolizer>
      </Rule>
     </FeatureTypeStyle>
    </UserStyle>
   </UserLayer>
</StyledLayerDescriptor>
```

To view the symbolization of this file a WMS layer can be imported in QGIS. To do that the „admin.sld“ file first has to be placed in the main „qgis_map_server“ directory as explained in chapter 5.6 *Editing an „admin.sld“ file*. Afterwards this layer can be opened in QGIS with the instructions of chapter 6.1 *QGIS* which leads to the following visualization of the style:

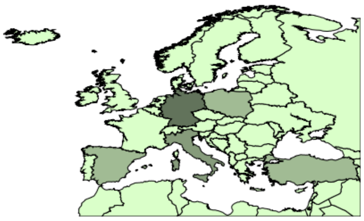


Figure 47: WMS layer for polygon symbolization

7.1.2 Adaption of the Dasharray of an Outline Stroke

If this visualization result does not turn out satisfactory the style can directly be changed in the „admin.sld“ file. The outline color which is at the moment black and a solid line wants to be changed to a darkbrown color and dashed line. To do this all stroke paragraphs have to be changed into the following code:

```
 <Stroke xmlns="http://www.opengis.net/sld">
   <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#000000</CssParameter>
   <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >1</CssParameter>
  <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-dasharray">2 1 3</CssParameter>
 </Stroke>
```

The result can be viewed in QGIS after a reload of the layer.
Note: To refresh the layer visualization move the layer with the panning tool in QGIS desktop version. The outline strokes will change consequently:

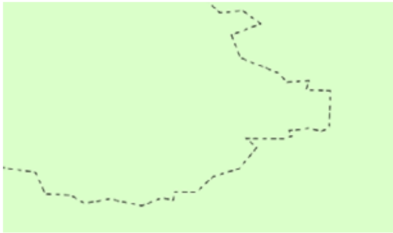


Figure 48: Outline style polygon symbolization

7.1.3 Creation of a User-defined Pattern in SVG

A very useful functionality is the implementation of user-defined patterns. To do so the pattern has to be available in the Scalable Vector Graphics format (SVG). The easiest way to create such a pattern is the use of a graphics program such as Adobe Illustrator or Inkscape. The graphic can be exported as a SVG-File and opened in any text editor.
Inside the polygon symbolizer and the fill-tag a new tag named <pattern> has to be created with the size of the SVG-pattern. Inside the tag <pattern> a new group <g> is implemented in which the SVG-symbol is pasted from the text document. The example below shows the structure the “admin.sld” file should have after the editing:

```
<PolygonSymbolizer xmlns="http://www.opengis.net/sld">
 <Stroke xmlns="http://www.opengis.net/sld">
  <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#000000</CssParameter>
  <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >0</CssParameter>
 </Stroke>
 <Fill xmlns="http://www.opengis.net/sld">
  <pattern x="0" y="0" width="12" height="12">
   <g>
   <svg>
     <g>
     <rect style="fill:none;" width="12" height="12"/>
     <line style="fill:none;stroke:#FEDC00;stroke-width:2;" x1="6" y1="12" x2="6" y2="0"/>
    </g>
```

```
        </svg>
      </g>
    </pattern>
  </Fill>
</PolygonSymbolizer>
```

The resulting pattern will look as follows when published:

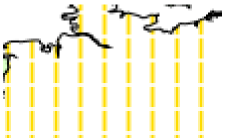
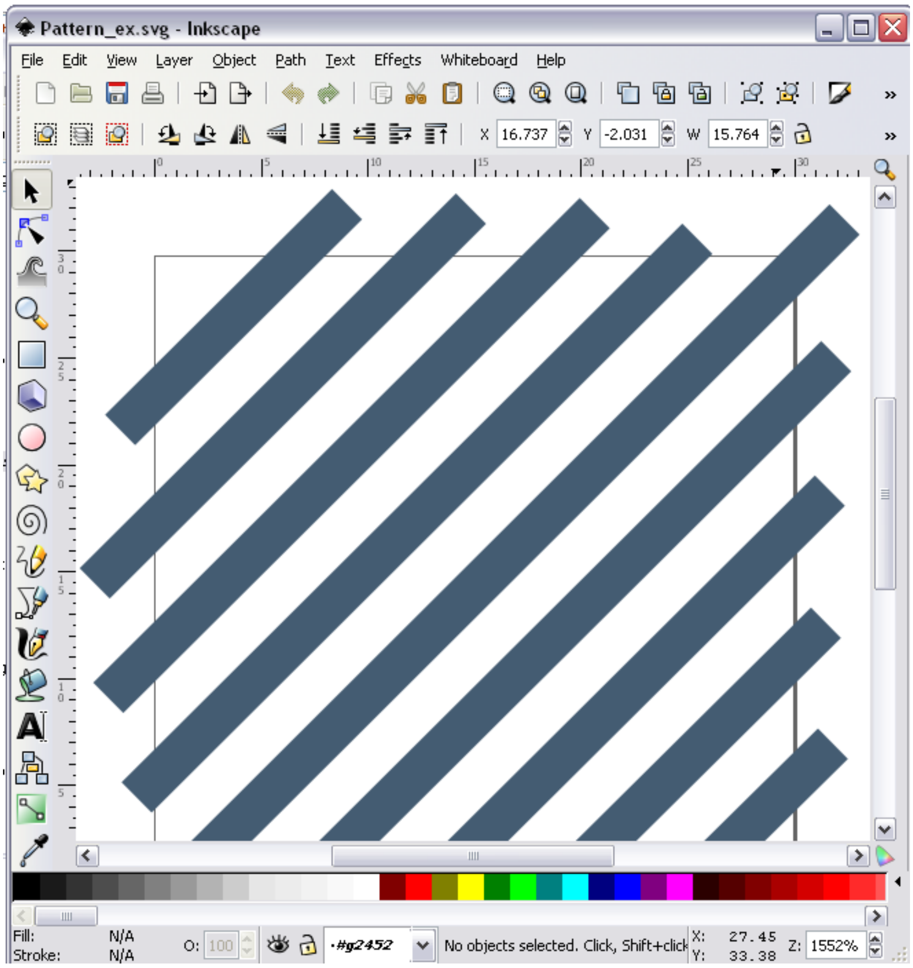


Figure 49: User-defined pattern

The following example demonstrates the use of Inkscape to define more advanced patterns. The screenshot below shows an example of the created pattern:



X 16.737 Y -2.031 W 15.764

Fill: N/A
Stroke: N/A
O: 100
#g2452
No objects selected. Click, Shift+click
X: 27.45
Y: 33.38
Z: 1552%

Figure 50: Creation of a pattern in Inkscape

This Inkscape-file is saved in the SVG format. Afterwards it is opened in a text editor and shows the structure shown below. Note that this is only an extraction of the complete file which can be found in the ZIP folder complementing this User Manual.

```
<?xml version="1.0" encoding="iso-8859-1"?>
<!-- Generator: Adobe Illustrator 13.0.2, SVG Export Plug-In . SVG Version: 6.00 Build 14948)  -->
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN" "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">
<svg
...
</svg>
```

This code is now included in the „admin.sld“ file until it looks as seen in the following code:

```
<PolygonSymbolizer xmlns="http://www.opengis.net/sld">
        <Fill xmlns="http://www.opengis.net/sld">
         <pattern width="29" height="29" x="0" y="0">
         <g>
          <svg
           xmlns:dc="http://purl.org/dc/elements/1.1/"
           xmlns:cc="http://creativecommons.org/ns#"
           xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
           xmlns:svg="http://www.w3.org/2000/svg"
           xmlns=http://www.w3.org/2000/svg
...
          </svg>
         </g>
         </pattern>
        </Fill>
</PolygonSymbolizer>
```

The code leads to the following result:

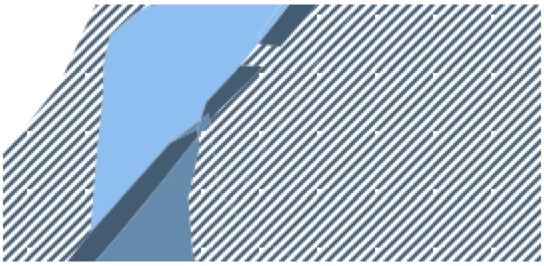


Figure 51: User-defined pattern created in Inkscape

7.1.4 Filter Encoding

Another helpful symbolization option is the use of filter encoding. With it objects with a certain attribute value can be symbolized separately. The following code shows an example of its use. All objects that have a value between -0.001 and 6975.500 in the attribute called “SERVICE” will be symbolized as defined between the <PolygonSymbolizer>-tags.

```
<Rule xmlns="http://www.opengis.net/sld">
 <Filter xmlns="http://www.opengis.net/ogc">
  <PropertyIsBetween xmlns="http://www.opengis.net/ogc">
   <PropertyName xmlns="http://www.opengis.net/ogc">SERVICE</PropertyName>
   <LowerBoundary xmlns="http://www.opengis.net/ogc">
    <Literal xmlns="http://www.opengis.net/ogc">-0.001</Literal>
   </LowerBoundary>
   <UpperBoundary xmlns="http://www.opengis.net/ogc">
    <Literal xmlns="http://www.opengis.net/ogc">6975.500</Literal>
```

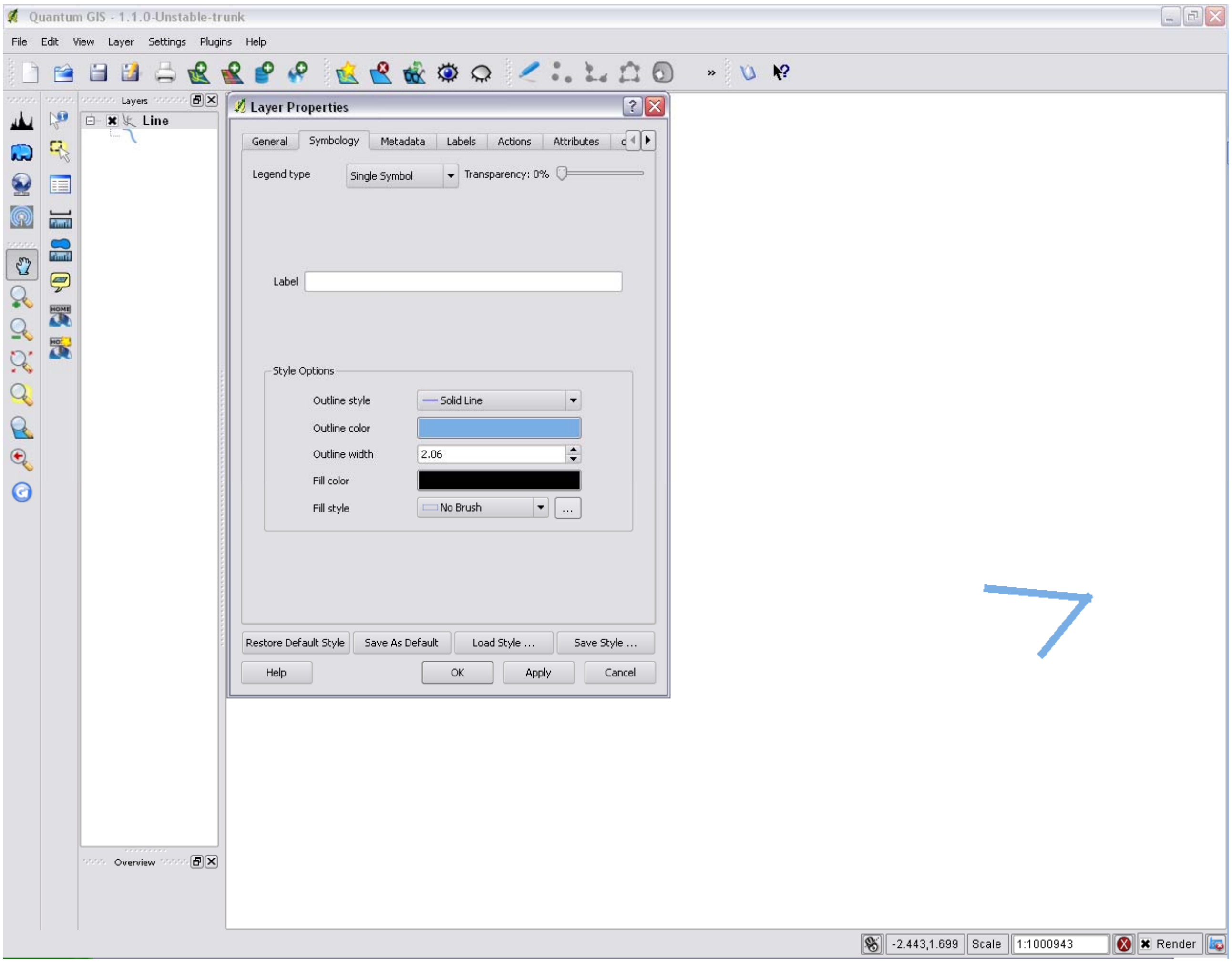
```
      </UpperBoundary>
    </PropertyIsBetween>
  </Filter>
  <PolygonSymbolizer xmlns="http://www.opengis.net/sld">
    <Stroke xmlns="http://www.opengis.net/sld">
      <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#000000</CssParameter>
      <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >0</CssParameter>
    </Stroke>
    <Fill xmlns="http://www.opengis.net/sld">
      <CssParameter xmlns="http://www.opengis.net/sld" :name="fill" >#daffc9</CssParameter>
    </Fill>
  </PolygonSymbolizer>
</Rule>
```

For further styling options please refer to Appendix B *Definition of symbolizing options* where all implemented possibilities are listed.

7.2. Line Symbolization

7.2.1 *Creation of an „admin.sld“ file for Lines*

For this symbolization method the layer “Line” is used. The data is processed in QGIS desktop version as described in chapter 5.4 *Preparation of Data in QGIS*. The symbolization properties have the following values:



Legend type: Single Symbol
Transparency: 0%
Label:

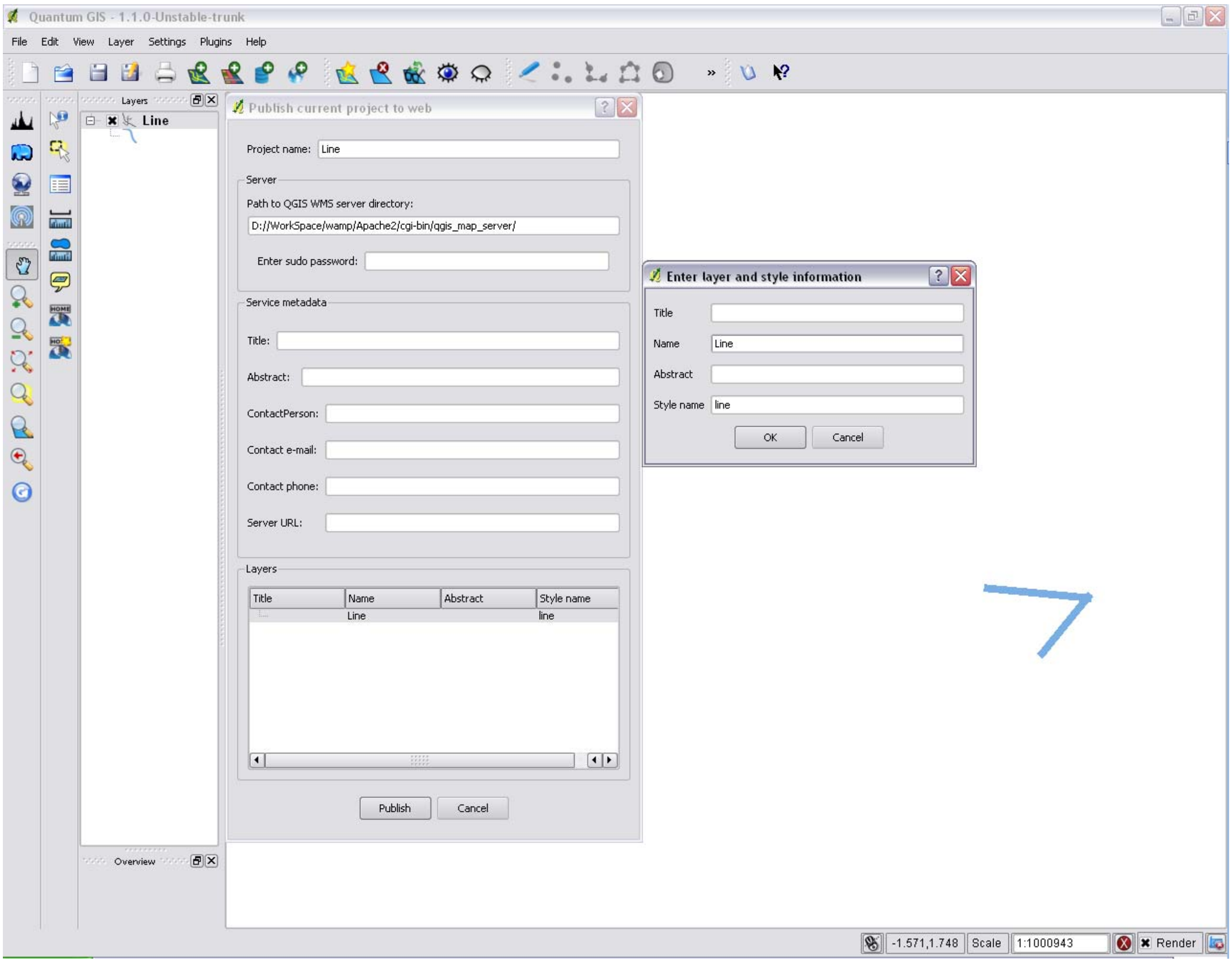
Style Options

Outline style: Solid Line
Outline color:
Outline width: 2.06
Fill color: ■
Fill style: No Brush

-2.443,1.699 Scale 1:1000943

Figure 52: Layer properties for line symbolization

With the plugin “Publish to Web” the SLD-file is automatically generated as described in chapter 5.5 *Data Publishing with QGIS Mapserver*. Absolutely required are the project name, the path to the server directory and an appropriate name and style name for the published layer.



Quantum GIS - 1.1.0-Unstable-trunk
File Edit View Layer Settings Plugins Help
Layers
Line
Overview
-1.571,1.748
Scale
1:1000943
Render

Publish current project to web

Project name: Line

Server

Path to QGIS WMS server directory: D://WorkSpace/wamp/Apache2/cgi-bin/qgis_map_server/

Enter sudo password:

Service metadata

Title:

Abstract:

ContactPerson:

Contact e-mail:

Contact phone:

Server URL:

Layers

Title	Name	Abstract	Style name
	Line		line

Publish Cancel

Enter layer and style information

Title:

Name: Line

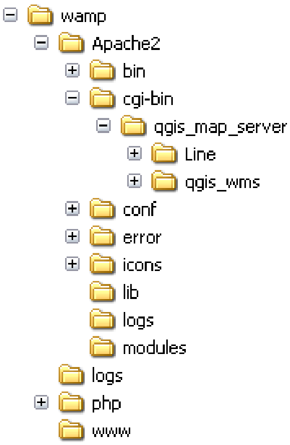
Abstract:

Style name: line

OK Cancel

Figure 53: Publish to Web for line symbolization

As a result a new folder called “Line” is created inside the “qgis_map_server” directory as seen in Figure 54.



```
⊟ wamp
   ⊟ Apache2
      ⊞ bin
      ⊟ cgi-bin
         ⊟ qgis_map_server
            ⊞ Line
            ⊞ qgis_wms
      ⊞ conf
      ⊞ error
      ⊞ icons
        lib
        logs
        modules
     logs
   ⊞ php
     www
```

Figure 54: Folder structure for line symbolization

Inside this folder the file called “admin.sld” can be opened with any text editor. It will be structured as follows:

```
<StyledLayerDescriptor xmlns="http://www.opengis.net/sld" units="mm" >
 <UserLayer xmlns="http://www.opengis.net/sld">
  <Name xmlns="http://www.opengis.net/sld">Line</Name>
  <Title xmlns="http://www.opengis.net/sld"></Title>
  <Abstract xmlns="http://www.opengis.net/sld"></Abstract>
  <HostedVDS xmlns="http://www.opengis.net/sld" providerType="ogr" uri="D:/LineExamples/Line" />
  <UserStyle xmlns="http://www.opengis.net/sld">
   <Name xmlns="http://www.opengis.net/sld">line</Name>
   <FeatureTypeStyle xmlns="http://www.opengis.net/sld">
    <Rule xmlns="http://www.opengis.net/sld">
     <LineSymbolizer xmlns="http://www.opengis.net/sld">
      <Stroke xmlns="http://www.opengis.net/sld">
       <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#79aee5</CssParameter>
       <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >10</CssParameter>
      </Stroke>
     </LineSymbolizer>
    </Rule>
   </FeatureTypeStyle>
  </UserStyle>
 </UserLayer>
</StyledLayerDescriptor>
```

To view the symbolization of this file a WMS layer can be imported in QGIS. To do that the „admin.sld" file first has to be placed in the main "qgis_map_server" directory as explained in chapter 5.6 *Editing an „admin.sld" file*. Afterwards this layer can be opened in QGIS with the instructions of chapter 6.1 *QGIS* which leads to the following visualization of the style:

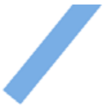


Figure 55: Extract of a WMS layer for line symbolization

7.2.2 Adaption of the Line cap

If this visualization result does not turn out satisfactory the style can directly be changed in the „admin.sld" file. The symbolization of the river is in a light blue color with square line caps. For rounded line caps the stroke code has to be changed into the following lines:

```
<Stroke xmlns="http://www.opengis.net/sld">
 <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#79aee5</CssParameter>
 <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >10</CssParameter>
 <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-linecap" >round</CssParameter>
</Stroke>
```

The result can be viewed in QGIS after a reload of the layer.
Note: To refresh the layer visualization move the layer with the panning tool in QGIS desktop version. The line cap will change consequently:

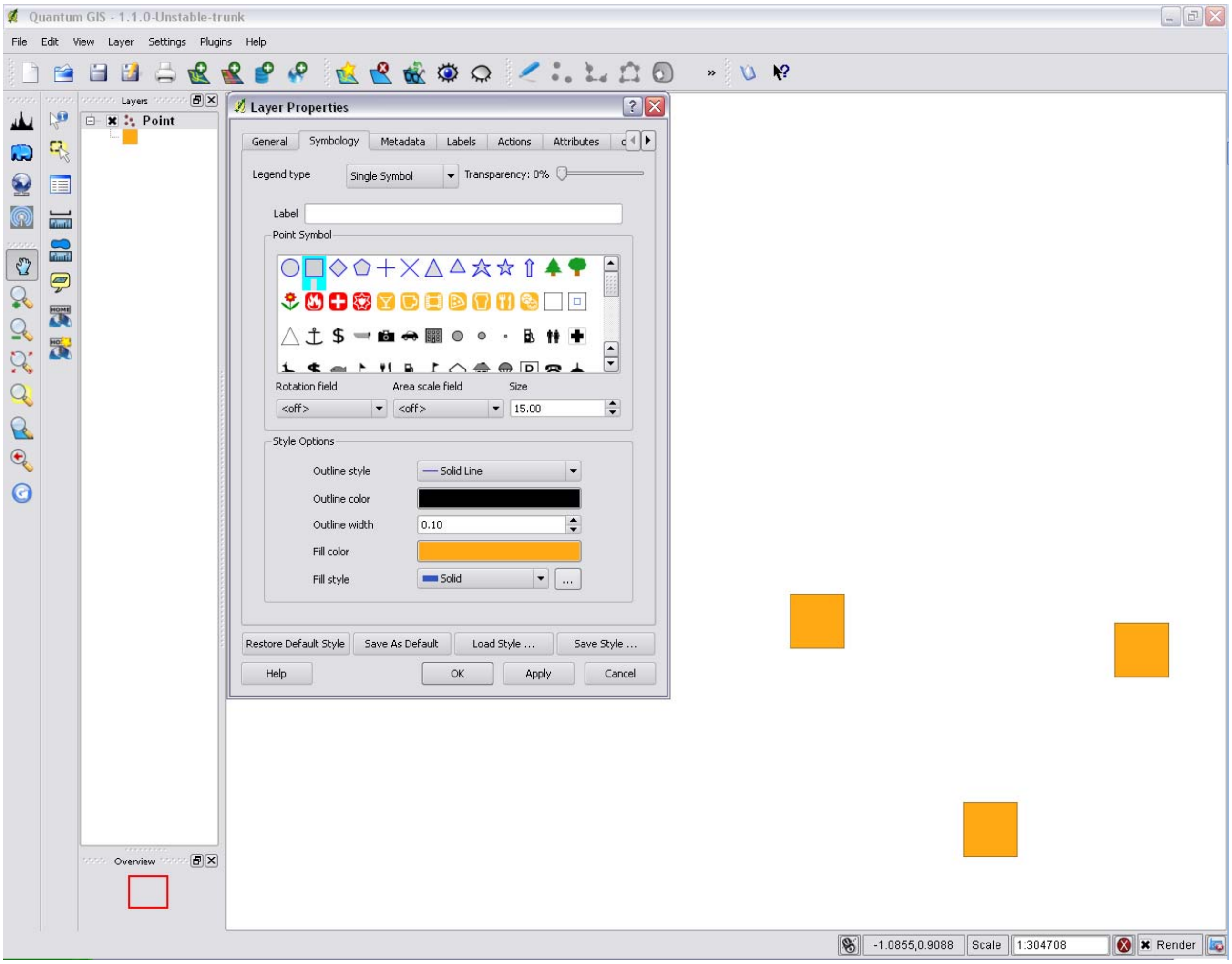
Figure 56: Line cap in line symbolization

For further styling options please refer to Appendix B *Definition of symbolizing options* where all implemented possibilities are listed.

7.3. Point Symbolization

7.3.1 Creation of an „admin.sld“ file for Points

To demonstrate the symbolization possibilities of point symbols the layer “Point” is used. The data is processed in QGIS desktop version as described in chapter 5.4 *Preparation of Data in QGIS*. The symbolization properties have the following values:

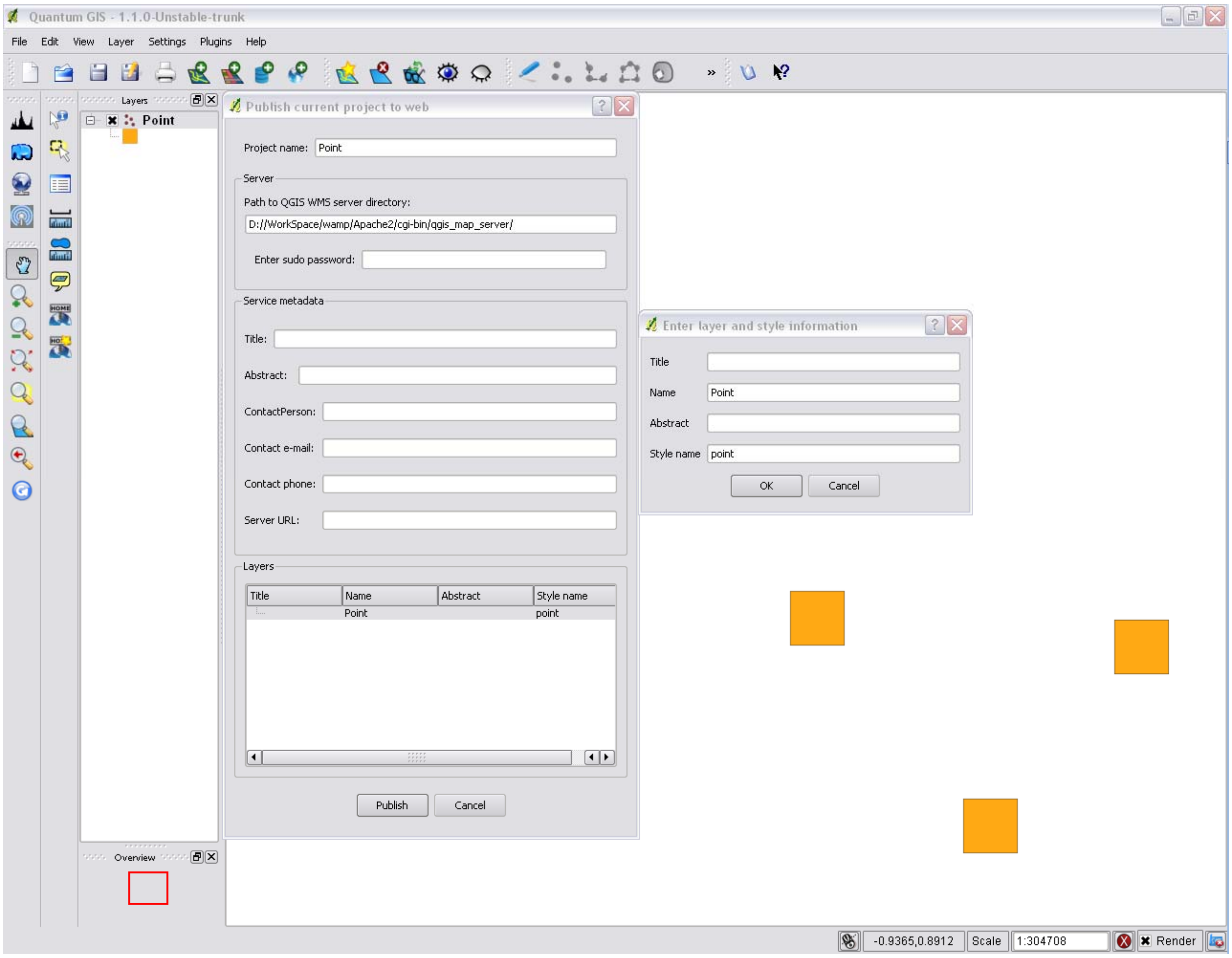


Quantum GIS - 1.1.0-Unstable-trunk
File Edit View Layer Settings Plugins Help
Layers
Point
Overview
Layer Properties
General Symbology Metadata Labels Actions Attributes
Label
Point Symbol
Style Options
Restore Default Style Save As Default Load Style ... Save Style ...
Help OK Apply Cancel
-1.0855,0.9088 Scale 1:304708 Render

Legend type: Single Symbol
Transparency: 0%
Rotation field: <off>
Area scale field: <off>
Size: 15.00
Outline style: Solid Line
Outline width: 0.10
Fill style: Solid

Figure 57: Layer properties for point symbolization

With the plugin “Publish to Web” the SLD-file is automatically generated as described in chapter 5.5 *Data Publishing with QGIS Mapserver*. Absolutely required are the project name, the path to the server directory and an appropriate name and style name for the published layer.



Publish current project to web

Project name: Point

Server

Path to QGIS WMS server directory: D://WorkSpace/wamp/Apache2/cgi-bin/qgis_map_server/

Enter sudo password:

Service metadata

Title:

Abstract:

ContactPerson:

Contact e-mail:

Contact phone:

Server URL:

Layers

Title	Name	Abstract	Style name
	Point		point

Enter layer and style information

Title

Name Point

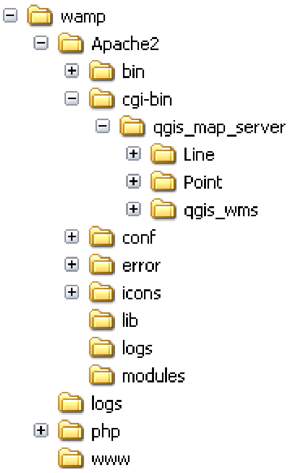
Abstract

Style name point

-0.9365,0.8912 Scale 1:304708

Figure 58: Publish to Web for point symbolization

As a result a new folder called “Point” is created inside the “qgis_map_server” directory as seen in Figure 59.



```
wamp
 Apache2
  bin
  cgi-bin
   qgis_map_server
    Line
    Point
    qgis_wms
  conf
  error
  icons
  lib
  logs
  modules
 logs
 php
 www
```

Figure 59: Folder structure for point symbolization

Inside this folder the file called “admin.sld” can be opened with any text editor. It will be structured as follows:

```
<StyledLayerDescriptor xmlns="http://www.opengis.net/sld" units="mm" >
 <UserLayer xmlns="http://www.opengis.net/sld">
  <Name xmlns="http://www.opengis.net/sld">Point</Name>
  <Title xmlns="http://www.opengis.net/sld"></Title>
  <Abstract xmlns="http://www.opengis.net/sld"></Abstract>
  <HostedVDS xmlns="http://www.opengis.net/sld" providerType="ogr" uri="D:\PointExample\Point.shp" />
  <UserStyle xmlns="http://www.opengis.net/sld">
   <Name xmlns="http://www.opengis.net/sld">point</Name>
   <FeatureTypeStyle xmlns="http://www.opengis.net/sld">
    <Rule xmlns="http://www.opengis.net/sld">
     <PointSymbolizer xmlns="http://www.opengis.net/sld">
      <Graphic xmlns="http://www.opengis.net/sld">
       <Mark xmlns="http://www.opengis.net/sld">
        <WellKnownName xmlns="http://www.opengis.net/sld">rectangle</WellKnownName>
        <Stroke xmlns="http://www.opengis.net/sld">
         <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#000000</CssParameter>
         <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >0</CssParameter>
        </Stroke>
        <Fill xmlns="http://www.opengis.net/sld">
         <CssParameter xmlns="http://www.opengis.net/sld" :name="fill" >#ffa914</CssParameter>
        </Fill>
       </Mark>
       <Size xmlns="http://www.opengis.net/sld">15</Size>
      </Graphic>
     </PointSymbolizer>
    </Rule>
   </FeatureTypeStyle>
  </UserStyle>
 </UserLayer>
</StyledLayerDescriptor>
```

To view the symbolization of this file a WMS layer can be imported in QGIS. To do that the „admin.sld“ file first has to be placed in the main „qgis_map_server“ directory as explained in chapter 5.6 *Editing an „admin.sld“ file*.

Note: This procedure is at the moment only automatically possible with some well-known-name object such as circle or square. Other symbols have to be manually changed by editing the „admin.sld“ file which will be explained on the next page.

7.3.2 Adaption to a different Point Symbol

After the described procedure this layer can be opened in QGIS with the instructions of chapter 6.1 *QGIS* which leads to the following visualization of the style:

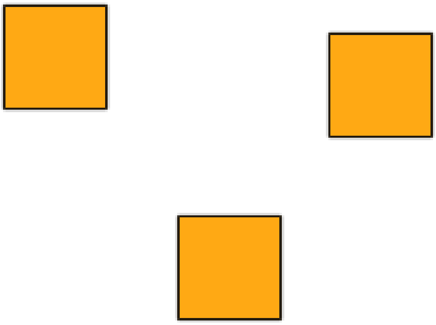


Figure 60: Extract of a WMS layer for point symbolization

If this visualization result does not turn out satisfactory the style can directly be changed in the „admin.sld“ file. At the moment the point symbols are orange squares. To change that symbolization to another well-known-name symbol exchange the WellKnownName-tag with the following:

```
<WellKnownName xmlns="http://www.opengis.net/sld">star</WellKnownName>
```

The result can be viewed in QGIS after a reload of the layer.
Note: To refresh the layer visualization move the layer with the panning tool in QGIS desktop version. The symbol will change consequently:

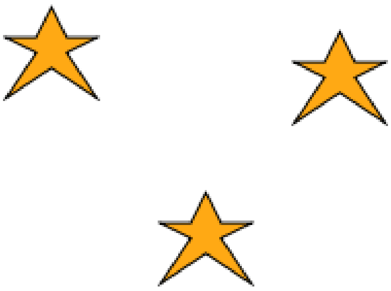
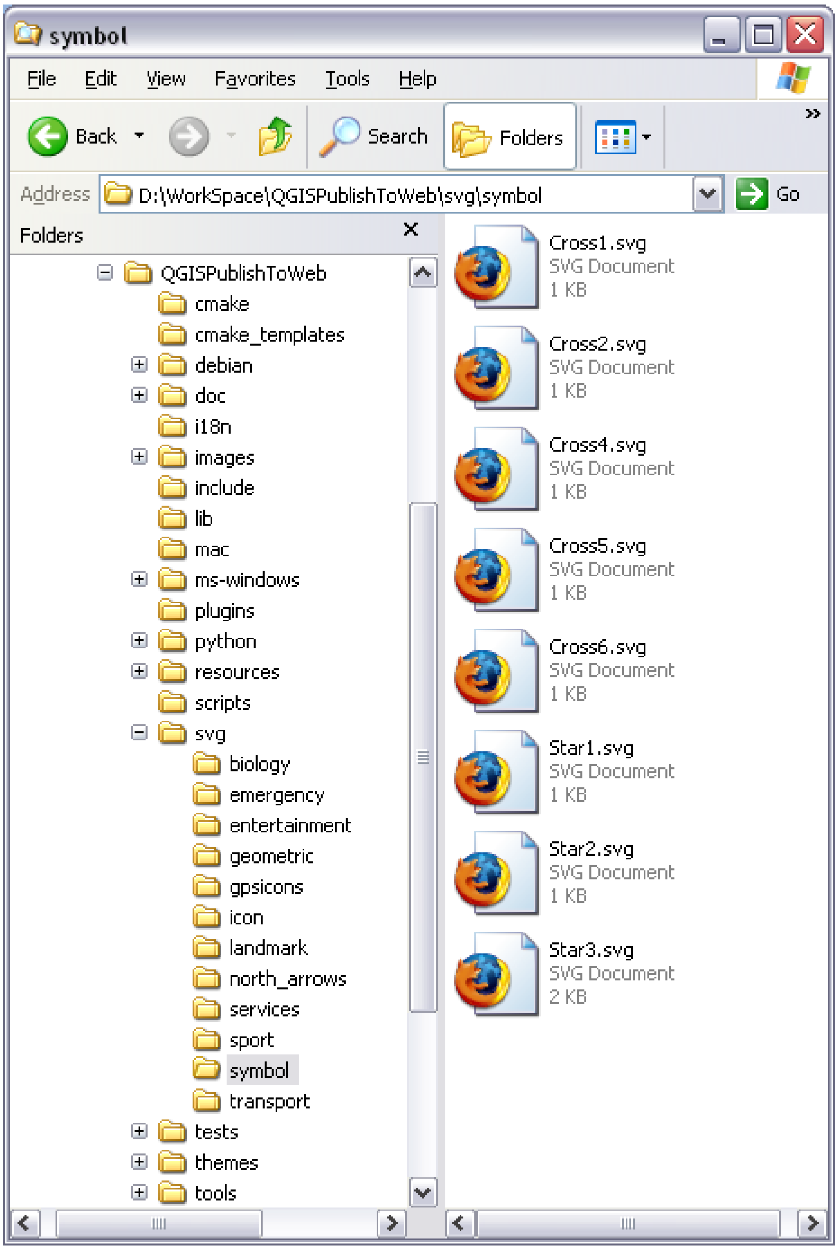


Figure 61: Line cap in line symbolization

7.3.3 Adaption to a User-defined Point Symbol

A user-defined symbol can be visualized as well. To do so the symbol has to be available in the Scalable Vector Graphics-format (SVG). The easiest way to create such a symbol is the use of a graphics program such as Adobe Illustrator or Inkscape. The graphic can be exported as a SVG file.
To be able to use this user created symbol it has to be copied into the SVG-file inside the "QGISPublishtoWeb" folder as shown in the screenshot below:



Address D:\WorkSpace\QGISPublishToWeb\svg\symbol

Figure 62: Placing the SVG-Symbol

Alternatively the SVG code can be opened inside any text editor. The code can then be inserted into the „admin.sld" file. Inside the mark-tag a new tag called "SvgSymbol" has to be created in which the SVG-code has to be inserted:

```
<Mark xmlns="http://www.opengis.net/sld">
 <SvgSymbol xmlns="http://www.opengis.net/sld">
  <svg width="100%" height="100%" xmlns="http://www.w3.org/2000/svg">
   <g xmln="http://www.w2.org/2000/svg">
    <rect x="0" y="0" height="30" width="30" style="fill:#0000b9"/>
    <line x1="6" y1="0" x2="30" y2="12" style="stroke:#00ffff"/>
   </g>
  </svg>
 </SvgSymbol>
</Mark>
```

The following output is created:

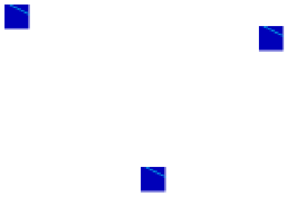


Figure 63: User-defined symbolization

For further styling options please refer to Appendix B *Definition of symbolizing options* where all implemented possibilities are listed.

7.4. Text Symbolization

Text symbolization is not yet implemented to appear automatically. However by editing an „admin.sld“ file manually labels can easily be displayed.
The following SLD-file shows the point symbolization from the example above.

```
<StyledLayerDescriptor xmlns="http://www.opengis.net/sld" units="mm" >
  <UserLayer xmlns="http://www.opengis.net/sld">
    <Name xmlns="http://www.opengis.net/sld">Point</Name>
    <Title xmlns="http://www.opengis.net/sld"></Title>
    <Abstract xmlns="http://www.opengis.net/sld"></Abstract>
    <HostedVDS xmlns="http://www.opengis.net/sld" providerType="ogr" uri="D:\PointExample\Point.shp" />
    <UserStyle xmlns="http://www.opengis.net/sld">
      <Name xmlns="http://www.opengis.net/sld">point</Name>
      <FeatureTypeStyle xmlns="http://www.opengis.net/sld">
        <Rule xmlns="http://www.opengis.net/sld">
          <PointSymbolizer xmlns="http://www.opengis.net/sld">
            <Graphic xmlns="http://www.opengis.net/sld">
              <Mark xmlns="http://www.opengis.net/sld">
                <SvgSymbol xmlns="http://www.opengis.net/sld">
                  <svg width="100%" height="100%" xmlns="http://www.w3.org/2000/svg">
                    <g xmln="http://www.w2.org/2000/svg">
                      <rect x="0" y="0" height="30" width="30" style="fill:#0000b9"/>
                      <line x1="6" y1="0" x2="30" y2="12" style="stroke:#00ffff"/>
                    </g>
                  </svg>
                </SvgSymbol>
              </Mark>
              <Size xmlns="http://www.opengis.net/sld">15</Size>
            </Graphic>
          </PointSymbolizer>
        </Rule>
      </FeatureTypeStyle>
    </UserStyle>
  </UserLayer>
</StyledLayerDescriptor>
```

To insert a label for every point on the right of the point symbol the following lines have to be placed inside the rule-element:

```
<TextSymbolizer xmlns="http://www.opengis.net/sld">
  <Label xmlns="http://www.opengis.net/sld">
    <PropertyName xmlns="http://www.opengis.net/sld">PointExamp</PropertyName>
  </Label>
  <LabelPlacement xmlns="http://www.opengis.net/sld">
    <PointPlacement xmlns="http://www.opengis.net/sld">
      <DisplacementX xmlns="http://www.opengis.net/sld">30</DisplacementX>
    </PointPlacement>
  </LabelPlacement>
</TextSymbolizer>
```

The following graphic will result thereafter:

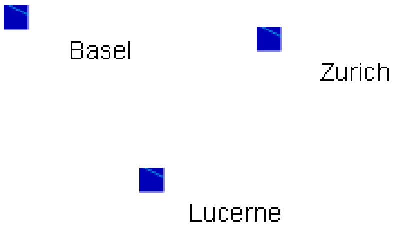


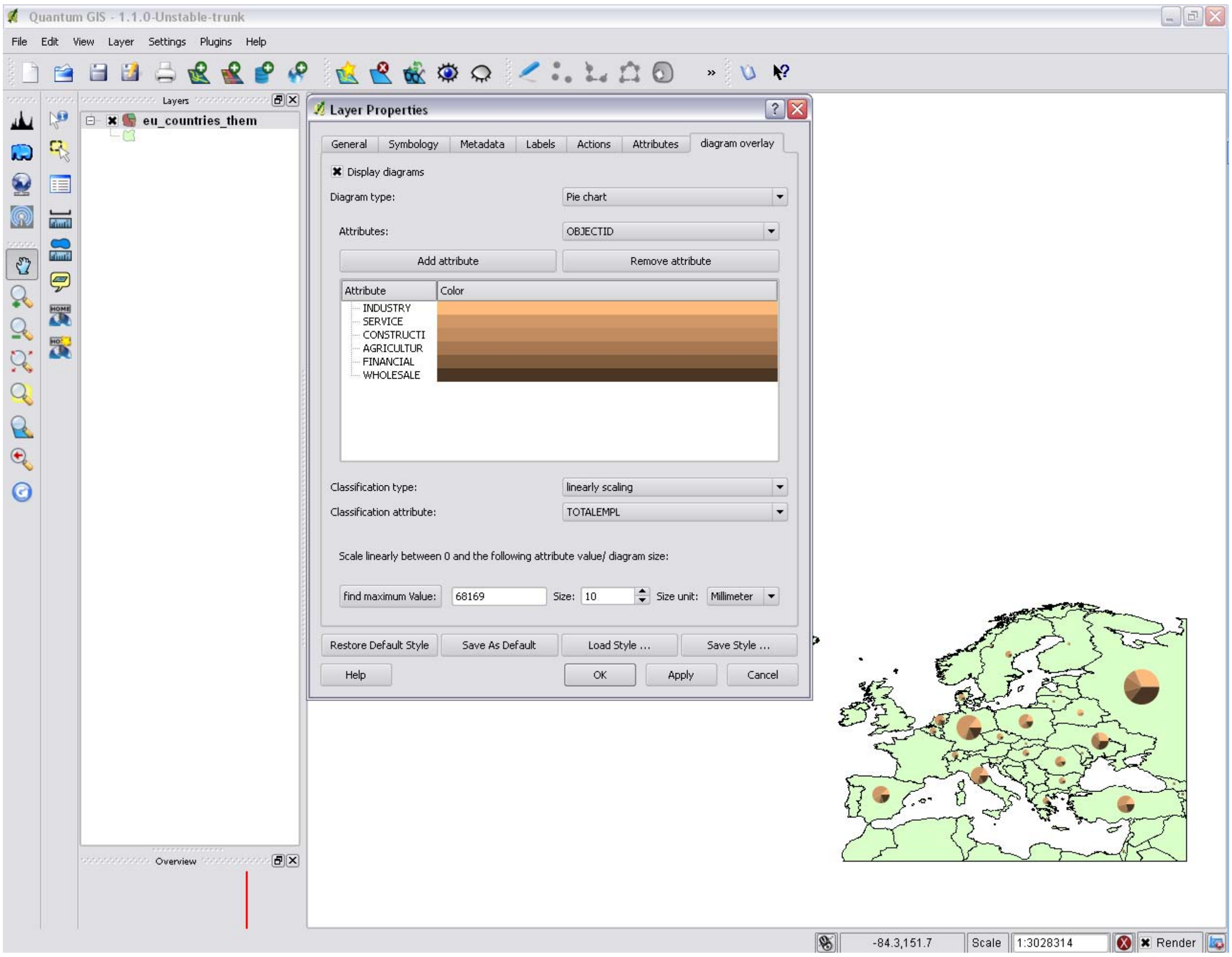
Figure 64: Text symbolization

For further styling options please refer to Appendix B *Definition of symbolizing options* where all implemented possibilities are listed.

7.5. Diagram Symbolization

7.5.1 Creation of an „admin.sld" file for Diagrams

To demonstrate the symbolization possibilities of thematic data in diagrams the layer eu_countries is used. The data is processed in QGIS desktop version as described in chapter 5.4 *Preparation of Data in QGIS* and chapter 5.4.3 *Diagram Overlay*. The symbolization properties have the following values:



☒ Display diagrams

Diagram type: Pie chart

Attributes: OBJECTID

Attribute	Color
INDUSTRY	🟧
SERVICE	🟫
CONSTRUCTI	🟫
AGRICULTUR	🟫
FINANCIAL	🟫
WHOLESALE	🟫

Classification type: linearly scaling

Classification attribute: TOTALEMPL

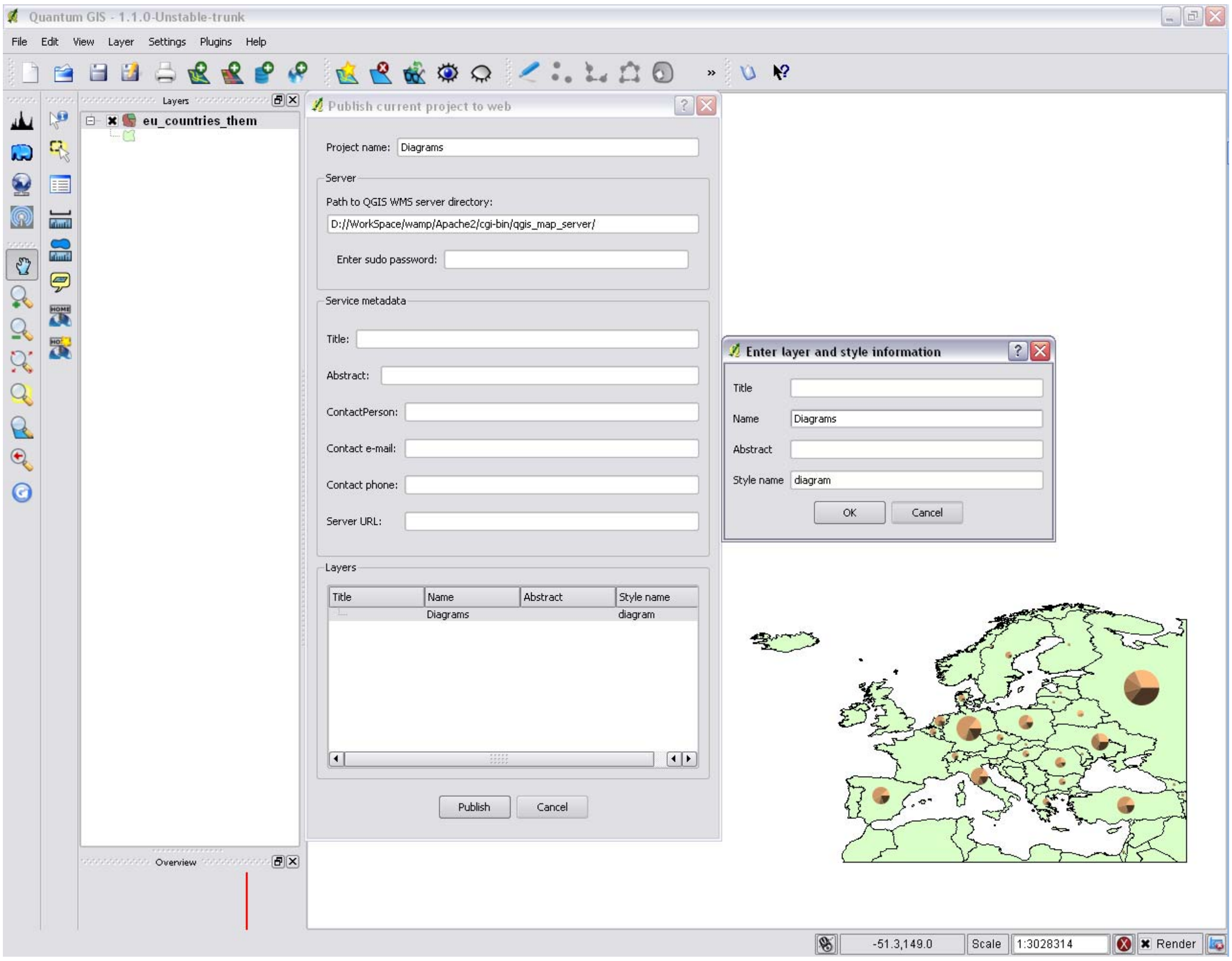
Scale linearly between 0 and the following attribute value/ diagram size:

find maximum Value: 68169 Size: 10 Size unit: Millimeter

-84.3,151.7 Scale 1:3028314

Figure 65: Layer properties for diagram symbolization

With the plugin “Publish to Web” the SLD file is automatically generated as described in chapter 5.5 *Data Publishing with QGIS Mapserver*. Absolutely required are the project name, the path to the server directory and an appropriate name and style name for the published layer.


Quantum GIS - 1.1.0-Unstable-trunk
File Edit View Layer Settings Plugins Help
Layers
eu_countries_them
Overview
Publish current project to web
Enter layer and style information
OK
Cancel
Publish
Cancel
Render

Project name: Diagrams

Server

Path to QGIS WMS server directory:
D://WorkSpace/wamp/Apache2/cgi-bin/qgis_map_server/

Enter sudo password:

Service metadata

Title:

Abstract:

ContactPerson:

Contact e-mail:

Contact phone:

Server URL:

Layers

Title	Name	Abstract	Style name
	Diagrams		diagram

Enter layer and style information

Title

Name Diagrams

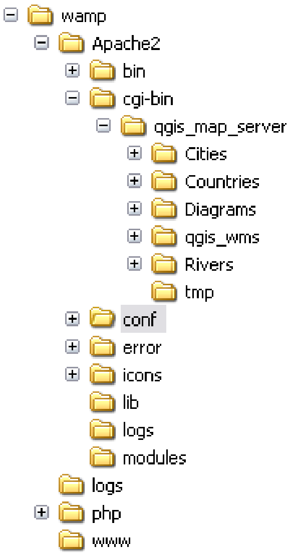
Abstract

Style name diagram

-51.3,149.0 Scale 1:3028314

Figure 66: Publish to Web for diagram symbolization

As a result a new folder called “Diagrams” is created inside the “qgis_map_server” directory as seen in Figure 67.



```
wamp
  Apache2
    bin
    cgi-bin
      qgis_map_server
        Cities
        Countries
        Diagrams
        qgis_wms
        Rivers
        tmp
    conf
    error
    icons
    lib
    logs
    modules
  logs
  php
  www
```

Figure 67: Folder structure for diagram symbolization

Inside this folder the file called “admin.sld” can be opened with any text editor. It will be structured as follows:

```
<StyledLayerDescriptor xmlns="http://www.opengis.net/sld" units="mm" >
 <UserLayer xmlns="http://www.opengis.net/sld">
  <Name xmlns="http://www.opengis.net/sld">Diagrams</Name>
  <Title xmlns="http://www.opengis.net/sld"></Title>
  <Abstract xmlns="http://www.opengis.net/sld"></Abstract>
  <HostedVDS xmlns="http://www.opengis.net/sld" providerType="ogr" uri="D:\user\geodata_eu\eu_countries_them.shp" />
  <UserStyle xmlns="http://www.opengis.net/sld">
   <Name xmlns="http://www.opengis.net/sld">diagram</Name>
   <FeatureTypeStyle xmlns="http://www.opengis.net/sld">
    <Rule xmlns="http://www.opengis.net/sld">
     <PolygonSymbolizer xmlns="http://www.opengis.net/sld">
      <Stroke xmlns="http://www.opengis.net/sld">
       <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke" >#000000</CssParameter>
       <CssParameter xmlns="http://www.opengis.net/sld" :name="stroke-width" >0</CssParameter>
      </Stroke>
      <Fill xmlns="http://www.opengis.net/sld">
       <CssParameter xmlns="http://www.opengis.net/sld" :name="fill" >#daffc9</CssParameter>
      </Fill>
     </PolygonSymbolizer>
    </Rule>
    <Rule xmlns="http://www.opengis.net/sld">
     <DiagramSymbolizer xmlns="http://www.opengis.net/sld">
      <Diagram xmlns="http://www.opengis.net/sld">
       <WellKnownName xmlns="http://www.opengis.net/sld">Pie</WellKnownName>
       <Category xmlns="http://www.opengis.net/sld">
        <PropertyName xmlns="http://www.opengis.net/ogc">INDUSTRY</PropertyName>
        <SvgParameter :name="fill" >#ffba7e</SvgParameter>
       </Category>
       <Category xmlns="http://www.opengis.net/sld">
        <PropertyName xmlns="http://www.opengis.net/ogc">SERVICE</PropertyName>
        <SvgParameter :name="fill" >#d19767</SvgParameter>
       </Category>
       <Category xmlns="http://www.opengis.net/sld">
        <PropertyName xmlns="http://www.opengis.net/ogc">CONSTRUCTI</PropertyName>
        <SvgParameter :name="fill" >#c08b5f</SvgParameter>
       </Category>
       <Category xmlns="http://www.opengis.net/sld">
        <PropertyName xmlns="http://www.opengis.net/ogc">AGRICULTUR</PropertyName>
        <SvgParameter :name="fill" >#a67852</SvgParameter>
       </Category>
       <Category xmlns="http://www.opengis.net/sld">
        <PropertyName xmlns="http://www.opengis.net/ogc">FINANCIAL</PropertyName>
        <SvgParameter :name="fill" >#815d3f</SvgParameter>
       </Category>
       <Category xmlns="http://www.opengis.net/sld">
        <PropertyName xmlns="http://www.opengis.net/ogc">WHOLESALE</PropertyName>
        <SvgParameter :name="fill" >#4a3524</SvgParameter>
       </Category>
       <Size xmlns="http://www.opengis.net/sld">
        <Interpolate xmlns="http://www.opengis.net/ogc" mode="linear" >
         <LookupValue xmlns="http://www.opengis.net/sld">
          <PropertyName xmlns="http://www.opengis.net/ogc">TOTALEMPL</PropertyName>
         </LookupValue>
         <InterpolationPoint xmlns="http://www.opengis.net/sld">
          <Data xmlns="http://www.opengis.net/sld">0</Data>
          <Value xmlns="http://www.opengis.net/sld">0</Value>
         </InterpolationPoint>
         <InterpolationPoint xmlns="http://www.opengis.net/sld">
          <Data xmlns="http://www.opengis.net/sld">68169</Data>
          <Value xmlns="http://www.opengis.net/sld">10</Value>
         </InterpolationPoint>
        </Interpolate>
       </Size>
      </Diagram>
     </DiagramSymbolizer>
    </Rule>
   </FeatureTypeStyle>
  </UserStyle>
 </UserLayer>
</StyledLayerDescriptor>
```

7.5.2 Adaption of the Zoom Dependency of Diagram Size

To view the symbolization of this file a WMS layer can be imported in QGIS. To do that the „admin.sld“ file first has to be placed in the main „qgis_map_server“ directory as explained in chapter 5.6 *Editing an „admin.sld“ file*. Afterwards this layer can be opened in QGIS with the instructions of chapter 6.1 *QGIS* which leads to the following visualization of the style:

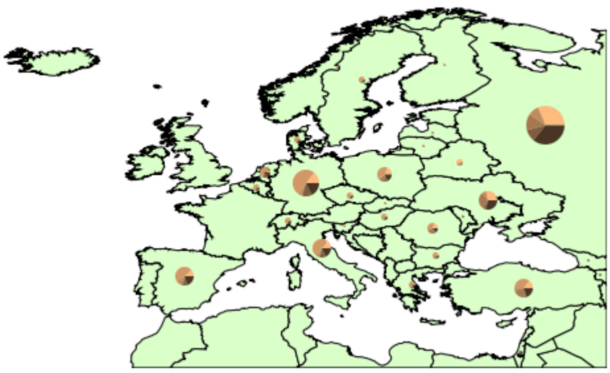


Figure 68: WMS layer for diagram symbolization

If this visualization result does not turn out satisfactory the style can directly be changed in the „admin.sld“ file. The visualization of the „admin.sld“ file now returns the diagrams but the size of the diagrams stays exactly the same independent of the zoom level. To change this fact the following code can be inserted:

```
<Diagram xmlns="http://www.opengis.net/sld">
       <Scale>
        <MinScaleDenominator>5000000</MinScaleDenominator>
        <MaxScaleDenominator>5000000</MaxScaleDenominator>
        <MinScaleSizeMultiplication>5</MinScaleSizeMultiplication>
        <MaxScaleSizeMultiplication>1</MaxScaleSizeMultiplication>
       </Scale>
...
</Diagram>
```

The result can be viewed in QGIS after a reload of the layer.

Note: To refresh the layer visualization move the layer with the panning tool in QGIS desktop version. The symbol will change consequently:

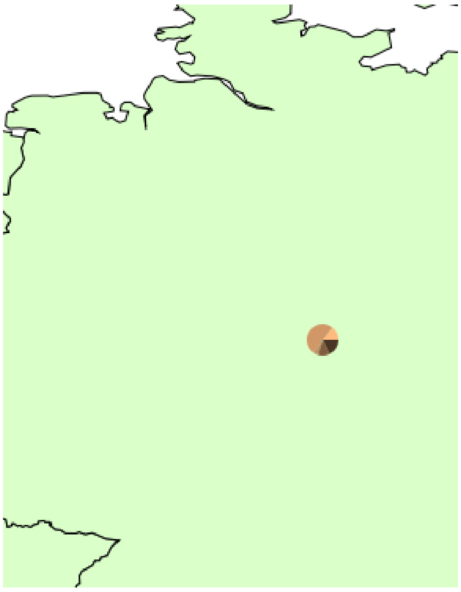


Figure 69: Diagram size before editing

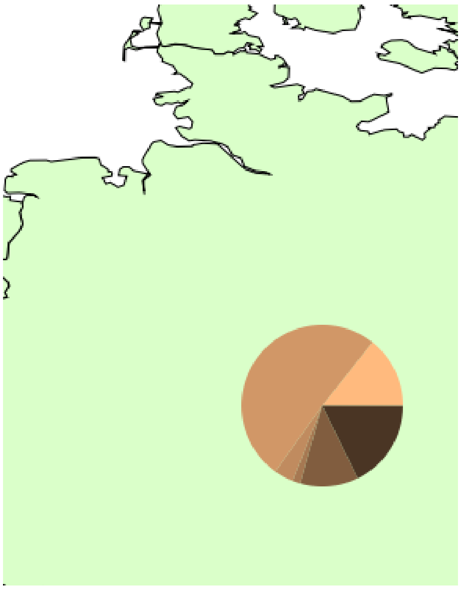


Figure 70: Diagram size after editing

For further styling options please refer to Appendix B *Definition of symbolizing options* where all implemented possibilities are listed.

7.6. RasterSymbolization

To demonstrate the symbolization possibilities of raster datasets the layer eu_cities is used. The data is processed in QGIS desktop version as described in chapter 5.4 *Preparation of Data in QGIS*. The symbolization properties have the following values:

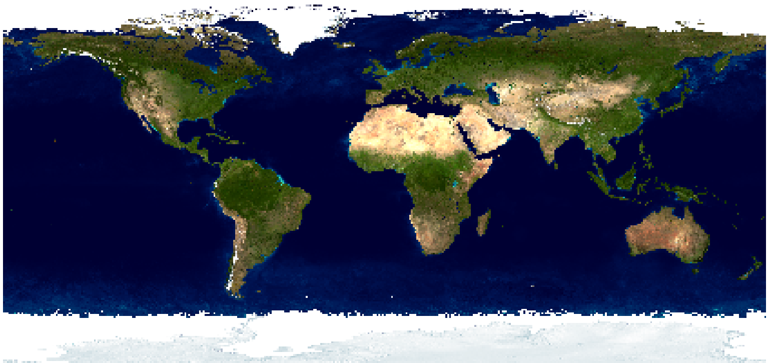
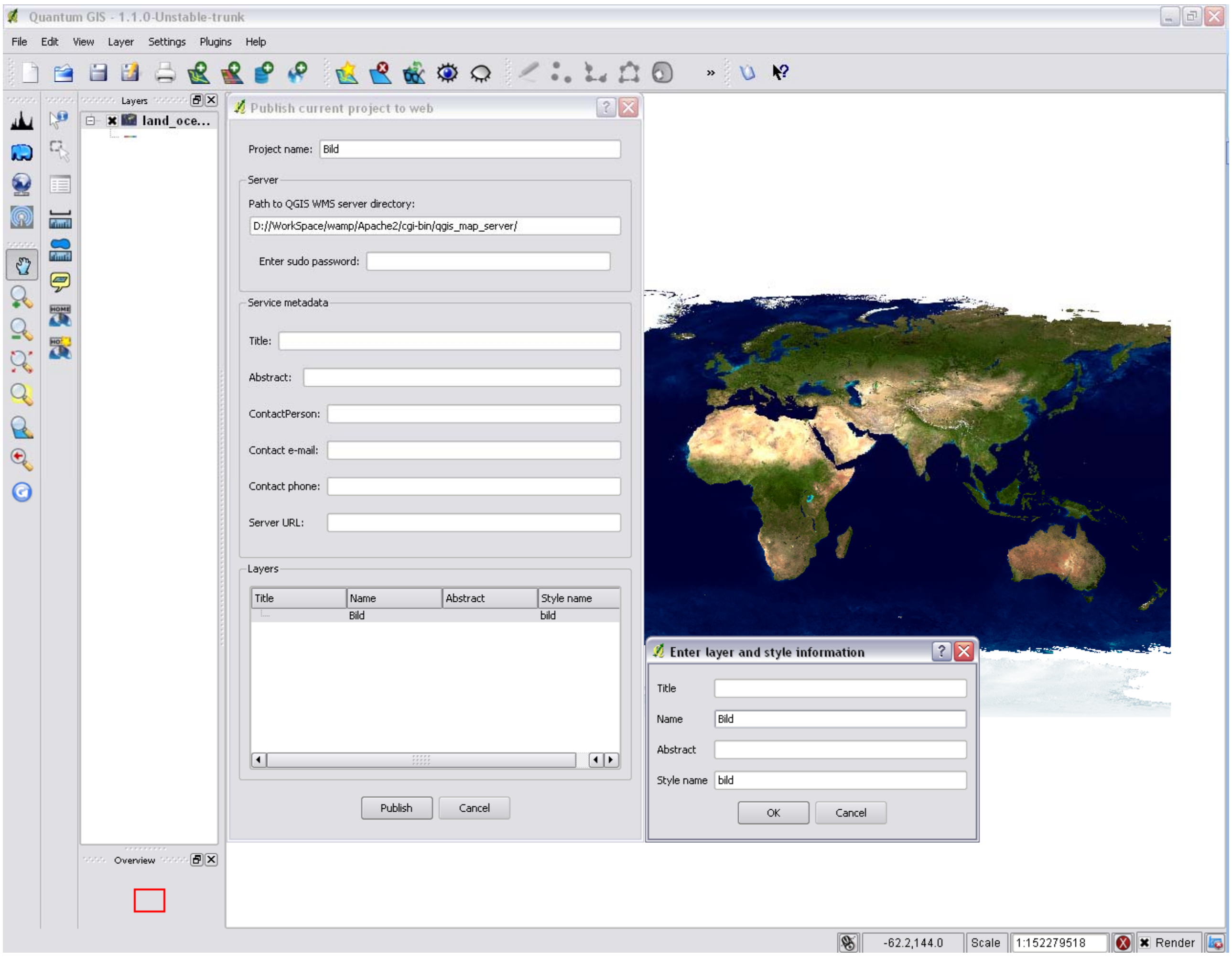


Figure 71: Layer properties for raster symbolization

With the plugin “Publish to Web” the SLD-file is automatically generated as described in chapter 5.5 *Data Publishing with QGIS Mapserver*. Absolutely required are the project name, the path to the server directory and an appropriate name and style name for the published layer.


Quantum GIS - 1.1.0-Unstable-trunk
File
Edit
View
Layer
Settings
Plugins
Help
Layers
land_oce...
Overview
Publish current project to web
Enter layer and style information
Publish
Cancel
OK
Cancel
Render

Publish current project to web

Project name: Bild

Server

Path to QGIS WMS server directory: D://WorkSpace/wamp/Apache2/cgi-bin/qgis_map_server/

Enter sudo password:

Service metadata

Title:

Abstract:

ContactPerson:

Contact e-mail:

Contact phone:

Server URL:

Layers

Title	Name	Abstract	Style name
	Bild		bild

Enter layer and style information

Title:

Name: Bild

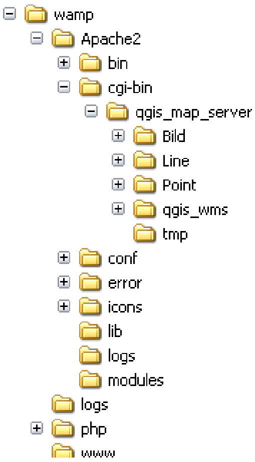
Abstract:

Style name: bild

-62.2,144.0 Scale 1:152279518

Figure 72: Publish to Web for raster symbolization

As a result a new folder called “Bild” is created inside the “qgis_map_server” directory as seen in Figure 73.



```
⊟ wamp
  ⊟ Apache2
    ⊞ bin
    ⊟ cgi-bin
      ⊟ qgis_map_server
        ⊞ Bild
        ⊞ Line
        ⊞ Point
        ⊞ qgis_wms
          tmp
    ⊞ conf
    ⊞ error
    ⊞ icons
      lib
      logs
      modules
    logs
  ⊞ php
    www
```

Figure 73: Folder structure for raster symbolization

Inside this folder the file called “admin.sld” can be opened with any text editor. It will be structured as follows:

```
<StyledLayerDescriptor xmlns="http://www.opengis.net/sld" units="mm" >
 <UserLayer xmlns="http://www.opengis.net/sld">
  <Name xmlns="http://www.opengis.net/sld">Bild</Name>
  <Title xmlns="http://www.opengis.net/sld"></Title>
  <Abstract xmlns="http://www.opengis.net/sld"></Abstract>
  <HostedRDS xmlns="http://www.opengis.net/sld" uri="U:\Bild\land_ocean_ice_8192.tif" />
  <UserStyle xmlns="http://www.opengis.net/sld">
   <Name xmlns="http://www.opengis.net/sld">default</Name>
  </UserStyle>
 </UserLayer>
</StyledLayerDescriptor>
```

To view the symbolization of this file a WMS layer can be imported in QGIS. To do that the “admin.sld”-file first has to be placed in the main „qgis_map_server“ directory as explained in chapter 5.6 *Editing an „admin.sld“ file*. Afterwards this layer can be opened in QGIS with the instructions of chapter 6.1 *QGIS* which leads to the following visualization of the style:

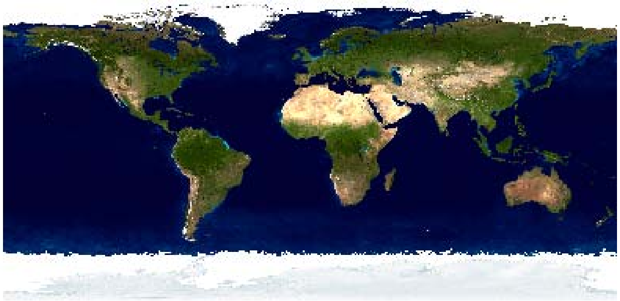


Figure 74: Extract of a WMS layer for raster symbolization

For further styling options please refer to Appendix B *Definition of symbolizing options* where all implemented possibilities are listed.

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10 Appendix

Appendix A Example of the integration of an „admin.sld“ file in OpenLayers

```
<html xmlns="http://www.w3.org/1999/xhtml">
  <head>
    <title>test</title>
    <style type="text/css">
      #map {
      width: 100%;
      height: 100%;
      border: 1px solid black;
      }
      div.olControlMousePosition {
      font-family: Verdana;
      font-size: 0.9em;
      background-color:white;
      opacity: 0.70;
      }
      .olControlScaleLine {
      left: 10px;
      bottom: 15px;
      font-size: small;
      background-color:white;
      opacity: 0.70;
      }
    </style>
    <script src="../map/lib/OpenLayers.js"></script>
    <script type="text/javascript">
      <!--
        var map;
        function init(){
        var options = {
        projection: new OpenLayers.Projection("EPSG:21781"),
        units: "m",
        maxExtent: new OpenLayers.Bounds(420000, 50000, 890000, 340000),
        maxResolution: "auto",
        numZoomLevels: 11,
        restrictedExtent: new OpenLayers.Bounds(450000, 50000, 880000, 330000)
        };
        map = new OpenLayers.Map( 'map' , options);

        var kar_wms5 = new OpenLayers.Layer.WMS( "synoptische karte",
        "http://karlinapp.ethz.ch/fcgi-bin/qgis_map_server/webgisluzern/qgis_map_serv.fcgi?",
        {transparent: "true", format: "image/png"
        , layers: "synoptische_Karte", styles: "syn" }, {isBaseLayer: false, opacity: 0.7});
        kar_wms5.setVisibility(true);
        map.addLayer(kar_wms5);


        var kar_wms6 = new OpenLayers.Layer.WMS( "synoptische kart2e",
        "http://karlinapp.ethz.ch/fcgi-bin/qgis_map_server/webgisluzern/qgis_map_serv.fcgi?",
        {transparent: "true", format: "image/png"
        , layers: "map2", styles: "sym" }, {isBaseLayer: false, opacity: 0.7});
        kar_wms6.setVisibility(true);
        map.addLayer(kar_wms6);

        var layerswitch = new OpenLayers.Control.LayerSwitcher({'ascending':false});
        map.addControl(layerswitch);
        layerswitch.maximizeControl();
        var navtbar = new OpenLayers.Control.NavToolbar({position: new OpenLayers.Pixel(40,-290)});
        var nav = new OpenLayers.Control.NavigationHistory();
        map.addControl(nav);
        navtbar.addControls([nav.next, nav.previous]);
        map.addControl(navtbar);
        map.addControl(new OpenLayers.Control.MousePosition());
        map.addControl(new OpenLayers.Control.KeyboardDefaults());
        var vo = {size: {w: 250, h: 160}, layers: [overview_wms],
        mapOptions: {projection: new OpenLayers.Projection("EPSG:21781"),
        units: "m", maxExtent: new OpenLayers.Bounds(420000, 50000, 890000, 340000), numZoomLevels: 1}};
        map.addControl(new OpenLayers.Control.OverviewMap(vo));
        map.zoomToMaxExtent();
        map.setCenter(new OpenLayers.LonLat(619528, 163817), 3);
        }
        // -->
    </script>
  </head>
  <body onload="init()">
    <p id="map"></p>
  </body>
</html>
```

Appendix B Definition of symbolizing options

Green are available options, red are not supported options.

Note: This list was created in May 2009. Further options may be available by the meantime.

LineSymbolizer	Geometry	See “Ogc:PropertyName”
	Stroke	Stroke Stroke-width Stroke-opacity Stroke-linejoin Stroke-linecap Stroke-dasharray Stroke-dashoffset

PolygonSymbolizer	Geometry	See “Ogc:PropertyName”	
	Fill	Fill Fill-opacity	Pattern
	Stroke	Stroke Stroke-width Stroke-opacity Stroke-linejoin Stroke-linecap Stroke-dasharray Stroke-dashoffset	

PointSymbolizer	Geometry	See “Ogc:PropertyName”	
	Graphic	Graphic Opacity Size Rotation Mark	WellKnownName Fill Stroke SvgSymbol

TextSymbolizer	Geometry	See “Ogc:PropertyName”	
	Label		
	Font	FontFamily Font-style Font-weight Font-size	
	LabelPlacement	PointPlacement LinePlacement	AnchorPointX AnchorPointY DisplacementX DisplacementY Rotation PerpendicularOffset
	Halo	Radius Fill	
	Fill	Fill Fill-opacity	

RasterSymbolizer	Geometry	See “Ogc:PropertyName”	
	Opacity		
	ChannelSelection	RedChannel GreenChannel BlueChannel GrayChannel	
	OverlapBehavior	LATEST_ON_TOP EARLIEST_ON_TOP AVERAGE RANDOM	
	ColorMap	ColorMapEntry	Color Opacity Quantity Label
	ContrastEnhancement	Normalize Histogram GammaValue	
	ShadedRelief	BrightnessOnly ReliefFactor	
	ImageOutline	LineSymbolizer PolygonSymbolizer	

DiagramSymbolizer	Geometry	See “Ogc:PropertyName”	
	Name	Name	
	Diagram	WellKnownName	Pie Bar Line Area Ring Polar
		Subtype	Normal Stacked Percent
		Category	Title See “ogc:PropertyName” SvgParameter Symbolizer Gap
		3D	
		SvgSymbol	
		Size	SizeType
		Scale	
		Opacity	
		Rotation	
		AnchorPoint	
		AnchorLine	
		Displacement	
		Halo	

Filter	Rule	Equals Disjoint Touches Within Overlaps Crosses Intersects Contains DWithin Beyond BBOX PropertyIsEqualTo PropertyIsNotEqualTo PropertyIsLessThan PropertyIsGreaterThan PropertyIsLessThanOrEqualTo PropertyIsGreaterThanOrEqualTo PropertyIsLike PropertyIsNull PropertyIsBetween And Or Not logicOps _Id FeatureId GmlObjectId Add Sub Mul Div PropertyName Function Literal Function Filter_Capabilities

Appendix C Example of an SVG-file

```
<?xml version="1.0" encoding="iso-8859-1"?>
<!-- Generator: Adobe Illustrator 13.0.2, SVG Export Plug-In . SVG Version: 6.00 Build 14948)  -->
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN" "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">
<svg
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:cc="http://creativecommons.org/ns#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:svg="http://www.w3.org/2000/svg"
  xmlns="http://www.w3.org/2000/svg"
  xmlns:sodipodi="http://sodipodi.sourceforge.net/DTD/sodipodi-0.dtd"
  xmlns:inkscape="http://www.inkscape.org/namespaces/inkscape"
  version="1.1"
  id="Layer_1"
  x="0px"
  y="0px"
  width="29.936px"
  height="29.77px"
  viewBox="0 0 29.936 29.77"
  style="enable-background:new 0 0 29.936 29.77;"
  xml:space="preserve"
  sodipodi:version="0.32"
  inkscape:version="0.46"
  sodipodi:docname="Luzern_neu_Wasser.svg"
  inkscape:output_extension="org.inkscape.output.svg.inkscape"><metadata
    id="metadata2475"><rdf:RDF><cc:Work
      rdf:about=""><dc:format>image/svg+xml</dc:format><dc:type
        rdf:resource="http://purl.org/dc/dcmitype/StillImage" /></cc:Work></rdf:RDF></metadata><defs
          id="defs2473"><inkscape:perspective
            sodipodi:type="inkscape:persp3d"
            inkscape:vp_x="0 : 14.885 : 1"
            inkscape:vp_y="0 : 1000 : 0"
            inkscape:vp_z="29.936001 : 14.885 : 1"
            inkscape:persp3d-origin="14.968 : 9.9233335 : 1"
            id="perspective2477" /></defs><sodipodi:namedview
              inkscape:window-height="968"
              inkscape:window-width="1280"
              inkscape:pageshadow="2"
              inkscape:pageopacity="0.0"
              guidetolerance="10.0"
              gridtolerance="10.0"
              objecttolerance="10.0"
              borderopacity="1.0"
              bordercolor="#666666"
              pagecolor="#ffffff"
              id="base"
              showgrid="false"
              inkscape:zoom="21.94715"
              inkscape:cx="4.6609352"
              inkscape:cy="15.27984"
              inkscape:window-x="-4"
              inkscape:window-y="-4"
              inkscape:current-layer="g2452" />
  <g
    id="g2452">
    <line
      style="fill:url(#Unnamed_Pattern_1);stroke:#445c72;stroke-width:2;stroke-opacity:1"
      x1="31.826143"
      y1="22.839552"
      x2="24.017271"
      y2="30.535725"
      id="line2454" />
    <line
      style="fill:url(#Unnamed_Pattern_1);stroke:#445c72;stroke-width:2;stroke-opacity:1"
      x1="31.500111"
      y1="17.182501"
      x2="17.736534"
      y2="30.800545"
      id="line2456" />
    <line
      style="fill:url(#Unnamed_Pattern_1);stroke:#445c72;stroke-width:2;stroke-opacity:1"
      x1="31.684469"
      y1="11.000681"
      x2="10.958408"
      y2="31.575134"
      id="line2458" />
    <line
      style="fill:url(#Unnamed_Pattern_1);stroke:#445c72;stroke-width:2;stroke-opacity:1"
      x1="31.980234"
      y1="4.712297"
      x2="6.4546394"
      y2="30.071522"
      id="line2460" />
    <line
      style="fill:url(#Unnamed_Pattern_1);stroke:#445c72;stroke-width:2;stroke-opacity:1"
      x1="32.373138"
      y1="-1.6827757"
      x2="-0.81054503"
      y2="31.337877"
      id="line2462" />
    <line
      style="fill:url(#Unnamed_Pattern_1);stroke:#445c72;stroke-width:2;stroke-opacity:1"
      x1="25.471237"
      y1="-0.78149611"
      x2="-0.82361865"
      y2="25.35257"
      id="line2464" />
    <line
      style="fill:url(#Unnamed_Pattern_1);stroke:#445c72;stroke-width:2;stroke-opacity:1"
      x1="20.65983"
      y1="-1.9817268"
      x2="-2.1523352"
      y2="20.692924"
      id="line2466" />
    <line
      style="fill:url(#Unnamed_Pattern_1);stroke:#445c72;stroke-width:2;stroke-opacity:1"
      x1="14.857673"
      y1="-2.191546"
      x2="-2.7882533"
      y2="15.339822"
      id="line2468" />
    <line
      style="fill:url(#Unnamed_Pattern_1);stroke:#445c72;stroke-width:2;stroke-opacity:1"
      x1="9.0443783"
      y1="-2.396369"
      x2="-1.5954781"
      y2="8.1631575"
      id="line2470" />
  </g>
</svg>
```