Setting Up and Deploying Geospatial Data Shares Using the QGIS Server Application

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The OFWIM 2017 Annual Conference and Business Meeting
“A Picture is Worth 1000 Words: Displaying and Sharing Your Data in a Compelling Way.”
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Quantum GIS (QGIS) Applications

QGIS is not only a desktop GIS. We also provide a spatial file browser, a server application, and web applications.

**QGIS Desktop:** Create, edit, visualize and publish geospatial information. For Windows, Mac, Linux, BSD and Android.

**QGIS Browser:** Browse and preview your data and metadata. Drag Drop your data from one datastore into the other.

**QGIS Server:** Publish your QGIS projects and layers as OGC compatible WMS and WFS services. Control which layers, attributes, layouts and coordinate systems are exported.

**QGIS Web Client:** Publish your QGIS Projects on the web with ease. Benefit from the powerful symbology, labeling and blending features to impress with your maps.

**QGIS on Android** (in beta)
Quantum GIS (QGIS) Applications

- QGIS Desktop
- QGIS Browser
- QGIS Server
- QGIS Web Client
QGIS Server is an open source WMS 1.3, WFS 1.0.0 and WCS 1.1.1 implementation that, in addition, implements Advanced cartographic General features for thematic mapping. The QGIS Server is a FastCGI/CGI Tools (Common Gateway Interface) application written in C++ that works together with a web server (e.g., Apache, Lighttpd). It has Python plugin support allowing for fast and efficient development and deployment of new QGIS features. The original development of QGIS Server was Funded by the EU projects Orchestra, Sany and the city of Uster in Switzerland.
QGIS Server Set Up

Background on Set Up

Server: QGIS Server
Server OS: Ubuntu 17.04 LTS (Linux)
Server Software:
  Apache2 – Version 2.4.25
  PHP – Version 7.0.22
  QGIS – Version 2.14.11

Client: QGIS Desktop
Client OS: Ubuntu 14.04 LTS (Linux)
QGIS Version 2.18
Setting Up QGIS Server - STEPS

1. Installed Quantum GIS Desktop (Synaptic)
2. Installed Quantum GIS Server (Synaptic)
3. Followed “QGIS as a OGC Data Server” Document from qgis.org
4. Rounded up Tennessee geospatial data
5. Set up ‘o2k17_tn_wms’ Workspace
6. Set up ‘o2k17_tn_wcs’ Workspace
7. Built QGIS Desktop Projects for Raster and Vector
8. Added Web Services to Projects
9. Verified QGS Server Fast CGI configurations
Setting Up QGIS Server - STEPS

1. Installed Quantum GIS Desktop (Synaptic) or . . .
   
   sudo apt-get install qgis python-qgis

2. Installed Quantum GIS Server (Synaptic) or . . .
   
   sudo apt-get install qgis-server

3. “QGIS as a OGC Data Server” - STEPS [qgis.org]
   
   3a. Installation of a HelloWorld example plugin for testing servers. You create a directory to hold server plugins. [ details: next slide ]
Setting Up QGIS Server - STEPS

“QGIS as a OGC Data Server” - STEPS [continued]

3a. Installation of a HelloWorld example plugin.

$ sudo mkdir -p /opt/qgis-server/plugins
$ cd /opt/qgis-server/plugins
$ sudo wget https://github.com/elpaso/qgis-helloserver/archive/master.zip
# In case unzip was not installed before:
$ sudo apt-get install unzip
$ sudo unzip master.zip
$ sudo mv qgis-helloserver-master HelloServer
Setting Up QGIS Server - STEPS

“QGIS as a OGC Data Server” - STEPS [continued]

3c. Then enabled the virtual host and restart Apache:

$ sudo a2ensite 001-qgis-server
$ sudo service apache2 restart

3d. Test the server with the HelloWorld plugin:

$ wget -q -O - “http://localhost/cgi-bin/qgis_mapserv.fcgi?SERVICE=HELLO”

HelloServer!
3e. Creating a WMS/WFS/WCS server from a QGIS project. To provide a new QGIS Server WMS, WFS or WCS, we have to create a QGIS project file with some data. Here, we use the ‘Alaska’ shapefile from the QGIS sample dataset. Define the colors and styles of the layers in QGIS and the project CRS, if not already defined.

NOTE: I followed the steps given to set up a QGIS Server with the Alaska data set, then set up QGIS Server instances for the “OFWIM 2017 QGIS Server Tennessee Data Shares”
Setting Up a QGIS Server for: “OFWIM 2017 Tennessee Data Shares QGIS Server”

4. Rounded up Tennessee geospatial data

Sources of the Tennessee geospatial data were:

USDA/NRCS Geospatial Data Gateway:
https://gdg.sc.egov.usda.gov/

USGS Geonames Web Site:
https://geonames.usgs.gov/

Tennessee Wildlife Resources Agency ArcGIS Online Site:
https://twra.maps.arcgis.com/home/gallery.html#c=organization&o=modified
Setting Up a QGIS Server for:
“OFWIM 2017 Tennessee Data Shares QGIS Server”

4. Rounded up Tennessee geospatial data
5. Set up `o2k17_tn_wms` Workspace

Placed 'Vector' Coverages in a QGIS Desktop 'Project' *

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Type</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chattanooga, Tennessee</td>
<td>Point Coverage</td>
<td>NRCS/GSD</td>
</tr>
<tr>
<td>Chattanooga Topo Quad Boundary</td>
<td>Polygon Coverage</td>
<td>NRCS/GSD</td>
</tr>
<tr>
<td>Hamilton County GNIS Features</td>
<td>Point Coverage</td>
<td>USGS/Geonames</td>
</tr>
<tr>
<td>Hamilton County Populated Places</td>
<td>Point Coverage</td>
<td>USGS/Geonames</td>
</tr>
<tr>
<td>Hamilton County Primary Roads</td>
<td>Line Coverage</td>
<td>NRCS/GSD</td>
</tr>
<tr>
<td>Hamilton County Secondary Roads</td>
<td>Line Coverage</td>
<td>NRCS/GSD</td>
</tr>
<tr>
<td>Hamilton County Streets</td>
<td>Line Coverage</td>
<td>NRCS/GSD</td>
</tr>
<tr>
<td>Hamilton Vicinity Watersheds</td>
<td>Polygon Coverage</td>
<td>NRCS/GSD</td>
</tr>
<tr>
<td>Hamilton County Boundary</td>
<td>Polygon Coverage</td>
<td>NRCS/GSD</td>
</tr>
<tr>
<td>Hamilton County Topo Boundaries</td>
<td>Polygon Coverage</td>
<td>NRCS/GSD</td>
</tr>
<tr>
<td>Tennessee Counties</td>
<td>Polygon Coverage</td>
<td>NRCS/GSD</td>
</tr>
<tr>
<td>Tennessee Geology</td>
<td>Polygon Coverage</td>
<td>NRCS/GSD</td>
</tr>
<tr>
<td>TWRA Lands</td>
<td>Polygon Coverage</td>
<td>TWRA/ArcGIS</td>
</tr>
</tbody>
</table>

* Style(s) applied to coverages; 2 Projections: EPSG: 26916 / EPSG: 102736
Setting Up a QGIS Server for:
“OFWIM 2017 Tennessee Data Shares QGIS Server”

5. Set up ‘o2k17_tn_wms’ Workspace  (continued)

Placed 'Vector' Coverages in a QGIS Desktop 'Project'
5. Set up ‘o2k17_tn_wms’ Workspace (continued)

Placed 'Vector' Coverages in a QGIS Desktop 'Project'
5. Set up ‘o2k17_tn_wms’ Workspace  (continued)

Placed 'Vector' Coverages in a QGIS Desktop 'Project'
6. Set up ‘o2k17_tn_wcs’ Workspace

Placed 'Raster' Coverages in a QGIS Desktop 'Project'

Hamilton County National Elevation Data       NRCS/GDG
30 m resolution

Hamilton County NAIP (2016) Imagery (subset)  NRCS/GDG
1m resolution – subset of Chattanooga Topo Area

Hamilton County Digital Raster Graphic (subset)   NRCS/GDG
30m resolution – subset of Chattanooga Topo Area

Tennessee Land Use Land Cover (USGS)           NRCS/GDG
Statewide coverage for Tennessee
6. Set up ‘o2k17_tn_wcs’ Workspace

Placed 'Raster' Coverages in a QGIS Desktop 'Project'
6. Set up ‘o2k17 tn wcs’ Workspace

Placed 'Raster' Coverages in a QGIS Desktop 'Project'
Setting Up QGIS Server - STEPS

7. Built QGIS Desktop Projects for Vector and Raster

O2K17_TN_WFS.qgs  O2K17_TN_WCS.qgs
Setting Up QGIS Server - STEPS

8. Added Web Services to Projects

Done by way of the File / Project Menu Options . . .
Setting Up QGIS Server - STEPS

8. Added Web Services to Projects  [ continued ]

Four 'Screen' of Parameters to Be Entered
Setting Up QGIS Server - STEPS

8. Added Web Services to Projects  [ continued ]

Screen 1 of 4 - of Parameters to Be Entered
Setting Up QGIS Server - STEPS

8. Added Web Services to Projects  [ continued ]

Screen 1 of 4 - of Parameters Populated
Setting Up QGIS Server - STEPS

8. Added Web Services to Projects  [ continued ]

Screen 2 of 4 - of Parameters to Be Entered
Setting Up QGIS Server - STEPS

8. Added Web Services to Projects  [ continued ]

Screen 2 of 4 - of Parameters Populated
Setting Up QGIS Server - STEPS

8. Added Web Services to Projects [ continued ]

Screen 3 of 4 - of Parameters to Be Entered
Setting Up QGIS Server - STEPS

8. Added Web Services to Projects  [ continued ]

Screen 3 of 4 - of Parameters Populated

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8. Added Web Services to Projects  [ continued ]

Screen 4 of 4 - of Parameters to Be Entered
Setting Up QGIS Server - STEPS

8. Added Web Services to Projects  [ continued ]

Screen 4 of 4 - of Parameters Populated
Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configuration

9a. Made 'CGI' workspaces under /usr/lib/cgi-bin
    For WMS/WFS ./o2k17_tn_wms
    For WMS/WCS ./o2k17_tn_wcs

9b. Placed 'Project' Files under /usr/lib/cgi-bin
    o2k17_tn_wms.qgs in ./o2k17_tn_wms
    o2k17_tn_wcs.qgs in ./o2k17_tn_wcs

9c. Placed 'Data' Files under /usr/lib/cgi-bin *
    Vectors in ./o2k17_tn_wms
    Rasters in ./o2k17_tn_wcs

* Note: on Linux system these could be symbolic links
Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations
   [ continued ]

In QGIS Desktop from client ( 'gulo.epcrossover.net' )
- Accessed Web Services on server ( 'zapus.epcrossover.net' )

Built “Connections” to Access “Data Shares” on 'zapus' . . .

WMS Web Services

WCS Web Services

WFS Web Services
Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations
   [ continued ]

   Built “Connections” to Access “Data Shares” on 'zapus' . . .

   Examples for:

   WMS (Web Map Services)  o2k17_tn_wms
   WCS (Web Coverage Services)  o2k17_tn_wcs
   WFS (Web Feature Services)  o2k17_tn_wfs
Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations
[ continued ]

Example for: WMS (Web Map Services) o2k17_tn_wms
Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations [ continued ]

Example for: WCS (Web Map Services) o2k17_tn_wcs
Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations
[ continued ]

Example for: WFS (Web Map Services) o2k17_tn_wfs
Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations [ continued ]

Examples Outputs for:

WM(T)S Selections          WCS Selections          WFS Selections
Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations [ continued ]

Examples Outputs for:

- WM(T)S Output
- WCS Output
- WFS Output
Thanks . . .

Quantum GIS Development Community (Coding)

Open Geospatial Consortium (Standards)

Data:
USDA/NRCS Geospatial Data Gateway
USGS Geonames Web Site
Tennessee Wildlife Resources Agency

Organization of Fish & Wildlife Information Managers
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