UK Location Programme

Location Information Interoperability Board

Data Publisher - How To Guide

Establish a Reference Implementation for an INSPIRE View Service using a GeoServer

DOCUMENT CONTROL

Change Summary

Version	Date	Author/Editor	Change Summary
1.0	23 Nov 2010	Andrew Radburn	Initial Version

References

Ref.	Title/Version/Publication Date/Author
[1]	OS OpenData http://www.ordnancesurvey.co.uk/oswebsite/opendata/
[2]	GeoServer User Guide http://docs.geoserver.org/stable/en/user/

CONTENTS

1 REFERENCE IMPLEMENTATION

This document describes the building of a Reference Implementation of an INSPIRE View Service using the Open Source software GeoServer and PostGIS.

The Reference Implementation holds the OS OpenData vector datasets Strategi and Vector Map District [1].

2 SYSTEM REQUIREMENTS

These are the hardware and software specifications used to build the Reference Implementation.

2.1 Hardware

- An Amazon EC2 Machine Image running Ubuntu 10.04 LTS Server.
  Large Instance
  7.5 GB memory
  4 EC2 Compute Units (2 virtual cores with 2 EC2 Compute Units each)
  850 GB instance storage
  64-bit platform
  I/O Performance: High
  AMI name: m1.large
- Laptop / desktop computer
- Internet connection between the two

2.2 Software

- Ubuntu 10.04 LTS
- Sun Java Runtime Environment 64 bit server VM 1.6.0_22
- Java Advanced Imaging 1.1.3
- JAI ImageIO Tools 1.1
- Tomcat Servlet Container 6.0.24
- Apache Web Server 2.2.14
- GeoServer 2.0.2
- PostgreSQL 8.4.5
- PostGIS 1.4.0-2
- PgAdmin 1.12.1
- GDAL 1.6.3
- Putty 0.60
- Web browser (Chrome 7 and Firefox 3.6.10)

3 SKILLS AND RESOURCES

The skills and knowledge required were

- Ubuntu Linux administration
- Using a command line via SSH
- Shell scripts
- Running GDAL and OGR2OGR programs
- Database skills (Using PGAdmin)
- Coordinate Reference Systems
- Knowledge of the datasets to be published

Two IT resources were used with the above skills.

4 STEPS TAKEN

4.1 Install Server

An Amazon AMI installation of Ubuntu (10.04) Lucid Lynx LTS Server was used as the basis of the Reference Implementation. This AMI has a 64-bit hardware architecture and so 64-bit versions of programs have to be used where appropriate.

When the server has been installed it first needs to be updated with any security and patch upgrades. So login as the administrator and from the terminal command line, enter the commands:

```
sudo apt-get update
```

```
sudo apt-get upgrade
```

4.2 Install PostgreSQL and PostGIS

Installing PostGIS will also install PostgreSQL first as a dependency.

```
sudo apt-get install postgresql-8.4-postgis
```

4.3 Install GDAL

```
sudo apt-get install gdal-bin
```

4.4 Install Java

Install the Sun Java6 Java Runtime Environment

```
sudo add-apt-repository “deb http://archive.canonical.com/ lucid partner”
```

```
sudo apt-get update
```

```
sudo apt-get install sun-java6-jre sun-java6-fonts
```

```
sudo update-java-alternatives -s java-6-sun
```

To check the version of Java installed, use:

```
java –version
```

This should report back with:

```
java version "1.6.0_22"
Java(TM) SE Runtime Environment (build 1.6.0_22-b04)
Java HotSpot(TM) 64-Bit Server VM (build 17.1-b03, mixed mode)
```

4.5 Install Apache and Tomcat Servers

Although strictly only a servlet container is needed to run GeoServer, installing both Apache and Tomcat servers on the same machine enables it to be more flexible in serving other data from Apache. This will enable the machine to act as a full web portal as well as a data server using such packages as Drupal CMS or even a Wordpress Blog.

Install the server packages:

```
sudo apt-get install apache2
```

```
sudo apt-get install tomcat6 tomcat6-admin
```

Enable the communication between Apache2 and Tomcat.

```
sudo a2enmod proxy_ajp
```

```
sudo vi /etc/apache2/conf.d/proxy_ajp.conf
```

Add the following lines:

```
<Proxy *>
  Order deny,allow
  Allow from all
</Proxy>
```

```
ProxyPass /geoserver/ ajp://localhost:8009/geoserver/
ProxyPassReverse /geoserver/ ajp://localhost:8009/geoserver/
ProxyPass /manager/ ajp://localhost:8009/manager/
ProxyPassReverse /manager/ ajp://localhost:8009/manager/
```

Run this to reload the new apache configuration:

```
sudo /etc/init.d/apache2 reload
```

Uncomment out the lines in Tomcat server.xml to enable the AJP connector:

```
sudo vi /etc/tomcat6/server.xml
```

Remove the lines `<!–`and `-->` around the AJP connector definition.

The usernames, passwords and roles can be defined centrally in Tomcat 6.0 by editing the `/etc/tomcat6/tomcat-users.xml` file:

```
sudo vi /etc/tomcat6/tomcat-users.xml
```

Add this between the tomcat-users tags:

```
<role rolename="admin"/>
<role rolename="manager"/>
<user username="admin" password="yourpassword" roles="manager,admin"/>
```

Restart Tomcat:

```
sudo /etc/init.d/tomcat6 restart
```

You can then login to the Tomcat admin page using a web browser at:

```
http://yourhostname/manager/html/
```

4.6 Configure Tomcat

To customise Tomcat for running GeoServer in a production environment, edit the Java JVM startup parameters here to utilise more memory:

```
sudo vi /etc/default/tomcat6
```

Find and alter the following lines:

```
# You may pass JVM startup parameters to Java here. If unset, the default
# options (-Djava.awt.headless=true -Xmx128m) will be used.

JAVA_OPTS="-Djava.awt.headless=true –server -Xms48m –Xmx512m"
```

Edit the java security permissions:

```
sudo vi /etc/tomcat6/policy.d/50local.policy
```

Add these lines at the bottom:

```
grant codebase "file:${catalina.base}/webapps/geoserver/WEB-INF/classes/-" {
  permission java.security.AllPermission;
};

grant codebase "file:${catalina.base}/webapps/geoserver/WEB-INF/lib/-" {
  permission java.security.AllPermission;
};
```

4.7 Install Java Advanced Imaging and JAI ImageIO Tools

Install the native Java Advanced Imaging (JAI) as defined in the GeoServer User Guide [2]:

```
wget http://download.java.net/media/jai/builds/release/1_1_3/jai-1_1_3-lib-
linux-amd64-jre.bin

sudo cp jai-1_1_3-lib-linux-amd64-jre.bin /usr/lib/jvm/java-6-sun/jre

cd /usr/lib/jvm/java-6-sun/jre

sudo sh jai-1_1_3-lib-linux-amd64-jre.bin

# Accept license agreement.

sudo rm jai-1_1_3-lib-linux-amd64-jre.bin
```

Install JAI ImageIO tools:

```
wget http://download.java.net/media/jai-imageio/builds/release/1.1/jai_imageio-
1_1-lib-linux-amd64-jre.bin
```

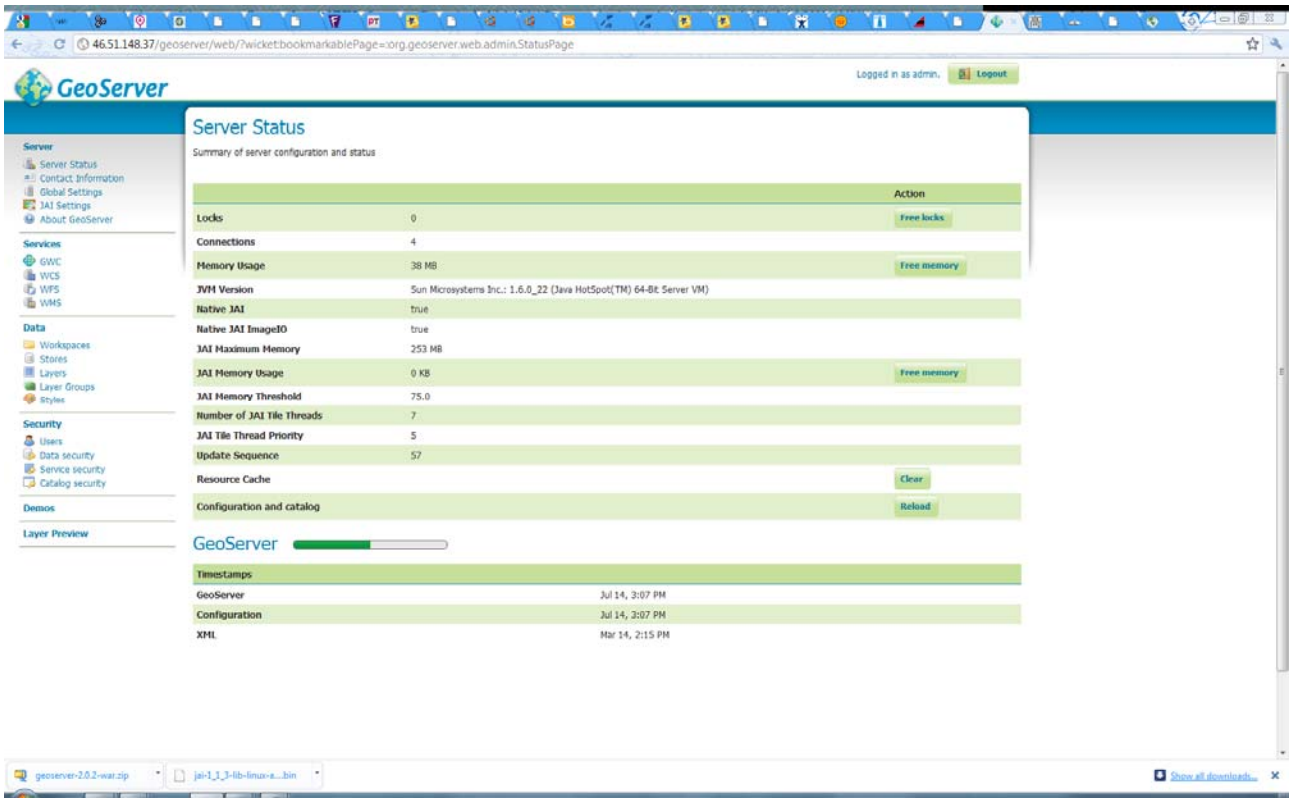
```
sudo cp jai_imageio-1_1-lib-linux-amd64-jre.bin /usr/lib/jvm/java-6-sun/jre

cd /usr/lib/jvm/java-6-sun/jre

sudo su

export _POSIX2_VERSION=199209

sh jai_imageio-1_1-lib-linux-amd64-jre.bin

# Accept license agreement

rm ./ jai_imageio-1_1-lib-linux-amd64-jre.bin

exit
```

4.8 Install GeoServer

Download the latest stable GeoServer WAR file from http://geoserver.org/display/GEOS/Stable

Install this WAR file via the Tomcat manager page.

Go to the GeoServer main page: http;//yourserver/geoserver/ and log in at the top with username admin and password geoserver. Go to the server status page and you should see:



You can then change the default password for the administrator under the Security – Users menu link. Also change the contact information under the Contact Information menu link.

4.9 Configure PostGIS

Add a password for the postgres database admin user:

```
sudo -u postgres -i

psql -U postgres

user postgres with password 'yourpassword';

\q

exit
```

To enable remote administration of the PostgreSQL database with PGAdmin, edit this file:

```
sudo vi /etc/postgresql/8.4/main/pg_hba.conf
```

Comment out the line and add the following line (with your machine's IP address)

```
#local   all         all                               ident
host    all         all         62.25.96.244/32       md5
```

```
sudo vi /etc/postgresql/8.4/main/postgresql.conf
```

Replace this line:

```
#listen_addresses = 'localhost'         # what IP address(es) to listen on;
listen_addresses = '*'          # what IP address(es) to listen on;
```

And edit the following lines:

```
shared_buffers = 128MB # 16384 for 8.1 and earlier
checkpoint_segments = 20
maintenance_work_mem = 256MB # 256000 for 8.1 and earlier
autovacuum = off
```

Edit the kernel parameter shmmax to increase maximum size of shared memory:

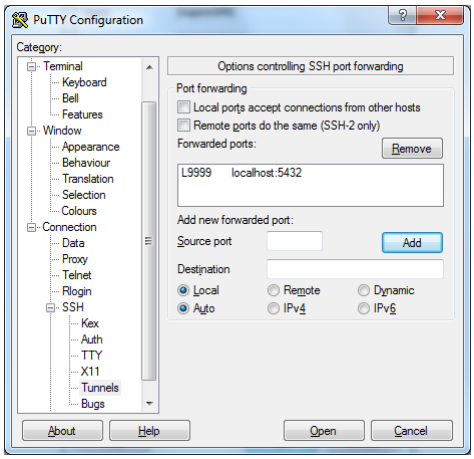
```
sudo sh -c "echo 'kernel.shmmax=268435456' > /etc/sysctl.d/60-shmmax.conf"
sudo service procps start
```

Restart PostgreSQL to enable the changes

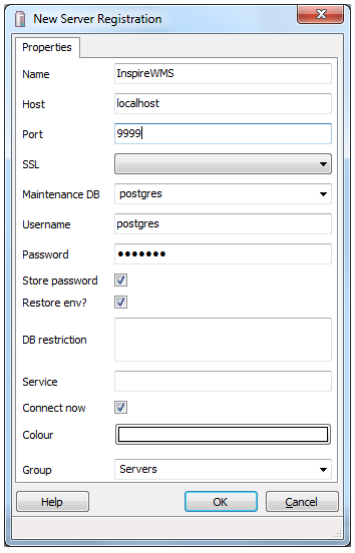
```
sudo /etc/init.d/postgresql-8.4 restart:
```

4.10 Configure Putty

Configure Putty for SSH port forwarding:



You can now run PGAdmin and connect via localhost:9999

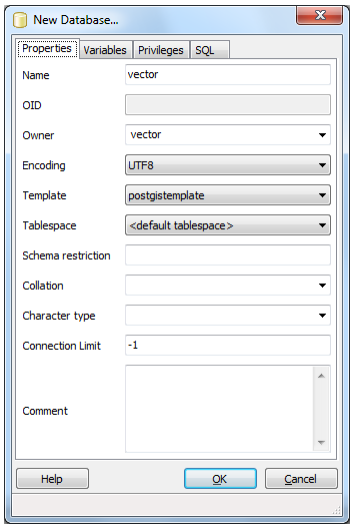


Create a POSTGIS template database

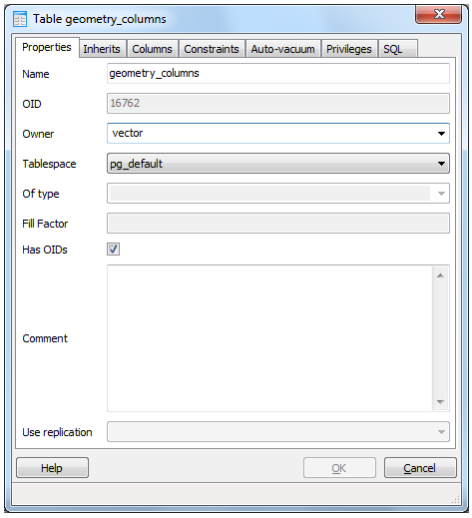
```
sudo -u postgres -i

createdb postgistemplate
createlang plpgsql postgistemplate
psql -d postgistemplate -f /usr/share/postgresql/8.4/contrib/postgis.sql
psql -d postgistemplate -f /usr/share/postgresql/8.4/contrib/spatial_ref_sys.sql
psql -d postgistemplate -f
/usr/share/postgresql/8.4/contrib/postgis_comments.sql
exit
```

Using PGAdmin it is now possible to login and create a user via “New Login Role”. Use “vector” as the username and tick the “Can create database objects” box.

Create database using the postgistemplate as a template database and the owner set to the user created above:



Alter the owner of the two tables created in the new database (geometry_columns and spatial_ref_sys) to the user created above.



4.11 Configure Data

Upload the datasets to the server using PSFTP (part of Putty software).

Create and run a script to pre-process the data and re-project it into ETRS89.

See Appendix A for an example script used to collate and re-project the Strategi OS OpenData.

Possibly due to some incompatible versions of some packages, we found we had to link to the correct Proj4 library to be able to re-project the data:

```
sudo ln -s /usr/lib/libproj.so.0 /usr/lib/libproj.so
```

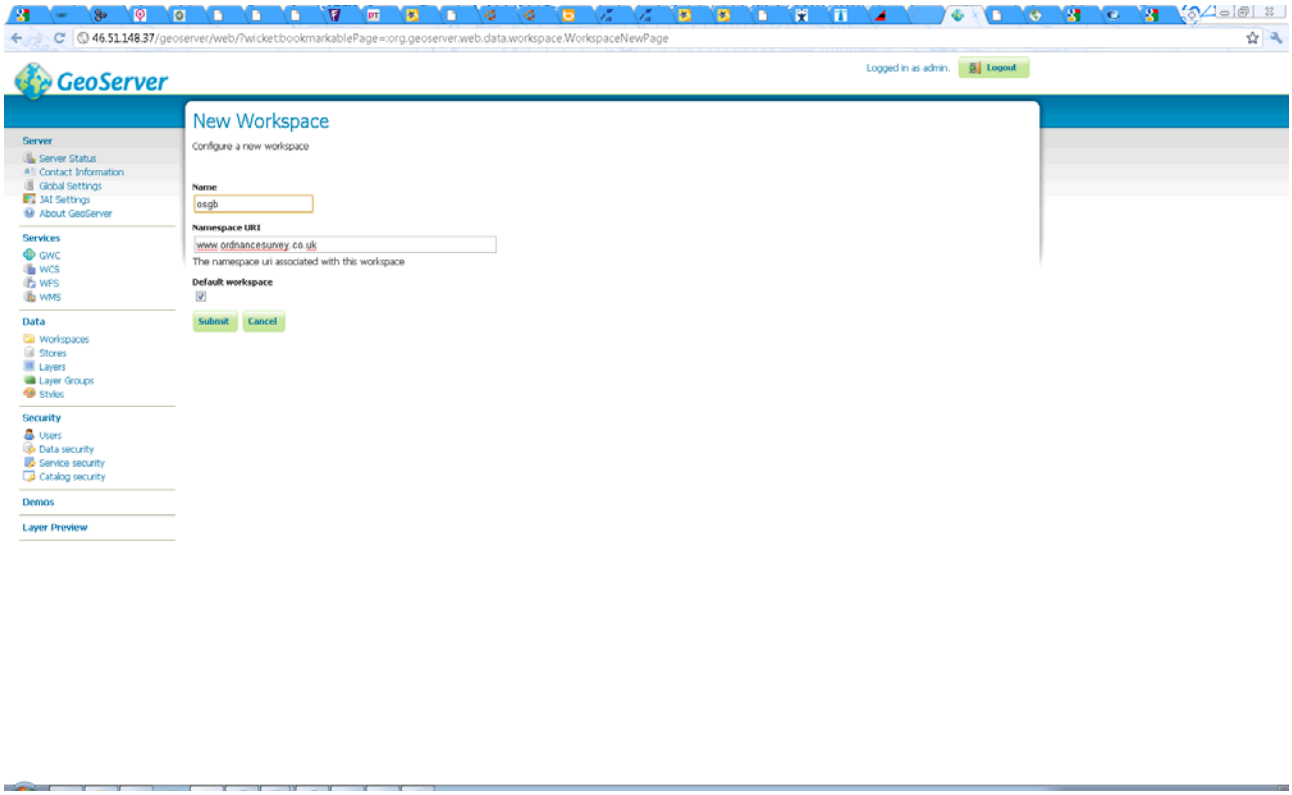
4.12 Load Data

Crate and run a load script to load the data into the PostGIS database. The ogr2ogr program automatically creates any database tables and updates the geometry_columns table with the required details. Sometimes the `PGCLIENTENCODING` environment variable has to be set to enable accented characters to be handled correctly.

See Appendix B for an example of how to load pre-processed Strategi shapefile data into a PostGIS database.

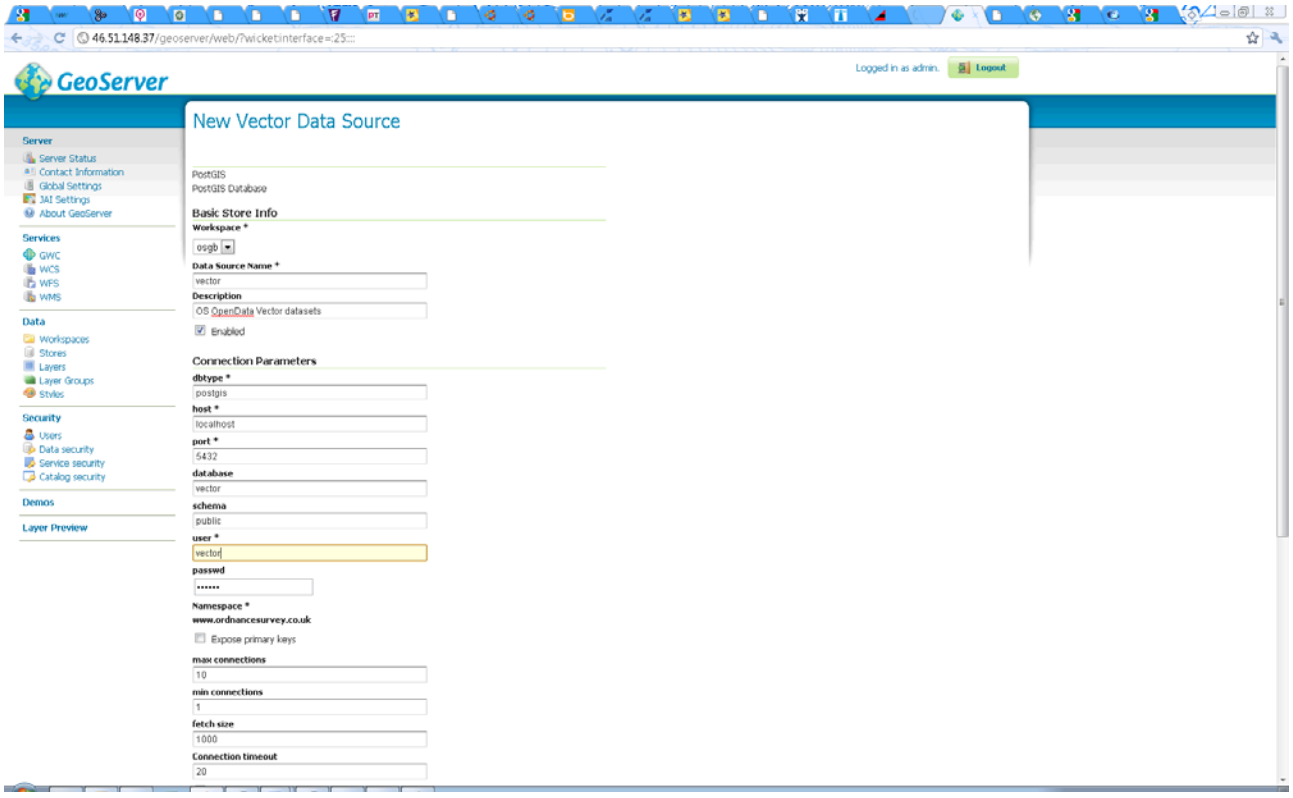
4.13 Configure Workspace

Add a new workspace which will group your layers together logically.



4.14 Configure Data Store

Add the PostGIS data store to GeoServer. Step by step instructions can be found in the GeoServer User Manual, under the “Getting Started” - “Adding a PostGIS table” section.



4.15 Styling with SLDs

In GeoServer, styling is accomplished using a markup language called Styled Layer Descriptor, or SLD for short. See the GeoServer User manual for detailed instructions on how to write and load a SLD into GeoServer.

Add the styles for each layer type using the admin panel of GeoServer.

The SLDs use external graphics for some of the map symbols, such as road name shields. In this case, these symbols are referenced relative to the SLD, so copy over the directory of symbols:

```
cd /var/lib/tomcat6/webapps/geoserver/data/styles
sudo mkdir symbols
sudo chown tomcat6 symbols
sudo chgrp tomcat6 symbols
sudo chmod 777 symbols
# Use SFTP to copy over symbols directory
sudo chmod 755 symbols
```

The SLDs use a non default font for the text rendering, so we have to install some extra fonts:

Enable multiverse in /etc/apt/sources.list:

```
sudo vi /etc/apt/sources.list
```

Add the following line

```
deb http://eu-west-1.ec2.archive.ubuntu.com/ubuntu/ lucid main multiverse
```

Then install the fonts:

```
sudo apt-get update
sudo apt-get install msttcorefonts
```

4.16 Configure the layers

Add the layers from the PostGIS data store as shown in the GeoServer User Guide. To each layer add the appropriate style as defined in the section above.

4.17 Configure the layer group

A layer group can now be created with the layers defined in the following order:

- Polygons
- Lines
- Roads
- Points
- Text

This will draw the combined layer in the correct order, with polygon areas on the bottom, overlaid with lines, roads, then points and finally text on the top.

5 TIME TAKEN

The Reference Implementation took two people about five days to build the system, install the software, load the data, configure the system and test the results. The bulk of the time was taken writing scripts to load and re-project the data.

6 HANDY HINTS

At each stage check the data to see that the processes are working. So for the conversion process you can look at the shapefiles in a GIS such as ESRI ArcGIS or an open source GIS such as Quantum GIS (QGIS). When the data has been loaded into the database, you can check the PostGIS tables have loaded correctly with a tool such as PgAdmin. You can also view the PostGIS tables directly in QGIS to see if they are OK.

The field names referred to in a SLD are case sensitive, so make sure they match with the columns named in your PostGIS database.

Some people prefer to work with a command interface and some with a GUI. All the tasks done via PgAdmin can also be done on the command line using the psql command.

When creating a database from the PostGIS template with a different user as owner, make sure you change the ownership of the “geometry_columns” table and “spatial_ref_sys” table to the same user.

7 LESSONS LEARNT

It may take longer than planned to write a script to gather, re-project and load the data into PostGIS tables. Although this process may only be needed once, some data sets require a regular update cycle and so the process should be as automated as possible.

Make sure documentation and articles read from the Web apply to the versions of software you are currently using.

APPENDIX A

```
#!/bin/bash
# Script to collate OS OpenData Strategi shapefiles
#
# Andy Radburn 17th Nov 2010
#
STRATEGI_DIR="/Data/OrdnanceSurvey/StrategiShape/data"
OUTPUT_DIR="TestStrategy"
OUTPUT_SRS=EPSG:4258

echo Processing OS OpenData Strategy from $STRATEGI_DIR

OUTFILE=Lines.shp
OUTNAME=Lines
OUTTYPE=LINESTRING

ogr2ogr -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt $OUTTYPE
$OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/admin_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/coast_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/ferry_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/land_use_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/nat_park_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/railway_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/rivers_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/txttrans_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/admin_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/coast_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/ferry_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/land_use_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/nat_park_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/railway_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/rivers_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/txttrans_polyline.shp


echo Lines Done.

OUTFILE=Polygons.shp
OUTNAME=Polygons
OUTTYPE=MULTIPOLYGON

ogr2ogr -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt $OUTTYPE
$OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/foreshor_region.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/lakes_region.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/urban_region.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/woodland_region.shp
```

```
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/foreshor_region.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/lakes_region.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/urban_region.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/woodland_region.shp

echo Polygons Done.

OUTFILE=Points.shp
OUTNAME=Points
OUTTYPE=MULTIPOINT

ogr2ogr -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt $OUTTYPE
$OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/admin_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/airport_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/land_use_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/nat_park_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/seeds_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/settlmnt_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/settlmnt_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/tourist_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/trans_pt_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/trans_pt_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/txttrans_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/water_ft_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/admin_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/airport_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/land_use_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/nat_park_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/seeds_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/settlmnt_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/settlmnt_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/tourist_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/trans_pt_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/trans_pt_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/txttrans_font_point.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/water_ft_font_point.shp


echo Points Done.
```

```
OUTFILE=Roads.shp
OUTNAME=Roads
OUTTYPE=LINESTRING

ogr2ogr -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt $OUTTYPE
$OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/a_road_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/b_road_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/minor_rd_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/motorway_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/primy_rd_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/a_road_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/b_road_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/minor_rd_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/motorway_polyline.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/primy_rd_polyline.shp

echo Roads Done.

OUTFILE=Text.shp
OUTNAME=Text
OUTTYPE=POINT

ogr2ogr -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt $OUTTYPE
$OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/txtadmin_text.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/txtother_text.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_NORTH/txttrans_text.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/txtadmin_text.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/txtother_text.shp
ogr2ogr -append -update -f "ESRI Shapefile" -s_srs EPSG:27700 -t_srs $OUTPUT_SRS -nln $OUTNAME -nlt
$OUTTYPE $OUTPUT_DIR/$OUTFILE $STRATEGI_DIR/GB_SOUTH/txttrans_text.shp

echo Text Done.
echo Finished.
```

APPENDIX B

```
export PGCLIENTENCODING=WIN1252
INPUT_DIR=TestStrategy

ogr2ogr -a_srs EPSG:4258 -f "PostgreSQL" PG:"host=localhost user=vector
dbname=vector password=yourpassword"  $INPUT_DIR/Lines.shp

ogr2ogr -a_srs EPSG:4258 -nlt GEOMETRY -f "PostgreSQL" PG:"host=localhost
user=vector dbname=vector password= yourpassword "  $INPUT_DIR/Polygons.shp

ogr2ogr -a_srs EPSG:4258 -f "PostgreSQL" PG:"host=localhost user=vector
dbname=vector password= yourpassword "  $INPUT_DIR/Points.shp

ogr2ogr -a_srs EPSG:4258 -f "PostgreSQL" PG:"host=localhost user=vector
dbname=vector password= yourpassword "  $INPUT_DIR/Roads.shp

ogr2ogr -a_srs EPSG:4258 -f "PostgreSQL" PG:"host=localhost user=vector
dbname=vector password= yourpassword "  $INPUT_DIR/Text.shp
```