GEO1007 Practical assignment 1: Setting up an OGC WMS and WFS server

Goal of this first practical assignment is to set up the server-side of the Geoweb services architecture. You will use the open source product GeoServer to publish geodata via a WMS (map service) and a WFS (data service).
The software needed for this assignment is

- For the data storage: PostgreSQL / PostGIS
- For the web server: Apache Tomcat
- For the WMS and WFS services: GeoServer

The geodata that is needed

- A PostGIS table with cadastral parcels of Delft. For this there is on blackboard the script delft_parcels.sql with insert statements.

In GEO1006 most / all of you have installed PostGIS. You can use that same database, same user and same schema for the GEO1007 practical assignments.
(Note: if you did not follow GEO1006, then contact the supervisor present at the Geolab, or send an email to m.e.devries@tudelft.nl.)

The text below will explain where to download and how to install Apache Tomcat and GeoServer.

The information is for Windows computers or laptops. If you use a Mac or Linux it should work the same way, but in case of problems contact the supervisors.

In the text there are 6 questions (one question per section, two in section 5). Answer these questions in your report.

➔ QUESTION 1: This is more a 'meta' question as a start, about the computer you use for this assignment:

- What kind of operating system does your computer have (Windows, Mac OS or Linux)?
- If you know other specifics (version of the operating system, whether it is 32 or 64 bits) please also include that.

This is for us to know if the software works well on different systems.

1. Preparation

On your C: or D:drive create a new folder with the name 'geoweb16'.

2. Download and installation of Apache Tomcat

Download Apache Tomcat from: https://tomcat.apache.org/download-80.cgi#8.0.33

Choose the first download possibility listed under 'Core' with the link name: 'zip'. The file name is: apache-tomcat-8.0.33.zip.

Download and unzip, and copy the innermost 'apache-tomcat-8.0.33' directory to your folder 'geoweb16', so you will have the following directory structure: geoweb16/ apache-tomcat-8.0.33 /bin etc.

In the geoweb16/ apache-tomcat-8.0.33 /bin folder: use a text editor to open the file startup.bat and add as

last line (after `:end)` the command: `pause`, like this:

```
…
:doneSetArgs

call "%EXECUTABLE%" start %CMD_LINE_ARGS%

:end
pause
```

This helps capturing problems, because it ensures that the start.bat script does not close immediately after an error or warning.
(For Linux users: do the same, but then with the file startup.sh.)

Starting Apache Tomcat
Use startup.bat (Windows) or startup.sh (Linux) to start the Apache Tomcat web server.

There are now two possible situations:

a. **You get an error message** that neither the JAVA_HOME nor the JRE_HOME environment variable is defined.

If you get that error message: you must define JRE_HOME. In Windows this is done via the method described below. (For Mac or Linux the steps will differ).

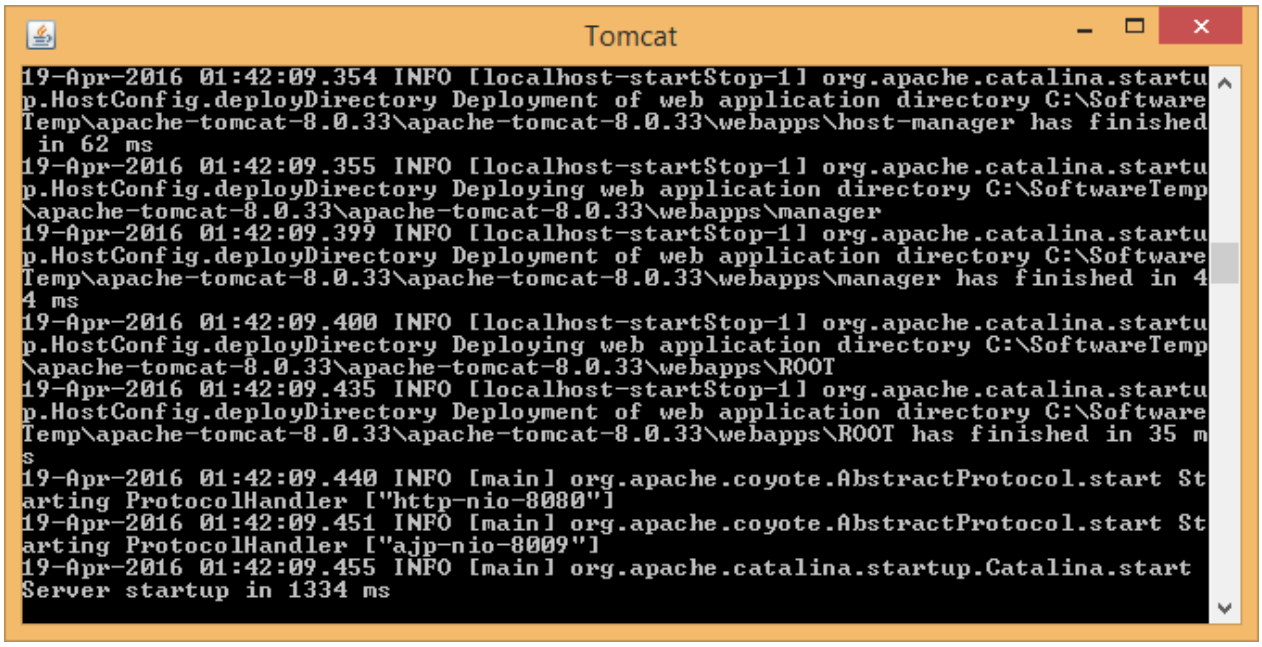
How to set JRE_HOME in Windows 7/8:
Go to Control Panel, System, Advanced System Settings. Click the Environment Variables button.
Under System Variables, click New:

- Enter as the variable name: JRE_HOME
- Enter as the variable value: the Java jre folder on your laptop (for example: C:\Program Files\java\jre8)

Click OK (or Apply Changes).

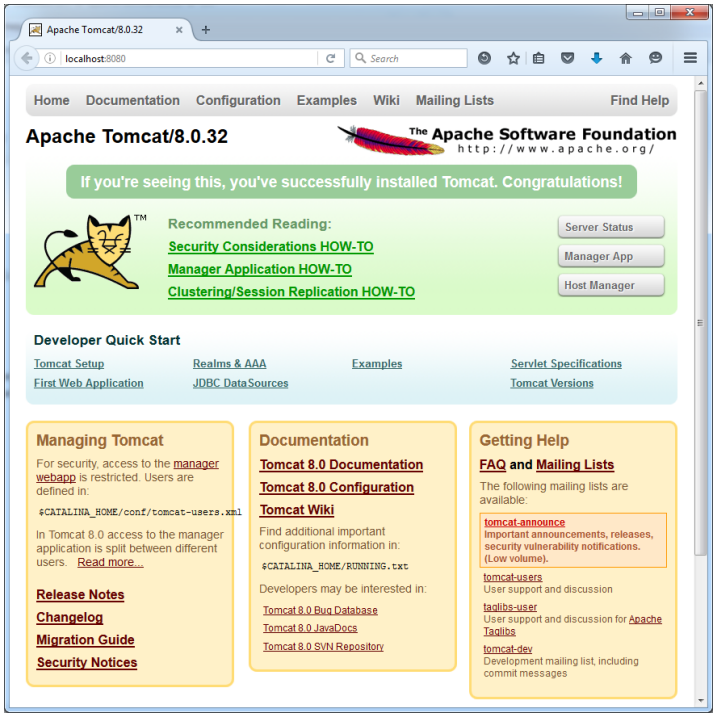
You might need to restart your computer (depends on your Windows version).

b. **Everything is OK** when you do not see the error message and the script continues to open a second command line window:



This command line window will stay open as long as the server is not stopped.
When you see the message ‘Server startup in … ms’, you are probably successful …

To be sure: Open Firefox or another internet browser and type ‘http://localhost:8080’ in the address bar.
You should see the following



You now have a web server running on your laptop with the base url: http://localhost:8080 (default name and port number). It is ‘localhost’, this means you can access the web services from your laptop, but not from other computers (web clients) via the Internet.

Now that you have tested the installation: stop the Apache server by running bin/shutdown.bat (or bin/shutdown.sh for Linux).

➔ QUESTION 2: What is the main function of a web server?

3. Download and installation of GeoServer

The latest stable release of GeoServer is version 2.8.3
Go to http://geoserver.org/release/stable/ and choose as installation package the "Web Archive (war)" package.
Click on the "Web Archive (war)" package, and download the file (the filename is geoserver-2.8.3-war.zip). The download can take a while, depending on network and server traffic.
When the file is completely downloaded: unzip it and move its content (= the file geoserver.war, the directory 'target', and the 2 text files) to the folder geoweb16/apache-tomcat-8.0.33 /webapps.

Start the Apache Tomcat server again, with bin/startup.bat.
Because the geoserver.war file is in the webapps directory, Apache Tomcat will deploy GeoServer as a web application, you can follow that process in the command line window.

When you see the message 'Server startup in … ms', you can start working with GeoServer:
GeoServer now runs on the 'localhost:8080' web server, offering two kinds of functionality:

- There is a 'Web Administration Interface' that lets you define OGC web services (not only WMS and WFS, but also other types). See step 4.
- It is the base url for the OGC web services you will create in step 4.

➔ QUESTION 3: What is the main function of GeoServer (compared with that of a web server like Apache Tomcat)?

4. Setting up a WMS/WFS service - tutorial, with Delft data

Open the GeoServer 'Web Administration Interface' in your browser with the following url: http://localhost:8080/geoserver. Default login is 'admin' and password 'geoserver'.

The 'Getting Started' section of the GeoServer user manual has examples how to set up a geoweb service that publishes geodata stored in ESRI shapefiles or PostGIS tables:
http://docs.geoserver.org/latest/en/user/gettingstarted/index.html

Skip the shapefile tutorial, only do the 'Publishing a PostGIS table' tutorial, but with other data than mentioned in the tutorial: instead use the delft_parcels.zip that is on blackboard.

First run the delft_parcels.sql script to load the 'parcels' table into your PostGIS database.

Then follow the 'Publishing a PostGIS table' tutorial.

Start with the section 'Creating a new workspace'.
It is important to create your own 'workspace' (or 'namespace'), to be able to distinguish layers you have defined from the existing example layers.
Choose a short name, for example your first name (if that is unique among this course's students), and make that workspace the default one.

After creating the workspace, you continue with defining your PostGIS 'store'.

After creating the 'store', the next step is: creating the 'parcels' 'layer'.

The Spatial Reference System for the 'parcels' data is: EPSG:28992 (= value for 'Declared SRS' in the 'Edit Layer' form).

The result should be: one new layer in the layer overview, with the workspace name you created for yourself, and with the layer name 'parcels'.

➔ QUESTION 4: Why is it essential to specify the correct SRS (Spatial Reference System aka Coordinate Reference System or CRS) for a dataset that is published as WMS/WFS layer via GeoServer?

5. **Test the WMS and WFS web services that you created**

The test can be done in GeoServer itself with 'Layer preview':

a. **Preview the 'parcels' layer using WMS**, with .png or .jpeg as output format.

Include in your report
- the HTTP request that is generated by the Layer preview software. This is the url string you will see in your Web browser address bar when the WMS output is shown.
- the WMS output itself (first save it)

➔ QUESTION 5.a: List the parameters (aka Key Vale Pairs) you see in the WMS url, and give a short explanation for each of these parameters with focus on: what is the parameter used for?

b. **Again in 'Layer preview' request the same layer but now as data service, via a WFS request** with GML 3.1.1 output.

Again, include in your report
- the HTTP request that is generated (this time it is a WFS GetFeature request)
- And save the GML output as (XML) file.

➔ QUESTION 5.b: Which differences do you see between the WFS request and the WMS request for the same 'parcels' layer? Relate these differences to the different purpose of WFS and WMS.

Your report with answers should be in a zipfile containing:
- The report itself with the answers to the 5 questions. The text of the report should be between half a page and one page (not counting pictures).
- The image output of the WMS request (5.a) (as picture in the report)
- The GML output of the WFS request (5.b) (as separate file)

Submit the zipfile via blackboard.