ABSTRACT: OMA – LIGHTNING APPLICATION

"Oma – Lightning" is an online tool which delivers a visualization from the different types of lightning to the web. Its main function is to display the different types of lightning (cloud – cloud and cloud – earth) in an user–friendly web application.

The data consists of the exact location of impact, a timestamp and some other attributes (mainly different types of id's). This information is gathered by a network of sensors, also know as the SAFIR system, across three countries (Belgium, Luxembourg and The Netherlands). The SAFIR System is a product of Vaisala (www.vaisala.com) and is the result of research and development conducted by the French National Aerospace Research Agency (ONERA). The application is the successor of an old (1995) desktop application, which could only visualize the information. The main users are scientists, bank and insurance companies, and other meteorological services.

The lightnings are visualized in two different ways:

- each lightning is rendered separately, thus has a point on the map;
- the visual area is covered with a grid, from which the cell size is user–defined. Each cell gets a value, represented by a color, which equals the total number of lightnings it contains.

Both types of visualization can be drawn in two timeframes: the user can query the last N minutes or a specific timeframe.

Oma – Lightning is entirely open source: Linux/Tomcat/PostgreSQL/Java on the server–side and OpenLayers, JQuery on the client–side.

The server–side consists of 2 different services: a WMS service and a JSON service. The WMS service is used by the OpenLayers interface on the client side. Because of the different types of visualization there has been build a custom WMS server, partially based on GeoTools, and large pieces of own code (with a little peek to GeoServer). The data resides in a PostgreSQL/PostGis database.

The main focus (next to the usability) was the performance of the WMS server. This resulted in some extra coding and some additions to the GeoTools code base. An example of this is the implementation of some of the principles of the uDig shapefilerenderer (which is know for its excellent performance) into the standard shapefilerenderer of GeoTools (www.geotools.org). Because of the use of a WMS Server, it's possible to show the data in other applications, off course with the necessary additions of the parameters and the integration in other web applications.

Every other request to the server is in the JSON–format, performed by Jquery at the client–side. The information provided by the JSON–service depends on the type of map that is visualized in the application. If the point–map is drawn, a click on the map queries the database for the closest lightnings to the click. If the density–map is visible, a click on the map results in a value that represents the amount of lightnings in the respective cell. On the server–side this JSON–service is based on own code, and the operations on the database are performed by Hibernate Spatial. The choice for Hibernate Spatial was very easy, it's the perfect combination to retrieve objects, combined with a spatial query on the database.

This lecture will describe the development, infrastructure and methodology of the Oma – Lightning application. Special attention will be paid to the performance issues and their different solutions.

Oma – Lightning has been developed for the Royal Meteorological Institute of Belgium (RMI). This is a scientific institute, engaged in meteorology and depending from the Ministry of Economy. The application was created by Geo Solutions, a subdivision of Cronos (Belgium).