



Spatial statistics on Web

A joint project between the NSI and the NMA to improve usability of spatial statistics

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Abstract

Statistics Finland published datasets via the Finnish National Geoportal for the first time in 2013. The geoportal provides spatial data discovery and viewing services, for example. The viewing services are based on standard Web Map Service interfaces (WMS). In addition, the geoportal enables standard Web Feature Services (WFS) and browsing of features in an integrated view where data are visualised as maps and tables of attributes. Today, Statistics Finland provides more than 60 WMS and WFS datasets for browsing and integrating on the Finnish National Geoportal together with about 700 other national geospatial datasets (<http://www.paikkatietoikkuna.fi/web/en>).

Spatial Statistics on Web is a joint project by Statistics Finland and the National Land Survey of Finland to improve the national geoportal services from the viewpoint of statistical data users. The project follows Inspire directive obligations and implements an open source web application (Oskari) to tailor spatial analysis tools to statistical data.

The Spatial Statistics on Web project focuses on developing tools for analysing grid-based data, but most of the developed analysis methods can be used for other kinds of spatial data as well. The application, including the user guide, is made in three languages: Finnish, Swedish and English.

The presentation will discuss the cooperation of the national statistical institute and the national mapping agency in the project, how the application is developed with user cases, and how the statistical data are served and integrated to the spatial data infrastructure of Finland. The demo will illustrate the functionalities of the spatial analysis tools developed so far and how these tools are implemented as a part of the national geoportal.

The project received a grant from Eurostat and is running until the end of 2015.

Key words: spatial statistics, spatial analysis, grid-based data, open source application

1. Introduction

This paper discusses some key elements of the joint project, whose results will be presented in the session STS086 of the 60th ISI conference in Rio Janeiro. The project is carried out in cooperation between Statistics Finland (SF) and the National Land Survey of Finland (NLS-FI) in 2014 to 2015. The project is about using data services promoted by Inspire¹ and

¹The INSPIRE directive (2007) came into force in May 2007 and will be implemented in various stages, with full implementation required by 2019. It aims to create a European Union (EU) spatial data infrastructure. This will enable the sharing of environmental spatial information among public sector organisations and better facilitate public access to spatial information across Europe.



implementing an open source web application to make spatial analysis tailored to statistical data. The project is partly funded by the Eurostat grant "Merging Statistics and Geospatial Information".

First, I will describe how data, and especially statistical data are served on the national geoportal. Second, there is some information about the Oskari platform, an open source software platform, which is used as a framework of the application to be developed. Then, I will discuss how cooperation is organized in practice. Finally, before the conclusions, some ideas about further development of geo- and statistical portals are presented.

2. Statistical data on the national geoportal

SF offers geographic data for viewing (WebMapService -WMS) and downloading (WebFeatureService -WFS and Atom feed). Information can be selected and viewed in the national geoportal, Paikkatietoikkuna (National Land Survey 2015a), which is maintained by NLS-FI. Where necessary, the data can be downloaded to one's application also via SF's interface service. The interface service is a technological access connection, by means of which data users can access SF's map server and download necessary data. Use of the interface services requires access to software that makes requests to SF's server. In practice, this means GIS-software or some self-programmed application.

The data and services are integrated with other data belonging to the national spatial data infrastructure. All the data, including statistical data, are served directly from the data providers' own servers, in our case from our geoserver. All available geographic data are open data. SF's general terms of use for free-of-charge data applies to this geographic data as well (Statistics Finland 2015a). The Inspire directive (2007) and the corresponding national Act (The National Spatial Data Infrastructure Act 2009) and Decree (The National Spatial Data Infrastructure Decree 2009) define the standards for the data and services.

The national geoportal is a public and free website that is open to all. The roots date back to the 1980s, when the first spatial data directory service was released. Already then, SF published metadata about regional statistics via the geoportal. After EU launched the Inspire directive (2007), the role of the geoportal has strengthened and it has become a focal point of the national spatial data infrastructure. The data available via the geoportal are cumulating fast. Today, data and data services are harmonized and based on Inspire and the National Spatial Data Infrastructure (NSDI) specifications. In addition to the basic services of geoportals, the Finnish geoportal enables, e.g. the design and publishing of embedded maps by building on the web service interfaces of many data providers at national and local levels.

SF published Inspire compatible WMS and WFS data services for the first time in May 2013. These data have been updated annually since and some additional data have been published. The statistical data, which are available via the geoportal and for the NSDI, are listed on SF's website (Statistics Finland 2015b).

All the data, including Inspire compatible metadata, can be reached both via SF's website and via the national geoportal.



3. Oskari platform

The mission of the Oskari platform is to offer easy-to-use, browser-based tools to access and re-use information from various data sources, including the Inspire Spatial Data Infrastructure. All the developed code is released within the framework of Open Source Licenses (MIT/EUPL).

The Finnish national geoportal is an example of an Oskari user interface. The Oskari user interface is implemented as a collection of reusable bundles. Bundles are used as uniform containers to ship and share new functionalities to the application setups. Additions to existing functionalities are implemented as Plugins shipped within the bundles. Server-side functionality of the platform is implemented as a Java servlet, which can also be extended to handle new functionalities. Oskari uses standard Open Source components such as OpenLayers, GeoTools, GeoServer, Jackson and jQuery. The developed Open Source code stitches these applications together and makes it possible to extend the functionality of the platform in a coordinated manner. The guidelines, source code and all the content can be found on the Developer Web Site for the Oskari Platform.

The Oskari network in Finland has an agenda to

- Develop Oskari software as a user-friendly and versatile tool for utilising geographic information
- Agree on roles and share development work in order to avoid overlapping work
- Ensure integration, uniformity and documentation of new components
- Publish results of development work as open source codes
- Ensure that different services are compatible
- Develop cooperation activities and practices

Currently, the network has around 30 organisational members. It has raised interest to cooperate in using open source software especially among public authorities. The network promotes ideas that are hardly to be ignored; to cut software costs, to avoid overlapping work, to share suitable tasks and timetables, to promote coherent development work with a common vision and architecture.

4. Cooperation in improving usability of statistical data

Population grid data was among the first datasets, which SF published via the national geoportal. The current geoportal with its user interface already provides an excellent window for integrating map data to basic regional and local statistics by visualising thematic map layers on top of each other. However, especially usability of grid data could be improved by spatial analysis tools.

It was obvious that the Oskari platform could be developed further by adding tools for spatial analysis. SF had an interest to improve the usability of statistical data in the geoportal and NLS-FI, as a coordinator of the Oskari platform and a maintainer of the national geoportal, had an interest to further develop the geoportal. A cooperation project was launched from the beginning of 2014. The good relationship, which already existed between our organisations was strengthened. This concrete project has made communication between the organisations livelier concerning many other issues as well.

SF has acted as a project leader of the action. Responsibilities of its team include providing WMS and WFS data services for specific user cases. SF's team has the main responsibility to define the user cases on which the spatial analysis tools are based. NLS's team has a responsibility to make technical descriptions about the functionalities. It also manages a



scrum team, who makes java scripts or uses ready-made components to apply the functionalities to web application tools. SF's team tests the tools and gives comments. The whole project is responsible for ultimate verification of the tools. NLS' team publishes the tools on the national geoportal and adds the technical documentation to a GIT-hub of OSKARI (Developer Web Site for Oskari Platform).

The implementation from user cases to the application has been carried out according to AGILE methods, which is supervised by a project member of NLS-FI. The scrum reviews have taken place every 14th day. SF's team has had the opportunity to take part in them via videoconferencing. However, major follow-ups of the implementation of the application have taken place in face-to-face project meetings.

The project continued until the end of 2015. So far, about 90 per cent of the planned functionalities have been included in the beta version (Analyse (Beta) of the Map Window of the web application (National Land Survey 2015b). This includes such methods as buffer, key ratio computation, union, clipping, union of the intersecting features, multiple buffers, difference computation and spatial join.

The application, including the user guide, will be made in three languages; Finnish, Swedish and English. The components of the implemented application are documented, and the descriptions and codes will be downloadable on the developer website of the Oskari platform. All functionalities in the Oskari platform, including those implemented in the project so far, are listed on the OSKARI Web Site (Developer Web Site for the Oskari Platform).

5. Future challenges

The statistical data, which are now available via the geoportal are still very limited. All data are served as open data. However, small area statistics, which are of interest to spatial analysis have mainly been chargeable in Finland. There are already plans to add an identification of user roles according to which the use of certain data can be restricted or charged.

The spatial analysis tools are somewhat complicated and often need some advance knowledge of GIS. The major focus of the project until now has been to implement innovative tools technically. There are still challenges to improve user experiences to make these tools useable to everyone. If the project is allowed to continue, the next version of the application may include wizards to guide users to perform desired spatial analysis.

The population grid data are now protected by a minimum threshold of 10 inhabitant per a grid cell. This has been taken into account when showing and interpreting results of spatial analysis. In future, it may be worth studying other ways to handle confidential data in the application; e.g. there are methods to protect data on micro level or the application may perform data protection on the fly.

The Oskari platform is a promising platform to provide various statistical services. Now it has been developed mainly from the scope of geospatial information. The national geoportal is the most advanced Oskari application at the moment. The usability of the geoportal from the statistical data point of view has improved through the project. However, most of its data users are still traditional map users. There might be a time to start building a separate statistical portal with the help of the Oskari platform and open source software. There are already parts of it emerging on webpages of some Finnish municipalities. The major



challenge is how to integrate it with other statistical services already available on SF's web pages. However, there is already some pressure to proceed further. The final report of the project about "Map service for knowledge management" (JulkICTLab 2014) financed by the Ministry of Finance of Finland suggests building of central statistical portal using the concepts of Inspire and the Oskari platform.

6. Conclusions

The implementation of the Inspire directive and development of an innovative web application by open source software initiated Statistics Finland and National Land Survey to work together in a joint project. A common interest to improve the national geoportal by spatial analysis tools concretised the objectives of the action. The project has illustrated that new relevant information can be created by integrating statistical data and geospatial data, and by making spatial analysis with the help of the web application.

The focal objective of the project was to improve usability of grid based data served in the geoportal. The tools for spatial analysis were tailored for statistical data, especially for grid data. The functionalities were developed with the help of user cases compiled through SF's experience of customer needs.

Another important objective of the project was to gain experiences of implementing open source software in an web application with spatial analysis. The framework was the Oskari platform with experienced users of open source software and of Java coders in the geographic information field. The objectives has been shown feasible by results available already now. The application runs on the Finnish geoportal managed by NLS-FI. The data, including statistical data, are served according to Inspire requirements as decentralised by data providers' interface services.

The responsibilities of the project teams of both organisations were defined carefully in a written agreement. Both teams have learnt a lot from each other. The cooperation between our organisations has been very fruitful and inspiring. There is a strong will to continue the project to further stages. There are many ideas how to improve geoportal and statistical services while utilising the Oskari platform. Other ideas about joint projects are also emerging.

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