Managing the Flemish Functional Cycle Network: a FOSS4G solution

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Abstract

Everyday people make a lot of movements between their home and attraction poles in cities and municipalities such as work, school, stores,.... A lot of these functional movements could be done by bike if the appropriate infrastructure would be there. More than 10 years ago, The Flemish Ministry of Mobility and Public Works defined a Functional Cycling Network (FCN) to realise a logical and safe infrastructure for functional cycle movements between these environments.

The GIS architecture that was set up in that period was not appropriate anymore to serve the current goals and possibilities. Figure 1 shows this former architecture; the base is a central database (Oracle). Every work cycle, distributed datasets (Personal geodatabases) were created for editing in a Desktop GIS (ESRI). After editing the information was validated, corrected and re-entered in the central database. Reporting (statistics & static maps) was based on the central database.

![Figure 1: Former architecture with distributed datasets for desktop editing.](image)

The scope of this project was to provide a GIS-based web tool to manage the data and provide tools to monitor, analyse and report about the FCN. This to improve the FCN according to defined standards for cycling infrastructure. As this tool is going to be used by the responsibles in every municipality of Flanders, they expect a reliable, performant and stable system that can
manage this kind of data.

Figure 2 shows the state-of-the-art architecture, based upon several FOSS4G components (PostGIS, Geotools, Geoserver, Openlayers 2/3) and OGC standards (WMS, WFS, WPS).

![Diagram](image)

**Figure 2: New architecture for GIS based web tool based on FOSS4G.**

Postgres/Postgis serves as the central database where all the (geo)data is stored. The baseline road network is lineair referenced and all the attribute information about the FCN is stored as event tables.

For performance issues the attribute information is generalized and materialized for visualisation purposes. Every night, data is summarized to serve predetermined reports.

The map in the web client is mainly based on OpenLayers 2. Only for the editing window OpenLayers 3 is introduced for its capabilities to turn the map to show bicycle roads in a horizontal manner (Figure 3). Furthermore the web client integrates all functionalities for editing, monitoring and reporting the FCN (Figure 4).

Together with the renewed architecture, a new baseline road network was introduced for the FCN. Because the new baseline differs geometrically from the former baseline, OpenLR was used to convert the FCN. OpenLR is a technique to encode routes in a map agnostic format so it can be decoded to a
geometrically different road network. Afterwards, validation and manual correction of the transformed FCN was still necessary. All attribute information, referenced to the former baseline was transformed to new events on the new baseline using a combination of Lineair Referencing Postgis Queries. This project shows that FOSS4G components can be used to create a reliable and stable GIS application and have the ability to overcome typical migration and linear referencing problems.

Figure 3: GIS-based web client editing capabilities.
Figure 4: GIS-based web client reporting general statistics.

References