BIOGRAGHICAL INFORMATION

Pieter G. Meijer
Senior GIS consultant
Ministry of Transport, Public Works and Water Management of The Netherlands
Directorate-General for Public Works and Water Management (RWS)
Geo-Information and ICT Department (AGI)

Specific Responsibilities
Responsible for the architecture and standards policy for the geospatial part of the ICT-environment within RWS. Coordination of the 16 RWS-departments, each having a local geospatial infrastructure.

Past Experience
Working experience in the GI-industry since 1989. Past assignments include GI-system development, consulting for telecommunication and utility companies, scientific research in remote sensing and GI-project management. Since 1999 employed within the Dutch national government and involved in the national geo-information clearinghouse, architecture and standardization.

Educational Information
Masters in agricultural science, Wageningen University (1988): GIS and remote sensing.

Professional Memberships
Board member of Geo-Informatie Nederland (GIN). GIN is the Dutch professional organization for geo-information. In 2003 a number of different professional organizations in the field of remote sensing, geodesy, cartography and other geo-information professional organizations joined forces to form GIN. Amongst these organizations also was GITA-Netherlands. Thus GIN is now the representative of GITA in the Netherlands. For more information on GIN: www.geo-info.nl

Within GIN president of the section “Geo-ICT”.

Enterprise GIS Based on True Interoperability

Pieter G. Meijer
Telephone: +31-15-2757059 Fax: +31-15-2757576
E-mail: p.g.meijer@agi.rws.minvenw.nl

ABSTRACT

The directorate-general (DG) for public Works and Water Management (RWS) is responsible for maintaining and administering the main roads and waterways in The Netherlands. RWS is a organization with a headcount of about 10,000 employees, an annual budget of € 11 billion (US $13.3 billion) and more than 200 offices throughout the country. A new Dutch government policy has urged RWS to deliver more value for money on the same budget and to simultaneously reduce its employees. To achieve these goals, the organization is moving from a decentralized approach to a centralized steering model using uniform working models and organization-wide standards.

The department of Geo-information and ICT (AGI) is working with RWS to meet the challenge of reducing ICT (information and communications technology) costs considerably. The strategy to meet this challenge is built on the principles of: uniform working models, open standards, server-based computing and central data hosting and maintenance. A geo-information infrastructure based on the OpenGeospatial Consortium (OGC) Services Architecture has been established using both open source software (OSS) and vendor components. This infrastructure has already enabled broad geo-information sharing throughout the organization and has proven to be cost effective. Expected future developments include feature services and the implementation of a transactional web feature service for mobile clients.

INTRODUCTION

This paper first describes the background of the directorate-general (DG) for public Works and Water Management (RWS) and sketches in brief an outline of this organization. Then the role of geo-information is highlighted as the stages through which the geospatial information policy of the organization evolved. Subsequently is explained how the demands of today require a new approach to geo-data processing and management.

Using the results of recent projects an illustration is given how geospatial data management at RWS moves to a new stage in which the demands of today can be met. Key factors in this geospatial data management policy are centralization of geo-data in centrally managed geodatabases, the use of open standards, the exchange of Windows-clients for small-footprint browser-based web-clients and the use of mobile technology which is seamlessly connected to the main geospatial infrastructure.

RIJKSWATERSTAAT: OVER 200 YEARS OF EXPERIENCE

The directorate-general (DG) for public Works and Water Management, Rijkswaterstaat (RWS) is since 1798 responsible for maintaining and administering the main roads and waterways in The Netherlands. These tasks include protection of the country against floods from both the rivers and the sea. RWS is a organization

having 10,000 employees, an annual budget of € 11 billion (US $13.3 billion), and more than 200 offices throughout the country. Accurate and up-to-date geo-information has always been a necessity for administering the main water- and road networks of the Netherlands. The department of Geo-information and ICT (AGI) is responsible for providing the organization with the IT and the (geospatial) information needed for its tasks.

STAGES IN THE GEOSPATIAL INFORMATION MAN AGEMENT RWS

As water management was crucial to survive in the low-parts of the Netherlands the management of the water systems was already conducted in a sophisticated and organized way in the middle ages. There are e.g. map series of thematic maps of the water system on a scale of 1 to 19:000 (15 sheets) dated 1611. RWS has thus a long and standing tradition of mapping and geospatial data processing. RWS, like many similar organizations, moved through the consequent stages in which the process of geospatial data management was automated. First the mapping process was automated using mostly CAD and automated drawing techniques. Then stand-alone desktop GI-Systems were introduced, first mainly for more complicated geo-processing task like modeling and analyzing data for policy making. When desktop GIS became more lightweight and easier to use and access, the use of GIS further spread throughout the organization. As it was relatively easy to develop add-ons, scripts and applications, and there was no strict policy for application development and maintenance, many smaller and larger GIS -applications popped-up. Because less emphasis was laid on datamanagement and data distribution and application maintenance was not embedded within the organization this lead to a sub-optimal situation in which software maintenance was expensive and data management cumbersome.

TO CORPORATE GIS-DATABASES AND ENTERPRISE-WIDE GIS

At an early stage the responsible professionals recognized the drawbacks of the very bottom-up approach in which geospatial data processing was managed and developed. Single-use GIS applications were replaced by multi user client-server type solutions but the bottom up steering (and funding) of development still blocked a more structural approach.

A new Dutch government policy has urged RWS in the last years to deliver “more value” on the same budget and to simultaneously reduce its number of employees. To achieve these goals, the organization is moving from a decentralized approach to a centralized steering model using uniform working models and organization-wide standards. When the board of directors, alerted by the rising costs of IT and geo-data management, recognized the problems in this field, a centralized steering model for IT was put in place. This makes it now possible to work on Enterprise GIS: geo-data once and securely managed and accessible for any worker who needs it any time and anywhere it is needed. In this paper components of this centralized solution are discussed.

GEOSPATIAL INFORMATION MANAGEMENT AT A NEW LEVEL

The department of Geo-information and ICT (AGI) is working with RWS to meet the challenge of reducing ICT (information and communications technology) costs considerably. The strategy to meet this challenge is built on the principles of: uniform working models, open standards, server-based computing and central data hosting and maintenance. A geo-information infrastructure based on the OpenGeospatial Services Architecture has been established using both open source software and vendor components. This infrastructure has already enabled broad geo-information sharing throughout the organization and has proven to be cost effective. Expected future developments include feature services and the implementation of a transactional web feature service for mobile clients.

OPEN STANDARDS AND OPEN SOURCE SOFTWARE

About ten years ago, during the rapid bottom-up development of GIS within the organization there was an awareness that some form of standardization was necessary in order to be able to exchange data and share applications. By that time the only way to achieve this was to standardize on a vendor and ESRI-software was selected to provide this “GIS-standard” for RWS.

Now there comes a need for open standards in order not to have a “vendor lock-in” and to be able to communicate with other organizations. In 2004 RWS made the decision to base development on the Open Geospatial Consortium standards. Especially the OGC Services Architecture was adopted. The use of open standards makes it now feasible to use open source software. For some developments open source software proves to be competitive with commercial based software and is successfully deployed.

CENTRALLY MANAGED GEO-DATABASES

Since the whole of the organization is now connected with a reliable broad-band network, data can be stored in centralized databases and other centrally managed data stores. As data sharing and interoperability becomes more important and open standards are required a transition is made from file-based storage e.g. in coverage files of shape files to storage in a database which is geo-enabled. RWS uses both the ESRI SDE-database application and Oracle Spatial for this purpose.

THE GEOSERVICES INFRASTRUCTURE

Within the “Geoservices” project an OGC services architecture infrastructure has been implemented. The technical architecture of this infrastructure is sketched in figure 1. Because the architecture is based on Open Standards, components of different vendors could be assembled to form the Geoservices infrastructure. The objectives of this infrastructure is to provide a robust framework for delivering web applications and to serve the available (base) geodata to any client within the organization. For the construction of the geoservices infrastructure a growth model was used. The infrastructure now includes a catalog service (OGC WCAS), an OGC compliant geocoder, a feature service (OGC WFS) and ,for the time being, an ArcIMS service to support some legacy applications.

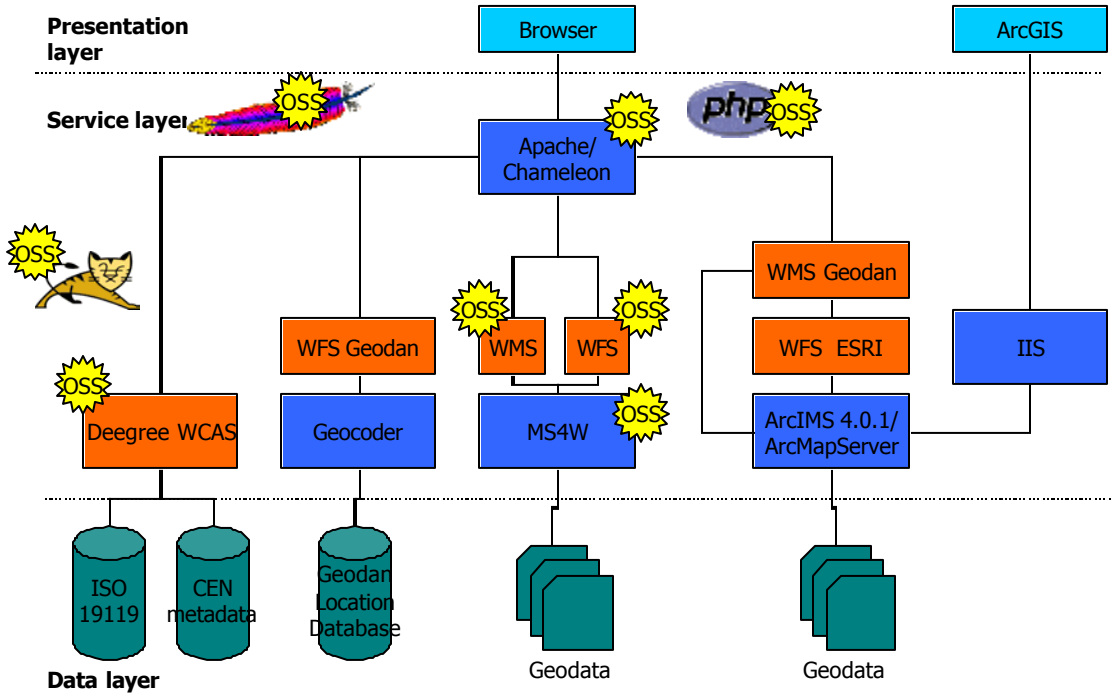

Figure 1. OGC Services Architecture implemented at RWS.

On the client side three categories of users are identified: The "*viewers*", the "*users*" and the "*doers*". The *viewers* mainly will use tailored small footprint webapplications. A number of smaller applications now running on a desktop GIS will be migrated to the web. *Users* typically gather there own information and start playing around to do analysis. These users will be provided with a powerful desktop GIS which can connect to the Geoservices infrastructure for data sources. The *doers* are in charge of the maintenance of the base data. These people will edit the data, get external updates etc. They might work directly on the geodatabases or connect via the Geoservices infrastructure using OGC WFT-T specifications.

The main GI-software supplier of RWS is an OGC Principal Member and implements the OGC standards in its products. This makes it possible for RWS to move to an Open Standard environment without having to write off major investments in licenses, software and know-how. RWS and this supplier are cooperating in the field of OGC-standards and software interoperability.

Open Standards paved the way to a more independent attitude towards the GI-software industry. In one of the first software selection cases (for WMS) one of the bidding system integrators, Geodan, proposed a solution based on Open Source Software (OSS). This solution has proved to be competitive and was up and running in a relatively short period of time. Although the experiences with OSS are positive, the use of OSS will not be a decisive criterion in the deployment of webbased GIS applications. The main criteria are: out of the box functionality, supporting of the

OGC-standards, robustness and flexibility, performance and fitting within the RWS ICT-environment. For the further extension of the Geoservices infrastructure (WFS and WFS-T) probably a commercial software product will be chosen.

MOBILE TECHNOLOGY

To carry out the day-to-day RWS activities many RWS-workers are out in the field - inspecting infrastructure, checking permits and regulations etc. To supply these workers with hand-held mobile computers with GPS location and a wireless connection to the office network proved to be very productive. Apart from the time saved also the quality of the decisions made increased because of the information available on the spot. In a pilot project mobile computers running a web browser were connected to several databases and able to do vector editing in these databases all through OGC standard protocols.

CONCLUSIONS

A strategy of uniform working models, open standards, server-based computing and central data hosting and maintenance is feasible and has many advantages. OGC standards are matured so these enable the construction of an enterprise geo-infrastructure based on open standards. Advantages for the organization are a robust data management, the widespread availability of geodata and low threshold for data sharing. Apart from this a more independent attitude towards GI-software suppliers is possible: the vendor which delivers the required features at acceptable conditions can be chosen. The main GI-software supplier for RWS supports the OGC standards which minimizes legacy issues to be dealt with.