Note: This document is not an OGC Standard. Internal and external documents cannot refer to it as such. Drafts are distributed for review and comment and are subject to change without notice.

User Exerience: Wireless Info Project

The following user experience is about using the WMS interface for Web mapping on mobile devices.

The WirelessInfo project focuses on the development of a planning support system for the evaluation of landscape changes. The whole project is oriented at the connection of GIS systems (including GPS technologies, remote sensing, photogrammetry, 3D modeling) with wireless communication based on utilization of 2G and 2.5G networks (GSM, GPRS, HSDCS). The main objective is the exploitation of wireless communication for decreasing the data transport (server - terrain, terrain - server) time between data collection and data processing.

The central aim of the work effort is to find the most effective way to obtain data for Web mapping using wireless devices. In many applications with mobile data access, it is necessary to have parallel data access. The data sources are usually distributed among many organizations (many data servers) which collect this data. Up till now, this situation was solved by replication of the same data in different institutions. But here the task of modifying a map or creating new features in the most convenient and exact way is in question. Another important point was to obtain the most effective dual mode communication with the University of Minnesota (UMN) MapServer. A mobile UMN MapServer public client was implemented to address this.

The project solutions were based on INSPIRE[1] recommendations and utilization of OGC standards. This ensures base conditions for interoperability of GIS services. Specifically, the solution is based on WMS server cascades. This type of solution offers a more operative data access anywhere at anytime.

Solution Outline & Testing Overview

The WirelessInfo solution is considered optimal for several reasons:

- Mobile device gateway is already developed and running inside of a project
- Implementation of OGC standards
- Open solution with AGILE community of the developers

A variety of GIS software, wireless devices, and GPS receivers were analyzed and compared, with due consideration for the fact that geographical data standards are different in the Czech Republic from those in other countries. To provide tools for 3D analysis and remote sensing analysis, a direct link between UMN MapServer and another Open Source solution, GRASS, was established.

At this stage, the participants[2] of the WirelessInfo project are testing and establishing the proposed structure on an Intranet environment. They are simulating a network of WMS enabled data sources with cascading WMS server, such as the UMN Mapserver. WMS cascade servers play a role of hubs of WMS networks and offer the possibility to create a gateway for mobile devices that use different sources of geographic information.

For mobile systems, two approaches need to be considered. The first is shown in Figure 1:

---

[1] *Towards a European Spatial Data Infrastructure: http://195.228.254.144/Eloadasok/Stream1/Wednesday_11hr/Alessandro_Annoni_11_str1/GSDI6_26_Annoni.pdf.*

[2] *Participants in the WirelessInfo project included: UV, SPACECAD, INGR, HSRS, and Lesprojekt.*

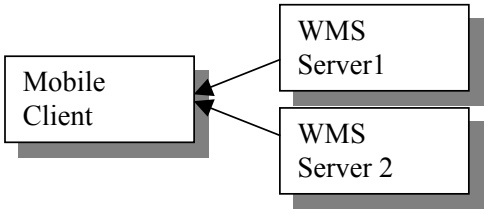

Figure 1: DHTML/CSS mobile client

Advantage:

- Servers work in parallel, so there is faster response from the server side.

Disadvantages:

- The CSS explorer is necessary on the terminal side. Many current mobile terminals do not have this functionality. There is a higher processing load on client side.
- It is necessary to obtain information from all servers in the some coordinate system.
- A large amount of data is transferred, which could be very important using GPRS technology.

The second approach is shown in Figure 2:

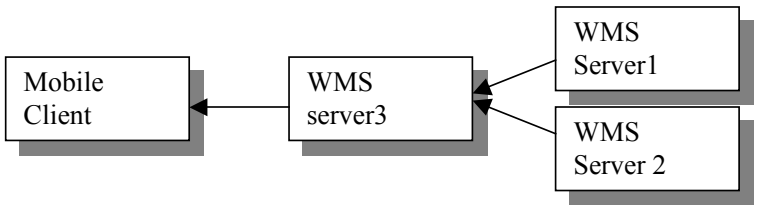

Figure 2: Cascading Server using Mapserver

Advantages:

- Low processing load on the client side (HTML is enough).
- Solution supports Java clients.
- It is possible to use data from servers that use different coordinate systems, Coordinate Transformation Web Services are used by server3.

Disadvantages:

- It is necessary to have one more server
- The data are downloaded after downloading of all data on the server.

After analysis, it was decided to use the first model only in the case where PC's were used as field computers. In this case a thick client could be used and part of the data could be stored on a field server and WMS services could run on the field server. Such systems work partly independent of the GPRS cellular network, and there usually is a large amount of data that is already downloaded onto the field server. For handheld type computers, there is a recommendation to use the second solution model, which is independent of a particular technology.

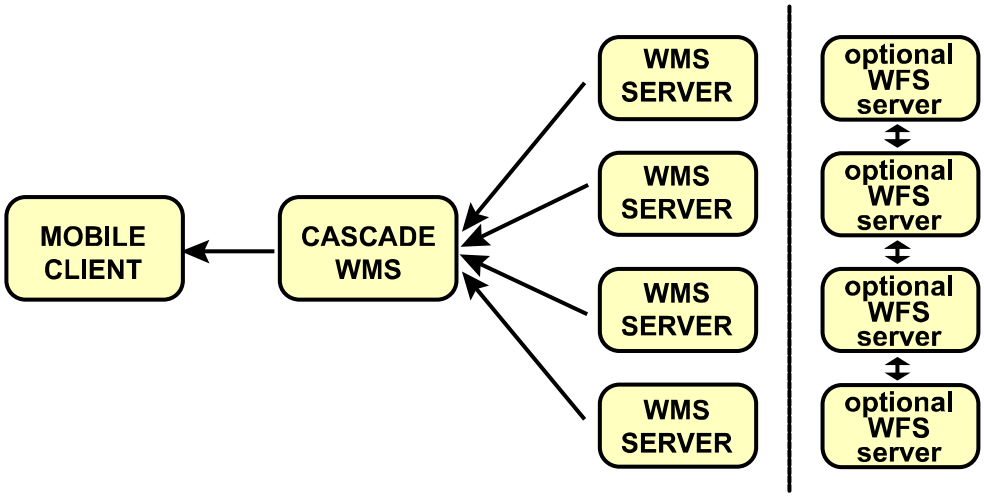

Figure 3 below shows a sketch of the structure of the proposed WirelessInfo network.

Figure 3: Proposed Structure of the WirelessInfo Network

In terms of network nodes, WirelesInfo is testing all WMS solutions that can be used by current data providers. A key challenge that resulted during testing is spatial projection system handling. This is, of course, a necessary condition for geodata interoperability. The problem is the absence of some national projections in the EPSG list[3]. In the case of the Czech Republic, this is the S-JTSK system, which is widely used by state administrators. During testing, data was transformed into WGS84 coordinates. Efficiency of the transformation needs to be resolved.

Pilot testing in Forest Management Institute

The current firewall system in FMI Brandys n. L. is based on the VPN-1 Enterprise FireWall, which covers license to unlimited numbers of users and also contains a management module for engineering additional distributed modules of firewall. There are good conditions for using the protective modules in external subjects and fixation of two functions:

- Effective protection of external subject network by the high-tech
- protection system with opportunity costs.
- Creation of protected communication data line among the external
- subjects and the central evidence for data transfer by any TCP/IP protocol.

Testing tools:

- Phone Card 2.0 with enabled data service

[3] See OpenGIS Coordinate Transformation Services Implementation Specification: Revision 1.00 OpenGIS Project Document 01-009.

- SW Driver for Phone Card 2.0
- Notebook PCMCIA with OS Windows 2000SW VPN Secure Client FW
- Service Setup for card phone 2.0

Set-up:

- Installation of SW Driver for Phone Card 2.
- Device connection to PCMCIA slot.
- System configurations to FW for authorisation access to Firewall from the Internet.
- Connectivity verification to data service provider (Eurotel).
- Installation of FW Secure Client to notebook with W2000.
- System configuration for connection to Firewall and authorisation to system Firewall.
- Verification and connection to UHULnet.
- Wireless connection of distant client to FMI network through VPN.

Hardware and software equipment required:

- Module Nokia Card Phone 2.0
- Corresponding software for Module Nokia Card Phone 2.0 handling
- Activation of data services on the corresponding SIM card for certain providers of the mobile data data network is necessary.
- Firewall software for secure remote client

Self-connection approach:

- Installation of Module Nokia Card Phone 2.0
- Plug-in of Module Nokia Card Phone 2.0 during installation
- Reset of the system
- Setting of baud rate in SW Nokia Card Phone 2.0 system
- Installation of SW Firewall Secure Remote client
- Reset of system
- Configuration of connection to data network mobile provider
- Configuration of SW Firewall Secure Remote client
- Self connection to network

Using GPRS data service, it was discovered that GPRS Eurotel data service does not support the IPSec protocol. Testing of this service should debug different forms of access to data, methods and forms of data storage for different server types (UMN MapServer and Intergraph GeoMedia WebMap). The goal is to create an optimized communication environment and to navigate a user so that the user maximally exploits the prepared data. In addition, the goal was to have the data stay at the data collector.