Georama – A Web Portal for Mountain and Countryside Tourism

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Abstract

Planning holidays via the Internet and finding the appropriate information can be a daunting experience. Some locations provide Internet Mapping Services for promoting their recreation facilities. These solutions are limited to certain locations and activities. Information is most often provided in one or two languages.

In the European project GEORAMA a new framework is created, gathering tourism regions and their sports activities in a central access point. A web portal for sport practitioners, tourists as well as local population, provides multilingual information based on GIS technology. The latest European standards for data interoperability are considered for setting up an open GIS architecture. We report our experience with the ESRI ArcIMS 4.0.1 and the available Standard OGC Connector.

1 Introduction

Imagine yourself being in the process of planning your holidays. Perhaps you are in a hurry. Perhaps you like to be better informed than ever. You are looking for recreation and sport activity at a specific place in Europe. Nowadays you can get the information via the Internet, but it takes some time to find the appropriate information under dozens of websites.

There exist a lot of locally organized tourist information systems like (see web links):

- Austria: TIS Cover
- Portugal: Portugal in Site
- Italy: ENIT state tourist board
- Greece: GNTO National tourist organization site

Only a few of them are connected on a European level. Geoinformation technologies are seldom used to provide tourist information services. Previous projects trying to retrieve tourist information from GIS can be found in (Mogorovich, Magnarapa et al. 1992), (Panagopoulou G., Sirmakessis S. et al. 1994).

In this paper we like to present a web based geo-navigational portal that will provide all necessary information and services to the mountain and countryside tourism community. In the European project GEORAMA we setup a multilingual, interoperable framework for a tourist information system. Issues for such a portal are extensibility and openness to deal with the diversity and heterogeneity of different cultures and countries. The latest OGC standards have been considered for the design of the system using OGC web mapping services (WMS) for the implementation of a prototype.

Section two discusses the developments in current tourist information systems. Open GIS technologies are rarely used to realize such systems. The need for user driven GIS development is stressed, by identifying outcomes of user requirement analysis of some projects.

The OGC Web Service initiative is introduced in section three. We describe a technical architecture of an open system for tourist information, showing where data is stored, how users access to multi geographic data sources and how they get the required information from the system. Available WMS connectors for the most popular GIS systems have been utilized to realize a framework of European data interoperability.

The aim of a tourism related project is certainly to provide geographic information as close as possible to the users' needs. However there is a gap between what current web services are able to provide and what users need. Section four will show up these differences and present a proposal for the design of web map service client software.

Conclusions will be made in the fifth section, as well as an outlook given to our next steps in the project.

2 Intelligent Tourism Systems

Current Tourist information systems are hardly based on GIS technology. The provided maps are usually static, enriched with textual descriptions and web services like web cams, web services for weather forecasting or multimedia animations via browser plug-in. Map based solutions are mostly designed for users being familiar with CAD or GIS viewer experience. To the authors knowledge these systems are all based on proprietary technologies. Leukert and Reinhardt give a good overview on proprietary internet mapping systems (Leukert and Reinhardt 2000).

A new generation of tourist information systems is growing, being scaleable, open, heterogeneous, distributed and cooperative. Personalized services that are aware of the user's location and his context shall guarantee the success of tourist information systems in the future. Most of the services are considered to be mobile and assisted by agents for gathering, integrating and monitoring tourist information (Werthner, Knoblock et al. 2002). Georg Gartner has pointed out that from a point of view of ethics these developments are very questionable. They require very personal information about the user (AGIT 2003, keynote).

A number of European projects deal with tourist services in mountain and rural areas. The *Webpark* project (Krug, Mountain et al. 2003) offers its customers services in coastal, rural and mountainous areas for mobile phones or personal digital assistants (PDA). The Location Based Services are personalized, providing the end user with customized information. Surveys on potential users raised the following demands regarding maps: safety information, digital maps for location based services, thematic maps to provide wildlife information beside others.

The same group of target users is addressed in the *Paramount* (Gonzalez, Moner et al. 2003) project. This project stands for Public safety and Commercial Info Mobility Applications and Services in the Mountains. A user requirement analysis identified increasing safety and providing information as the main interests for the service.

The GEORAMA project concentrates on web client users and considers mobile users in a future scenario. A first questionnaire identified similar user requirements as listed in the projects above. As GEORAMA aims to be open and extensible we investigated current data standardization processes in Europe.

3 A System Architecture for GEORAMA

3.1 The OGC Web Service Initiative

The Open GIS Consortium (OGC) is a non for profit consortium of 258 industrial, governmental, and academic members. The aim is an integration of the geo-data processing into the common data processing (Buehler and McKee 1996). Spatial interface specifications shall be widely available for global use. The OGC Web Services Initiative (OGC 2001) is one of the movements to this vision.

OGC Web Services act like wrappers to GIS data holdings. Via standardized interfaces parameterized requests can be made to access the services and receive well defined result e.g. an XML document, being readable by humans as well as machines. The most prominent services are described in the following sections.

A web map service (WMS) is a special kind of web service having an interface with two required and one optional operation. The mandatory GetCapability operation returns a self description of the service as an XML document. The obligatory GetMap operation returns a map as a geo-referenced image. The optional GetFeatureInfo operation returns information (any MIME type) about particular features shown on a map. WMS that support this optional interface are said to be “queryable” (OGC 2002a).

If one would like to access the GIS data holding and receive features instead of images, one could use the OGC web feature service (WFS). To do so a web feature service interface has to support three operations: GetCapabilities, DescribeFeatureInfo, GetFeature. The GetCapabilities is analogous to the web map service. The DescribeFeatureInfo returns a description of provided features in GML. GML is an XML dialect provided by OGC to transport and exchange geographic features via the internet. The GetFeature operation allows retrieving features via a parameterized request from the service. A transactional WFS is able to insert, update and delete data to the data holding wrapped by the service (OGC 2002b).

Data provided by the WMS is organized in named layers and styles. Styles are a predefined set of rules on how to display certain layers. The user has no influence on the way the data is displayed; he has just the option to choose between styles. Here the styled layer descriptor (SLD) interface specification (OGC 2003) extends the WMS specification for user customizable styles. The idea is that the user provides portrayal rules to a web feature server in order to do a map rendering via a web map server.

At this point of the development the human user has been completely ignored. A web service is supposed to be read by machines and humans. Protocols, XML, and specified interfaces do certainly support machines, but for human users special client software has to be provided that considers the classic cartographic rules of human perception for generating maps. There is a high need for such client software to make OGC web Services useable for human users.

3.2 User Requirements

The user of the planned architecture is a mountain and countryside tourist. In the course of the project a questionnaire has been released on the web to determine the user requirements. Internet users have been asked about the activities they like to carry out in the specified regions, as well as the services they like to be provided with. Specific questions about the content of information have been made. The user requirements are one important factor to define system requirements. Several other methods like focus groups, etc. have been applied in this phase of the project.

Data acquisition is heavily influenced by the outcomes of the user requirement analysis. The acquisition of data must respond to the user requirements rather than to the available data. Additional data acquisition has to be carried out if there is a user demand.

The idea of the project is to develop a general applicable portal is a challenge. GEORAMA shall stand for the information access point in the internet on sport and recreation activities in the mountain and countryside area of Europe. Various heterogeneous data sources contribute to the system, being available at the most different places. Existing GIS structures and formats have to be considered as well as regions that build up totally new GIS systems. An open and distributed architecture has been chosen to achieve the maximal extensibility of the system. The standards proposed by the OGC have been considered sufficient to support the required functionality.

3.3 System Design

The following main elements can be identified in the architecture of an open tourist information system. A web portal serves as a central access point to the information system. National data providers in participating countries bundle data and services and provide them via OGC web map services to the portal. On the lowest level of the multi tiered approach local data providers do the actual data acquisition and maintenance. All these parts are connected by a registry, containing metadata about web services, and relations between those and certain locations and activities. The following section gives a detailed description about each part of the system.

Content as well as geo-data are distributed through various providers and companies in the participating countries. Participating *data providers* are asked to supply their data in an agreed format to national providers or they will have to provide OGC web map services themselves. Location independent content information is stored central in a database at the portals site, while the geo-related data stays distributed. The maintenance and data acquisition is done by the local data provider, who is the expert and creator of the information.

In our multi tiered approach *national data providers* (fig. 1 – TUV/A, GIM/BE) will act as gateways to geo-data from different sources in a country. They have the competence to organize the data acquisition on a national level and provide all their data via open services. National providers will

1. publish proprietary data, they have bought via open web services and
2. cascade different services to create value added information.

Each national data provider has to register metadata about the provided services in a common database, which acts as a *web service registry*. The abilities and availability of the offered web services will be published in this meta database. Activities (sports, recreation, …) will be also described by geometrical attributes, like a bounding box and type information. A web application will allow easy access and maintenance for data providers to the meta database.

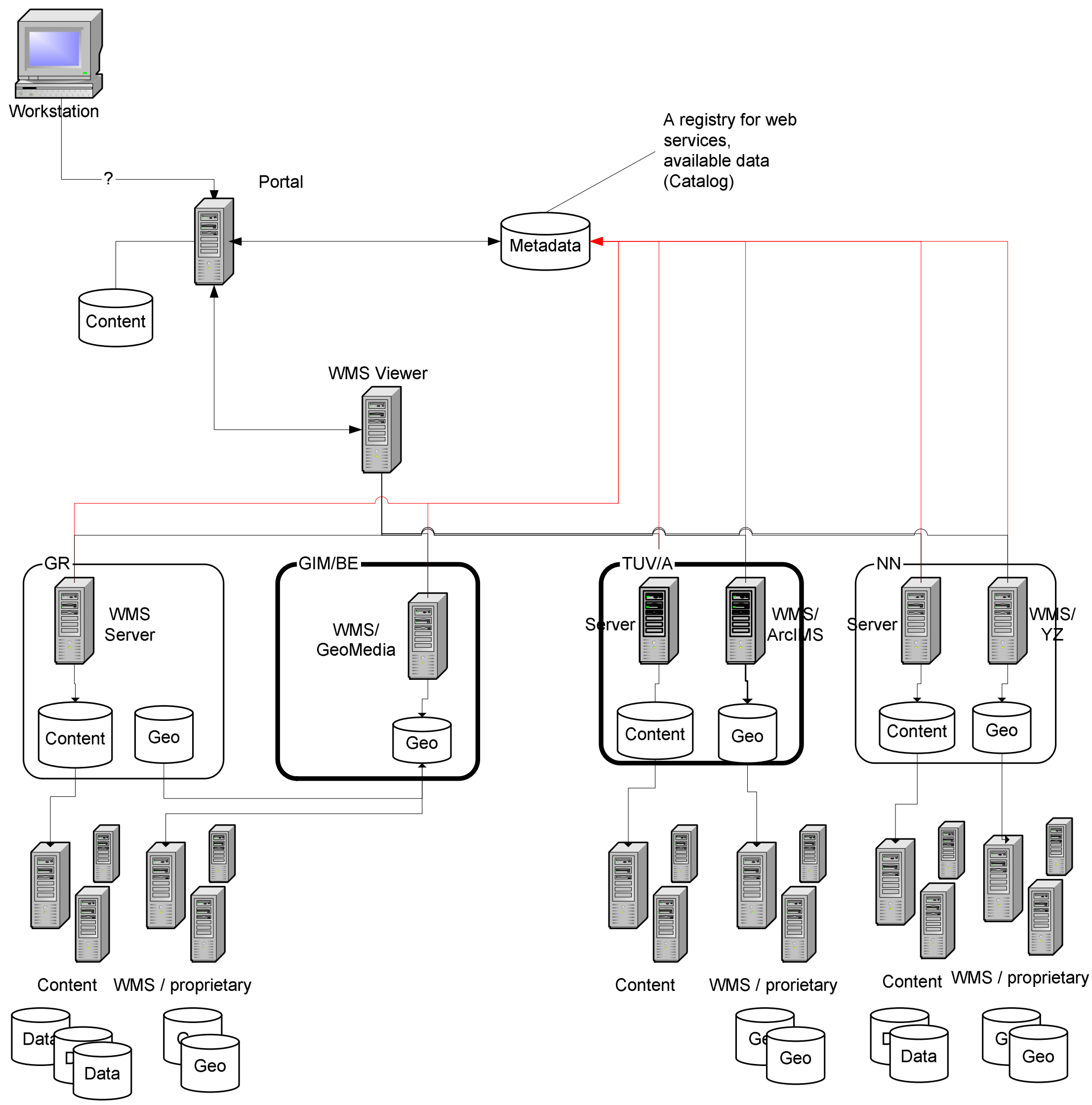

Fig. 1: GEORAMA system architecture

A *central portal* allows clients to retrieve information from the system. At a specific request, the portal looks up the availability of corresponding services in the meta database and makes a request for them to a national WMS server. A map is generated just in time at the national WMS server and the according link is send back to the portal. A special map viewing software interacts with the user of the portal (see section 4).

3.4 Practical Issues with Current WMS Implementations

A web map service has been setup (http://gi16.geoinfo.tuwien.ac.at/wmsViewer) using a Windows environment and ArcIMS 4.0.1. A very simple first proprietary solution is available there. The standard OGC connector coming with the ESRI installation has been activated. Our experience is that the connector is very sensitive on country settings of the system platform. The capabilities file has to be hard coded and cannot be generated on the fly. The server-side reprojection of coordinate systems is not supported at this point of time as well as the styled layer descriptor (SLD) interface.

Knowing about this issues it is very easy to setup a web map service, it can be done out of the box within one or two hours. The local ESRI provider, but also the newsgroups and the OGC WMS cookbook (OGC 2003) have been a valuable aid for the successful setup of the services.

To show real interoperability on different platforms, web services by other vendors have been setup as well (Intergraph Geo Media, Ionic Red Spider Web and lat/lon deegree). With the growth of experience the time needed to setup the WMS decreased from several weeks for the first service to several hours for the recently installed service. It can be considered easy to provide a GIS data source via a web map service, after a few clicks and some configuration the service is available (Gietler, Hofer et al. 2003), (OGC 2003). But setting up OGC services and implementing the specified standards will not form a framework of data interoperability. WMS agreements must cover at least scale, spatial reference systems, version of web service (SOGI 2003). In the case of our project agreements about these issues have been made within the consortium, the meta database, guarantees also that web services are able to interoperate properly.

4 Towards a User Friendly WMS Client

4.1 Basic Map Operations

The task of a WMS client is to send standardized requests to the web map service and make them useable for a human viewer. Additional functionality allows the navigation through the map provided by the service.

The implementation by different ventures for OGC web services is still ongoing, but there exist already some basic viewing clients (Fig. 2). It can be seen that the design of viewing clients is made for GIS, graphics and CAD experts rather than layman.

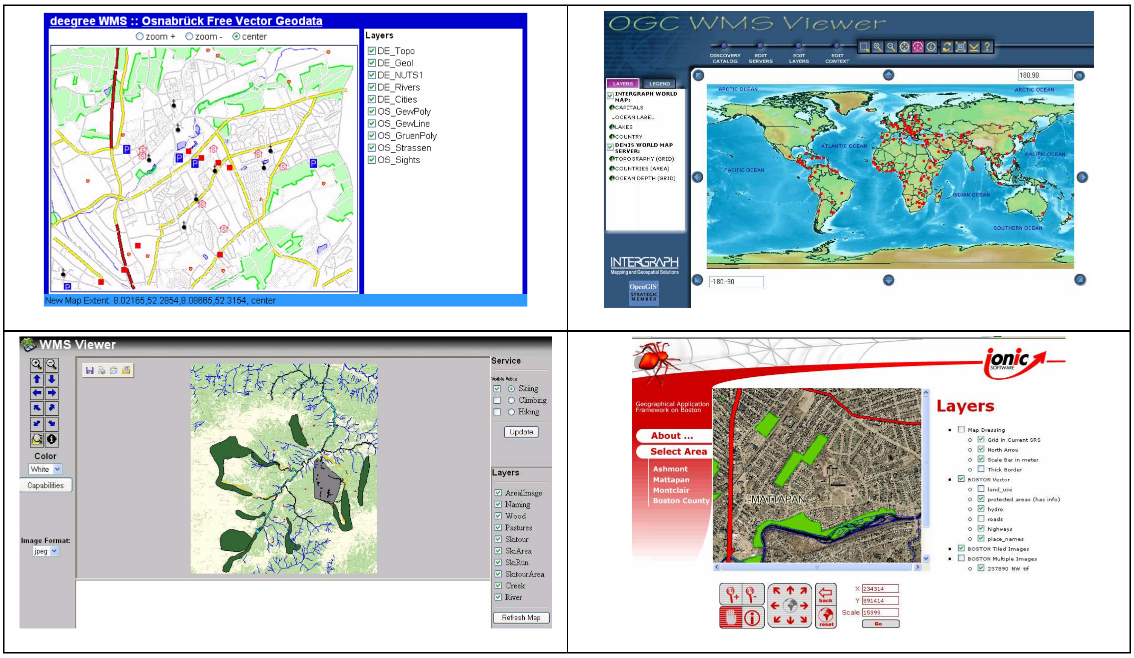

Fig. 2: Different WMS clients provided by ventures of web services: (a) deegree, (b) Intergraph, (c) ESRI, (d) IONIC.

The average user might know to drag a window to zoom *in* on a map presentation, but it is not that intuitive to drag a window for a zoom *out* operation. Zoom buttons with fixed zoom factors using symbols of various sizes might be more appropriate to zoom *out*.

Panning operations are a good method to move on a map, an arrow symbolizes a direction, pointing where to go to. Pointing is an operation which we use since we are one year old. Children make somebody else attentive for the location of a certain object in their mind (Gopnik, Meltzoff et al. 2001).

Generally there are two possibilities to implement zoom and pan operations:

1. Move the world.
2. Move the window.

For maps it seems more applicable to move the window, however zoom and pan operation should behave the same way (Apple Computer 1987).

A cartometric operation like measuring the length of a road, requires the provision of a “Sum up function”. A *measurement tool* has to be handled with care, due to generalization effects and great differences between 3D and 2D distances in mountainous regions (especially in small scales). Users have to receive advice or it should be left out of the user interface.

We propose a very simple viewing client in the framework of our project. As the audience is a general tourist and a cartographic layman only a few basic operations like zoom and pan are proposed.

4.2 Consider Cartographic Design Rules!

The design of the user interface for a WMS client is a complex process. It is easy to setup or implement a web map service that fulfills the OGC specification, but it is difficult to make a WMS useable. Cartographic considerations have to be included when publishing maps (Miller 1999).

A restriction for the presentation of cartographic information on computer displays is the dimension and the resolution of the viewing device. To preserve legibility cartographic information has to be divided in different information levels (Kelnhofer et al 1999). In order to provide a level of detail representation in the framework, the (server-side) web services have to make use of the "scale hint" tag in the GetCapabilities description. The client is then able to provide overview and detailed maps for tourist regions from a single data set.

Knowledge about the three basic cartographic attributes scale, projection and symbolization (Monmonier 1991) is necessary to design useful (analogue) maps. This holds also for digital maps:

— Large scale maps, as they are used for mountain sport activities should provide a graphical scale like a scale bar instead of a numerical scale. When these maps are copied and printed on arbitrary devices one is not able to guarantee that the scale ratio will stay constant. Scale bars shrink with the distances and symbols on a map while numerical scales do not change (Monmonier 1991).

— Most maps contain symbolism that requires explanation in order to enable decoding and interpretation. Multimedia allows the definition of symbols that provide its own descriptive information, i.e., a window pops up when the mouse is moved over a symbol (Miller 1999). The "self-describing" symbols should be utilized in addition to legends to make digital maps more useable.

Web map services without styled layer descriptors do not support *legends*, users are lost in colorful maps not being able to decode information out of the map. The use of legends is crucial to enable information decoding from maps.

Users are confused when they enter multilingual web sites and then only parts of the content are translated. A *consistent multilingual user interface* has to provide all displayed information translated. Therefore we introduce meta information for the translation of the legends. The envisioned client application will retrieve the appropriate caption of the legend via a meta database (section 3.3). An alternative would be to store the required information in the capabilities document.

The utilization of cartographic rules for the design of a WMS viewing software shows clearly that it is not possible to solely look at the client-side of such a system. Dependencies with the server application and the provided services have to be considered.

5 Summary and Conclusion

In this paper we present a new approach to an open GIS framework for countryside and mountain tourism in Europe. Current developments for tourist information systems have been reviewed and an overview of the OGC web service initiative has been given.

OGC web services have been investigated for their usability to realize a tourist information system. The design of system architecture has been proposed and experience with web mapping software especially the ArcIMS 4.0.1 has been reported. Web services alone do not form an interoperable framework. Necessary extensions are stressed in the paper.

The potential user is in focus of the discussion around the setup of the framework. The tourist is considered to be a non expert, demanding properly conditioned geo-information. User friendliness is the key to the success of such a project. The current lack of suitable client software for WMS motivated the design and prototypic implementation considering basic cartographic principles. Key points have been identified and presented in the paper.

We are in the middle of the prototypic implementation of the framework. According WMS services have to be setup, the client software has still to be implemented. The connection of the GIS system to a web portal will be done in the second half of the year. We eagerly wait for new releases of web map services by several vendors. Our project will profit a lot from the announced new versions of WMS connectors, which shall support styled layer descriptors and cascading web map services.

Spatially interlinked and navigable tourist information allows new ways of data retrieval and information understanding. Extensions to the current specifications are necessary to achieve user friendly and useable map presentations. Web services are certainly the future for developing interoperable GIS.

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References

Apple Computer, I. (1987). Human Interface Guidelines: The Apple Desktop Interface. Reading, MA, Addison-Wesley.

Buehler, K. and L. McKee, Eds. (1996). The OpenGIS Guide - An Introduction to Interoperable Geoprocessing. Wayland, MASS., The OGIS Project Technical Committee of the Open GIS Consortium.

SOGI, Schweizerische Organistation für Geoinformation (2003). Worin liegt der praktische Nutzen von Interoperabilität und Normung für den GIS-Anwender in der Schweiz.

Gietler, L., B. Hofer, et al. (2003). Web Mapping a la Cuisine. Angewandte Geographische Informationsverarbeitung XV. J. Strobl. Heidelberg, Wichmann Verlag.

Gonzalez, J. C., I. Moner, et al. (2003). Information and Navigation System for Mountaineers: The Paramount Project. 9th EC-GI & GIS Workshop ESDI: Serving the User, La Coruna.

Gopnik, A., A. N. Meltzoff, et al. (2001). The Scientist in the Crib, Perennial.

Krug, K., D. Mountain, et al. (2003). WebPark Location-Based Services For Mobile Users in Protected Areas. GeoInformatics**:** 26-29.

Leukert, C. and W. Reinhardt (2000). GIS-Internet Architectures, Amsterdam.

Miller, S. (1999). Design of Multimedia Mapping Products. Multimedia Cartography. W. Cartwright, M. P. Peterson and G. Gartner. Heidelberg**:** 51-63.

Mogorovich, P., C. Magnarapa, et al. (1992). Merging GIS with Multimedia Technologies: The Case-Study of an Information System for Tourist Applications. Proceedings of EGIS '92, Munich, EGIS Foundation.

OGC (2001). Introduction to OGC Web Services - OGC Interoperability Program White Paper, Doyle, Allan Reed, Carl.

OGC (2002a). Web Map Service Implementation Specification, Jeff, de La Beaujardiere. **2003**.

OGC (2002b). Web Feature Service Implementation Specification, Panagiotis A. ,Vretanos. **2003**.

OGC (2003). OGC WMS Cookbook, Kris, Kolodziej. **2003**.

Panagopoulou G., Sirmakessis S., et al. (1994). Athena: Integrating GIS and Multimedia Technology. The Design of a Tourist Information System for the County of Attica. EGIS '94, Paris.

Werthner, H., C. Knoblock, et al. (2002). "Intelligent Systems for Tourism." IEEE Intelligent Systems, Trends & Controversies(17(6)): 53-66.

Weblinks

AGIT Symposium Salzburg	www.agit.at
Austrian tourism portal	www.tiscover.at
Deegree WMS	http://deegree.sourceforge.net/
EContent Project GEORAMA	www.georamaproject.net
ESRI	www.esri.com
Greek national tourist organisation site	www.gnto.gr
Greek tourist web portal	www.travel.gr
Greek tourist web portal	www.hit360.com
Intergraph`s WMS viewer	www.wmsviewer.com
Italian tourist web portal	www.enit.it
Italian tourist web portal	www.turismo.it
Portugal in Site	http://www.portugalinsite.com/
Web Mapping – IONIC	www.ionic.be
WebPark project	http://www.webparkservices.info