

Internet GIS and Possibility of its Remote Administration

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Abstract

Nowadays geographic information is needed by the people, public administration and business. It has become a necessary part of our lives. Due to the increasing demand for easy and cheap access to geographic information and geoprocessing services new technologies have been developed. Internet GIS and they are spreading rapidly over the Internet. First results concerning remote administration of selected application server - GeoMedia WebMap Professional of on-going study are described.

Introduction

Geographic information is more and more demanded not only by the business sphere but by the public as well. Today it is impossible to manage a territory, property, utilities, etc., without using geographic information systems (GIS). Traditional GIS are quite complicated so Internet map servers, today usually called Internet GIS or Web-based GIS, are spreading rapidly over the Internet. For many people it has become normal to use their services like searching the best route, realty, and many others [7]. Many schools have introduced subjects concerning Internet GIS. Internet GIS can be now understood as a common software tool and part of institutional information system which is widely spread over the world. Importance of Internet GIS solutions grows along with introduction of information society ideas in EU countries and the Czech Republic [9].

The result is that many new demands on Internet GIS have risen – e.g. reliability, trustworthiness, fast response or possibility of remote administration. Remote administration is very important possibility in the days of widening of teleworking and outsourcing of information and communication technologies. But it is not so easy to implement remote administration because of security restrictions, operating system capabilities, application server's requirements, speed of Internet connection and many other reasons. First results of on-going research dedicated to the utilization of Internet GIS in the Czech public administration are described in the paper.

Internet Geographic Information Systems

As it was told, professional GIS are from the users point of view quite complicated and costly software packages. Users need to be well educated to be able to use functions provided by professional GIS. Only a small part of GIS users has these special skills. It is estimated that about 90% of traditional GIS use less than 10% of functions provided by application [7]. This was the reason why cheaper and more user-friendly solutions were looked for. The aim was to allow end users to use geographic information without any special skills and deep knowledge of GIS.

The new solution is based on Internet technologies and now is usually called Internet GIS. In general it is an interface accessible through network which is built with Internet technologies and which provides maps of georeferenced data and geoprocessing services [6]. Internet GIS meets above given demands. It provides more mobile, flexible and enough powerful functionality. Thus Internet GIS solutions are spreading rapidly over the world [5].

Technical principles of Internet GIS are taken from the Internet technologies and information systems in general. So they are usually based on three-tier client/server architecture. It means the whole solution is divided into the next three parts (see the Fig. 1) [2]:

- Presentation layer – simple software tool for user’s work (client). Common Web browser or simple viewers are usually used as a client. They are user friendly - it is easy to use them. In addition they are for free or low costs too.
- Application function – application logic; functions which obtain user question, do all the work and return answer to the user.
- Data management – important part which deals with data storing and management. Data can be stored and managed separately, i.e. independently on the application server and presentation layer.
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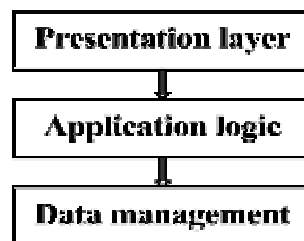


Fig. 1: Three-tier client/server architecture

Advantage of this solution is that in the framework of client/server architecture there are almost no costs (or low costs) on the client side. Client software is usually for free and easy to use without demanding maintenance. Very important is that users do not need to take care of data and do not need to be well educated in GIS and computer science in general. Most of the costs and problems are solved on the side of server [2]. This is one of the reasons of fast spreading of Internet GIS solutions.

Driven by development of Web services, Internet GIS are involving this functionality as well. Interoperability of proprietary systems is a result of this process. Of course it is another reason for spreading of Internet GIS. For example in the case of the Czech public administration principles of web services are going to be used in so called reference interface which will connect all the information systems of the Czech public administration authorities [4]. But, as far as principles of Web services are adopted by Internet GIS, a quality of services should be considered too [1].

Providing information on Internet is today connected to another significant problem – a fast searching for information. Agent technologies have been more and more used for this task. Czech language uses many specific features (e.g. some characters are used with special signs) which must be considered [3].

Users of Internet GIS

As it was said before, regular remote access to geographic information is a must in our days. Internet GIS become an inherent part of information systems in both public administration and private sector. They are used as a cheap tool for dissemination of geographic information and results of spatial analyses done by GIS specialists among end users, e.g. employees, citizens, tourists, business partners, etc. During a time, a few groups of users have raised [7].

Although the question of division of users is still in discussion and distinguished groups vary from author to author, at least four basic types of users are now usually distinguished:

- **Low-end users** – residents, tourists, etc. These people use Internet GIS solution irregularly. Only few functions are interesting for these users. They usually need to select appropriate data, view geographic information, change scale, run simple queries and print outputs or save a result maps. Internet access is supposed by means of various Web browsers.
- **Regular users** – employees, customers, cooperating partners, etc. Regular, everyday use of Internet GIS is typical of this group of users. Their demands are a little different but they need only some functions too. Access is supposed by means of appointed Web browser or other client.
- **High-end users** – data providers, GIS specialists.
- **Mobile users** – people who use wireless technologies and devices like PDA or mobile phones to connect to a server and access geographic information and geoservices provided by the server. They can vary from low-end users to high-end users [5, 7, 8].

Partitioning of possible users is very important for optimizing the whole Internet GIS solution. Thanks to partitioning of the users solution can provide to them only functions and geographic information they need. It means they are not confused by complicated software and too much or inadequate geographic information.

Remote administration of selected map server

In our case, remote administration of GeoMedia WebMap Professional was tested. Partly it was tested during the practical seminars of the subject which deals with Internet GIS from the administrator's point of view.

The first step was to provide remote access to the full-time students. They can work in computer laboratories at the university but they cannot access server directly (for example they cannot use its keyboard). So they need a remote access to server too. Their advantages and main differences from distance students are:

- They work only in a time given by their timetable
- They are inside a university network, i.e. they do not need a passage through firewall.

Remote Administration of GeoMedia WebMap Professional

As far as server operating system was Microsoft Windows NT server 4 in the case of GeoMedia WebMap Professional 5.1, Microsoft NetMeeting was chosen as a tool for remote access to server's desktop (see Fig. 2). Unfortunately, administrators could not work simultaneously on a remote desktop in this case - only one person could use remote desktop at the same time. In general, the others still could do something: they could map network drive from the server and work with some of the configuration files for example. They could go through help files and usually they could access demo applications by means of HTTP protocol. Nevertheless, for some tasks a work on server's desktop is necessary.

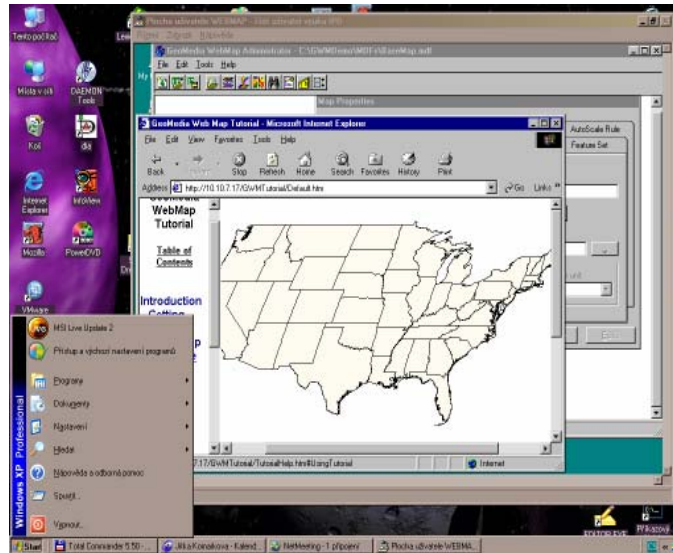


Fig. 2: Remote administration of GeoMedia WebMap Professional

Configuration of WWW server MS Internet Information Server is accessible through Web interface so there are no problems with it. Configuration of Apache WWW server is possible by a network drive mapping and editing a corresponding file so there are no problems with it as well.

The second step was to allow remote access for distance learning students. It meant to allow remote access to people who were outside of a university's network. In this case cooperation with a network administrator was necessary because the network was protected by firewall.

According to our experience, in the case of GeoMedia WebMap Professional at least the below listed ports had to be opened:

- Mapping of network drives, samba protocol: TCP, UDP ports 137 - 139 (NETBIOS Session Service)
- Windows service: Remote desktop: TCP port 3389 (MS WBT Server)
- NetMeeting:
 - 1720 (h323hostcall) – static port for the first call (establishing a connection)
 - port 522 (User Location Server)
 - 389 (Internet Locator Server, LDAP)
 - TCP port 1503 (T.120)
 - TCP port 1731 (Audio call control)
 - dynamic assignment of ports, which is a part of H.323 standard; it is necessary for NetMeeting
- FLEXlm – port 744 (Flexible License Manager).

A speed of connection could be a serious problem. Our students in computer laboratories used connections 10 or 100 Mbps which was of course all right. For the distance learning students GPRS and dial-up connections (speeds around 40 kbps) were supposed so they were tested as well and were found usable.

Conclusion

Internet GIS have become a regular part of technologies and services offered on Internet. Their development is very fast and is of course partly driven by development of Internet. Supporting of web services can be used as one example. A few years ago none knew about them. Now each and every who wants to play a significant role on the Internet GIS market, must support web services. It concerns Internet GIS solutions as well.

Remote administration of Internet GIS systems is becoming more and more important too. Not only due to the spreading of teleworking and outsourcing of information and communication technologies, but due to the changing of character of Internet GIS. They are now more often understood as distributed systems which are built to provide integrated services for everyone according to his/her/its demands. Anyway, regardless of enthusiasm from possibilities of remote access and administration of servers, aspects of security and data protection cannot be forgotten.

We tested possibility of remote administration of selected map server (GeoMedia WebMap Professional 5.1) in the case of both full-time and distance students in a real environment of functional and protected network of the university. In general, we found remote administration possible, even by using slow dial-up or GPRS connections. Just in the case of the large group of users working at the same time one server we did not find remote administration so easily practicable. However, this situation is not typical in practice. Only one or a few administrators are usually designated so remote administration can be used without solving the problem with concurrent work of more administrators.

A precise measuring of the time of response of the Internet GIS servers is considered next step. This task brings problems with defining a time of response and some tools for measuring of the time of response must be created as well.

Acknowledgements

This research and paper was created with a kind support of the Grant Agency of Czech Republic, grant Nr. GACR 402/02/1460, and Intergraph Registered Research Laboratory (RRL) program.

References:

- [1] Araban S., Sterling L., Quality of Service for Web Service. In *Proceedings of WSEAS AIKED-SEPADS-ISRPA-EHAC 2004 conferences* [online]. [cit. 2004-10-27]. Salzburg: WSEAS, 2004. Available from <http://www.wseas.com/austria2004_cd/papers/482-350.pdf>
- [2] Alter S., Information systems: foundation of e-business. 4th edition. Upper Saddle River: Prentice-Hall, 2002, 587 s.
- [3] Janakova H., Text categorization with feature dictionary problem of Czech language, In *WSEAS TRANSACTIONS on INFORMATION SCIENCE AND APPLICATIONS*, Vol. 1, Nr. 1, 2004, pp. 368 - 372
- [4] Kosek J., Reference Interface. In *Proceedings of conference Internet in Public Administration – ISSS 2004* [online]. [cit. 2004-10-27], Available from <<http://www.issc.cz/archiv/2003/program.asp>>
- [5] Longley P. A., Geographic information systems and science. Chichester: John Wiley & Sons, 2001, 454 s.
- [6] Lowe J. W., The anatomy of Web map services. In *Geospatial Solutions*, Vol. 12, No. 9, 2002, pp. 42-45
- [7] Peng Z.-R., Tsou M.-H., Internet GIS: distributed geographic information services for the internet and wireless networks. Hoboken: John Wiley & Sons, 2003, 679 s.
- [8] Schaller J., GIS on the Internet and environmental information and planning. In *13th ESRI European User Conference, 7. – 9. 10. 1998, Firenze, Italy, 2002* [online]. [cit. 2004-10-27]., Available from <<http://gis.esri.com/library/userconf/europroc98/proc/idp27.html>>

[9] - The Office of the CR Government – [online]. [cit. 2004-10-27]. Available from <<http://www.vlada.cz/1250/eng/vrk/rady/sip/dokumenty/sipcesta/sip.eng.html>>

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