Why interoperability for agriculture and tourism

Proč interoperabilita v zemědělství a lesnictví

K. CHARVÁT*, S. KAFKA**, Z. TRÁVNÍČEK*** et al.

** Lesprojekt služby s.r.o, Kostelec nad Labem, Czech Republic*
***Help Service Remote sensing, s r.o., Benešov u Prahy, Czech Republic*
**** Research Institute of Agricultural Economics, Prague, Czech Republic*

Abstract: The main focus of the future solutions will be sharing of knowledge. The coming systems will be designed and implemented as advanced distributed interoperable Web services that will share data, information, knowledge and services across Europe. The innovative systems will also implement advanced functionality for mobile data access; location based services, personalised and position sensitive services. The interoperability on the level of data as well as services will be important topic in next years. The WirelessInfo project was one from the first worldwide practical implementation of GIS interoperable standards on mobile platform.

Key words: interoperability, Web services, GIS, e commerce

Abstrakt: Vývoj budoucích systémů bude ve značné míře zaměřen na sdílení znalostí. Budoucí řešení budou navrhována a implementována na principu moderních distribuovaných interoperabilních Webových služeb umožňujících sdílení dat, informací znalostí a služeb v celé Evropě. Moderní systémy budou nabízet možnosti mobilního přístupu k datům, určování polohy a budou přizpůsobovat své chování konkrétnímu uživateli nebo poloze. Interoperabilita na úrovni dat i služeb bude v budoucnosti nezbytností. Projekt WirelessInfo je jedou z prvních implementaci interoperabilních standardů v GIS pro mobilní systémy.

Klíčová slova: interoperabilita, Webove služby, GIS, e commerce

The relationships between the human society and the land have been progressively transformed as a result of dramatic changes in the course of the 20th century. It was particularly by increasing industrialisation, mechanisation of agriculture and forestry, immediacy in global trade and communication, rapid increases in population size and densitiy and the expanding use of bio-technologies... In the most marginal agricultural zones, the resident populations have become dependent on a permanent exchange with and remittances from the exterior. Ties to urban and often international markets are the consistent features of rural economies. The emerging awareness that agriculture contributes in many varied forms to societal goals leads to a need for better understanding of the "multiple functions of agriculture". Other economic activities have strong relationships to land use, but agriculture also has unique social and environmental dimensions.

Rural areas are at the core of European the existence. These areas can attain their full potential by implementing the existing and new Information and Communication Technologies (ICT) to improve the quality of life, to increase employment opportunities for the rural area residents and to strengthen rural economy. ICT adoption as an enabling factor will facilitate rural areas' full integration into the emerging knowledge-based economy of Europe and their contribution to it.[1]

RURAL ECONOMY AND KNOWLEDGE MODELS

In the rural economy, which is usually based on SMEs activities, rather than accelerating single steps in the production process, now the whole process chains are being targeted for elimination or speeding up. SME added value chain represents the parallel economy that could complement to the large enterprises. It is imperative for European rural regions to build a parallel SME economy that would be capable of offering new possibilities of employment and also providing new entrepreneurial personnel for successful and competitive regional rural industries. This dual role of SMEs' Virtual Enterprises Economy is socially and economically very desirable. The second important aspect is that rural regions are very often limited in the number of production sectors.

[1] Valencia declaration. Valencia, 3–4 February, 2003.

Not necessarily always, but very often, it could be agri-food activities or forest/wood activities, tourist activities. It is then characteristic to form horizontal and vertical added value chains that can support local products and specialities.

All these ideas increase the importance of new information services and the importance of access to information. The availability of information can also fall into the social function, though these issues cut across the spectrum of functions. Also important will be new knowledge based models, and data security will play an important role. The valuation of local knowledge and the forging of relationships between local communities and external sources of expertise, information and advice are of particular importance. Important for future participation of regional clusters on the globalised economy and forming national and international dynamic added value chains will be the formation of a Single European Rural Market. This is the only way how small enterprises from rural regions can participate in the globalised economy. Starting of new economy in Europe can be partially addressed by the vigorous added value-chain co-operation of regional and trans- regional enterprises. The difficulties are still staggering: lack of business-to-business internet and extranet utilisation, lack of trust and co-operative behaviour. SMEs from rural regions can find new possibilities to enter larger markets in the internet commerce. Use of the innovative Web services and communication networks could lower transaction costs to increase challenges for rural SMEs. There is no necessity for a closed set of interoperable standards with the additional large investment requirements in infrastructure. This is a major benefit for companies with internet access, particularly for small upstream companies in the supply chain that can participate in electronic trading at the low cost.

The future effective e rural information system may be built on Interoperable Web Services. The system has to take into account the spatiality of rural regions and a great number of very small producers. These providers are often organised in regional structures and associations. This structure defines the possible structure of information systems. In future, it will be important to build this service across Europe, which will offer services through all its distributed servers across Europe. This is the only effective way to be competitive for rural regions. The interoperability will obviously play an important role and would require a legislative support and defining of standards.

From the point of view of support development of rural regions, there are potential benefits including the enhanced effectiveness of public sector organisations. They have a role in providing services, improved access to education and training at a distance, improved communications for individual businesses and managers, provision of an improved market place for products and inputs, and improved access in terms of business credit**.** They have the best information about the social and economic status of the area, ranging from the physical to the infrastructure reality of the region, the human reality, agriculture, handicraft, business, and industry. Local administration is able to use this information in order to serve the planning activities of the administration itself and its pulling role for the local economy. Local administration will play an important role in rural development and many activities will be based on Public Private Partnership (PPP).

CURRENT AND FUTURE SOLUTIONS

The classical current application is usually built on the principles of man-machine interaction. This kind of solution gives only a limited possibility for a really interoperable effective access to information on different places in Europe, and also for an effective communication between different groups of people.

The future systems will be fully based on the implementation of Web Services with utilisation of the Open Source solutions. This approach is based on communication network of servers, which offer data or services. The important aspect of this solution is communication machine to machine, based on standardised interface. From the user viewpoint, it is not possible to recognise that s/he works with data, information, knowledge and service from different sources. The basic principles of this architecture are:

– Interoperability, distributed systems
– Offering services, not data
– Data collection and management in the local place, data are all time- actualised
– Special black boxes on WEB as services
– Utilisation of different SW platforms
– User use only requested functionality
– Possibility to build mobile application with the same technology as classical internet.

CURRENT STANDARDISATION INITIATIVE AND EFFORTS

The utilisation of standards and also contribution to standardisation processes will be one of the very important topics of the future system project. Standardisation is realised:

– on the level of business services
– on the level of data sources
– on the level of Web services
– on the network level.

W3C

Because the future information system will support utilisation of the innovative Web Services, the related W3C standards will be supported. The XML based Web Services will be emerging as tools for creating the next generation distributed applications for presentation of knowledge. Besides recognising the heterogeneity as a fundamental ingredient, these web services, independent

of platform and development environment, can be packaged and published on the internet, as they can communicate with other systems using the common protocols like HTTP and SOAP. The objective is to create a Web Service that defines its interfaces and invocation methods, followed by publishing to one or more intranet or internet the information about the local cultural and historical heritage across Europe. W3C standards as Web Services Description Language (WSDL) – language for description of the Web - will be extended for the purpose of Intertour project.

ebXML

ebXML standard will be supported for e commerce application. The vision of ebXML is to create a single global electronic marketplace where enterprises of any size and in any geographical location can meet and conduct business with each other through the exchange of XML based messages. ebXML enables anyone, anywhere, to do business with anyone else over the internet. ebXML is a set of specifications that together enable a modular, yet a complete electronic business framework. If internet is the information highway for electronic business, then ebXML can be thought of as providing the on-ramps, off-ramps, and the rules of the road.

The ebXML architecture provides:
– a way to define business processes and their associated messages and content
– a way to register and discover business process sequences with related message exchanges
– a way to define company profiles
– a way to define trading partner agreements.

Membership in ebXML is open to anyone and the initiative enjoys a broad industry support with over 75 member companies, and in excess of 2,000 participants drawn from over 30 countries. Participants represent major vendors and users in the IT industry and leading vertical and horizontal industry associations. ebXML is evolutionary**,** not revolutionary. It is based on internet technologies using the proven, public standards such as: HTTP, TCP/IP, mime, smtp, ftp, UML, and XML. The use of public standards yields a simple and inexpensive solution that is open and vendor-neutral. ebXML can be implemented and employed on just about any computing platform and programming language.

GIS

Semantic interoperability

The semantic interoperability is key issue for GIS. In practice, much of the data currently held will need to be re-engineered in order to achieve the desired levels of interoperability. The data were up to now collected according to different rules and they are in forms, which do not allow the common use of different sources. The semantic interoperability could be described in following steps:
– Incremental (change-only) updating (which includes versioning of geographic information)
– Semantic interoperability, including data dictionaries and multi-lingual aspects
– Generalisation of data models
– Unique identifiers.

OGC standards

Open GIS Consortium (OGC) is an industrial body focused on standardisation of the GIS filed. On the level of the currently utilised geographical the OGC standards or recommendations, there have to be mentioned the Web Mapping Services (WMS), Web Feature Services (WFS), Web Catalogue Services, Gazetteer services, which allowed building of geographical web services.

INSPIRE

The INSPIRE initiative intends to trigger the creation of a European spatial information infrastructure that delivers integrated spatial information services to the users. These services should allow the users to identify and access spatial or geographical information from a wide range of sources, from the local level to the global level, in an interoperable way for a variety of uses. The target users of INSPIRE include policy-makers, planners and managers at the European, national and local level and the citizens and their organisations. Possible services are the visualisation of information layers, overlay of information from different sources, spatial and temporal analysis, etc.

The spatial information infrastructure addresses both technical and non-technical issues, ranging from technical standards and protocols, organisational issues, data policy issues including data access policy and the creation and maintenance of geographical information for a wide range of topics.

The INSPIRE initiative intends to improve the current situation by triggering the creation of an European Spatial Data Infrastructure for the access and use of spatial information built on the basis of the following principles:
– Data should be collected once and maintained at the level where this can be done most effectively
– It must be possible to combine seamlessly the spatial information from different sources across Europe and to share it among many users and applications
– It must be possible for information collected at one level to be shared among all the different levels, e.g. detailed for detailed investigations, general for strategic purposes
– Geographic information needed for good governance at all levels should be abundant and widely available under conditions that do not restrain its extensive use
– It must be easy to discover which geographic information is available, fits the needs for a particular use and under what conditions it can be acquired and used.

Geographic data must become easy to understand and interpret because it can be visualised within the appropriate context and selected in a user-friendly way."[2]

Networking

On networking, level Intertour will enhance the use of several networks depending on the access scenarios (to be provided by the use of case definition) and the needs associated to them particularly with terrestrial infrastructures. Although the majority are standards recognised universally, DVB-RCS is still with its premises and can gain an international recognition here. The promotion of this European standard can thus be assured easily in the non-EU countries. It will deal with the protocol towers of global and wide area networks (such as GPRS, UMTS, GSM, SMS), satellite systems and local area networks (WLAN). In the last case, we envisage the use of the standard 802.11 (more precisely 802.11b or g), but we will also take into consideration the protocols still being implemented in this area.

If the user accesses the system and s/he is out of the reach of the WLAN (or s/he has not been provided with the necessary access network card), s/he will make use of GSM, GPRS or UMTS depending on the availability of them and the capabilities of the device s/he is using to access the network. We will make trials of all of them.

WirelessInfo OBJECTIVE

The goal of WirelessInfo project (IST-1999-21056) is to develop a new kind of applications for rural areas. The project solution offers new possibilities of implementation of the mobile communications with the innovative Web services. WirelessInfo is the first project in the Czech Republic and one from the first in Europe introduced into practice combination of mobile systems with Web services.

The WirelessInfo project goal was to develop advanced systems and services for agriculture and forest administration and other relevant bodies in rural areas, to improve access to agricultural, forest and rural information for citizens and businesses and to facilitate contacts, exchanges and feedback between rural administrations and third parties, i. e. citizens, institutions and businesses. The project demonstrates the improved internal effectiveness of agriculture and forest data and information management as compared to the existing systems. Confidentiality, reliability, security, trustworthiness and accessibility of the common data, their audibility, real-time translation capability, robustness and user-friendliness are the inherent features of the newly established service proposed by this project.

In many applications for the mobile data access, it is necessary to access parallelly more data sources. This is in relation to the INSPIRE recommendation. These data sources are usually distributed among more organisations, which collect the data, and they are located among more data servers. Currently, this situation was solved by replication of the same data in different institutions. A WirelessInfo solution is based on server cascades. It offers an operative data access anywhere and anytime and offers a more operative solution.

SOLUTION OUTLINES

According to the intentions of the WirelessInfo project, its technological background is based on OGC standards. This approach ensures base conditions for interoperability of the used geo-data services. Till this date, the OGC published several standards for sharing geo-data over WWW. To the most developed and also widely adopted, there belongs WMS.

The WMS is a Web Map Service (specifically an OGC Web Map Service). The WMS is capable of producing maps drawn in the standard image format (PNG, JPEG, etc) based on the standard set of input parameters. The resulting map can contain "transparent" pixels, where there is no information and thus several independently drawn maps can be laid on top of each other to produce an overall map. This is possible even when the maps come from different Web Map Servers.

WMS is based on the ability to supply answer to several formalised requests. To the requests, there belongs:

GetCapabilities first allows a client (or client proxy) to instruct the server to expose its mapping content and processing capabilities.

GetMap enables a client to instruct multiple servers to independently craft "map layers" that have an identical spatial reference system, size, scale, and pixel geometry. The client can then display these overlays in the specified order and transparency such that the information from several sources is rendered for the immediate human understanding and use.

GetFeatureInfo enables a user to click on a pixel to inquire about the scheme and meta-data values of the feature(s) represented there.

WMS is based on the transfer of geo-referenced maps, i.e. images or eventually drawings, which are generated on request. In some cases, there exists demand on transfer not of maps but of geo-features. This possibility belongs to communication among the geo-data sources. Such type of the service is covered by another OGC specification WFS – Web Feature Service. This specification defines the formal request over WWW, which returns OGC simple features in GML format. GML is an XML dialect for geographic features. Specification consists of two requests:

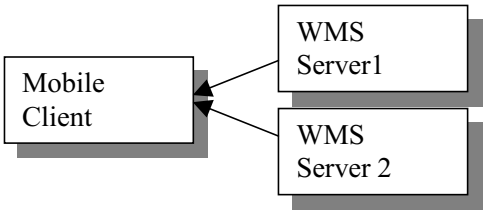
– GetFeatue

– DescribeFeatureType.

From the WirelessInfo point of view, there is important the ability of 1.1.0 WMS servers to establish the so-called cascade servers. Cascade servers play the role of hubs of the WMS networks and they offer the possibility to create a gateway for mobile devices, which use different sources of the geographic information. For mobile systems, there exists the two-principle solution:

[2] INSPIRE Infrastructure for Spatial Information in Europe, Reference Data and Metadata Position Paper.

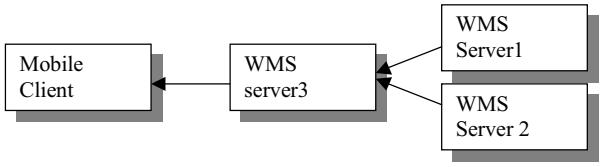
1. DHTML/CSS mobile client



Advantages:
– Servers work parallelly, there is a faster response from the server's side.

Disadvantage:
– The CSS explorer is necessary on the side of terminal; many currents mobile terminals do not have this functionality. Higher request on the side of client
– It is necessary to obtain information from all server in the some co-ordinated system
– There is transferred a large amount of data, which could be very important using the GPRS technology.

2. Cascading using Mapserver



Advantage:
– Low request on the client side (HTML is enough)
– Solution support Java clients
– It is possible to use data from the servers, which use different co-ordinated systems, Coordinated WEB Services are realised on server

Disadvantage:
– It is necessary to have one more server
– The data are downloaded after downloading of all data on server 3.

After analysis, it was decided to use the first model only in the cases of using PC based field computer with thick client and storing part of data on field server and in combination with the Web Feature Services (WMS) services. Such system works partly independently of the functionality of GPRS network, but there is usually downloaded a large amount of data.

Construction of the simple features GML broker

For the future planed communication between data providers, we try to develop also a simple GML broker, which will support the subset of WFS conditions. Development is under open source Ruby language and is based on Apache Web server equipped with mod-ruby. Mod-ruby allows to build up servlets based on ruby language. In this stage, we have done readers for geo-data in the Shapefile and GML format and we are testing communication over the tcp/ip based on GML data.

In this phase, we implement just the GML broker queries based on feature attributes and selection box. In the case of selection box, we distinguish between overlap and completely inside option. Full implementation of spatial relation algebra is planed for future. This scheme could support implementation of thick clients on the base of Web Feature Services (WFS) as for example GeoMedia from Intergraph.

CONCLUSION

The Wirelessinfo demonstrated the possibility of utilisation of the new interoperable technologies in agriculture and forestry practices. The first practical pilot was realised in the Forest Management Institute, the Research Institute of Agricultural Economics, in the Region Jeseníky, the municipalitiy Senožaty and others. The WirelessInfo project demonstrated new concepts of agriculture and forestry public private partnership for data sharing, new technological solution, when governmental organisation supported private sector by information.

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Contact address:

RNDr. Karel Charvát, Lesprojekt služby s.r.o, Záryby-Martinov 197, P.O. Box 21, 277 13 Kostelec nad Labem, Česká republika, tel.: +420 604 617 327, e-mail: charvat@lesprojekt.cz

Ing. Stanislav Kafka, Help Service Remote sensing, s r.o., Černoleská 1600, 256 01 Benešov u Prahy, Česká republika, tel.: +420 317 724 620 , e-mail: bnhelp@bnhelp.cz