On the Way to Open Access to Digital Geographic Information

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Key words: Information Interface, XML.

ABSTRACT

In recent decades the benefits to be gained from the common use of geographical information have been recognized. The technology now appears to be mature enough to allow these benefits to be realized.

To answer the need for the common use of geographical information, the National Land Survey of Finland (NLS) has begun the construction of an Information Interface for the databases that it manages. The software used for production already incorporates some features encoded using XML, a widely adopted public standard for the realization of this type of interface. The current target is a well-defined interface - with both a public space and an internal space - which allows information to be exported to and imported from other software, web browsers and mobile devices. The first part of this interface will serve the need for cadastral spatial data and some cadastral attribute data.

This presentation describes the process, which resulted in the standard information format, how the interface is constructed and how it is used.

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1. THE INFORMATION INTERFACE AS A SOLUTION FOR OPEN ACCESS

1.1 What is the significance of the Information Interface?

'Information Interface' is a technical term, which means both a shield for the data being stored, and a *service*, which handles the transfer of data through the shield between users and the data archives. In this case the term 'users' means software, web browsers, mobile devices, etc. (See Figure 1.)

Users are not able to see the database and it is not essential for the data archive function to identify users. The shield incorporates predefined functionality and predefined questions, which can be visualized as channels through which users can communicate with the data archive function. This arrangement allows the data archive administrator to alter the structure used for archiving without requiring any changes in user activities.

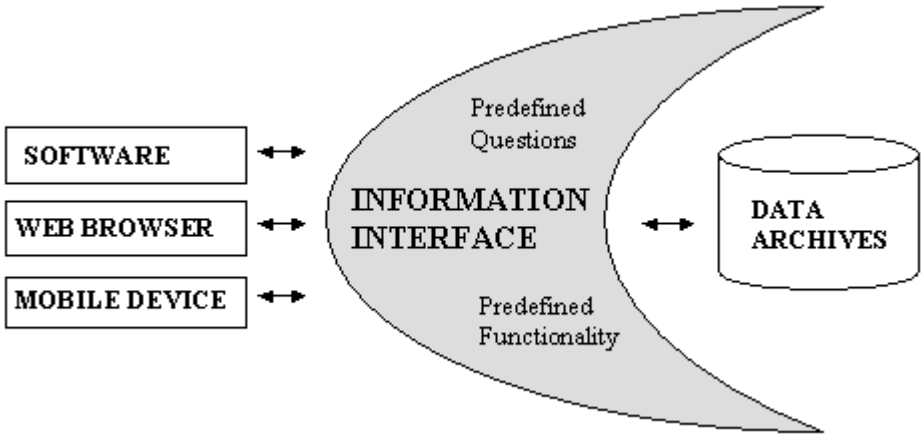

Figure 1. Information Interface

1.2 Technology

XML (eXtensible Markup Language) technology is now a public standard for the realization of both user interfaces and information interfaces (these two types of interface should not be confused with each other). Independent of both software and hardware, XML is a text-based universal format for structured documents and data in which the formatting is actually included in the data. (See Figure 2.)

```
<CadastralDivision>
        <BoundaryMark ID="85342122245">
            <Number>14</Number>
        </BoundaryMark>
</CadastralDivision>
```

Figure 2. A short example of XML

2. WHY DID THE NLS START TO DEVELOP THE INFORMATION INTERFACE?

2.1 Several databases already exist in digital form

The National Land Survey of Finland (NLS) manages several data resources. For example:
- Real Estate Register
- Digital Cadastral Boundary Map
- Real Estate Market Price Register
- Topographic Database
- Geodetic Control Points Register
- Digital Orthophotos

The NLS have developed second-generation applications in several major projects in recent years (for example for the first four of the above-mentioned data resources). Also, the process of converting the data to digital form is now almost complete. Several modern operational applications with data resources covering almost the whole of Finland therefore exist.

To be ready for the next generation of databases and/or operational applications, all new or modified functions, which operate between applications and databases will employ the Information Interface. This makes it possible to change both the applications and the data storage resources independently.

2.2 Information service

The NLS must provide its customers with an efficient information service. As and when information service applications are renewed, they will become users of the Information Interface. Co-operating partners will be offered the opportunity to make direct use of the Information Interface.

There are currently several projects, which concern the Information Interface. The pressure to carry out pilot projects is immense. Interest in the Information Interface has been expressed by:
- Projects inside the NLS concerning some databases and data distribution
- Projects involving other administrative institutions
- Projects with funding from the European Union
- Private companies

2.3 Internal pilots with new technology

Some operational applications within the NLS already use XML technology, for example:
- In producing documents
- When transferring files
- In product descriptions
- In user interfaces

Experiments involving these occasional implementations have encouraged wider use of the new technology.

3. HOW SHOULD THE INFORMATION INTERFACE BE REALISED?

Finland's Ministry of Finance has published recommendations about the Information Interface for use by public administrations. This document provides a conceptual description of the architecture to be used for electronic communication. (See Figure 3.) [Ministry of Finance, 2001]

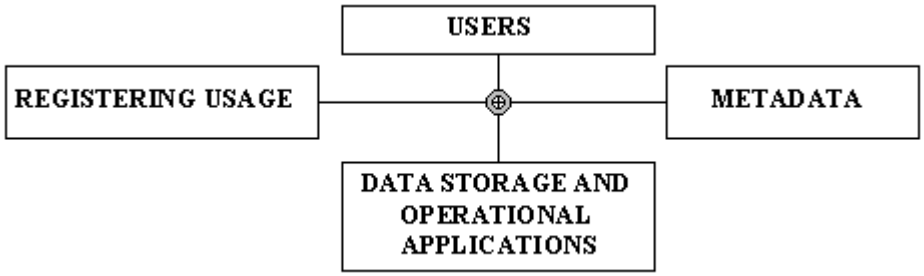

Figure 3. Architecture for electronic communication

The ministry's recommendations have, in the most part, been adopted by the NLS when implementing the information service.

3.1 Supply

To establish what data will be supplied, both the *data storage resources* and the *applications* must be documented. These documents make it possible to identify the data that users could be able to access via the Information Interface. Once the data to be supplied has been selected, *conceptual models* of this data must be constructed (if they do not already exist).

3.2 Demand

To establish the demand for data, possible *users* and the data they may need must be documented. Future demand should also be considered. By analyzing these data needs, so-called *use cases* can be constructed and form the basis for products, which will be made available via the Information Interface.

3.3 Metadata

Conceptual models are converted into data storage vocabularies using processes, which are as automated as possible. The format used in these vocabularies is XML. Products are also encoded using XML and are termed product vocabularies. All this information about data, products and descriptions is known as *metadata* and is located in a metadata storage facility.

3.4 Registering usage

Investigation of the demand for data reveals the conditions that should be attached to its use and the type of information that should be recorded when it is used. This information is then employed when encoding the transaction vocabulary. For example, data gathered during a transaction can be transferred to an invoicing application for further processing.

Information concerning access permissions is encoded in the access vocabulary using the customer data structure as a basis.

3.5 Service process

Execution of the service process requires that both the metadata and usage registration functions have been implemented. (See Figure 4.)

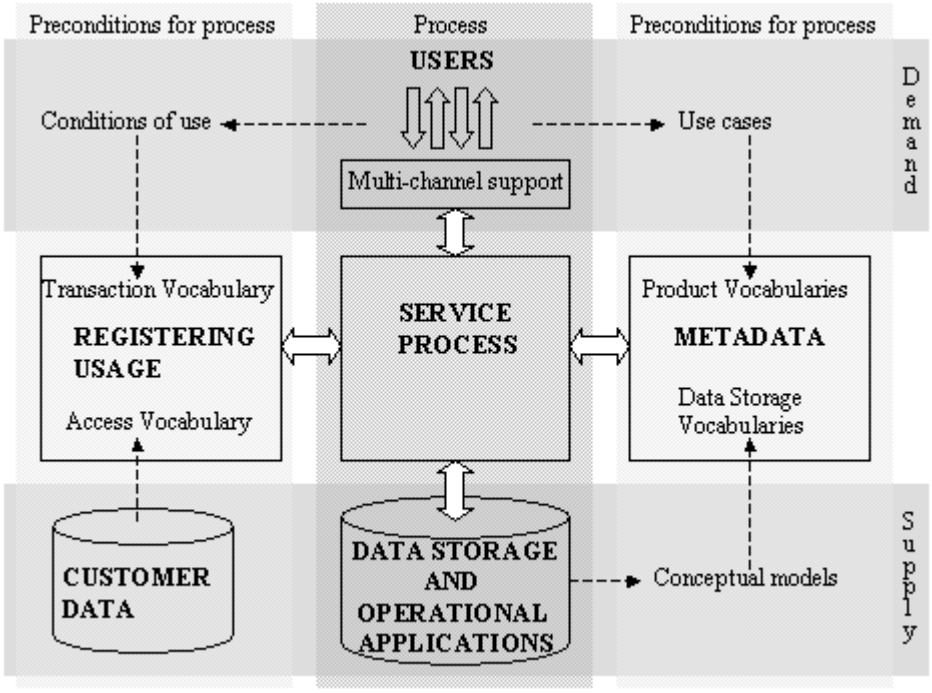

Figure 4. Information Interface structure

Multi-channel support between the service process and users standardizes the messages that are received from different kinds of users.

The service process handles the following functions in the Information Interface:
- Control, i.e. receiving questions/messages, delivery of these to the operational applications and relaying messages to users.
- Registration, i.e. control of who is allowed to do what, and registration of user transactions.
- The Metadata service, i.e. use of the product and other metadata vocabularies.
- Data collection, i.e. handling the operational applications which transfer data.
- Transformation, i.e. conversion of messages into the desired format.
- Publishing, i.e. the modification of messages into a proper form for the user.

The service process requires its own databases to store the data that it handles.

3.6 Activation of the Information Interface

As the Information Interface is able to serve both internal and external users, the parts that are available to the public, registered users and pricing must be defined. Co-operation partners should be informed that the Information Interface is active, and a help desk should be set up to handle problem situations. (See Figure 5.)

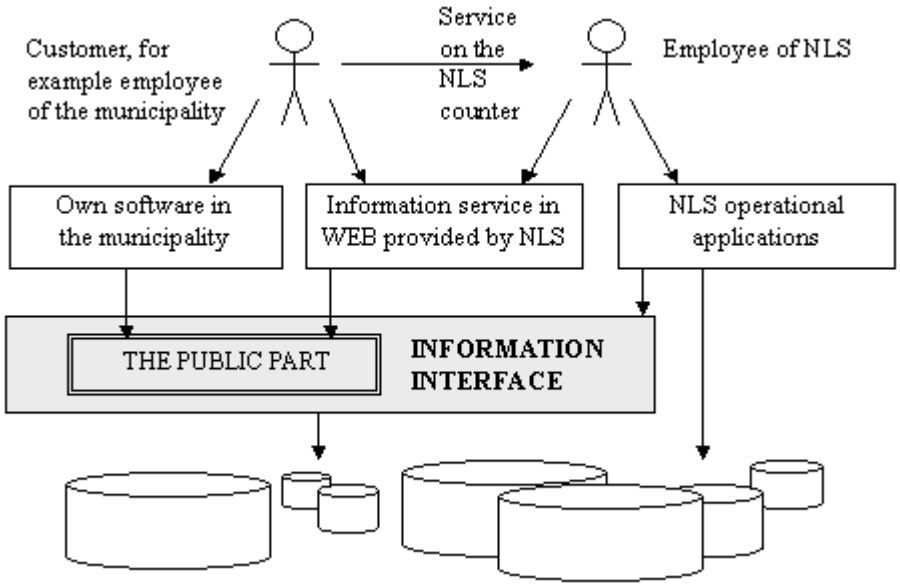

Figure 5. After activation of the Information Interface

4. THE CURRENT SITUATION AT THE NLS

There is a current project in the NLS to construct an Information Interface for applications. The primary aim of this project is to create:
- Message descriptions (i.e. vocabularies) for use in transferring data and in controlling data transfers.
- A service to handle and control the data transfers process.

In the first phase the data archives to which access will be provided via the Information Interface will be the Real Estate Register, raster maps and the Topographic Database.

Designing of products and activation of the Information Interface will then be carried out.

This project has produced a document detailing possible users of the Information Interface. A document describing the data that the Information Interface could provide has also been produced.

Currently, a conceptual model of cadastral data using the UML (Unified Modeling Language) description language is being constructed. Tests involving the automatic transfer of data storage models to XML data storage vocabularies have been conducted. The intention is to prevent lower-level XML from being bound to any external standards. Conversions to different standards will be carried out as and when required.

Plans for the service process are complete and the separate parts of the process have been tested on an individual basis. Integration of the separate parts should be completed by the autumn of 2002 when a renewed Internet map service called MapSite is released. MapSite will be the first user of the Information Interface. It is clear that a number of the technological elements used are not yet in their final form. Development work continues and the external part of the Information Interface will be opened as soon as the technology employed is considered to be ready.

5. CONCLUSION

Discussion of an Information Interface is complicated by the fact that it is not a visible but an abstract object. There are many levels at which discussion can take place. At the technology level, discussion is difficult because the components of an Information Interface are built using a variety of technologies and only a few people are familiar with all of them. At the functional level, discussion is difficult because an Information Interface resembles a chameleon adapting to the requirements stated by the user.

The technology employed in implementation of the Information Interface is not yet in its final form. The same is true of standards, as these are also under development. Much has been written about information interfaces and many pilot trials have been carried out, but the lack of real experience in the field means that the NLS is a pioneer in this area.

The advantage offered by an Information Interface is the ease with which new users can start using it. New users of the public connection to an Information Interface will need documentation to enable them to develop systems, which employ the Information Interface. The owner of an Information Interface must therefore provide new users with up-to-date documentation and access permissions. If user needs are not defined at an early stage, the publishing service might require some reprogramming.

As an Information Interface makes it possible to reach data in different data archives, a single user will be available to access several sources of data simultaneously. Easier access to

different data archives also means a reduction in copying between different systems. As the NLS has many data archives, the aim must be to construct a universal Information Interface, which handles all types of data.

The Information Interface is the road to the future implementation of different systems. In simple terms, the Information Interface allows open access to data archives.

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BIOGRAPHICAL NOTES

Tarja Myllymäki is a Master of Science (in Surveying). She has worked in the National Land Survey of Finland on developing land consolidation systems, the cadastral system JAKO and the Real Estate Market Price registration system. She is currently developing the Information Interface and a new land information system, which includes both NLS data and data from municipalities. Her paper for the FIG 1998 congress (Com 3) concerned the cadastral system JAKO (How to Update a Cadastre).