

An EIS Called WuNDa

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Abstract: The WuNDa project intends to offer to the users in different sections of the environmental department of the city of Wuppertal an access to GIS-data and factual data by a unique and simple navigation user interface, based on internet/intranet techniques. The first step is a prototype for the management of contaminated sites but the system architecture foresees already the integration of other application areas. The system is based on the SIRIUS tool set.

1. PROJECT BACKGROUND

In the environmental department of the city of Wuppertal, Germany a variety of geographical and factual data has to be managed for use in different administrative processes. Several sub-systems exist concerned with different themes (water supply, construction, contaminated sites, biotopes, etc.). Most of these subsystems consist of stand-alone applications in local networks, these networks being connected to an overall administration network.

The geographical data are managed on the basis of the SICAD GIS in a geo database called GDBX. Factual data are hold in different Informix and Access data bases and are used in a variety of Windows applications. The better part of the geographical data can only be used by specialized users working with a SICAD workstation. The cost of these workstations as well as the necessary user specialization are the limiting factors for wider use. A transition into the office environment of the mass of the users and a flexible connection to other information systems in the administration of the city is

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impossible. Many processes however require the integration of the different themes and their related geographical data. Today this is often done "by hand".

The results of the TEMSIS-project (see GÜTTLER and BURGARD) with many similar requirements lead to the basic ideas for WuNDa.

2. SUMMARY OF PROJECT OBJECTIVES

The data navigation and management system is intended to support the users in the navigation process by offering descriptions for information objects and thus to help non-specialists to search in information areas not belonging to their own area of expertise. The user-interface must be a simple Web- and Windows-like browser for all kind of data. Search criteria may be factual or geographical (selected part in a map, address, ...). The data access is performed in a transparent way across the system interfaces. Access methods are stored in the meta data base. The presentation of information is done by a geo-viewer and several factual viewers for different factual object types.

These services must be available for all users connected to the administration network without specialized configurations of their client workstations. This means that one main issue is the integration of factual and geographical data in a unique user interface not requiring a GIS in the client.

In further extensions it is planned to open the WuNDa data reservoir also for a controlled direct access by citizens including an E-Commerce system for particular services.

Another objective of WuNDa is to correspond to the dynamic behaviour of applications and administrative processes in the city. This includes the necessity of a stepwise integration of new information sources as well as the possibility for data administrators to modify "local" systems and their related meta information dynamically including the management of access rights at different levels. These issues require a "common information model", a generic data model for meta information.

The first prototype offers the integration of factual and geographical data in the field of contaminated sites for a variety of user groups. The system architecture allows incremental development of an overall data navigation and management system for the city of Wuppertal based on this prototype.

3. FUNCTIONALITY

We have to distinguish between the functionality offered by the basic user interface itself (the navigator) and those which can be activated in a context sensitive way from different positions in the navigator. From a user

point of view the functionality must correspond to requirements in his daily work processes. In the field of contaminated sites some of the main requirements from the work processes to be supported by the system are:

- consultation of the contaminated sites database by a citizens
- demand for a statement about a specific geographical area in the administration process concerning a construction
- demand for a statement about a specific geographical area in land use planning

The user interface offers as basic functionality the navigation through the entire information pool using a catalogue, a tree-like structure analogue to the Windows Explorer (see fig.1). Other than the Windows Explorer this tree-like structure can offer a variety of sub-trees corresponding to different user views leading to the same objects or collections of objects (it is not a tree from a theoretical point of view). When navigating in the catalogue, all available meta information corresponding to the actual position is visualized in the right part of the window (see fig. 1 upper right). This meta information may consist of text, data, graphical elements, photos and so on. Links to related nodes are visualized in the same area. In the upper menu different additional functionalities can be activated under the menu "Funktionen" in relation to the actual position in the catalogue. The main function categories are:

- retrieval function

The retrieval function can be activated from any node. The search criteria may be factual or geographical and can be formulated either in the navigator in a special window or - in the geographical case - in the geo-viewer. In the special search window the user can combine the criteria: full text, date (real date and system date), address and map section. In the geo-viewer the user can select by bounding box.

The information source, in which the search takes place, is defined by the actual tree position. The result is visualized as a sub-tree below the navigation tree (see fig.1 lower left).

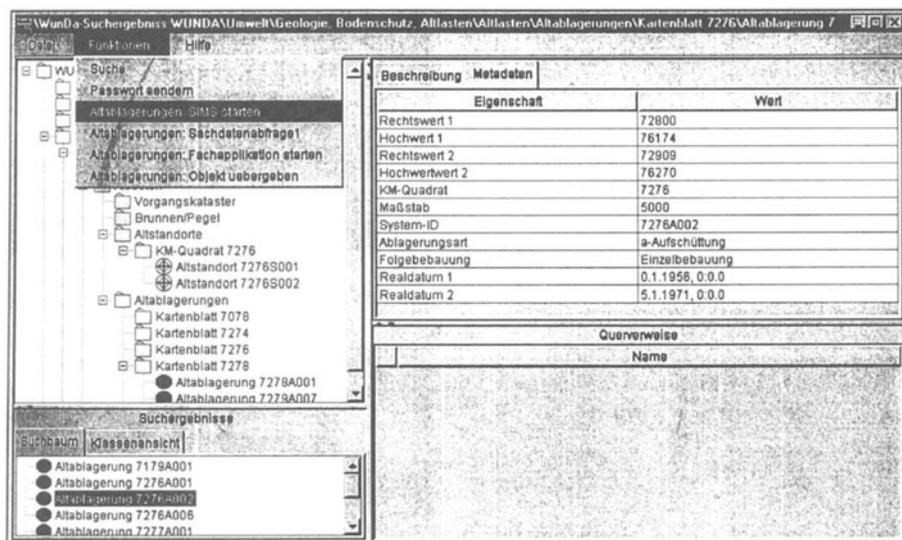


Figure 1. WuNda Browser

- factual viewer

If the actual position in the navigation tree is on a selected object of a type for which the corresponding information source is integrated into the system, the user can activate the so-called factual viewer. The corresponding data base is accessed and the data corresponding to the selected object are visualized in a html-page in an extra window (where the user can manipulate these data at his wish, e.g. print). The important point is, that the user can access in this way the corresponding data, but does not need to know the use of the corresponding specialized application.

- activation of the specialized factual application

For a certain group of users familiar with a specialized application for a thematic field within the environmental department (waste sites, contaminated sites, water supply, ...) it might be interesting to access the corresponding data using the specific application with its full power. These applications can be activated in the function menu bar. The activation can be done using some activation parameters like the identification of a corresponding object in the navigator. However, the users must be aware that the effects of the use of the specialized application (the results of whatever the user did) can not be exploited after returning into the navigator.

The reason is that it is not intended - and seems not useful - to modify the specialized application.

- activation of the geo-viewer

Once the user has selected one of certain nodes in the navigator, he might be interested to visualize the corresponding objects in a map. To do this he can activate (in the function menu bar) the SICAD Internet Map Server (SIMS). SIMS chooses an appropriate background map and visualizes the desired objects in this map using some standard layers defined for the object type in the navigator and transmitted during the activation of SIMS (see fig. 2). In SIMS the user can operate using basic GIS functionality like zooming, adding or removing layers, choosing another geographical area and some more.

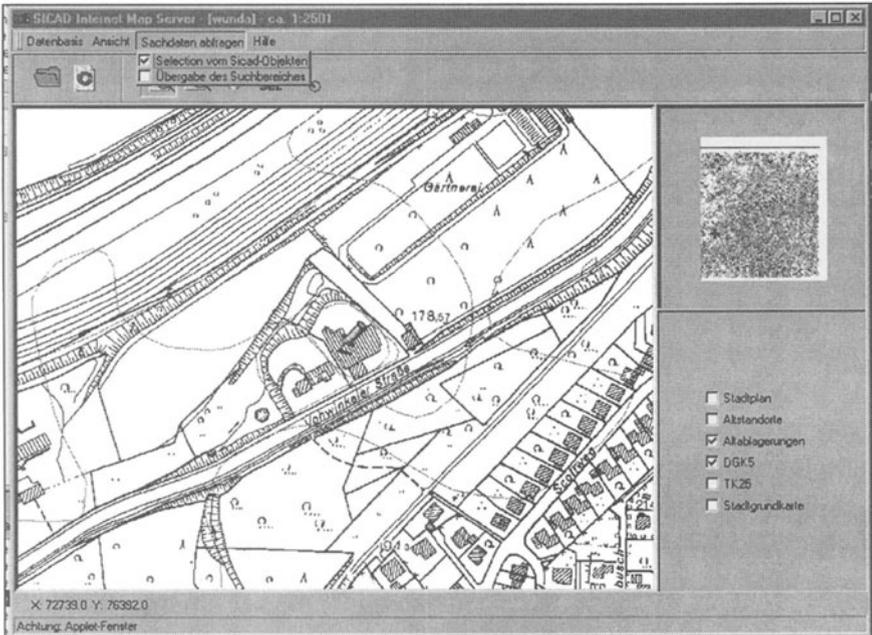


Figure 2. SIMS

A special feature in SIMS is the preparation of the access to the factual data corresponding to selected objects. The selection can be done just by clicking on objects or by opening a bounded box. These objects can be transmitted to the navigator which can exploit the information in a search process (see retrieval function above).

4. SYSTEM ARCHITECTURE

4.1 Base Tools

WuNDa uses as much as possible tools already available. The client is implemented using standard browser technology like the MS-Internet-Explorer for all client functionality (navigator, SIMS client, factual viewer). SIRIUS is an integration tool set developed by the EIG research group at Saarbrücken. It covers the application protocol between clients and servers as well as the complete interface to the dedicated data sources. SIMS is a product of SICAD Geomatics. It consists of a SIMS server and a client running in a standard Internet browser. The user can activate the GIS functionality in the client, some minor functions are performed locally in the client. The major GIS functionalities are performed in the SIMS server accessing a specialized SICAD data base. The results are transmitted to the client which performs the visualization. Besides the specialized SICAD data base for the SIMS only the commonly available products ORACLE, INFORMIX and ACCESS are used in WuNDa.

4.2 Software Architecture

Fig. 3 shows the software architecture of WuNDa with the components in the web-client and those in the web-server. The SIRIUS server is a pre-configured piece of software and identical for all data sources. This is true also for the SIRIUS client, i.e. the navigator, which is identical for the whole network and does not need to be modified whatever modifications take place in the data sources. The data model of the meta data base is completely generic and therefore does not have to be modified if new data sources are linked into the system. The diversity of the different data sources is covered by the contents of the meta data base including a description of the data sources (in our case the waste site management data base).

The meta data base offers the central information service for the other components. It contains

- the description of the tree-like structure for the navigator
- a part of the meta data behind the different nodes including
 - corresponding methods
 - activation information (e.g. standard layers for a certain object type when activating SIMS)
 - user access rights
 - identification (if the node represents a real object)
- a description of the factual data base(s) (i.e. structure and access ways)

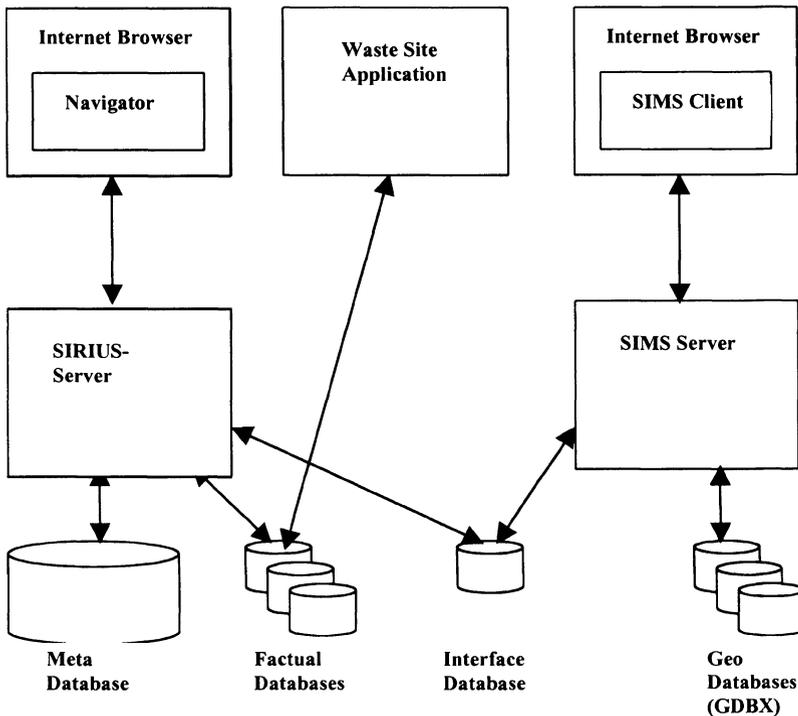


Figure 3. Software Architecture

All these information are accessed and exploited by the navigator.

When SIMS is activated, a new instance of the SIMS client is created within the WuNDA-client. The SIMS server needs some initial information in relation to the activation position in the navigator (e.g. geographical information like map section, standard layers corresponding to the chosen object type) to produce the correct initial geographical representation to be transmitted to the SIMS client. The exchange of these information is done via the interface data base. This is a secure and simple way to overcome problems in identification of the correct SIMS client instance arising from the fact, that there may be more than one open in the same WuNDA client (and thus at the same web address). As geographical information basis serves a set of SICAD GDBX data bases.

The specialized waste site management application (once activated) accesses directly the factual data base without any further contact to other software components.

4.3 Implementation Aspects

The navigator client is implemented as a Java applet running in a standard internet browser. The (fixed) server software is also developed in Java. The current WuNDa SIRIUS version is based on CORBA. For the generic data model there exists an implementation in ORACLE one in INFORMIX. The data access of data sources is done via JDBC. The interface data base used for parameter exchange between the SIRIUS server and the SIMS server is also implemented both in ORACLE and INFORMIX. The SIMS client is implemented in Java and can be manipulated via a simple interface. The specialized application for the first prototype - waste sites and sites under contamination suspicion - was implemented completely in MS Access.

5. PARTNERS

The project was developed in close cooperation between

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