Digital Archiving with the database application PGIS

Developing concepts to model archaeological data

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Expert information system for cultural heritage in Rhineland-Palatinate

It is the task of the General Department of Cultural Heritage Rhineland-Palatinate (GDKE Rheinland-Pfalz) to preserve cultural monuments. In 2018 a digitalisation strategy started in order to provide data without media interruptions. It aims to digitalize workflows and the emerging media.

With the foundation of the GDKE the state department inherited multiple database collections, which were to be consolidated and prepared for further use in the centralized database application PGIS (Himmelmann, Schuppert et. al., 2013). It manages metadata, geodata and media of all six directions (Department of State Archaeology, Department of State for Monument Conservation, State Museums in Koblenz, Mainz and Trier Rhineland-Palatinate, Administration of Palaces)

In the development process it was the aim to rely on open source software wherever possible. The advantages are reduced costs of licence purchases and the freedom to develop custom needs in the used software itself. The general conditions in the GDKE are based on a windows domain network and Microsoft Office integration.

In this abstract we want to focus on the implementation of the archaeological part of the PGIS application. It concludes data from excavation sites to inventory items in depots. To fulfil the legal requirements of the GDKE it is possible to designate special protection areas and publish statements to institutions of public issues. It is the objective of the database to create a dataset which links metadata, geodata and media. This results in a searchable archive.

Components and Structure of PGIS

Considering the combination of multiple data formats in metadata, geodata and media makes the need for different techniques obvious. The structure consists of the following components (fig. 1):

- **MSSQL Server** stores the data of the specific objects with their description and is also able to create reports in PDF and the common Microsoft Office formats xlsx and docx
- **PostgreSQL** Server stores geospatial data
- **Mapserver** handles publishing spatial data as Web Map Services (WMS)
- **Mapbender** and **OpenLayers** are both frameworks for the display of maps in a Webbrowser and in the PGIS application
- **QGIS** is the Desktop GIS used for creating geodata of the objects
- **Visual Studio .NET** for the GUI development and programming language

Using the advantages of a modular system, the departments can define their own datamodel including describing fields, thesauri, etc. (resulting in forms like fig.2). In a following process they can participate and influence layout and workflow.

PGIS functions as interface between all the above mentioned techniques. Starting from the dataset the user can create a geometry via QGIS and publish it in advance. For publishing there are several possibilities. The Geoportal RLP is a geodata infrastructure (GDI) regarding all data of Rhineland-Palatinate. An interface between PGIS and the GDI exists which enables data exchange. Further PGIS can extract data into various export data types including XML, CSV, HTML, Microsoft Office Documents and supports exchange formats like ADeX (Himmelmann 2008). Therefore PGIS is the central control element to create a dataset which describes a real life object.
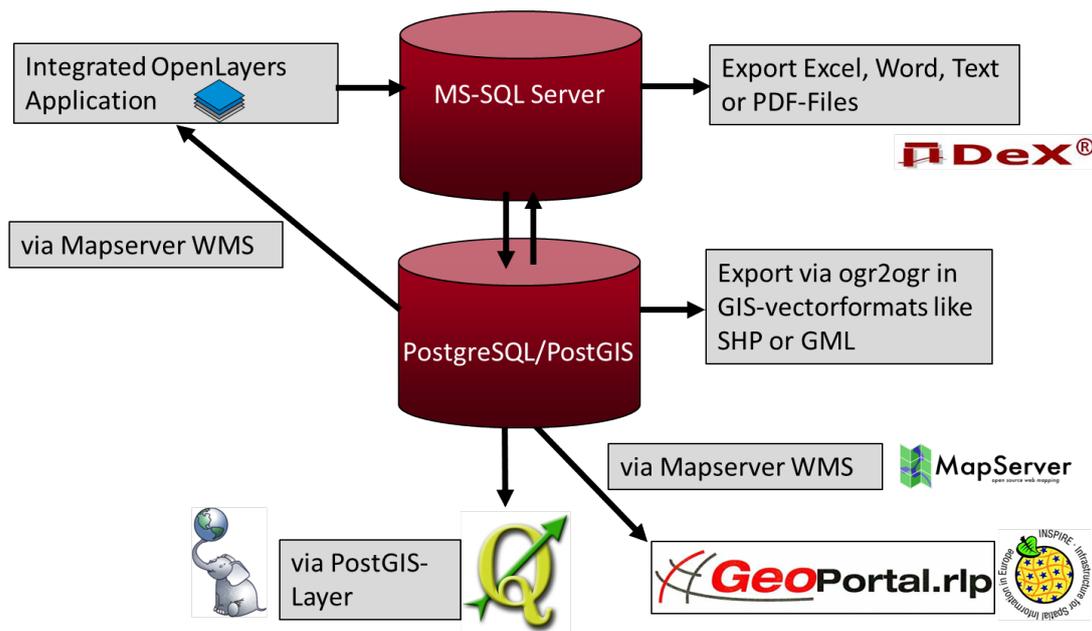
Fig. 1.Structure of PGIS components (© GDKE)

Handling of media and archiving in PGIS

Every dataset offers the possibility to store files within. In PGIS exists a well-defined list of file-types with the aim to ensure long term usage. Based on the work of Bibby, Brunn et. al.2011:15 et.seq. data types are divided in three levels which are adapted by PGIS. For text information TXT and PDF/A are considered *preferred*, in terms of image files the format of uncompressed TIF is considered as *preferred* and compressed TIF and JPEG are considered *accepted*. Given the general conditions of the GDKE MS Office Documents are used for the major part of exchange and therefore required to be part of the list. The upward compability of MS Office data formats allows to update documents in a regular process (e.g. doc → docx)
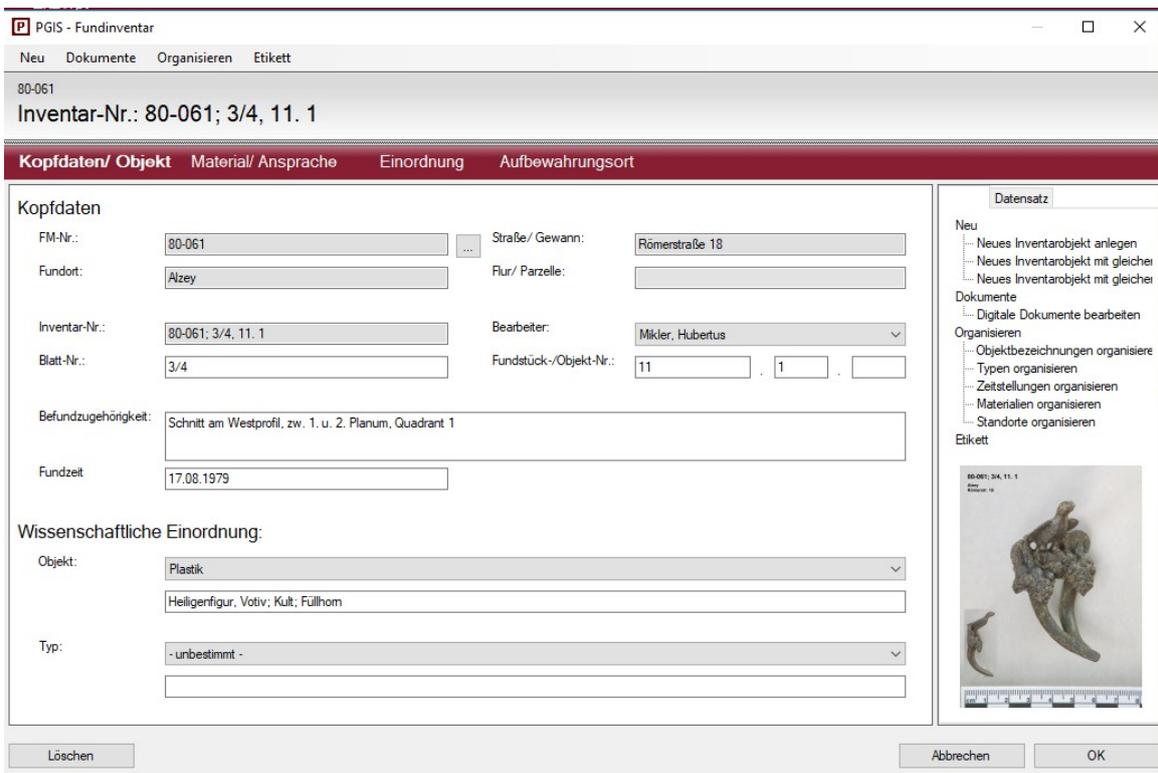

Fig. 2.A PGIS dataset linked with an image of an inventory object of the archaeological department Mainz (© GDKE)

In the process of linking a file to a dataset the file is copied to a storage system. By accessing, the file is copied to a temporary folder on the machine of the user. Any changes only affect the copy. In case of uploading, a new file is created and the original stays untouched. Therefore all files managed by PGIS are change proof and can be considered as 'archived'.

A major part of files are images, which are formatted to serve several purposes: the original is stored, one additional image gets rendered to a lower resolution for digital display, another image gets rendered as a thumbnail preview. Therefore the network traffic is reduced. For each dataset the user can select one of the existing images as most representative which is shown as 'title picture' (fig. 2).

For future developments it is aimed to enrich images by exporting text information from the database into the metadataset, for example storing the name of the shown object into the image file. Based on this information other applications like an image archive software can read the metadata and allow to categorize and create structures based on the information from the entries made in the database. Further it is planned to offer a possibility to connect one image to several datasets, which reduces redundancy of storing images.

Geodata Infrastructure in PGIS

With the technological advancements in the recent decade new possibilities for digital mapping emerged and found its way in the working processes of archaeologists. In PGIS this process developed from basic notation of numeric point coordinates to a complete geodata infrastructure.
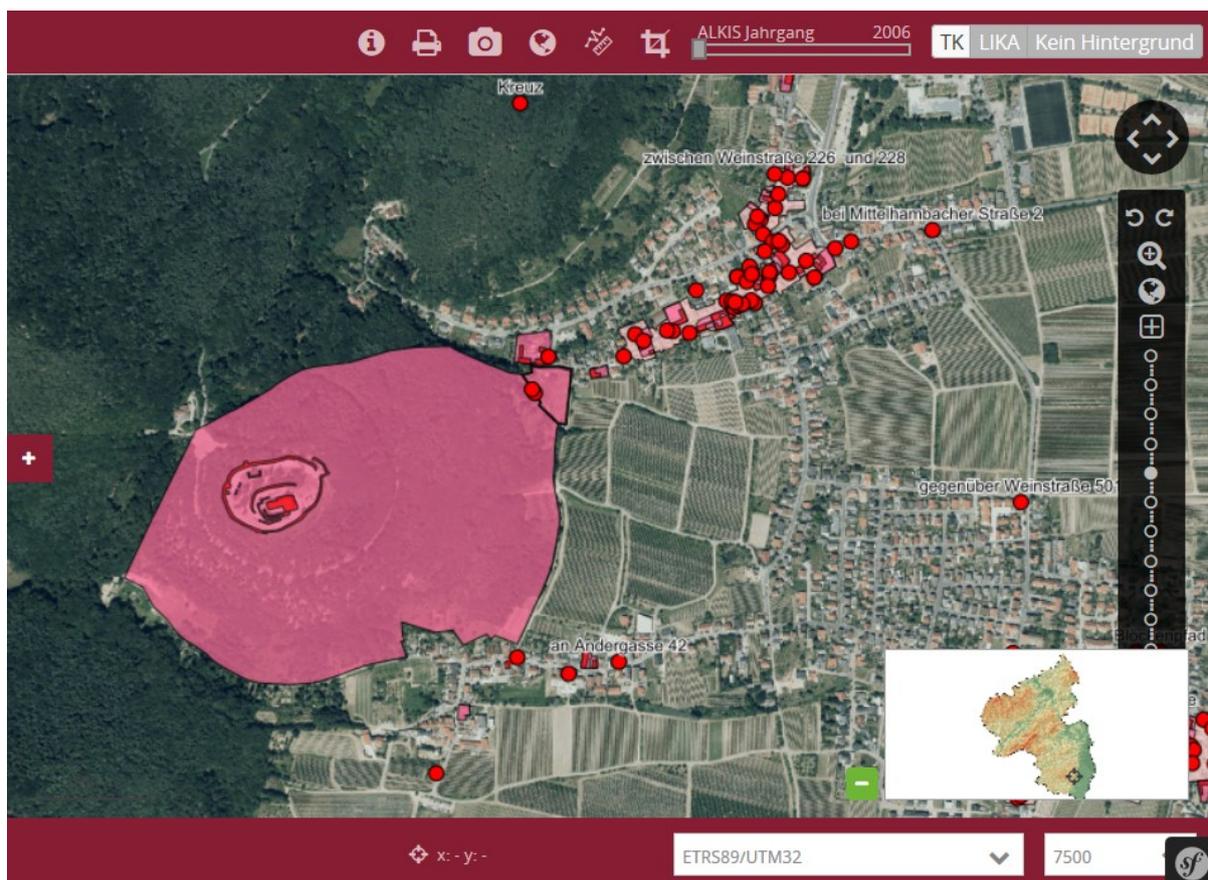

Fig. 3.Mapbender customized for use in GDKE displaying cultural monuments of Neustadt an der Weinstraße (© GDKE)

The framework Mapbender as well as OpenLayers play major roles in the interactive exchange of information. Being able to display information on a map offers various possibilities. Sharing information about sites between departments improved the harmonized output of public statements. The development of other institutions resulted in diverse offering of data which improved the quality and precision of information and evaluation possibilities. For this purpose both frameworks are able to import WMS and Web Feature Services (WFS) as Layers. In addition Mapbender offers the implementation of customized search queries.

For example requested parcels in public statement can easily be found, and combined with layers of the departments (fig. 3). The dimension handler element enables the Mapbender-application to overlay maps of different years in order to produce a timeline. Therefore the user can observe the change of the landscape over time in dependency of the site.

Conclusion

Based on the development of PGIS it became apparent that the topic of digital archiving can be interpreted as a process depending on three aspects: management of data, requirements of the GDKE and technical advancement. All of them are in constant change.

Storing data in databases (PostgreSQL and MSSQL), media on file storage systems and using logic in form of PGIS application to connect both enables dynamic reaction to changes in any of the three aspects. Advances in new technologies can be integrated and changed comfortably.

The exchange and constant communication with others provide improvements in the process of adopting of the changing circumstances.

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