Open Source Software in daily Bavarian cadastral work – Practical experience

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Presentation outline

• Framework (implementation, standardization, organization)
• ICT in the Bavarian cadastral administration
• OSS Experiences (technology, software, basic requirements, policy issues)
• Examples
• Conclusion
Organisation of Land Administration in Bavaria

Land Register

Bavarian State Ministry of Justice

72 district courts

electronic data communication

Cadastre

Bavarian State Ministry for Finance
Dept. 7: Bavarian Surveying Administration, Information and Communication Technology

Bavarian State Agency for Surveying and Geographic Information

51 surveying agencies and 22 substations

The German National Geodatabase – Reference Data

ALK
Automated Real Estate Map

ALB
Automated Real Estate Register

ATKIS
Official Topographic and Cartographic Information System

AFIS-ALKIS-ATKIS
Application Schema
UML Data Model

GML Data Exchange Interface

Geodetic Reference Points
Freund, Johann (LVG); 15-10-2007

LVG: Professional and technical competence for all aspects of land surveying and cadastre

Freund, Johann (LVG); 15-10-2007

Freund, Johann (LVG); 15-10-2007

execute cadastal surveying and maintain the cadastre in a GIS-System (based on open source)
The new Cadastral Information System

ALKIS = Official Real Estate Cadastre Information System

- Standard for the federal states of Germany
- Conformant to ISO and OGC standards
- Integration of spatial and alphanumeric data (e.g. parcels and owners)
- Implementation by the federal states (in Bavaria self development based on open source software)

Framework for Developing Cadastral Systems in Germany

INSPIRE is the harmonised framework directive for implementation of a European spatial data infrastructure (ESDI)
The consequent use of ISO Standards

The application of basic ISO standards in any GIS (e.g. ALKIS) will help to:

- Increase the understanding and usage of geographic information
- Increase the availability, access, integration, and sharing of geographic information
- Promote the efficient, effective, and economic use of digital geographic information and associated hardware and software systems
- Allow any software developer to analyze the specific demands and to derive an implementation model out of the conceptual data model
- Implement open source tools to support components of an application schema (e.g. ISO 19107 Spatial Schema)

The German cadastral authorities have consequently adopted these objectives and decided to consider the ISO standards within the new AAA application schema as far as possible.

Consequent use of International Standards - Data Harmonization

INSPIRE recommendation: ISO 19109 and referred standards are promoted as ESDI rules for specifying data structures and semantics.

19109 Rules for application schema

19136 (GML) profile

19118 Level 1

AAA application schema

19107 – 19111 Geometry, CRS

19112 – 19115 Metadata

19103 Conceptual schema language (UML)

19110 Feature catalogue

Feature Catalogue (XML)

Feature Catalogue (HTML, RTF)
ICT Architecture (Cadastre)

- Integral Geo Database
- 10.4 Mio. parcels
- 3.0 Mio. buildings …
- 2010
  - ALB (Automated Real Estate Register)
  - DFK (Digital Real Estate Map)
- >2010 ALKIS

Replication

- 73 locations
  - (PostgreSQL, PostGIS, UMN Mapserver)

- > 2500 clients with full cadastre functionality (GIS)

ICT at Surveying Offices

- Instructions
- Measurements (distances, angles etc.)
- Outdoor notebook
- Linux
- Application software (Tcl/Tk, Java, OSS-Libraries)

- LAN
- PostgreSQL
- PostGIS
- UMN Mapserver…

- LAN
- Client
Online Data Distribution

Experiences OSS - Technology

- Technical requirements (performance, stability etc.) are fulfilled by OSS products
- PostgreSQL is a powerful database for GIS purposes based on ISO-standards
- System requirements are lower for open source products than for commercial products
- Good maintainability
- Installation can be efficiently automated (from one location to 73 servers and 2500 clients without manual interaction)
- Products can be easily adapted to changing needs
- Fast reaction
Experiences OSS - Software

- Commercial software solutions: do they really meet the demands of a specific country and of specific workflows?
- There is a demand for open source core cadastral functions (no one should reinvent the wheel)
- WMS, WFS: modular components inter-operating on web services -> spatial data infrastructure -> accessibility to cadastral informations (”web services for geo-enabling the world”)
- The reputation of Open Source Software is not the very best. People assume that installation is difficult, the operation is complicated and there is bad support. Even it has been proved that it is not the case in the Bavarian Administration for Surveying this assumption is still there.

Basic Requirements

- Technical skills: programming languages (Java etc.), DBMS, SDBMS (PostgreSQL), system, networks and …
- Data migration (to meet the rules of the data-model) and data collection -> in Bavaria the most work-intensive and technical challenging task
- Understanding of ISO methodology
Policy Issues

- OSS is not yet accepted everywhere (due to the misunderstandings as difficult installation, complicated operation, bad support …)
- No License costs: 73 (server) × 0.00 + 2500 (clients) × 0.00 = 0

Annual report of the Bavarian Supreme Court of Accounts (2001)
(controlling body of national finances)

In its annual report the Bavarian Supreme Court of Accounts argues for the application of open source software in public administration. In a particular chapter “application of open source” it criticises the public IT’s strong dependence of a single software producer – Microsoft – and shows options for the application of open source software.

- The application of open source products is fixed in the Bavarian IT-standards.

Bavarian IT-standards in public administration

Operating Systems

### Produktkatalog

<table>
<thead>
<tr>
<th>Produkt</th>
<th>Version</th>
<th>Kategorie</th>
<th>Begründung</th>
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</thead>
<tbody>
<tr>
<td>Suse Linux mit KDE-Desktop</td>
<td>mindestens Suse Linux Enterprise Desktop 10</td>
<td>Standard</td>
<td></td>
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<tr>
<td>Suse Linux mit KDE-Desktop</td>
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<td>Standard</td>
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<tr>
<td>Microsoft Windows</td>
<td>Windows XP</td>
<td>Standard</td>
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<tr>
<td>Microsoft Windows</td>
<td>Windows 2000</td>
<td>erlaubt</td>
<td></td>
</tr>
<tr>
<td>Microsoft Windows</td>
<td>Vista</td>
<td>in Beobachtung</td>
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Bavarian IT-standards in public administration

Data Base Management Systems (DBMS) for Complex Applications

<table>
<thead>
<tr>
<th>Product</th>
<th>Version</th>
<th>Category</th>
<th>Reasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft SQL Server</td>
<td>2000</td>
<td>Standard</td>
<td>High performance and reliability.</td>
</tr>
<tr>
<td>Microsoft SQL Server</td>
<td>2005</td>
<td>in development</td>
<td></td>
</tr>
<tr>
<td>ORACLE</td>
<td>11.10g</td>
<td>Standard</td>
<td>Experienced and well-supported database system.</td>
</tr>
<tr>
<td>ADABAC C</td>
<td>3</td>
<td>in development</td>
<td>Relational DB system for large databases.</td>
</tr>
<tr>
<td>DB2</td>
<td>7</td>
<td>Standard</td>
<td>Relational DB system for large databases.</td>
</tr>
<tr>
<td>PostgreSQL</td>
<td>7.4</td>
<td>Standard</td>
<td>Supports complex applications and large datasets.</td>
</tr>
<tr>
<td>PostgreSQL</td>
<td>7.5</td>
<td>in development</td>
<td></td>
</tr>
<tr>
<td>MySQL</td>
<td>5</td>
<td>Standard</td>
<td>Features and scalability for a variety of applications.</td>
</tr>
<tr>
<td>Trineo XARL Server</td>
<td>4.2</td>
<td>Standard</td>
<td>Suits orientation database system with native XML-implementation</td>
</tr>
</tbody>
</table>

Examples

1. Collection of Land Use Data
2. Web Services, Bayern-Viewer Agrar
Geoservices

Based on OGC Web Map Service (WMS), implemented by UMN Web Map Server

• Request of digital maps in raster format (PNG, GIF, TIFF, JPEG) coming from separated digital geographic databases
• Displaying with an ordinary web browser

Bayern-Viewer Agrar

Cooperation of the Bavarian State Ministry for Finance and the Bavarian State Ministry for Agriculture and Forestry
Access for 130000 farmers in Bavaria
Application for funds from the European Union
Q: Is it possible to develop a cadastral application that fulfills the demands of every country? No. (Germany: 16 federal states)

But: every country uses GIS functionalities, cadastral, calculation and surveying operations. They can be combined to a customized solution. This is the chance of Open Source.

Define standardized core processes as a sublevel of the main processes that depend on local requirements such as laws and regulations (-> Land Administration Domain Model, LADM)

Scalable toolkit for cadastral and land registration purposes

Business processes and technical solutions must be adjusted to one another

Conclusion

Even if there are still some challenges and definitely a lot of things to be done before Open Source Software can be sufficiently implemented, the experiences in Bavaria are very positive.

It has been shown that the implementation of Open Source applications is a reasonable approach in the field of cadastral administration.

Thank You!
aspects to be considered when building up an open source initiative:

- data model (CCDM?)
- data ! (migration, collection)
- business processes
- subjective aspects: precedices
- policy
- consulting

Freund, Johann (LVG); 24-10-2007