Usage of a Multidisciplinary GIS Platform for the Design of Building Structures

Dalibor Bartoněk, Jiří Bureš, Aleš Dráb, Miroslav Menšík

Institute of Geodesy
Institute of Water Structures
Institute of Computer Aided Engineering and Computer Science

Integration of Needs in Many Technical Building Branches

Study programme - Civil Engineering
Specialization - Water Management and Water Structures
• Institute of Water Structures in the field of GIS application in water management
• Institute of Landscape Water Management,
• Institute of Municipal Water Management,

Faculty of Civil Engineering

Specialization - Constructions and Traffic Structures
• Institute of Railway Constructions and Structures

Usage of a Multidisciplinary GIS Platform

... other building branches don’t realize that GIS is needed.

Multidisciplinary Integration of Needs

Study programme - Architecture and Urban Design
Subjects: - Development planning of the city and region
- Graphic techniques - visualisation and animation

Faculty of Architecture

Study programme - System Engineering and Informatics
Specialization: Management informatics
Subjects: Date and functional modeling
- Database systems

Faculty of Business and Management

Study programme - Management and Economics
Specialization: Company Management and Economics,
Subjects: Strategic Management
- Information support of processes
- Applied informatics

Spatial Information Systems
(opened since 2006/2007, guaranteed by study programme Geodesy and Cartography)

1. Introduction, definition of GIS, development, relations, geographical object, homeomorphism.
2. Information systems: types, design methods
3. Overview of database systems, relational algebra, SQL, spatial indexes and queries, data mining (cluster analysis, artificial neural networks, genetic algorithms)
4. Basic of graph theory, selected tasks on graph structures
5. Topology approach: mathematics, pragmatic - DIGEST standard
6. Data models in GIS (raster, vector, matrix data)
7. Digital Terrain Model (raster, vector, TIN)
8. Data capture, metadata, data quality and accuracy - standards
9. Map algebra: model, operators, functions, tasks
10. Spatial analysis: history, objective, types (measured and classify functions, overlay, focal functions, join functions)
11. Current trends and developments of GIS
Platforms of GIS

**ESRI**
- ArcGIS
  - 10 different modules of ArcGIS + Leica Extensions for ArcGIS
  - in total 300 licences
  - operation via BUT academic network interface

**Intergraph**
- Geomedia
  - Registered Research Laboratory (RRL)
  - in total 30 students' licences with 1 year validity

Multidisciplinary Data Warehouse of BUT Conception

Source geodata from
- Bachelors works
- Diploma works
- PhD works

External Bindings
- Faculty of Civil Engineering
- Faculty of Architecture
- Faculty of Business and Management

Exploitation for Another Bc, Dipl., PhD Works

Publications Selected Bc, Dipl., PhD Works

Remote Access for Combined Mode of Study

Hardware and Software Guarantee GIS

HP ProLiant DL380 G5 rack server

- processor – 2x Quad-Core Intel Xeon Processor E5440 (2.83 GHz, 80 Watts, 1333 FSB)
- memory – 32GB RAM PC2-5300 Fully Buffered DIMMs (DDR2-667) with Advanced ECC
- disc space – 8x 146GB HDD SAS 10000 rpms
- Hot-plug
- net interface – 2x Gbit LAN
- redundant supplies and fans

Software platforms:
- Disc subsystem RAID-5 mode with one disc in hot-swap mode.
- Database Microsoft technologies MS SQL 2008 in 64 bit

Multidisciplinary Data Warehouse of BUT

a) digital state map work
b) orthophoto
c) digital thematic maps of large scale
d) digital terrain models and laserscanning
e) satellite data
f) historical maps and documents
g) catalogue of maps

Multidisciplinary data warehouse is operated by authorized access through academic network BUT.
Digital State Map Work

- Fundamental Base of Geographic Data CZ (ZABAGED) and Geonames, middle scale, full volume, vector format - in extent of 99 map sheets, district Brno and environs, area of Jeseníky mountains, district Velké Meziříčí, format DGN, SHP
- State map 1:5 000 (SM 5), vector format, 32 map sheets, district Brno,
- Raster map 1:50 000 (RMZ 50), 8 map sheets,
- Raster map 1:25 000 (RMZ 25), 20 map sheets,
- Raster map 1:200 000 (RMZ 200), 1 map sheet
- Raster map 1:500 000 (RMZ 500), 1 map sheet
- Raster map 1:1 000 000 (RMZ 1M), 1 map sheet
- Cadastral maps and data of Real Estates - district Brno - cadastral area - Veveri - SPI, area Moravian Karst (cad. area Jedovnice) - graphic data (SGI), description data (SPI).
GIS – Geodynamic Applications

GIS – Evaluation of Flood Hazard

GIS – Small Municipalities

GIS – Localities for Field Training of Students
Conclusions

• integration of extensive needs of branches at FCE,
• usable for the whole faculty,
• platform usable also by other faculties BUT,
• usable for full-time and combined mode of study,
• graduate theses, lifelong learning, CPD, eventually complementary activity.

Immediate benefit is in extension and higher quality of GIS education and for another subjects using geographic data at Faculty of Civil Engineering BUT.

Long-time effects:
• enhanced assert of graduates in practice which is the main criterion for evaluation of the tuition
• possibility of offer creation of specialized subjects within lifelong learning for building practice and public administration

Thank you for your attention