GIS for Insurance –
Flood Risk and Real Estate

Zoning-System for Floods, Tailback and Heavy Rain (ZÜRS)

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Agenda

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- Introduction
- Description of ZÜRS
- Client and contractor
- Redesign of ZÜRS

The Solution

- ZÜRS Architecture
- Geodataserver
- Data and Data Processing in ZÜRS
- Workstation for Maintenance
- ZÜRS Software
  - ZÜRS Viewer
  - ZÜRS Black Box
  - ZÜRS light
- Concept for the future
Project Overview

- The Association of German Insurance Companies (GDV) represents about 450 insurance companies.
- A particularly vast flood in summer 1997 in the eastern part of Germany caused the GDV to initialize the development of a software for the nationwide classification of flood risks in Germany.
- The Project is called „Zoning-System for Floods, Tailback and heavy Rain“ (ZÜRS) and enables insurance companies to classify the flood risk of real estate.
- Main purpose is the address assignment to risk classes, e.g. probable areas of flood.
- The potential flood areas are classified into 4 classes which are based on the likelihood of floods in different periods.
... Project Overview

- The basic software of ESRI is ArcSDE, ArcEditor and MapObjects LT, with various application modules, data base is Oracle.
- The first version of ZÜRS was distributed to insurance companies in 2001. The GDV decided to start the redesign of ZÜRS in 2002.
- The project is ongoing and will be finished until late summer 2003.
- The software enables insurance companies to classify the flood risk of real estate all over Germany.
- 170 insurance companies will use the Software for their insurance business of flood risks of real estate.
Introduction

- Flood insurance is based on an appropriate rating of the risk classification, which the companies calculate individually.
- Apart from other factors it depends on the quality of statistical data and the calculated probability of flood, how insured damages affect the insurance companies.
- A new quality of local distribution and classification of flood risk scenarios will be achieved by the functionality of the GIS software and the applications of ZÜRS.
- Of utmost importance are the data - either the data of the insurance companies or the geo data available on the market (water lines, street maps, postal zip codes, community boundaries, geographic data etc.).
... Introduction

Large floods in recent years
- Eastern Europe, Odra Basin, Summer 1997
  Damages in Czech Republic, Poland, and Germany more than 3.5 billion EURO; heavy rains with more than 400 mm/ m²
- South-eastern Germany, Summer 2002
  largest flood since more than 200 years; damages more than 10 billion Euro, insured about 1,7 billion Euro; heavy rains with up to 200 and 400 mm/ m²

Conclusions
- Increased frequency of extreme floods in recent years
- Reduced percentage of insured damages (10-20 % only)
- Many people homeless, ruined, injured or death
- Increasing damages up to billions of Euro
... Introduction
... Introduction

Impressions
Description of ZÜRS

Until 2001 no possibility of estimating flood risks all over Germany

Basics of ZÜRS I

- Production of flood risk areas countrywide and classification of floods in 3 different classes, integration of tailback and heavy rain
- Integration of all important water lines with altogether 55,000 kilometres of rivers in a digital elevation model
- Calculation of probable flood areas in periods of 10, 50 or more years along important rivers of Germany, based on flood models
- Support by the National Water Management Authorities and adaptation to local conditions

First version ZÜRS was distributed to insurance companies in summer 2001
Association of German Insurance Companies (Gesamtverband der Deutschen Versicherungswirtschaft (GDV))

- Members
  in total 447 insurance companies, 170 companies in the sector of property insurance / material damage

- Tasks
  Lobby of the insurance companies - Dialog with government and political parties, representation at European Union, Contacts with international organizations

- Service for the Members
  own institutes for prevention of damage and investigation with specialized committees

- http://www.gdv.de
Redesign of ZÜRS

- Redesign of ZÜRS based on ESRI GIS
- New technology, use of standard technology
- New data and software concept, i.e. central GeoDataBase
- Simple integration of additional risk classes
- Expandable data model
## Consortium

<table>
<thead>
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<th>ESRI Geoinformatik</th>
<th>geomer GmbH</th>
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<td>International Distributor of ESRI in Germany</td>
<td>ESRI Solution Partner (1999)</td>
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### Consortium as Concept of Partnership

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ZÜRS - Flood Risk and Real Estate
New components of ZÜRS

- 4 risk classes characterize the probability of flood risk in defined areas
  - Floods at least once in a period of 10 years – very high risk class RC4
  - Floods at least once in a period of 10 to 50 years but less than once every 10 years – medium risk class RC3
  - Floods at least once in a period of 200 years but less than once every 50 years – small risk class RC2
  - Floods less than once in a period of 200 years – very low risk class RC1
- Regular updates of street data
- Regular adjustment of flood areas data with data from the National Water Authorities
The Solution

- ZÜRS Architecture
- Geodataserver
- Data and Data Processing in ZÜRS
- Workstation for Maintenance
- ZÜRS Software Modules
  - ZÜRS Viewer
  - ZÜRS Black Box
  - ZÜRS light
- Concept for the future
Geodataserver

- The Geodataserver with ArcSDE and Oracle is the central component for data storage (Central Data Base)
- Based on standard products
- Central data management and meta data administration
- Hosting of data for all participating insurance companies
Data

- Areas of flood risk classes RC 1-4
- Street data Germany (street sections) NavTech
- Geographic data and cadastral areas
- Geographic waterlines
- ZIP code data
- Zones of flood risks (Risk Class)
- External address data
Data Processing in ZÜRS

- Crucial procedure of ZÜRS is the risk class allocation
- Prerequisite is a Navtech data set with approx. 7 million street segments and corresponding address domains
- Actually are processed about 6 million single addresses
- Intersection of postal zip code areas, street segments and single addresses with the risk class areas, including the buffering of the data
- The result is a complete address list with allocated risk area classes as the data basis for the ZÜRS modules
ZÜRS Workstation for Maintenance

- The work station for maintenance (ArcEditor) is the central station for import, editing, data processing, and integration of data for the offline workstation of the ZÜRS Viewer.

- ArcEditor 8.2 is supplemented with components for:
  - Import/Export
  - Data processing
  - Metadata management in ArcCatalog with customized metadata viewer.

- The MapEngine, as part of the maintenance component, is used for the selection, compression, encoding and export of ZÜRS data products.
ZÜRS Workstation for Maintenance

- Structure of data sets
- Data import of ZIP-codes, NavTech street data, addresses, flood areas, water lines
- Basic data for calculation of risk class, addresses...
- Data...
ZÜRS Workstation for Maintenance

- Address adjustment
- ZÜRS addresses and coordinates
- Allocation of risk classes (RC 1-4)
ZÜRS Workstation for Maintenance

- Special metadata scheme for ZÜRS
- Status of the data sets
ZÜRS Workstation for Maintenance

- Viewer extension in ArcMap
- Allocation of risk classes finished
- Preprocessing finished
ZÜRS Software Modules

The ZÜRS software consists of 3 modules

- ZÜRS Viewer (application)
- Black Box (application)
- ZÜRS light (data file)
ZÜRS Viewer

- The ZÜRS Viewer is the most important application module of the ZÜRS software; it is installed at the client with the Black Box and ZÜRS light.
- It visualizes the preprocessed, compressed and optimized data from the GeoDataServer (Maintenance).
- The independent application is used by the insurance companies for the input of addresses and it returns the corresponding risk class on the screen.
- The given risk class can be checked by the simultaneous display of the corresponding map with water lines, rivers, streets and flood areas.
- The data for the Viewer are compressed and stored on CD.
ZÜRS Viewer screenshots

- Waterlines and rivers of Germany
ZÜRS Viewer screenshots

- Viewer Box - Input of address, town and street-map
- Risk class of given address is indicated in map
- Zoom in automatically, view of street and house number

<table>
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<th>Risk Classes</th>
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<td>RC 1 - 10 years</td>
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<td>RC 2 - 50 years</td>
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<td>RC 3 - 200 years</td>
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<td>RC 4 - over 200 years</td>
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ZÜRS Viewer screenshots
ZÜRS Black Box

- The Black Box application assigns risk classes to a large number of addresses in batch processing.
- It contains compressed and encoded data.
- The address input is made in an ASCII file, the input of the determined risk class is made in an additional column to the address.
- The result of the allocation (risk class-address) is written into a text file.
- The Black Box is integrated into the ZÜRS Viewer by a dialogue; it can be integrated also into other applications of the insurance companies (stand alone).
ZÜRS light

- ZÜRS light is developed as a compact and memory-minimized form of data for platform-independent employment (CD-mobile devices)
- It contains all compressed address data (structured ASCII file) as result of intersection of the geometry with the areas of risk classes without geographic map data
- ZÜRS-light enables risk class allocation on the same database as ZÜRS Viewer but without visualization of the geographic data
**ZÜRS Offline Client**

- 10,000 Viewer will be licensed for the Insurance Companies

- ZÜRS light requires much less memory than the Viewer (Light: 10 MB, Viewer + data: 650 MB)

- ZÜRS-light will be used by the sales forces
Concept for the future

- The software ZÜRS will be updated regularly, regarding street maps and flood areas as a requirement of the insurance companies.
- One of the next steps is the integration of a new risk classes (e.g. extreme events, for example dike rupture), improving the accumulation management in the sector of elementary damage.
- ZÜRS is expandable regarding content and technology.
- The concept of the central GeoDataServer (Central Geodatabase) allows the upgrading of the system for Internet use by integration of ArcIMS.
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