GIS for Insurance – Flood Risk and Real Estate

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

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Agenda

- Project Overview
- 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/ m^2
- 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/ m^2

- 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 Versicherungs-wirtschaft (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**

Association of German Insurance Companies (Gesamtverband der Deutschen Versicherungs-wirtschaft (GDV))

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

ESRI Geoinformatik

- International Distributor of ESRI in Germany
- Range of Services
  Products, Support, Training, Consul-ting, Development,
- Business Partners
- http://www.ESRI-Germany.de

geomer GmbH

- ESRI Solution Partner (1999)
- Range of Services
  Application Software (floods, environment), Geomarketing, Geodata, Training, Products, Support, Consulting
- http://www.geomer.de

con terra

- ESRI Solution Partner - 1995;
  (Partner of the Year 2001; Foundation Partner 2003)
- Range of Services
  Application Software, Hosting, Geodata, Training,
  Products, Support, Training, Consulting
- http://www.conterra.de

Consortium as Concept of Partnership

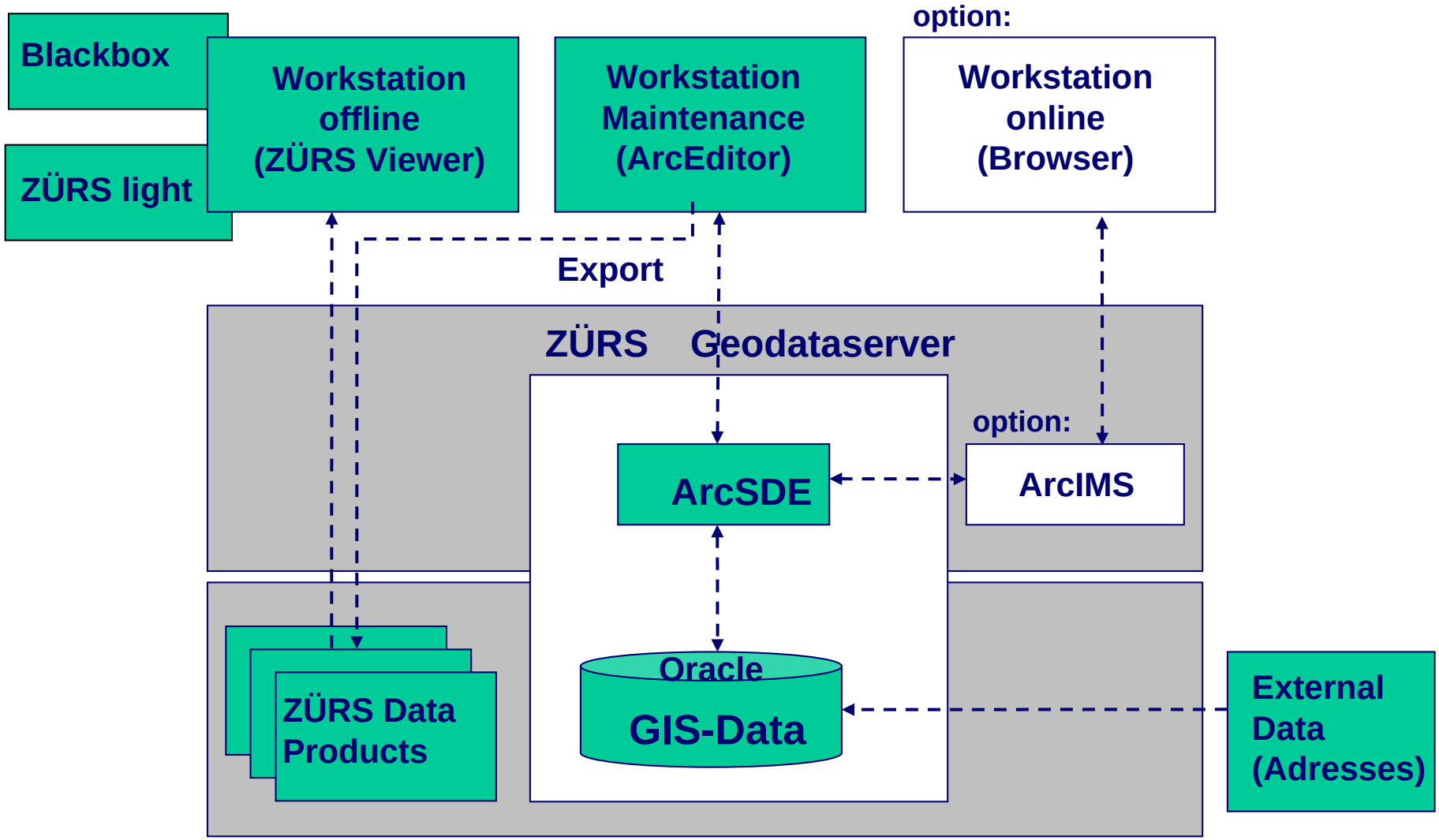
New components of ZÜRS

- 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

ZÜRS Architecture



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

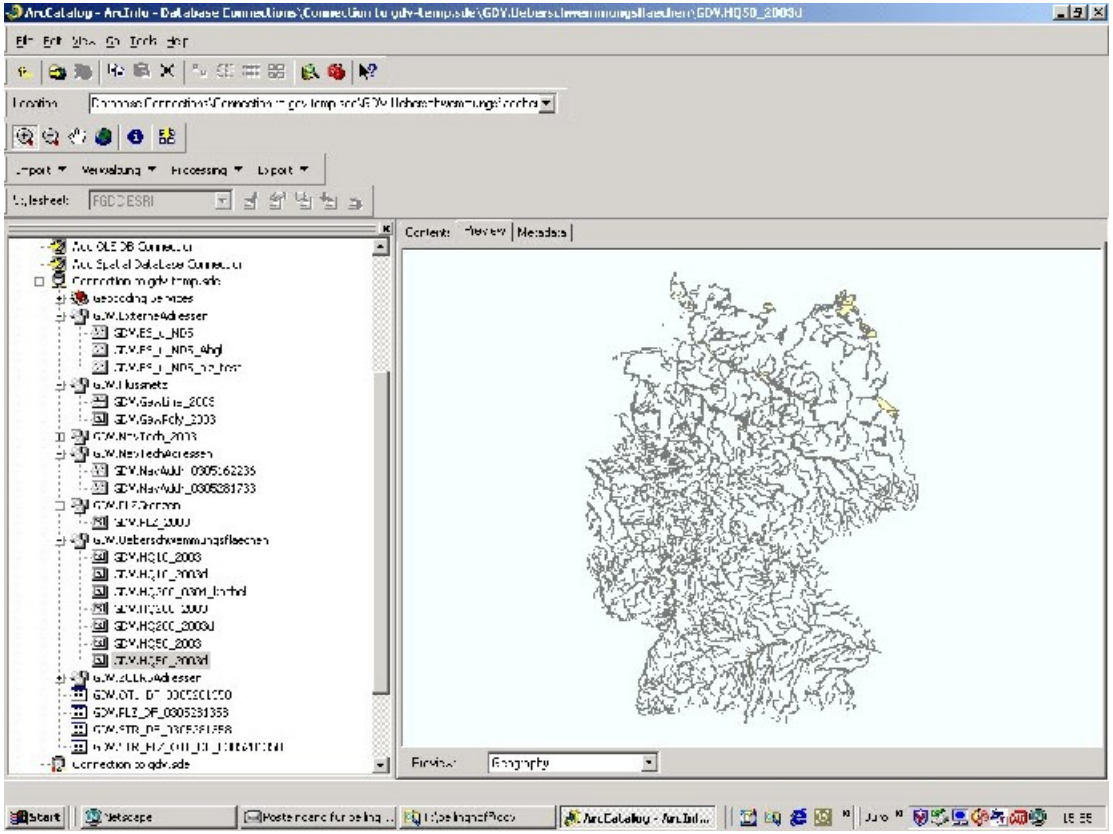
ZÜRS Workstation for Maintenance

- 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

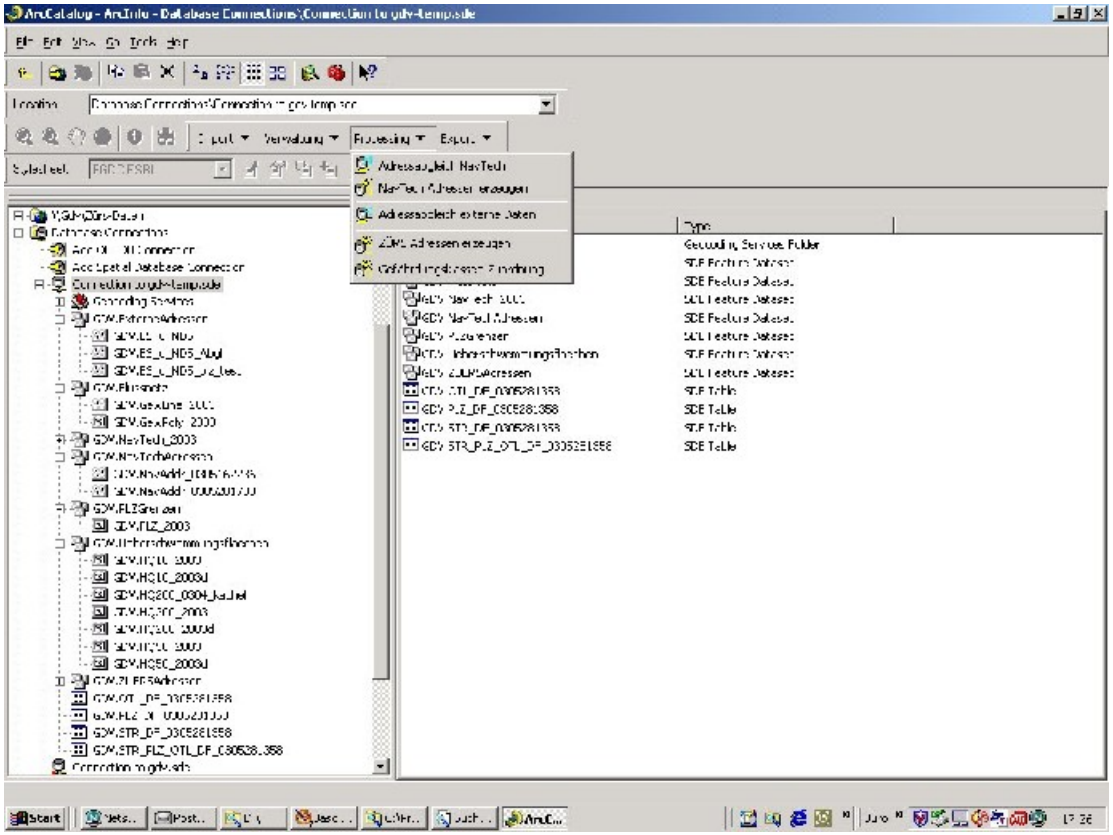
- The MapEngine, as part of the maintenance component, is used for the selection, compression, encoding and export of ZÜRS data products

ZÜRS Workstation for Maintenance



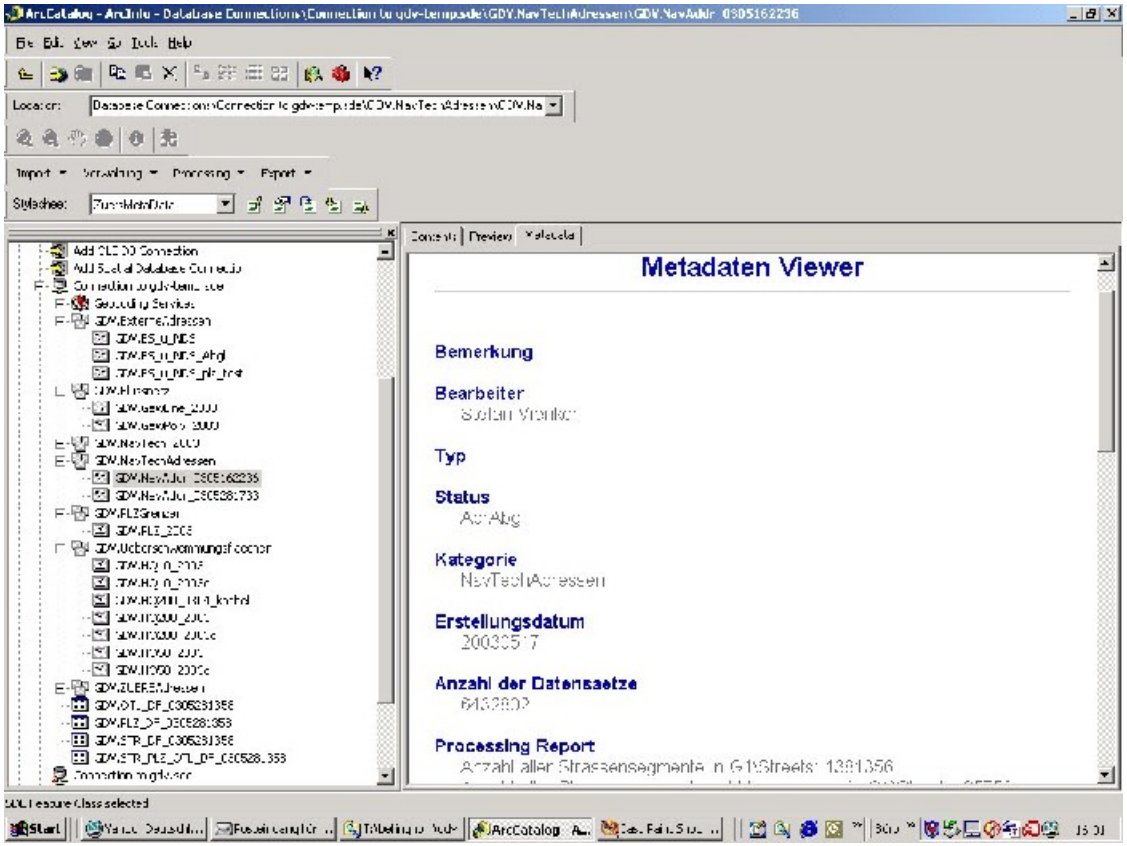
- Structure of data sets
- Data import of ZIP- codes, NavTech street data, addresses, flood areas, water lines
- Basic data for calculation of risk class, adresses …
- data …

ZÜRS Workstation for Maintenance



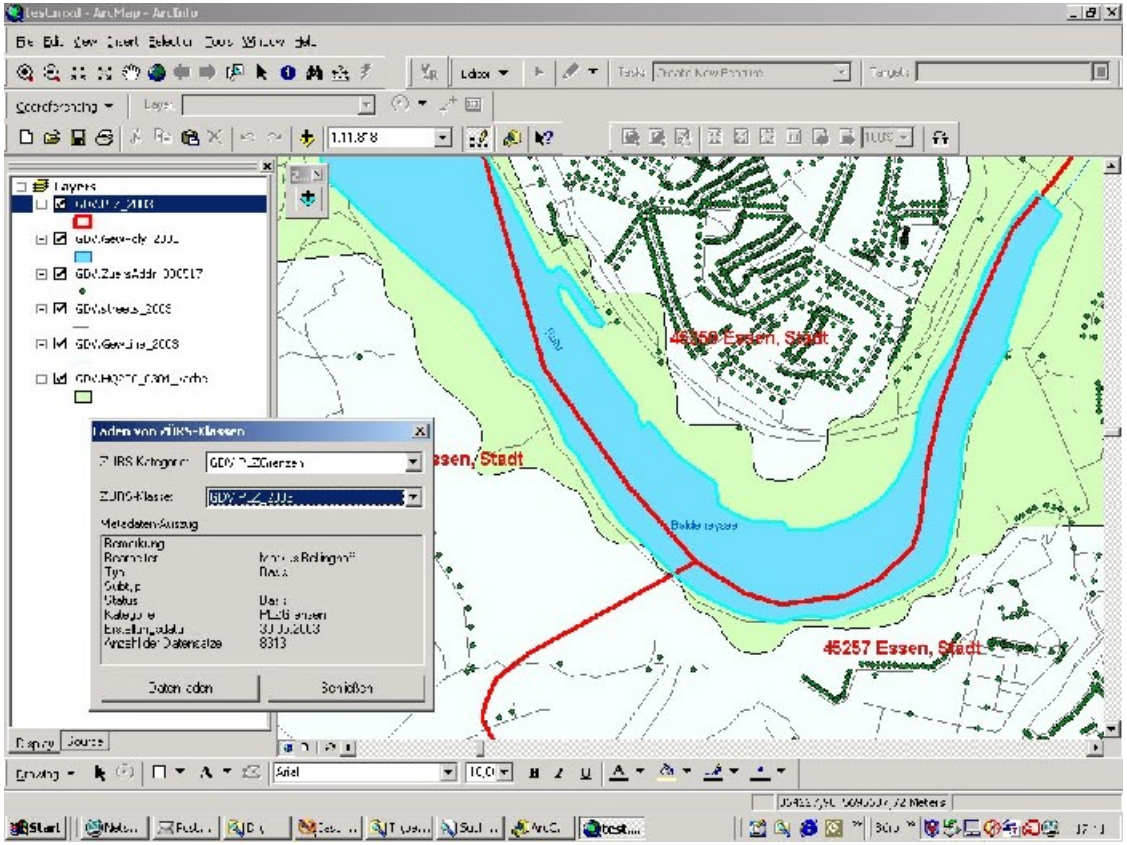
- **Address adjustment**
- **ZÜRS addresses and coordinates**
- **Allocation of risk classes (RC 1-4)**

ZÜRS Workstation for Maintenance



- **Special metadata scheme for ZÜRS**
- **Status of the data sets**

ZÜRS Workstation for Maintenance

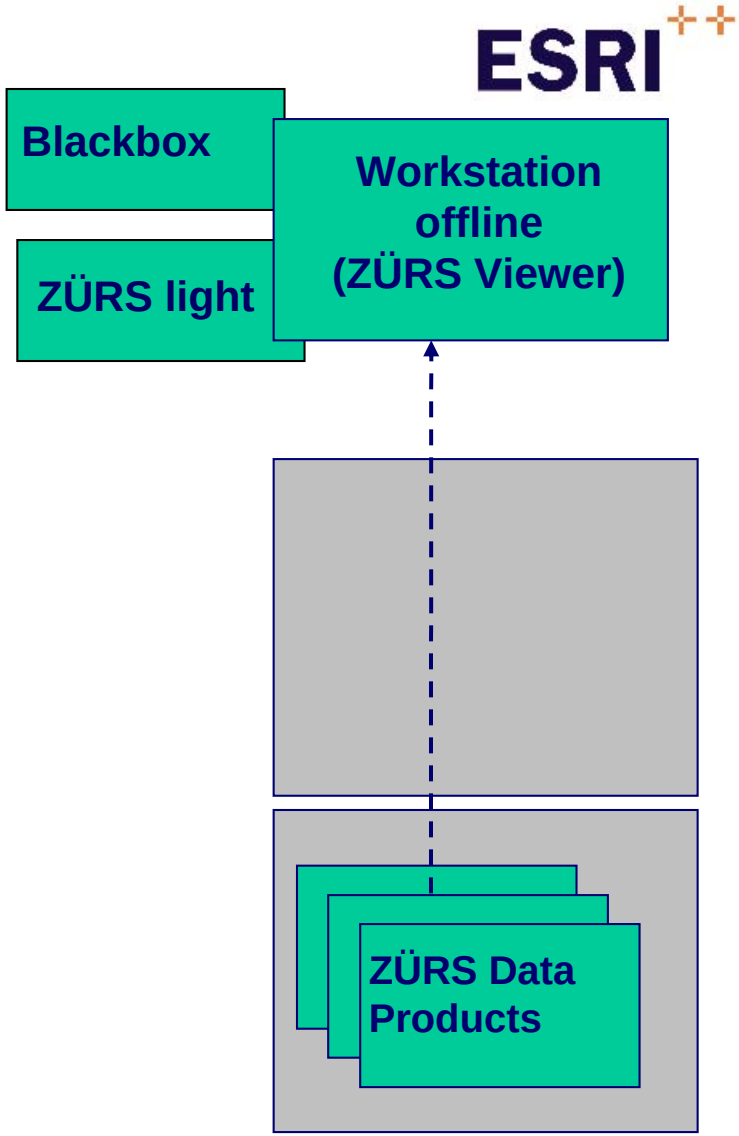


- Viewer extension in ArcMap
- Allocation of risk classes finished
- Preprocessing finished

ZÜRS Software Modules

The ZÜRS software consists of 3 modules

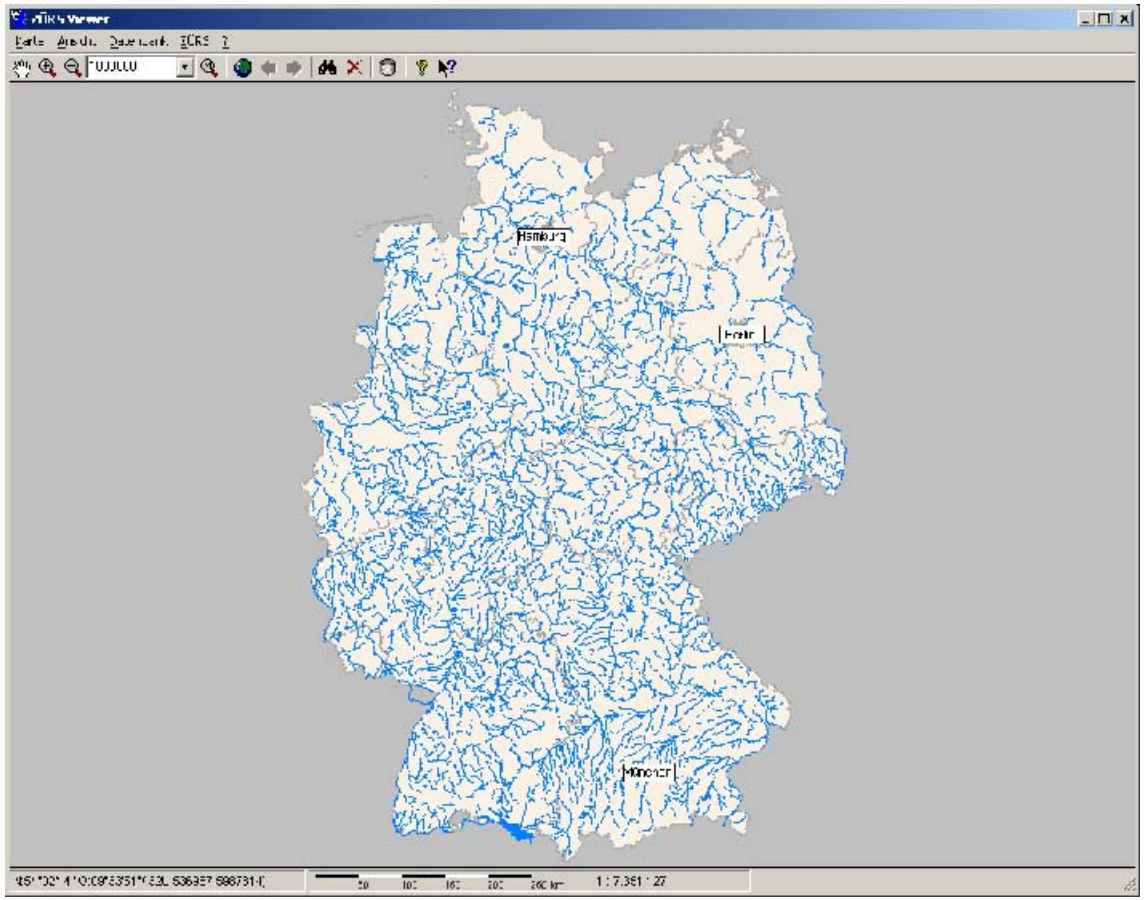
- ZÜRS Viewer (application)
- Black Box (application)
- ZÜRS light (data file)



ZÜRS Viewer

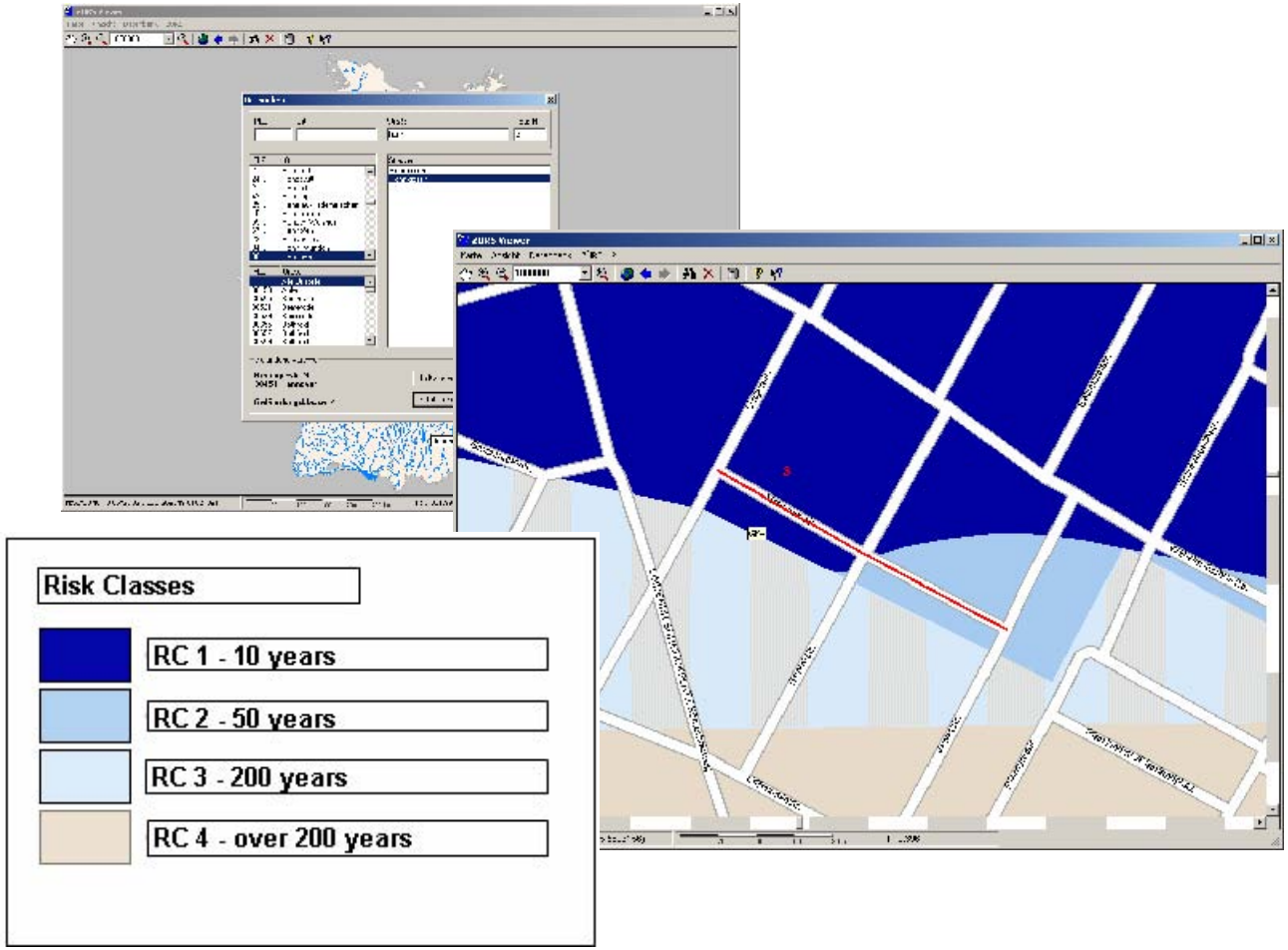
- The ZÜRS Viewer is the most important application module of the ZÜRS software; it is installed at the client with the Black Box and ZÜRS light
- It visualizes the pre processed, compressed and optimized data from the GeoDataServer (Maintenance)
- The independent application is used by the insurance 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



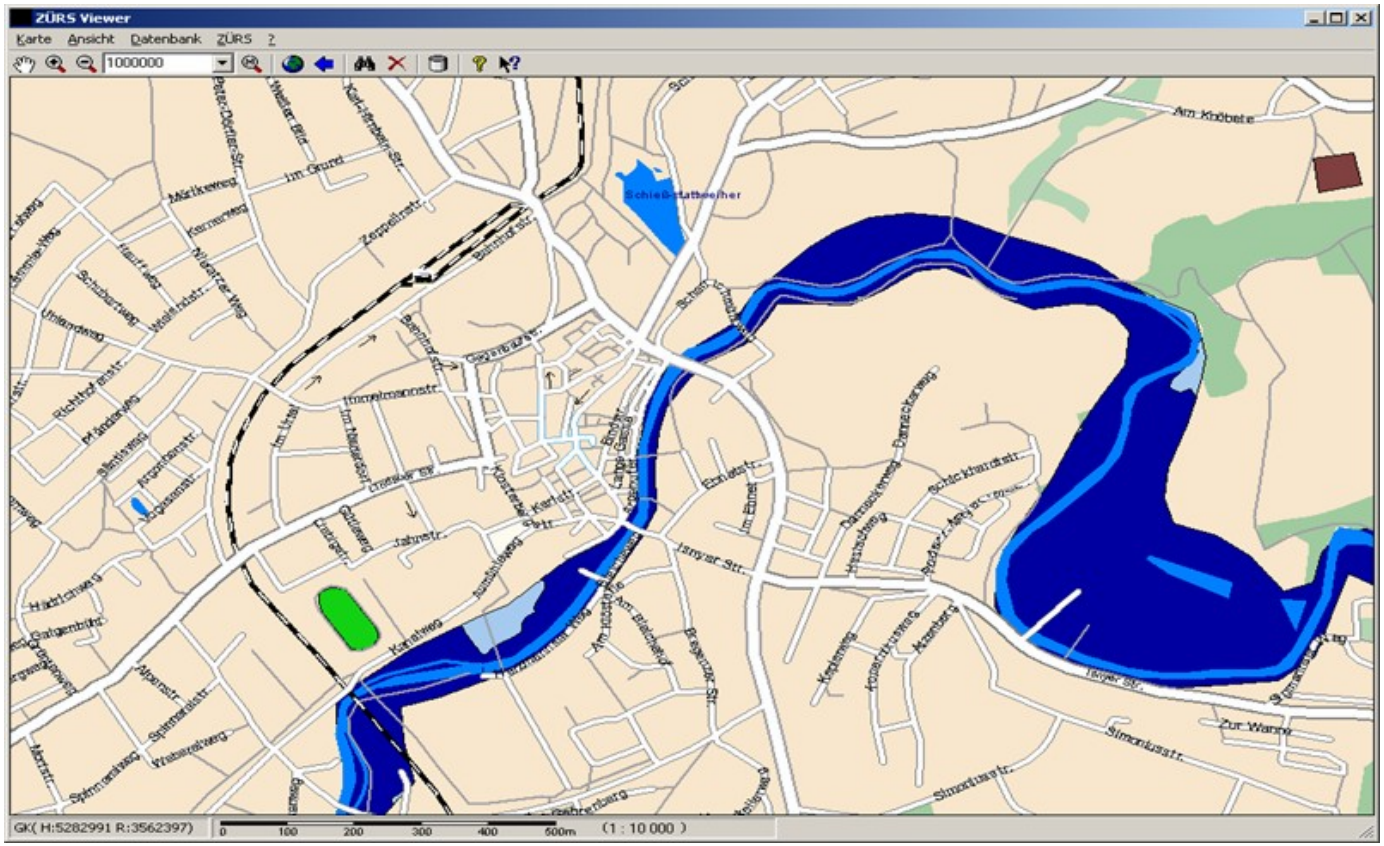
- **Waterlines and rivers of Germany**

ZÜRS Viewer screenshots



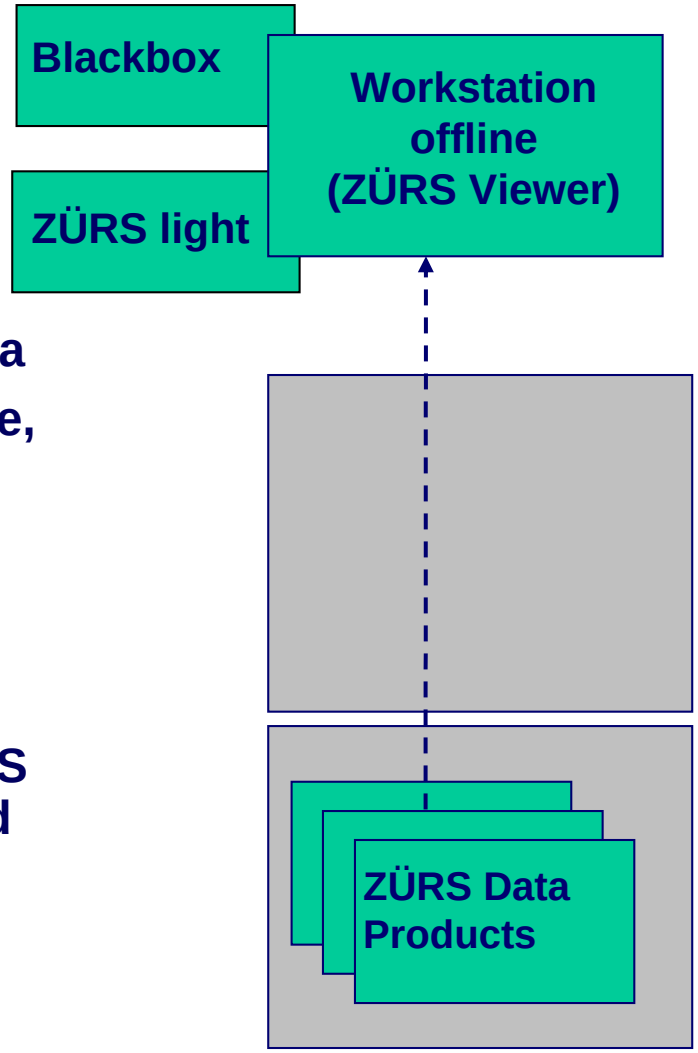
- Viewer Box - Input of address, town and street-map
- risk class of given address is indicated in map
- zoom in automatically, view of street an house number

ZÜRS Viewer screenshots



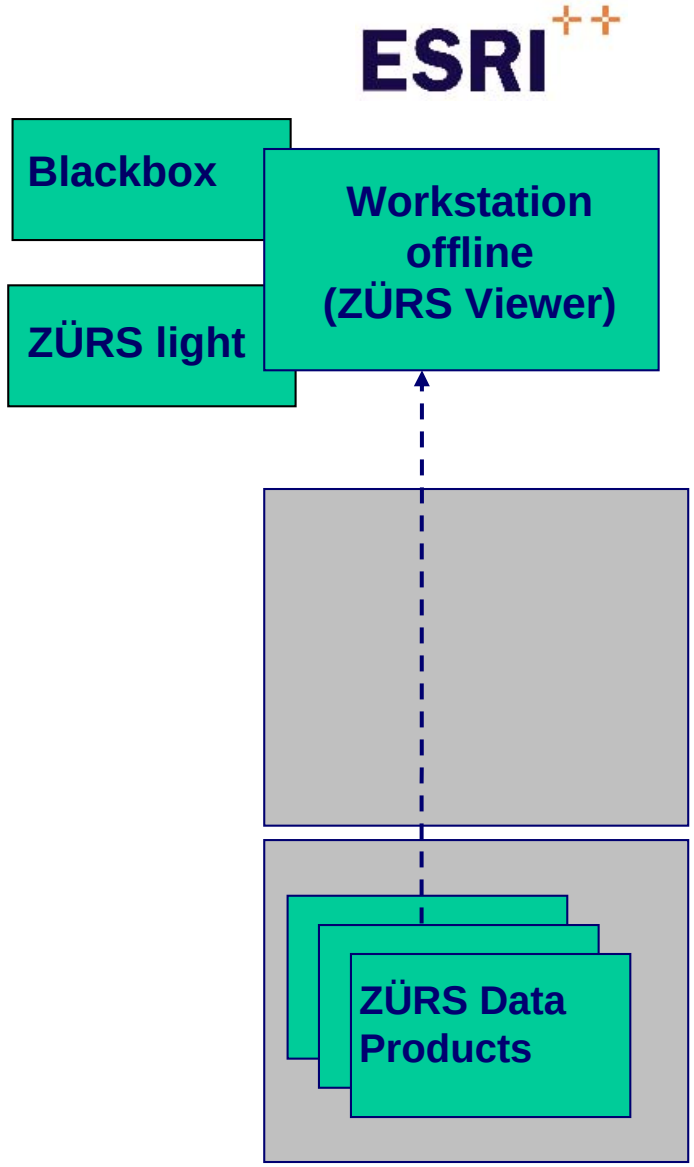
ZÜRS Black Box

- 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
- <u>The result of the allocation (risk class-address)</u> 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)



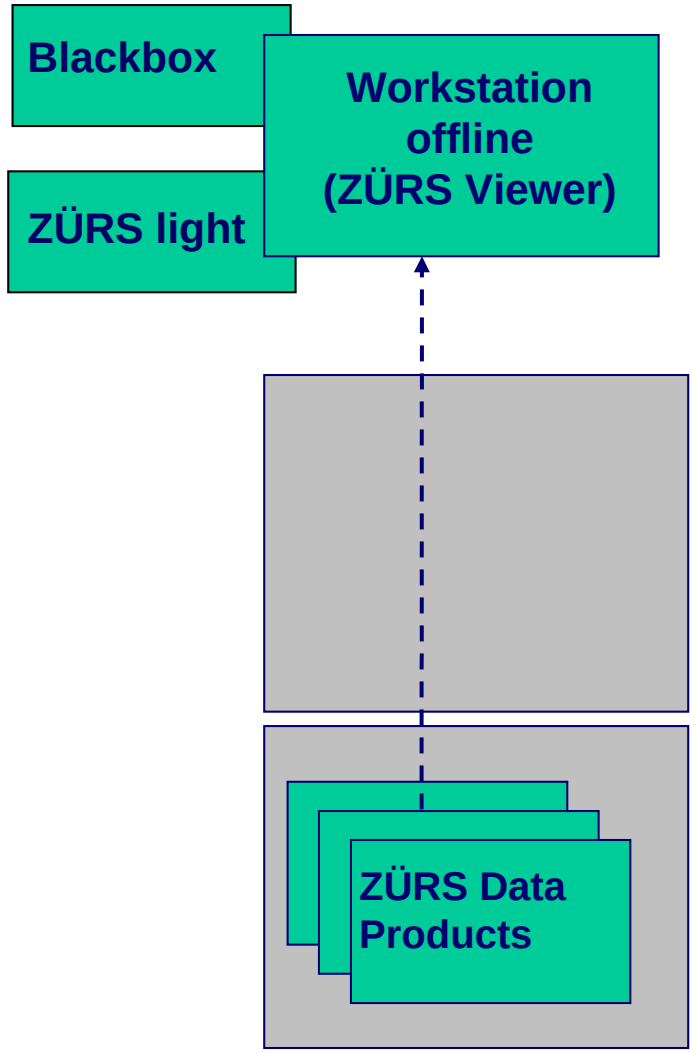
ZÜRS light

- 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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