METANET - Distributed Interactive Knowledge Network

Hannes Weingartner

META-D.O.N
Association for Cultural Substitution Services

April 17, 2010

project introduction

- **METANET:** the technical aspect of a project of the **Meta-D.O.N Association**: sociocultural studies in Serbia called **New[B]Order** - http://www.meta-don.org/newborder/
- project on the topography of the centre-periphery-complex in post-communist Eastern Europe
- metastatic penetration of social spaces scientifically measured to create quantitative and qualitative indicators for social disintegration

project introduction

- e.g. indicators
  - privatization aspects of companies in Serbia - **Freedom Fighters Collective** (http://www.freedomfight.net/cms/)
  - subversive signs of the periphery
  - turbo folk politics
- capture indicators cartographically with a link to a visual semantic database
- concept of an interactive geospatial **knowledge network**
- web application based on **free- and open source software components**

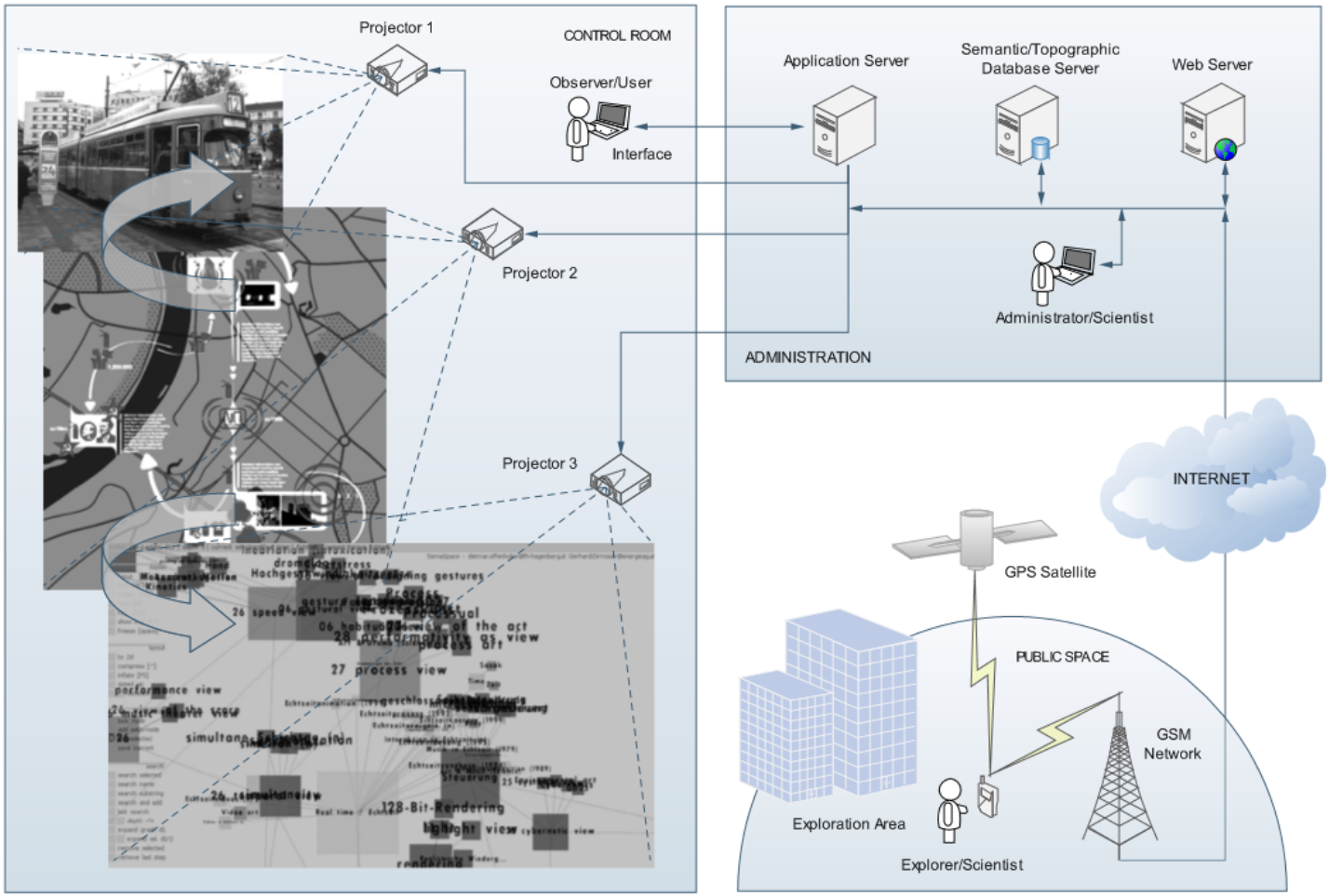
project goal

- providing a tool for individuals and communities to get **connected to complex relationships of scientfic measurement** with cartographical aspects
- receiving a better **overall view of knowledge related to public areas** which can be meaningful for exploring topics of interests through the user
- **flexiblity in usage:** generic tool for scientific research projects
- **administration:** intuitive CMS interface for researchers
- smart algorithms for finding similarities/references between artifacts
- **usability:** advanced hardware and software interfaces to the user (e.g for exhibitions)

project domains

- project consists of three **technical domains**
- **metablog - artifacts input:**
  - text, sound, images, an mm data through web-based CMS
  - mobile devices for geo-tagged content input
- **metamap:** 2D map for customized geographical representation of artifacts and transformation processes between them
- **metaspace:** 2D/3D semantic graph/subgraph associated with map artifacts for mapping the degree of connectivity between them

project domains



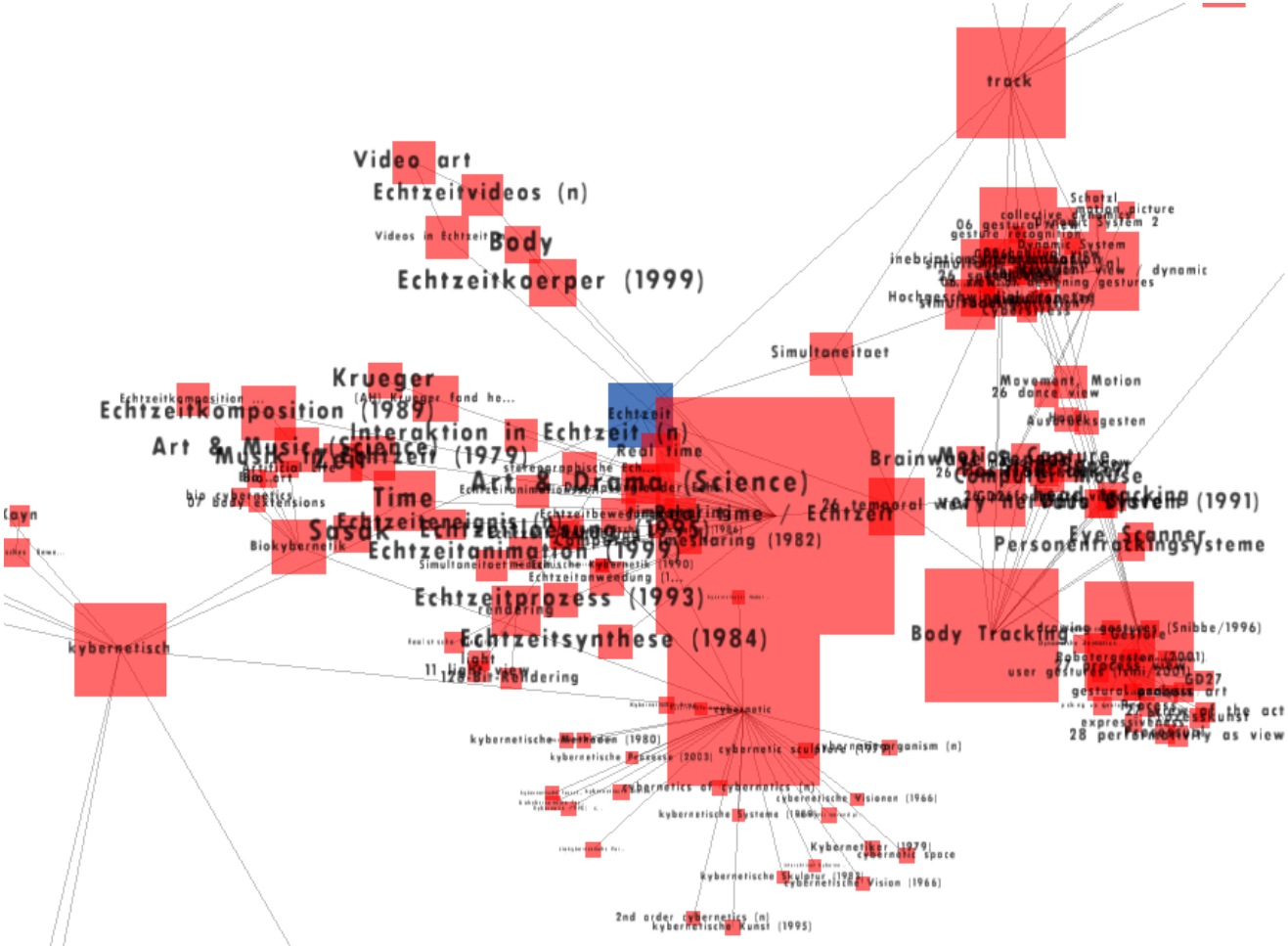
project challenges

- **metaspace hardware HCI** design and implementation for a seamless exploration of data in the semantic space - extension to keyboard and mouse
- **customization of map** design and implementation of interactive icons and transformations - extendable map APIs
- **intuitive administration** and performative web CMS interface for knowledge workers - ajax based server interaction
- **data consistency** between metamap and metaspace - network interface and structured graph datasets for synchronization
- **complex algorithms** for dependency calculation based on meta data and severity - generating an ontology of data

project technologies

- **main aspect:** utilization of proofed open-source/free tools for adapting them to our needs
- **dependencies on tools:**
  - **Semaspace** (http://residence.aec.at/didi/FLweb/)
  - **OpenStreetMap** aka OSM (http://www.openstreetmap.org/)
  - **Google Web Toolkit 2.0** aka GWT (http://code.google.com/webtoolkit/)
- **language:**
  - Java
  - Java Script

knowledge networks theory



knowledge networks theory

- **what are knowledge networks?**
  - **network of people** with a high interest in learning, investigating, developing and improving the knowledge subject matter and share common work goals
  - **enlarge the collective knowledge** of individuals (tacit knowledge)
  - **community of practice (COP):** model for a learning process of self organized individuals connected within social communities sharing same interests (Jean Lave)
  - activities of COP members usually bring **hidden and locked knowledge to light** that resides in our heads
  - COP will enable members to more **quickly leverage the knowledge** that exists in a knowledge network

(http://www.ewenger.com/theory/)

knowledge networks theory

- **community of interest (COI):** knowledge network which is 'looser' than COP - larger in membership - can significantly **assist the knowledge worker** in trying to obtain answers to knowledge needs
- **knowledge representation and visual interfaces** (http://media.lbg.ac.at)
  - **semantic networks** become readable if their structures are described through an ontology
  - **ontologies** are abstract knowledge models for describing used concepts and their possible relationships
  - interactive tools realize the generation of **smooth image of information** to take ambiguity and complexity into account

semaspace outline

- **fast OpenGL accelerated graph editor and browser** for large knowledge networks with more than 10000 text-fields
- developed by **Dietmar Offenhuber and Gerhard Dirmoser** - Ludwig Boltzmann Institute for Media Art Research
- **interactive graph layout** in 2D and 3D
- 'semaspace fills the gap between complex tools for network analysis and simple graph editors or mind-mapping tools' (Dirmoser)
- Gerhard Dirmoser creates complex large-scale wall diagrams on topics like **25 years of ARS Electronica or Performance Art** (2003)

semaspace outline

- manually **define the nodes overall shape** of the network by placing and subsequently locking the position of individual nodes
- **nodes** can incorporate data such as images, sound and text (added while navigating the graph)
- GUI for **web clients** and **exhibitions**
- **Java SWT** desktop application
- embedding into web clients with **virtools webplayer**

semaspace dependencies

- **JOGL:** open source Java binding to OpenGL API from Sun (for harware supported 3D graphics)
- **JFTGL:** java based lib for accessing TT fonts within OpengGL
- **Apache Batik SVG toolkit:** open source Java based toolkit for using images in the SVG format (XML based)
- **semaspace demo**

semaspace extensions

- **video nodes**
- **remote graph access and manipulation** through network connection and tagged datasets
- research and implementation of **extending hardware interfaces** for...
  - browsing (zoom, rotation)

semaspace extensions

- **video nodes**
- **remote graph access and manipulation** through network connection and tagged datasets
- research and implementation of **extending hardware interfaces** for...
  - browsing (zoom, rotation)
  - 2D/3D

semaspace extensions

- **video nodes**
- **remote graph access and manipulation** through network connection and tagged datasets
- research and implementation of **extending hardware interfaces** for...
  - browsing (zoom, rotation)
  - 2D/3D
  - fog

semaspace extensions

- **video nodes**
- **remote graph access and manipulation** through network connection and tagged datasets
- research and implementation of **extending hardware interfaces** for...
  - browsing (zoom, rotation)
  - 2D/3D
  - fog
  - freeze

semaspace extensions

- **video nodes**
- **remote graph access and manipulation** through network connection and tagged datasets
- research and implementation of **extending hardware interfaces** for...
  - browsing (zoom, rotation)
  - 2D/3D
  - fog
  - freeze
  - node distance

semaspace extensions

- **video nodes**
- **remote graph access and manipulation** through network connection and tagged datasets
- research and implementation of **extending hardware interfaces** for...
  - browsing (zoom, rotation)
  - 2D/3D
  - fog
  - freeze
  - node distance
  - collapsing

OSM outline

- **OSM: open source map solution** for web clients
- everyone can extend the map
- collecting GPS coordinates
- like wikipedia for maps
- **no legal or technical restrictions** on their use - full creativity
- other implementations do not allow highly customized overlays

OSM creating data

- **creating OSM data** with OSM map editors:
  - Java OSM (JOSM) - desktop app
  - Potlatch - flash
  - Merkaartor - for UNIX, WIN, MAC
- **adding tags** (node, linear, area) for OSM data do be rendered and upload
- **slippy map:** OSM default web interface for browsing rendered OSM data

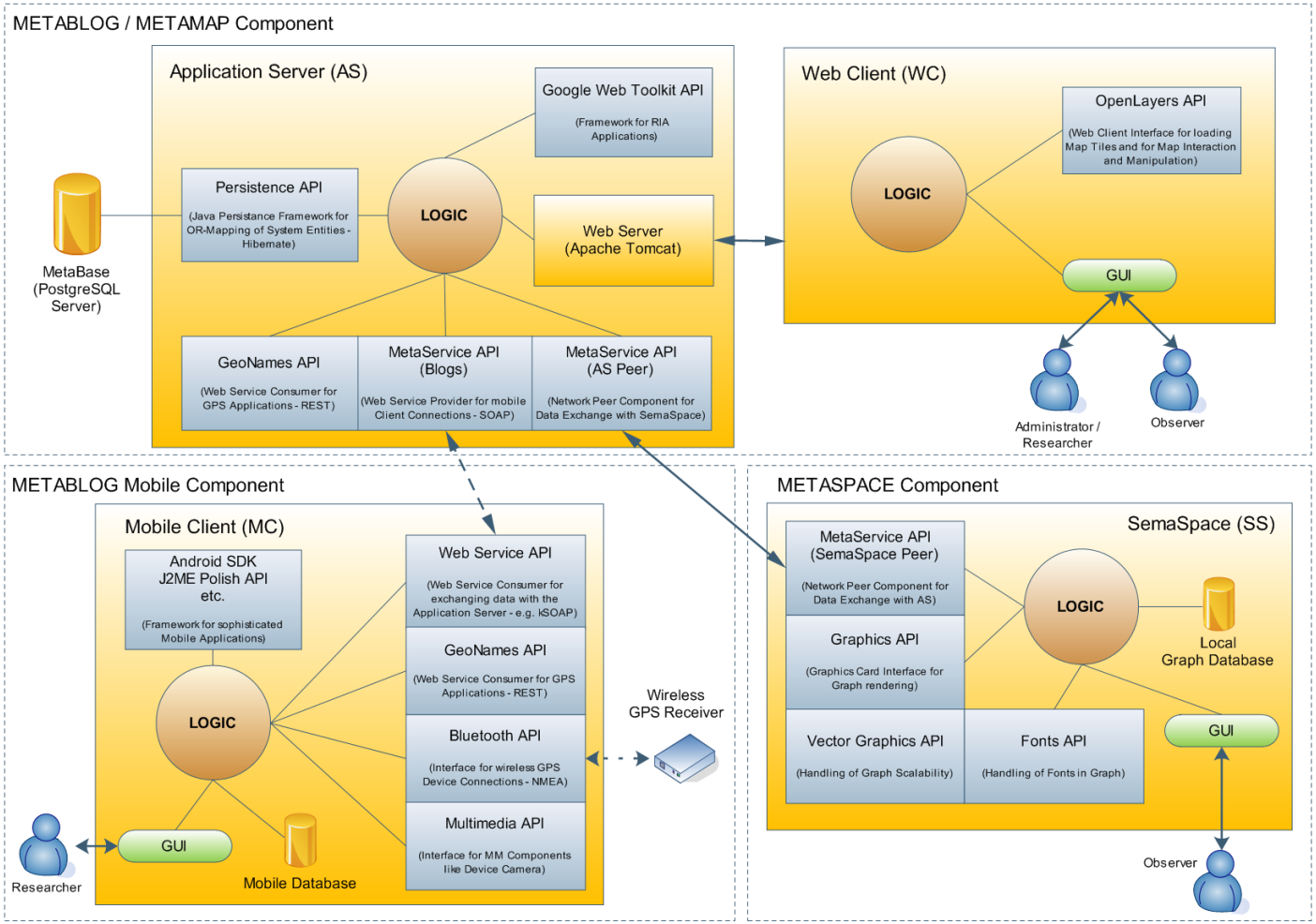
OSM rendering

- **generating rendered graphics** on own computer by using tools:
  - **kosmos:** lightweight OSM map rendering platform for WIN
  - **osmarender:** rendering platform for generating SVG image for OSM data based on XSLT
  - **mapnik:** opensource toolkit in C++ and python, all OS platforms
    - default for OSM - mapnik renders 256 x 256 px tiles served from the OSM tile server
    - XML file holds rendering props like color, withs of lines, etc.
    - rendered tiles are referenced by URLs through JS from web client
    - raw OSM data can be downloaded for setting up an own tile server (e.g. planet.osm)
    - uses PostgreSQL / PostGIS as spatial database (osm2pgsql converter)

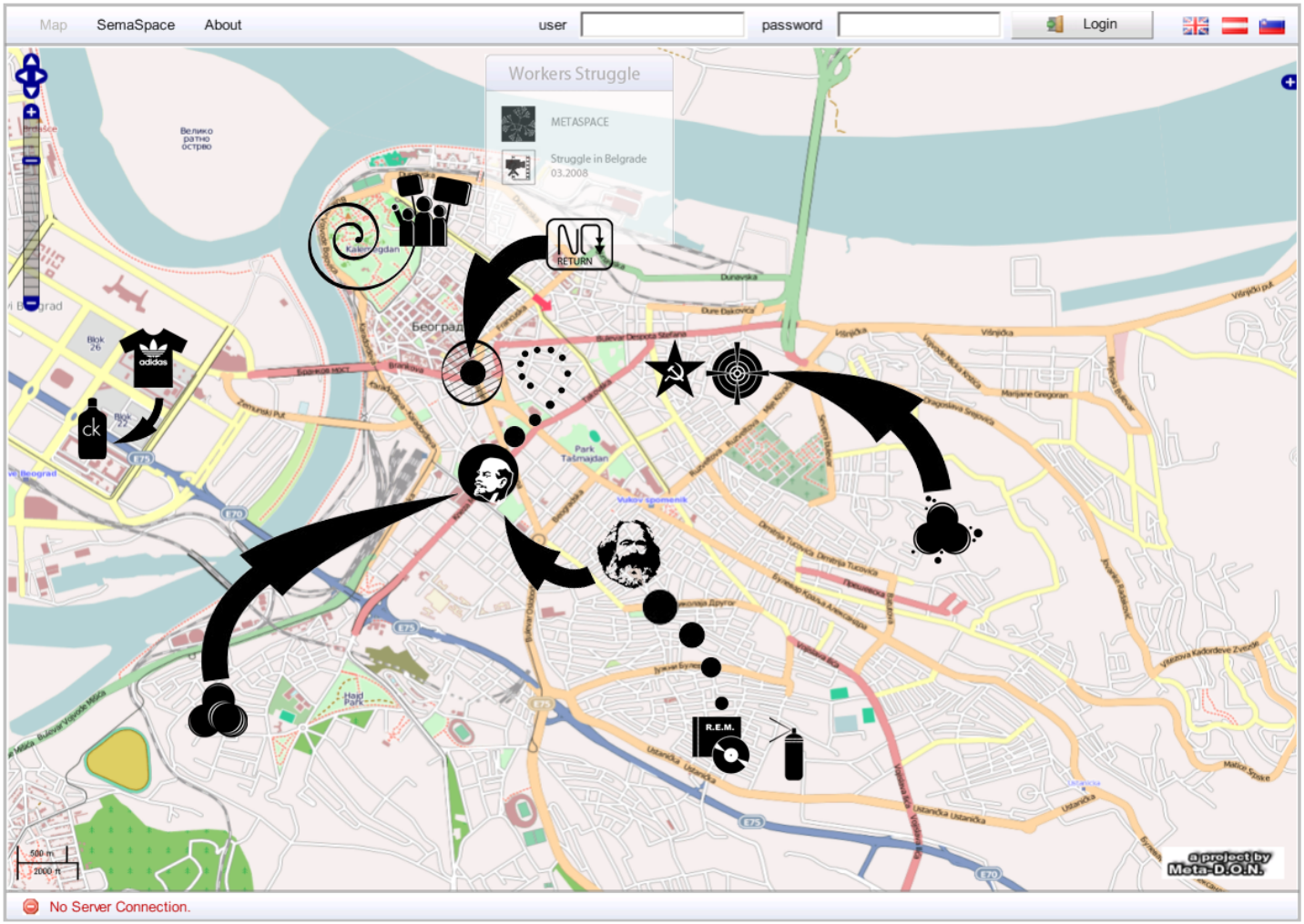
OSM embedding

- **integration in web page** like Google, Yahoo maps by using JS libs for customize the map and interface
  - **OpenLayers:** feature-rich, open source, most popular for OSM maps, BSD lic. (www.openlayers.org)
    - dynamic map for the web page
    - displays tiles and markers from any source
    - separation between tools and data
    - project of Open Source Geospatial Foundation (OSGeo)
  - **Mapstraction:** JS lib wrapper for multiple implementations (e.g. OL, Google, etc.)
- several project on google code with topic OSM on android
- integration of OL in GWT through open source project **GWT-OpenLayers** (http://sourceforge.net/projects/gwt-openlayers/)

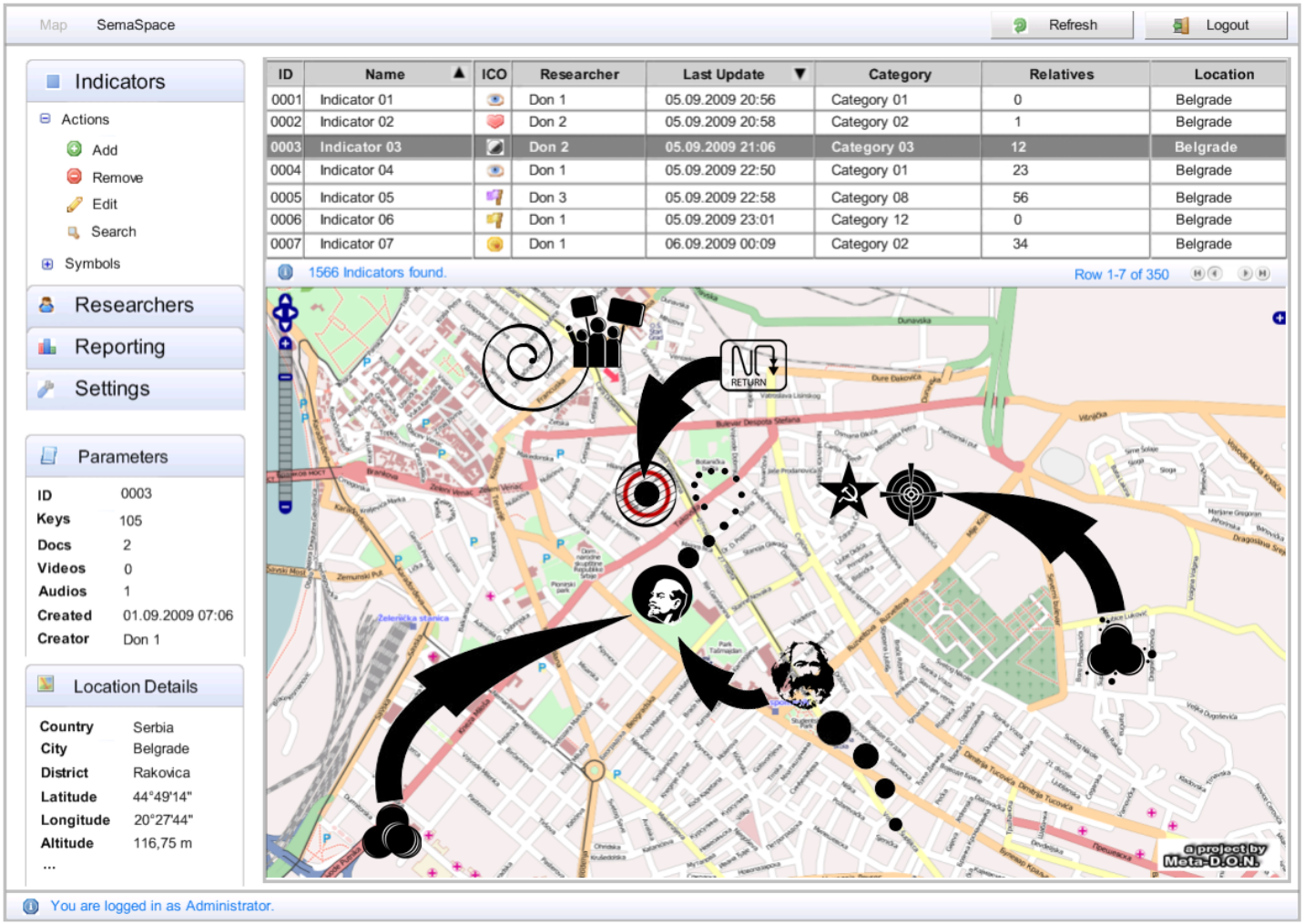
realization architecture



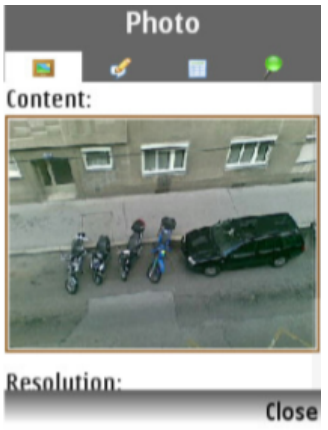
realization interface

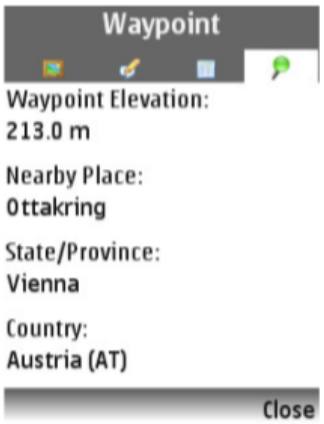


realization interface



realization interface





Summary

- **METANET - Distributed Interactive Knowledge Network**
  - a project of **Meta-D.O.N**: sociocultural studies in Serbia
  - tool for individuals and communities to get a **smooth image of social spaces** for taking ambiguity and complexity into account
  - utilization of proofed open-source/free tools for adapting them to our needs (semaspace, OSM, GWT)
  - reference project: **A geographic knowledge representation system for multimedia geospatial retrieval and analysis** (http://www.springerlink.com/content/qkh8hyecby6glww5/)

Thank You.