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Finnish Geodetic Institute

Challenges of Information Society for Map Generalization

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Outline

- Changes due to the Information Society
- Characteristics of Web/mobile maps
- XML and XSLT in real-time generalization
- Prototype at the Finnish Geodetic Institute
- Summary

Changing World

- changes in information infrastructure due to the advances in communication technologies: the Internet and mobile networks
- placeless accessibility:any-where/any-time
- spontaneous use
- interaction, virtual world, navigation
- dissemination of (geospatial) information: any-one/any-where/any-time/any-scale

Maps in the Internet

- Characteristics
  - temporary map displays
  - maps are used as searching mechanisms
  - maps as a clickable interface (Kraak&Brown,2000)
  - preview of geospatial data to be downloaded
  - easy to use (to pan, zoom, select layers)
  - integrated multimedia components (sound, images, video, animation)

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Web map services providing varying scales

- pre-created raster datasets
- alternatively, continuous scale variation by zooming, no change in contents
- no abitrary scales with generalized map display
- updated geo-database results in recreation and storing of new datasets

Restrictions of mobile devices

- small displays, limited processing power, internal memory
- only the most essential information can be displayed
- often monochrome, rather low resolution displays
  - compare: Nokia 9210 Communicator

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Mobile maps

- service oriented use, navigation, rescue situations, management of pipelines
- show relative importance of the map objects, i.e. visual hierarchy of map content
- relative locations between objects important
- objects can be used to access the second level of information content
- maps do not usually have any specific scale since they can be zoomed in and out
- high degreee of generalization
- location of the user

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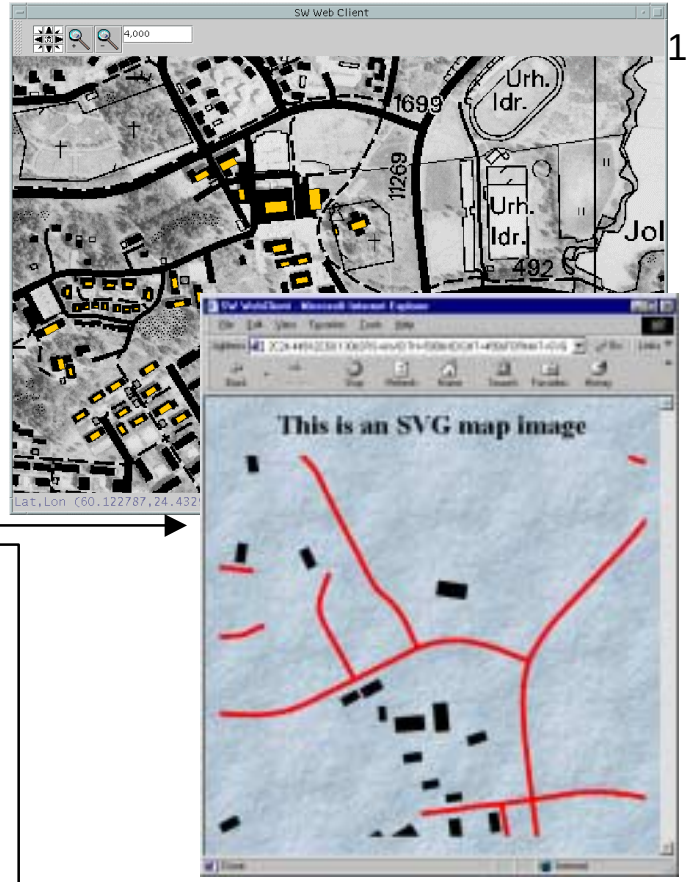
Real-time generalization

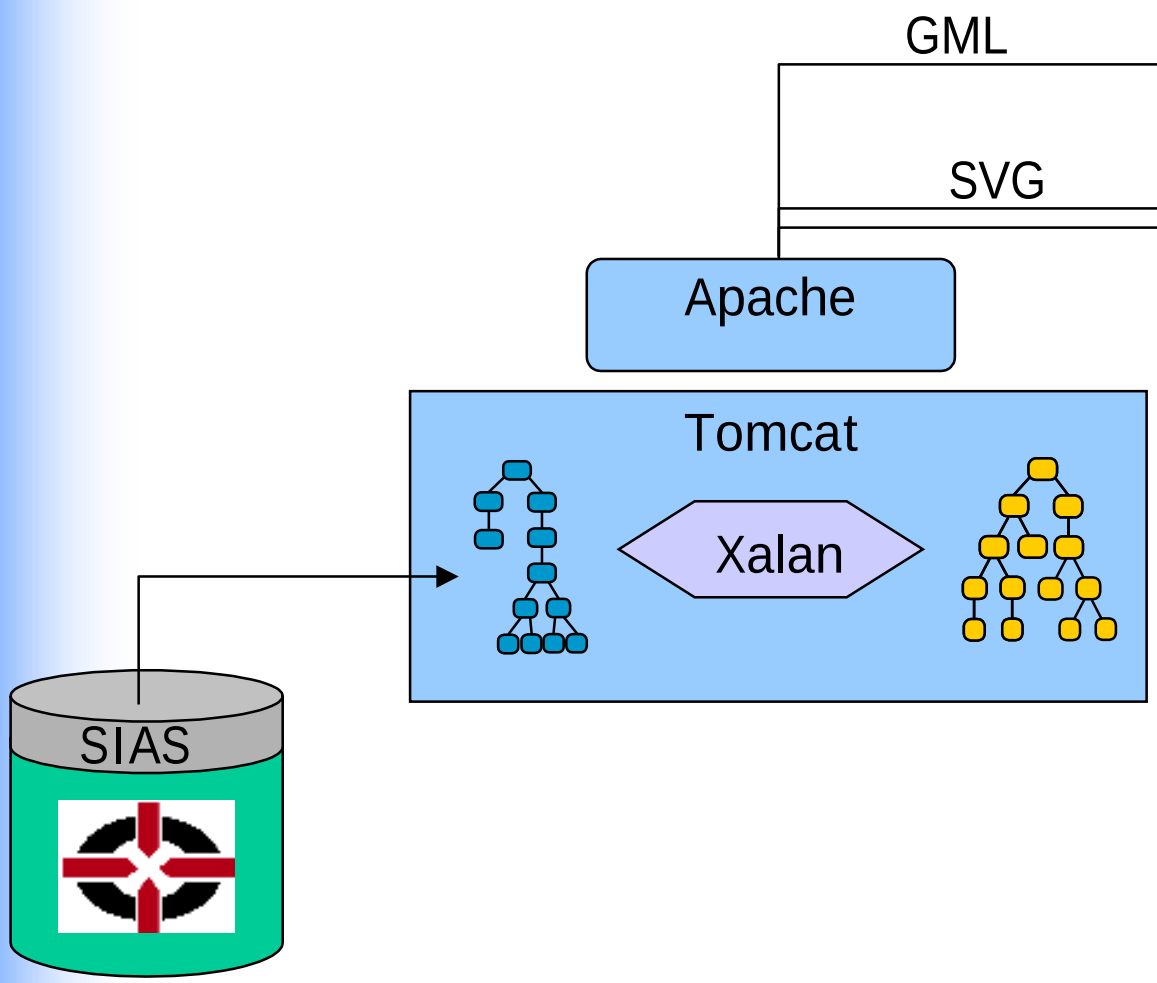
- generalized datasets are not stored beforehand in the geo-database, provides arbitrary scales
- computed during the request-response dialogue, in real time in the network
- unsupervised; no chance to check the result
- destinated to one individual end user
- user location

Examples on Tecniques used

- Extensible Markup Language, XML
  - Syntax for structured data encoding
  - Licence-free, platform-independent, well-supported
- Geography Markup Language, GML
  - Developed by Open GIS Consortium (OGC)
  - Based on Simple Features Specification
  - Point, LineString, Polygon; linear geometry
- Extensible Stylesheet Language Transformations, XSLT
  - W3C Recommendation 16th Nov 1999
  - Transforming an XML doc into another XML doc
  - Transformation run by an XSLT Processor
  - MSXML, Saxon, Xalan, XT ...
- Scalable Vector Graphics SVG

Prototype of FGI





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XSLT in generalization

- Real-time generalization of XML-encoded GI
  - Device, user preferencies, location
- Selection easy to implement
  - Object class, properties, context, computations
- Simplification of geometries
- Aggregation
- Most operators need use of extension functions
  - e.g. a Java class-based extension

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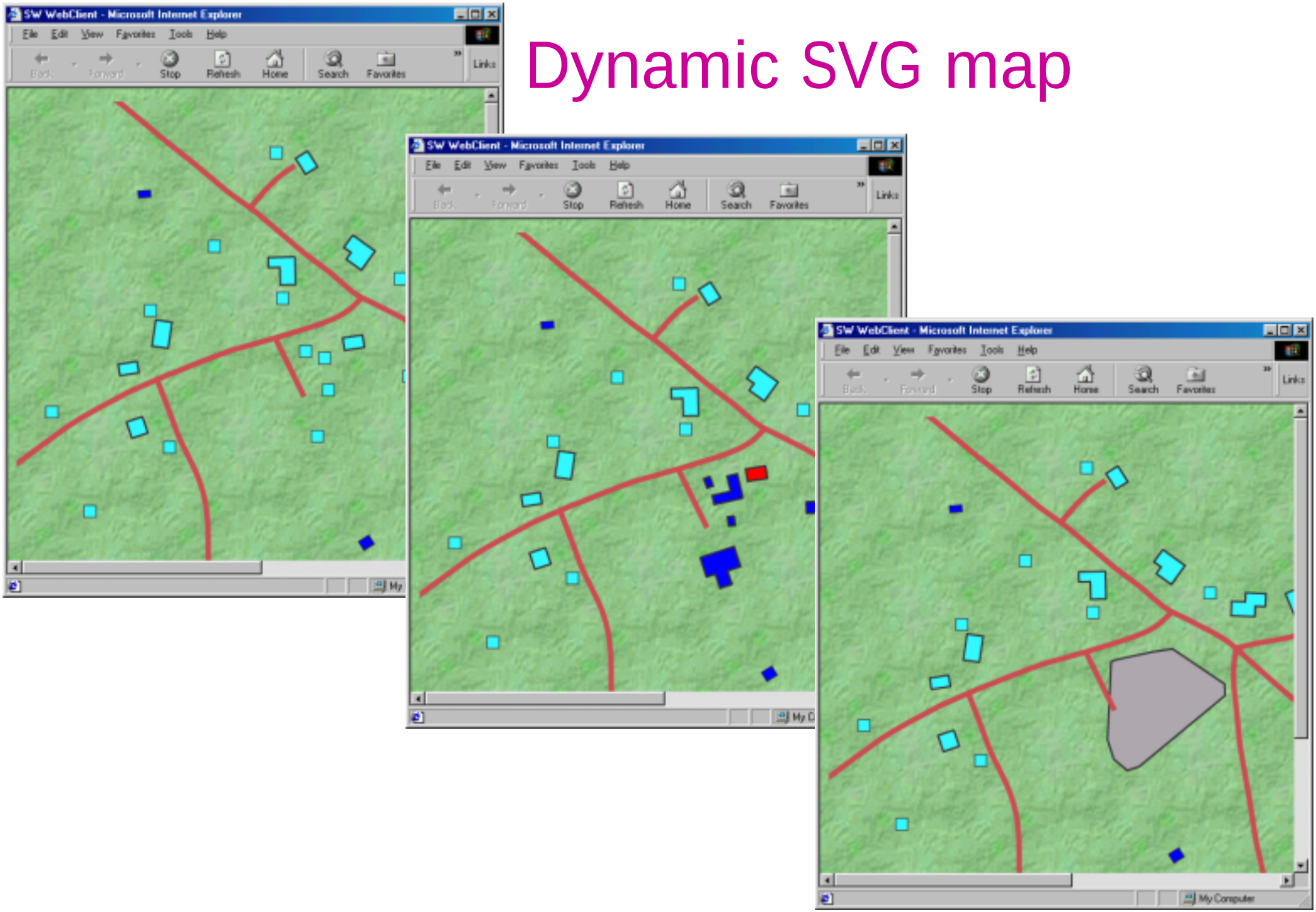
This is an SVG map image

Dynamic SVG map



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Real-Time Generalization in Information Society

- network-based spatial data services
- visualization in small display devices, e.g. mobile phones etc.
- direct access to up-to-date geo-databases
- the position of the end user to be applied
- supplying the users with up-to-date GI any-where/any-time/any-scale

Summary

- tools for real-time generalization needed
- XSLT, a promising tool for data transformations
- Real-time generalization as a case study
  - selection, simplification, aggregation
  - spatial operators as extension functions
- 3-tier prototype
  - SW, XSLT in Java servlet, SVG visualization