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Towards a National Finnish Semantic Web Infrastructure for eCulture

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http://www.seco.hut.fi/

Outline of Talk

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- The semantic web is coming
- A content infrastructure on the web is needed for it
- What should be done?
  - The vision of a national FinnONTO-project
  - Applications: semantic web at work

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A National Problem

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- Semantic Web = next generation/layer of the Web
- Ontologies = ”silver bullet” of the Semantic Web
- Finnish ontologies did not exist
- Something should be done about it!

- A solution approach:
  The National Finnish Semantic Web
  Ontology Project FinnONTO (2003-2007)

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FinnONTO Thesis

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- Semantic Web needs a **content infrastructure**
  - Like traffic needs roads
  - Like energy service needs powerlines, power plants, standards, ...
  - Like mobile phones need GSM or 3G-networks

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FinnONTO Solution Approach

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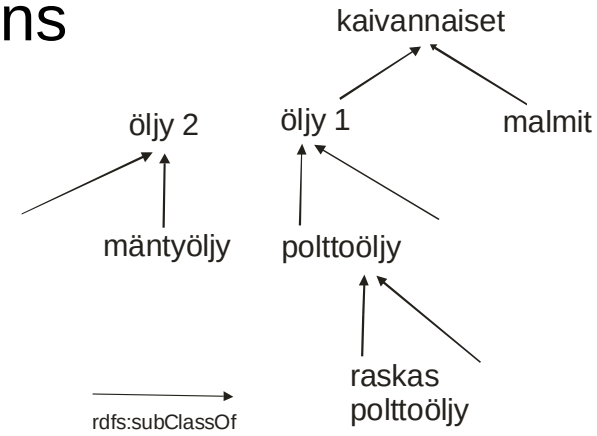
- Major infrastructure components
  - **Ontologies** to be shared
  - **Ontology services** to utilize ontologies
  - **Standards** to make things interoperable
    - » **E.g. metadata standards**
  - **Tools** to help in creating applications



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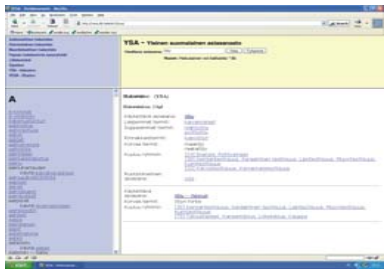
- Start a national multi-domain ontologization process
  - Making contents of different domain interoperable
  - Thesauri -> ontologies
    - » Human usage -> human/machine usage
  - Key ontologies should be open source and maintained publicly
    - » Wide acceptance and usage
- Business applications can be built effectively upon a solid infrastructure



Started 2003

2005-2006: 0,8M€ / year
30 funding organizations
(Tekes 80%)

Plan 2006-2007:
38 funding organizations

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Partnering organizations

Companies and Organizations

- AAC Global Oy
- Antikvaria-ryhmä
- AlmaMedia Oyj, 2003-2005
- Blue Meteorite Ltd (Sininen meteoriitti Oy)
- Connexor Oy
- Elisa Oyj
- Espoo City Museum (Espoon kaupunginmuseo)
- Finnish Agriculture Museum (Suomen maatalousmuseo)
- Finnish Broadcasting Company YLE (Yleisradio Oy)
- The Finnish Centre for Technical Terminology (Tekniikan Sanastokeskus ry)
- Finnish Literature Society (Suomalaisen kirjallisuuden seura)
- Finnish National Board of Education (Opetushallitus)
- The Finnish National Gallegy (Valtion taidemuseo)
- The Finnish Museum of Photography (Suomen Valokuvataiteen museo)
- The Finnish Terminology Centre (Sanastokeskus TSK)
- Geological Survey of Finland GTK (Geologian tutkimuskeskus GTK)
- Grip Studios Interactive Oy
- Helsinki City Library (Helsingin kaupunginkirjasto)
- Ministry of Agriculture and Forestry (Maa- ja metsätalousministeriö)
- Ministry of Finance (Valtiovarainministeriö)
- The National Board of Antiquities (Museovirasto)
- National Land Survey of Finland (Maanmittauslaitos)
- The National Library of Finland (Kansalliskirjasto)
- National Public Health Institute KTL (Kansanterveyslaitos)
- National Research and Development Centre for Welfare and Health (STAKES) / Luokituskeskus
- Tekes, the Finnish Funding Agency for Technology and Innovation
- M-Cult ry
- Opintoluotsi-project/OPM
- Sosiaaliportti-project / STAKES
- Suomen maatalousmuseosäätiö
- TietoEnator Corporation

Research organizations

- Helsinki University of Technology, Institute of Cartography and Geoinformatics (prof. Kirsi Virrantaus, subproject director)
- Helsinki University of Technology, Laboratory of Media Technology and University of Helsinki, Department of Computer Science, (prof. Eero Hyvönen, project director)
- University of Helsinki, Department of General Linguistics (prof. Lauri Carlson , subproject director)
- University of Tampere, Department of Information Studies (prof. Kalervo Järvelin , subproject director)

Memory organizations involved

- National Library of Finland
- Helsinki City Library
- Finnish Literature Society (SKS)
- Espoo City Museum
- National Board of Antiquities
- Finnish Agriculture Museum
- Finnish Museum of Photography
- Ca. 20 city Antikvaria museums
- New members joining in 2006-2007

FinnONTO is lead and is mostly carried out by the the Semantic Computing Research Group (SeCo) at the Helsinki Univ. of Tech. and University of Helsinki

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Goals

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- 1. **Ontology development** open source
  - General Finnish Ontology based on the national YSA thesaurus (23,000 concepts)
  - Various vertical ontologies based on YSO
- 2. **ONKI ontology services**
  - Collaborative ontology development
  - Content indexing using web services
  - Ontology-based information retrieval
- **3. Pilot applications**
  - Eating our own dog food

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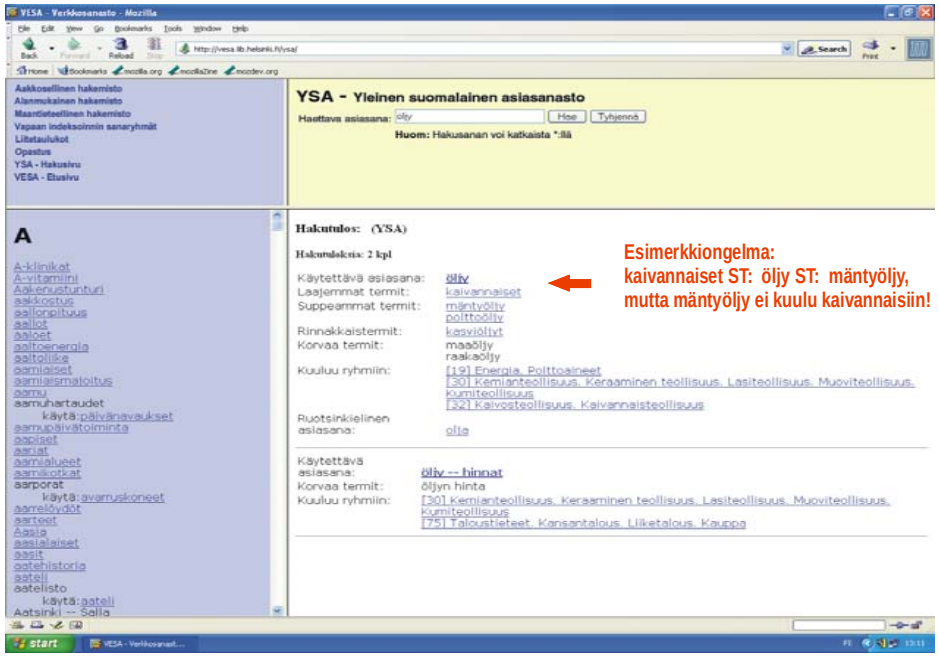
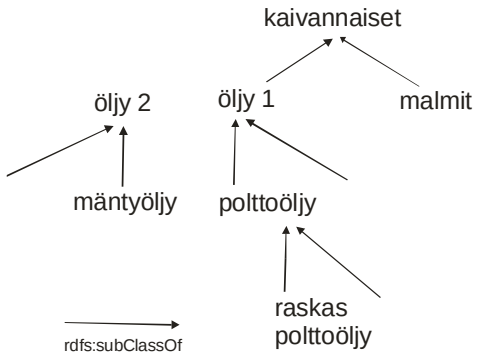
1. Ontology development

- Motto: Thesauri -> Ontologies!

YSA



YSO



Why Thesauri are Not Enough but Ontologies are needed?

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- Thesauri with its semantic relations are constructed mainly to help the indexer in her work
  - Understanding the relations needs human knowledge
- The computer could make use of the structure in many application areas:
  - Semantic search and information retrieval
  - Semantic linking of contents
  - Automatic indexing
  - Making contents semantically interoperable
  - ...
- But this is difficult, because the computer is stupid
  - It does not have the human knowledge of an indexer
- Ontologies define accurately the meaning to machines and the humans, too.

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Why Thesauri are Not Enough but Ontologies are needed?

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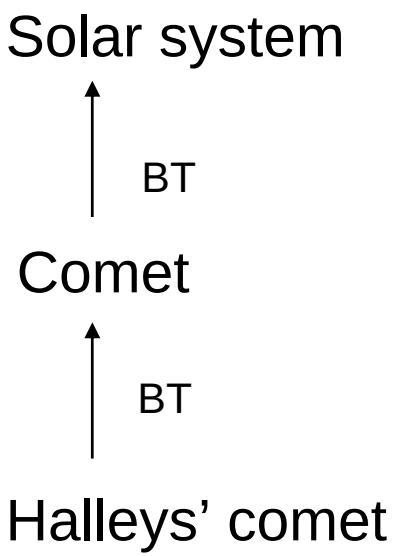
- Example from the YSA-thesaurus



- The machine is confused:
  - Is Halley's comet an individual or a class of them, such as Comet?
  - Can there be many Halley's comets or only one?
  - Is Comet a kind of Solar system or a part of a solar system. Is it a part as a concept or are all individual comets a part of some solar system?
  - What does "part of" mean: real part of, contained in, member of, made of, connected to.
  - Do comets have properties of solar systems (e.g. own planets) based on BT
  - Searching "Solars systems" would retrieve comets although comets are not solar systems
  - ...

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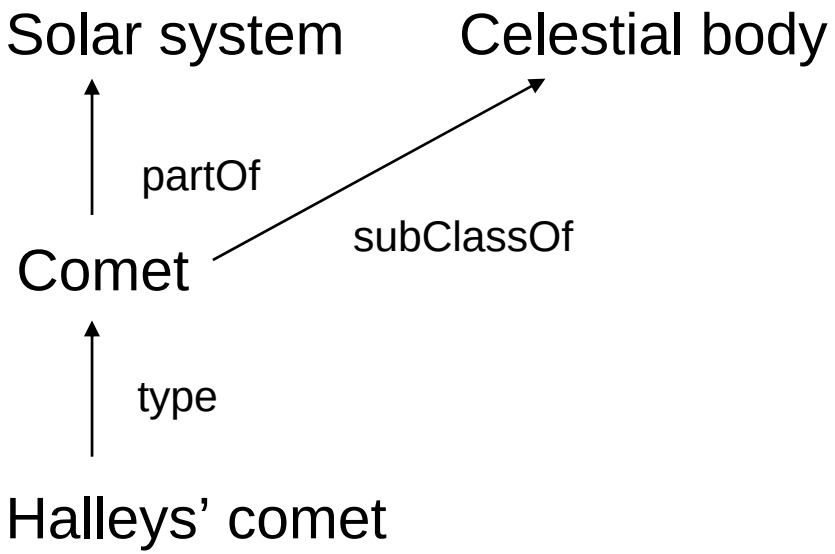
Our Practical Solution Approach

- Disambiguate individuals from classes
- Disambiguate major concept meanings
- Refine and disambiguate major meanings in BT, NT, and RT
- Check transitivity of semantic relation chains
- Reorganize and complete the structure into a simple taxonomic ontology
  - Every concept has super concept(s) except the ”Thing”



A Key Point of Ontologies: Using URIs, not Keywords!

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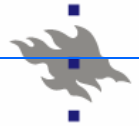
- Each concept will have a globally unique URI (across all domains)
  - URI = Universal Resource Identifier
    - » URL web addresses are a special case of URIs
  - E.g. ”finance:bank”, ”location:bank”, ”#GeorgeBush_23”, ”#Finland”, ...
  - A keyword is not enough for indexing the meaning:
    - » E.g. ”Nokia”:
      - = ”Nokia” as a company?
      - = ”Nokia” as a city in Finland?
      - = ”Nokia” a character in a F.E. Sillanpää’s novel?
    - » E.g. ”Pyhäjärvi” as a location
      - There 49 Pyhäjärvi lakes, villages etc. in Finland
- The URIs are globally shared among users



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Idea: Horizontal top ontology + vertical domain ontologies

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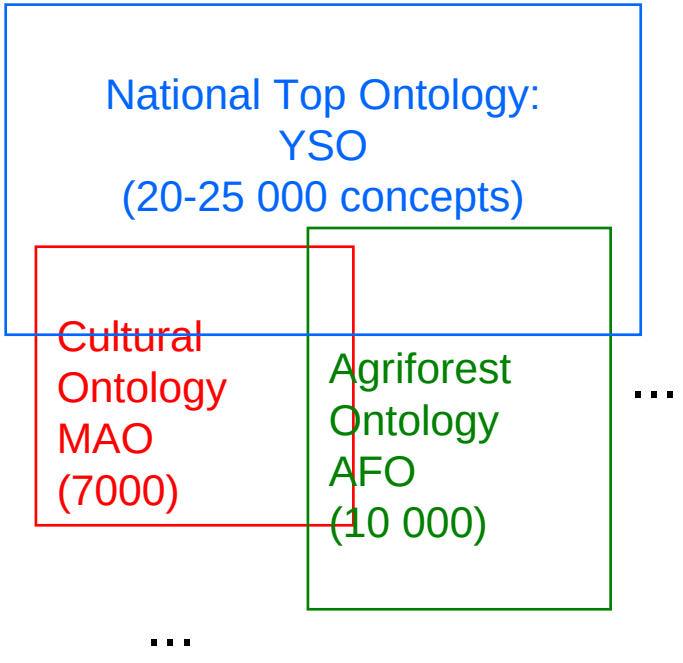
- Top ontology YSO as a semantic glue
- Merges overlapping domain ontologies
  - Cultural ontology MAO
  - Location ontology SUO
  - Time-location ontology SAPO
  - Actor ontology TOIMO
  - Event & Process ontology TAO
  - Photography ontology VALO
  - Agriforest ontology AFO
- Other classification systems as top ontologies
  - » HKLJ + YSO (library domain)
  - » ICONCLASS + YSO (fine art domain)
  - » MeSH + YSO (medicine domain)



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2. Ontology Services & User Groups

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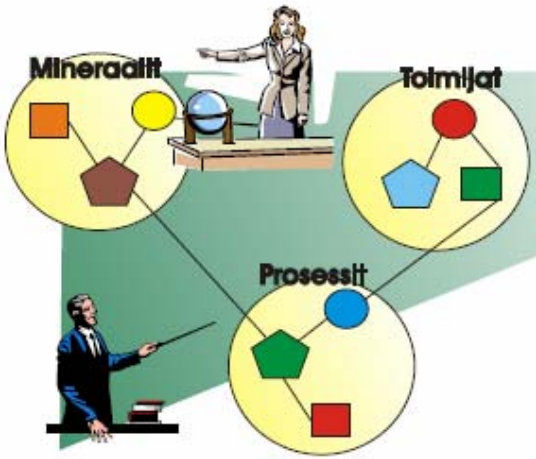
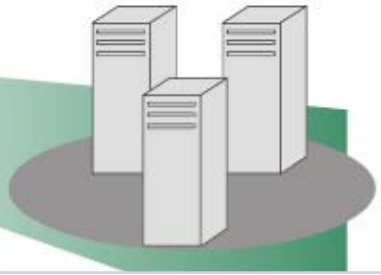
1. Ontology Developers
- Colloborative development of interdependent ontologies
- Versioning and support for updates

2. Information Searchers
- Support concept-based search
- Keyword disambiguation
- Finding the right search concepts

Nokia:
company or city?





2. Information Indexers
- Support indexing concept finding
- Keyword disambiguation
- Support indexing patterns

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ONKI-demonstration

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- Sharing ontologies on the web when indexing content
- http://demo.seco.tkk.fi/onki/mao/annotation
  - Indexing with concepts (meaning), not with keywords
  - Finding the right indexing annotation concept
  - Retrieving the corresponding URI automatically to an external application

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3. Pilot Applications

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- eCulture
  - MuseumFinland – Finnish Museums on the Semantic Web
  - CultureSampo – Finnish Culture on the Semantic Web
- eLearning
  - Orava – Semantic video & learning object portal
- eGovernment
  - Semantic Suomi.fi portal
- eHealth
  - Citizens' health promotion portal Tervesuomi.fi
- Meta-portals
  - Opintoluotsi.fi, Sosiaaliportti.fi, Suomi.fi, ...

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MuseumFinland

http://www.museosuomi.fi

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Google Maps + MuseumFinland

- Ideas
  - Global seamless view to heterogeneous collections
  - Semantic search + browsing
  - Common publication channel for museums
- (Inter)nationally awarded application
  - Semantic Web Challenge Award 2004
  - Nordic Digital Excellence in Museums 2004
  - Prime Minister's Innovation Acknowledgement

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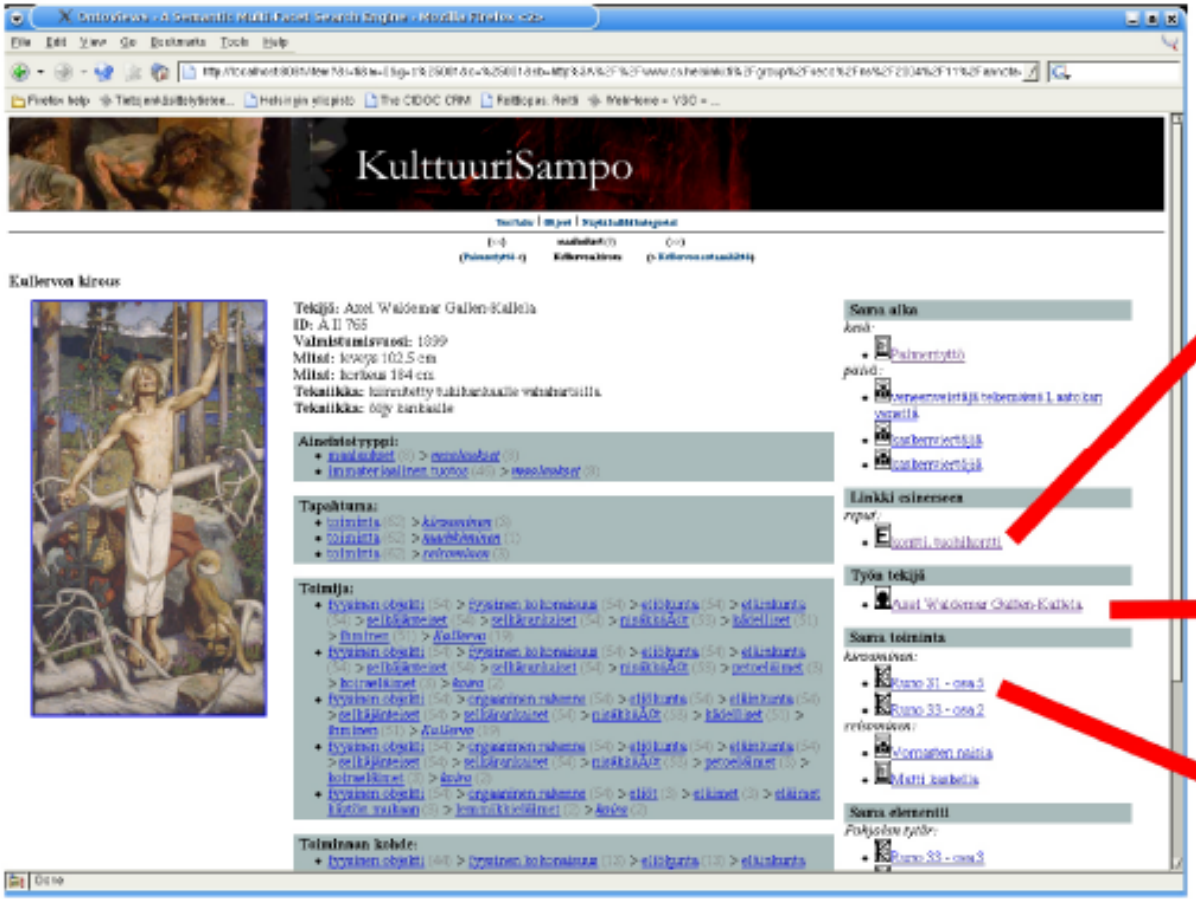
CultureSampo – Finnish Culture on the Semantic web



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Orava: Video clip & learning object portal

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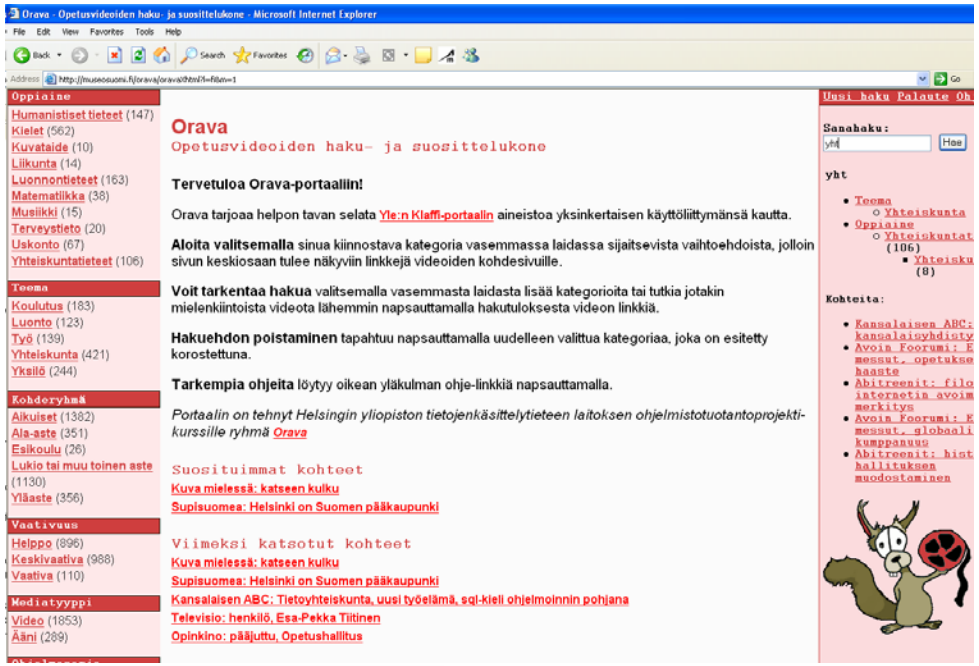
- Semantic search & browsing
  - » 2200 videos, Learning Object Metadata (LOM)
- Semantic autocompletion
- Inter-portal linking
  - » Linked with MuseumFinland



http://www.museosuomi.fi/orava

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Semantic Suomi.fi portal

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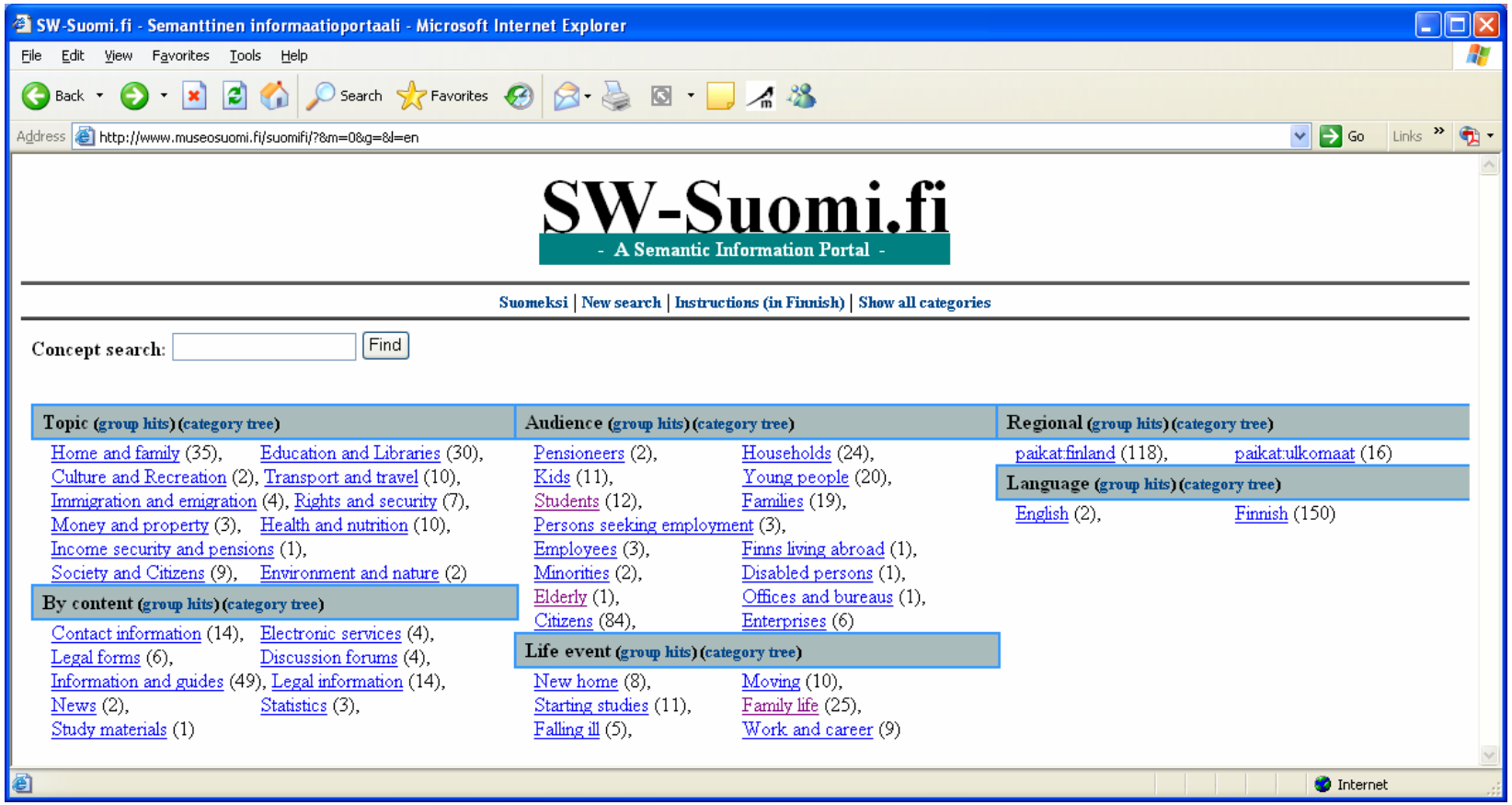
- Providing alternative views to eGov link library content
- Aggregating relevant content automatically from different organizations



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Research Topics Include

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- Ontology development
- Semi-automatic annotation
- Ontology mapping and uncertainty
- Semantic search & browsing
- Semantic recommending
- Automatic exhibition construction
- Semantic interoperability
- Semantic meta-search
- Semantic visualization
- Semantic disambiguation
- User interfaces
- Multi-lingual systems

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Conclusions

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- Semantic web is coming
- An ontology-based infrastructure is needed for it
  - Transforming existing thesauri into ontologies is needed
- Open infrastructure enables development of practical applications
- FinnONTO is an experiment of this on a national Finnish level

- Thank you
- Questions?

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