Nuclear Knowledge Bases and Portals

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Objectives and Methods

- Objectives
  - Knowledge Sharing
  - Knowledge Preservation
  - Knowledge Development
  - Search and Discovery
  - Collaboration and Communication
- Knowledge bases user interfaces
  - Portal, Wikis, Web Sites, Applications …
- Method: Knowledge Representation and Knowledge Modeling (KR)

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Knowledge Organization Systems

- KR based on Knowledge Organization Systems (KOS's)
  - Lists (e.g. Glossaries, Dictionaries, Authority Files); Taxonomies; Thesauri; Ontologies
- … and on Semantic Technologies
  - Intelligible by machines
  - "Entities" uniquely referred to by URI's (http://...)
  - Queries and Reasoning (SPARQL)

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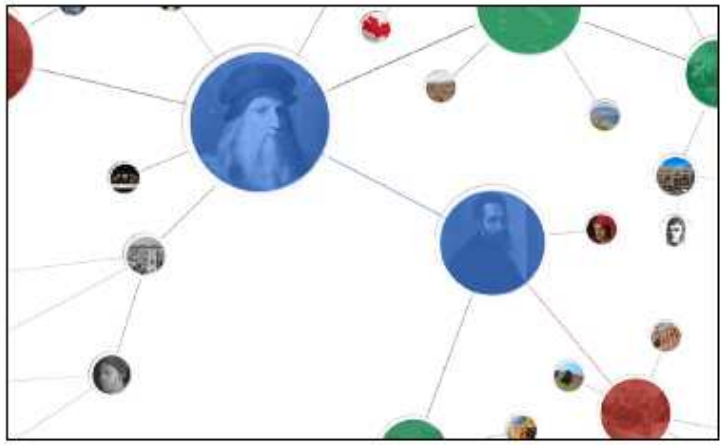
Semantic Web and Linked Data (1)

The Essence of the DataWeb



- **Entities**, not documents!
- **Things**, not strings!

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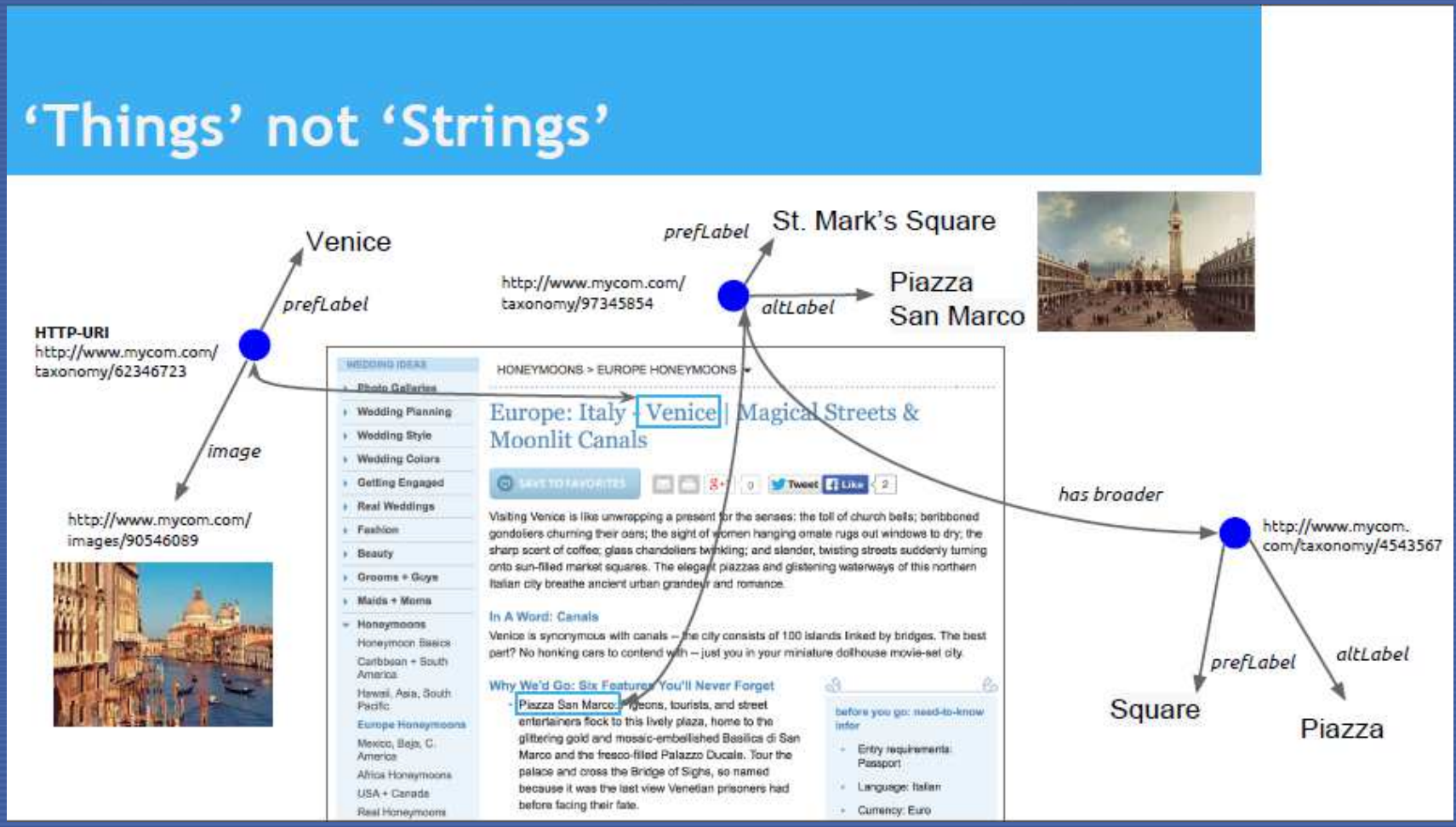
Courtesy Prof. Tassilo Pellegrini

Semantic Web and Linked Data (2)



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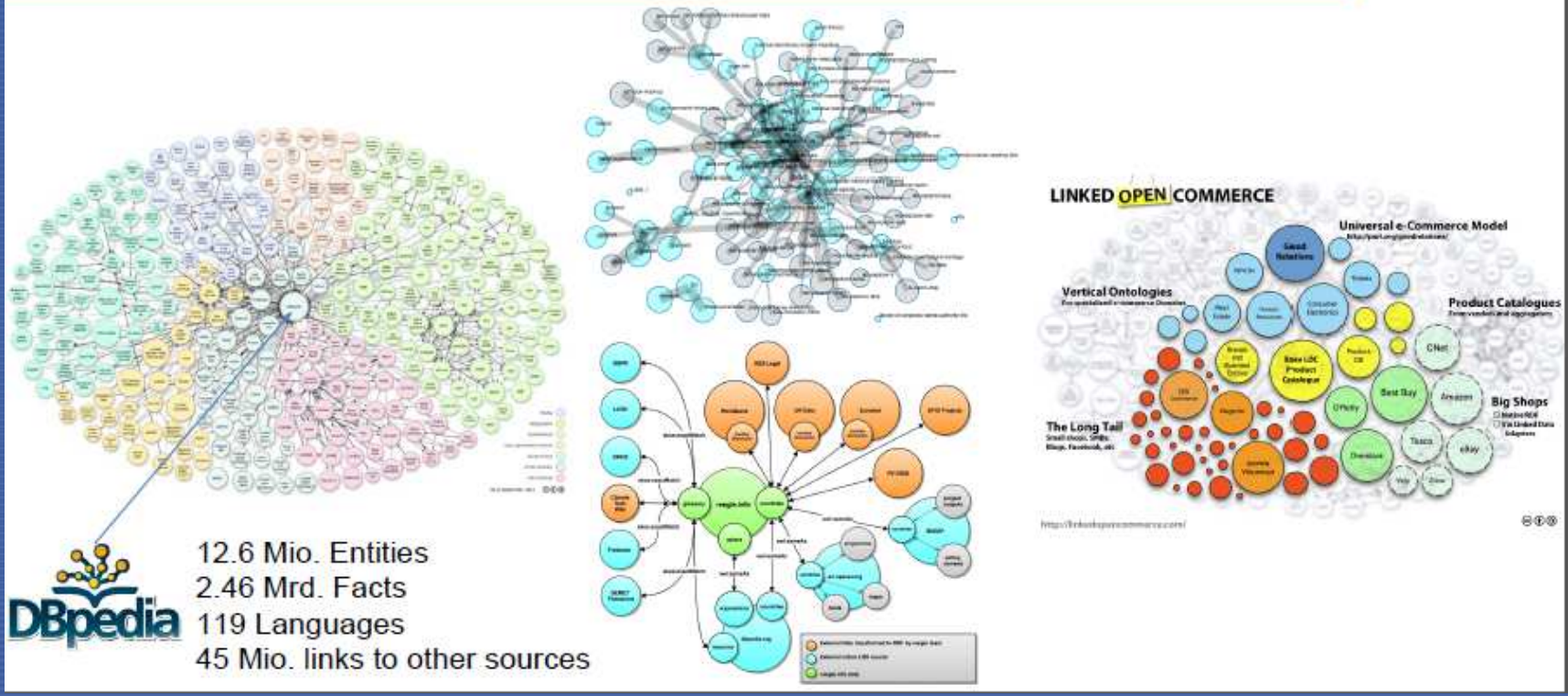
Semantic Web and Linked Data (3)

Giant Global Graphs



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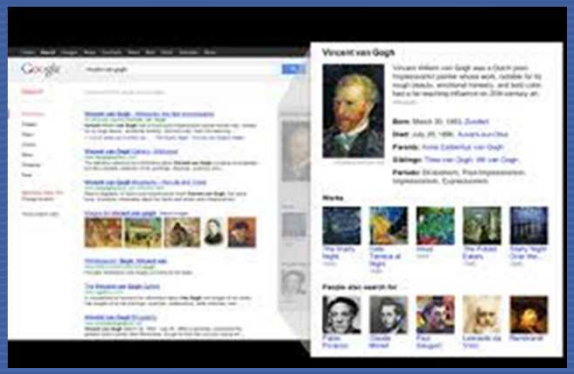
Knowledge Graphs

Google's Knowledge Graph

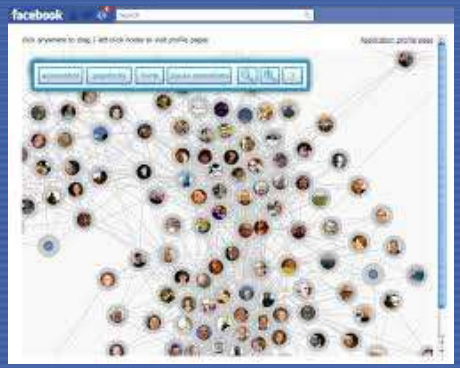


Microsoft Office Graph

IBM's Watson beating

"Jeopardy" - Champions

Facebook Social Graph



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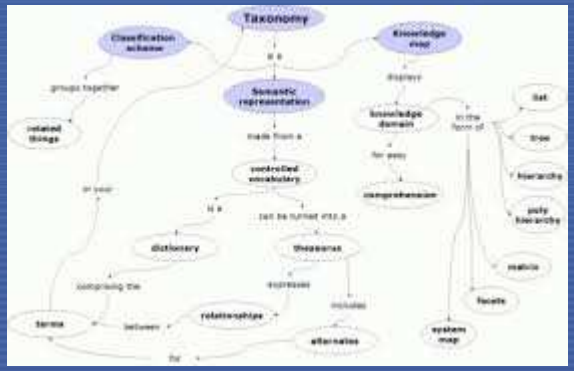
KOS's in Nuclear

- Glossaries and Taxonomies in the Nuclear Domain
  - IAEA: joint development of NKM-Section and Member States (MS):
    - Taxonomies for Fast Reactors, Nuclear Accidents, VVER
    - Many more KOS's available in other IAEA-Sections (INIS-Thesaurus, NE-Glossary, NS-Glossary …)
    - KOS developments in Member States
    - Applications based on KOS, e.g. search enhancement, querying KB's, combining information from many sources, …



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Knowledge Base Challenges

- Scope:
  - Rapidly increasing number of documents
    - free text search has limits

      → improving search by metadata, but manual markup very limited
  - Internal and external repositories (e.g. INIS, NuArch, …)
  - Document silos
- Structuring and navigation
  - Complex domain areas
  - Querying (complex) knowledge bases
  - Enrichment of knowledge bases by external data (in other institutions, on the Web) → Linked Data

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KOS Challenges

- Proliferation of Taxonomies and other KOS
- Maintaining KOS's, and following history (change management)
- Ownership, managing approval
- Interchanging and linking taxonomies
- Homogenization (avoid contradictions, but allow different views)

→ Use Standards

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NKM KOS initiative

- Relevant aspects for the NKM KOS initiative
  - Standards-based KOS management
    - Based on SKOS (Simple KOS) – W3C Standard: Easy linking of different KOS's, use outside schemes (e.g. Dublin Core), develop own ontology schemes
  - Recent significant progress in automatic tagging (mostly based on KOS)
  - Complex queries over inhomogenous, structured and unstructured data sources possible
  - SharePoint will be further developed as basic IAEA platform → autotagging to be possible in Sharepoint

→ Develop a rich, expandable Knowledge Base with advanced query, discovery and navigation abilities

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Developing Knowledge Portals (1)

- Outline of solutions and ongoing activities:
  - Installing a SharePoint development platform for NKMS
  - Installing Poolparty Server and Power Tagging
    - Management of KOS's based on W3C Standard SKOS (Simple Knowledge Organization System)
      - Multilingual
      - Linking of KOS (batch linking, single concept linking)
      - Approval workflows
      - Publish on the web (and on paper)
      - Export to SharePoint
    - KB enrichment: Linking of external schemes and data (e.g. Wikipedia in RDF, Member States repositories)

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Developing Knowledge Portals (2)

- Enhancement of taxonomies and thesauri with ontology features (classes, relations, attributes)
- Automatic tagging (manual intervention possible)

- Semantic Search (enhance search with synonyms, relations, facets, ...): Webpart in SharePoint
- Knowledge Base navigation and discovery: Webpart in SharePoint
- External applications (API available)
- Development of several Knowledge Portals
  - In cooperation with IAEA sections: Nuclear Accidents, Fast Reactors, …
  - Development of a Nuclear Knowledge Management Portal
    - Internal and external use
    - Integration of the E-Catalogue: a collection of Case Studies from Member States
    - Integration of the NKM Wiki

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- Fast Reactor Portal
  - Pilot search implementation on SharePoint 2010
    - Taxonomy to improve choice search terms
    - Searching INIS
    - Connection to SharePoint Search
  - Principle for Rights Management
    - Documents provided by MS will be in control of MS (definition of rights for other parties)
  - Next steps
    - Pilot portal in SharePoint 2013
    - Designing the portal pages
    - Uploading and autotagging documents from IAEA and MS

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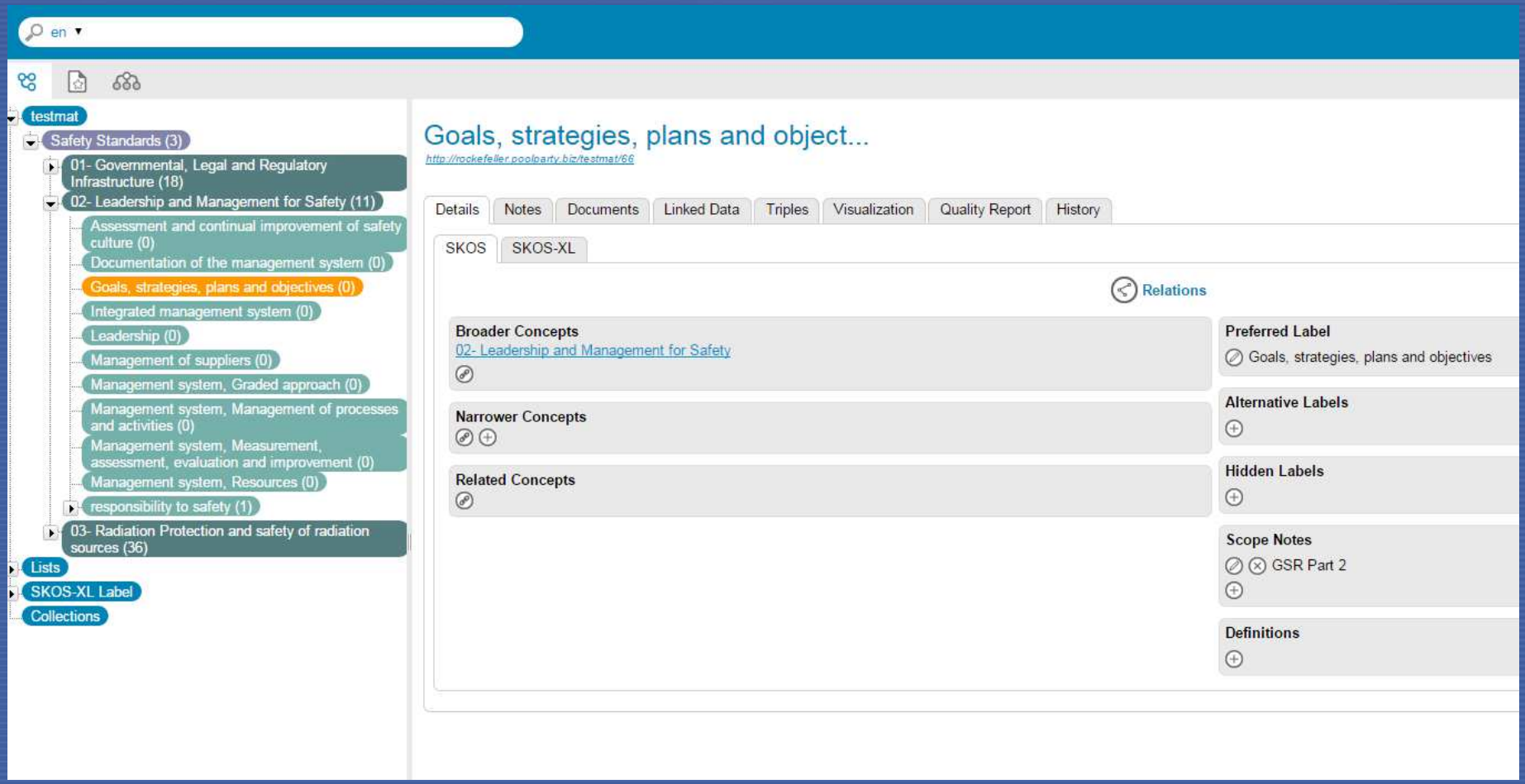
Example of SKOS properties



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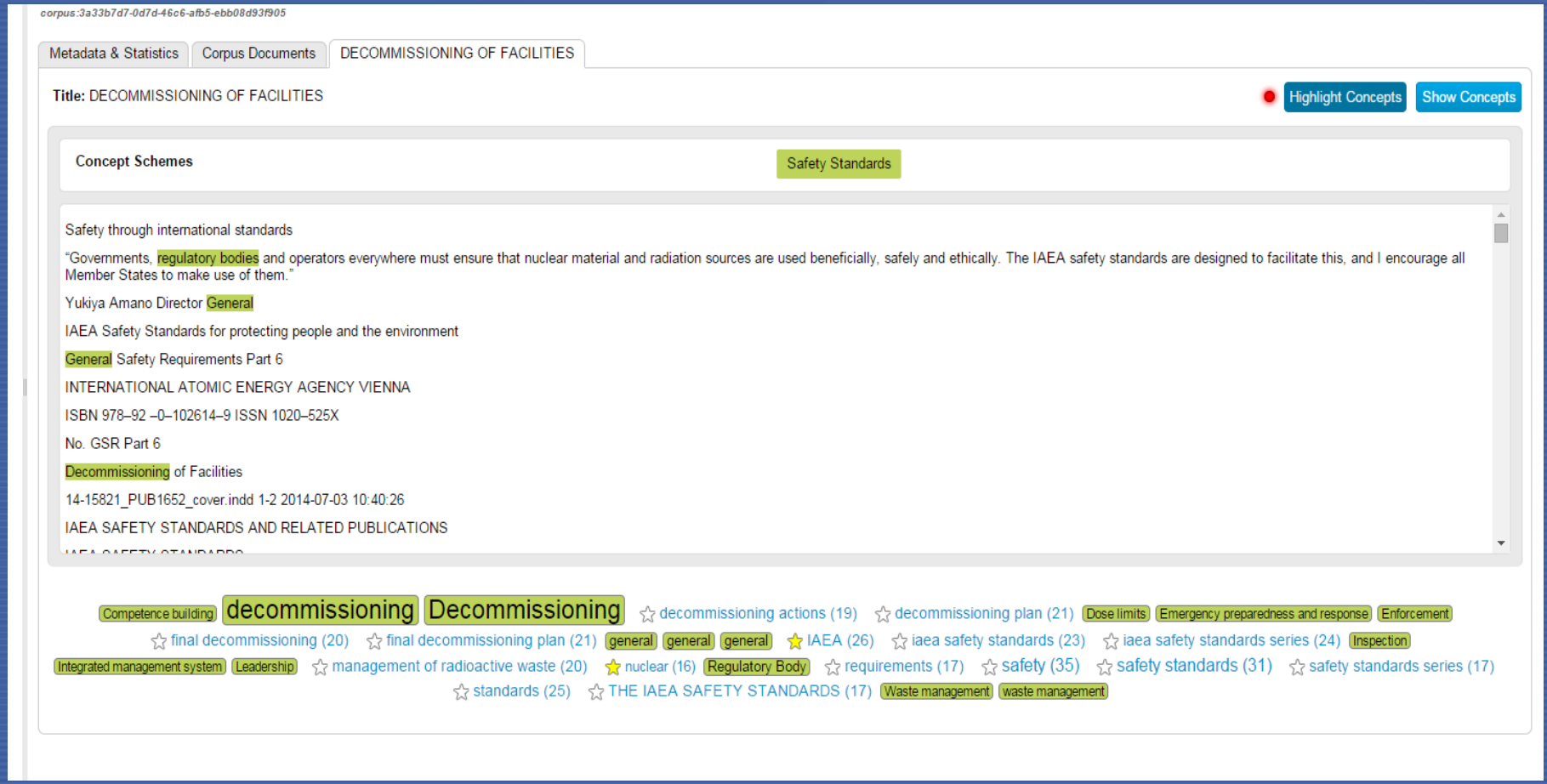
Entity extraction example



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