The ICAN Prototype

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Outline

- Aims of the ICAN Prototype
- Terminology
- Idea
- Approach
- Architecture
- Demonstration
- Future Work
- Recommendations

Aims of the ICAN Prototype

- Develop an internationally-enabled CWA ontology
  - users will be able to conduct sophisticated and meaningful queries across a range of atlases
- a proof-of-concept exercise
  - develop an ontology for a single test case
- make connections within regional partnerships
  - build and strengthen atlas networks

Terminology

- OGC Web Service:
  - OGC specification
  - Interface allowing requests for geographic "*resources*" across the Web using platform-independent calls
  - Main OGC services:
    - Catalogue Service for the Web (CSW)
    - Web Feature Service (WFS)
    - Web Coverage Service (WCS)
    - Web Map Service (WMS)

Terminology

- OGC Web Service:
  - Catalogue Service for the Web (CSW)
    - Allows requests for metadata across the Web
    - E.g. GeoNetwork is a CSW implementation

Request	Response
`Get Capabilities`	*Metadata about the types / operations the CSW supports*
`Get Records`	*Metadata records available, with possibility of filtering (bounding box, spatial, temporal, keywords search, etc.)*
`Get Record By ID`	*Record with the specified ID*

Terminology

- OGC Web Service:
  - Web Feature Service (WFS) → Vector data
    - Allows requests for geographic features across the Web
    - E.g. GeoServer, Deegree are WFS implementations

Request	Response
`Get Capabilities`	*Metadata about the types / operations the WFS supports*
`Describe Feature`	*Structural information about a feature type*
`Get Feature`	*Features, with possibility of spatial querying and filtering*

Terminology

- OGC Web Service:
  - Web Coverage Service (WCS) → Raster data
    - Allows requests for grid data across the Web
    - E.g. GeoServer, Deegree implement WCS

Request	Response
`Get Capabilities`	*Metadata about the types / operations the WCS supports*
`Describe Coverage`	*Structural information about one or more coverage(s)*
`Get Coverage`	*Coverage data from the server, with possibility of spatial querying and filtering*

Terminology

- OGC Web Service:
  - Web Map Service (WMS) → Maps
    - Allows requests for maps across the Web
    - E.g. UMN MapServer is a WMS

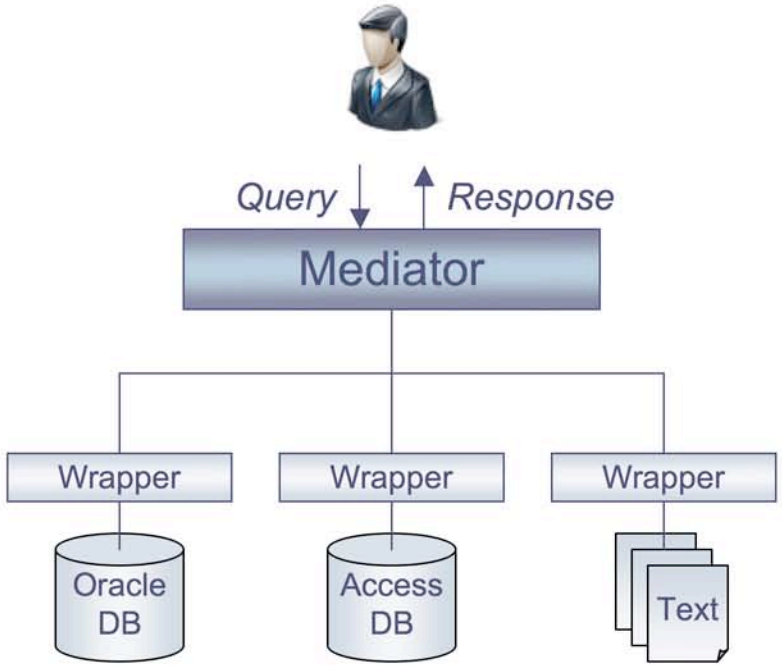
Request	Response
`Get Capabilities`	*Metadata about the types / operations the WMS supports*
`Get Map`	*Map of the requested data*
`Get Feature Info`	*Thematic information about a particular point within a map*

Terminology

- Ontologies:
  - A Knowledge Organisation System (KOS)
  - Define concepts (classes and objects)
  - Define relationships between concepts
  - Define inference rules
  - Examples:
    - John *is a* Person
    - Mary *is a* Person
    - Mary *is mother of* John
    - **If** (X *is father* of Y & Y *is father of* Z) **then** X is grand-father of Z

Terminology

- Mediation:
  - A virtual data integration approach
  - Allows transparent access and integration of autonomous distributed data sources



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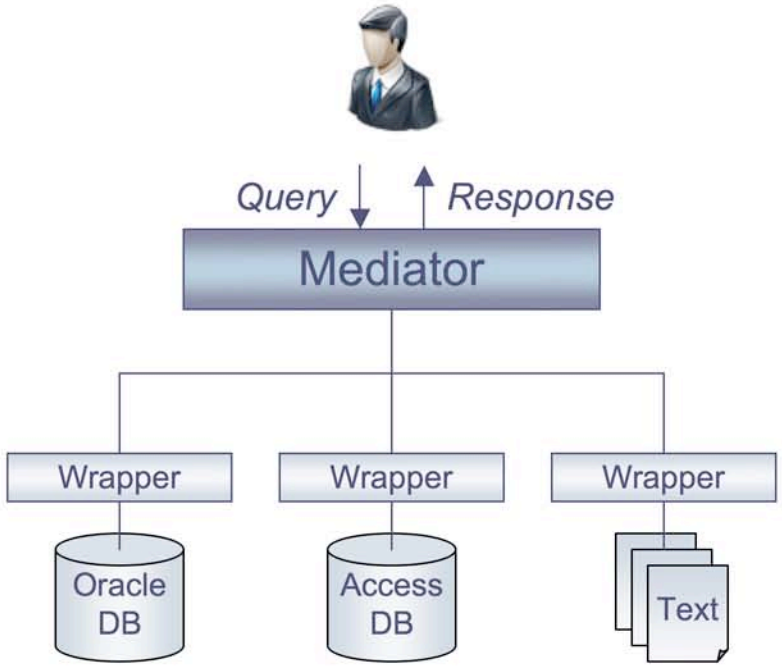

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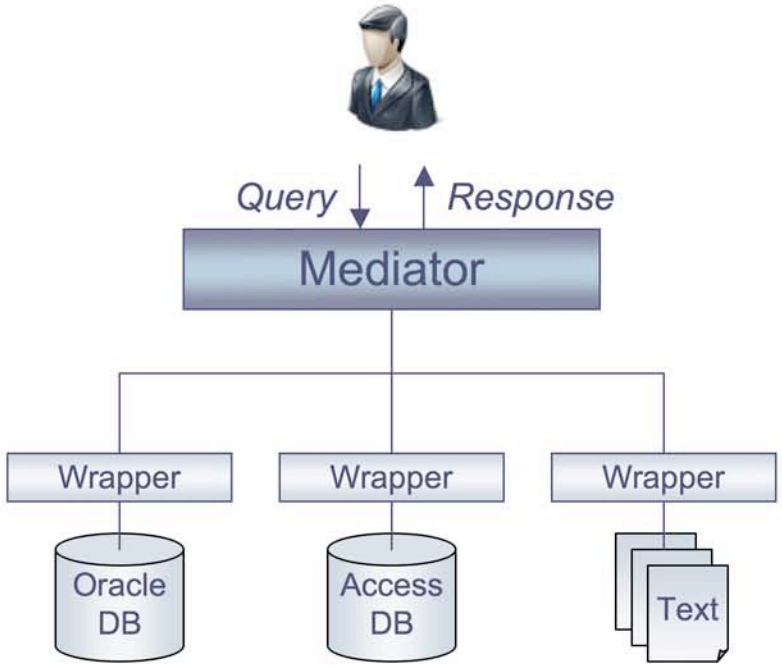

Same query language
Same data model and format

Heterogeneous data sources

Terminology

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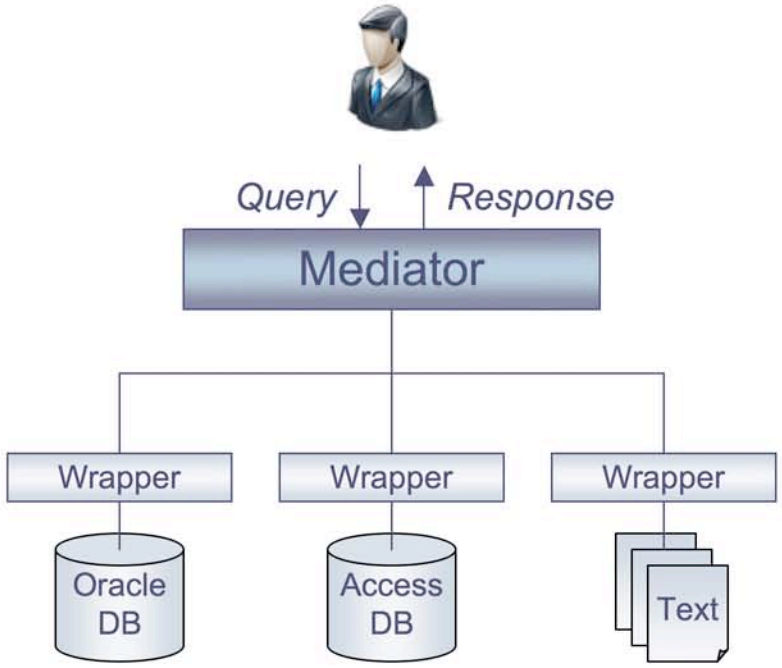

Same data structure
Same semantics

Same query language
Same data model and format

Heterogeneous data sources

Idea

- Connect individual coastal atlas projects to an integrated global atlas

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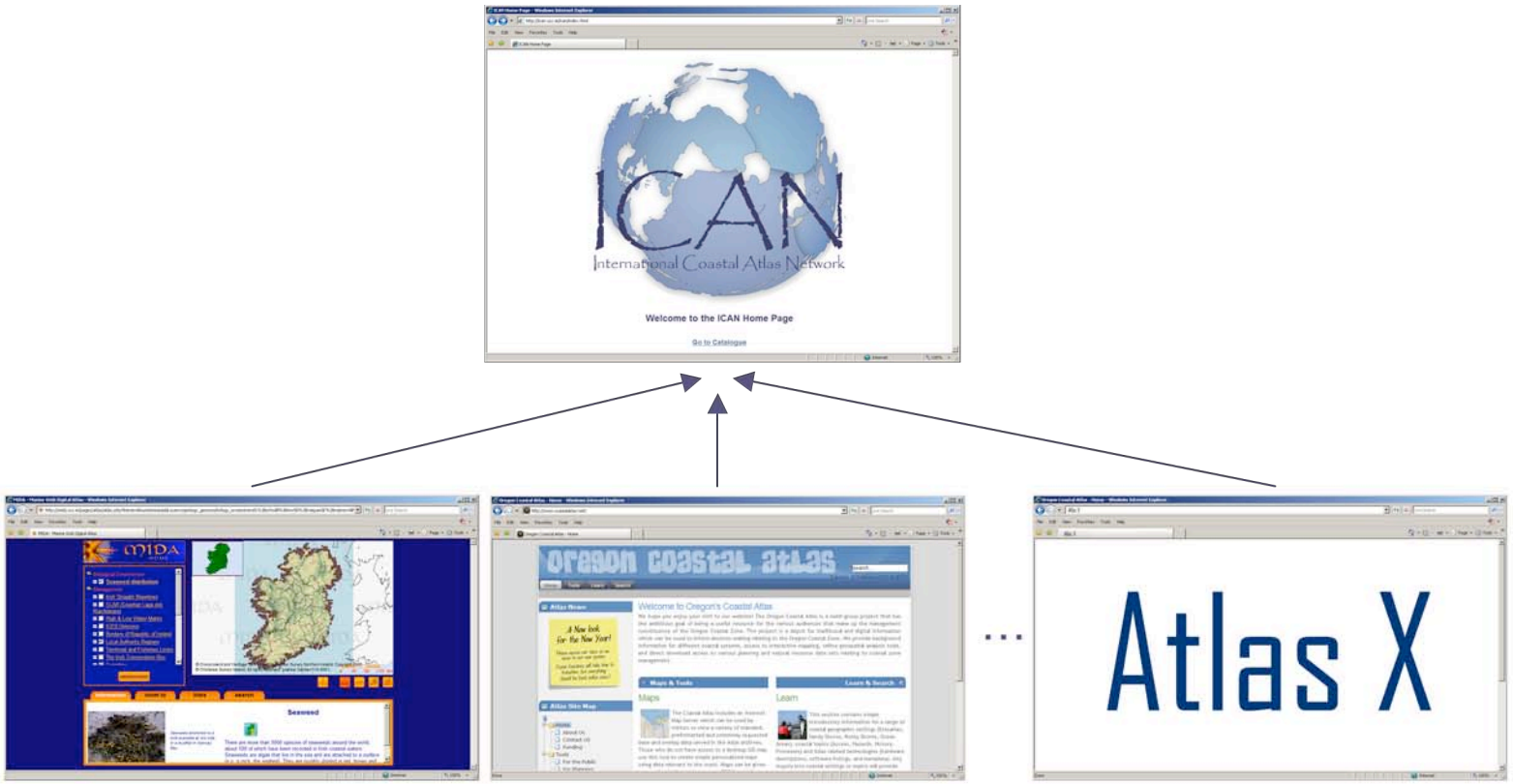

Idea

- Connect individual coastal atlas projects to an integrated global atlas

Global atlas

Local atlases

...

Approach

- Centralised system

  → Resources are accessed through one central system (ICAN global atlas)

- Virtual integration approach

  → Data are not copied into the global Atlas

- Local atlases autonomy

  → Each data atlas is autonomous and organises resources in its own way and uses its own terminology (ontology)

Approach

- To achieve interoperability:
  1. Harmonisation:
     - Harmonise access interfaces and resource formats
       - Implement OGC Web Services
         - » Catalogue Service for the Web (CSW)
         - » Web Feature Service (WFS)
         - » Web Coverage Service (WCS)
         - » Web Map Service (WMS)
       - Use ISO metadata standards
         - » ISO-19115 & ISO-19139

     → Harmonise Web querying and delivery formats

Approach

- To achieve interoperability:
  2. Mediation:
     - Allow local atlases to use their own data structures, semantics and vocabularies (ontologies)
     - Use a common data structure and a common ontology for the global atlas
     - Provide mappings (translations) between local ontologies and the global ontology

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Harmonisation vs. Mediation

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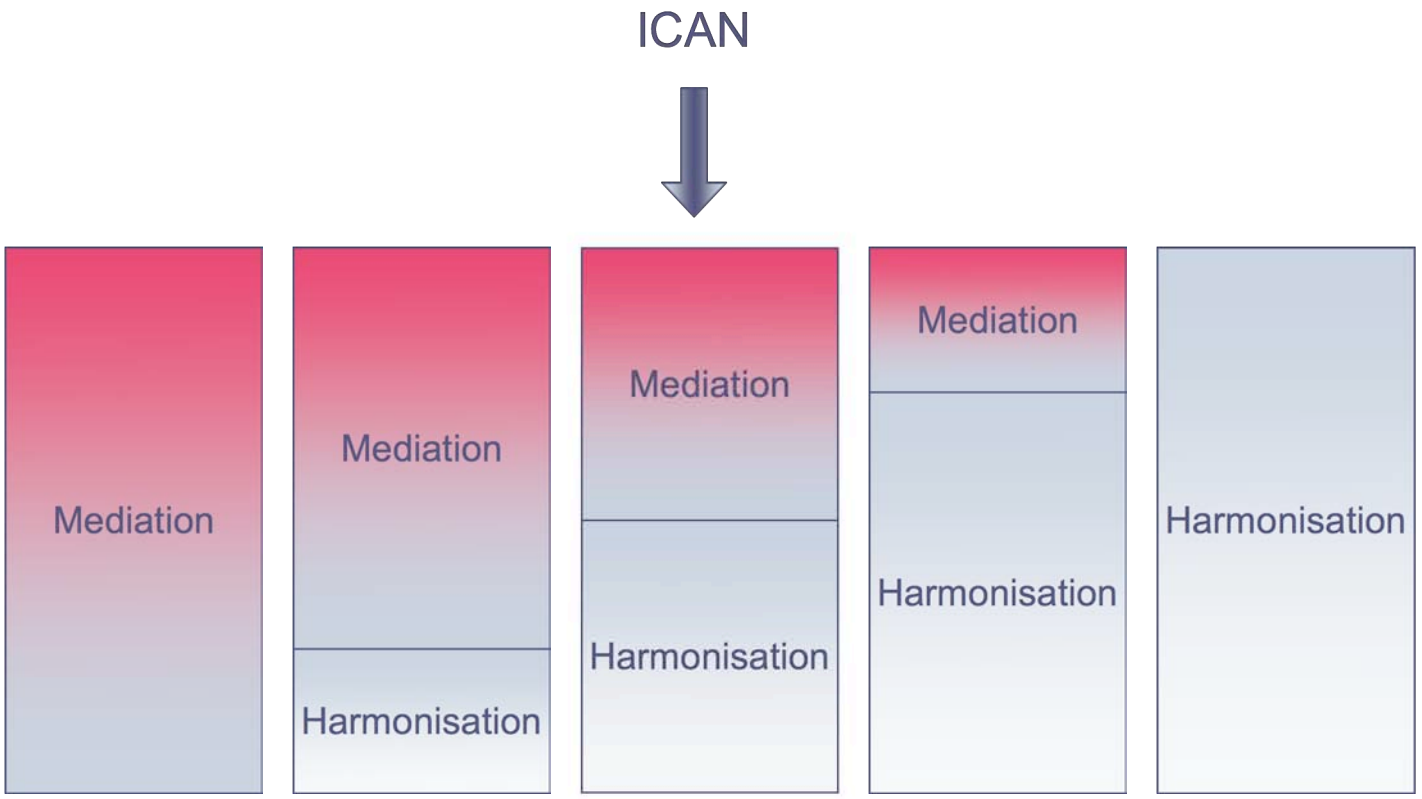
Harmonisation vs. Mediation



View from a Local Atlas

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- How to connect existing local atlas resources to ICAN?

Maps

The Coastal Atlas includes an Internet Map Server which can be used by visitors to view a variety of standard, preformatted and commonly requested base and overlay data served in the Atlas archives. Those who do not have access to a desktop GIS may use this tool to create simple personalized maps using data relevant to the coast. Maps can be given personalized titles and output to PDF format for use in printed reports, email, etc.

Tools

Tools help users acomplish common tasks. In the case of the Coastal Atlas tools list we've assembled links to a variety of tools created by NOAA, FEMA and others designed to help different types of coastal users answer questions that are common in coastal areas. In addition, we make available a series of Oregon topic-specific coastal tools constructed by Atlas partners though various grant opportunities.

Learn

This section contains simple introductory information for a range of coastal geographic settings (Estuaries, Sandy Shores, Rocky Shores, Ocean Areas), coastal topics (Access, Hazards, History, Processes) and Atlas related technologies (hardware descriptions, software listings, and metadata). Any inquiry into coastal settings or topics will provide both broad background materials as well as summaries and links to more specific data.

Search

The heart of the Coastal Atlas is an archive of geospatial data collected over the years by various program partners of the Oregon Ocean-Coastal Management Program. Rather than allow such data to gather dust on shelves and in storage boxes, we've made a concerted effort to look in our attic for digital data that can be brought into the future via the new Atlas Archive. The intent was to create a one-stop shop for finding the fruits of past data collection efforts.

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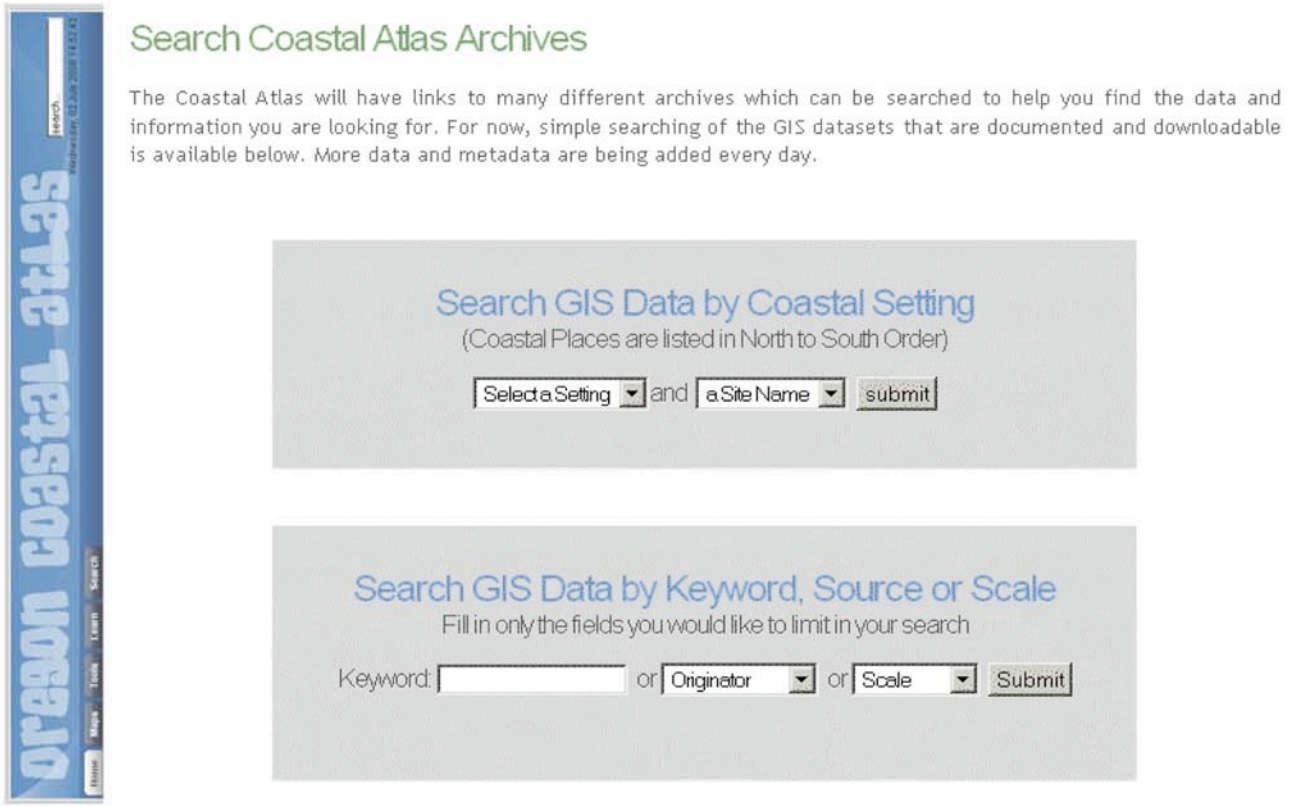

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We found 16 GIS Data Sets matching your Search:

Data Layer	Date	Source	Scale	
Clatsop County Soil Survey Geographic (SSURGO) Database	2000	NRCS	24,000	
Vectorized Shoreline of Oregon Coast - Clatsop Spit to Gearhart, NOS Coast Survey Map, 1926	1926	OCMP	20,000	
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Clatsop Spit 1:24000 U.S.G.S. Digital Orthophoto Quadrangle 46124b1, 1994	1994	USGS	24,000	
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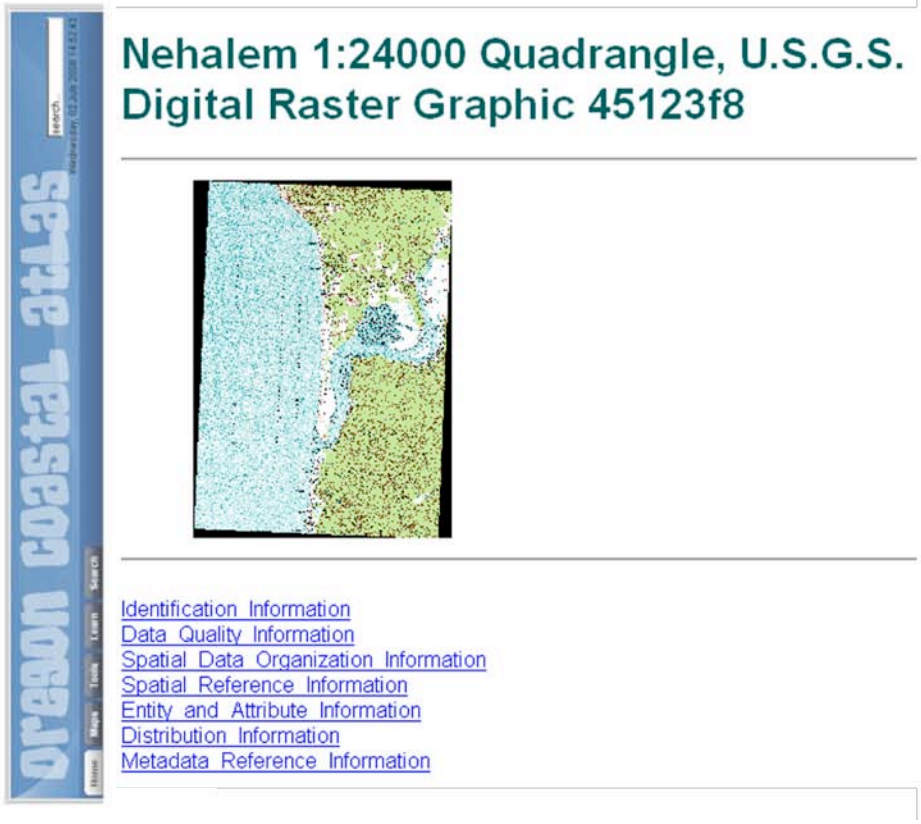

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- Coastal data sets documented with standards-based metadata
  → FGDC, ISO 19115

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- Coastal Atlas archive of Metadata
  → Database of data set characteristics

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- Coastal Atlas archive of Metadata
  → Database of data set characteristics
- Metadata holds the key
  → Titles, Abstracts and other metadata fields contain the Keywords which help users find relevant data.

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       - » Place
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       - » Theme

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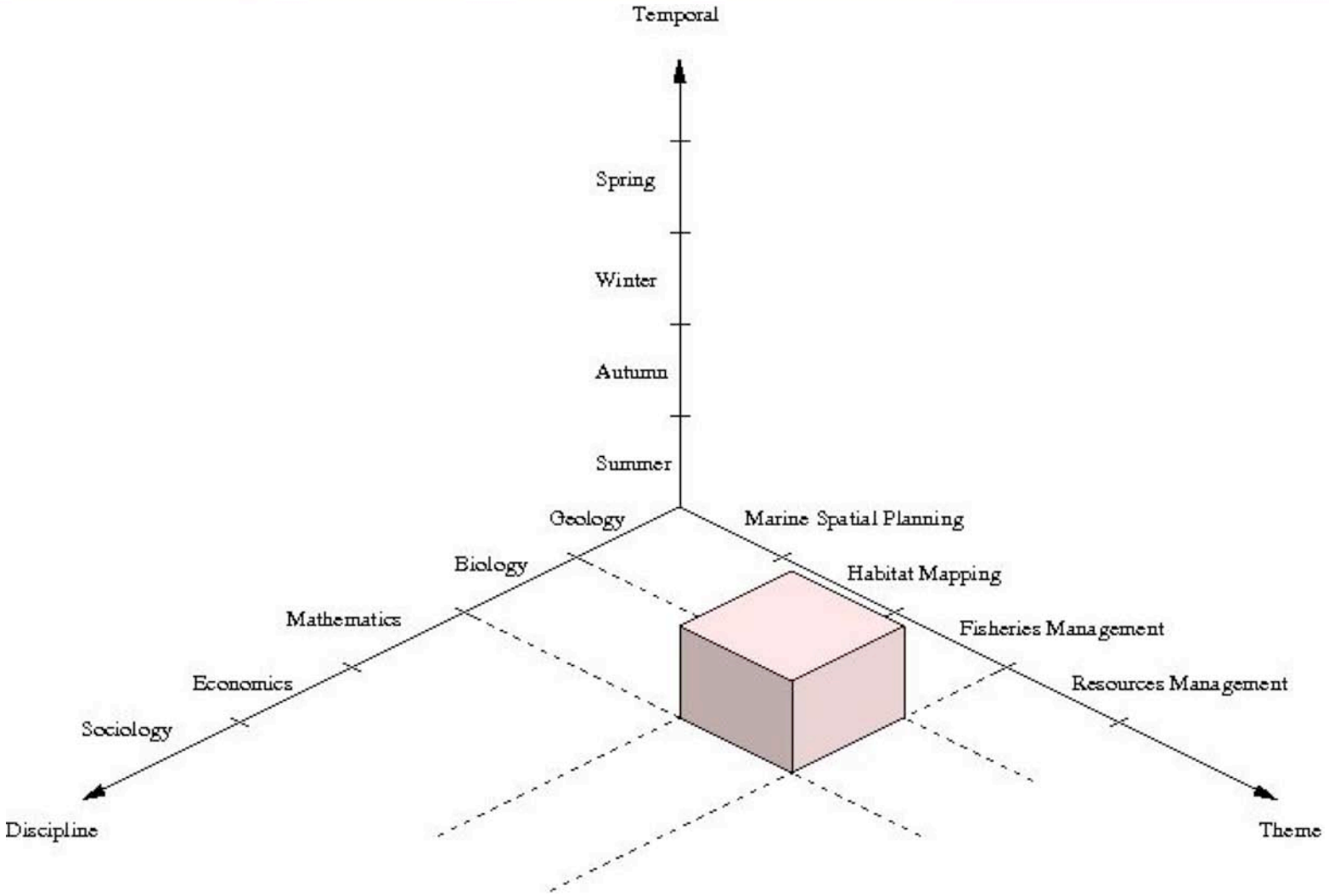

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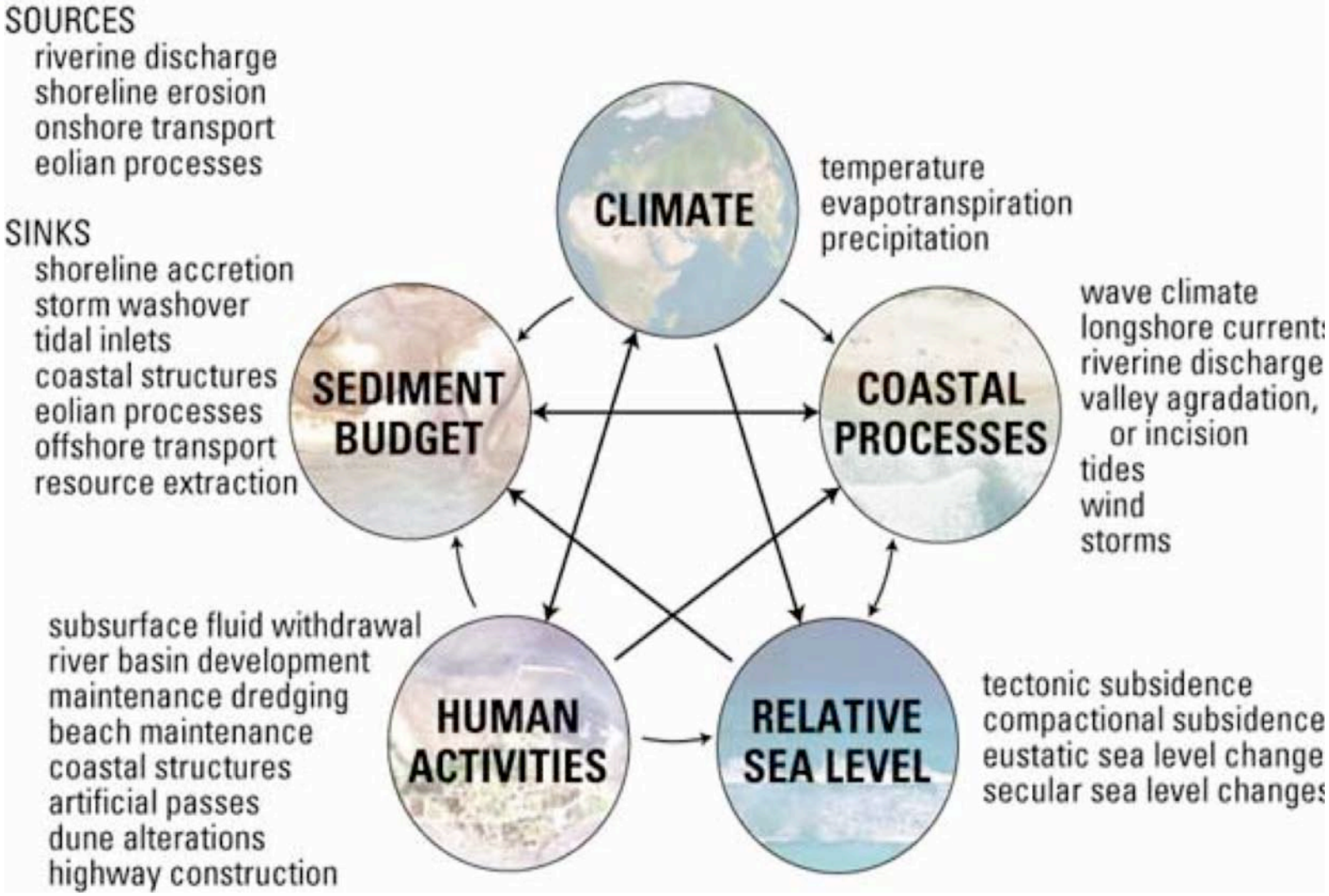

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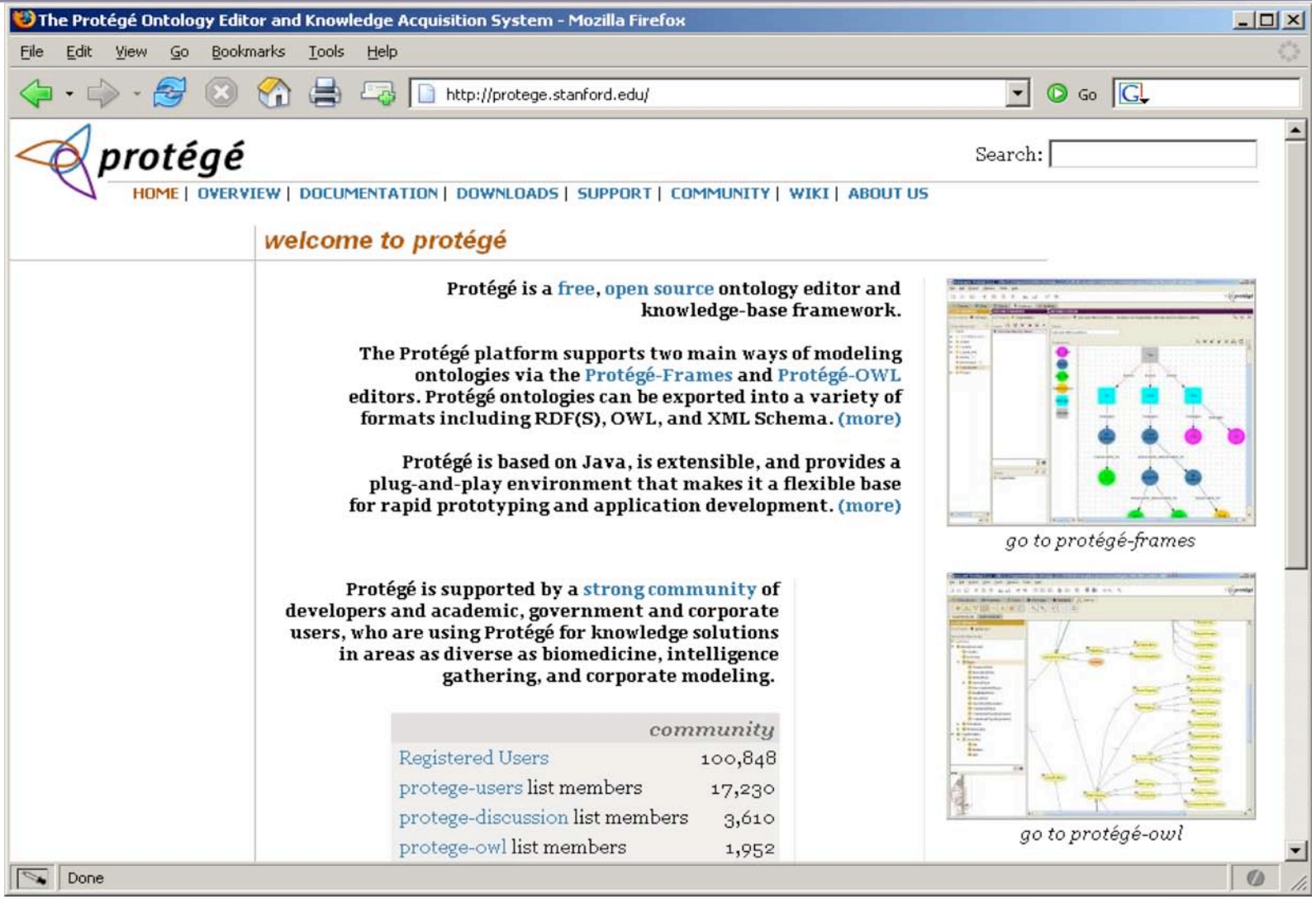

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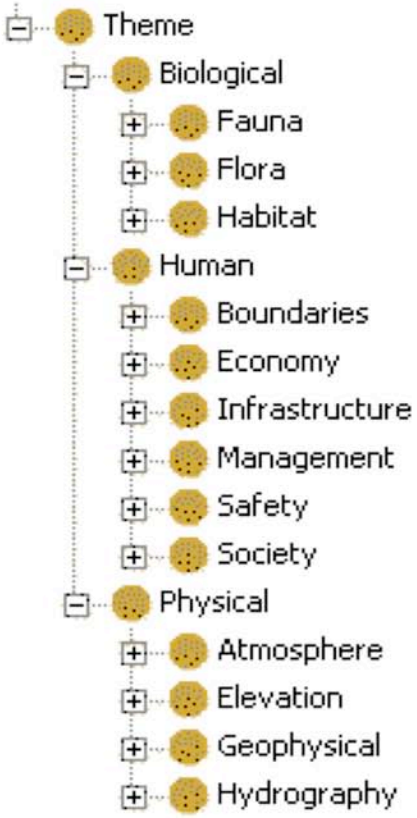

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     - Map the terms in this local ontology to relevant terms in the agreed global ontology

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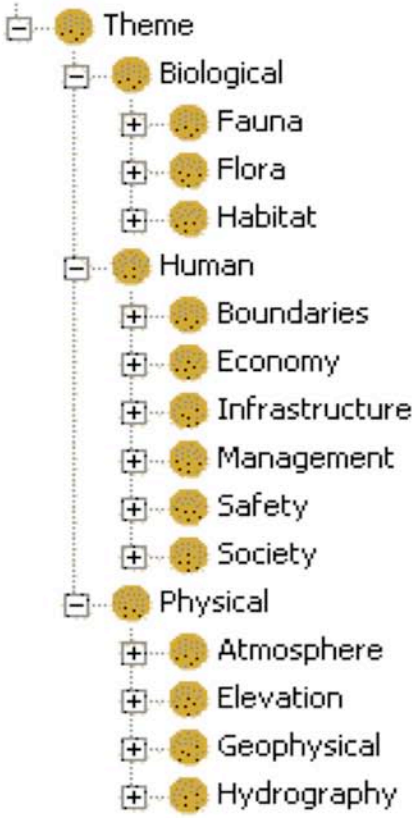

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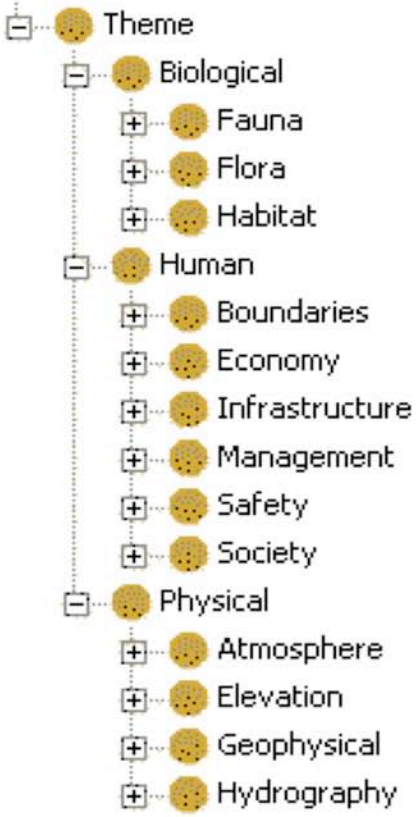

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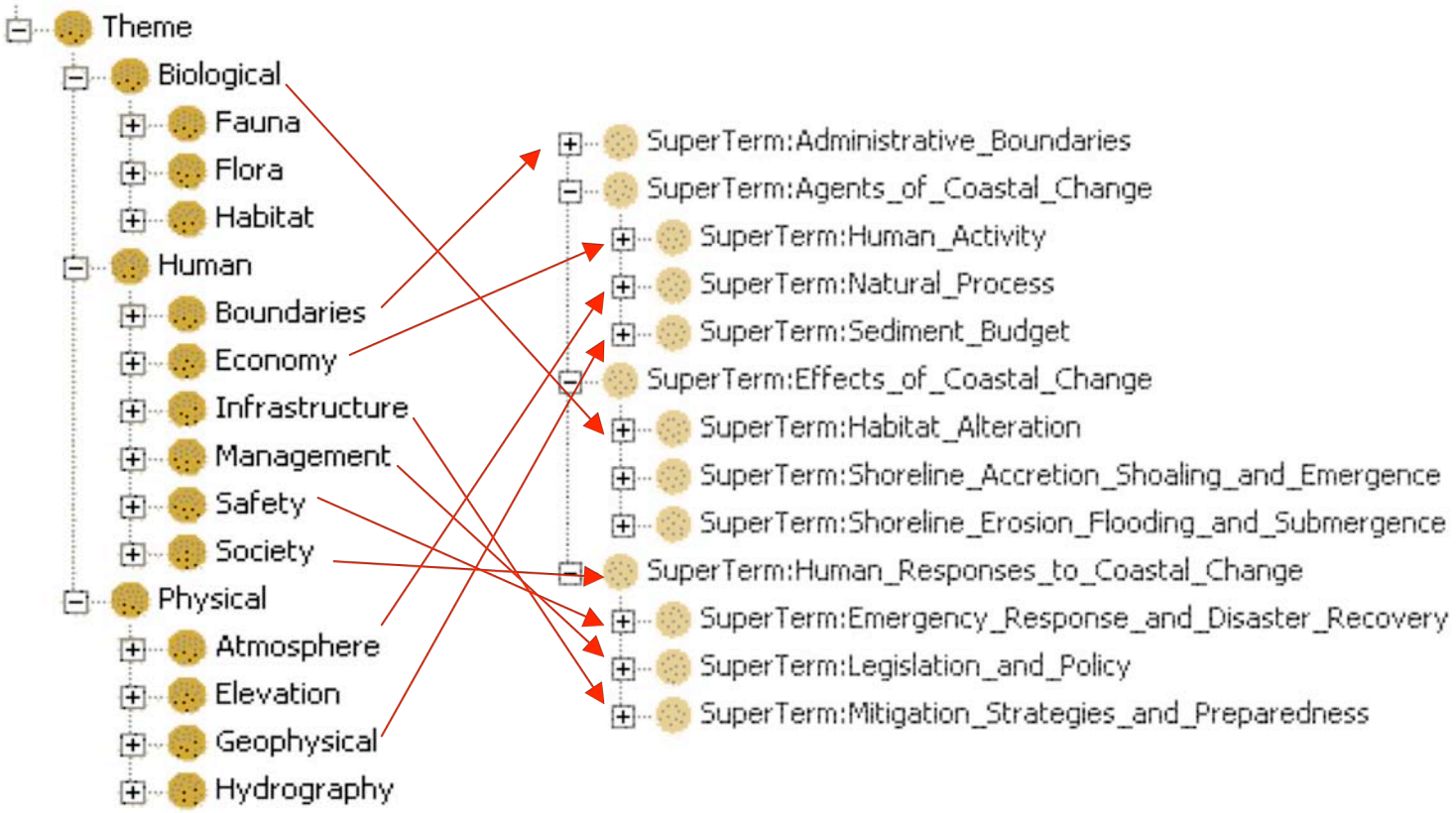

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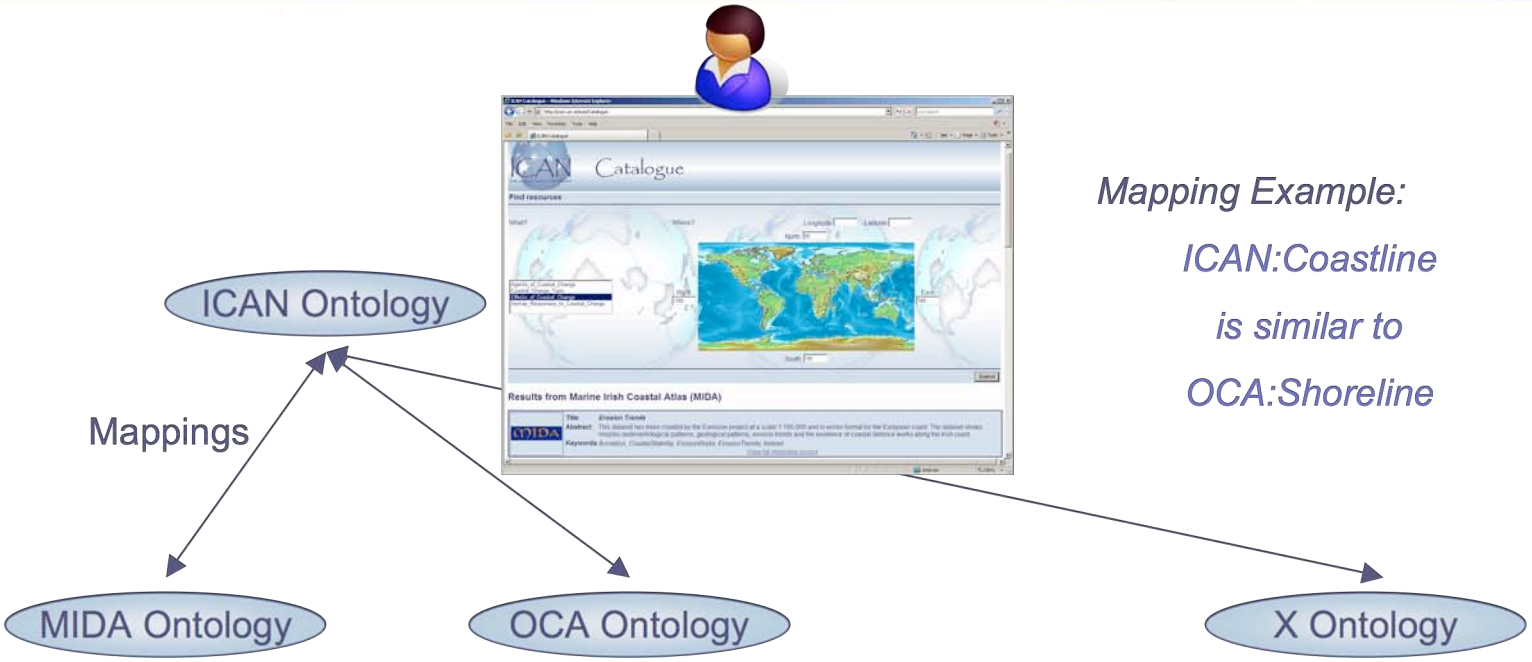

Mapping Example:

ICAN:Coastline

is similar to

OCA:Shoreline

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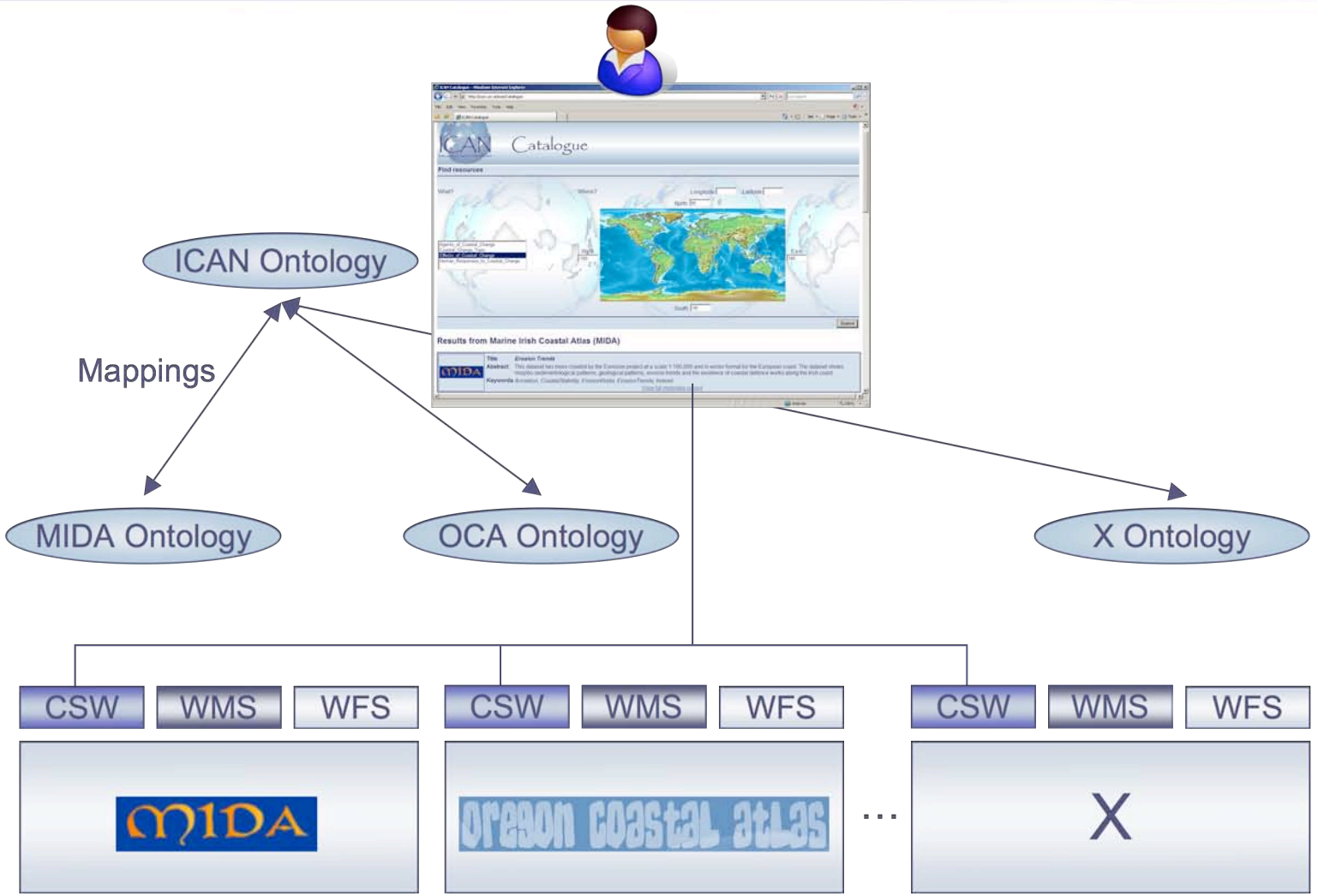

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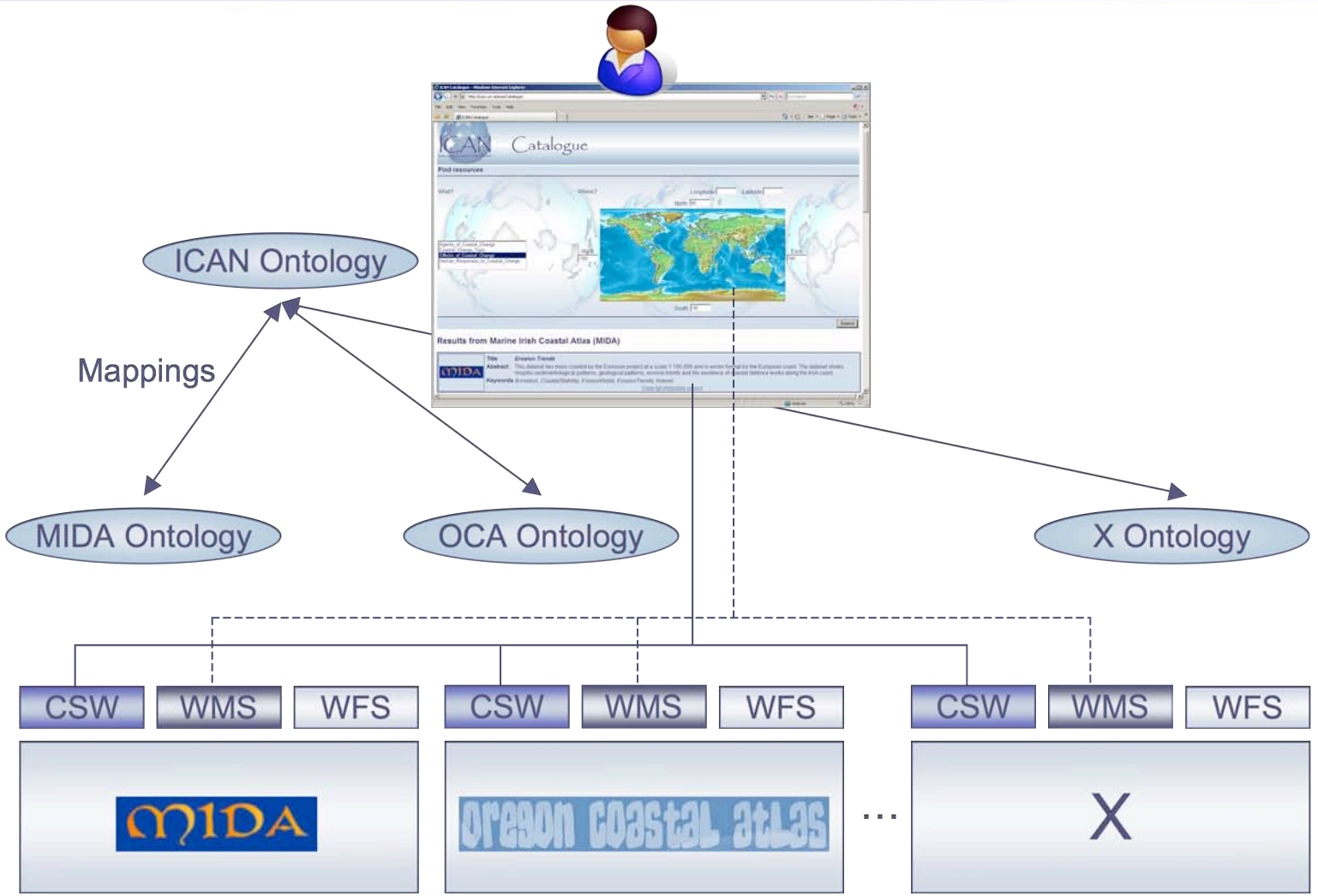

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Future Work

- Include WMS for data visualisation
- Include WFS & WCS for actual data delivery
- Share resources (thematic information about layer)

Recommendations

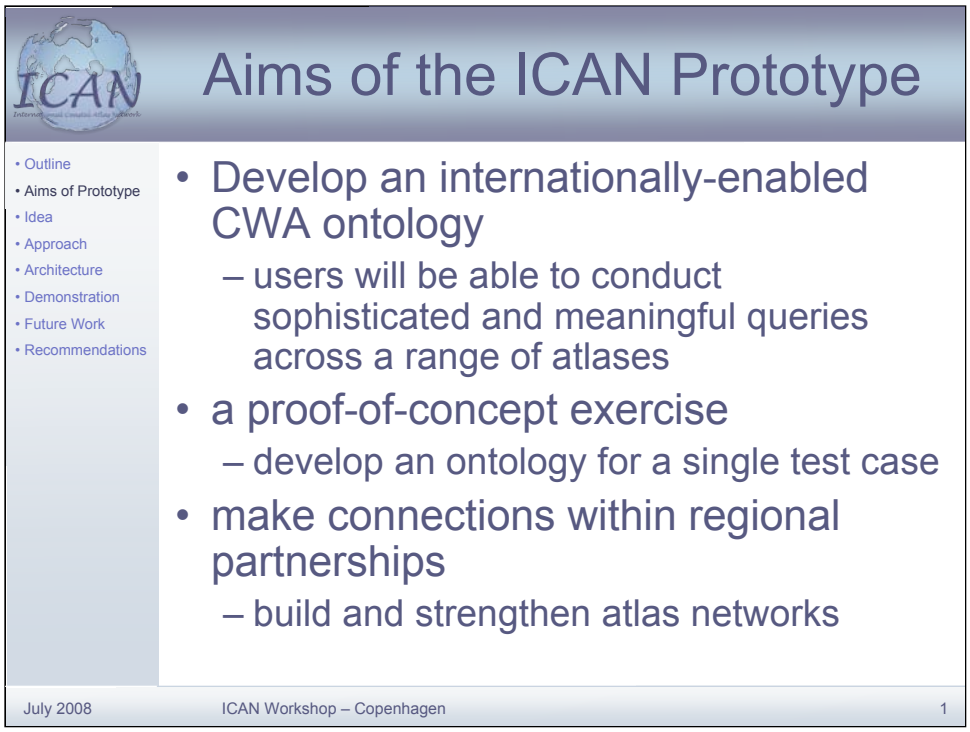
- Use standards:
  - OGC recommendations
    CSW, WFS, WCS, WMS
  - ISO metadata standards
    ISO-19115 & ISO-19139
- Use existing open source
  - GeoNetwork, GeoServer, etc.
- Use ontologies to define your controlled vocabularies (keywords, topics, units of measure, etc.)

Recommendations

- Reuse existing ontologies if possible
- Ontologies support multilingual vocabularies
- Structure and harmonise your resources and thematic information
- Use a Data Base Management System (DBMS) for storing and querying your resources (thematic information, multimedia, etc.)

Thank You

Thank You

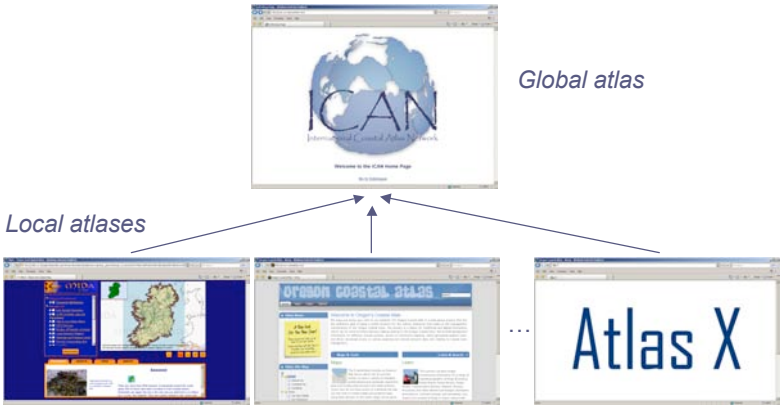


The first point is one of the long term aims of ICAN. The short term goal was then to develop a proof of concept based on a community agreed test case (coastal erosion) where the theme was of interest to both Oregon and Ireland. This proof of concept may then be used to make connections within regional partnerships (e.g., the OCA can use lessons learned in developing a regional network of atlases with Washington and California, while the MIDA can do the same for building and strengthening atlas networks with the UK, Belgium, and other parts of Europe. Similarly, lessons may be applied in other parts of the world; in Africa for the African Marine Atlas to develop and improve connections with national and regional African atlases.

Idea

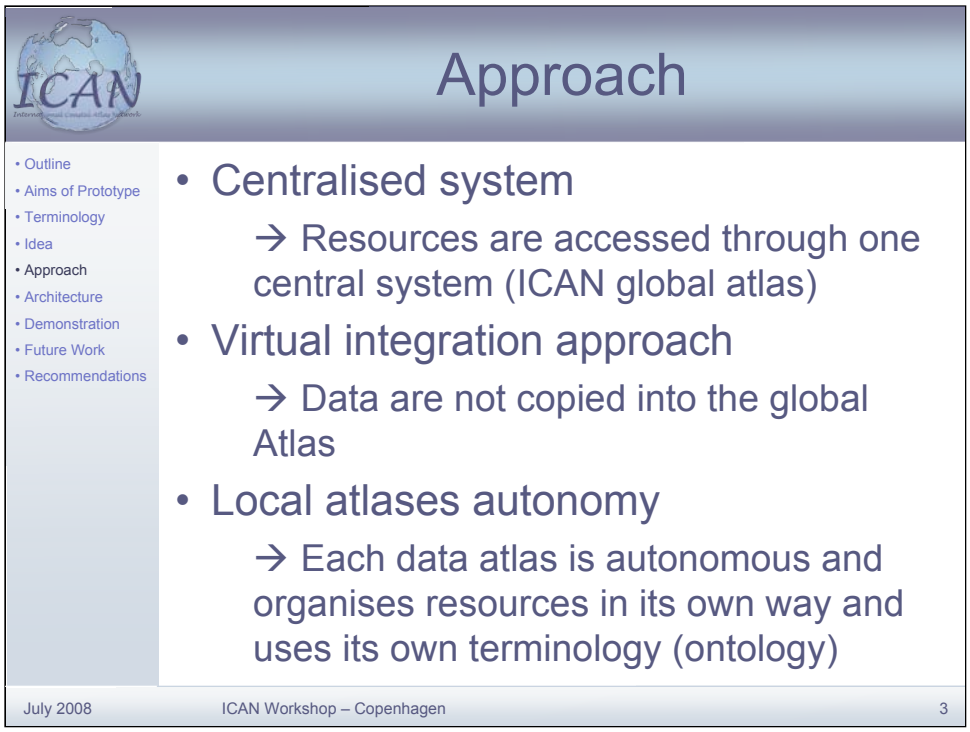
- Outline
- Aims of Prototype
- Terminology
- Idea
- Approach
- Architecture
- Demonstration
- Future Work
- Recommendations

- Connect individual coastal atlas projects to an integrated global atlas



July 2008 ICAN Workshop – Copenhagen 2

The idea of ICAN is to integrate several distributed and heterogeneous coastal atlases into one “global” coastal atlas, which is the ICAN Atlas. The term “global” does not refer to the globe, but is the term used by the Database community to refer to the integrated model or dataset (as opposed to the local models and datasets).

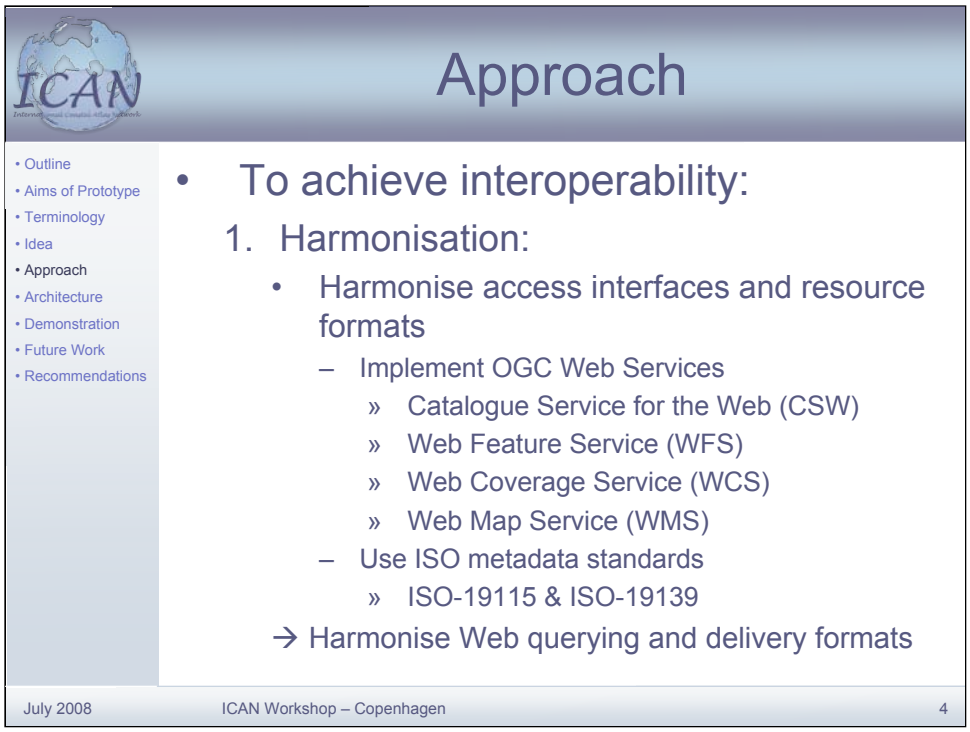


The approach relies on the following three points:

•Centralised system, which means that access to resources is through one central system which is the ICAN global atlas

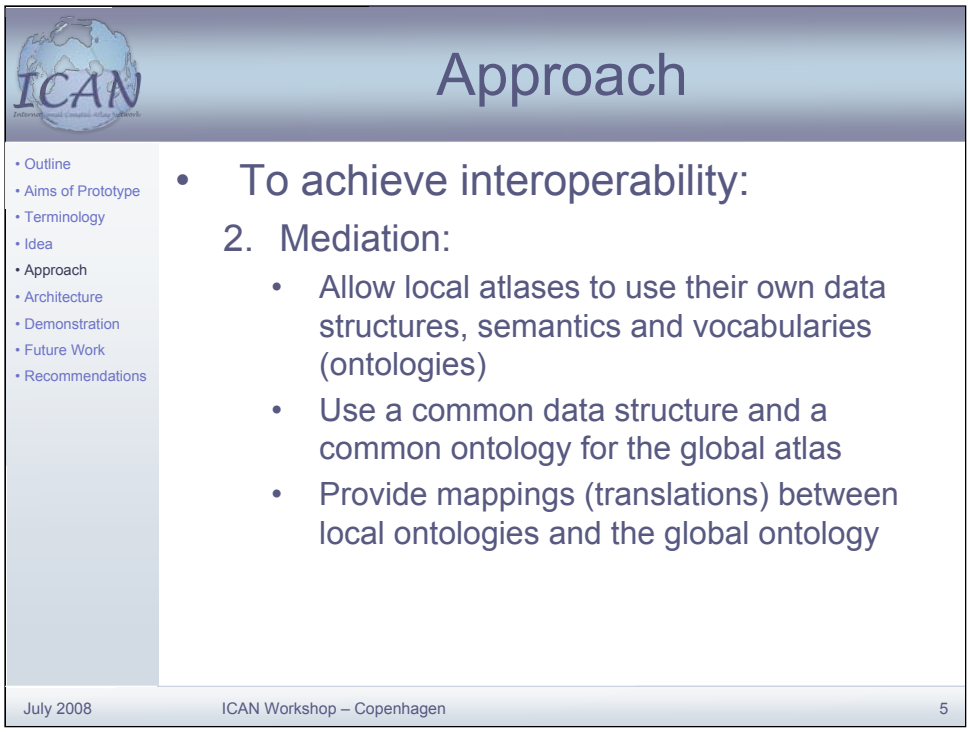
•Virtual integration approach, which means that data are not copied at the global level, they remain at their locations and responses to user queries are generated by the global atlas on the fly

•Local atlases remain autonomous, which means that their resources (and the size of their data) evolve independently from the global atlas without affecting its functioning. Also local atlases manage their resources internally independently from each other and from the global atlas, and they use different terminologies (or what we call ontologies)

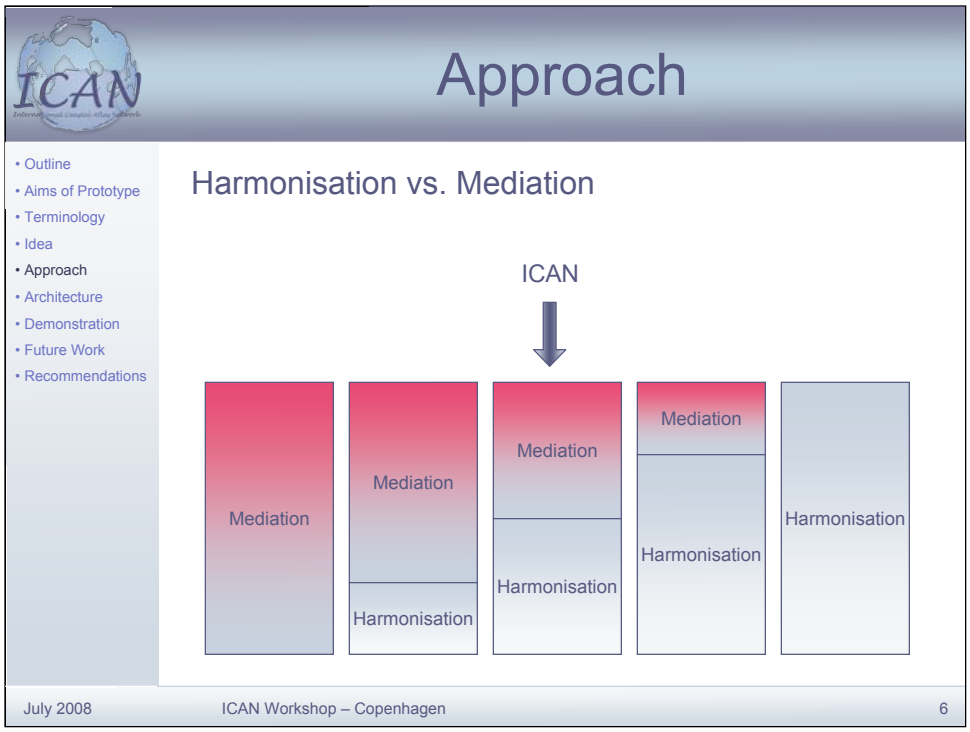


To achieve interoperability, we rely on two things:

First, Harmonisation, which means that we harmonise the access interfaces and resource and data formats among the local atlases. Harmonisation is achieved by implementing the OGC Web Services interfaces for Web querying the atlases resources. This also will guarantee that data & metadata are delivered in the same format (XML for metadata, GML for data, etc.).



Second, semantic mediation, which means that local atlases will keep on using their own data structures, semantics, languages and vocabularies. But a common data structure and a common ontology will be used at the global level and mappings between local and global structures and concepts should be provided to allow what we call mediation.



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