The ICAN Prototype

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ICAN
International Coastal Atlas Network

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Outline

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

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

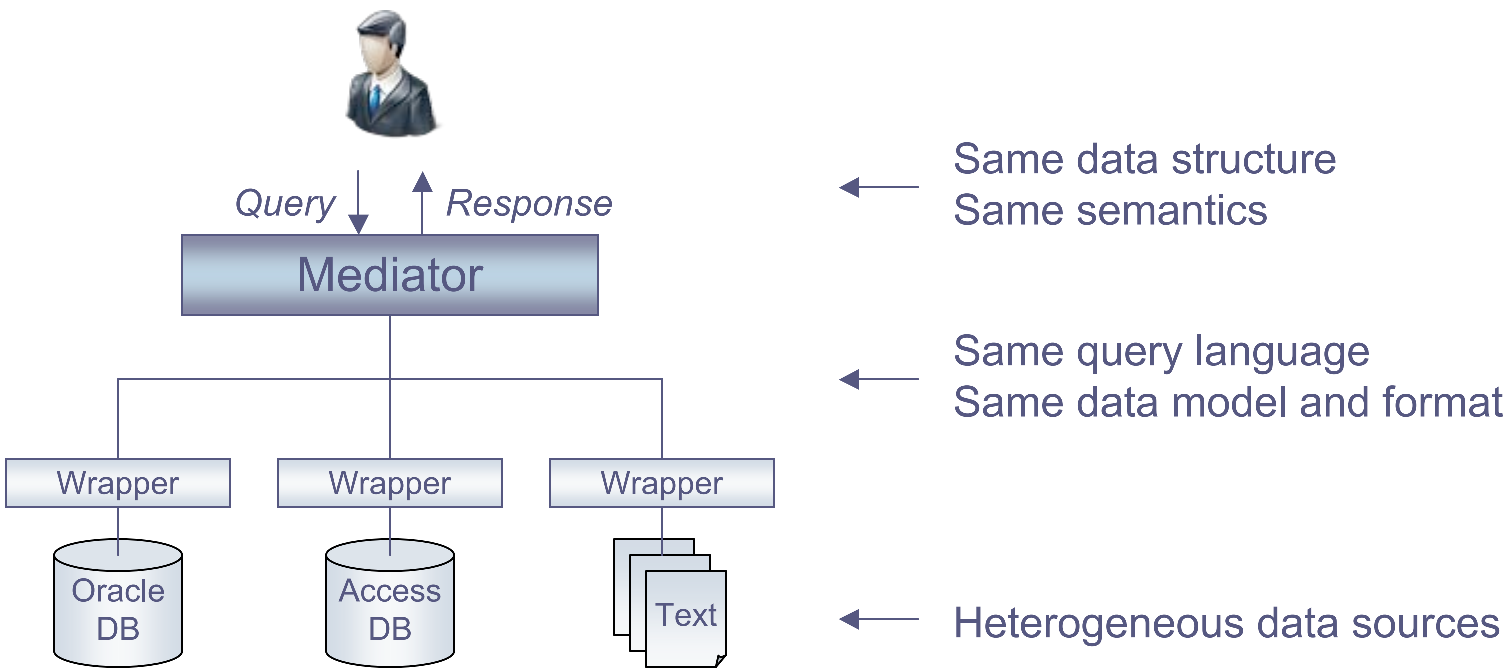
Request	Response
`Get Capabilities`	*Metadata about the types / operations the WMS supports*
`Get Map`	*Map of the requested data*
`Get Feature Info`	*Thematic information about a particular point within a map*

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



Idea

- Connect individual coastal atlas projects to an integrated global atlas

Approach

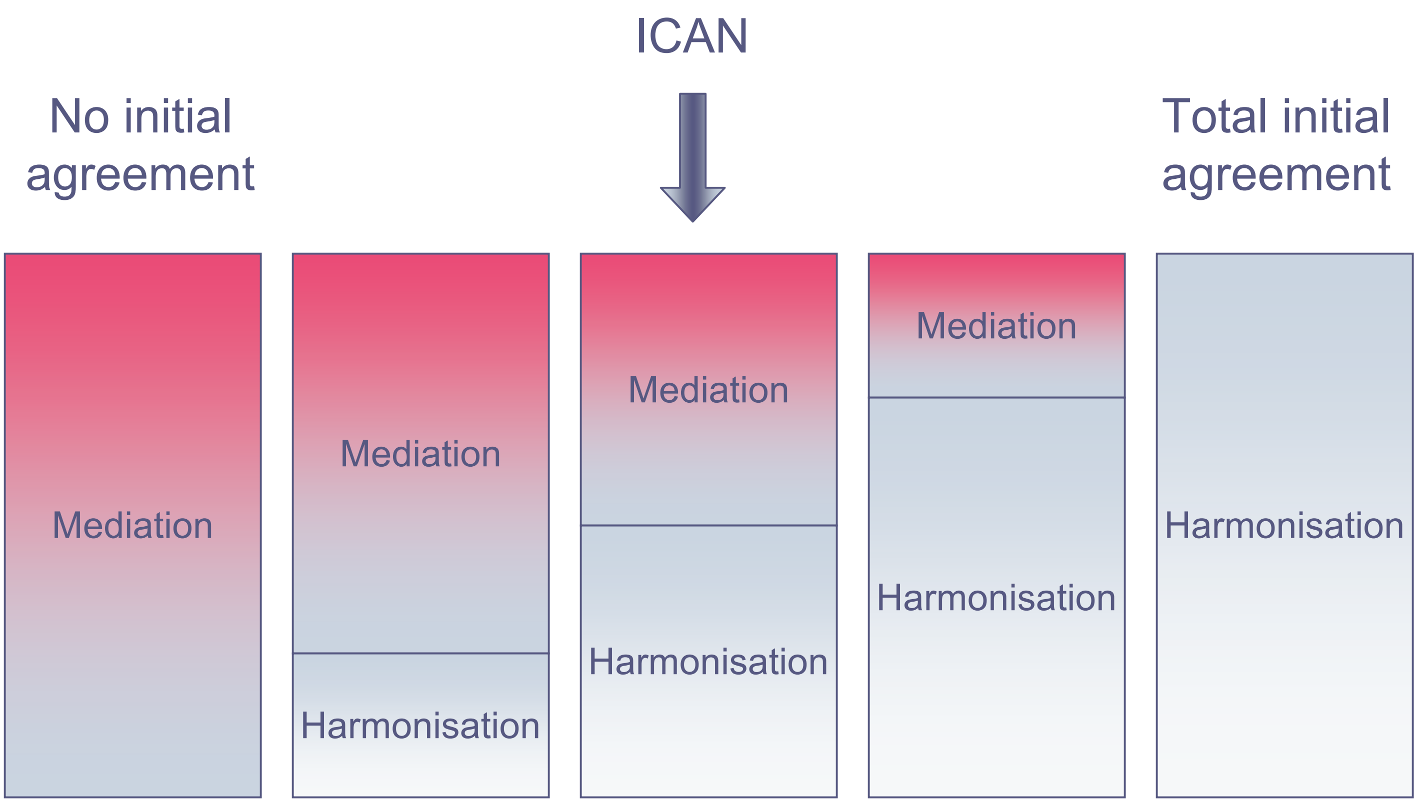
- To achieve interoperability:

Harmonisation

Mediation

Approach

Harmonisation vs. Mediation



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

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- 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

View from a Local Atlas

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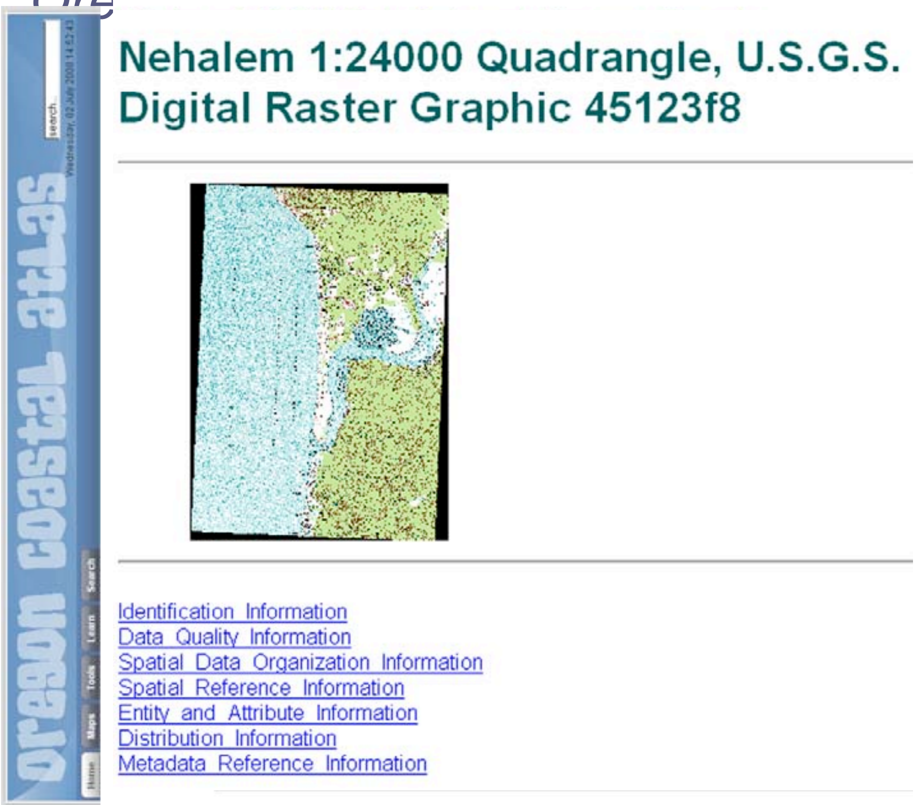
- How to connect existing local atlas resources to ICAN?
- *Ore*



View from a Local Atlas

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

Steps to a Local Ontology

- Towards a prototype:
  1. Each atlas must organize a local ontology
     - **Create master list of keyword vocabulary from existing metadata**

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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	
FEMA Q3 Flood Data, Clatsop County, OR 1996	1996	FEMA	24,000	
Clatsop Spit 1:24000 U.S.G.S. Digital Orthophoto Quadrangle 46124b1, 1994	1994	USGS	24,000	
Clatsop Spit 1:24000 Quadrangle, U.S.G.S. Digital Raster Graphic 46124b1	1985	USGS	24,000	
Clatsop Plains 187x Shoreline: Gearhardt to Fort Stevens	1870	DOGAMI	24,000	
Clatsop Plains 1926 Shoreline: Gearhardt to Fort Stevens	1926	DOGAMI	24,000	
Clatsop Plains 195x Shoreline: Gearhardt to Fort Stevens	1950	DOGAMI	24,000	
Clatsop Plains 1995 Shoreline: Gearhardt to Fort Stevens	1995	DOGAMI	24,000	
Clatsop Plains 1997 Shoreline: Gearhardt to Fort Stevens	1997	DOGAMI	24,000	
Clatsop Plains 1998 Shoreline: Gearhardt to Fort Stevens	1998	DOGAMI	24,000	
Clatsop Plains 1999 Shoreline: Gearhardt to Fort Stevens	1999	DOGAMI	24,000	
Clatsop Plains Active Hazard Zone, 2001	2001	DOGAMI	24,000	
Clatsop Plains Low Dune Hazard Zone, 2001	2001	DOGAMI	24,000	
Clatsop Plains Moderate Dune Hazard Zone, 2001	2001	DOGAMI	24,000	
Clatsop Plains High Dune Hazard Zone, 2001	2001	DOGAMI	24,000	

Steps to a Local Ontology

- Towards a prototype:
  1. Each atlas must organize a local ontology
     - Create master list of keyword vocabulary from existing metadata
     - **Sort keywords into 5 lists corresponding to ISO keyword types**
       - » **Discipline**
       - » **Place**
       - » **Stratum**
       - » **Temporal**
       - » **Theme**

Steps to a Local Ontology

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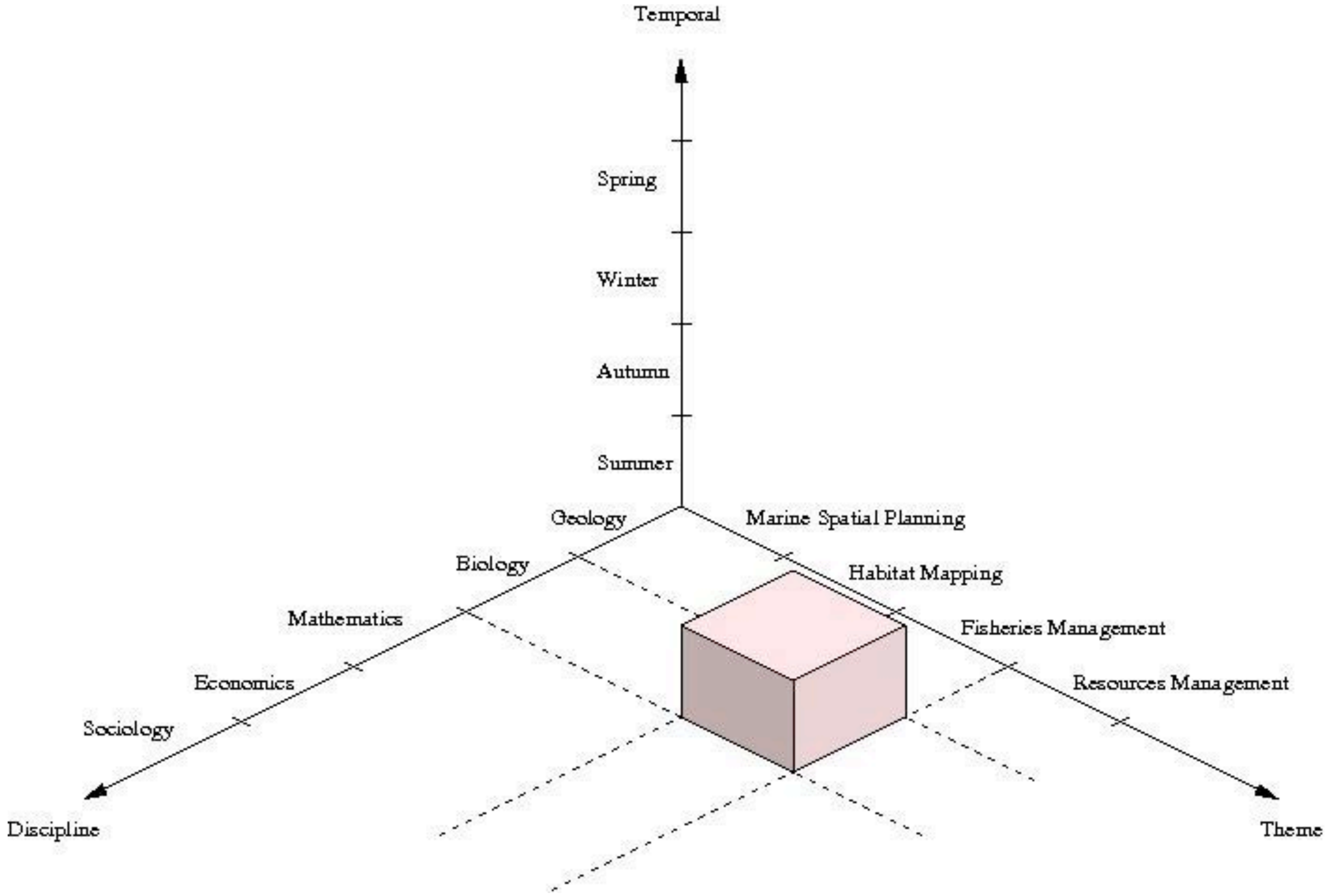

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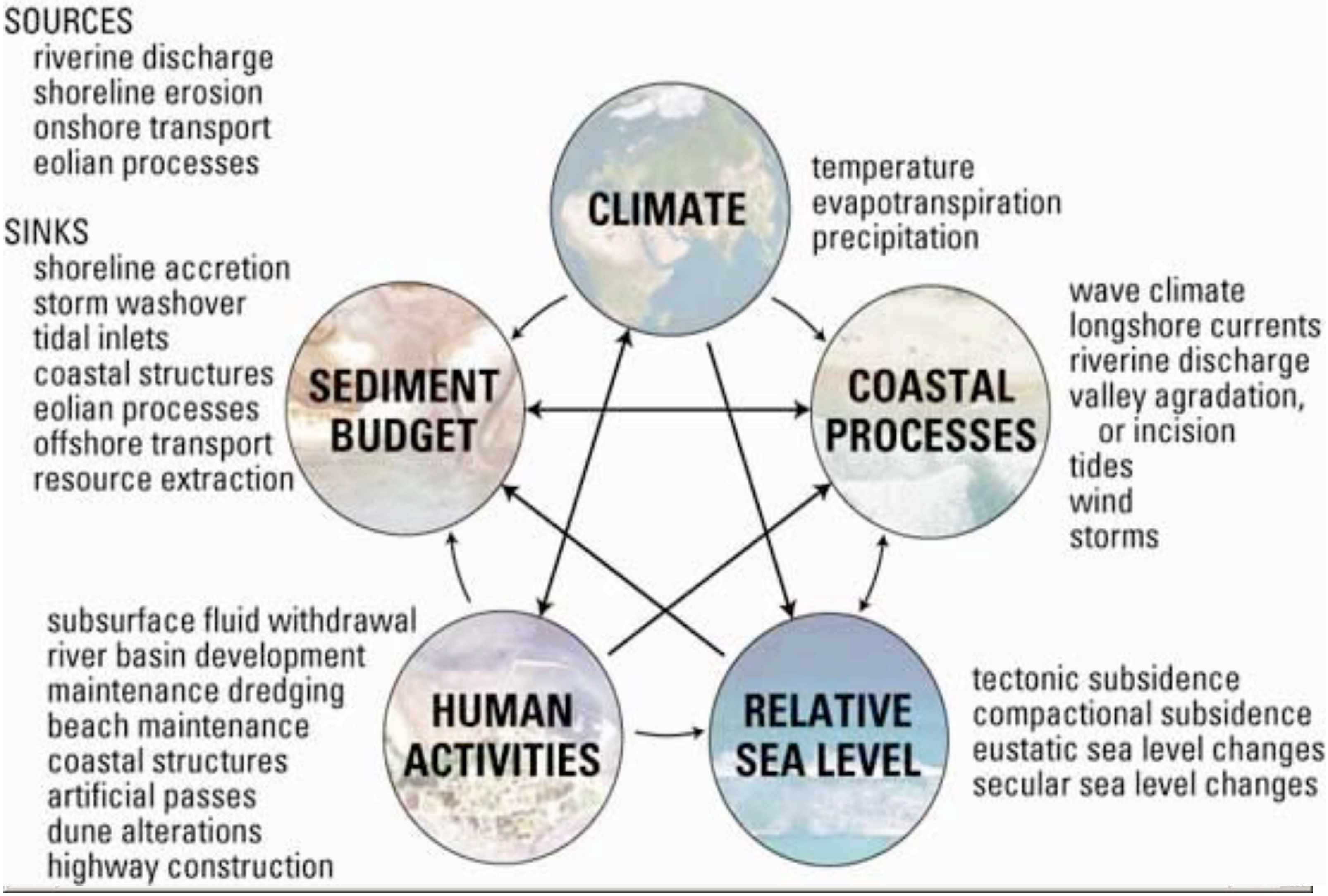

Steps to a Local Ontology

- Towards a prototype:
  1. Each atlas must organize a local ontology
     - Create master list of keyword vocabulary from existing metadata
     - Sort keywords into 5 lists corresponding to ISO keyword types
       - » Discipline
       - » Place
       - » Stratum
       - » Temporal
       - » Theme
     - **For each keyword type, organize the list into Classes and Sub-Classes**

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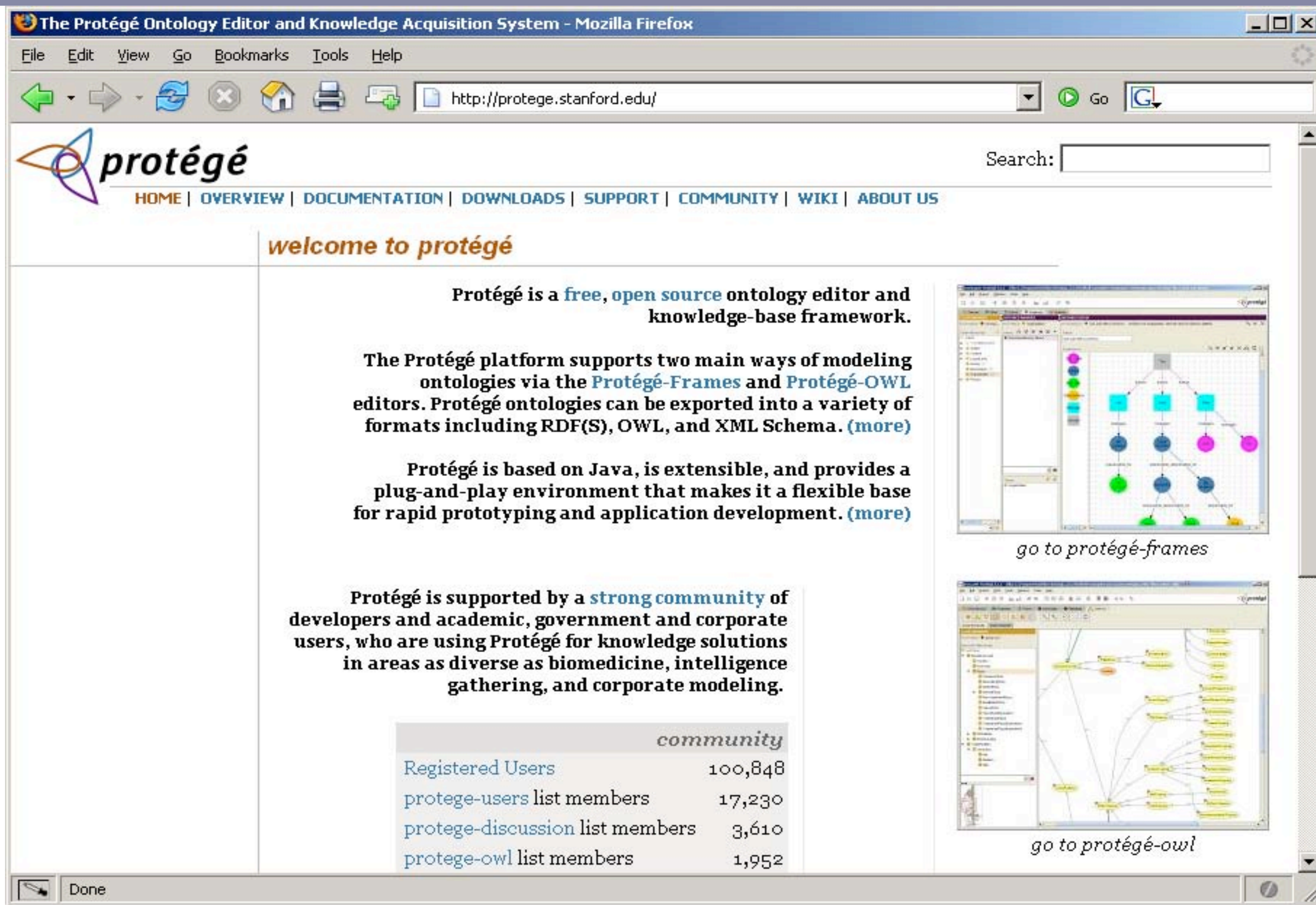

Steps to a Local Ontology

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- Theme
  - Biological
    - Fauna
    - Flora
    - Habitat
  - Human
    - Boundaries
    - Economy
    - Infrastructure
    - Management
    - Safety
    - Society
  - Physical
    - Atmosphere
    - Elevation
    - Geophysical
    - Hydrography

Steps to a Local Ontology

- Towards a prototype:

1. Each atlas must organize a local ontology
   - Create master list of keyword vocabulary from existing metadata
   - Sort keywords into 5 lists corresponding to ISO keyword types
     - » Discipline
     - » Place
     - » Stratum
     - » Temporal
     - » Theme
   - For each keyword type, organize the list into Classes and Sub-Classes
   - **Map the terms in this local ontology to relevant terms in the agreed global ontology**

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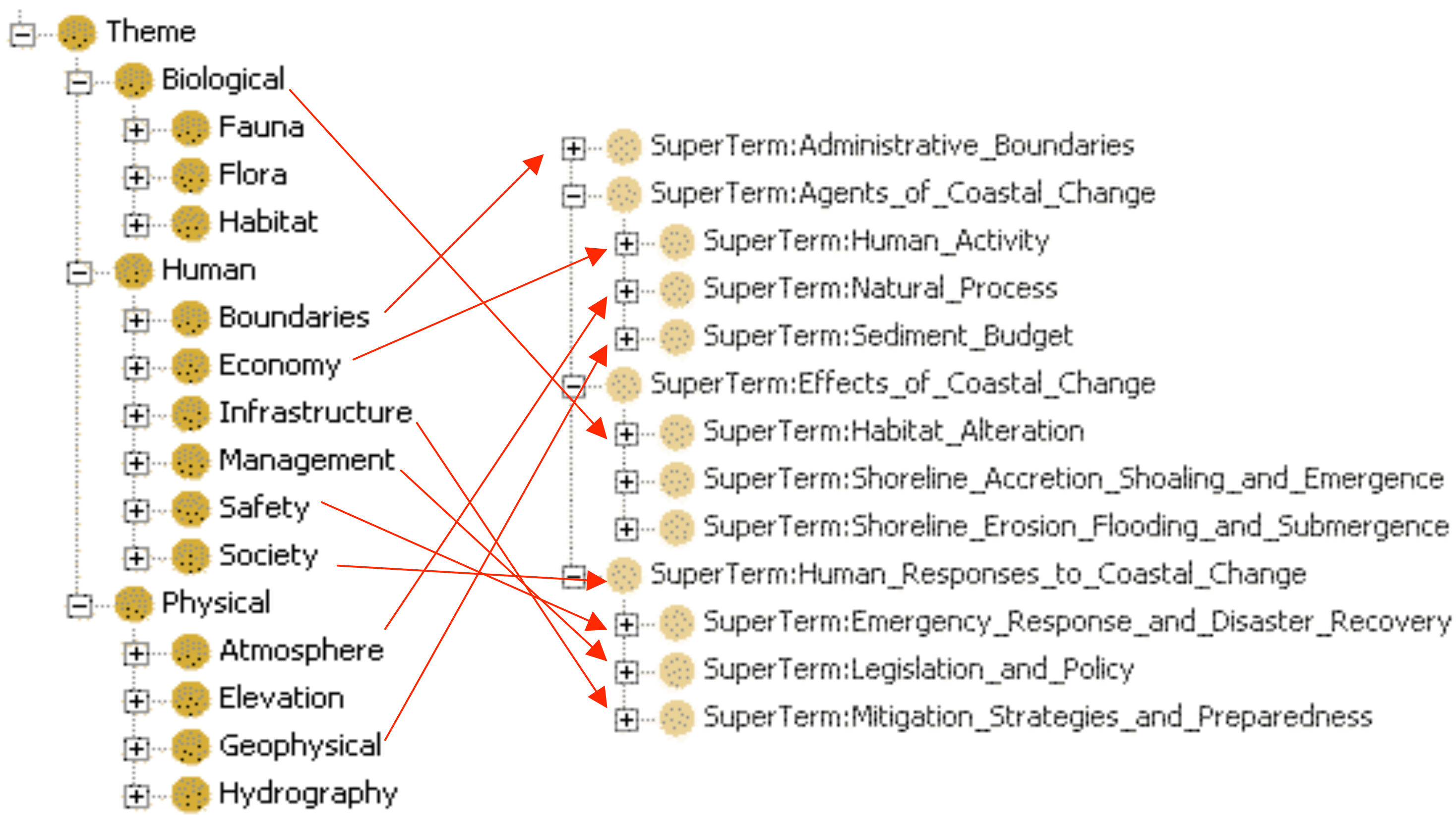

Architecture

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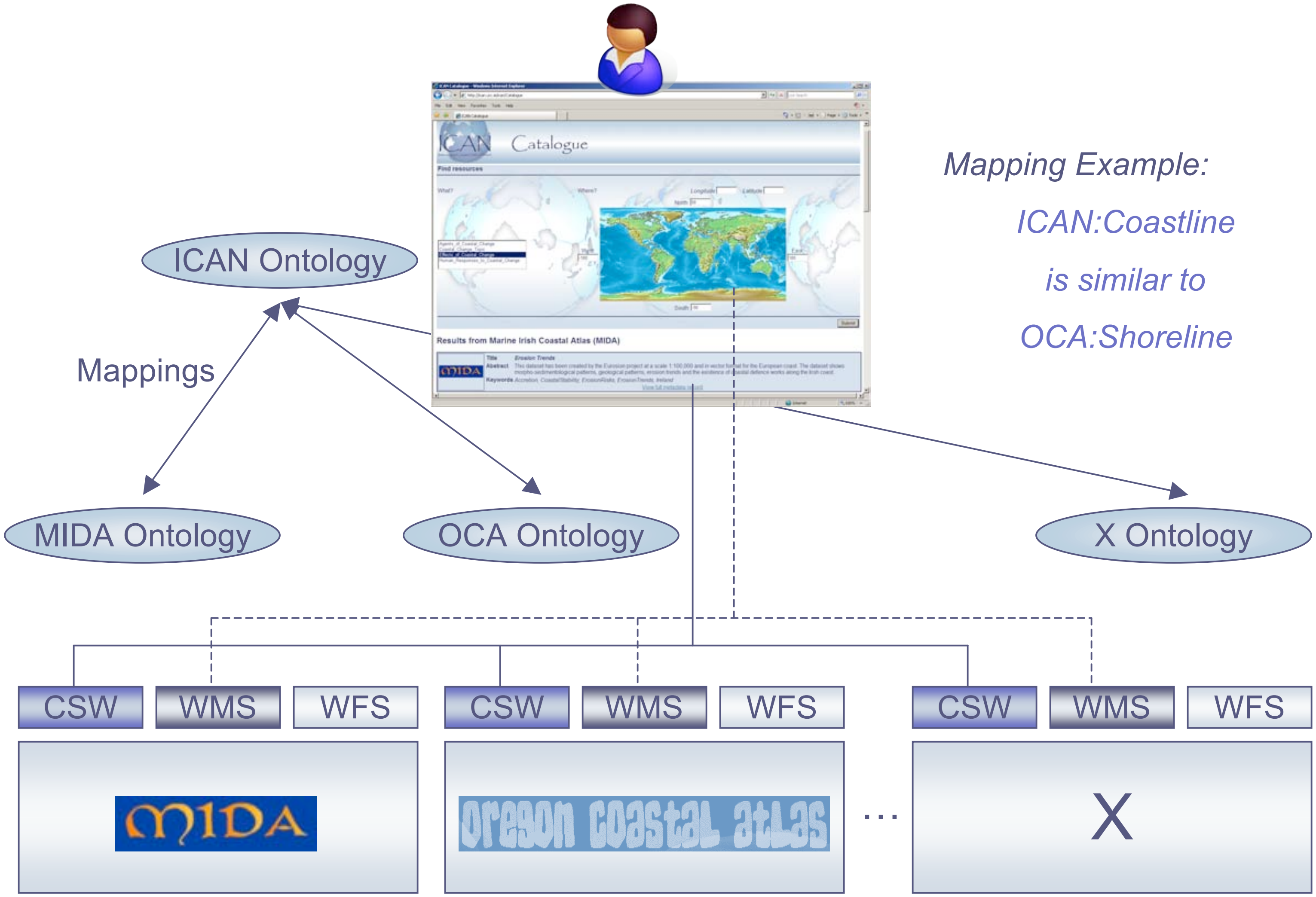

Mapping Example:

ICAN:Coastline

is similar to

OCA:Shoreline

Demonstration

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http://ican.ucc.ie

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

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- 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.)

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Thank You

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