From Vocabularies to Ontologies

A working group session to discuss how a semantic approach could be useful for the discover, search, interoperability and analysis of biological data.

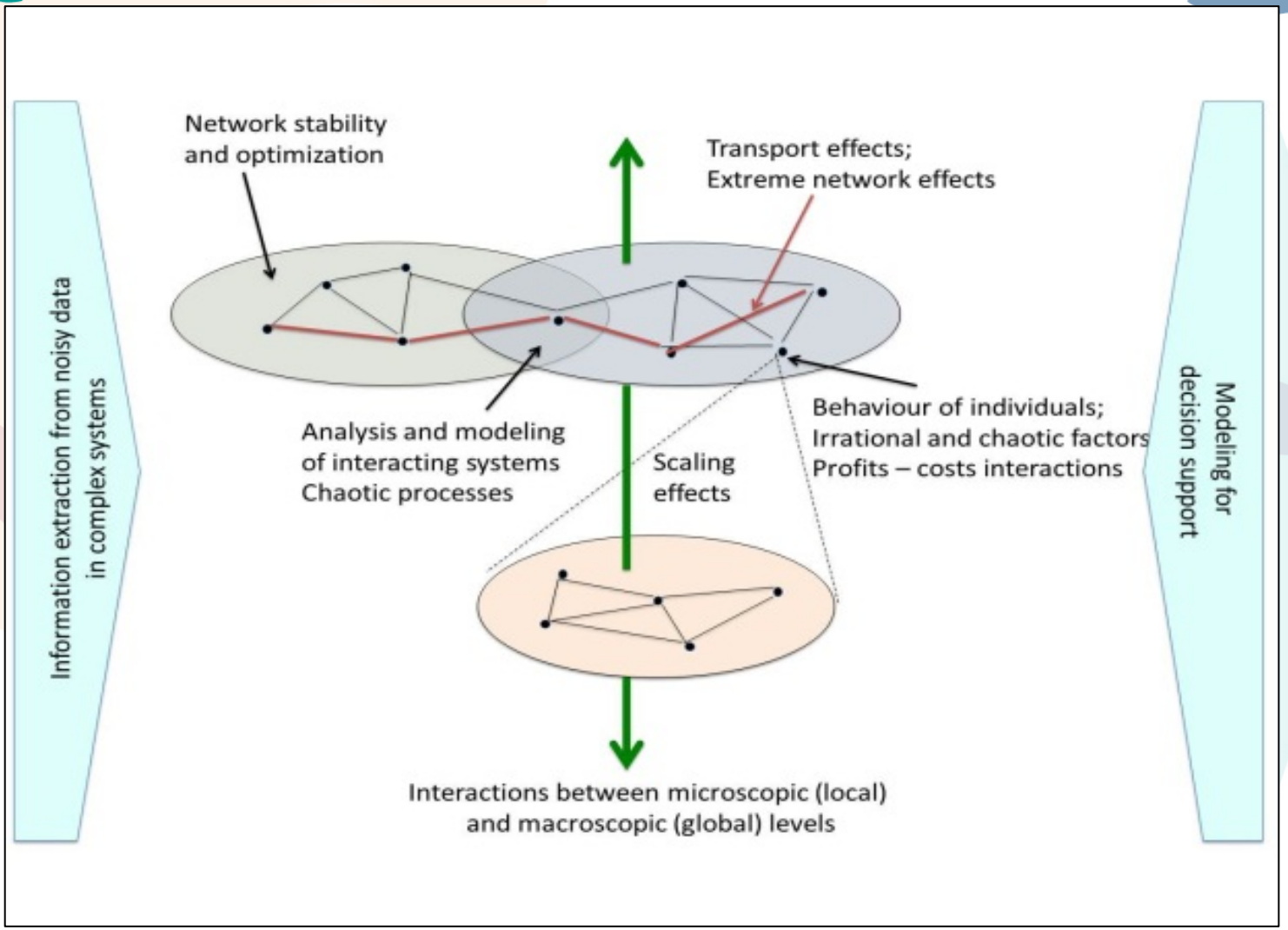
Nicola Fiore

University of Salento

Lifewatch Service Centre

Topics

- Ontologies for Biodiversity Research: State of the art
  - OBOE
  - SERONTO
  - O&M Lite
  - CIDOC CRM Extensions (CRMSci, CRMgeo, MarineTLO)
  - ….
  - Ontologies Interoperability ???
- Goals:
  - data discovery and integration
  - data quality ?
  - data analisys ?
- Use Cases
  - Phytoplankton
- Technologies & Tools



Scheme to cover multidimensional biodiversity challenges. (Source: Wouter Los.)

LifeWatch
e-Science European Infrastructure
for Biodiversity and Ecosystem Research

Background

A more flexible and powerful tool to capture the semantic means of complex ecological data, its structure and contents, and the interrelationships among data variables is needed

LifeWatch ITALIA

LifeWatch
e-Science European Infrastructure
for Biodiversity and Ecosystem Research

Background

Different ontology-based descriptions of ecological and environmental information has been proposed in the last years (e.g. OBOE, SERONTO, etc.)

The general goals was on providing:

- a robust framework for describing generic scientific observations;
- a structured approach for easily building and sharing domain specific ontology extensions; and
- data discovery and integration services, via semantic annotations to the ontology, **across varied ecological observation data** (and not just for a specific, specialized domain)

LifeWatch ITALIA

LifeWatch
e-Science European Infrastructure
for Biodiversity and Ecosystem Research

Background

All the proposals was with the following short term perspective:

- Common model on how ecological and socio-ecological observations can be structured for data management
- Agreed common representation on observations across different domains
- Agreed common key domain concepts (common knowledge space)

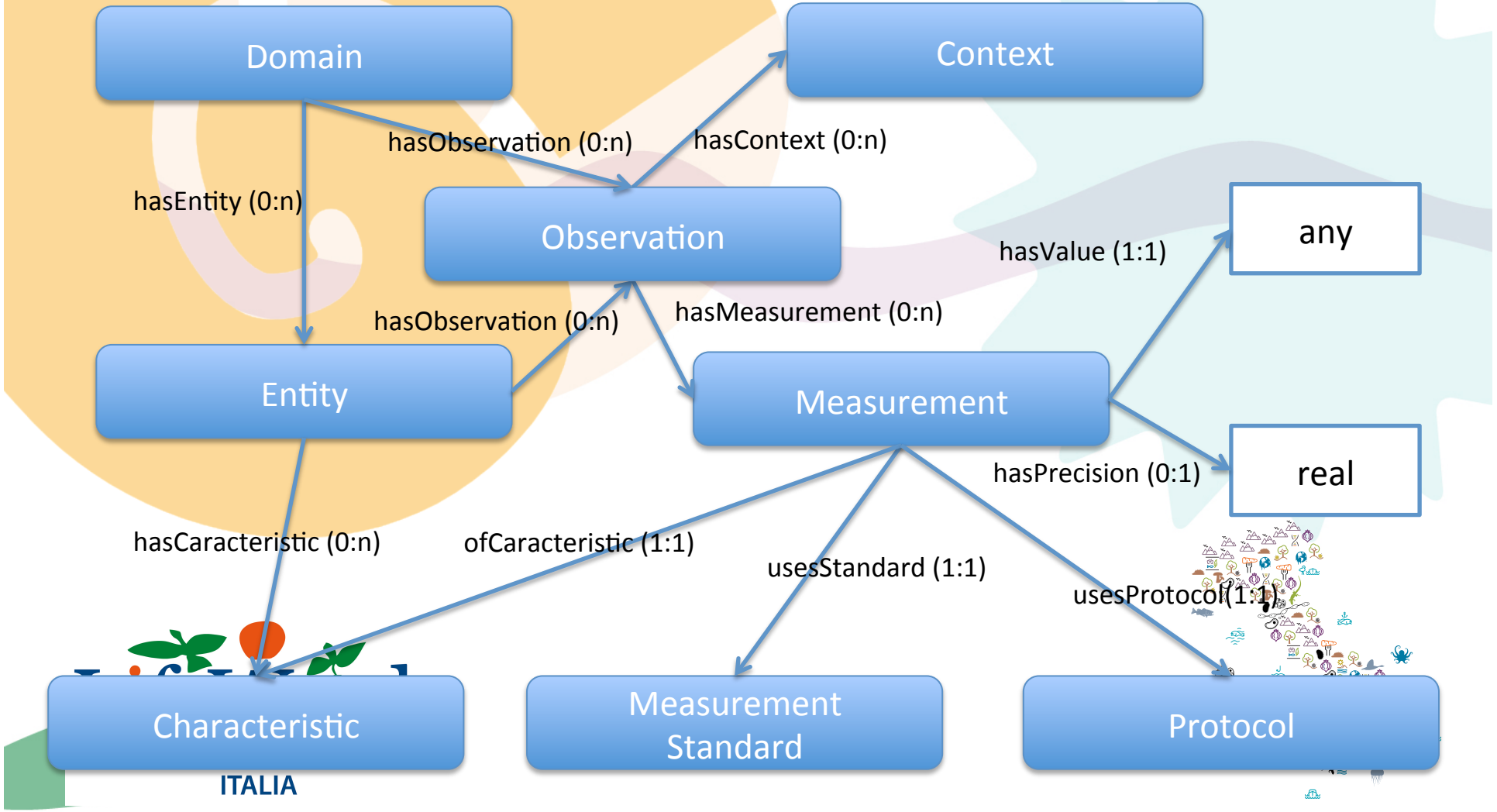
And the Mid-to long term perspective:

- Integrative data model for seamless data access and querying across multiple institutions and diverse data types (tested, mid-to long term perspective)

LifeWatch ITALIA

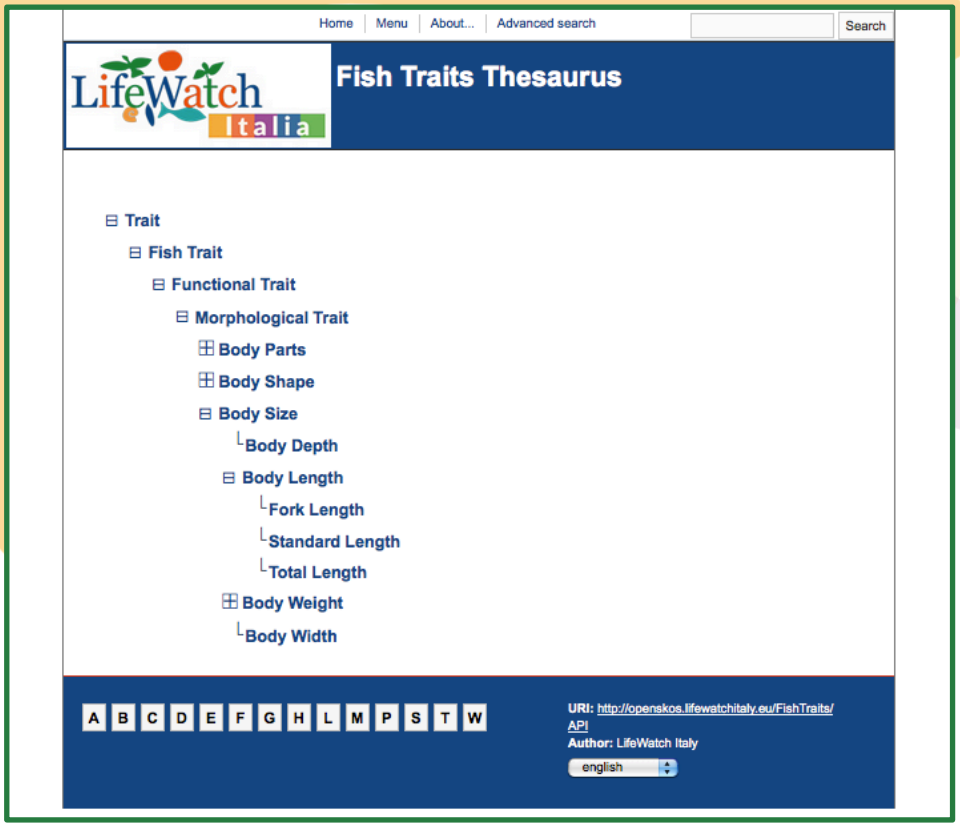
LifeWatch
e-Science European Infrastructure
for Biodiversity and Ecosystem Research

LW Model Core Ontology



LifeWatch
e-Science European Infrastructure
for Biodiversity and Ecosystem Research

Thesauri



Phytoplankton Traits Thesaurus

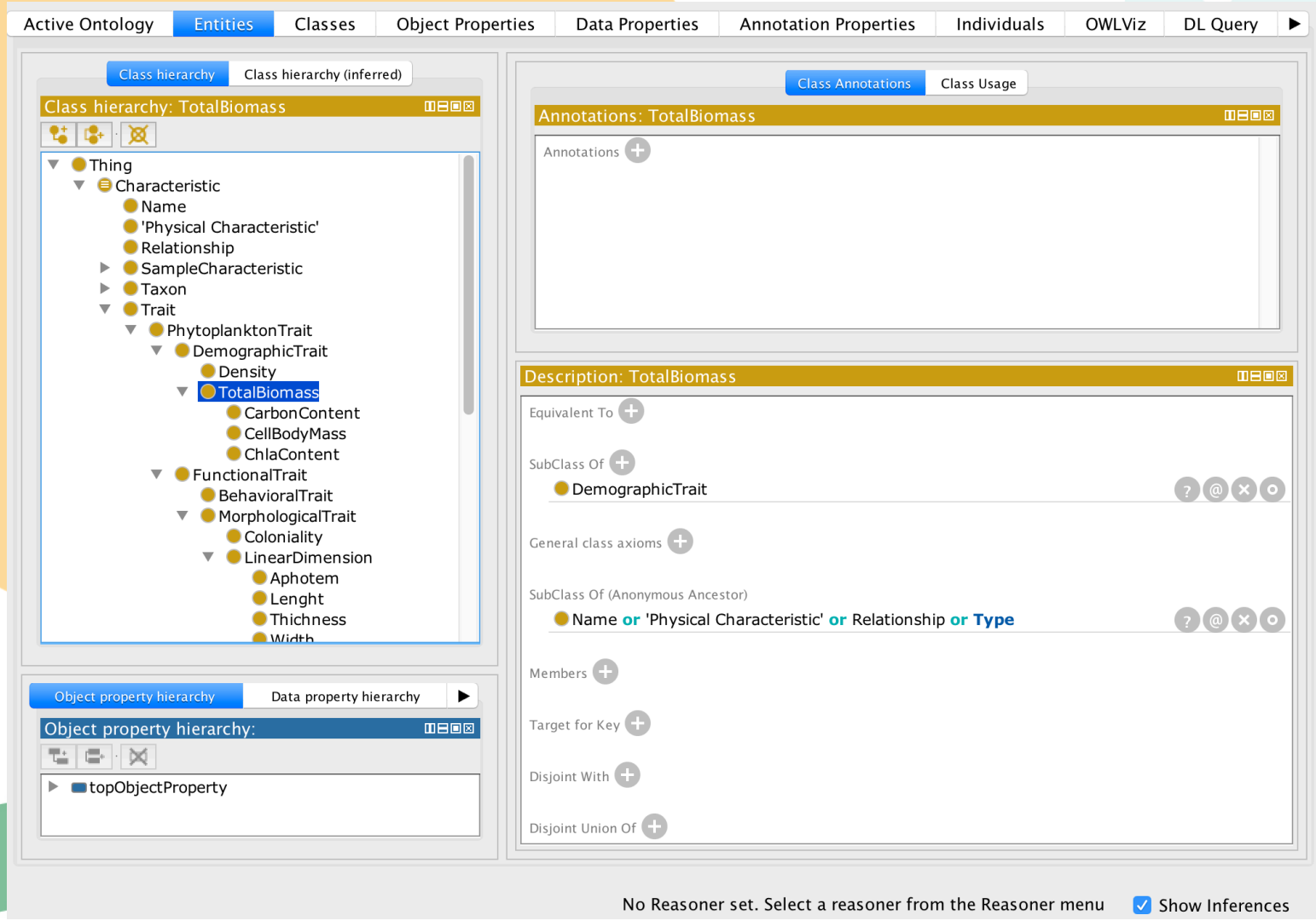
- More than 100 functional traits of phytoplancton
- Mostly morphological traits
- SKOS thesaurus: stable reference resource
- Available online :

http://thesauri.lifewatchitaly.eu/PhytoTraits/

LifeWatch ITALIA

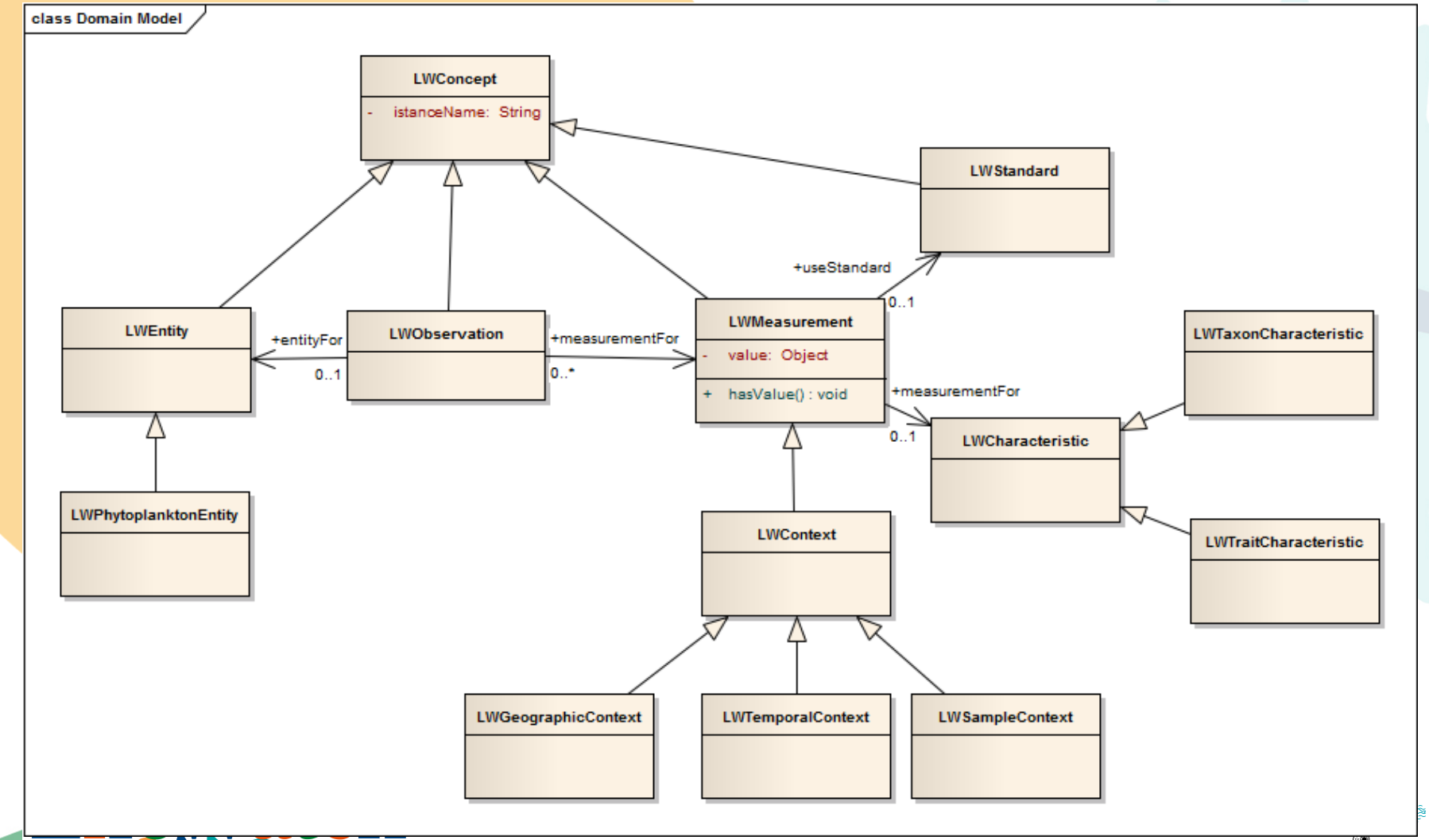
LifeWatch
e-Science European Infrastructure
for Biodiversity and Ecosystem Research

LW Model Core Ontology



LifeWatch
e-Science European Infrastructure
for Biodiversity and Ecosystem Research

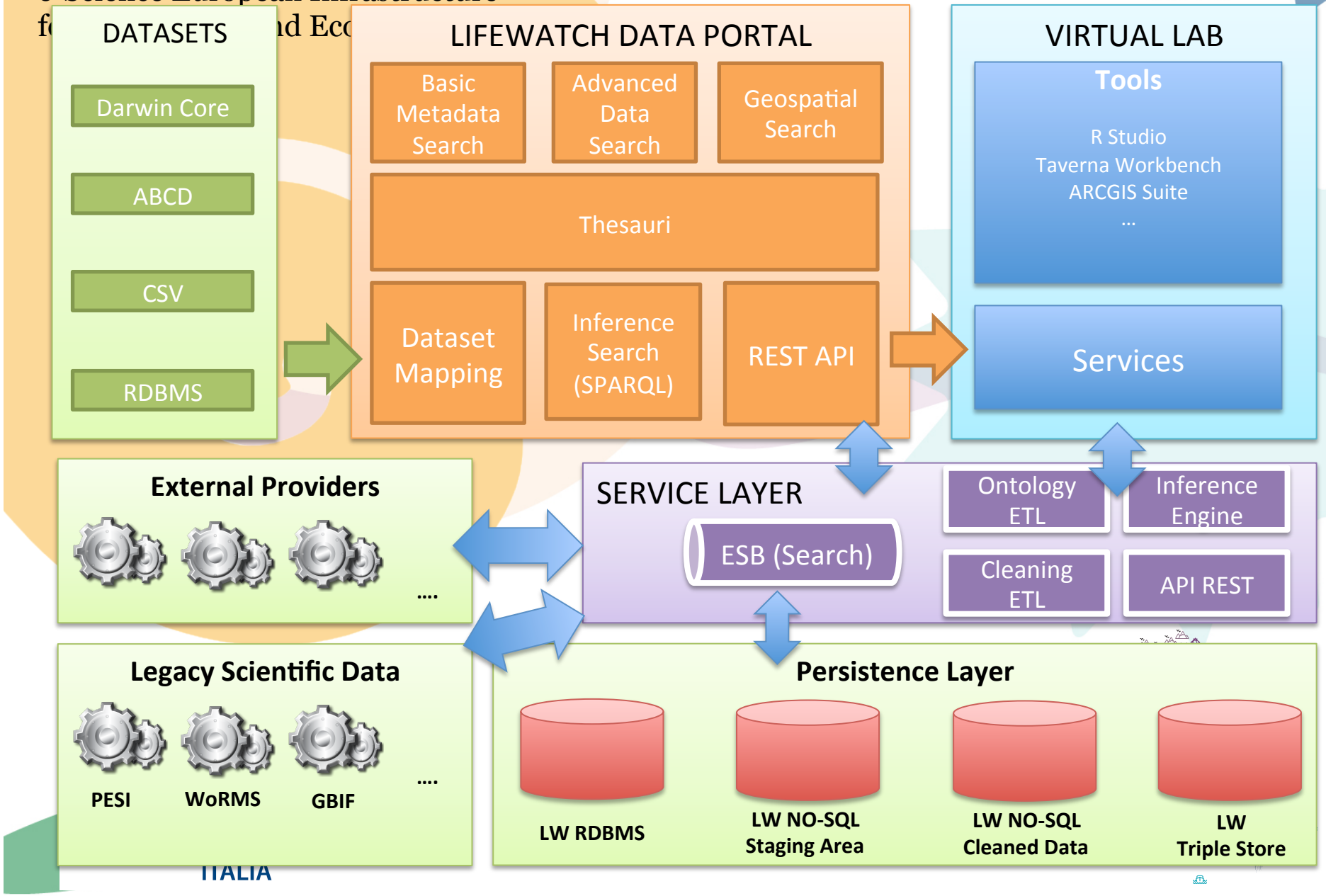
LifeWatch Model Class Diagram
CORE ONTOLOGY



ITALIA

LifeWatch
e-Science European Infrastructure
f… …d Ec…

LifeWatch DATA PORTAL Architecture



ITALIA

LifeWatch
e-Science European Infrastructure
for Biodiversity and Ecosystem Research

SPARQL END-POINT

Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IRI)

Query Text

```
                        ?subject oboe:ofCharacteristic lw:width .
                        ?subject lw:hasMeasurement ?measurement
                        {
                                SELECT ?lenghtValue as ?lenghtValue ?measurement
                                FROM <http://web13.linksmt.it#>
                                WHERE{
                                         ?subject2 lw:hasValue ?lenghtValue .
                                         ?subject2 oboe:ofCharacteristic lw:length .
                                         ?subject2 lw:hasMeasurement ?measurement
                                        }
                        }
                        BIND(REPLACE(IF((?widthValue >?lenghtValue), ?widthValue, ?lenghtValue),",",".") as ?mld)
                        FILTER(xsd:float(?mld)<=7)
                        }
        }
}
```

Sponging: Use only local data (including data retrieved before), but do not retrieve more

Results Format: HTML

Execution timeout: 0 milliseconds *(values less than 1000 are ignored)*

Options: Strict checking of void variables

(The result can only be sent back to browser, not saved on the server, see details)

Run Query Reset

ITALIA

LifeWatch
e-Science European Infrastructure
for Biodiversity and Ecosystem Research

Showcase Phytoplankton Traits

Which is the most oligotrophic ecosystem?

The ecosystem is oligotrophic is the phytoplankton is small.
(i.e. % of small organisms > 50%)

e.g.:
if **MLD < 20** micron the phytoplankton is small
if **MLD > 50** micron the phytoplankton is big.

Which is the percentage (%) of small organisms?

LifeWatch ITALIA

Biodiversity is life

Biodiversity is our life

USE CASE : PHYTOPLANKTON «TEST DIFFERENT ONTOLOGY MODELS»

PROVIDING DATA (Along with METADATA)

DEFINE QUESTIONS

MAPPING WITH : O&M, CRM EXT, LW ITA

WORKING GROUPS INVOLVED: LW ITA, BODC, LW GREECE, LTER, CEH

TIMELINE: 27° JUNE 2016

WORKING GROUP SPACE on LW COMMUNITY - MAILING LIST