Semantic Infrastructure and Platforms for Geospatial Services: A report from European Projects

4th International Workshop on Semantic and Conceptual Issues in GIS (SeCoGIS 2010)

Vancouver, Canada

November 1st, 2010

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Content

- ISO/TC211 19101, 19103, 19119 – OGC Ref.Architecture
- European projects (1): Orchestra, SANY
- Focus on Semantic technologies
- European projects (2): SWING, ENVISION
- European projects (3): Objective 6.4 projects
- ENVIP projects – objective 6 list
- TATOO, REMICS, …
- Future work – harmonisation/integration … standards ?

Relevant European projects

Orchestra - Open Architecture and Spatial Data

Sany -Sensors Anywhere

SWING -**S**emantic **W**eb Services **IN**teroperability in **G**eospatial decision making

ENVISION -ENVIronmental Services Infrastructure with Ontologies

NETMAR - Open service network for marine environmental data

OEPI - Exploring and Monitoring Any Organisation's Environmental Performance Indicators

PESCADO - Personalized Environmental Service Configuration and Delivery Orchestration

SUDPLAN - Sustainable Urban Development Planner for Climate Change Adaptation

TATOO - Tagging Tool based on a Semantic Discovery Framework

UncertWeb - The Uncertainty Enabled Model Web

UrbanFlood - Building an Early Warning System Framework for European Cities

GENESIS -GENeric European Sustainable Information Space for environment

ICT-ENSURE - ICT for Environmental Sustainability Research

GIGAS - GEOSS INSPIRE and GMES an Action in Support

REMICS: Migration to Cloud services – with Model Driven Service Interoperability

Web sites and Project references

- ISO/TC211: http://www.isotc211.org/
- OGC: http://www.opengeospatial.org/

- ORCHESTRA: http://www.eu-orchestra.org/
- SANY: http://www.sany-ip.eu/
- SANY book: http://sany-ip.eu/publications/3317
- SERVUS (PhD- Usländer, 2010):
- http://digbib.ubka.uni-karlsruhe.de/volltexte/1000016721

- SWING: http://138.232.65.156/swing
- ENVISION: http://www.envision-project.eu/
- ENVIP projects: http://ifgi.uni-muenster.de/~pajoma/persistent/ENVIP10/

The goal of ISO/TC 211...

... is to develop a family of international standards (using a conceptual modeling approach) that will

- support the understanding and usage of geographic information
- increase the availability, access, integration, and sharing of geographic information, enable inter-operability of geospatially enabled computer systems
- contribute to a unified approach to addressing global ecological and humanitarian problems
- ease the establishment of geospatial infrastructures on local, regional and global level
- contribute to sustainable development

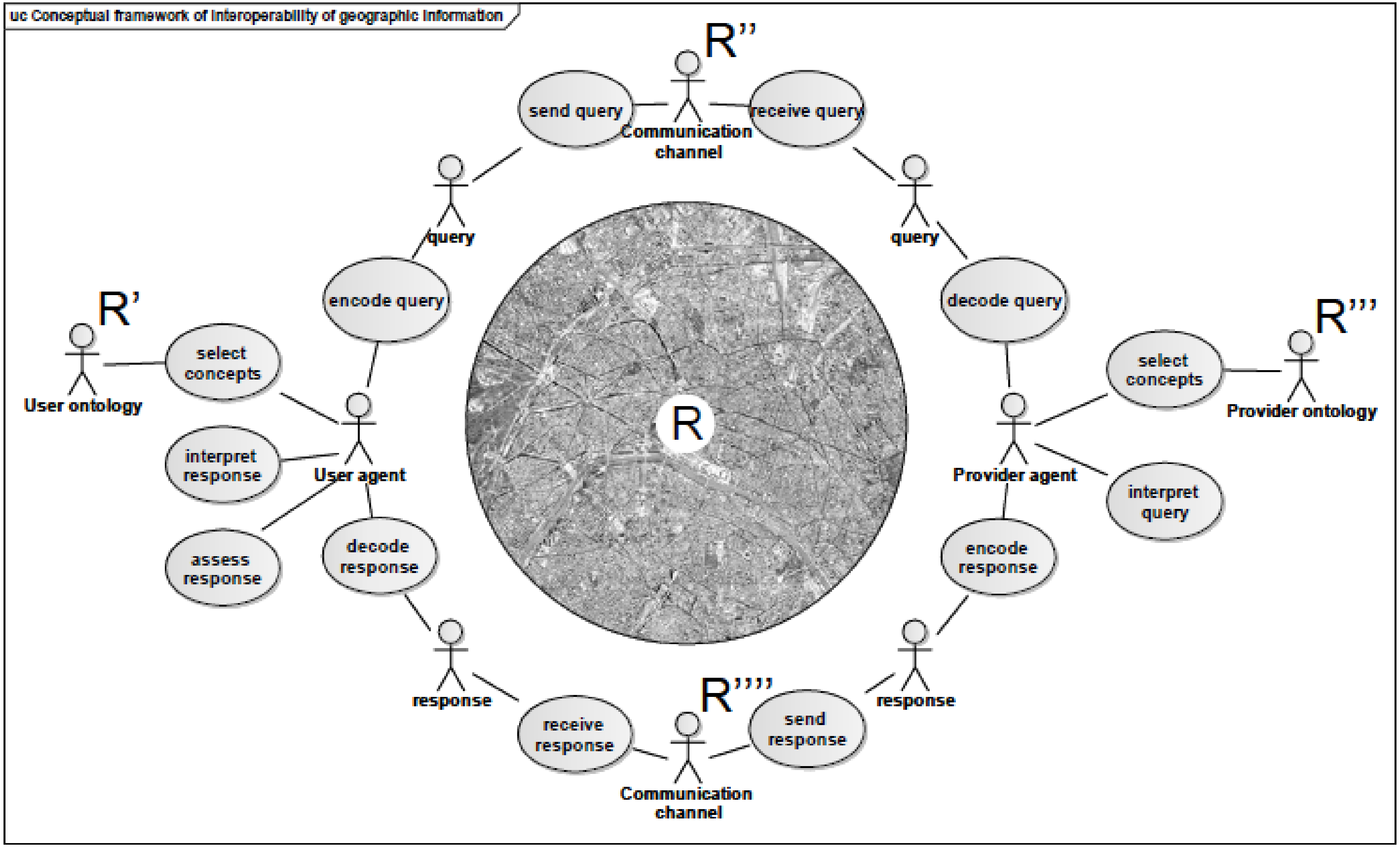
ISO/TC 211 Publicatons (1)

- **ISO 6709:2008 – Standard representation of geographic point location by coordinates**
- **ISO 19101:2002 – Reference model** (under revision)
- **ISO 19101-2:2008 – Reference model – Part 2: Imagery**
- **ISO/TS 19103:2005 – Conceptual schema language** (under revision)
- **ISO/TS 19104:2008 – Terminology**
- **ISO 19105:2000 – Conformance and testing**
- **ISO 19106:2004 – Profiles**
- **ISO 19107:2003 – Spatial schema**
- **ISO 19108:2002 – Temporal schema**
- **ISO 19109:2005 – Rules for application schema**
- **ISO 19110:2005 – Feature cataloguing methodology**
- **ISO 19111:2007 – Spatial referencing by coordinates**
- **ISO 19111-2:2009 – Spatial referencing by coordinates – Part 2: Extension for parametric values**
- **ISO 19112:2003 – Spatial referencing by geographic identifiers**
- **ISO 19113:2003 – Quality principles** (under revision)
- **ISO 19114:2003 – Quality evaluation procedures** (under revision)
- **ISO 19115:2003 – Metadata** (under revision)
- **ISO 19115-2:2008 – Metadata – Part 2: Extensions for imagery and gridded data**
- **ISO 19116:2004 – Positioning services**
- **ISO 19117:2005 – Portrayal** (under revision)
- **ISO 19118:2005 – Encoding** (under revision)

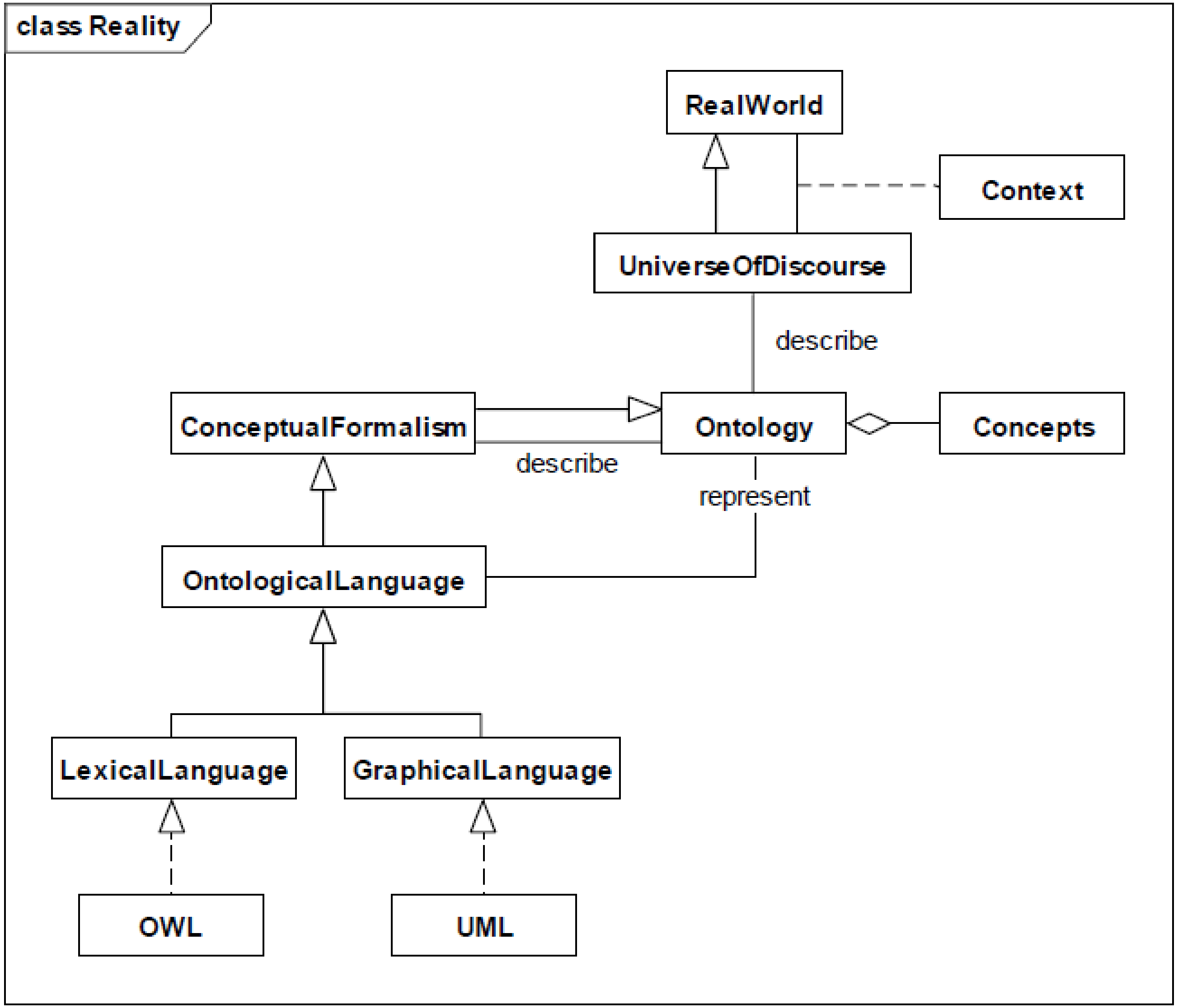
ISO/TC 211 Publications (2)

- **ISO 19119:2005 – Services**
- **ISO/TR 19120:2001 – Functional standards**
- **ISO/TR 19121:2000 – Imagery and gridded data**
- **ISO/TR 19122:2004 – Qualification and certification of personnel**
- **ISO 19123:2005 – Schema for coverage geometry and functions**
- **ISO 19125-1:2004 – Simple feature access – Part 1: Common architecture** (under revision)
- **ISO 19125-2:2004 – Simple feature access – Part 2: SQL Option** (under revision)
- **ISO/TS 19127:2005 – Geodetic codes and parameters**
- **ISO 19128:2005 – Web Map Server Interface**
- **ISO/TS 19129:2009 – Imagery, gridded and coverage data framework**
- **ISO 19131:2007 – Data product specification**
- **ISO 19132:2007 – Location-based services – Reference model**
- **ISO 19133:2005 – Location-based services – Tracking and navigation**
- **ISO 19134:2007 – Location-based services – Multimodal routing and navigation**
- **ISO 19135:2005 – Procedures for item registration**
- **ISO 19136:2007 – Geography Markup Language (GML)**
- **ISO 19137:2007 – Core profile of the spatial schema**
- **ISO/TS 19138:2006 – Data quality measures** (under revision)
- **ISO/TS 19139:2007 – Metadata – Implementation specification**
- **ISO 19141:2008 – Schema for moving features**
- **ISO 19144-1:2009 – Classification systems – Part 1: Classification system structure**

ISO 19101 (revised version, 2010)



19101 – Use of conceptual modeling



Reference model conceptual framework for the ISO geographic information standards

Reference model conceptual framework			
Level/Foundation	**Semantic foundation**	**Syntactic foundation**	**Processing and service foundation**
Meta-meta	Meta-meta:Semantic	Meta-meta:Syntactic	Meta-meta: ProcessingAndService
Meta	Meta:Semantic	Meta:Syntactic	Meta: ProcessingAndService
Application	Application:Semantic	Application:Syntactic	Application: ProcessingAndService
Instance	Instance:Semantic	Instance:Syntactic	Instance: ProcessingAndService

Open Geospatial Consortium

- Consortium of 330+ companies, government agencies, and academic institutes
- Open Standards development by consensus process
- Interoperability Programs provide end-to-end implementation and testing before spec approval
- **Standard encodings**, e.g.
  - GeographyML, SensorML, Observations & Measurements, TransducerML, etc.
- Standard Web Service interfaces, e.g.
  - Web Map Service
  - Web Feature Service
  - Web Coverage Service
  - Catalog Service
  - **Sensor Web Enablement Services** (Sensor Observation Service, Sensor Alert Service, Sensor Process Service, etc.)

OGC Mission

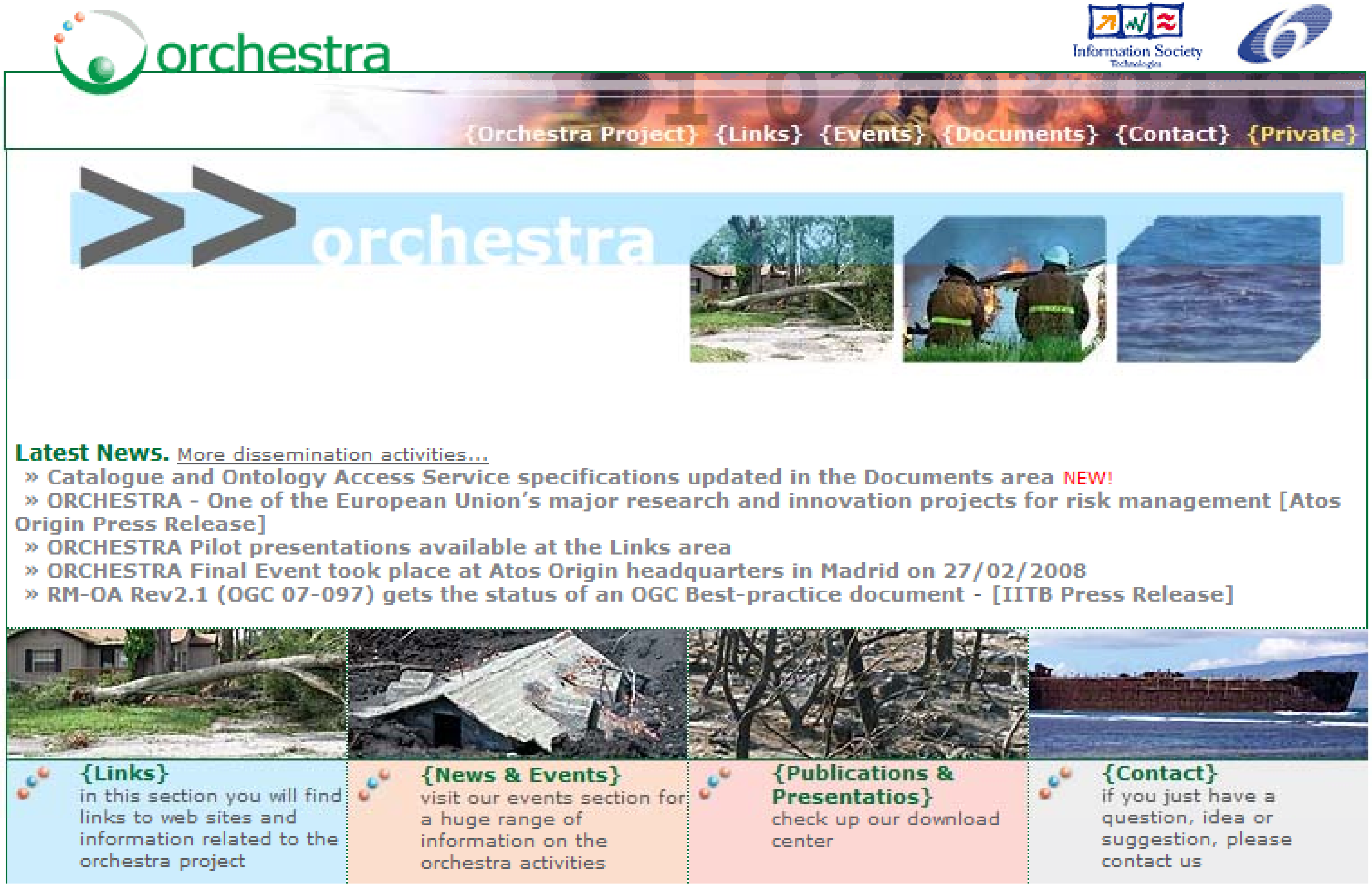
To lead in the development, promotion and harmonization of open spatial standards

OGC Reference Model

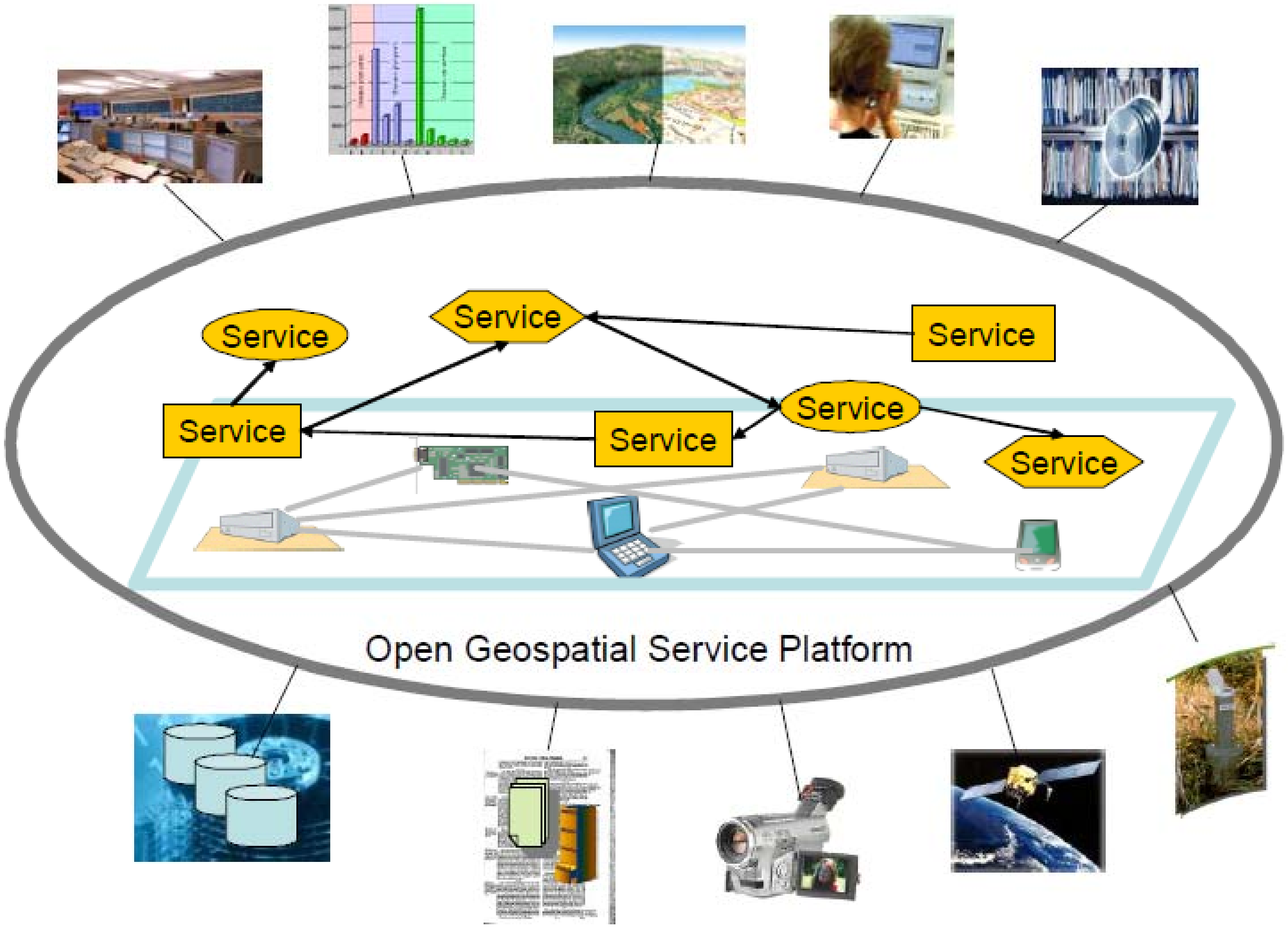
OGC Reference Model

OGC Reference Model
Open Geospatial Consortium Inc.
Date: 2008-11-11
Reference number: OGC 08-062r4
Version: 2.0

ORCHESTRA


orchestra
Information Society Technologies
{Orchestra Project} {Links} {Events} {Documents} {Contact} {Private}
>> orchestra
Latest News. More dissemination activities...
» Catalogue and Ontology Access Service specifications updated in the Documents area NEW!
» ORCHESTRA - One of the European Union's major research and innovation projects for risk management [Atos Origin Press Release]
» ORCHESTRA Pilot presentations available at the Links area
» ORCHESTRA Final Event took place at Atos Origin headquarters in Madrid on 27/02/2008
» RM-OA Rev2.1 (OGC 07-097) gets the status of an OGC Best-practice document - [IITB Press Release]
{Links}
in this section you will find links to web sites and information related to the orchestra project
{News & Events}
visit our events section for a huge range of information on the orchestra activities
{Publications & Presentatios}
check up our download center
{Contact}
if you just have a question, idea or suggestion, please contact us

Open Geospatial Service Platform

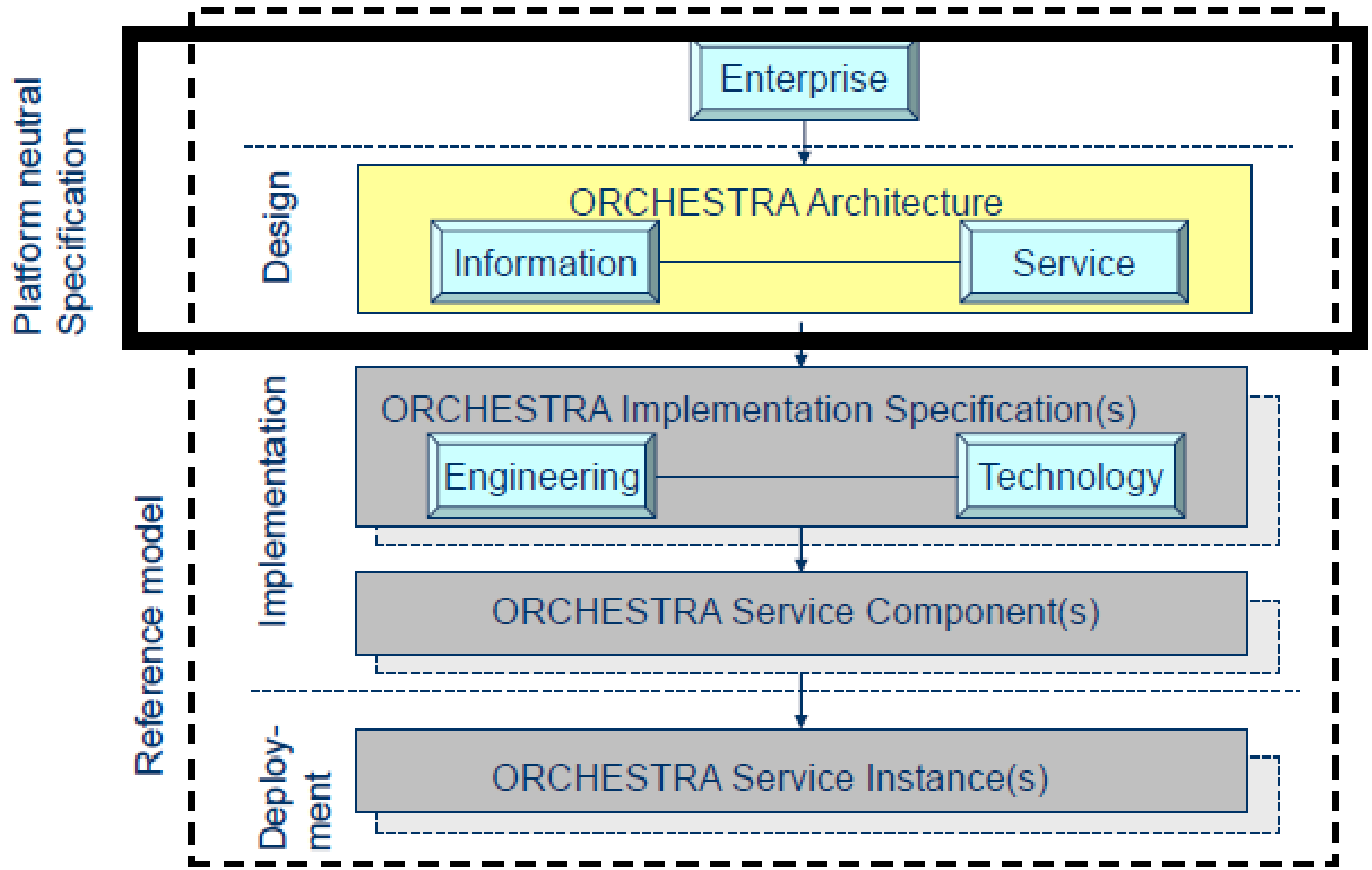


RM-OA Design Process

Reference Model for the ORCHESTRA Architecture

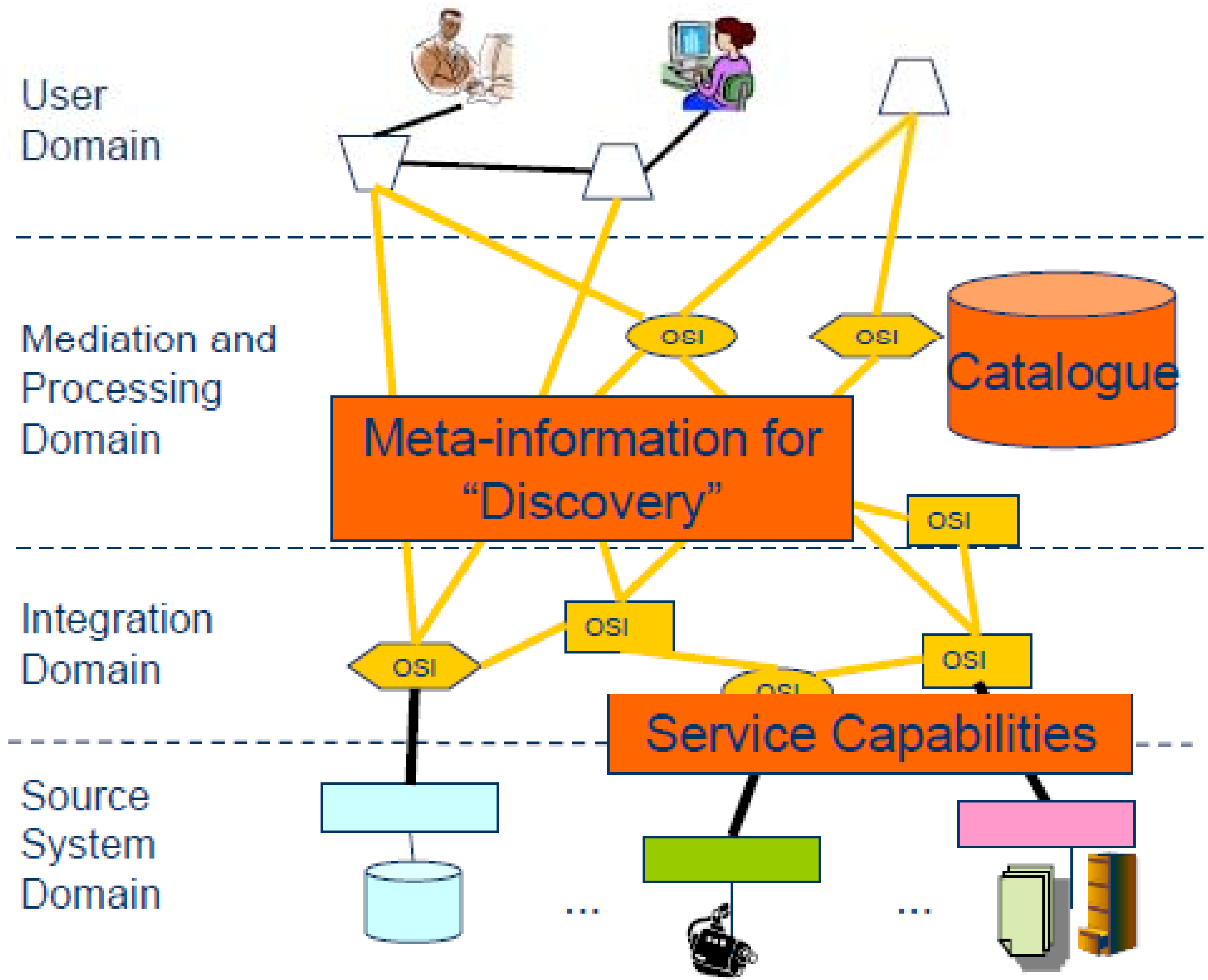
- Basis: Reference Model for Open Distributed Computing (**RM-ODP** ISO/IEC 10746)
- Follows the structure of RM-ODP (viewpoints for different layers from enterprise to technology viewpoint)
- RM-ODP-viewpoints are mapped to ORCHESTRA viewpoints
- In addition: precise definition of relevant terms (ORCHESTRA service, OSN, meta information…)
- Definition of the high level requirements: what means open?, …

RM-OA Scope



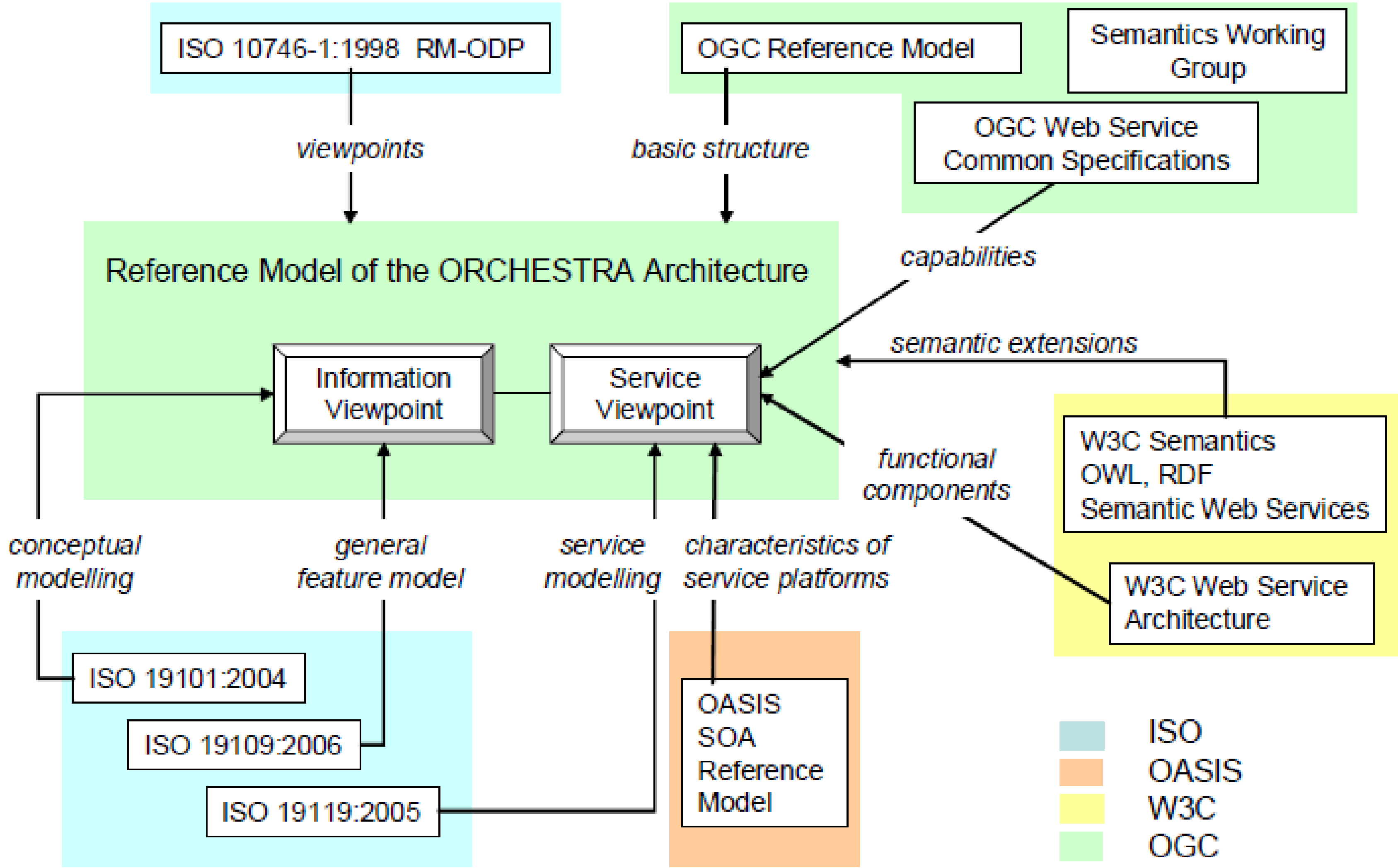
Platform neutral Specification
Reference model
Enterprise
Design
ORCHESTRA Architecture
Information
Service
Implementation
ORCHESTRA Implementation Specification(s)
Engineering
Technology
ORCHESTRA Service Component(s)
Deploy- ment
ORCHESTRA Service Instance(s)

RM-OA Design

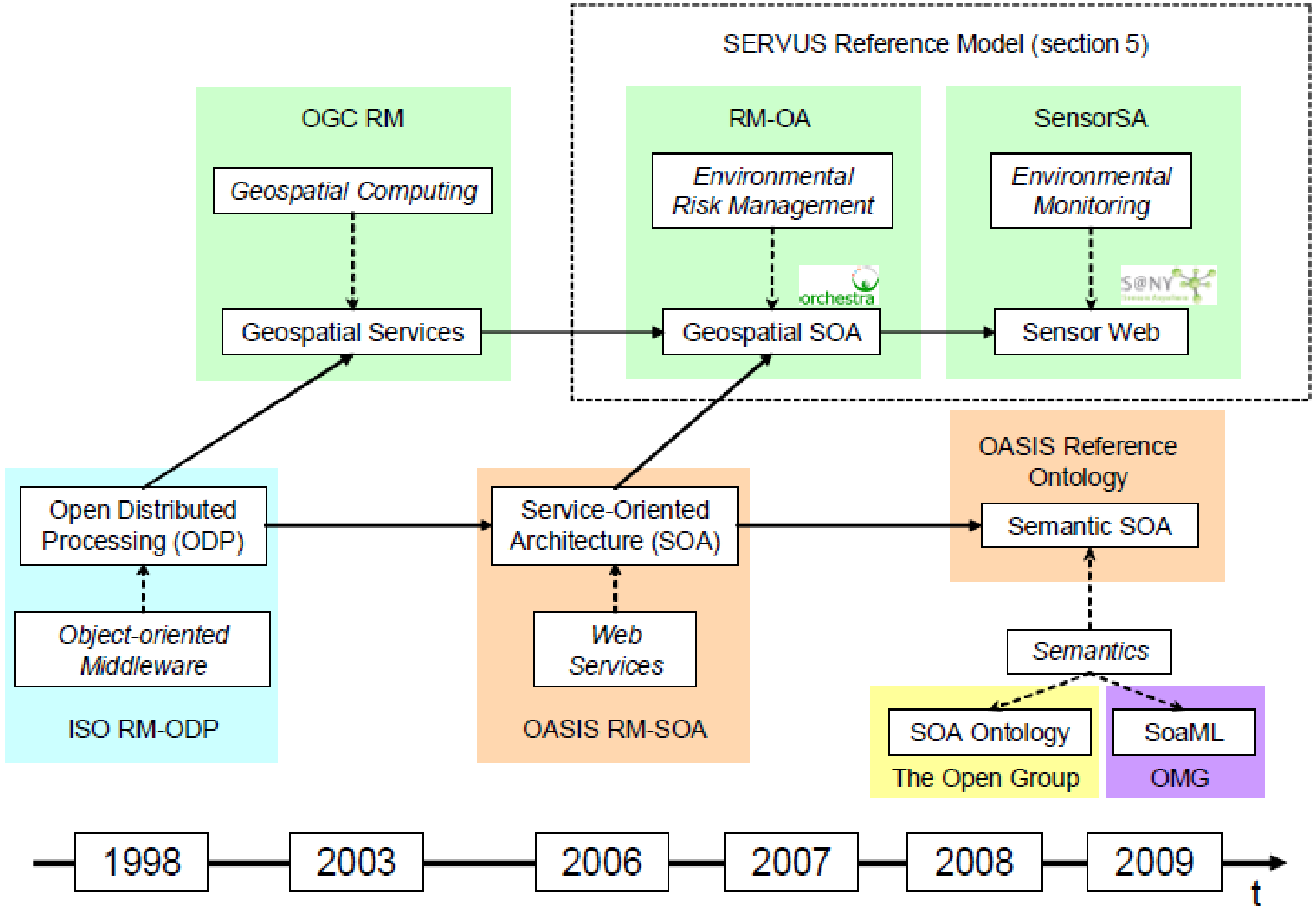


User Domain
Mediation and Processing Domain
Integration Domain
Source System Domain
OSI
OSI
Catalogue
Meta-information for "Discovery"
OSI
OSI
OSI
OSI
Service Capabilities
...
...

Influence of standards on RM-OA



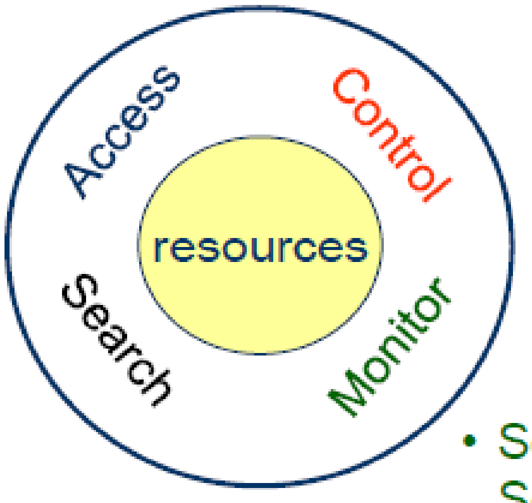
Evolution of Reference Models



OA Infrastructure services

- Feature Access Service
- Map and Diagram Service
- Document Access Service
- Sensor Access Service

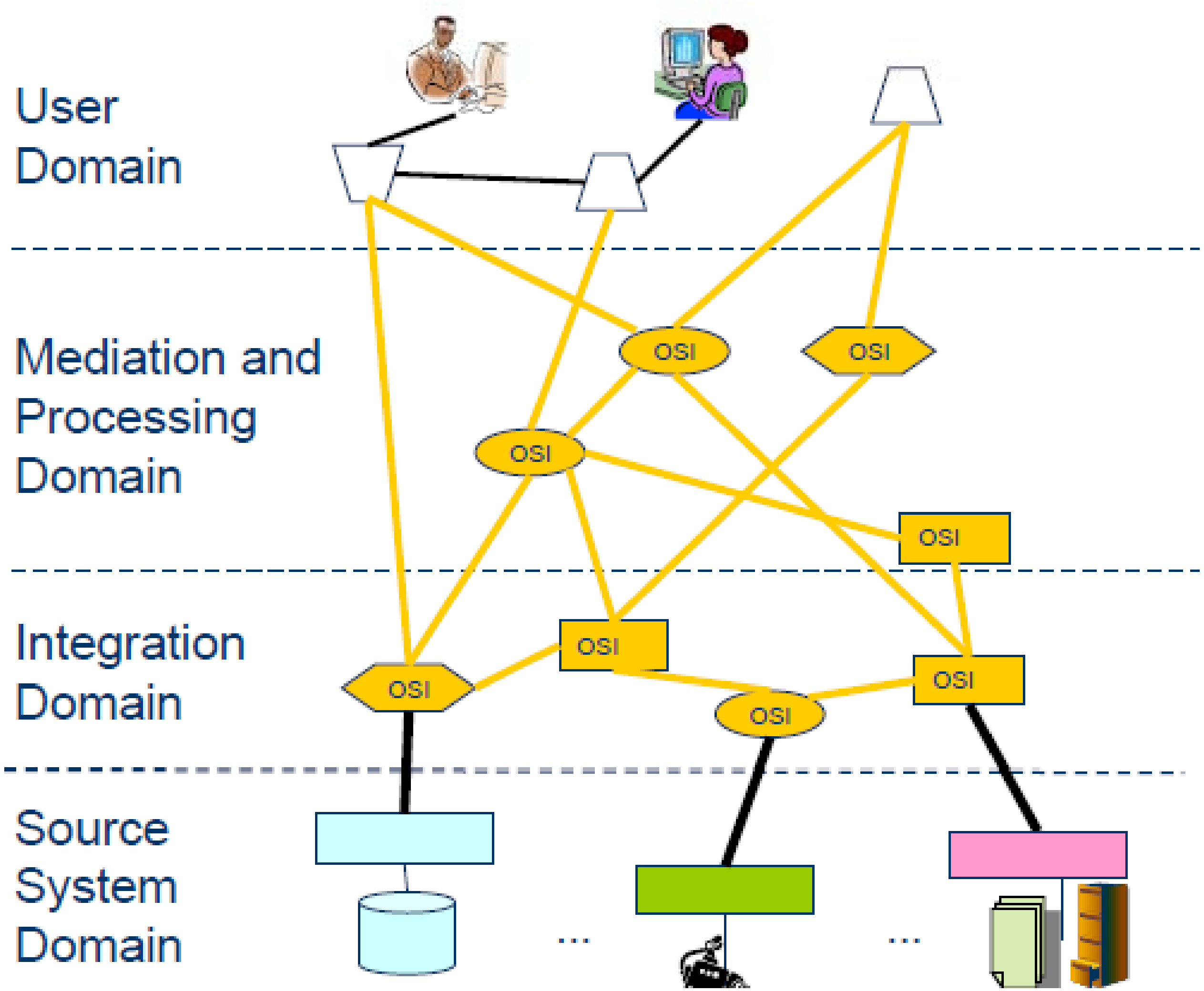
- User Management Service
- Authorisation Service
- Authentication Service



- Catalogue Service

- Service Monitoring Service

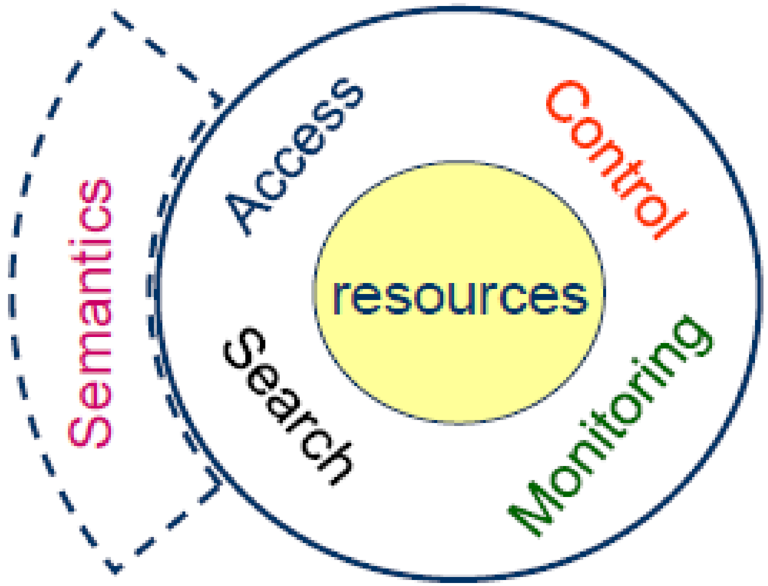
High level architecture



- Rigorous Use of Standards
- Loosely Coupled Components
- Technology Independence
- Evolutionary Development
- Component Independence
- Generic Infrastructure
- Self-describing Components

OA Support services

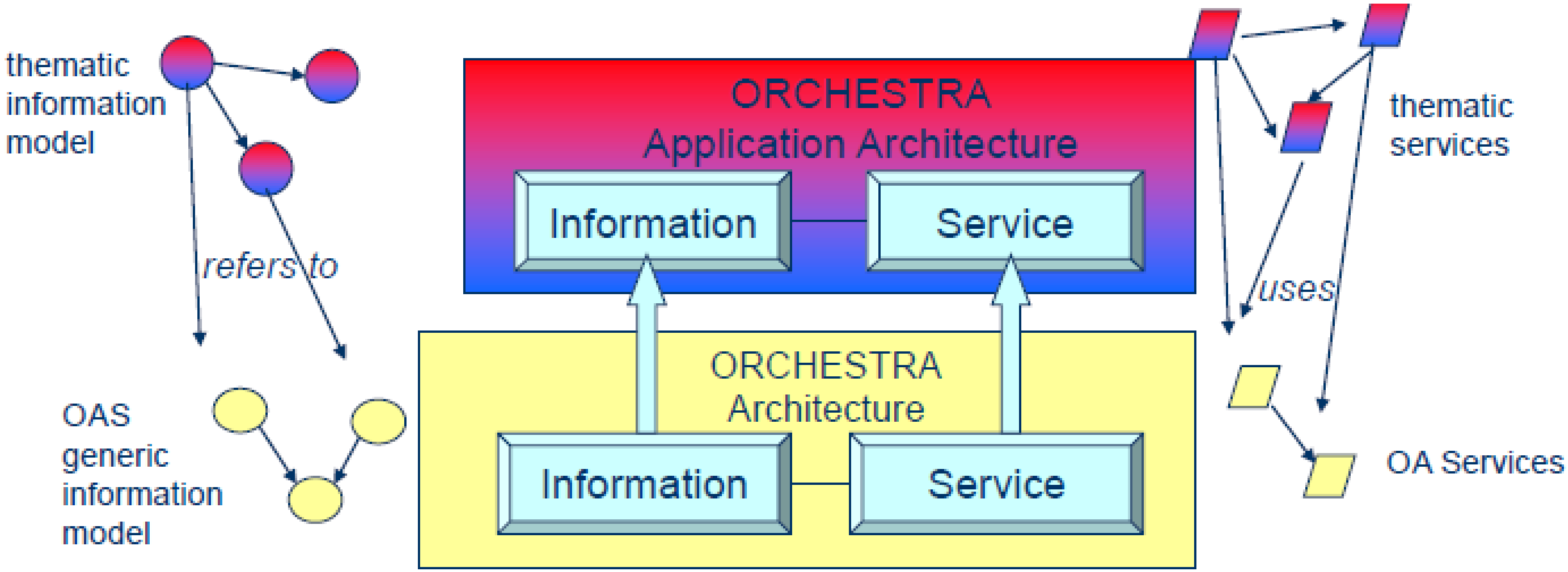
- Gazetteer Service
- Thesaurus Access Service
- Schema Mapping Service
- Format Conversion Service
- Coordinate Operation Service
- Ontology Access Service
- Service Chain Access Service



- Query Mediation Service
- Inferencing Service
- Annotation Service

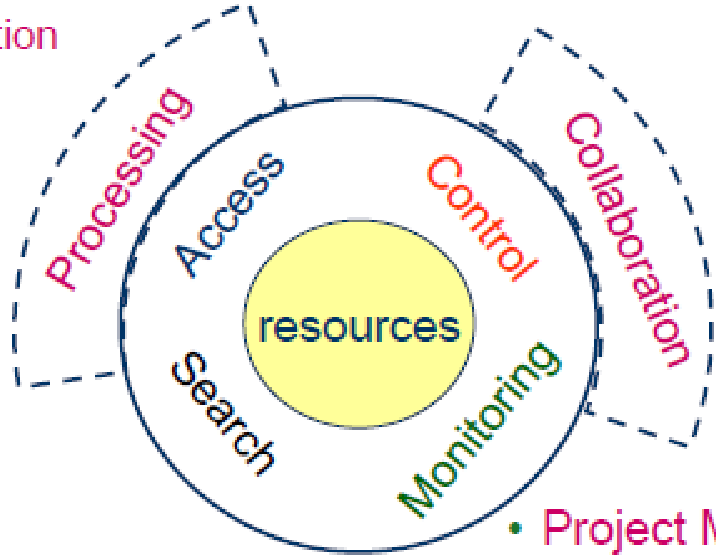
- Document Indexing Service

Orchestra Application Architecture



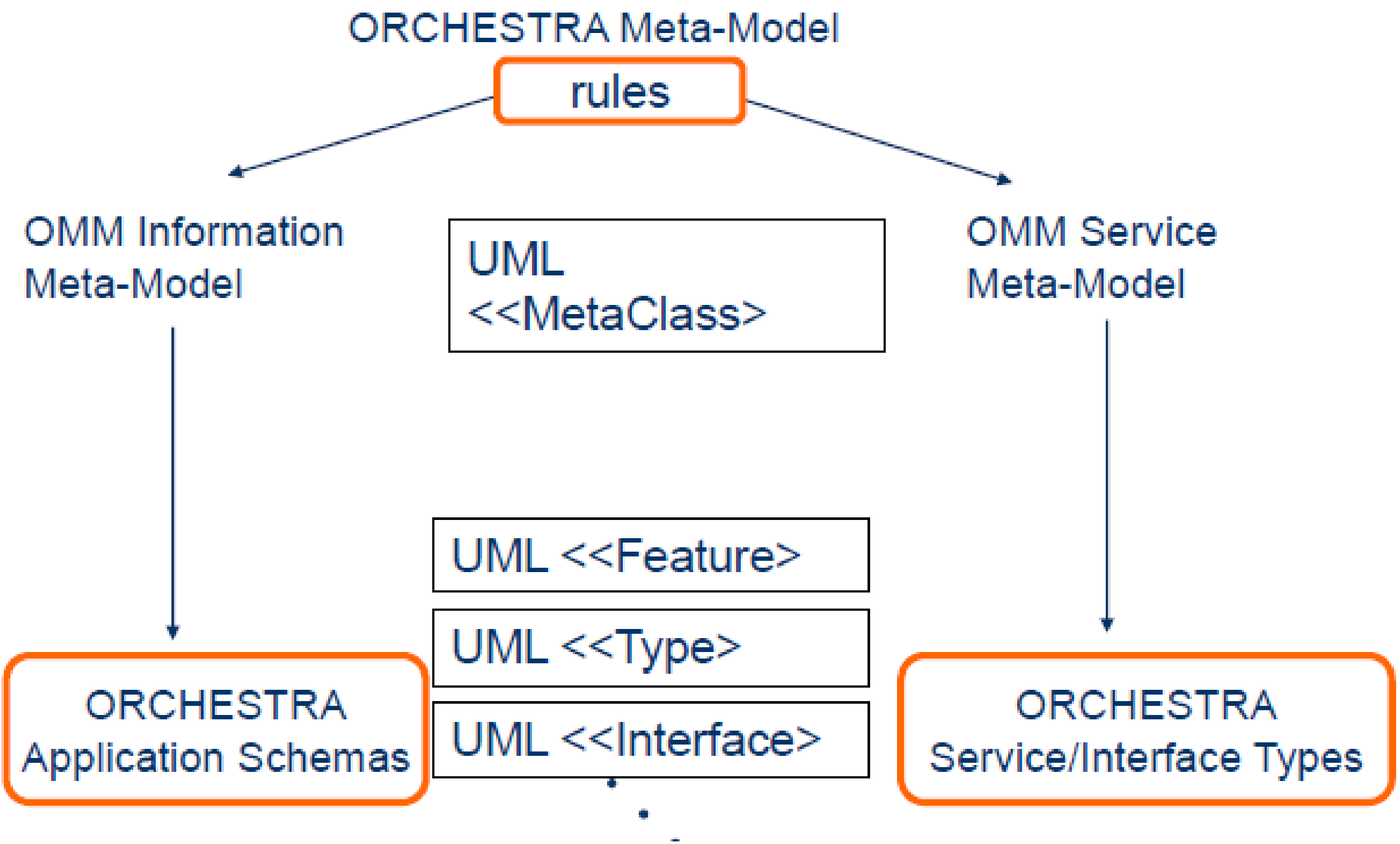
Thematic services

- Processing Service for
  - (geo) statistical calculation
  - aggregation
  - normalisation
  - image processsing
- Simulation Management Services

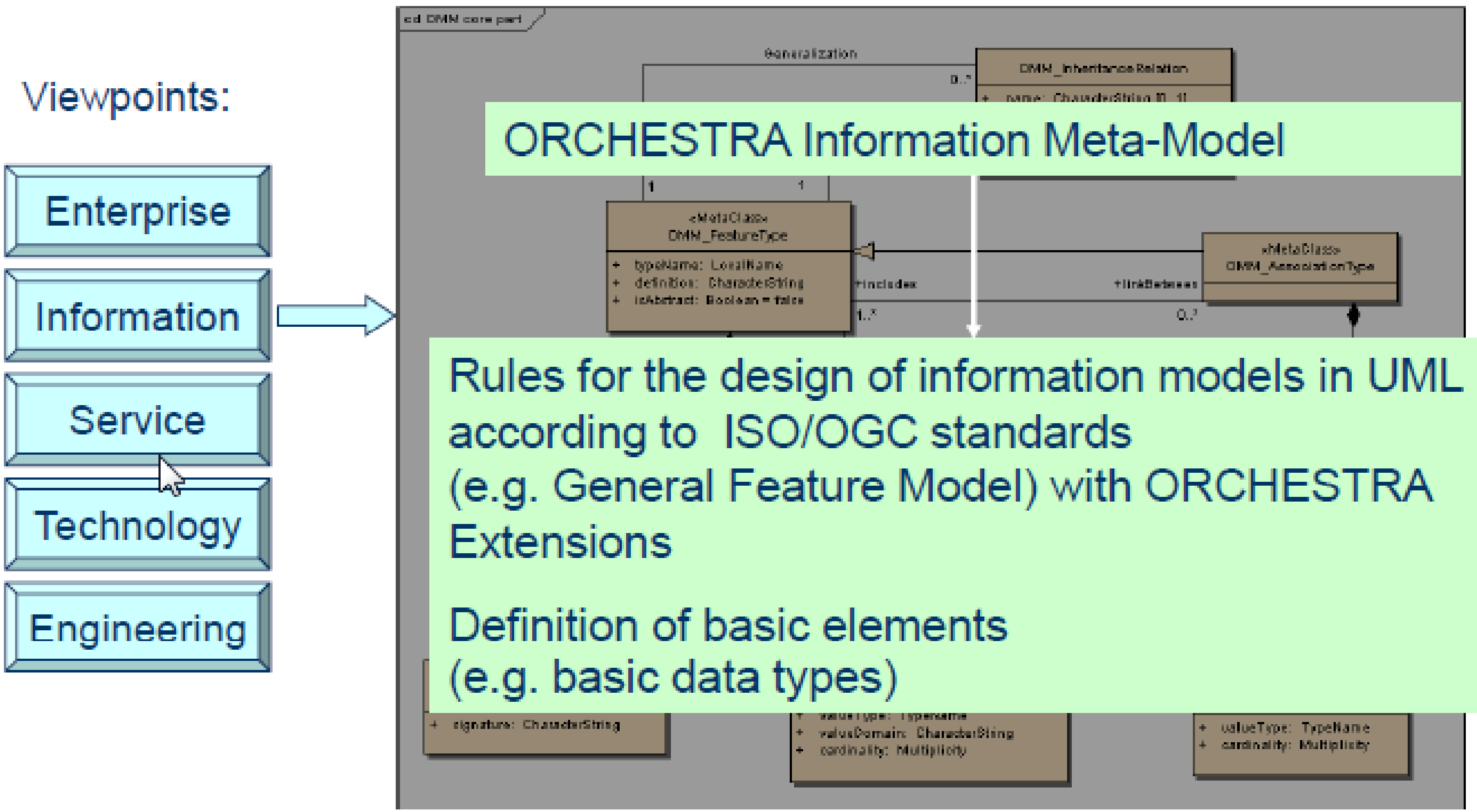


- Project Management Support Service
- Communication Service
- Calendar Service
- Reporting Service

OMM Information and Service Meta model



RM-OA Information viewpoint

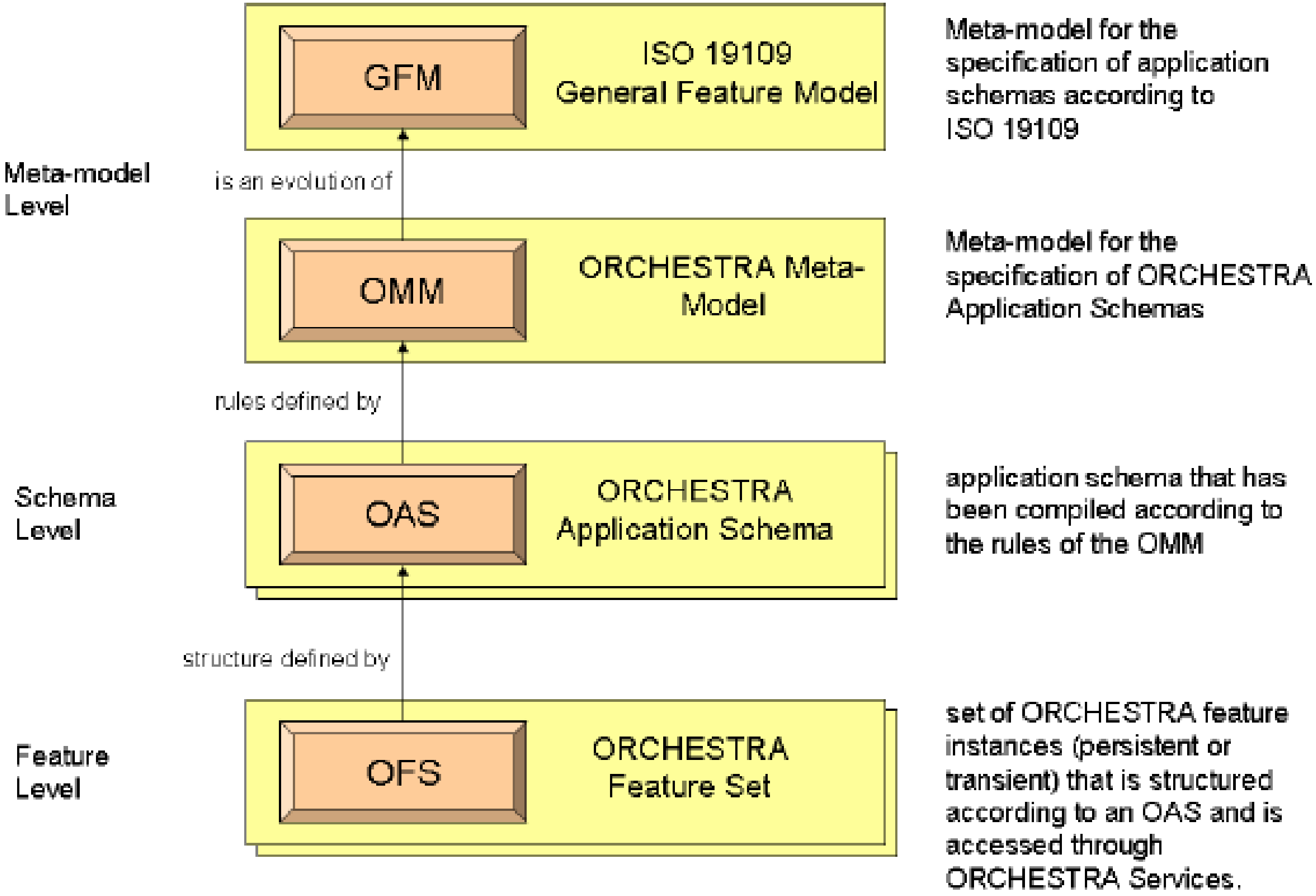


ORCHESTRA Information Meta-Model

Rules for the design of information models in UML according to ISO/OGC standards (e.g. General Feature Model) with ORCHESTRA Extensions

Definition of basic elements (e.g. basic data types)

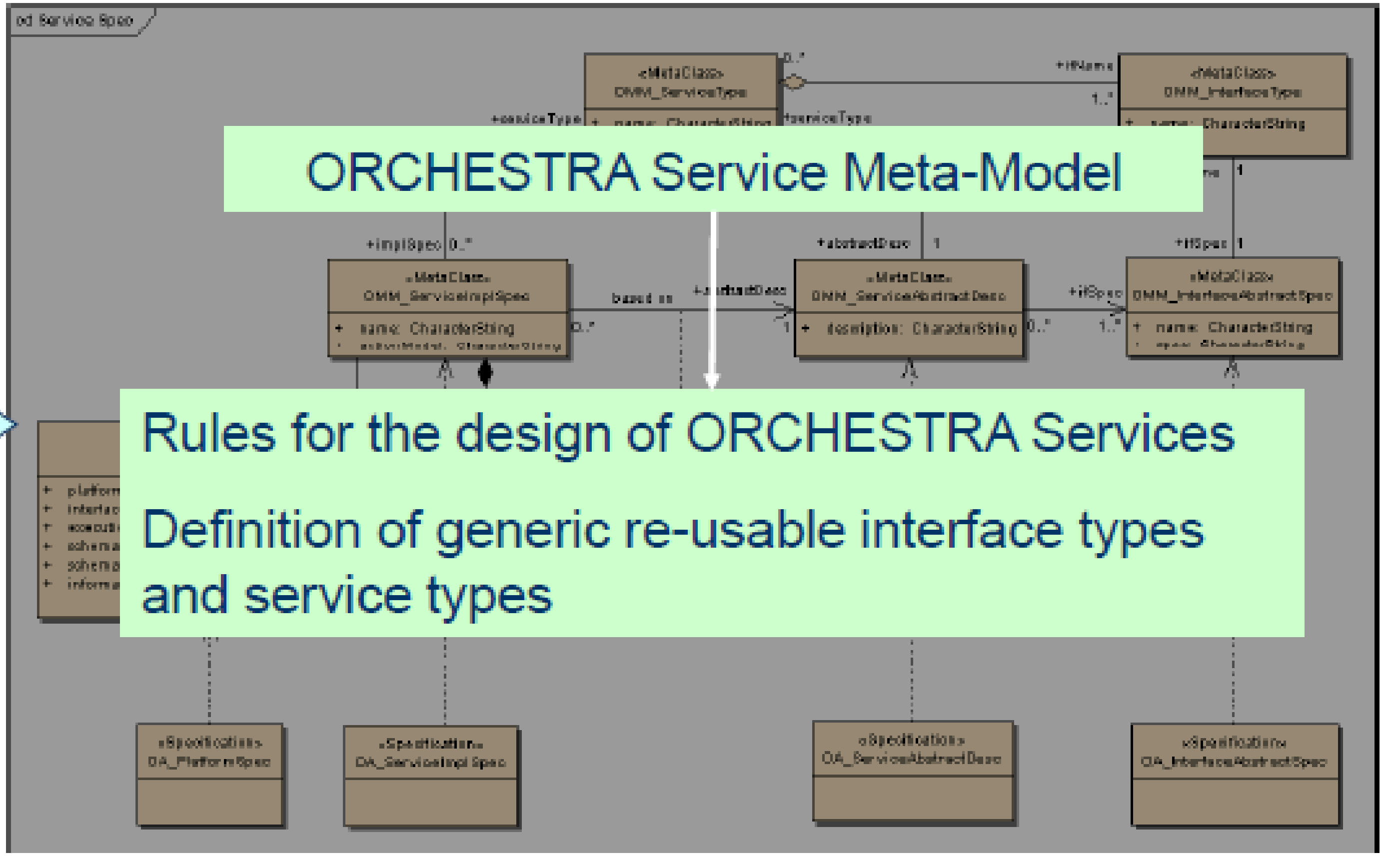
Orchestra Information Meta Model



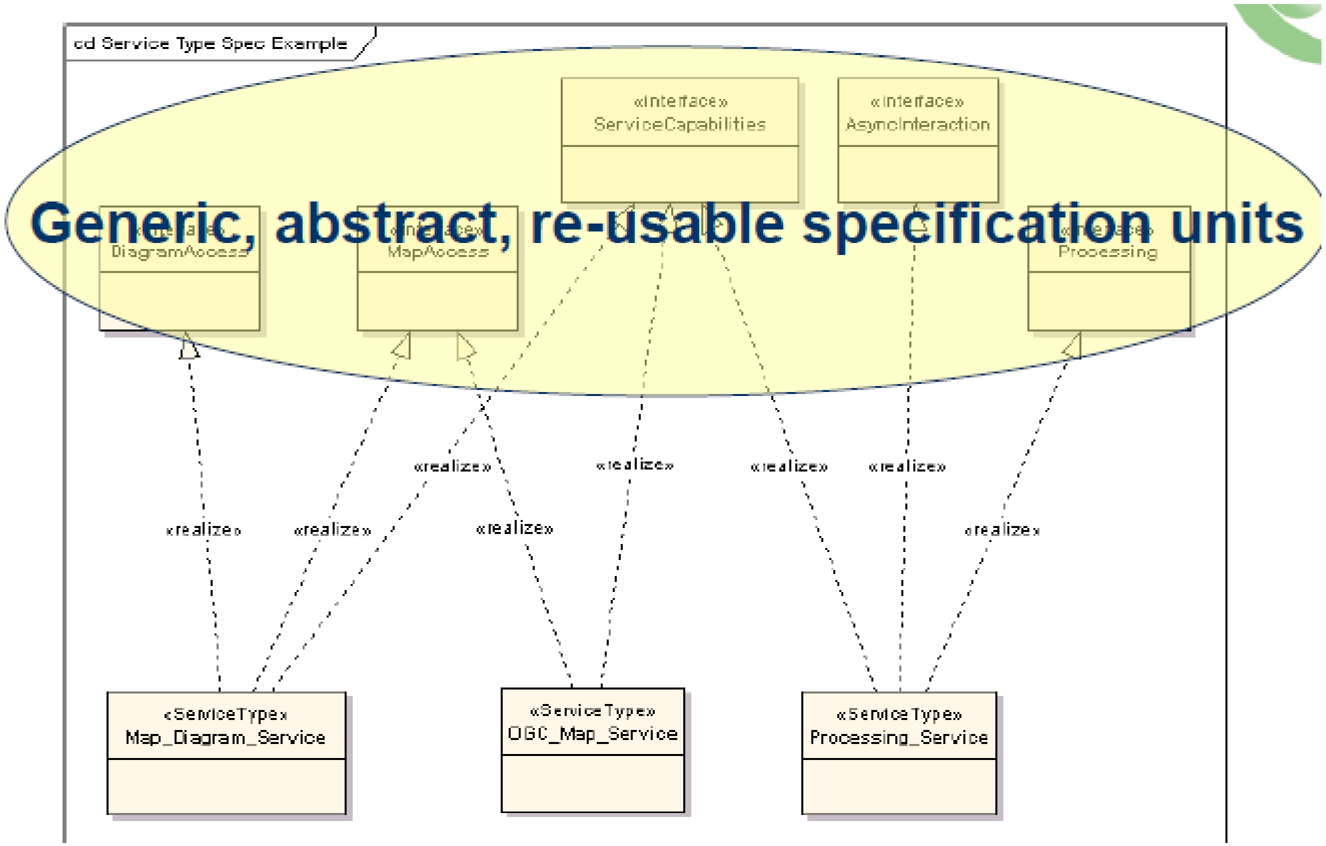
RM-OA Service viewpoint

Viewpoints:

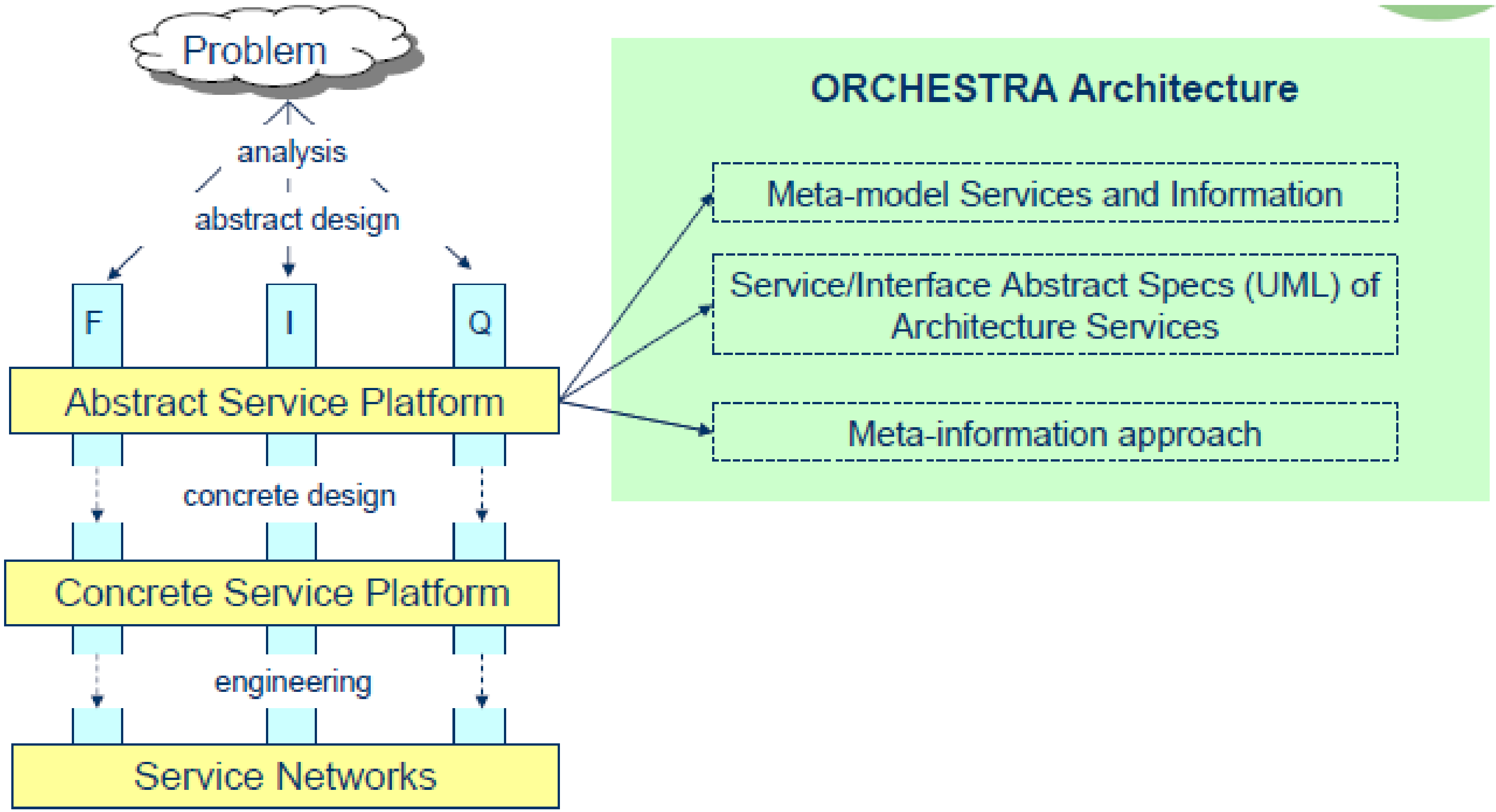
- Enterprise
- Information
- Service
- Technology
- Engineering



Service and Interface type examples



RM-OA Meta-information approach



Meta-information purposes

- The RM-OA defines a set of rules for building meta-information models OAS-MIs for “well-known” purposes like:
    - discovery (including search and navigation)
    - access, storage and service invocation
    - integration (collaboration)
    - interpretation
    - user profiling
    - quality control/management
    - transactions, synchronisation and locking
    - OSN configuration and management

SANY

S@NY Sensors Anywhere

SANY Sensors Anywhere

About SANY | News | Results | Downloads | Contact | Login
Why SANY? | Objectives | Project Structure | Partners | Acronyms | Related

Search

Search

Upcoming events

- no upcoming events available

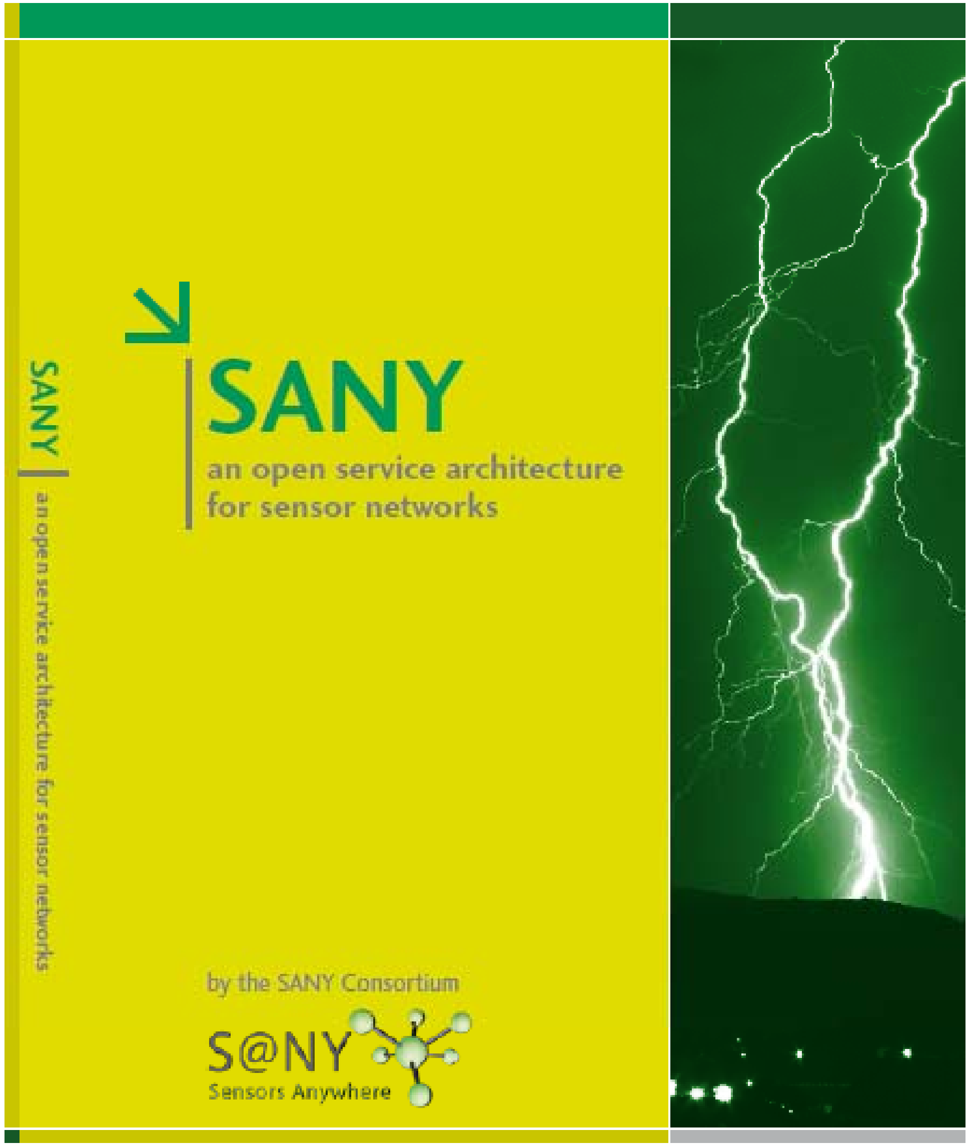
more

W3

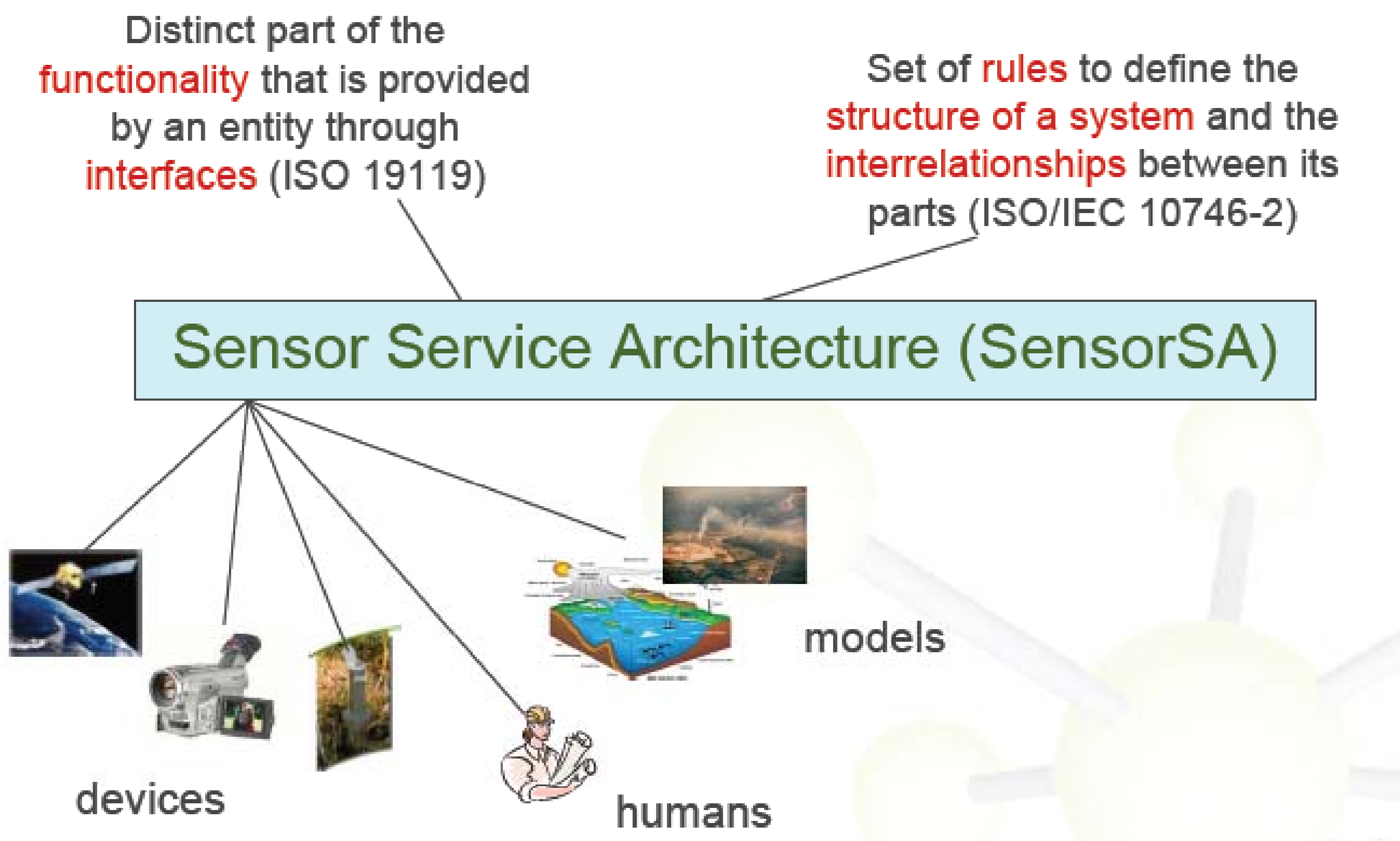
SANY Sensor Anywhere - IST FP6 Integrated Project

The SANY integrated project focused on interoperability of in-situ sensors and sensor networks, and assuring the sensor data can be easily processed and used as a basis for decision making. SANY **Sensor Service Architecture** (**SensorSA**) therefore provides a quick and cost-efficient way to reuse of data and services from legacy sensor- and data- sources. This site presents the project itself, its achievements, related publications as well as the public deliverables and software developed in SANY.

SANY and SensorSA

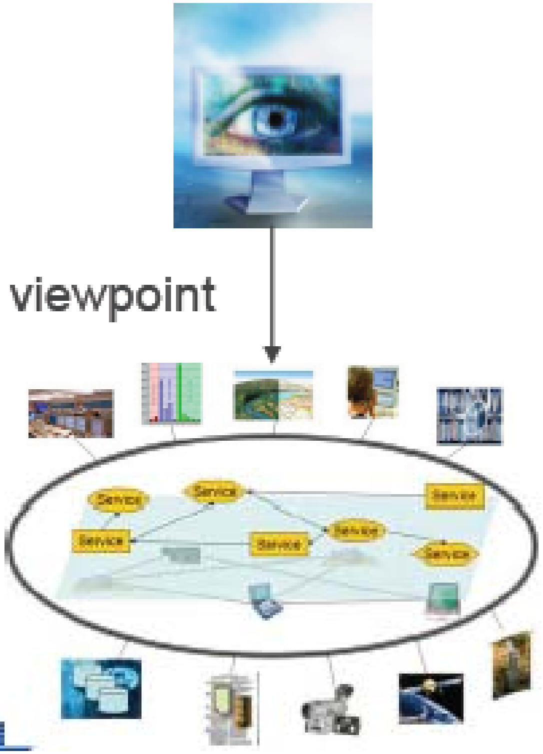


SensorSA – Sensor Service Architecture



SensorSA and RM-ODP

- SensorSA structured according to the ISO Referenc Model for Open Distributed Processing (RM-ODP)
  - compliant to the OGC design process
  - interpreted for a service-oriented architecture (SOA)



Enterprise: *What is required ?*

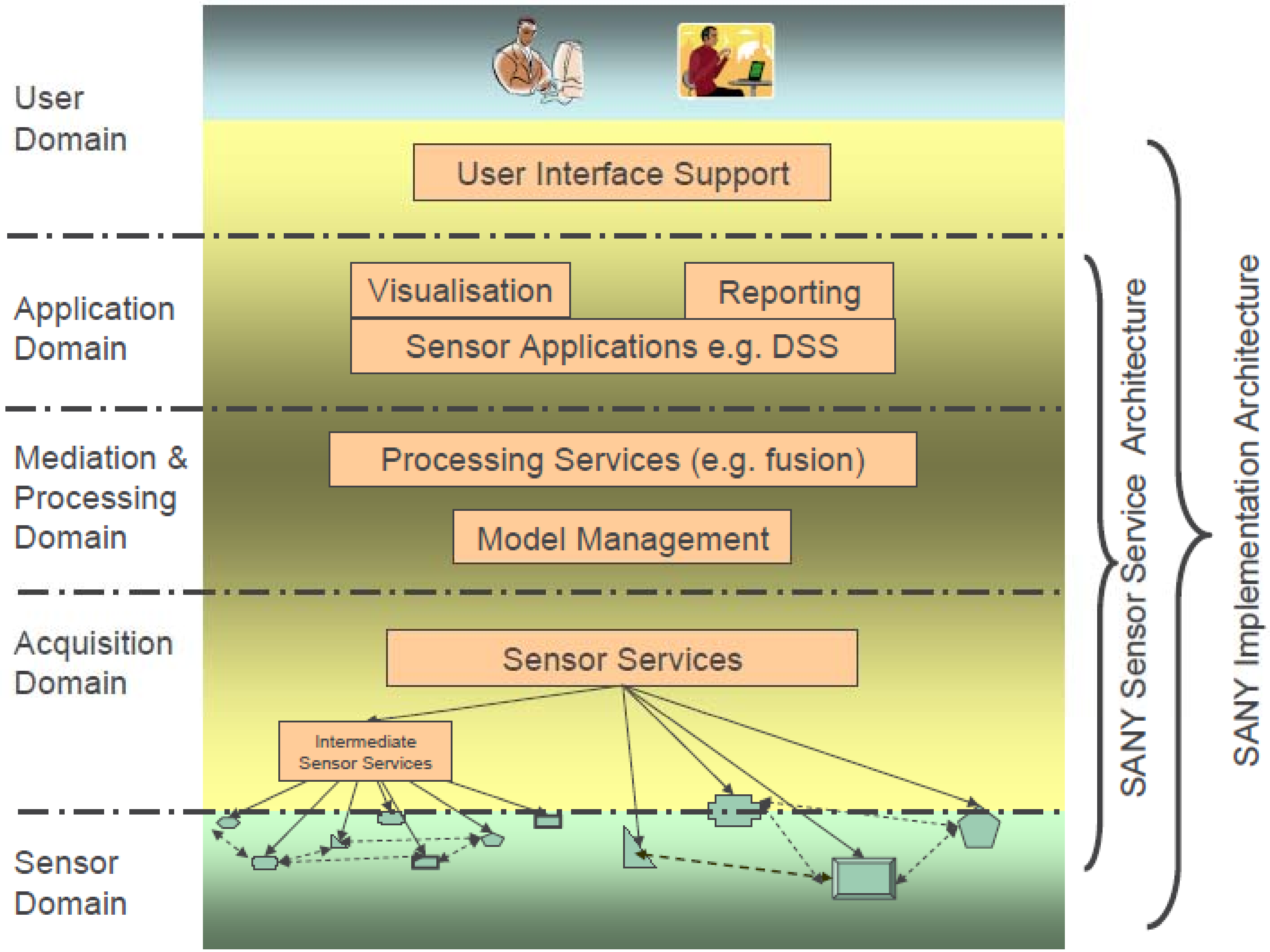
Information: *What to deal with ?*

Service: *Which functions ?*

Engineering: *How to build ?*

Technology: *What to use ?*

Service domains in SensorSA



RM-OA Sensor extensions

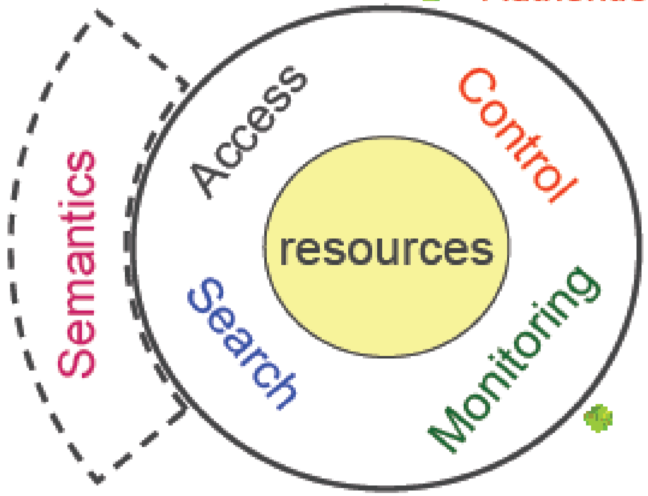
- Service Capabilities I/F
- Feature Access Service
- Map and Diagram Service
- Schema Mapping Interface
- Coordinate Operation Service
- Service Chain Access Service
- Processing Service

- Ontology Access Interface
- Inferencing Interface
- Annotation Service

- Catalogue Service

- Sensor Access Service

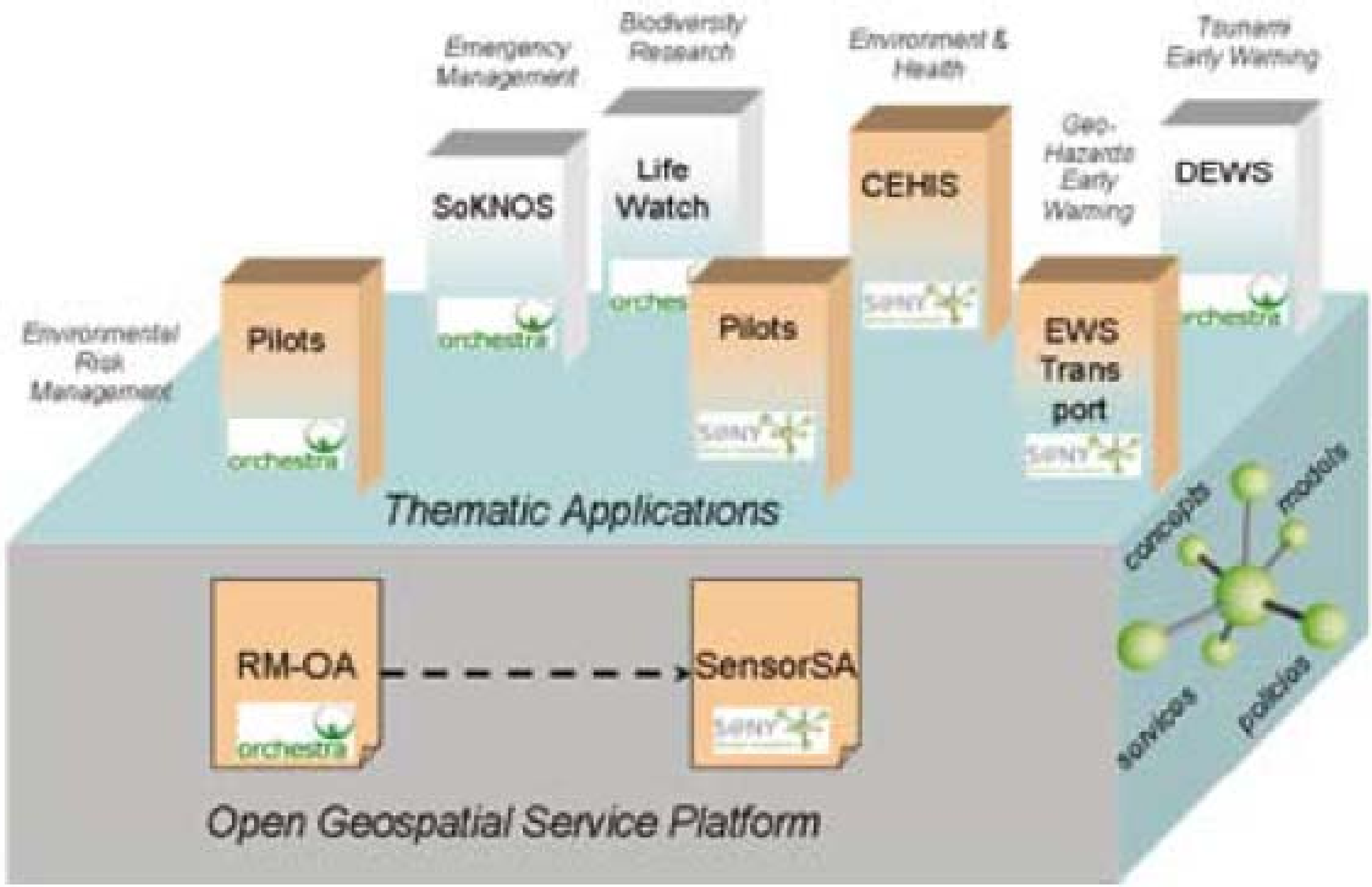
- User Management Service
- Authorisation Service
- Authentication Service



- Service Monitoring Service

OGC Sensor Web Enablement:
- Sensor Observation Service
- Sensor Alert Service
- Sensor Planning Service
- Web Notification Service

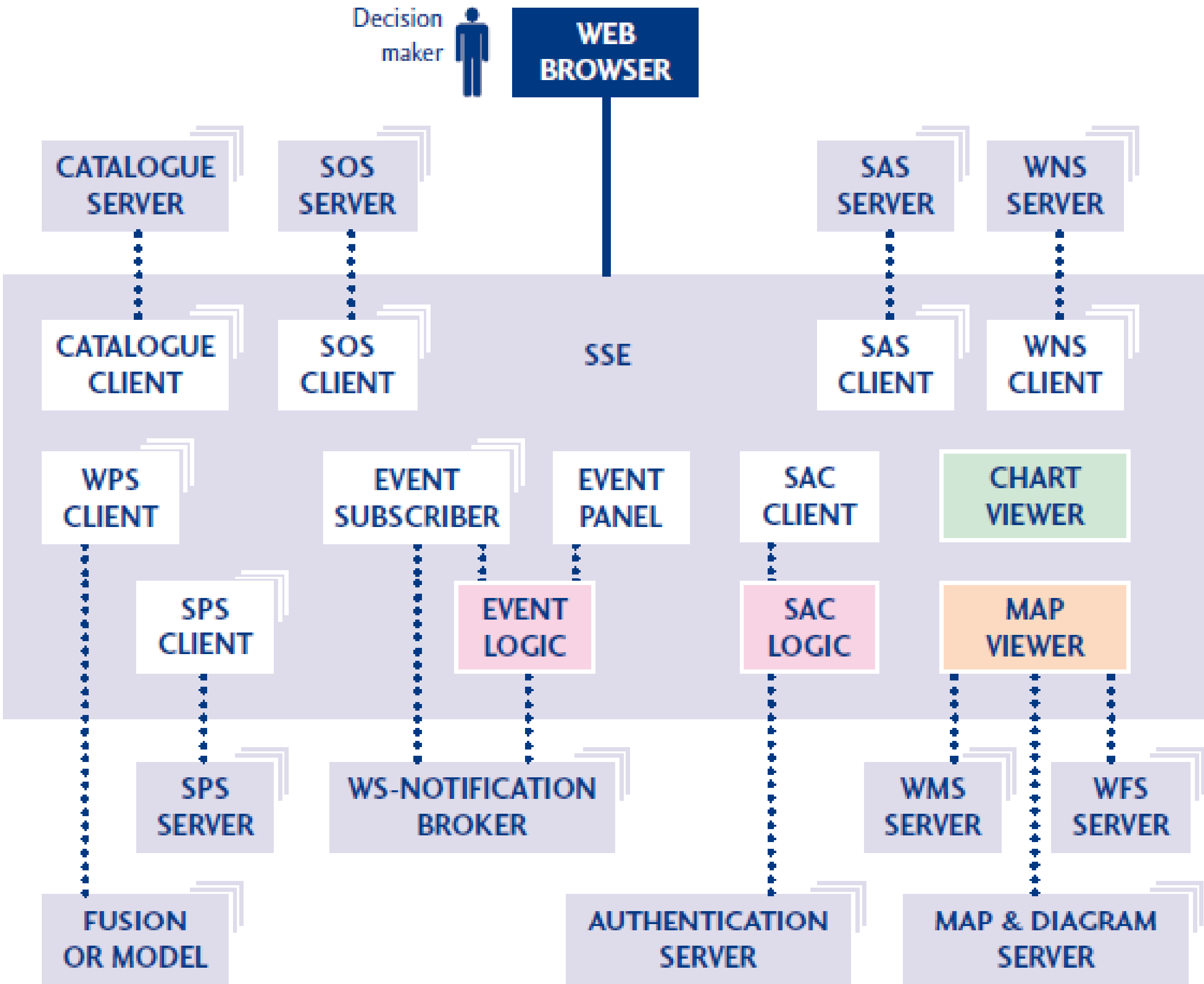
RM-OA and SensorSA – as a platform



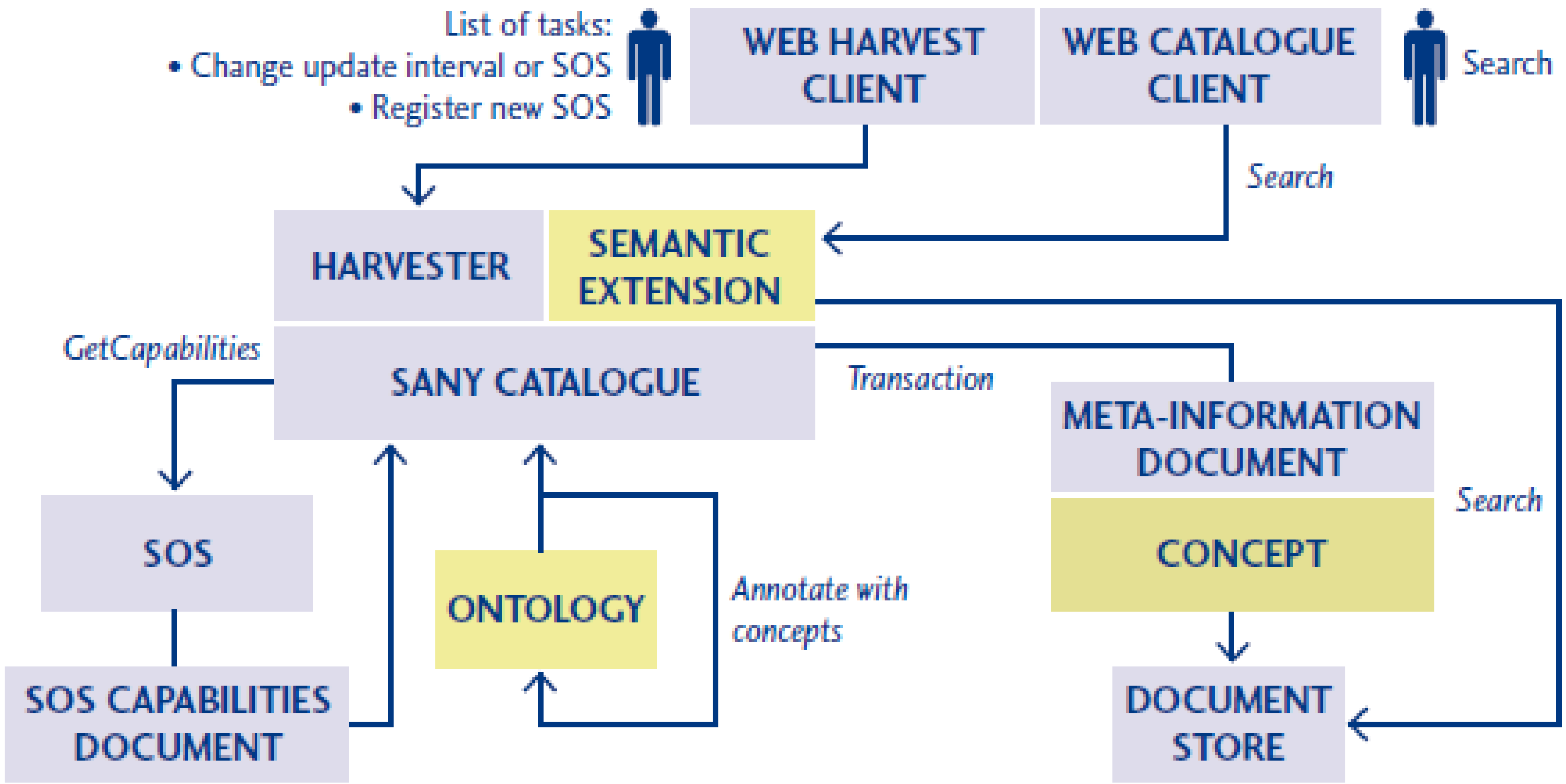
Future directions

- Sensor network and sensor service network to be added to “Sensor Model”
- Enhanced consideration of alternate architectural styles
  – event-driven interactions from sensor to application
  – collaboration with RESTful Web services

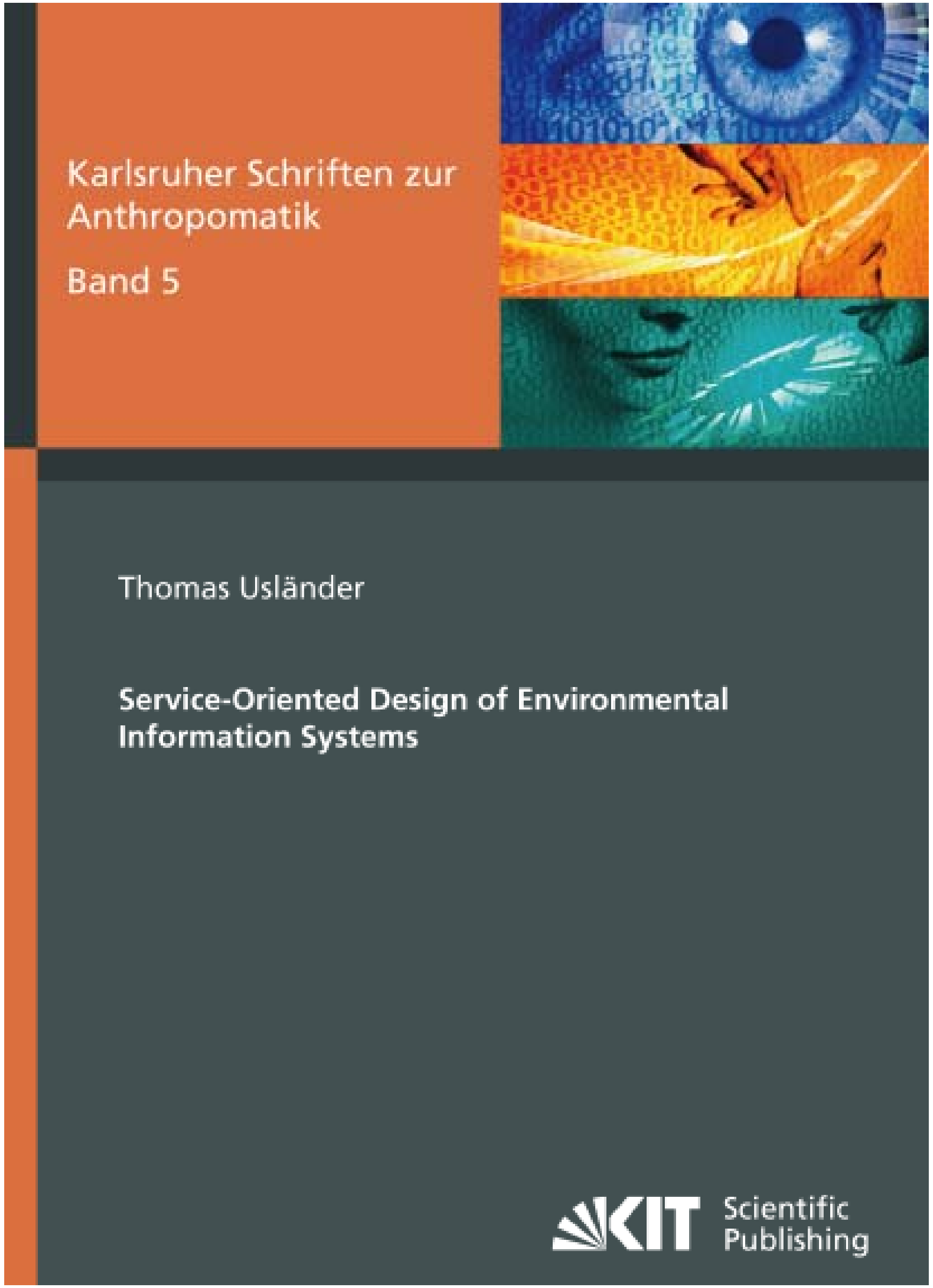
Decision Support Infrastructure – using the ESA SSE (Service Support Environment) Platform



Semantic Extension

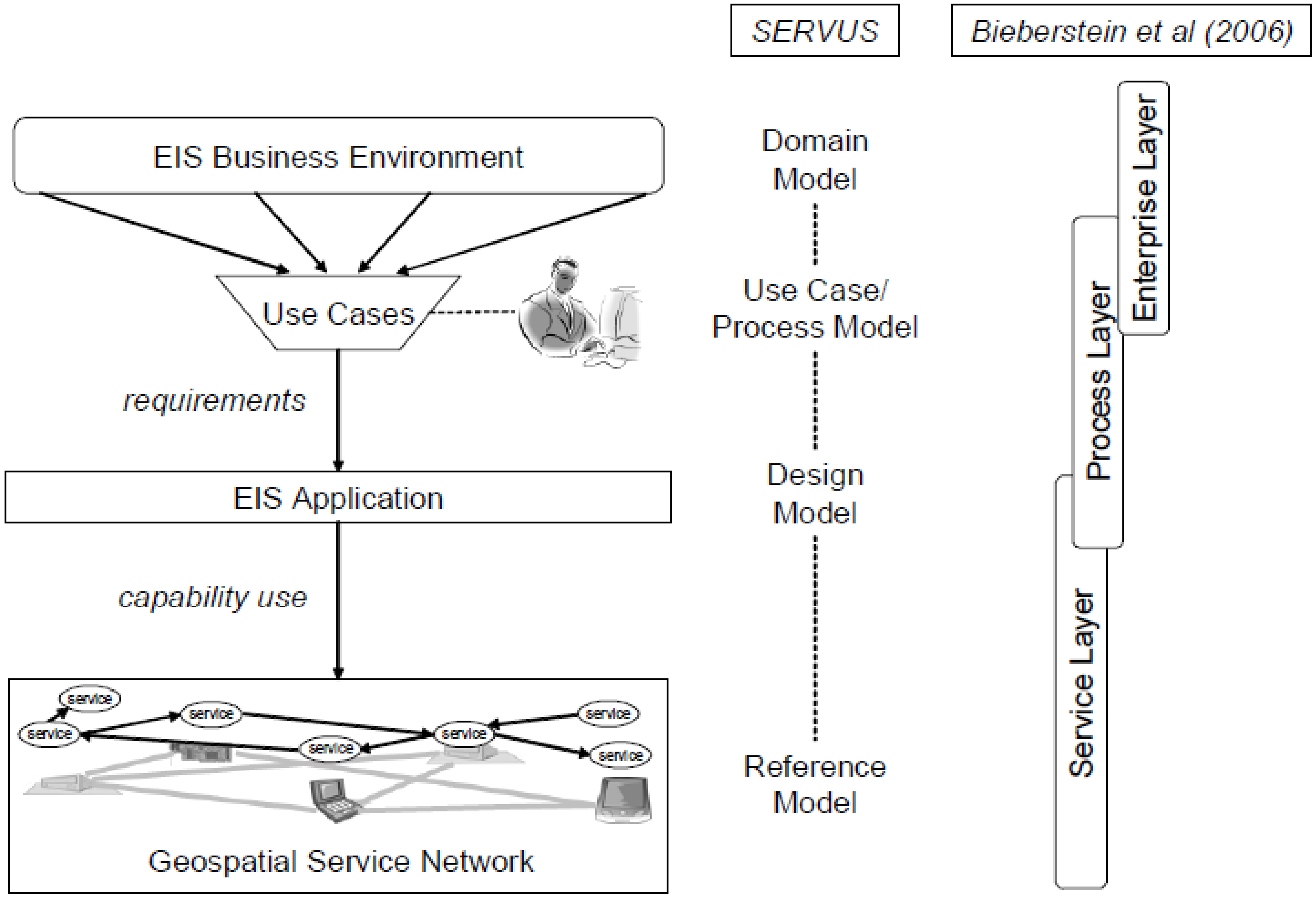


SERVUS

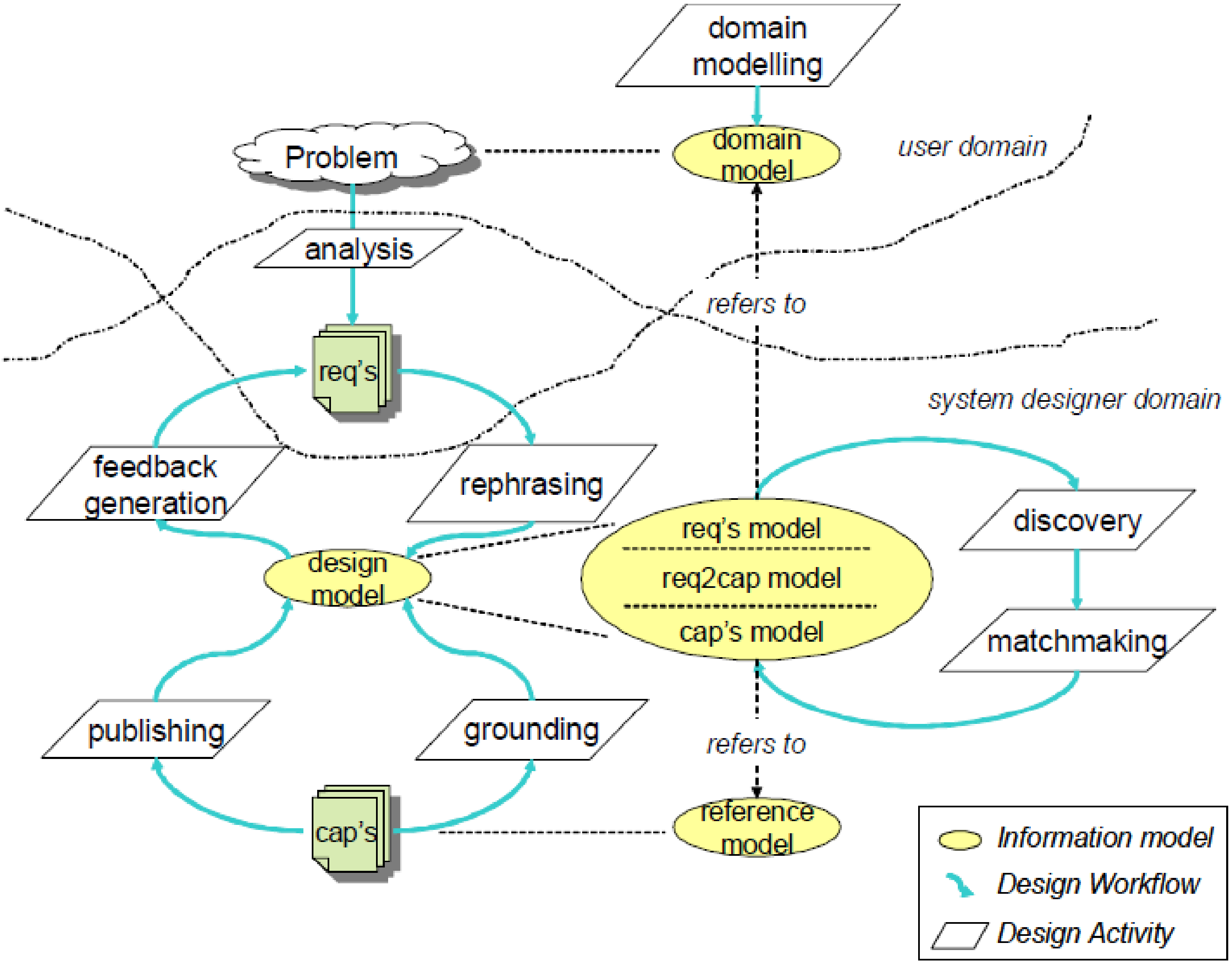


Karlsruher Schriften zur Anthropomatik
Band 5
Thomas Usländer
Service-Oriented Design of Environmental Information Systems
Scientific Publishing

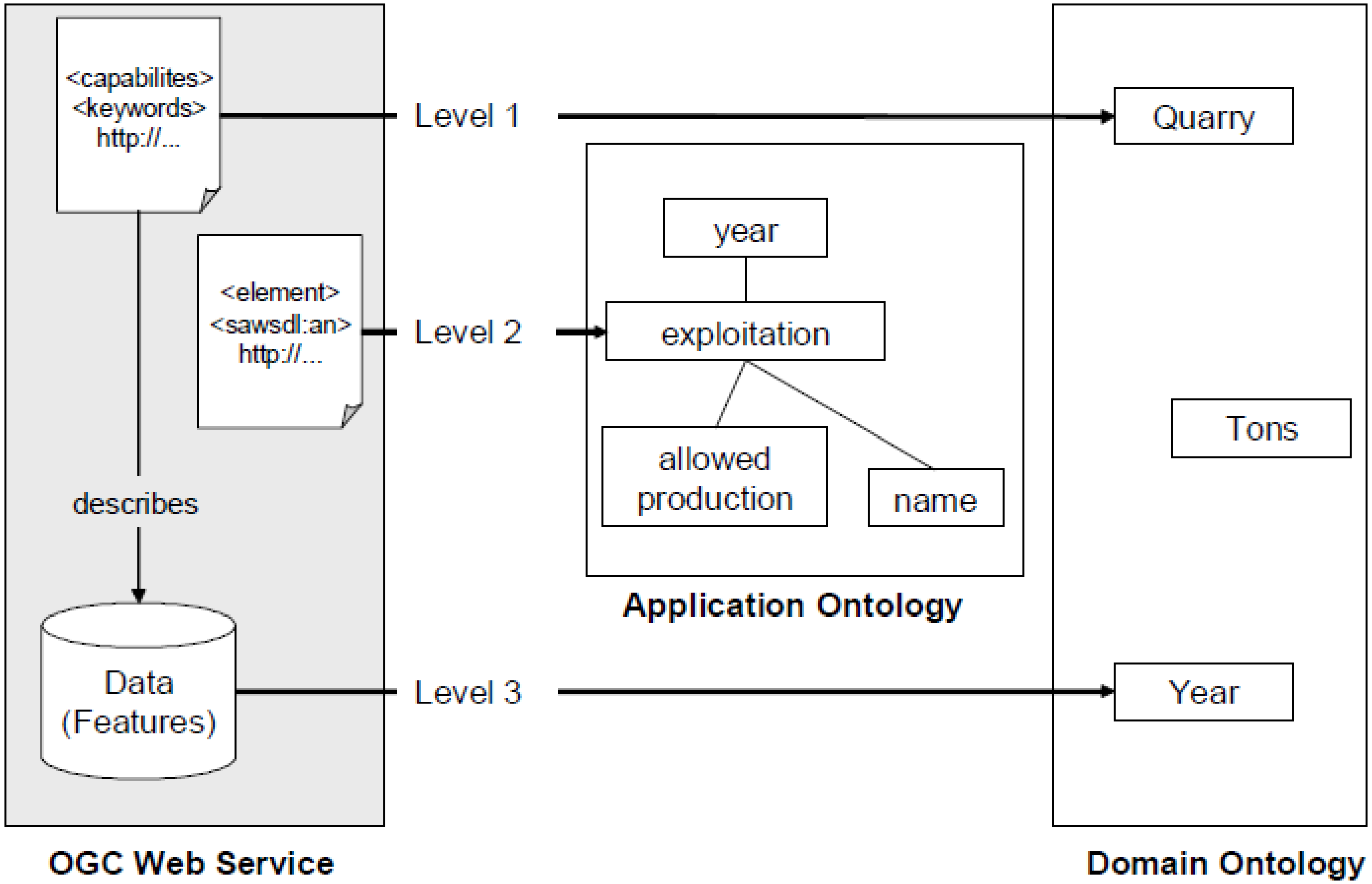
SERVUS Model hierarchy



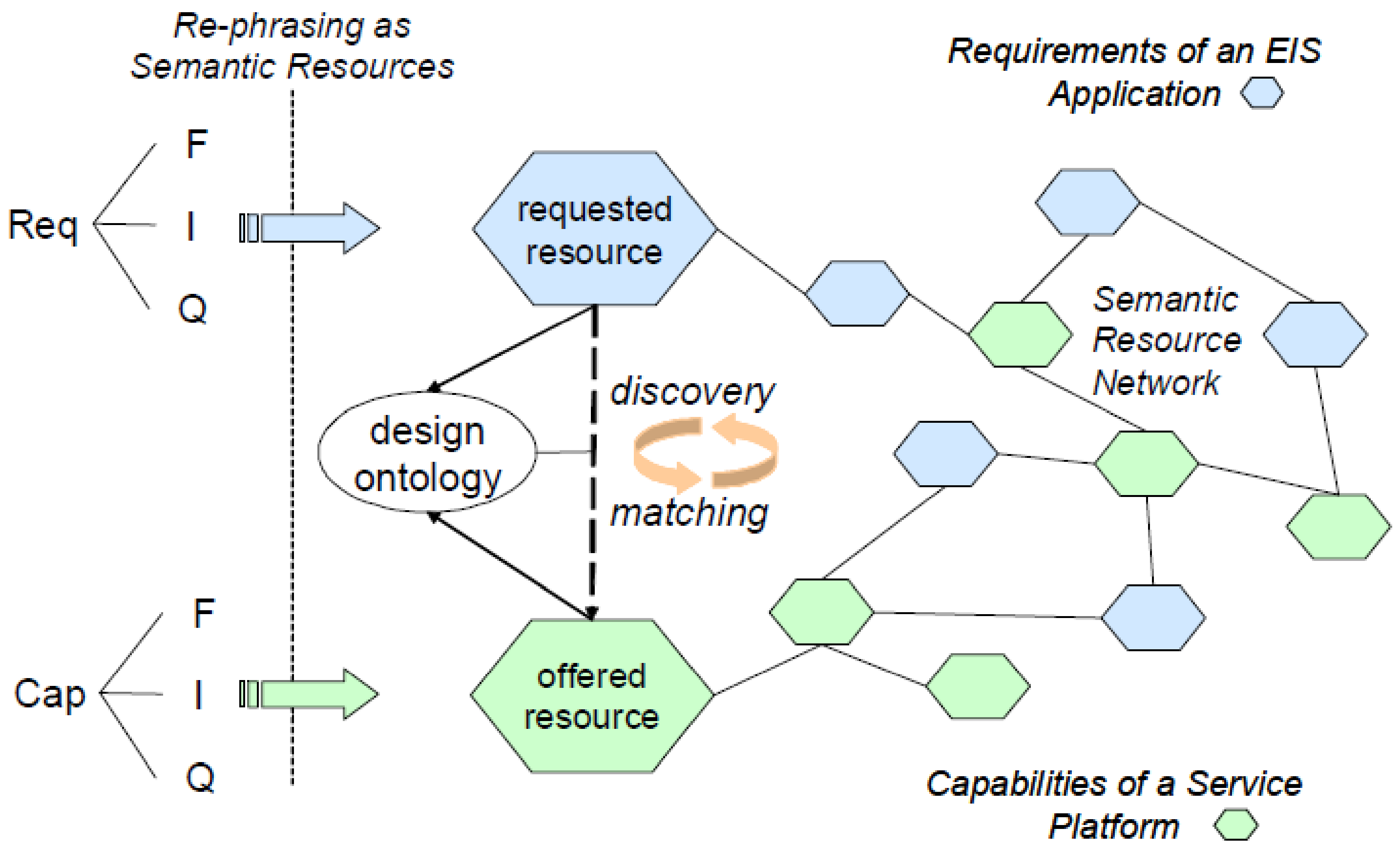
SERVUS Models and Design activities



Semantic annotation of OGC Web Services

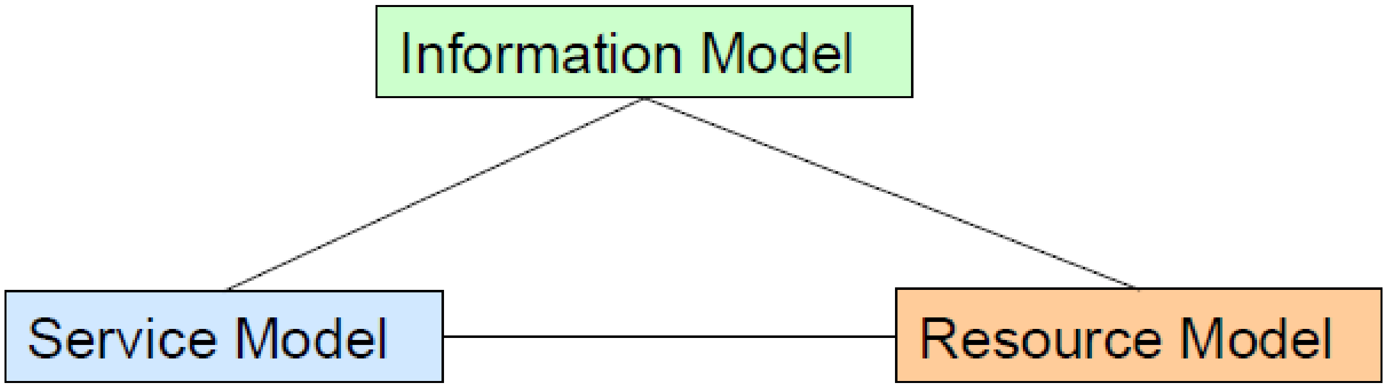


Principle of Rephrasing, Resource Discovery and Matching



Information, Resourcs and Service model

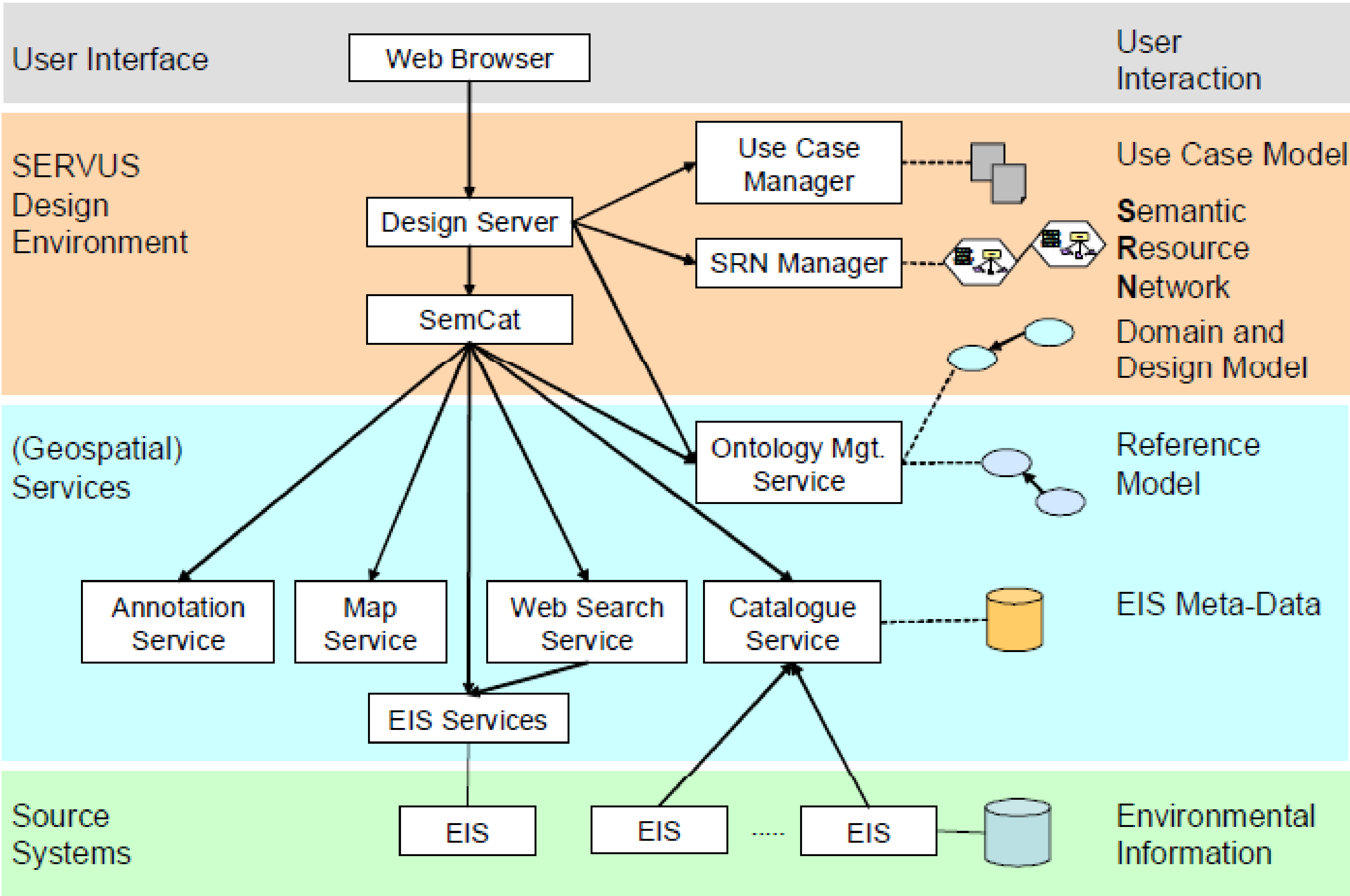
OGC General Feature Model (GFM) as part of
OGC Reference Model (Percivall (ed.), 2003)



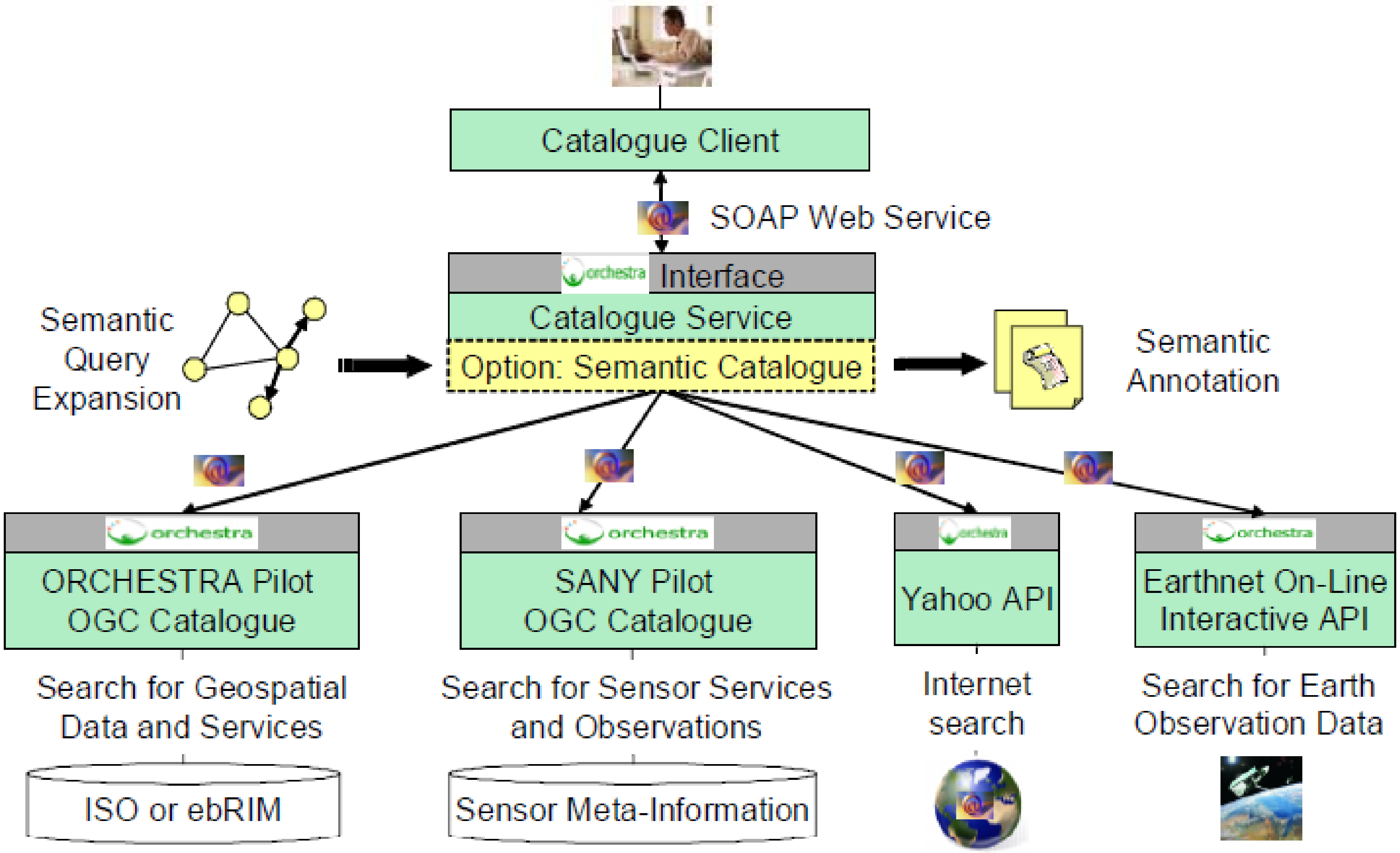
Reference Model for the
ORCHESTRA Architecture
(RM-OA)
(Usländer (ed.), 2007)

Integration of resource-oriented
architecture concepts into the
OGC Reference Model
(Usländer, 2008b)

SERVUS Implementation architecture



Architecture of Semantic catalogue



Use os Semantic technologies (SWING, ENVISION, REMICS projects)

- Semantic publishing

- Semantic Annotation
- Semantic Discovery and matchmaking
- Semantic Interoperability and Mediation

- Semantic Composition

SWING

Semantic Web services Interoperability for Geospatial decision making

- Home
- Partners
- Deliverables
- Publications & Links
- Workplan
- Demos
- Tools & Services
- Showcase
- Events
- Contact
- Internal

RDF Metadata

ENVISION project

The follow-up of SWING project is the ENVISION project. Visit the ENVISION website.

Objectives

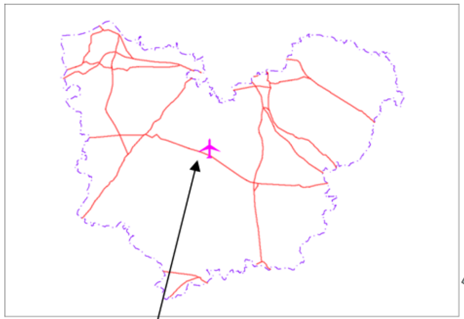
Today, a number of non-semantic web services are available within the geospatial domain. The scarcity of semantic annotation and the lack of a supportive environment for discovery and retrieval make it difficult to employ such services to solve a specific task in geospatial decision making.

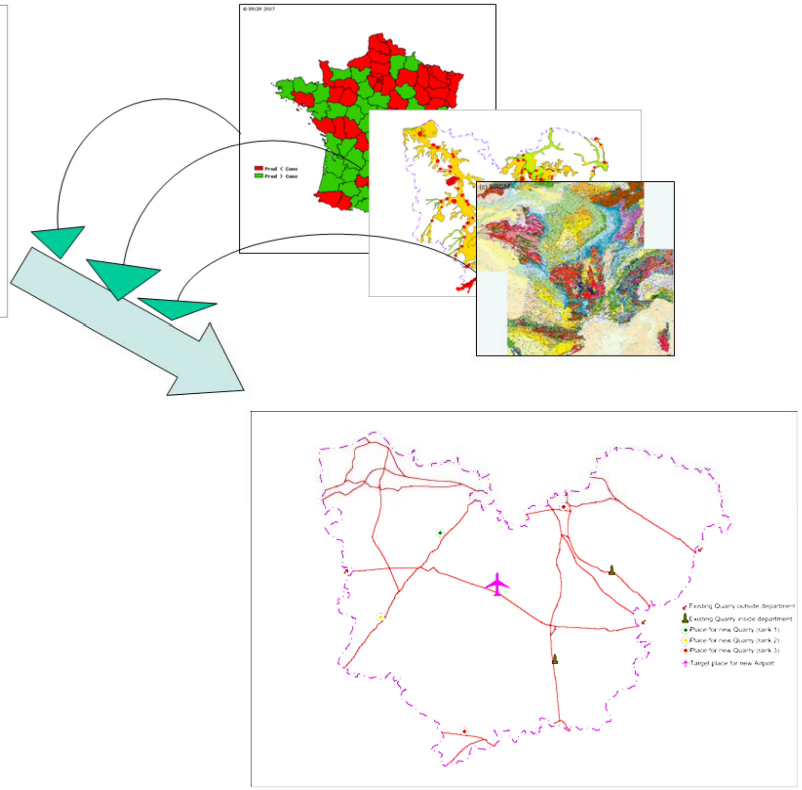
SWING aims at deploying Semantic Web Service (SWS) technology in the geospatial domain. In particular, we address two major obstacles that must be overcome for SWS technology to be generally adopted, i.e. to reduce the complexity of creating semantic descriptions and to increase the number of semantically described services. Today, a comprehensive knowledge of logics, ontologies, metadata and various specification languages is required to describe a service semantically. We will develop methods and tools that can hide the complexity – and automate the creation – of the necessary semantic descriptions. The objective of SWING is to provide an open, easy-to-use SWS framework of suitable ontologies and inference tools for annotation, discovery, composition, and invocation of geospatial web services.

SWING

http://www.swing-project.org/

- **S**emantic **W**eb Services **IN**teroperability in **G**eospatial decision making
- A framework for semantic discovery and composition of geospatial services
- Prototyped in the area of Mineral Resources Management



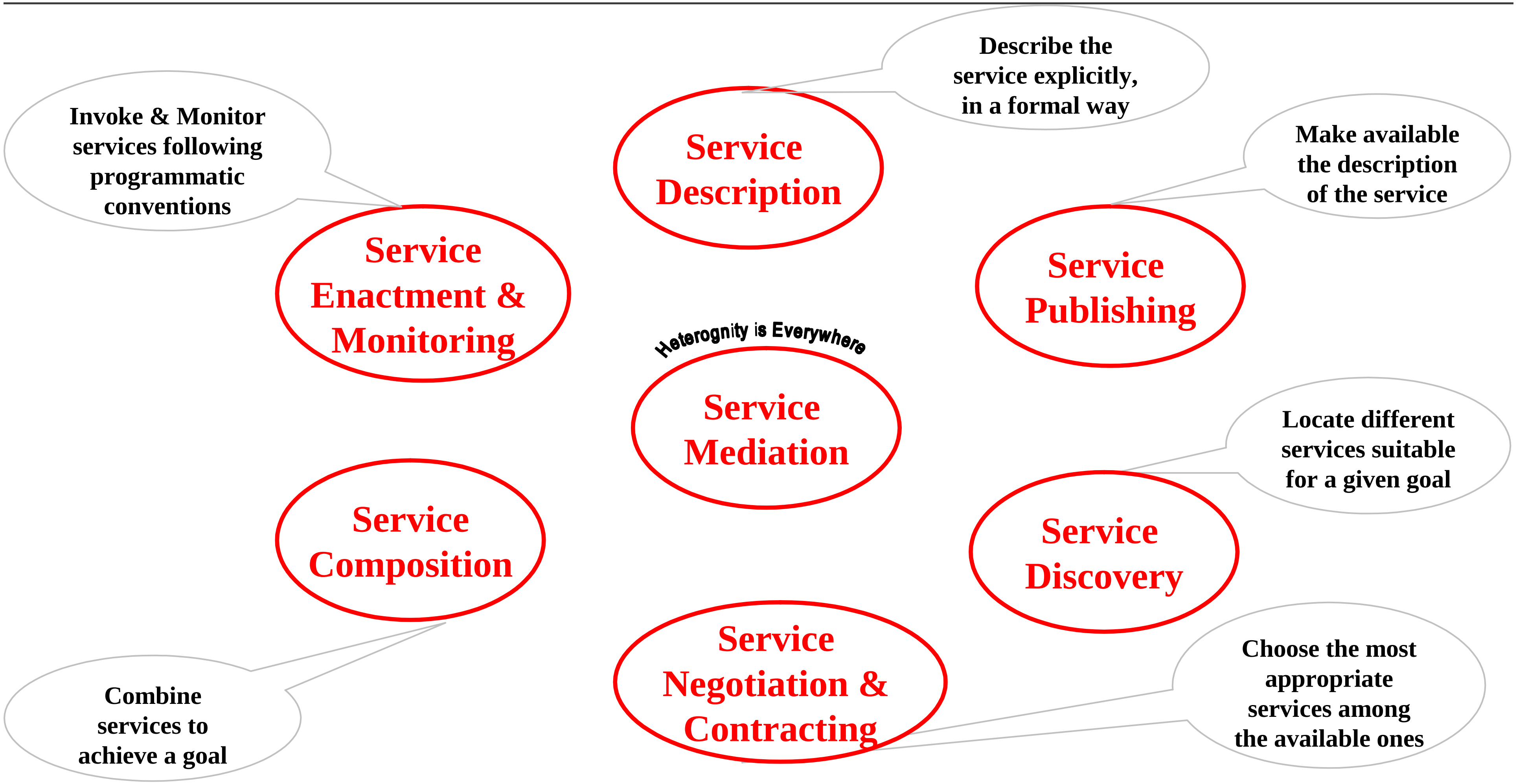


Substances	Quantity(*)
Sand	**110 000 tons**
Granite	**50 000 tons**
Concrete	**200 000 tons**

Semantic Web and Web Services - SWS

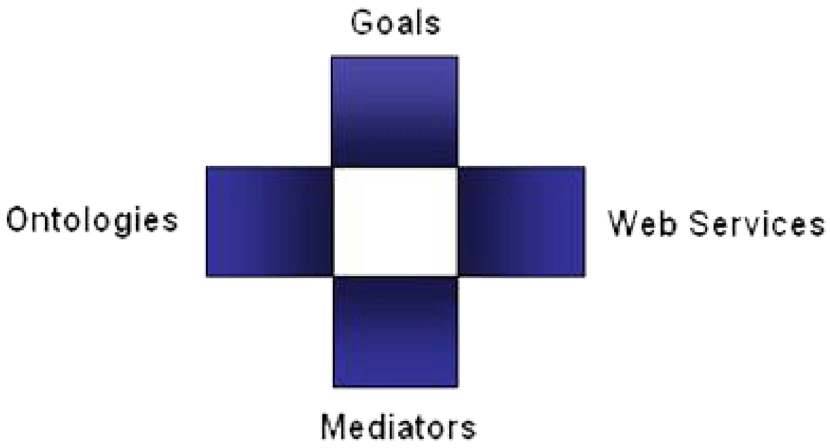
Dynamic	**Web Services** **UDDI, WSDL, SOAP**	→	**Semantic Web Services**
	↑		↑
Static	**WWW** **URI, HTML, HTTP**	→	**Semantic Web** **RDF, RDF(S), OWL, etc.**

SWS – Tasks to be Automated



The WSMO Approach to SWS

Objectives that a client may
have when consulting a Web Service



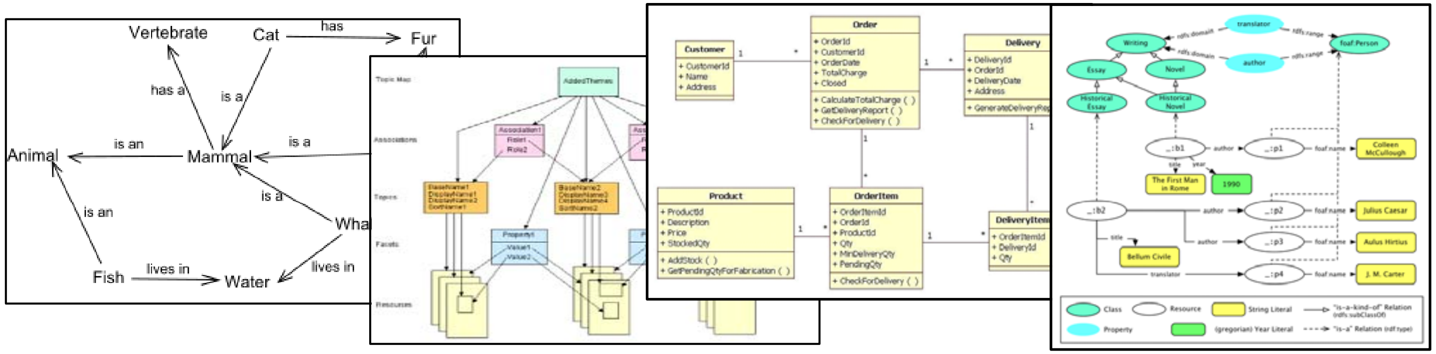
Provide the formally specified terminology of the information used by all other components

Semantic description of Web Services:
• **Capability** (*functional*)
• **Interfaces** (*usage*)

Connectors between components with mediation facilities for handling heterogeneities

Wide Variety of Languages for Specifying Ontologies

- **Graphical**: Semantic Networks, Topic Maps, UML, RDF



- **Logical**: Description Logics, First Order Logic, Rules, Conceptual Graphs

DL Syntax	Example
$C_1 \sqcap \ldots \sqcap C_n$	Human ⊓ Male
$C_1 \sqcup \ldots \sqcup C_n$	Doctor ⊔ Lawyer
$\neg C$	¬Male
$\{x_1\} \sqcup \ldots \sqcup \{x_n\}$	{john} ⊔ {mary}
$\forall P.C$	∀hasChild.Doctor
$\exists P.C$	∃hasChild.Lawyer
$\leqslant nP$	⩽1hasChild
$\geqslant nP$	⩾2hasChild

Brothers are siblings

$\forall x, y \;\; Brother(x, y) \;\Rightarrow\; Sibling(x, y).$

"Sibling" is symmetric

$\forall x, y \;\; Sibling(x, y) \;\Leftrightarrow\; Sibling(y, x).$

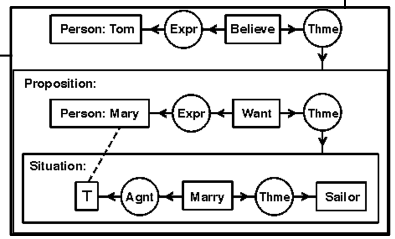
One's mother is one's female parent

$\forall x, y \;\; Mother(x, y) \;\Leftrightarrow\; (Female(x) \wedge Parent(x, y)).$

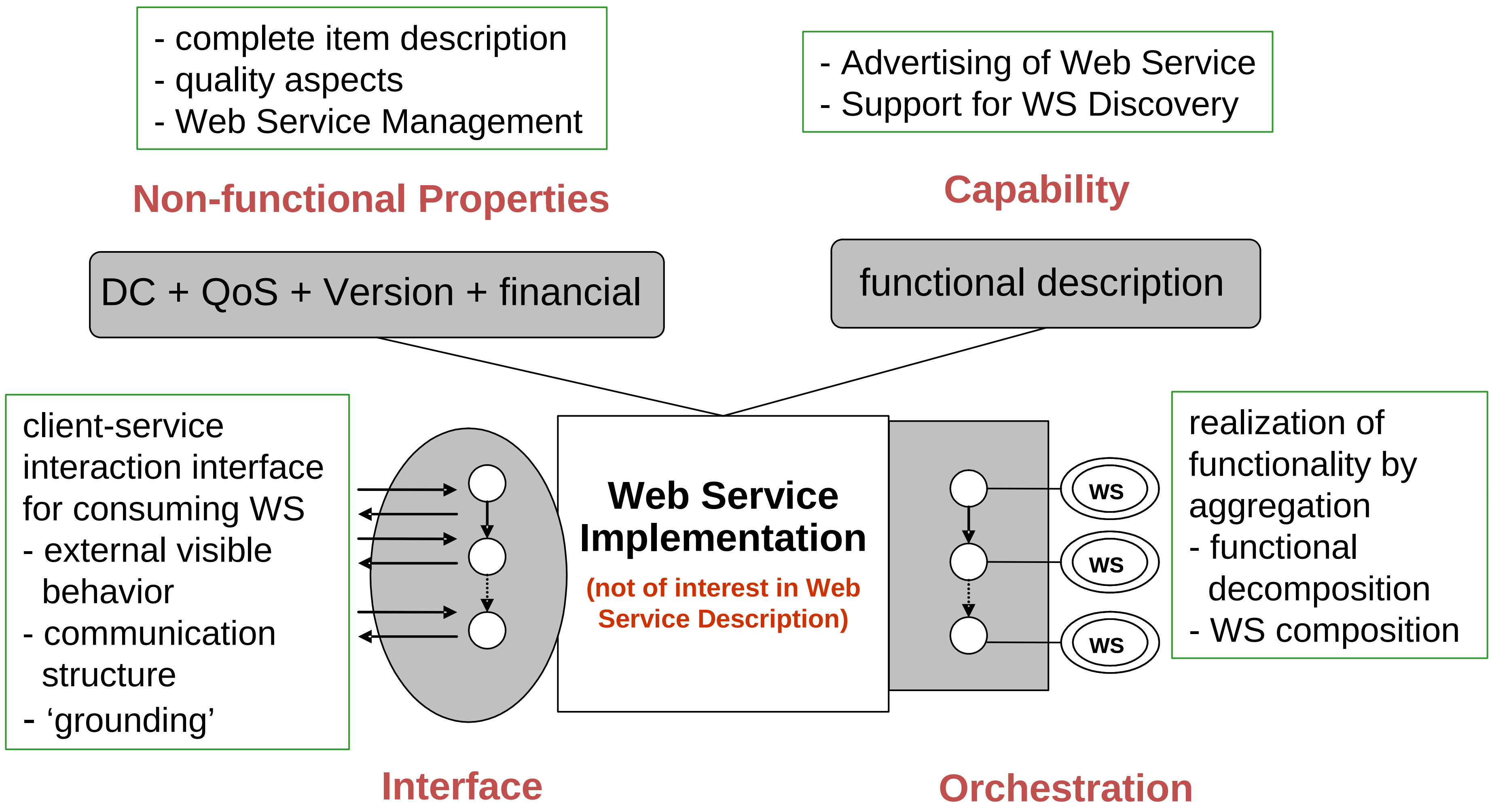
A first cousin is a child of a parent's sibling

$\forall x, y \;\; FirstCousin(x, y) \;\Leftrightarrow\; \exists p, ps \;\; Parent(p, x) \wedge Sibling(ps, p) \wedge Parent(ps, y)$

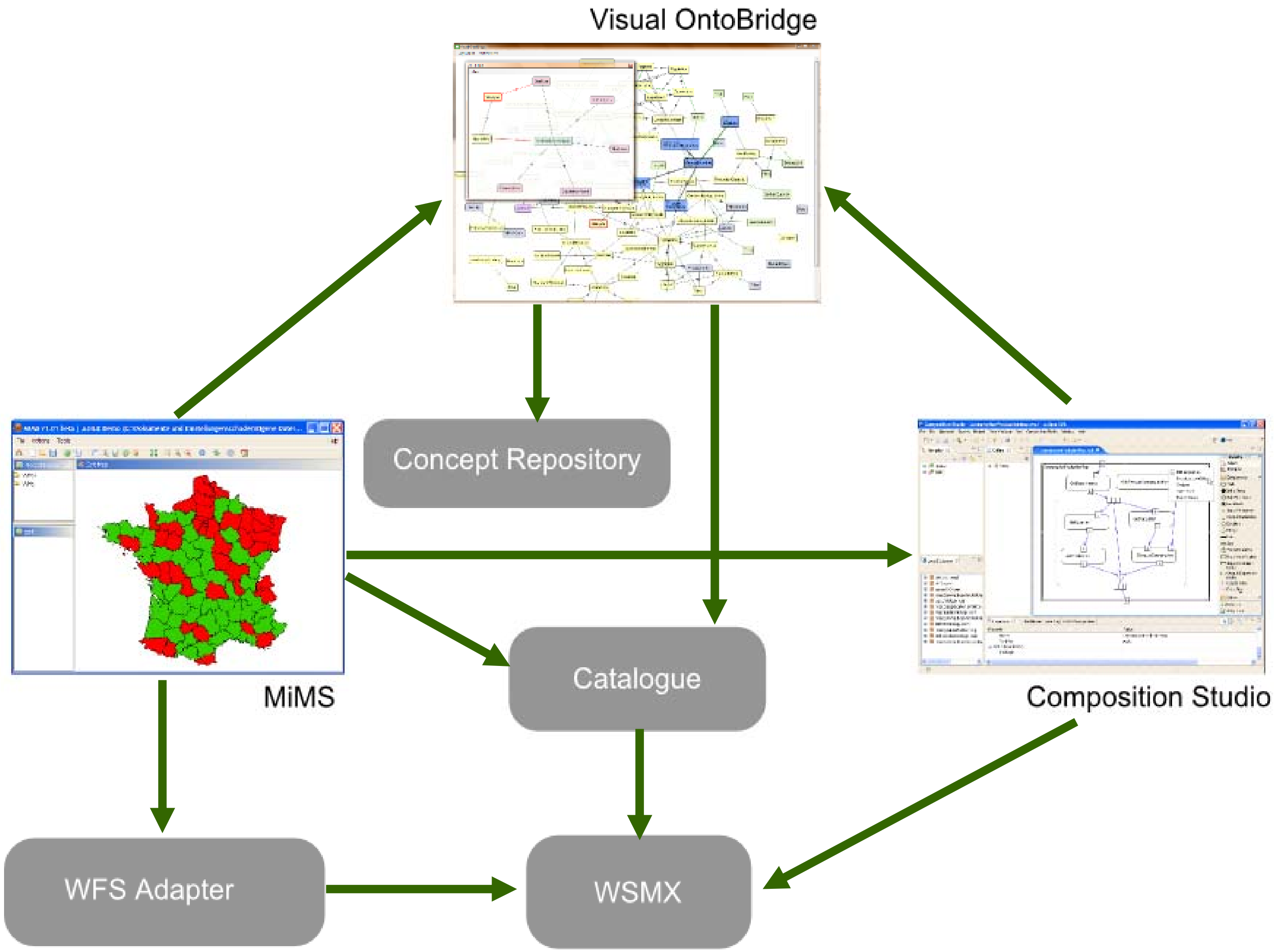
```
sibling(X, Y)      :- parent_child(Z, X), parent_child(Z, Y).
parent_child(X, Y) :- father_child(X, Y).
parent_child(X, Y) :- mother_child(X, Y).
mother_child(trude, sally).
father_child(tom, sally).
father_child(tom, erica).
father_child(mike, tom).
```



A Conceptual Model for Web Services



SWING – High-level Architecture



See demo at http://www.swing-project.org/showcase.html

SWING components and tools

- **MiMS**: Environment for domain expert
  - Convenient semantic annotation & discovery; use composed services (
- **WSMX**: Semantic web services platform
  - Geospatial semantic discovery; execution of composed services
- **Concept Repository**: Ontologies for semantic annotation
  - Used throughout components
- **Visual OntoBridge**: Annotation tool
  - Semi-automatic annotation of services and queries
- **Catalogue**: OGC Catalogue
  - Semantic discovery in interaction with WSMX
- **Composition Studio**: Environment for IT expert
  - Convenient semantic annotation & discovery; graphically compose services

ENVISION

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environmental services infrastructure with ontologies

home blog internal area

Navigation

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- At a Glance
- Consortium
- Publications
- Work Packages
- Deliverables
- Contact

Home

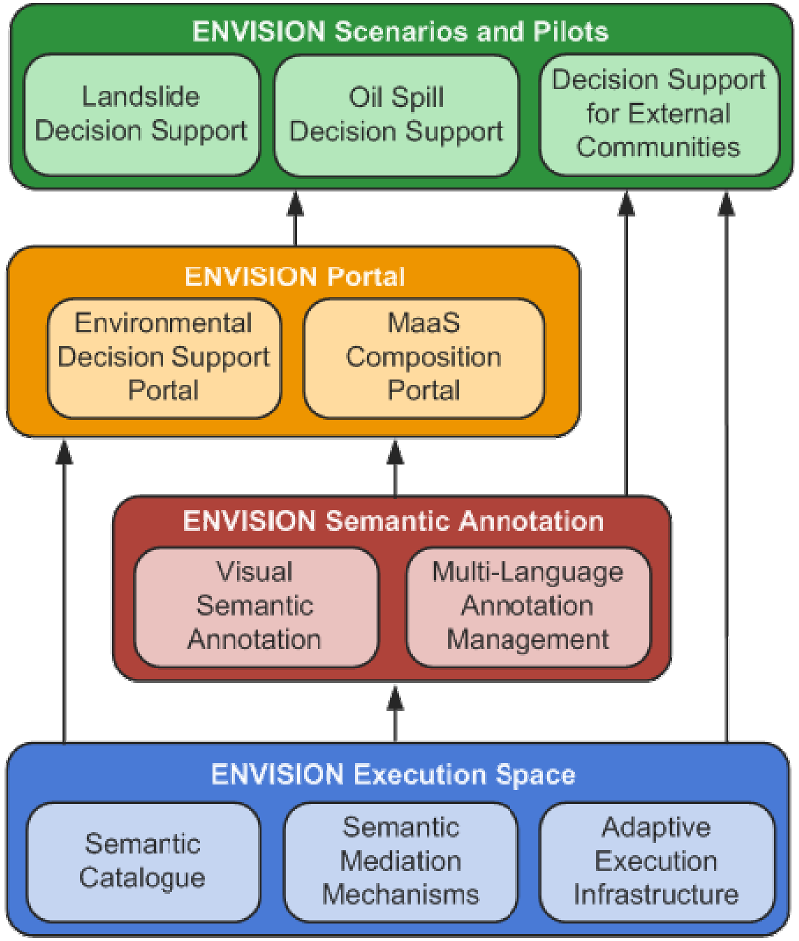
The ENVISION project provides an ENVIronmental Services Infrastructure with ONtologies that aims to support non ICT-skilled users in the process of semantic discovery and adaptive chaining and composition of environmental services. Innovations in ENVISION are: on-the-Web enabling and packaging of technologies for their use by non ICT-skilled users, support for migrating environmental models to be provided as models as a service (Maas), and the use of data streaming information for harvesting information for dynamic building of ontologies and adapting service execution.

The ENVISION Environmental Decision Portal supports the creation of web-based applications enabled for dynamic discovery and visual service chaining. The ENVISION Ontology Infrastructure provides support for visual semantic annotation tools and multilingual ontology management. The ENVISION Execution Infrastructure comprises a semantic discovery catalogue and a semantic service mediator based on a generic semantic framework and adaptive service chaining with data-driven adaptability.

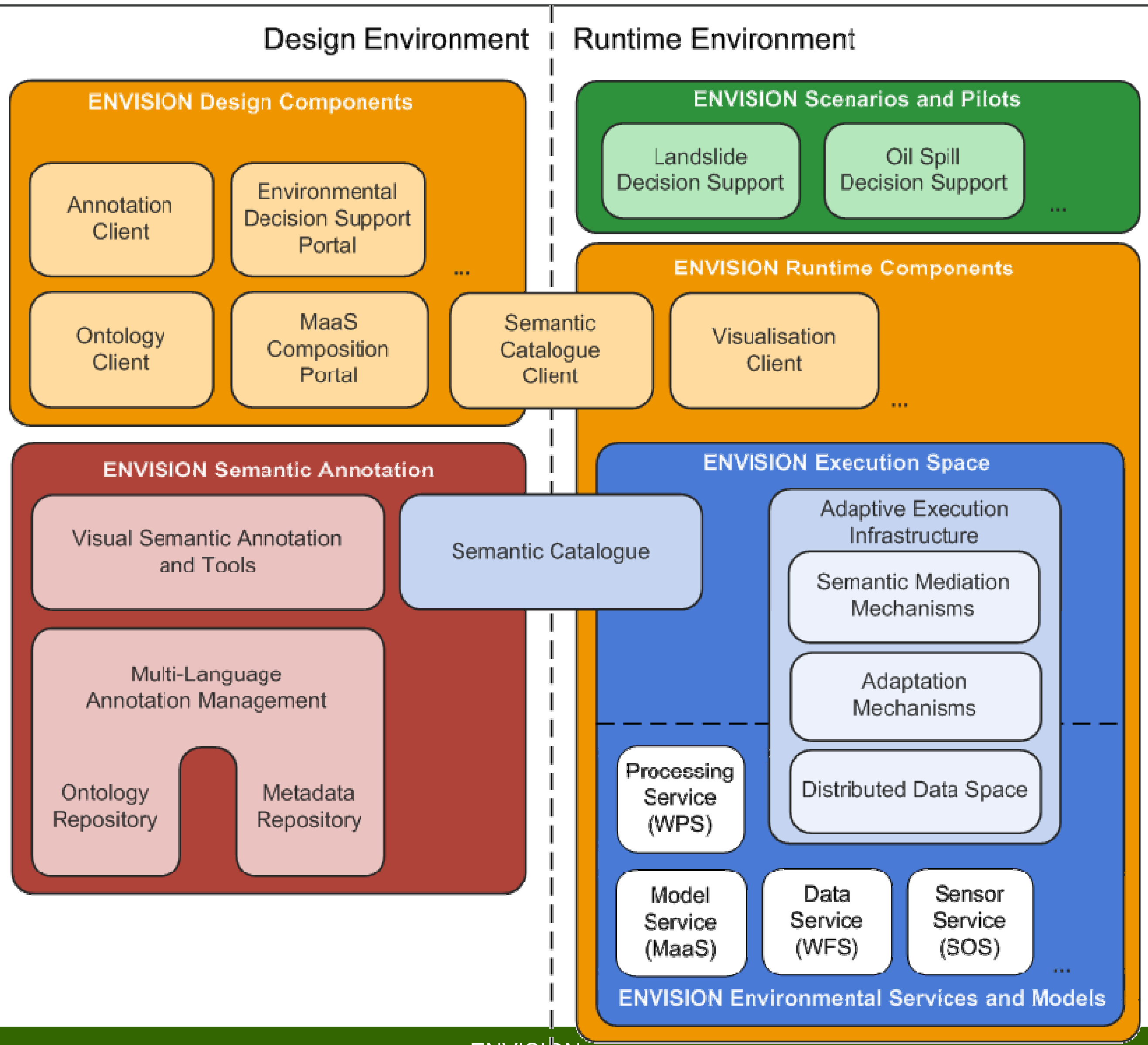
ENVISION – An Infrastructure for MaaS

- **ENVI**ronmental **S**ervices **I**nfrastructure with **ON**tologies

- Portal with a pluggable decision support framework
  - Visual service chaining
  - Migration of existing models to MaaS
- Semantic annotation infrastructure
  - Visual semantic annotation mechanism
  - Multilanguage ontology management
- Execution space
  - Semantic discovery catalogue
  - Semantic service mediator
  - Adaptive service chaining execution



ENVISION Architecture



A General Scenario for MaaS – User Operations

Design time
(provide on-the-shelf modeling solutions)

- Discover existing resources
- Build the modeling workflow
- Register/Annotate the new Service

Set-up time
(connect the appropriate sources of information to feed the modeling service)

- Discover existing Modeling Services
- Select a region of interest
- Discover existing data sources
- Select the data sources
- Set the parameters
- Play the scenario

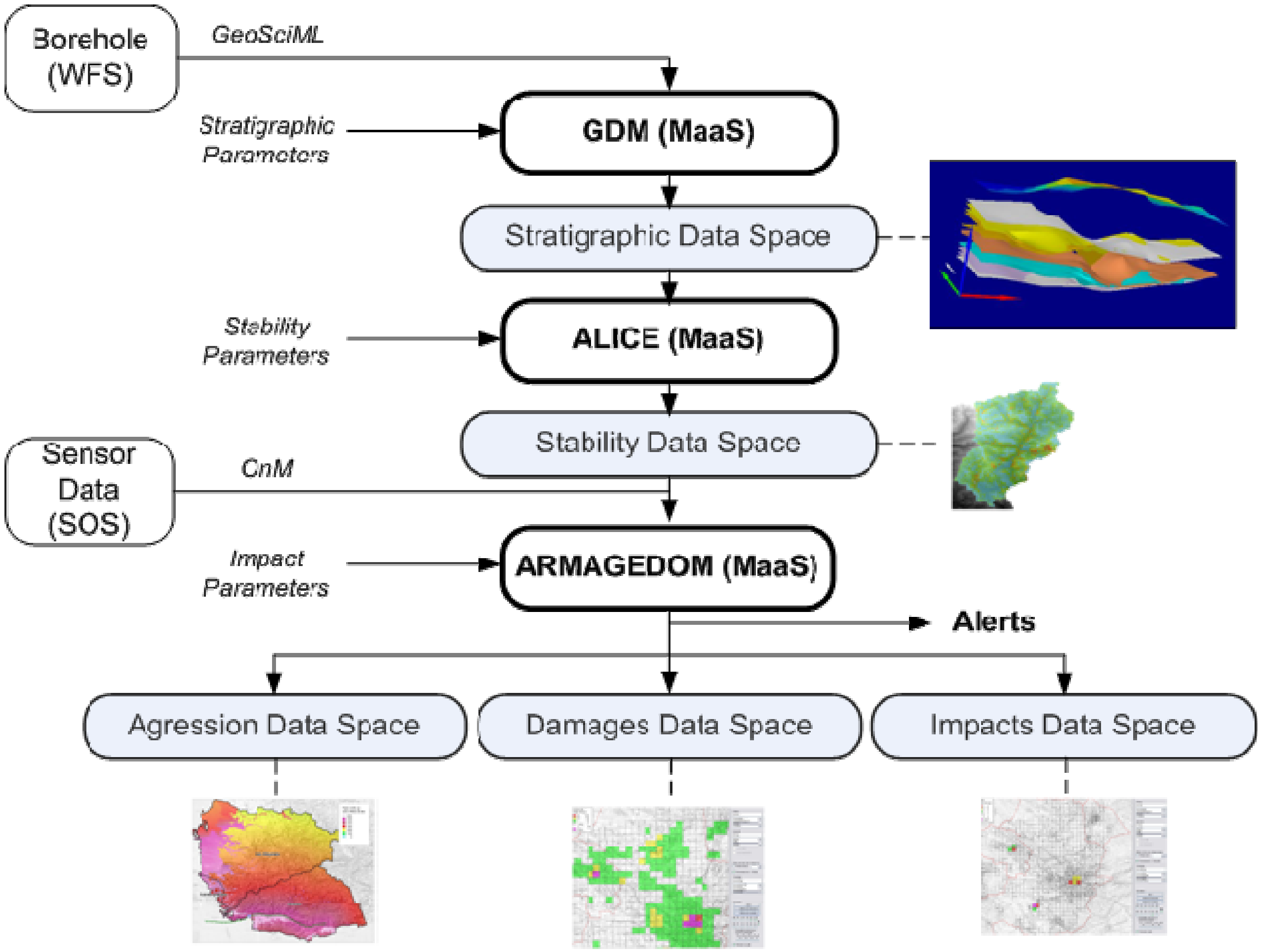
Execution time
(interact with the information provided by the models and monitor the system)

- Discover existing Modeling Services
- Select a region of interest
- Discover existing data sources
- Select the appropriate sensors data streams
- Select functional parameters for the alerting system

Semantic Annotations are a key enabler for discovery of services!

MaaS Scenario – Landslide Hazard Risk Assessment

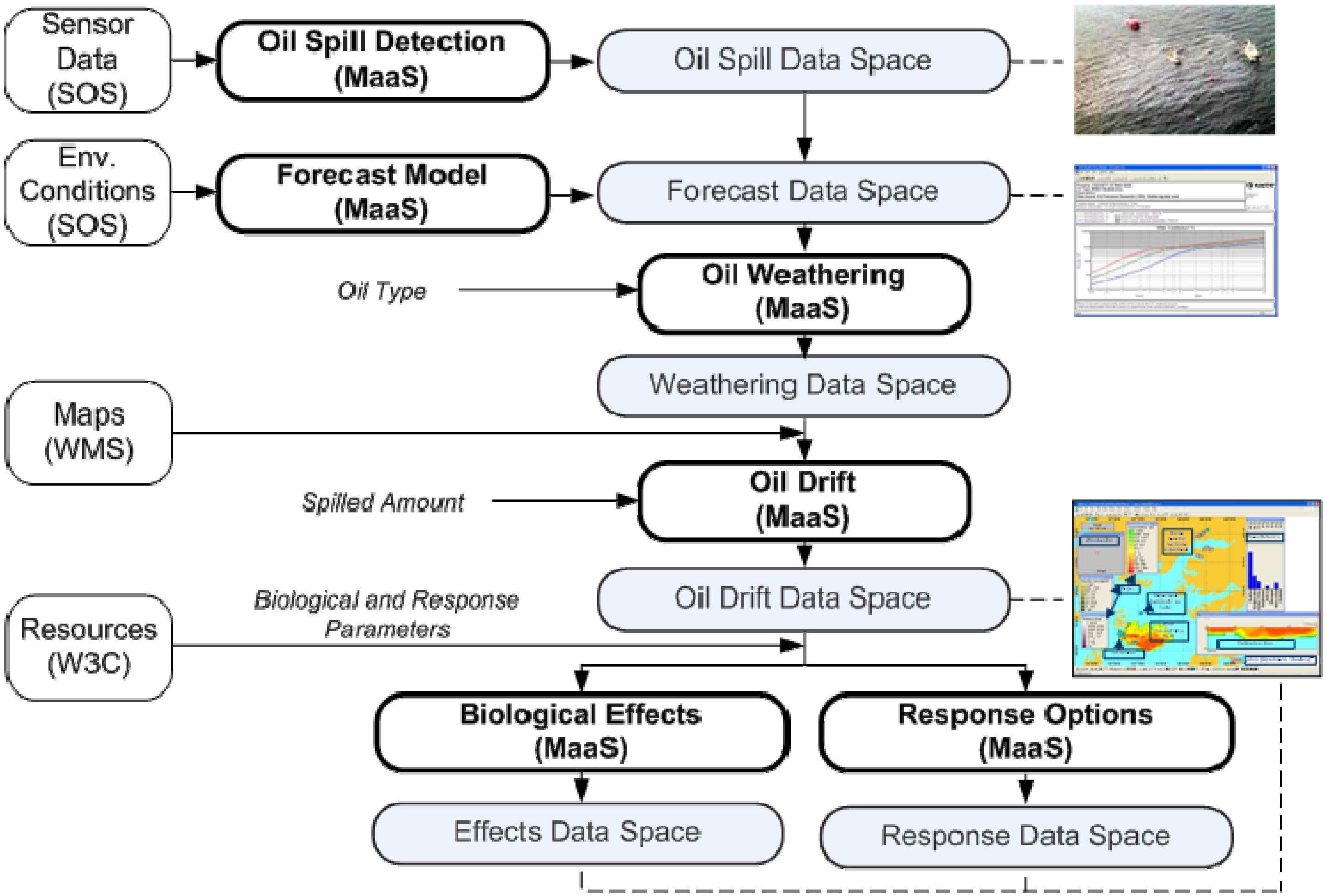
How to set up Web services that can be manipulated by non-technical operators and can simulate damage under different climatic and/or another potential trigger (e.g. earthquake) for landslides scenarios?



Source: French Geological Survey (BRGM)

MaaS Scenario – Oil Spill Risk Analysis

How to set up Web services that can be manipulated by non-technical operators and can enable a quick and adequate response in order to minimize biological consequences of oil spills at sea?



ENVIP

envip'2010

Environmental Information Systems and Services Infrastructures and Platforms

Workshop at **EnviroInfo2010**, Bonn/Cologne, October 6-8, 2010

Workshop Description:

The **Shared Environmental Information System (SEIS)** is one of three major initiatives along with the **INSPIRE Directive** and the **Global Monitoring for Environment and Security (GMES)** undertaken by Europe to collect and share environmental information for the benefit of the global society.

Different efforts are now emerging towards the creation of infrastructures and platforms for Environmental Information Systems and Services – including Infrastructures for flexible discovery and chaining of distributed environmental services.

Information and Communication Technologies (ICT) have an essential role to play in the context of Environmental systems as they provide the necessary support in terms of tools, systems and protocols to establish a dynamic environmental space of collaboration in a more and more sophisticated digital world. Core challenges are not only related to providing seamless environmental data access

Program

The keynotes for the ENVIP workshop will be shared with the ENVIROINFO conference. The program of the conference is **here**.

Thursday 09:00-10:30, KEYNOTE (EnviroInfo) and Coffee Break

Thursday 10:30-12:30, Session 1

Infrastructures with Semantic annotation and Uncertainty

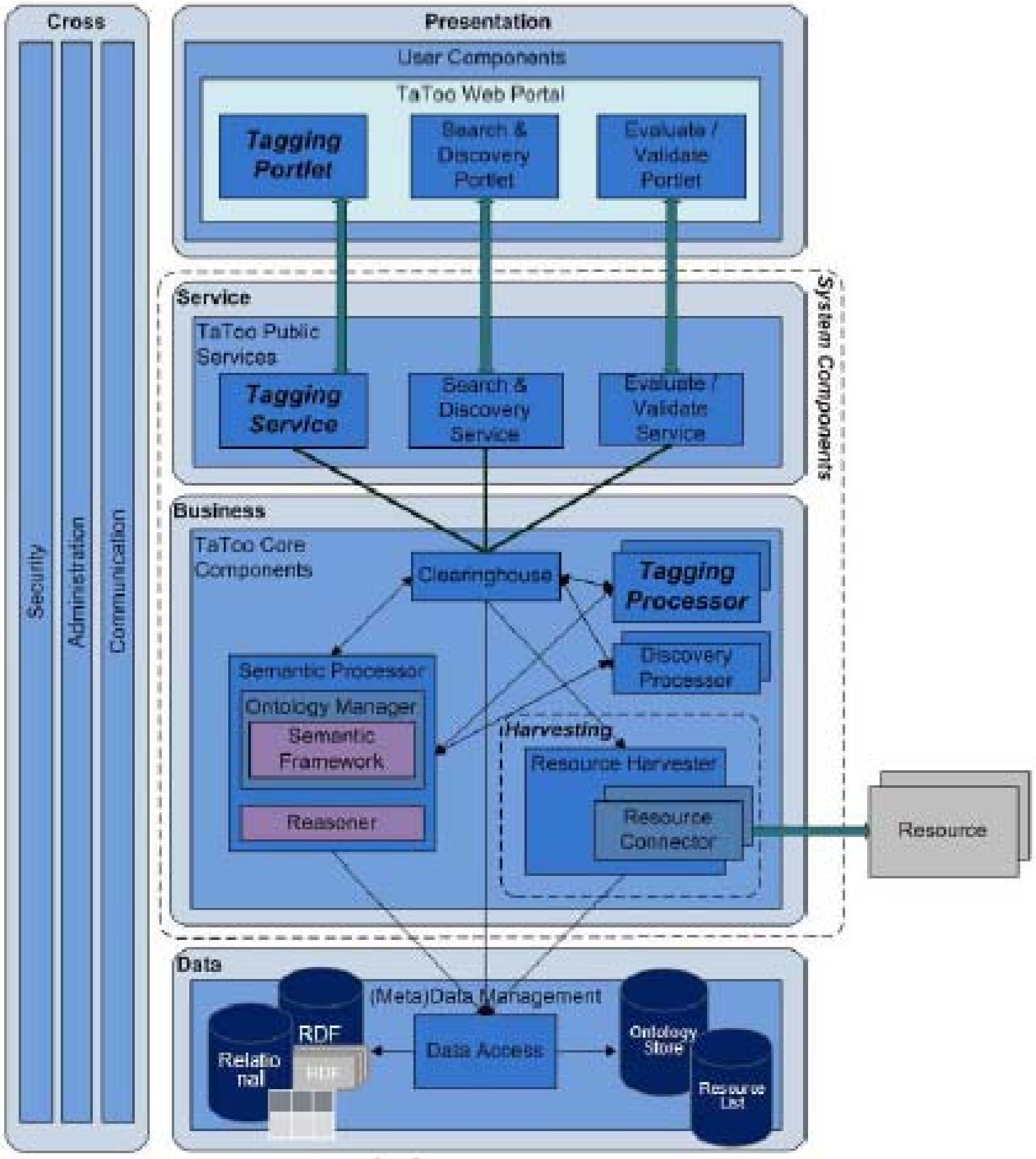
Chairs: Arne J. Berre, SINTEF and Denis Havlik, Austrian Institute of Technology)

- **Closing the discovery gap in environmental information resources using semantic annotations: the TaToo Approach**
  by Tomas Pariente Lobo, Mauricio Ciprian, Gerald Schimak, Giuseppe Avellino, and Sascha Schlobinski
- **Validation Scenario for Anthropogenic Impact and Global Climate Change for Tatoo**
  by Jiri Hrebicek, Ladislav Dusek, Miroslav Kubasek, Jiri Jarkovsky, Karel Brabec, Ivan Holoubek, Lukas Kohut, and Jaroslav Urbanek

Current ENVIP project areas

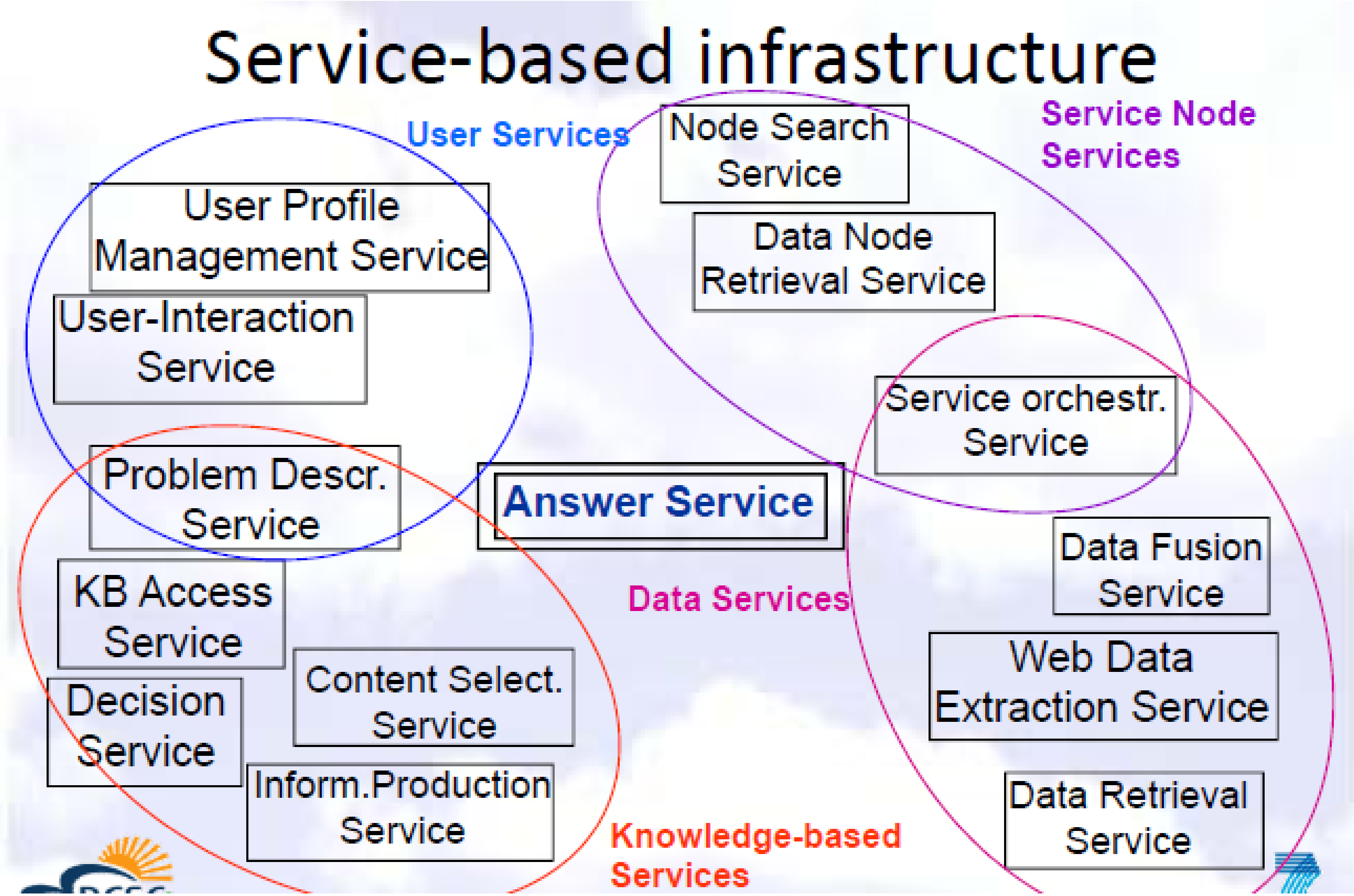
	Ontologies / domain models	(Service) discovery	(Service) Composition	Sensors access / streams	(Web) visualization	Multilingualism	Transformation / mapping	Standards contributions	Security
TATOO	X	X			X				
PESCADO		X	X		X				
UncertWeb		X	X					X	
SUDPLAN			X		X				
HYDROSYS				X	X				
NETMAR	X	X	X		X	X	X		
OEPI	X	X	X						
GENESIS-DEC	X	X	X		X			X	X
LARKC				X				X	
ENVISION	X	X	X	X	X	X	X	X	
DIADEM	X		X		X		X		

TATOO



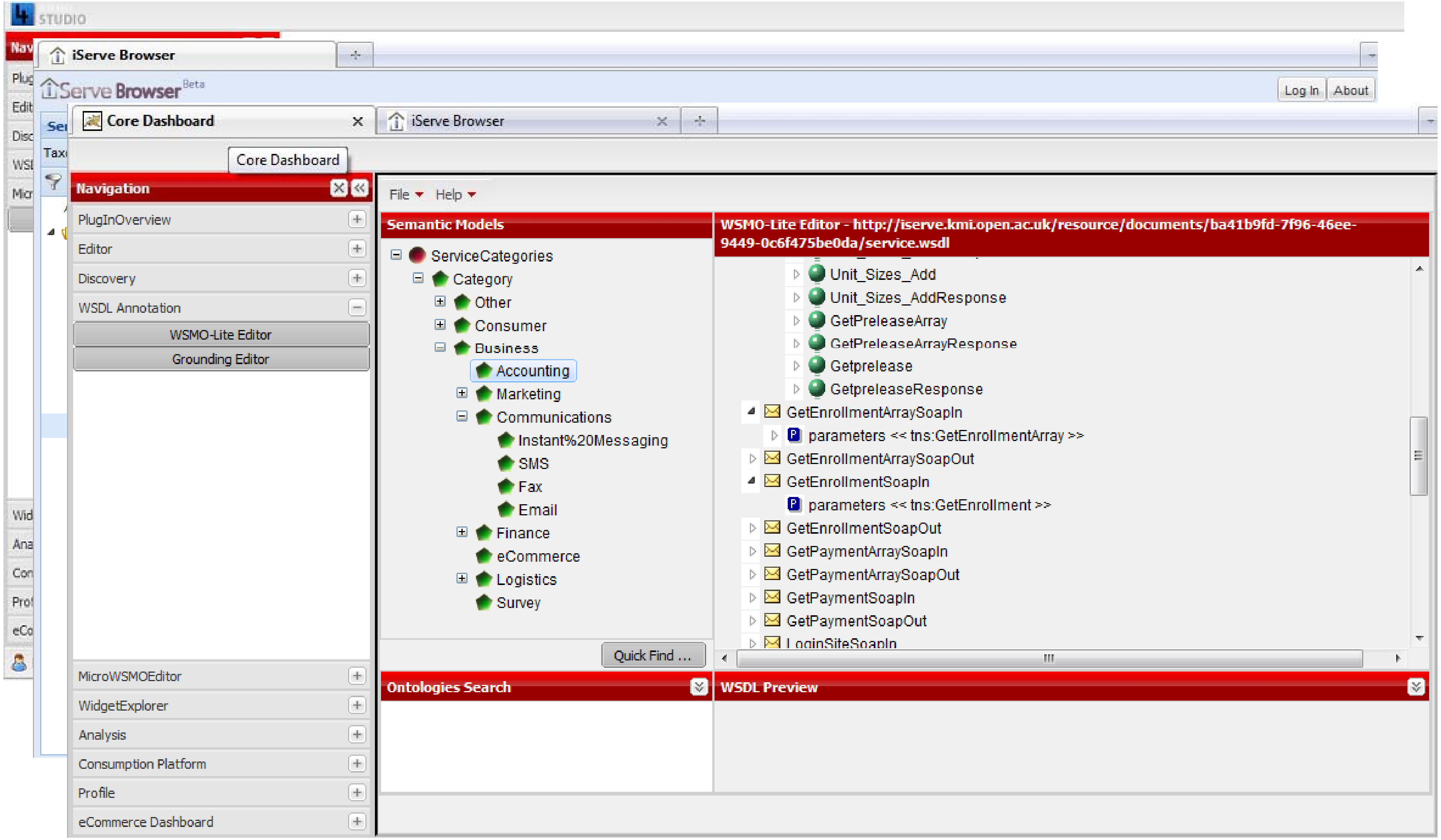
Cross
Security
Administration
Communication
Presentation
User Components
TaToo Web Portal
Tagging Portlet
Search & Discovery Portlet
Evaluate / Validate Portlet
System Components
Service
TaToo Public Services
Tagging Service
Search & Discovery Service
Evaluate / Validate Service
Business
TaToo Core Components
Clearinghouse
Tagging Processor
Discovery Processor
Semantic Processor
Ontology Manager
Semantic Framework
Reasoner
Harvesting
Resource Harvester
Resource Connector
Resource
Data
(Meta)Data Management
RDF
Relational
Data Access
Ontology Store
Resource List

PESCADO



Service-based infrastructure
User Services
Node Search Service
Service Node Services
User Profile Management Service
Data Node Retrieval Service
User-Interaction Service
Service orchestr. Service
Problem Descr. Service
Answer Service
Data Fusion Service
KB Access Service
Data Services
Web Data Extraction Service
Content Select. Service
Decision Service
Inform.Production Service
Data Retrieval Service
Knowledge-based Services

WSMO-Lite tools
(Demo: SOA4All Studio http://www.soa4all.eu/)



Linked Open (Geospatial) Data

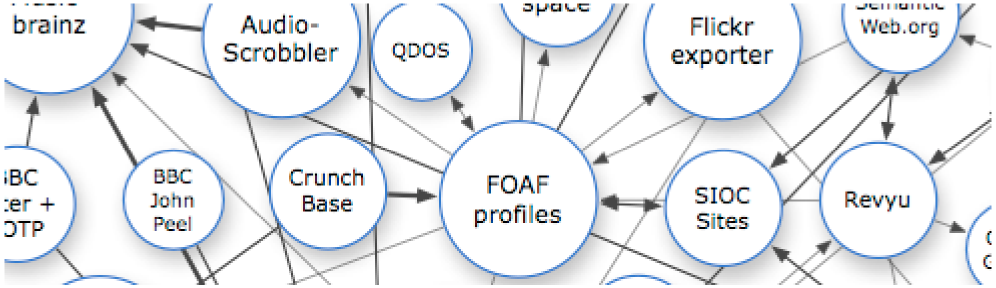
Linked Data - Connect Distributed Data across the Web

- Home
- Guides and Tutorials
- Frequently Asked Questions
- Glossary
- Images and Posters
- Presentations
- Data Sets
- Tools
- Events
- Calls for Papers
- Research
- News and Blogs
- Domains
- See Also

Linked Data

Linked Data is about using the Web to connect related data that wasn't previously linked, or using the Web to lower the barriers to linking data currently linked using other methods. More specifically, Wikipedia defines Linked Data as "a term used to describe a recommended best practice for exposing, sharing, and connecting pieces of data, information, and knowledge on the Semantic Web using URIs and RDF."

This site exists to provide a home for, or pointers to, resources from across the Linked Data community.



Linked Open Services

Linked Open Services

Linked Open Services (LOS) are an approach to exposing services, that is functionalities, on the Web using the same technologies that are associated with Linked Data, in particular HTTP, RDF and SPARQL read more...

This site is intended to serve as:

- An information point on the development of LOS - both services and principles - via the blog
- A collaborative basis for the definition and refinement of principles and best practices - via the wiki

Initial work on the LOS! Initiative was funded by the EU FP7 Integrated Project SOA4All

See: http://www.linkedopenservices.org/

Linked Open Services

Concretely, like Linked Data, Linked Open Services come with a set of guiding principles:

1. Describe services as **LOD prosumers**
   with input and output descriptions as **SPARQL graph patterns**
2. Communicate RDF by RESTful content negotiation
3. Include the **implicit knowledge contribution** that results from interactions in service descriptions and communications

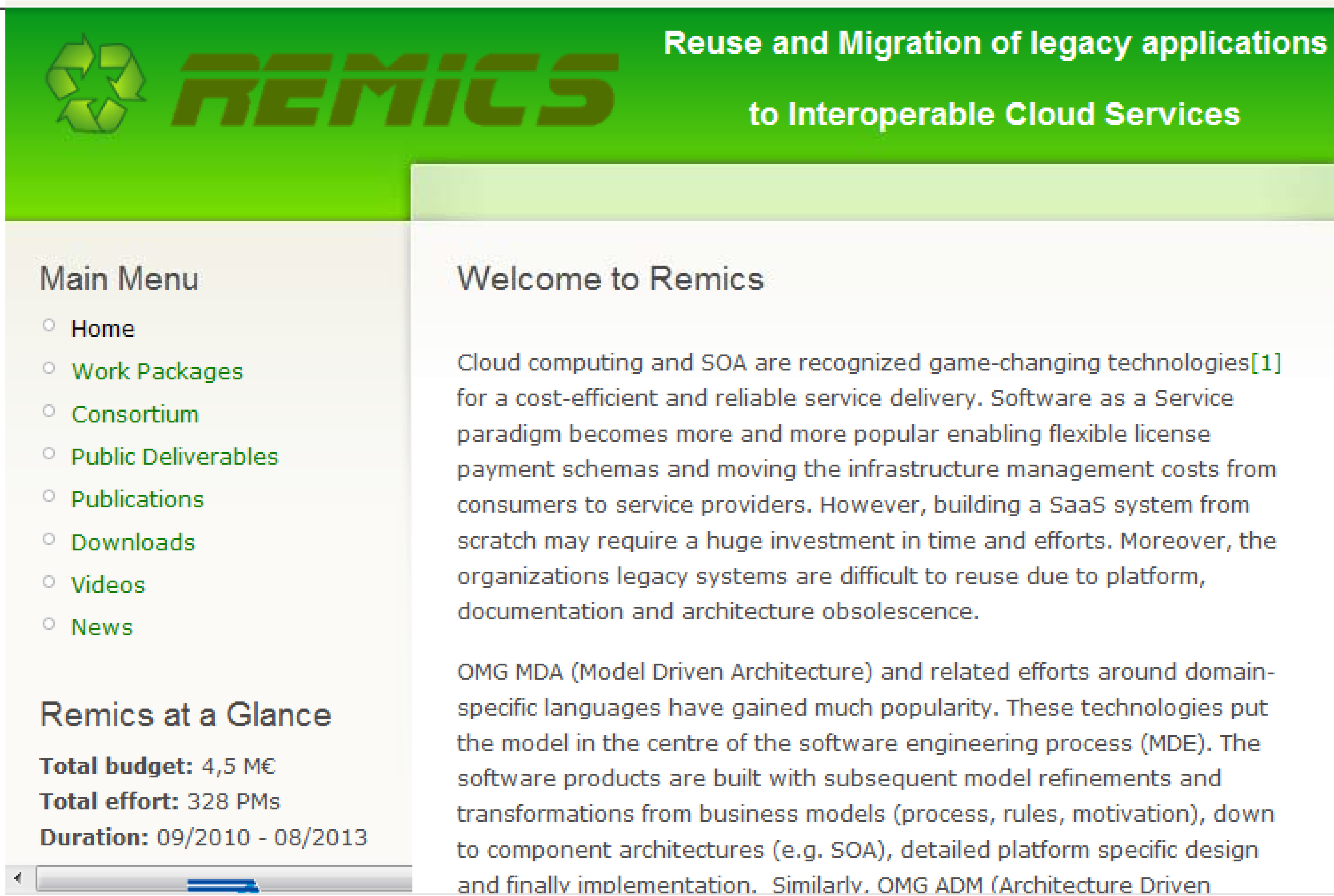
Associated with the last principle is an optional fourth:

1. *When wrapping non-LOS services*, extend the (lifted, if non-RDF) message to make explicit the implicit knowledge, and to use Linked Data vocabularies, using **SPARQL CONSTRUCT** queries

LOS are also intended to be composed - by processes, mash-ups and other means - according to a related set of principles:

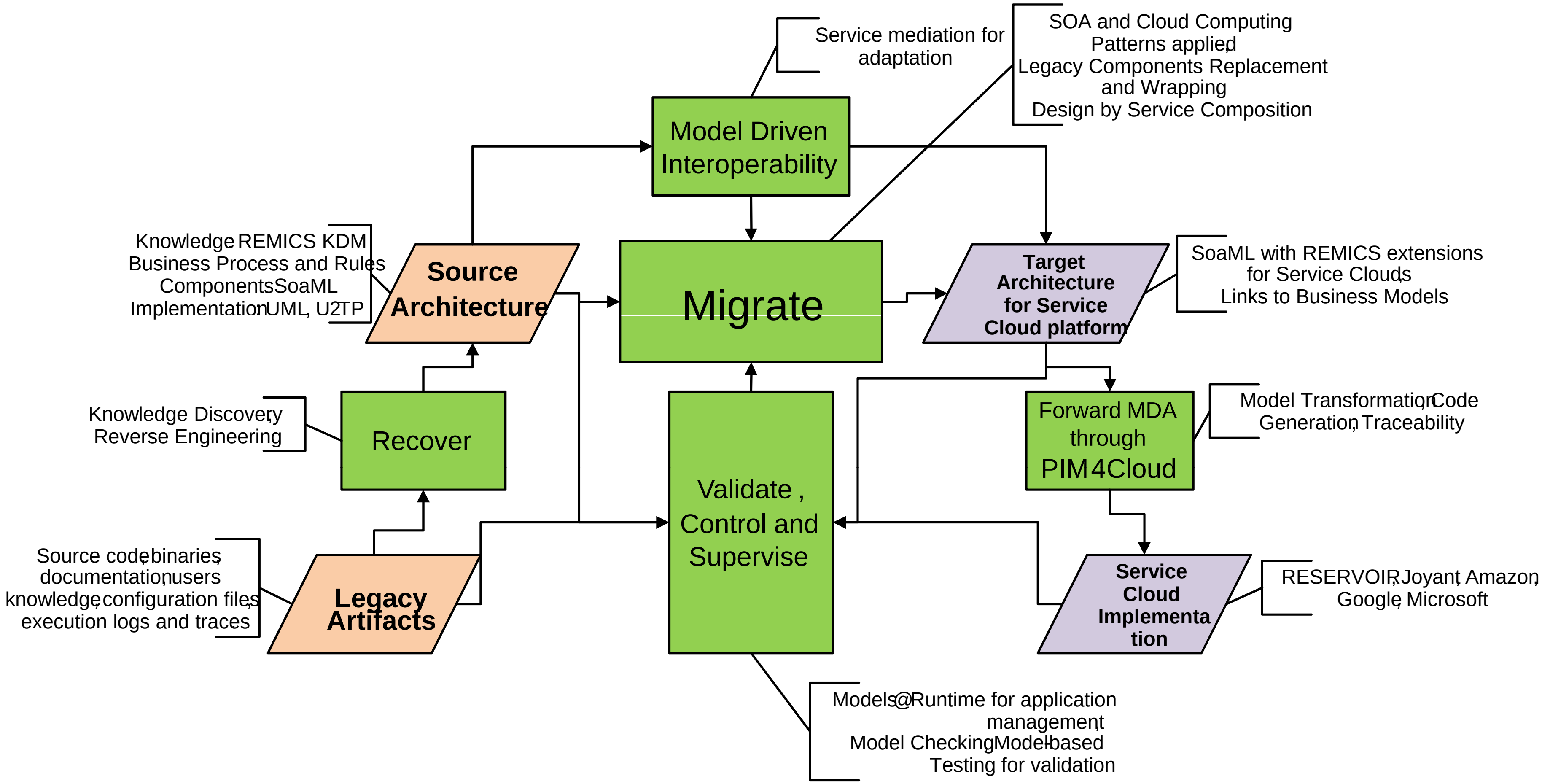
1. Decide control flow conditions based on **SPARQL ASK** queries
2. Base iteration on **SPARQL SELECT** queries
3. Define dataflow/mediation based on **SPARQL CONSTRUCT** queries

REMICS

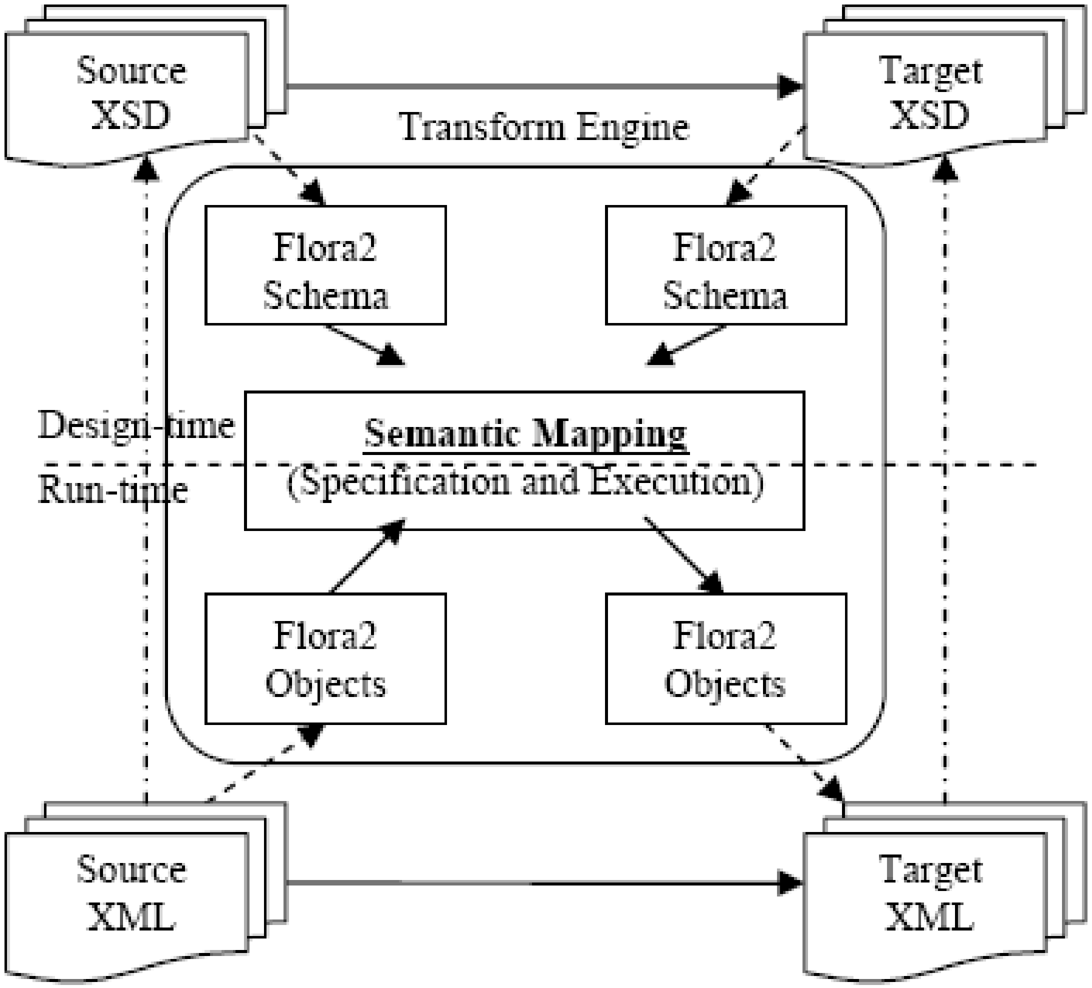


See: www.remics.eu

Model Driven Service Interoperability in the REMICS project



Semantic Interoperability using Flora2 (SINTEF)



Open Issues: Standardization

- Model References already standard (W3C SAWSDL)

- Support in OGC/TC211 Standards required
  - Storing semantic annotation
  - Querying semantic annotations
  - End-user tools support
- ...

Open Issues: Processes

- Model References already standard (W3C SAWSDL)
- Extensions for model based annotations ?
- Support in OGC/TC211 Standards possible ?
  - Storing semantic annotation
  - Querying semantic annotations
  - End-user tools support
- How can we annotate Geoprocesses
  - Domain vocabulary of Geo-operations required? All?
  - Or just describing relation between input and output?

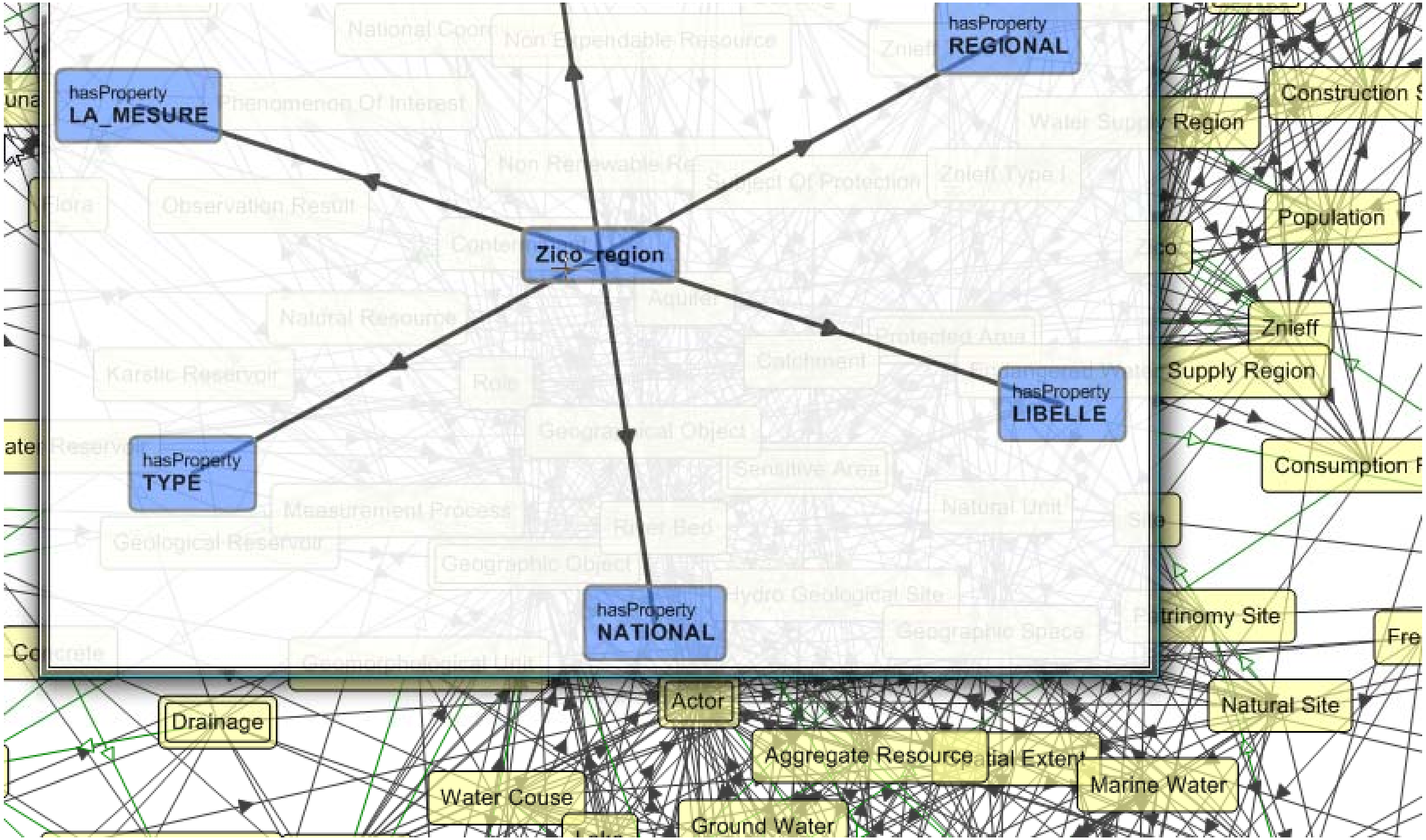
Conclusions and Outlook

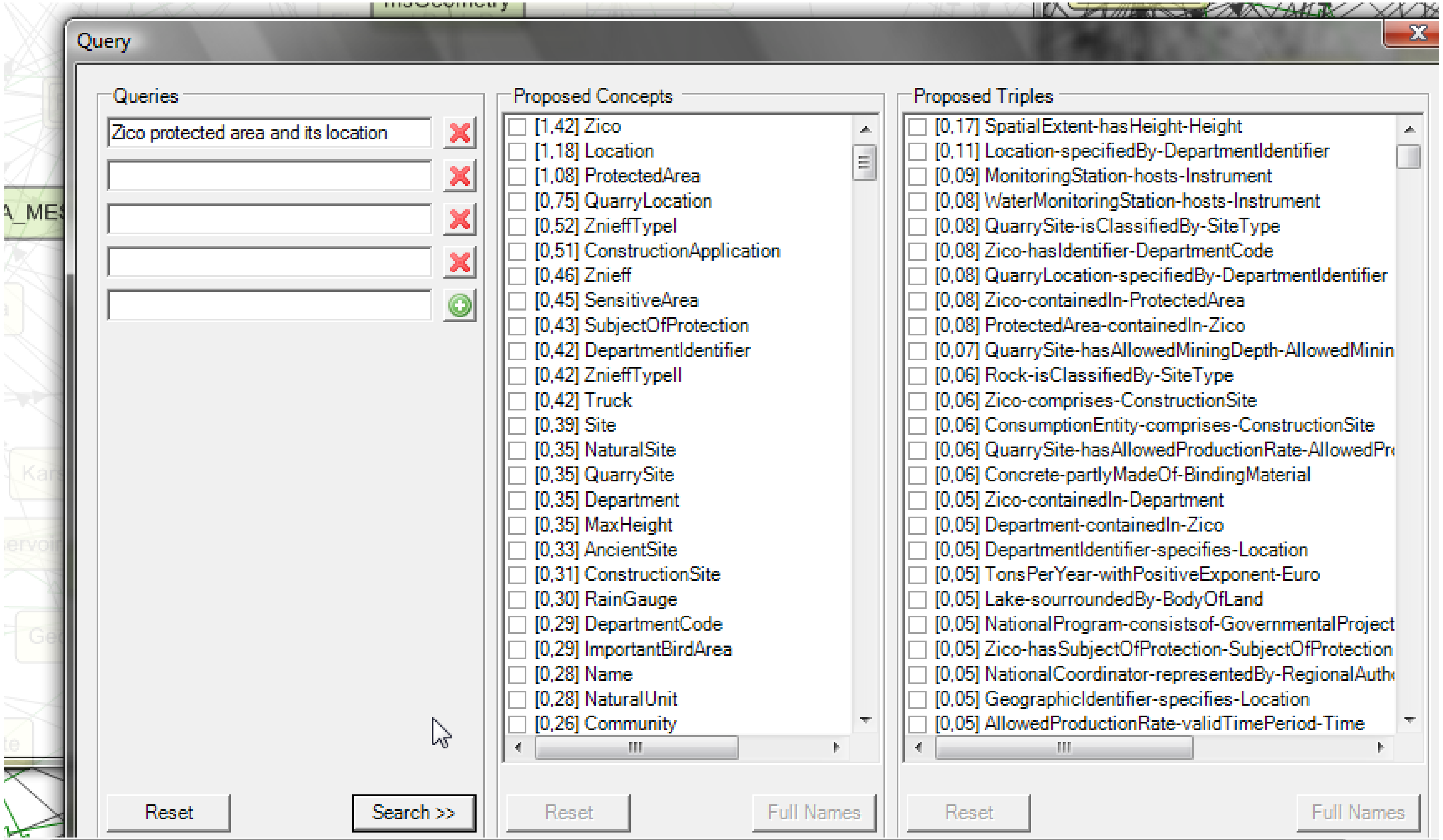
- Infrastructures and platforms based on service oriented architectures are maturing – link to a Future Internet Core platform …
- Modeling approaches for different resources – data/information, services (SoaML – see tutorial on Tuesday), events, processes are maturing
- Semantic technology extensions are being experimented with – what are the experiences and best practices ?
- Further work on harmonisation, integration and standardisation of approaches is a logical next step. ENVIP community, ISO/TC211, OGC etc.
- Further work is needed on semantic interoperability and composition.

SWING Showcase

See: Showcase video at:

http://138.232.65.156/swing


hasProperty
LA_MESURE
hasProperty
REGIONAL
Zico_region
hasProperty
LIBELLE
hasProperty
TYPE
hasProperty
NATIONAL
Population
Znieff
Supply Region
Natural Site
Actor
Drainage
Aggregate Resource
Marine Water
Water Couse
Ground Water



Query
Queries
Zico protected area and its location
Reset
Search >>
Proposed Concepts
[1,42] Zico
[1,18] Location
[1,08] ProtectedArea
[0,75] QuarryLocation
[0,52] ZnieffTypeI
[0,51] ConstructionApplication
[0,46] Znieff
[0,45] SensitiveArea
[0,43] SubjectOfProtection
[0,42] DepartmentIdentifier
[0,42] ZnieffTypeII
[0,42] Truck
[0,39] Site
[0,35] NaturalSite
[0,35] QuarrySite
[0,35] Department
[0,35] MaxHeight
[0,33] AncientSite
[0,31] ConstructionSite
[0,30] RainGauge
[0,29] DepartmentCode
[0,29] ImportantBirdArea
[0,28] Name
[0,28] NaturalUnit
[0,26] Community
Reset
Full Names
Proposed Triples
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[0,11] Location-specifiedBy-DepartmentIdentifier
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[0,08] WaterMonitoringStation-hosts-Instrument
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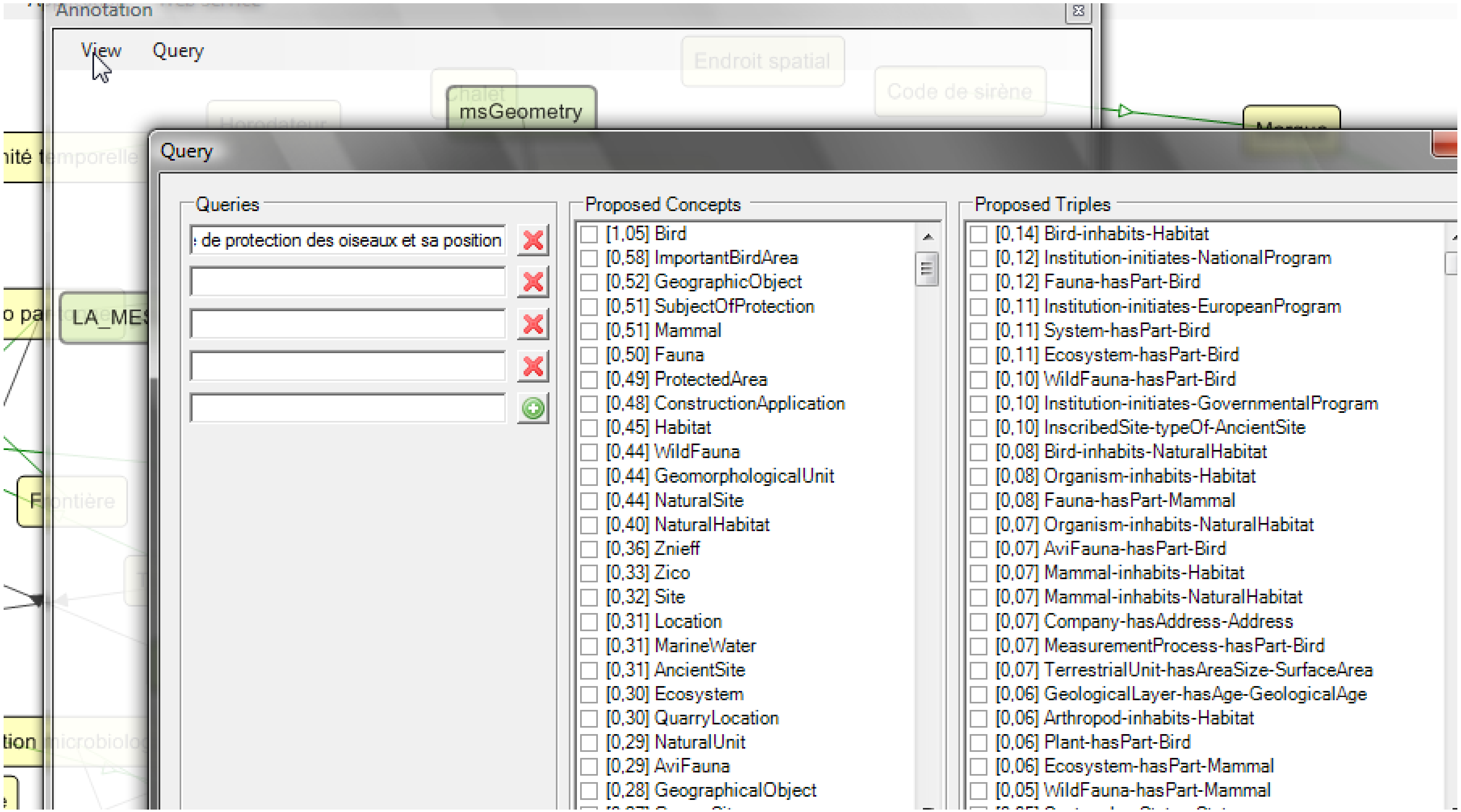
[0,08] QuarryLocation-specifiedBy-DepartmentIdentifier
[0,08] Zico-containedIn-ProtectedArea
[0,08] ProtectedArea-containedIn-Zico
[0,07] QuarrySite-hasAllowedMiningDepth-AllowedMinin
[0,06] Rock-isClassifiedBy-SiteType
[0,06] Zico-comprises-ConstructionSite
[0,06] ConsumptionEntity-comprises-ConstructionSite
[0,06] QuarrySite-hasAllowedProductionRate-AllowedPr
[0,06] Concrete-partlyMadeOf-BindingMaterial
[0,05] Zico-containedIn-Department
[0,05] Department-containedIn-Zico
[0,05] DepartmentIdentifier-specifies-Location
[0,05] TonsPerYear-withPositiveExponent-Euro
[0,05] Lake-sourroundedBy-BodyOfLand
[0,05] NationalProgram-consistsof-GovernmentalProject
[0,05] Zico-hasSubjectOfProtection-SubjectOfProtection
[0,05] NationalCoordinator-representedBy-RegionalAuth
[0,05] GeographicIdentifier-specifies-Location
[0,05] AllowedProductionRate-validTimePeriod-Time
Reset
Full Names

Showcase

Web Service WSML

```
wsmlVariant _"http://www.wsmo.org/wsml/wsml-syntax/wsml-flight"
namespace { _"http://swing.brgm.fr/ontologies/wsOntology_Zico_region#",
        ftoNs _"http://swing.brgm.fr/repository/webservices_fto/821197652524286l227#",
        dcNs _"http://purl.org/dc/elements/1.1/",
        annotNs _"http://swing.brgm.fr/repository/ontologies/Annotation/current#",
        gen _"http://swing.brgm.fr/repository/ontologies/Generic/current#" }
webService wsOntology_Zico_region_17aff2dc56856f946805434eacc089db
        nonFunctionalProperties
                dcNs#creator hasValue "Visual OntoBridge 0.9 Beta"
                dcNs#type hasValue "WFS Webservice Description"
                dcNs#source hasValue "http://swing.brgm.fr/cgi-bin/contraintes_bno?
service=wfs&version=1.0.0&request=DescribeFeatureType&typeName=Zico_region"
        endNonFunctionalProperties
        importsOntology {
                ftoNs#wsOntology,
                annotNs#Annotation,
                gen#GenericOntology,
                _"http://swing.uni-muenster.de/core/Swing/SwingDomainOntology" }
        capability wsOntology_Zico_region_17aff2dc56856f946805434eacc089dbCapability
                nfp
                        _"http://www.wsmo.org/webservice/discovery/rule" hasValue true
                endnfp
                sharedVariables { ?ftoVar1 }
                precondition wsOntology_Zico_region_17aff2dc56856f946805434eacc089dbPrecondition
                postcondition wsOntology_Zico_region_17aff2dc56856f946805434eacc089dbPostcondition
                definedBy
                        ?ftoVar2[ftoNs#msGeometry hasValue ?ftoVar1, ftoNs#REGIONAL hasValue ?ftoVar3, ftoNs#LIBELLE hasValue ?
```


Annotation
View
Query
msGeometry
Query
Queries
: de protection des oiseaux et sa position
Proposed Concepts
[1,05] Bird
[0,58] ImportantBirdArea
[0,52] GeographicObject
[0,51] SubjectOfProtection
[0,51] Mammal
[0,50] Fauna
[0,49] ProtectedArea
[0,48] ConstructionApplication
[0,45] Habitat
[0,44] WildFauna
[0,44] GeomorphologicalUnit
[0,44] NaturalSite
[0,40] NaturalHabitat
[0,36] Znieff
[0,33] Zico
[0,32] Site
[0,31] Location
[0,31] MarineWater
[0,31] AncientSite
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[0,30] QuarryLocation
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[0,28] GeographicalObject
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[0,11] Ecosystem-hasPart-Bird
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[0,07] Organism-inhabits-NaturalHabitat
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[0,07] Mammal-inhabits-NaturalHabitat
[0,07] Company-hasAddress-Address
[0,07] MeasurementProcess-hasPart-Bird
[0,07] TerrestrialUnit-hasAreaSize-SurfaceArea
[0,06] GeologicalLayer-hasAge-GeologicalAge
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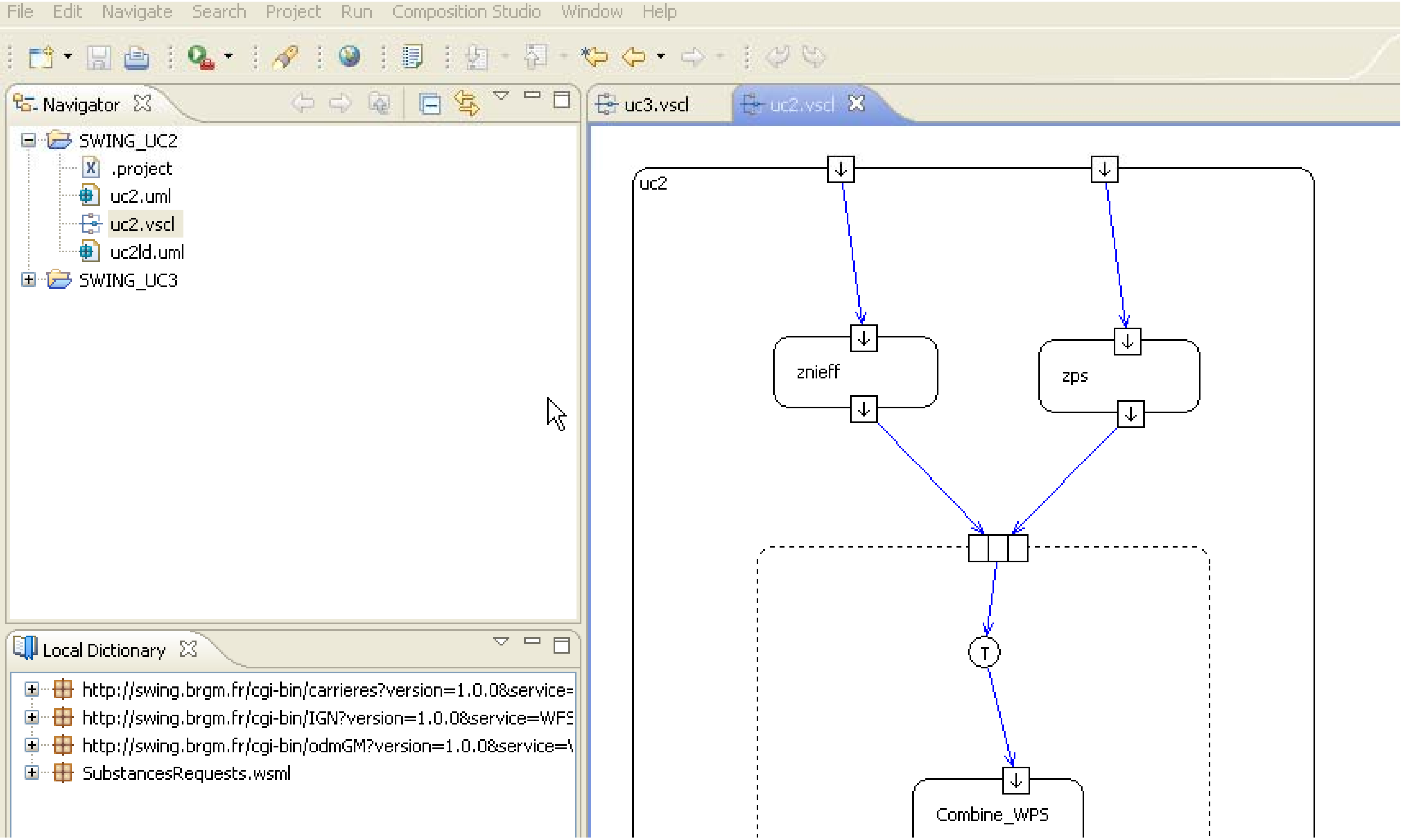
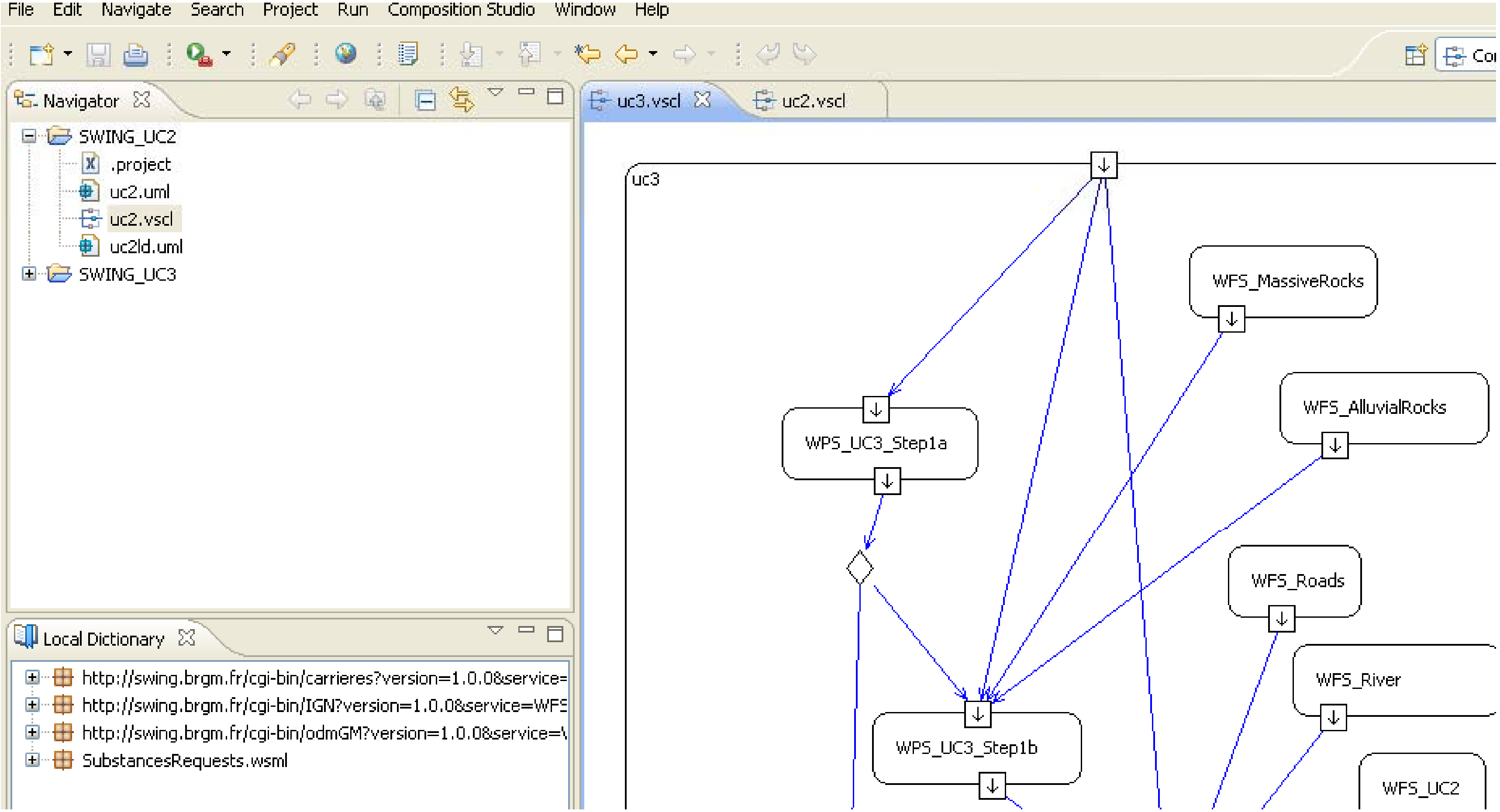
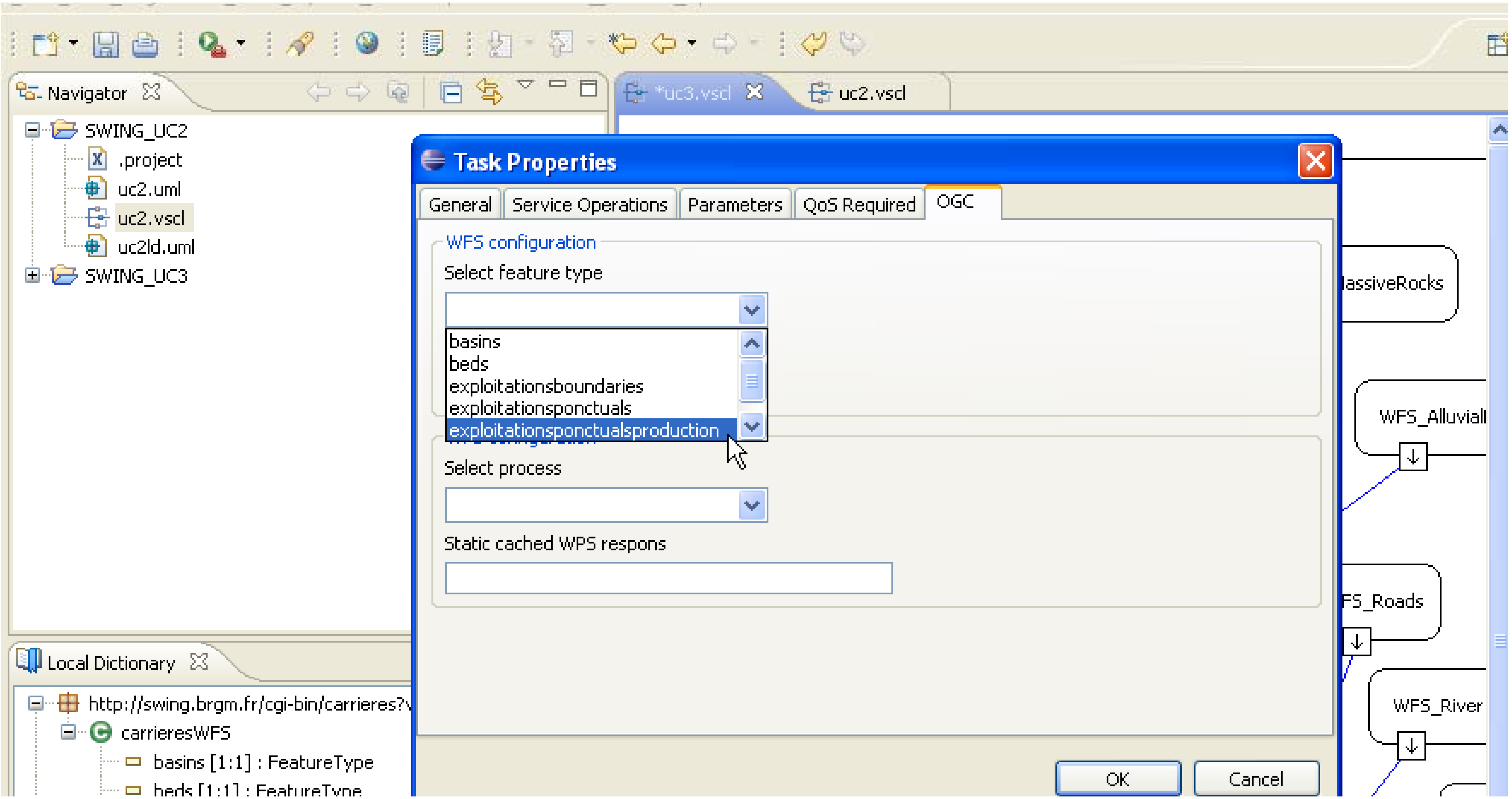
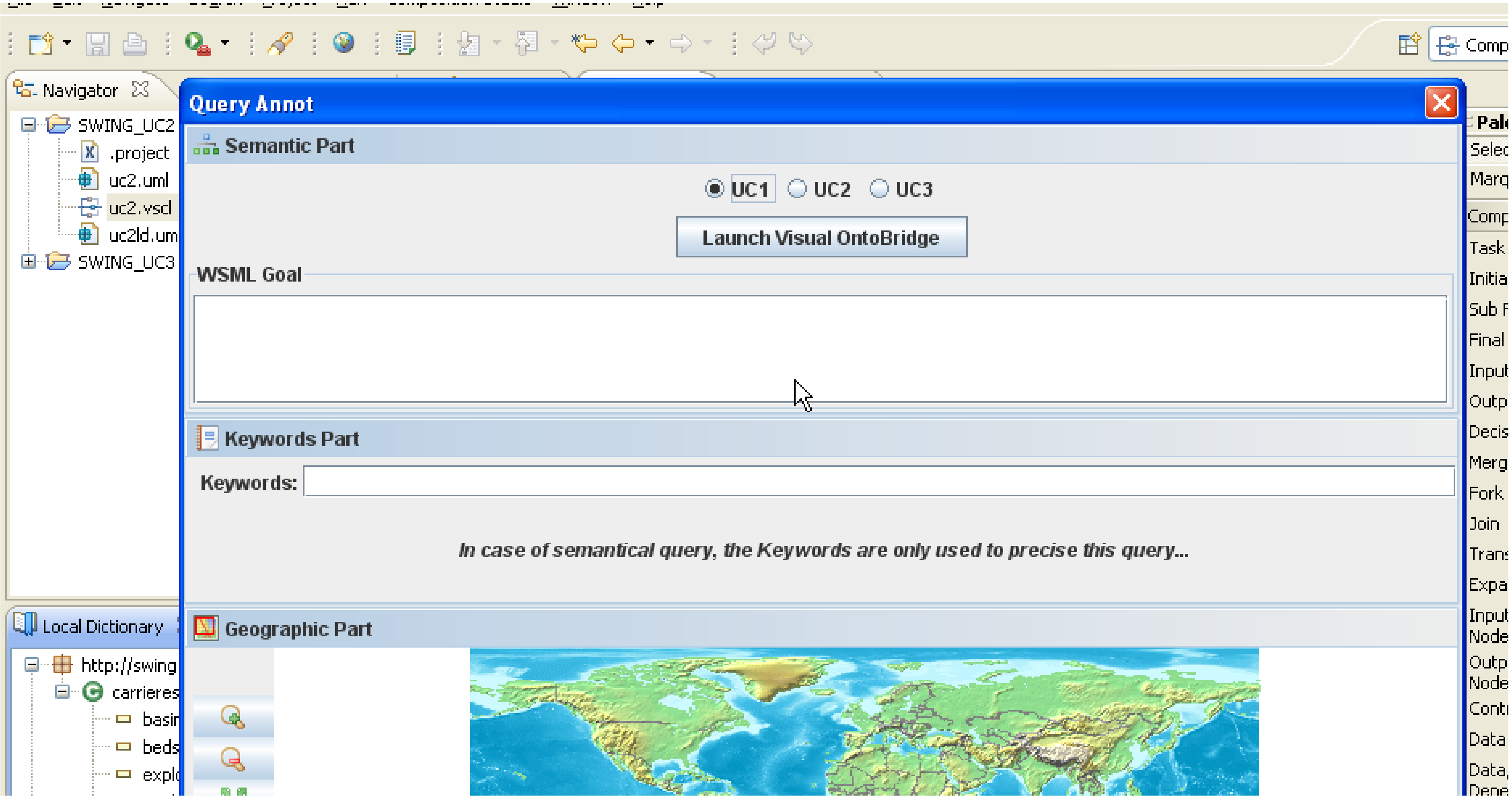
[0,06] Ecosystem-hasPart-Mammal
[0,05] WildFauna-hasPart-Mammal

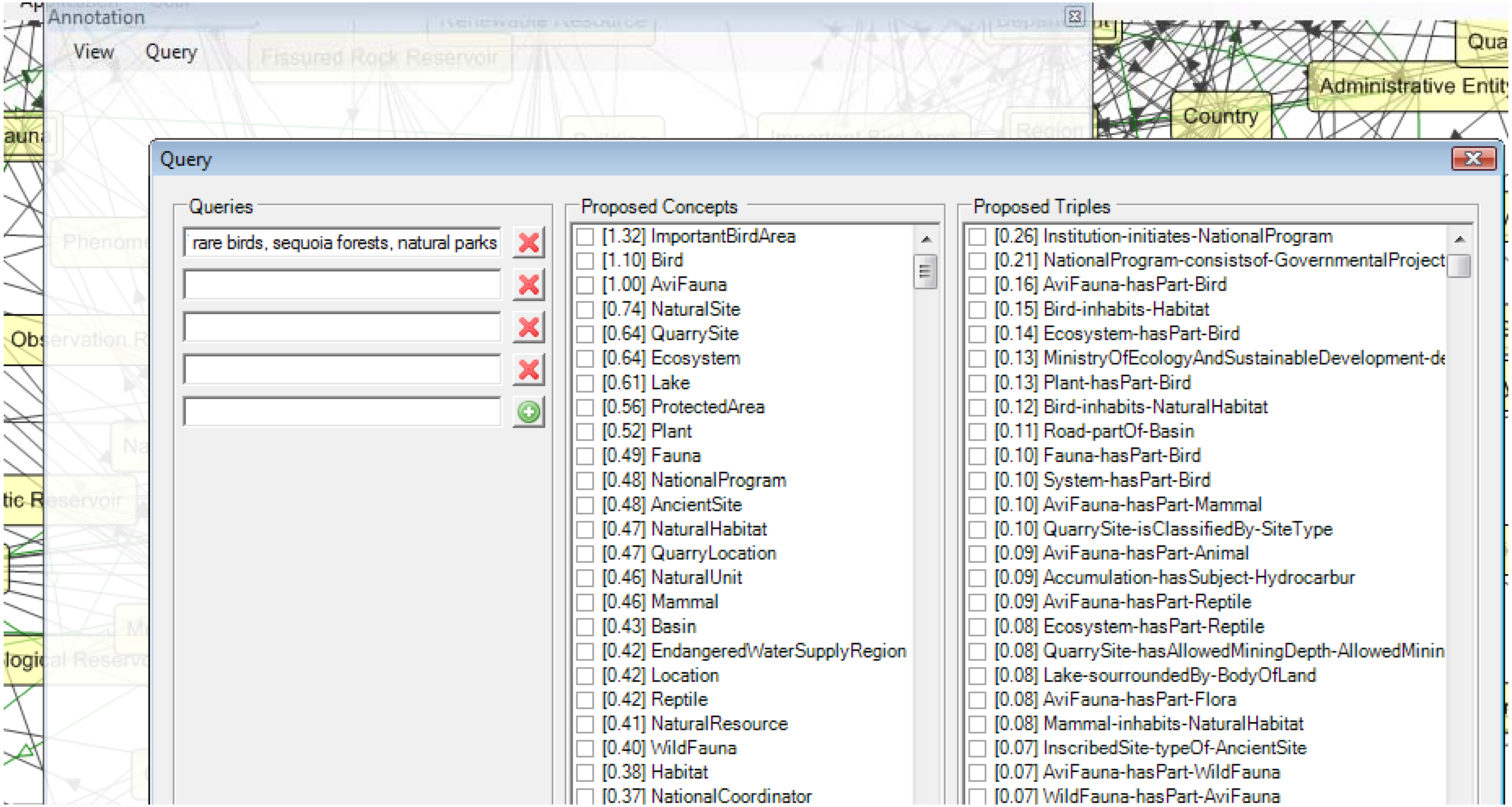

File Edit Navigate Search Project Run Composition Studio Window Help
Navigator
SWING_UC2
.project
uc2.uml
uc2.vscl
uc2ld.uml
SWING_UC3
Local Dictionary
http://swing.brgm.fr/cgi-bin/carrieres?version=1.0.0&service=
http://swing.brgm.fr/cgi-bin/IGN?version=1.0.0&service=WFS
http://swing.brgm.fr/cgi-bin/odmGM?version=1.0.0&service=\
SubstancesRequests.wsml
uc3.vscl
uc2.vscl
uc2
znieff
zps
T
Combine_WPS

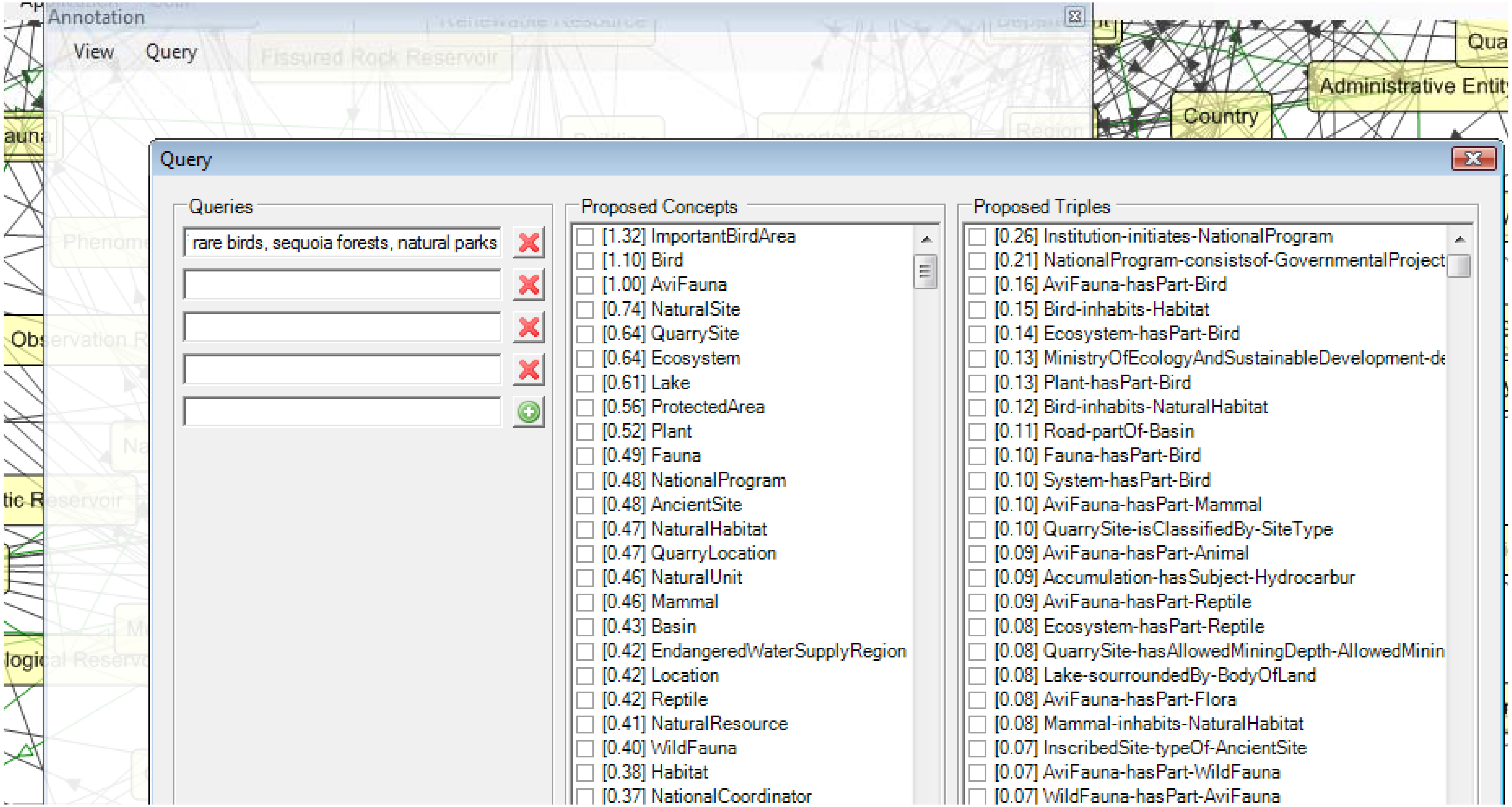

File Edit Navigate Search Project Run Composition Studio Window Help
Navigator
SWING_UC2
.project
uc2.uml
uc2.vscl
uc2ld.uml
SWING_UC3
Local Dictionary
http://swing.brgm.fr/cgi-bin/carrieres?version=1.0.0&service=
http://swing.brgm.fr/cgi-bin/IGN?version=1.0.0&service=WFS
http://swing.brgm.fr/cgi-bin/odmGM?version=1.0.0&service=
SubstancesRequests.wsml
uc3.vscl
uc2.vscl
uc3
WFS_MassiveRocks
WPS_UC3_Step1a
WFS_AlluvialRocks
WFS_Roads
WFS_River
WPS_UC3_Step1b
WFS_UC2


Navigator
SWING_UC2
.project
uc2.uml
uc2.vscl
uc2ld.uml
SWING_UC3
*uc3.vscl
uc2.vscl
Task Properties
General
Service Operations
Parameters
QoS Required
OGC
WFS configuration
Select feature type
basins
beds
exploitationsboundaries
exploitationsponctuals
exploitationsponctualsproduction
Select process
Static cached WPS respons
OK
Cancel
Local Dictionary
http://swing.brgm.fr/cgi-bin/carrieres?
carrieresWFS
basins [1:1] : FeatureType
WFS_Alluviall
WFS_River



Navigator
SWING_UC2
.project
uc2.uml
uc2.vscl
uc2ld.um
SWING_UC3
Local Dictionary
http://swing
carrieres
Query Annot
Semantic Part
UC1
UC2
UC3
Launch Visual OntoBridge
WSML Goal
Keywords Part
Keywords:
In case of semantical query, the Keywords are only used to precise this query...
Geographic Part


Annotation
View
Query
Fissured Rock Reservoir
Qua
Administrative Entit
Country
Query
Queries
rare birds, sequoia forests, natural parks
Proposed Concepts
[1.32] ImportantBirdArea
[1.10] Bird
[1.00] AviFauna
[0.74] NaturalSite
[0.64] QuarrySite
[0.64] Ecosystem
[0.61] Lake
[0.56] ProtectedArea
[0.52] Plant
[0.49] Fauna
[0.48] NationalProgram
[0.48] AncientSite
[0.47] NaturalHabitat
[0.47] QuarryLocation
[0.46] NaturalUnit
[0.46] Mammal
[0.43] Basin
[0.42] EndangeredWaterSupplyRegion
[0.42] Location
[0.42] Reptile
[0.41] NaturalResource
[0.40] WildFauna
[0.38] Habitat
[0.37] NationalCoordinator
Proposed Triples
[0.26] Institution-initiates-NationalProgram
[0.21] NationalProgram-consistsof-GovernmentalProject
[0.16] AviFauna-hasPart-Bird
[0.15] Bird-inhabits-Habitat
[0.14] Ecosystem-hasPart-Bird
[0.13] MinistryOfEcologyAndSustainableDevelopment-de
[0.13] Plant-hasPart-Bird
[0.12] Bird-inhabits-NaturalHabitat
[0.11] Road-partOf-Basin
[0.10] Fauna-hasPart-Bird
[0.10] System-hasPart-Bird
[0.10] AviFauna-hasPart-Mammal
[0.10] QuarrySite-isClassifiedBy-SiteType
[0.09] AviFauna-hasPart-Animal
[0.09] Accumulation-hasSubject-Hydrocarbur
[0.09] AviFauna-hasPart-Reptile
[0.08] Ecosystem-hasPart-Reptile
[0.08] QuarrySite-hasAllowedMiningDepth-AllowedMinin
[0.08] Lake-sourroundedBy-BodyOfLand
[0.08] AviFauna-hasPart-Flora
[0.08] Mammal-inhabits-NaturalHabitat
[0.07] InscribedSite-typeOf-AncientSite
[0.07] AviFauna-hasPart-WildFauna
[0.07] WildFauna-hasPart-AviFauna


Annotation
View
Query
Fissured Rock Reservoir
Qua
Administrative Entit
Country
Query
Queries
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[1.10] Bird
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[0.61] Lake
[0.56] ProtectedArea
[0.52] Plant
[0.49] Fauna
[0.48] NationalProgram
[0.48] AncientSite
[0.47] NaturalHabitat
[0.47] QuarryLocation
[0.46] NaturalUnit
[0.46] Mammal
[0.43] Basin
[0.42] EndangeredWaterSupplyRegion
[0.42] Location
[0.42] Reptile
[0.41] NaturalResource
[0.40] WildFauna
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[0.14] Ecosystem-hasPart-Bird
[0.13] MinistryOfEcologyAndSustainableDevelopment-de
[0.13] Plant-hasPart-Bird
[0.12] Bird-inhabits-NaturalHabitat
[0.11] Road-partOf-Basin
[0.10] Fauna-hasPart-Bird
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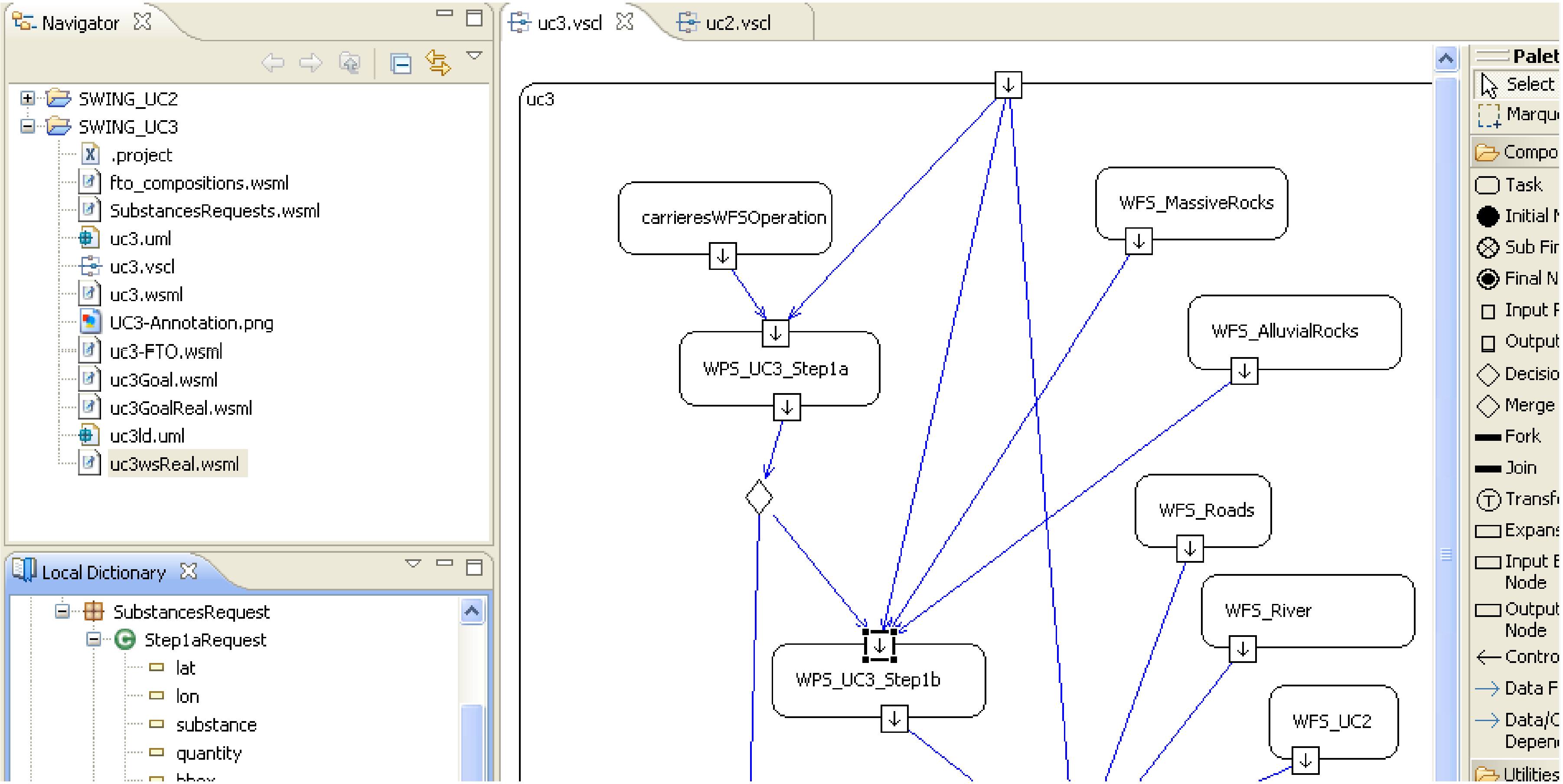
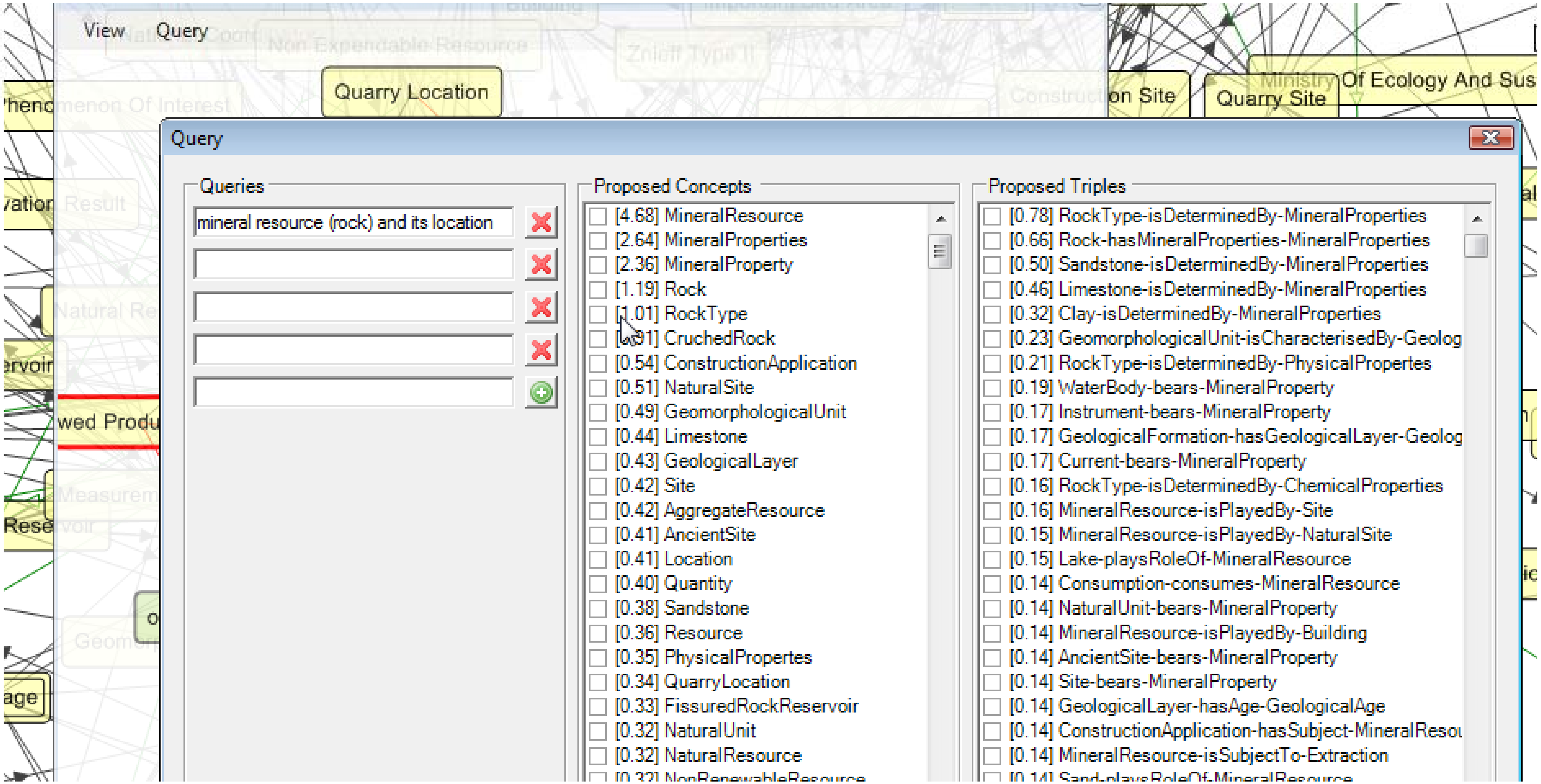
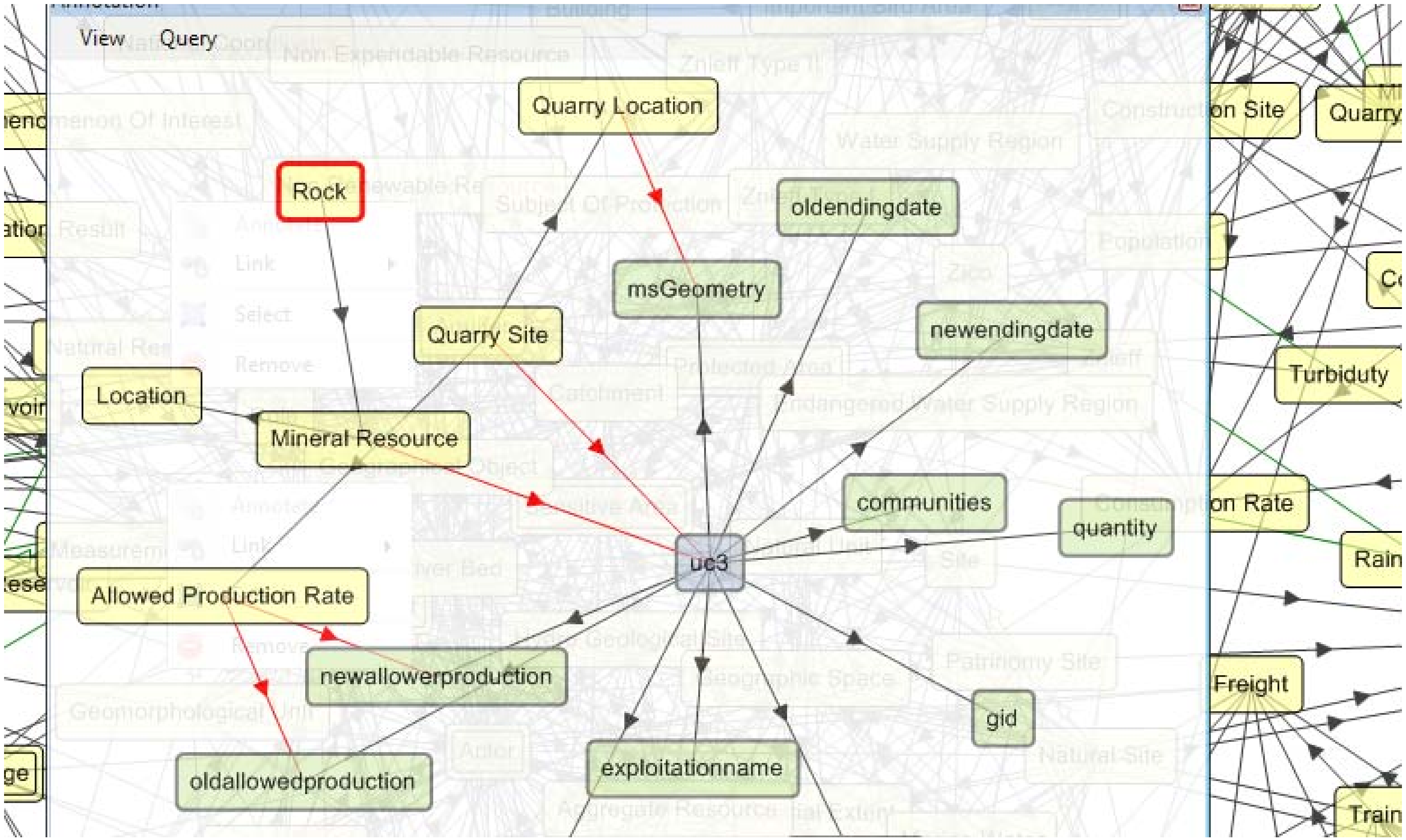
[0.07] AviFauna-hasPart-WildFauna
[0.07] WildFauna-hasPart-AviFauna

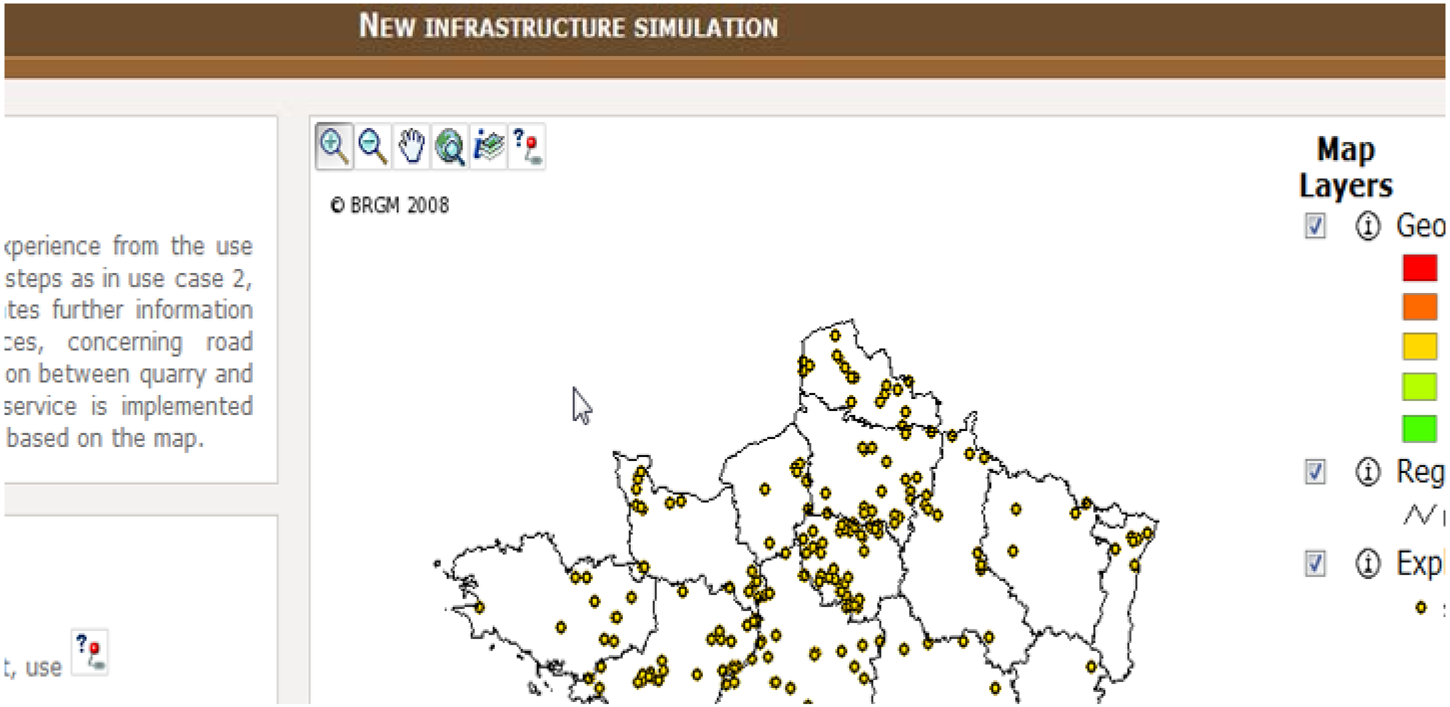


Navigator
SWING_UC2
SWING_UC3
.project
fto_compositions.wsml
SubstancesRequests.wsml
uc3.uml
uc3.vscl
uc3.wsml
UC3-Annotation.png
uc3-FTO.wsml
uc3Goal.wsml
uc3GoalReal.wsml
uc3ld.uml
uc3wsReal.wsml
Local Dictionary
SubstancesRequest
Step1aRequest
lat
lon
substance
quantity
uc3.vscl
uc2.vscl
uc3
carrieresWFSOperation
WFS_MassiveRocks
WPS_UC3_Step1a
WFS_AlluvialRocks
WFS_Roads
WFS_River
WPS_UC3_Step1b
WFS_UC2
Select
Task
Fork
Join
Merge


View
Query
Quarry Location
Quarry Site
Ministry Of Ecology And Sus
Query
Queries
mineral resource (rock) and its location
Proposed Concepts
[4.68] MineralResource
[2.64] MineralProperties
[2.36] MineralProperty
[1.19] Rock
[1.01] RockType
[1.01] CruchedRock
[0.54] ConstructionApplication
[0.51] NaturalSite
[0.49] GeomorphologicalUnit
[0.44] Limestone
[0.43] GeologicalLayer
[0.42] Site
[0.42] AggregateResource
[0.41] AncientSite
[0.41] Location
[0.40] Quantity
[0.38] Sandstone
[0.36] Resource
[0.35] PhysicalPropertes
[0.34] QuarryLocation
[0.33] FissuredRockReservoir
[0.32] NaturalUnit
[0.32] NaturalResource
Proposed Triples
[0.78] RockType-isDeterminedBy-MineralProperties
[0.66] Rock-hasMineralProperties-MineralProperties
[0.50] Sandstone-isDeterminedBy-MineralProperties
[0.46] Limestone-isDeterminedBy-MineralProperties
[0.32] Clay-isDeterminedBy-MineralProperties
[0.23] GeomorphologicalUnit-isCharacterisedBy-Geolog
[0.21] RockType-isDeterminedBy-PhysicalPropertes
[0.19] WaterBody-bears-MineralProperty
[0.17] Instrument-bears-MineralProperty
[0.17] GeologicalFormation-hasGeologicalLayer-Geolog
[0.17] Current-bears-MineralProperty
[0.16] RockType-isDeterminedBy-ChemicalProperties
[0.16] MineralResource-isPlayedBy-Site
[0.15] MineralResource-isPlayedBy-NaturalSite
[0.15] Lake-playsRoleOf-MineralResource
[0.14] Consumption-consumes-MineralResource
[0.14] NaturalUnit-bears-MineralProperty
[0.14] MineralResource-isPlayedBy-Building
[0.14] AncientSite-bears-MineralProperty
[0.14] Site-bears-MineralProperty
[0.14] GeologicalLayer-hasAge-GeologicalAge
[0.14] ConstructionApplication-hasSubject-MineralResou
[0.14] MineralResource-isSubjectTo-Extraction



View
Query
Quarry Location
Rock
oldendingdate
msGeometry
Quarry Site
newendingdate
Location
Mineral Resource
communities
quantity
uc3
Allowed Production Rate
newallowerproduction
gid
oldallowedproduction
exploitationname
Turbiduty
Freight
Rain
Train


NEW INFRASTRUCTURE SIMULATION
xperience from the use
steps as in use case 2,
ites further information
ces, concerning road
on between quarry and
service is implemented
based on the map.
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Map
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