Semantic interoperability services

- Industrial examples -

Semantic Days'2008, Stavanger,
Tuesday April 22nd, 2008, 1600-1630

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"Technologies for semantic interoperability in SOA systems"

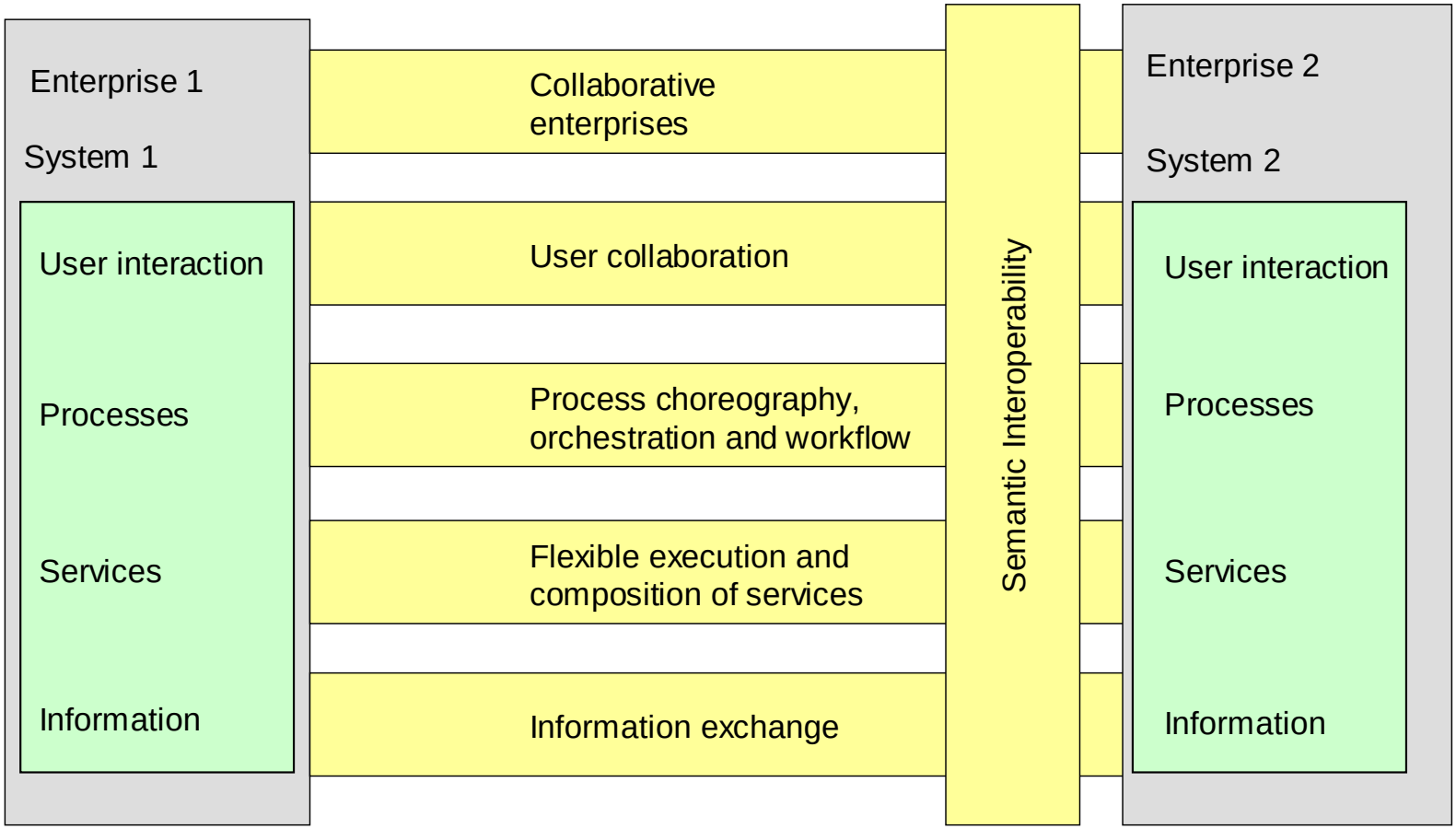
- Service-oriented Architecture (SOA) is an enabling technology for interoperability between networked enterprise systems. Further support for semantic interoperability can be provided through use of common ontologies and mediation support by semantic web services, model-based development and agent technologies.

- Dr. Klaus Fisher, DFKI, Germany
- Dr. Arne-Jørgen Berre, Chief Research Scientist, SINTEF

Outline

- OLF reference architecture with semantic interoperability
- COIN Integrated project – Collaboration and Interoperability for Networked Enterprises
- Semantic web and Service web – WSMO, OWL-S
- Semantic Annotation – SAWSDL
- Mediation and Ontology-based reconciliation
- Semantic interoperability
- Industrial Examples:
  - eProcurement (Buyer/Seller, PurchaseOrder)
  - Geospatial semantic services and multilinguality
- Conclusion and outlook:

The OLF Reference Architecture – with semantic interoperability



COIN, FP7-216256 Intgrated Project

"COllaboration and INteroperability for networked enterprises ", 2008-2010

COIN VISION: ***"By 2020 enterprise collaboration and interoperability services will become an invisible, pervasive and self-adaptive knowledge and business utility at disposal of the European networked enterprises from any industrial sector and domain in order to rapidly set-up, efficiently manage and effectively operate different forms of business collaborations, from the most traditional supply chains to the most advanced and dynamic business ecosystems."***

COIN MOTTO: ***"Enterprise Interoperability and Enterprise Collaboration are the two sides of the same COIN"***

COIN overview

EC form / EI challenge	Knowledge i/op	Business i/op
Supply Chains	Aerospace DTA Lazio (ITA)	Automotive Slovenian Net (SLO)
Collaborative Networks	ICT Network (HUN)	Aeronautic Cluster of Andalusia (SPA)
Business Ecosystems	Pulp & Paper Poyry (FIN)	Healthcare VEN (UK)

Knowledge-Oriented Collaboration

Web Technologies for EI

Interoperability Service Utility

Science Base

Software as a Service

SP5 COIN EI Services

WP5.2 Information	WP5.3 Knowledge	WP5.4 Business
WP5.1 Baseline EI Services		

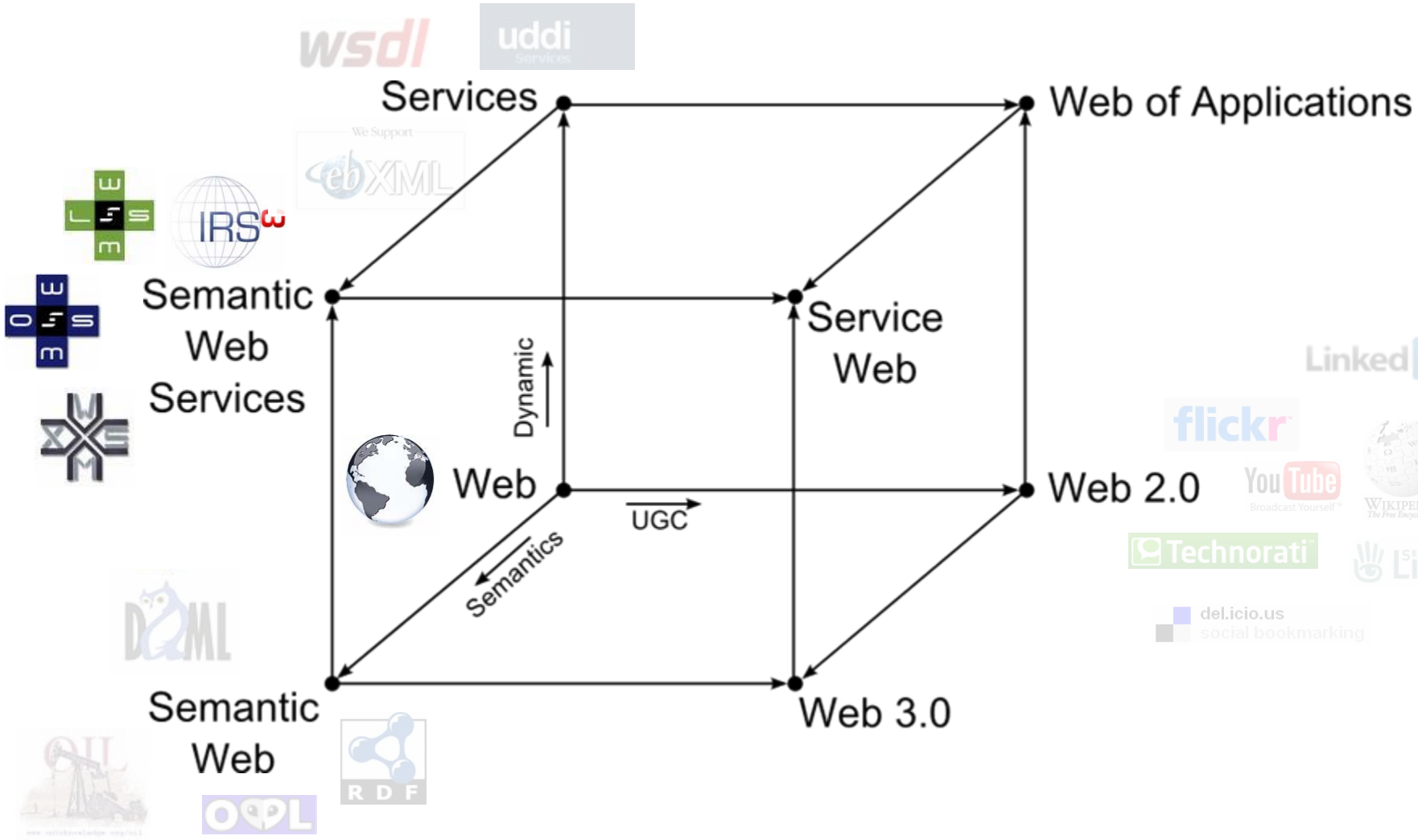
SP3 COIN Service Platform

WP3.2 Evolutionary	WP3.3 TSD	WP3.4 Bus. Know.
WP3.1 Baseline Service Platform		
WP6.2-6.3 Business: ISU, MMs		
WP6.1-6.4,5,6 UR Take-up Demo		

SP4 COIN EC Services

WP4.2 Product	WP4.3 Manuf.	WP4.4 Project	WP4.5 Human
WP4.1 Baseline EC Services			

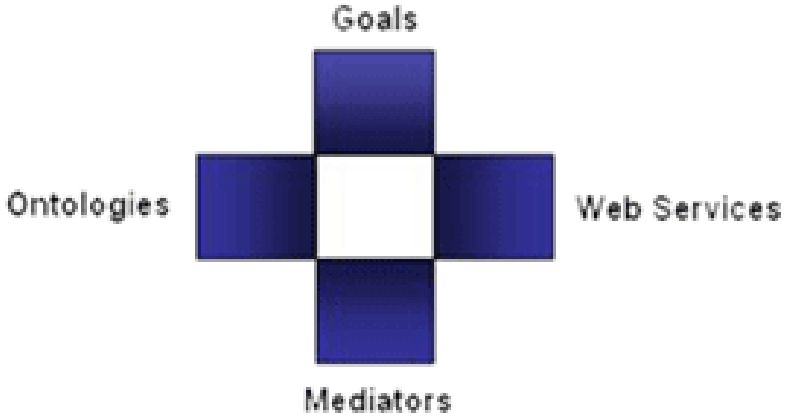
Service Web


Services
Web of Applications
Semantic Web Services
Service Web
Dynamic
Web
Web 2.0
UGC
Semantics
Semantic Web
Web 3.0

The Web Service Modeling Ontology (WSMO)

Objectives that a client wants to achieve by using Web Services

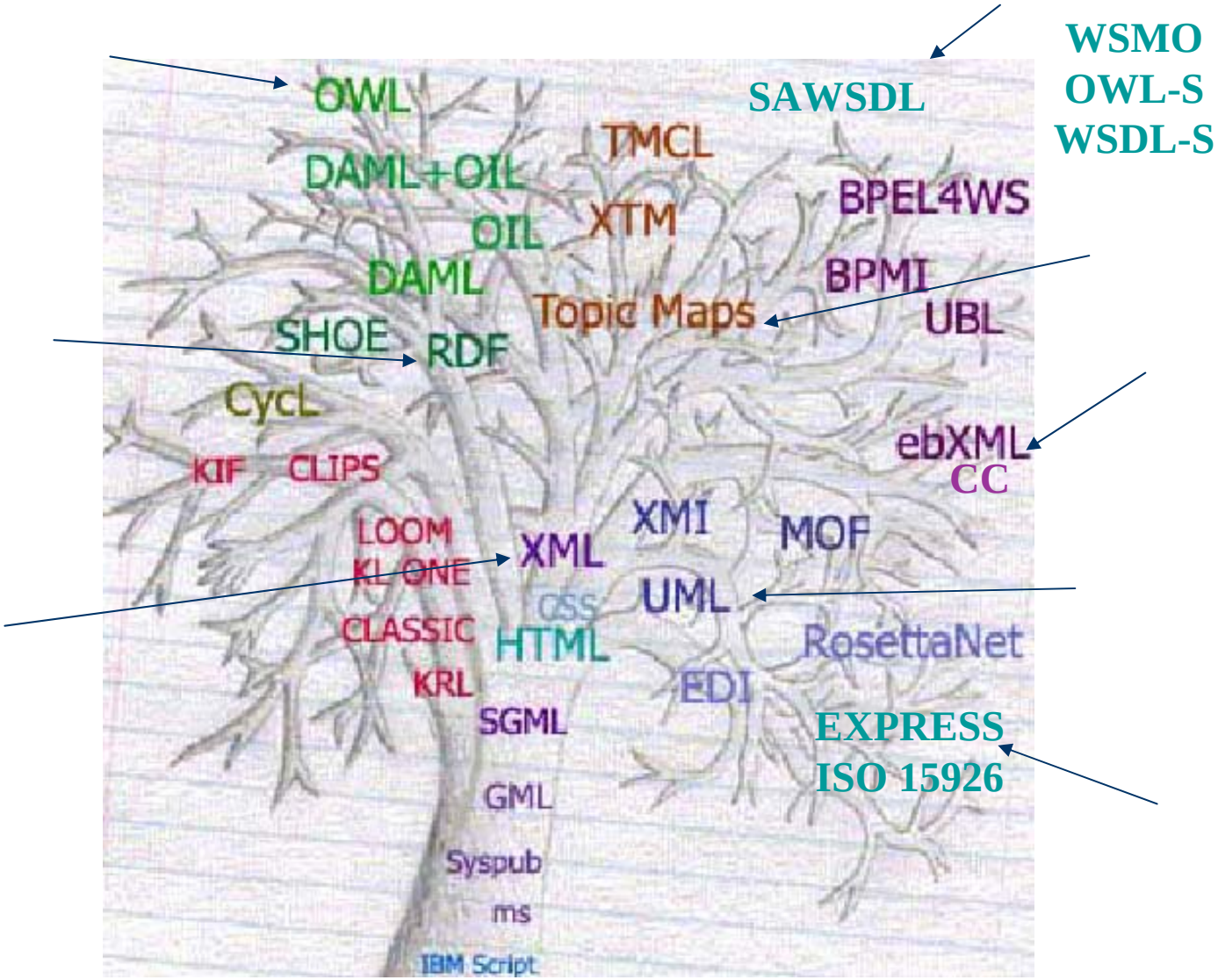
Provide the formally specified terminology of the information used by all other components



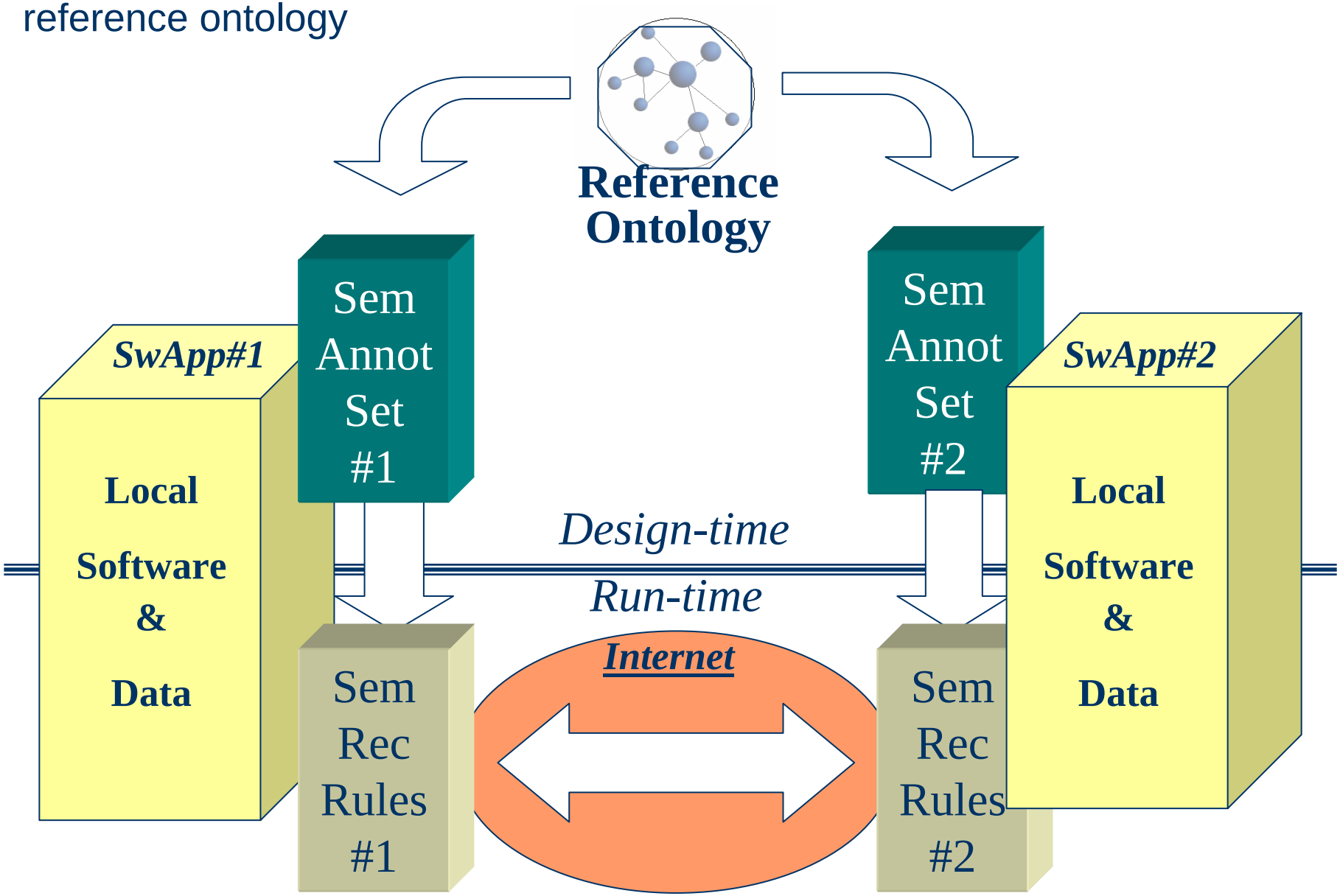
Semantic description of Web Services:
- **Capability** *(functional)*
- **Interfaces** *(usage)*

Connectors between components with mediation facilities for handling heterogeneities

The Tree of Knowledge Technologies
(Extended fromTop Quadrant)



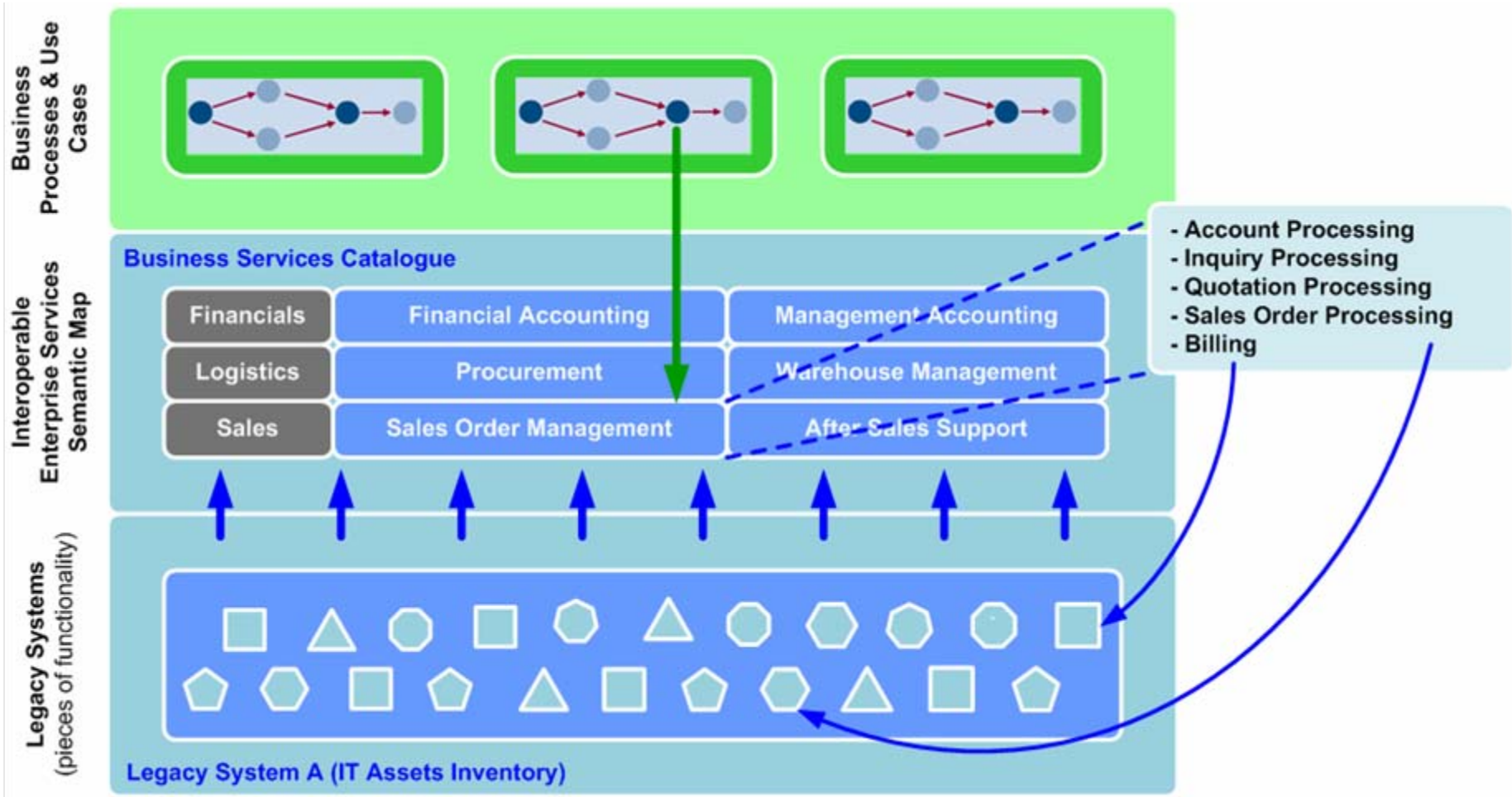
Supporting semantic interoperability through semantic annotations to a reference ontology



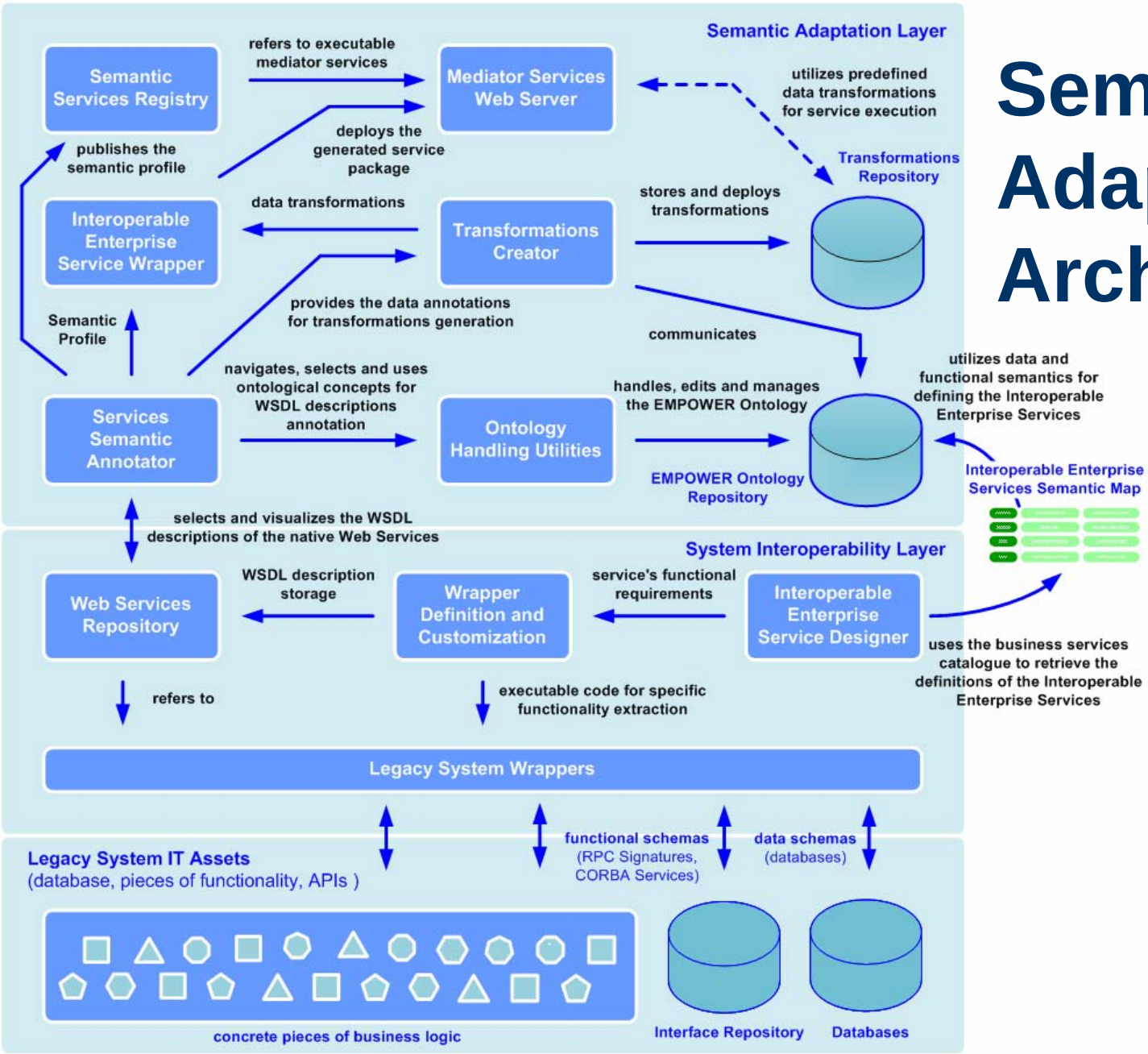
SAWSDL - Semantic Annotations for WSDL and XML Schema

- **W3C Standard August, 2007**
- **This specification defines a set of extension attributes for the Web Services Description Language and XML Schema definition language that allows description of additional semantics of WSDL components. The specification defines how such semantic annotation is accomplished using references to semantic models, e.g. ontologies**
- **3 constructs: modelReference, liftingSchemaMapping, loweringSchemaMapping**

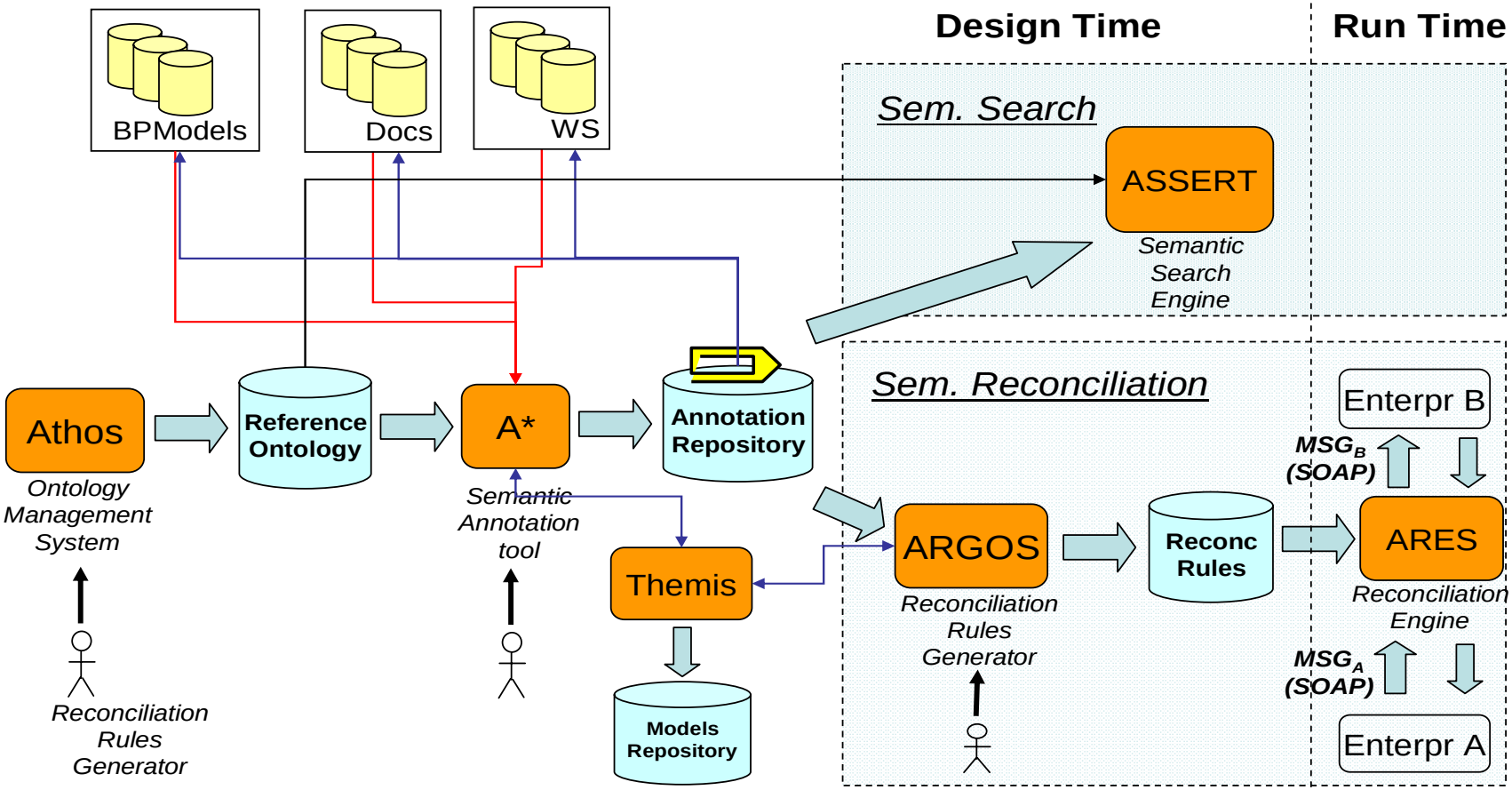
The EMPOWER Enterprise Interoperable Services Semantic Map



Semantic Adaptation Architecture



COIN Semantic toolset - streamline for semantic interoperability



ARGOS: a Transformation Rules Building tool

A graphical environment supporting a user in defining transformation rules

- guided by
  - Document model
  - Annotations
  - Reference Ontology
  - A set of Rule Templates
- using an abstract but expressive syntax

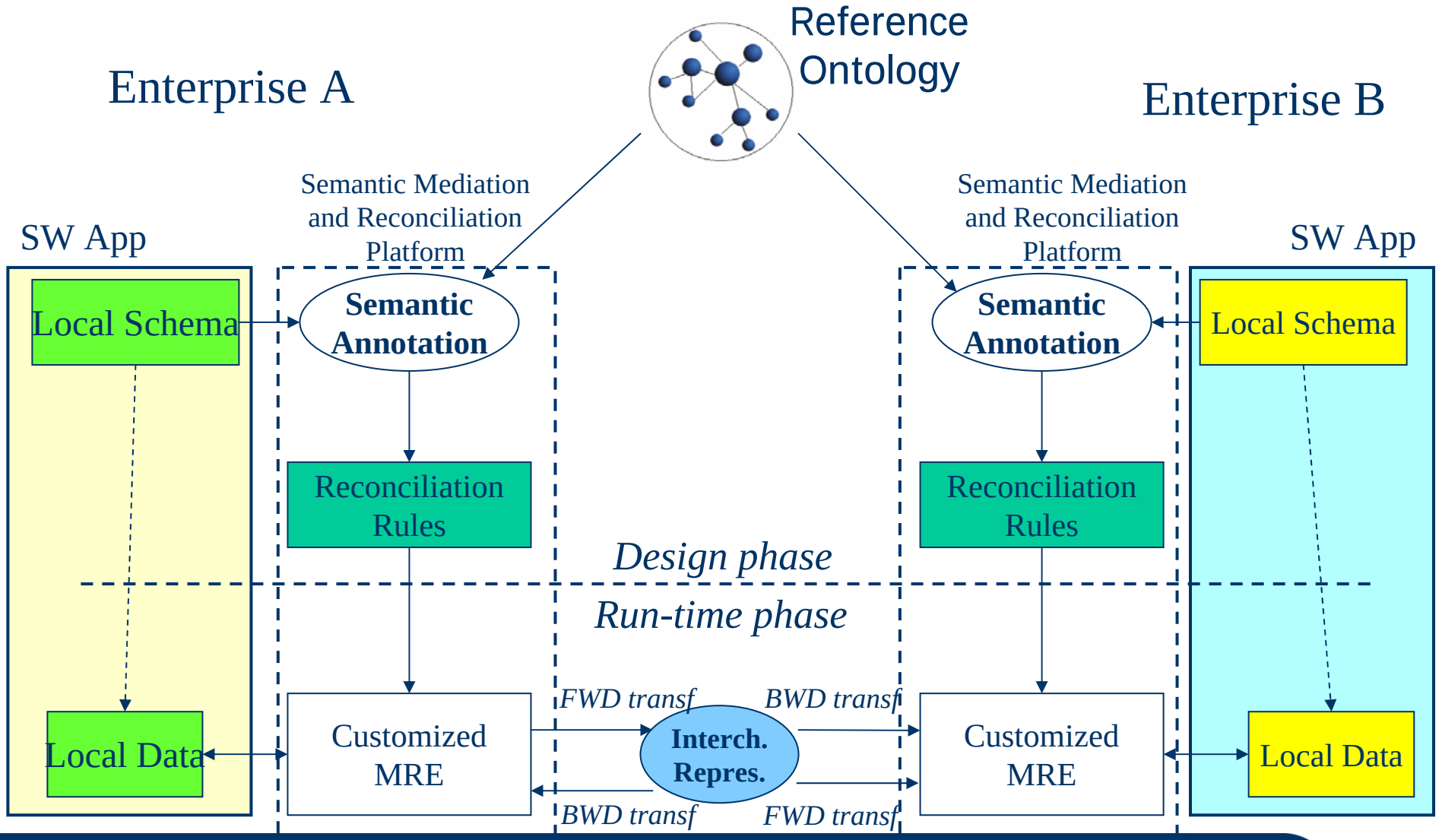
An intuitive interface supports the user in parametrising *transformation templates* (Rule Templates)

Instantiated Rules are *automatically transformed* by ARGOS into executable code (Jena rules) for the reconciliation engine (ARES)

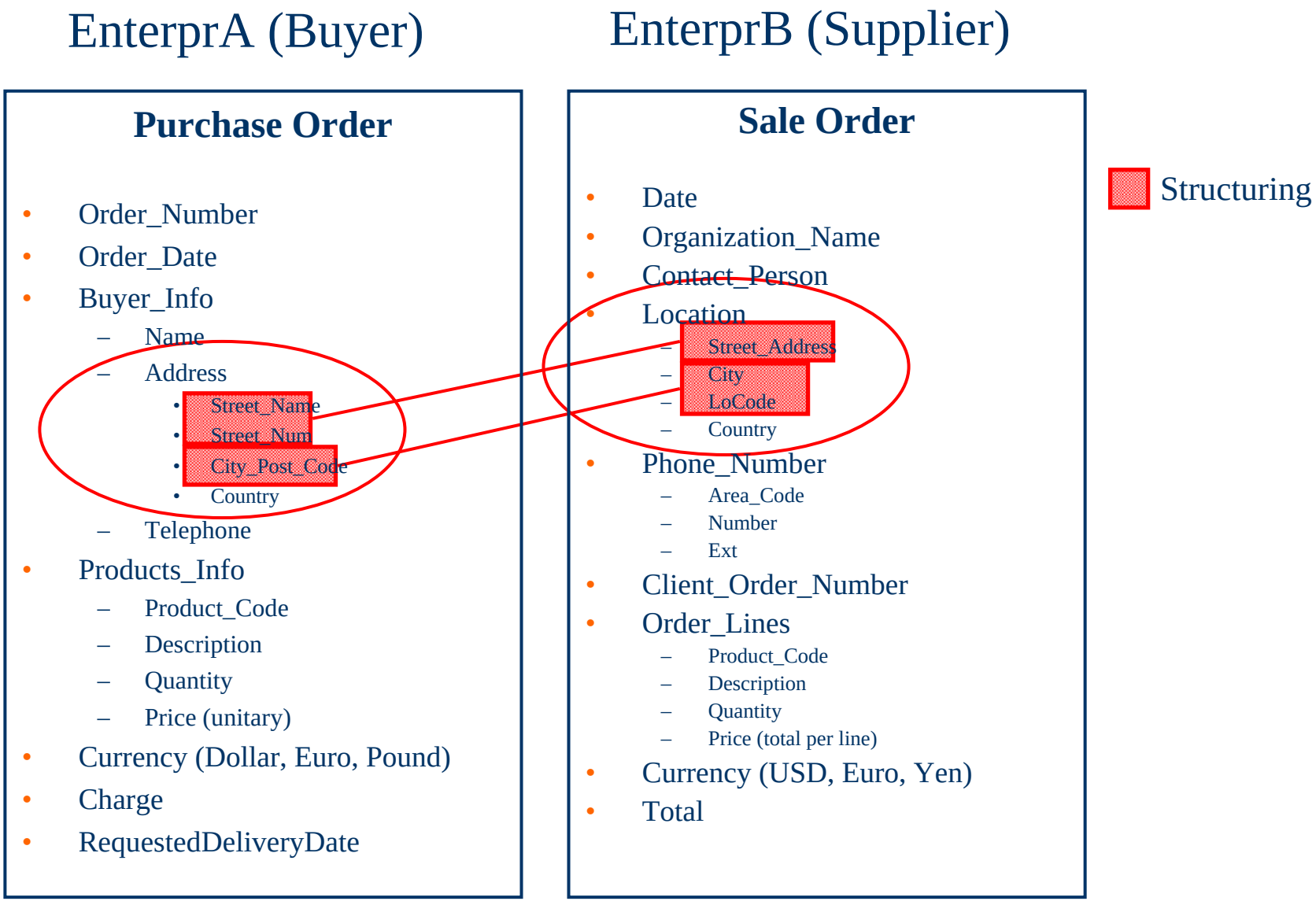
ARGOS: Rule Templates

- The most common kinds of interoperability clashes occurring within documents have been analysed
- Clashes can be solved applying *Transformations* consisting of one ore more Rule Templates
- Main ARGOS Rule Templates:
  - Merge
  - Split
  - Map
  - MapValue
  - Convert
  - Sum
  - Mult

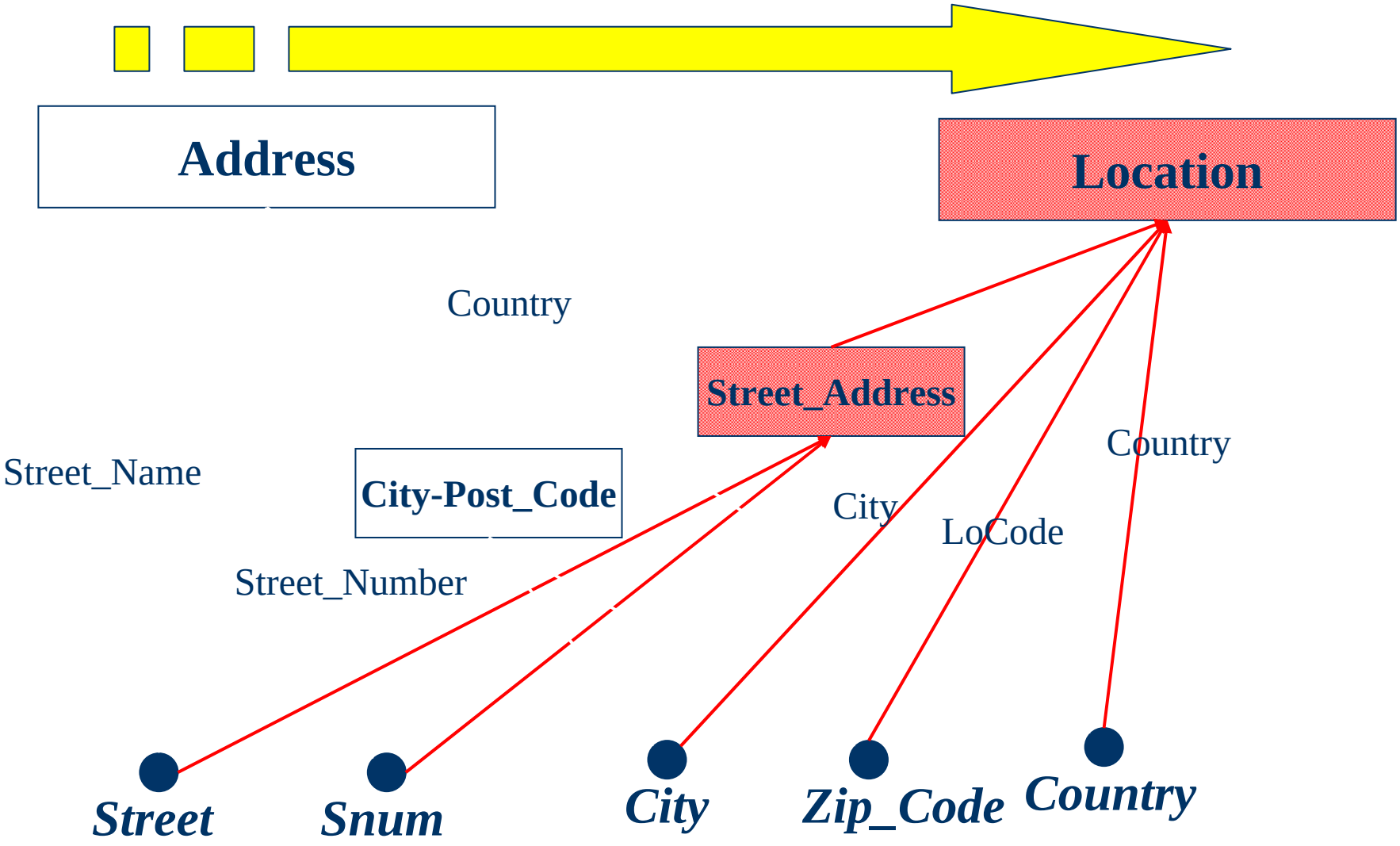
Ontology-based reconciliation



Example of Mismatch

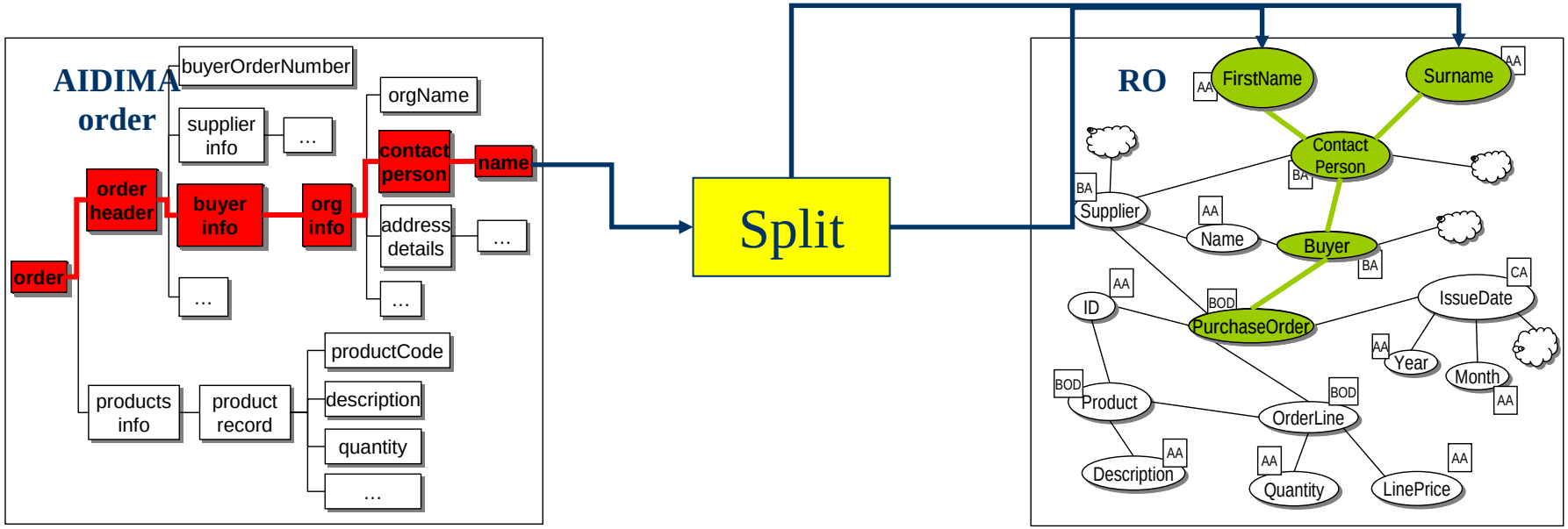


Ontology-based Reconciliation Approach



Reference Ontology

From Semantic Annotation to Transformation Rules



order.has_orderHeader.has_buyerInfo.has_organisationInfo.has_contactPerson.**has_name**

>:

PurchaseOrder_BOD.relTo_Buyer.relTo_ContactPerson. **hasPart _FirstName** ⊕

PurchaseOrder_BOD.relTo_Buyer.relTo_ContactPerson.**hasPart _Surname**

SSAX

SPLIT

order.has_orderHeader.has_buyerInfo.has_organisationInfo.has_contactPerson.**has_name**

INTO

PurchaseOrder_BOD.relTo_Buyer.relTo_ContactPerson.**hasPart_FirstName**

PurchaseOrder_BOD.relTo_Buyer.relTo_ContactPerson.**hasPart_Surname**

Forward Transf

An example of Transformation Rule in the Jena2 syntax

SPLIT

order.has_orderHeader.has_buyerInfo.has_organisationInfo.has_contactPerson.**has_name**

INTO

PurchaseOrder_BOD.relTo_Buyer.relTo_ContactPerson.**hasPart_FirstName**

PurchaseOrder_BOD.relTo_Buyer.relTo_ContactPerson.**hasPart_Surname**

Forward Transf Rule

NameSplitting:
[(?x0 rdf:type ai:order)
(?x0 ai:has_orderHeader ?x1) (?x1 rdf:type ai:orderHeader)
(?x1 ai:has_buyerInfo ?x2) (?x2 rdf:type ai:buyerInfo)
(?x2 ai:has_organizationInfo ?x3) (?x3 rdf:type ai:organizationInfo)
(?x3 ai:has_contactPerson ?x4) (?x4 rdf:type ai:contactPerson)
(?x4 ai:has_name ?x5)]

→

[(?x0 rdf:type ro:PurchaseOrder_BOD)
(?x0 ro:relTo_Buyer ?x2) (?x2 rdf:type ro:Buyer_BA)
(?x2 ro:relTo_ContactPerson ?x4) (?x4 rdf:type ro:ContactPerson_BA)
Split(?x4, " ", ?y1, ?y2, 'http://www.w3.org/2001/XMLSchema#string')
(?x4 ro:hasPart_FirstName ?y1) (?x4 ro:hasPart_Surname ?y2)]

Rule in the Jena2 syntax

Géosciences pour une Terre durable
brgm

Swing Project
Entry point for Data from BRGM

Navigation
- Home
- Contact
- Help

Swing Project
- Presentation
- Use Cases
- Data Access
- Documentation

Repository
- Ontologies
- Webservices & FTO
- Test Goals for Discovery
- Composition files

MiMS
- Overview
- Download
- History
- Future
- Video

Published WebSites
- *All Websites*
- *WebSite of UC1*
- *WebSite of UC2*
- *WebSite of UC3*

Official Web Site

SWING

- Application in SWING
- Semantic Discovery of Geospatial services
- Dealing with multilinguality (French, English, …)
- Cross-language term-matching demo

Presentation

This site is the entry point for the data available from BRGM and useful for the SWING use case.

Data Access chapter is organized by families; one sub menu per family of data.

The data source are supposed to be registered in the ionic catalog used for the project; see Catalog Browser at IonicSoft.com

swing-project.org

swing.brgm.fr

Conclusion and outlook

- Support for semantics with ontologies and mediation is available *now*
- Short term benefit can be gained in the area of services for semantic interoperability – through the use of ontologies, and use of mappings and transformations for information and service interoperability
- i.e. – start here from an industrial perspective, establish ontologies, use these directly or mediate through semantic annotation.
- Semantic Web Services and Service-oriented Semantic Architectures (SESA) is a promising *future* technology
- Longer term benefits can be expected related to matching goals with services for process and service composition and process interoperability