Closing the discovery gap in environmental information resources using semantic annotations: the TaToo Approach

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Overview

- The Problem
- Project Overview
- Ontology Development
- High Level Architecture
- Core Components
- Architecture Overview
- Web Portal
- Communities and Validation Scenarios

The Problem

- Internet has allowed the **exponential growing** of the **information** available in all knowledge domains

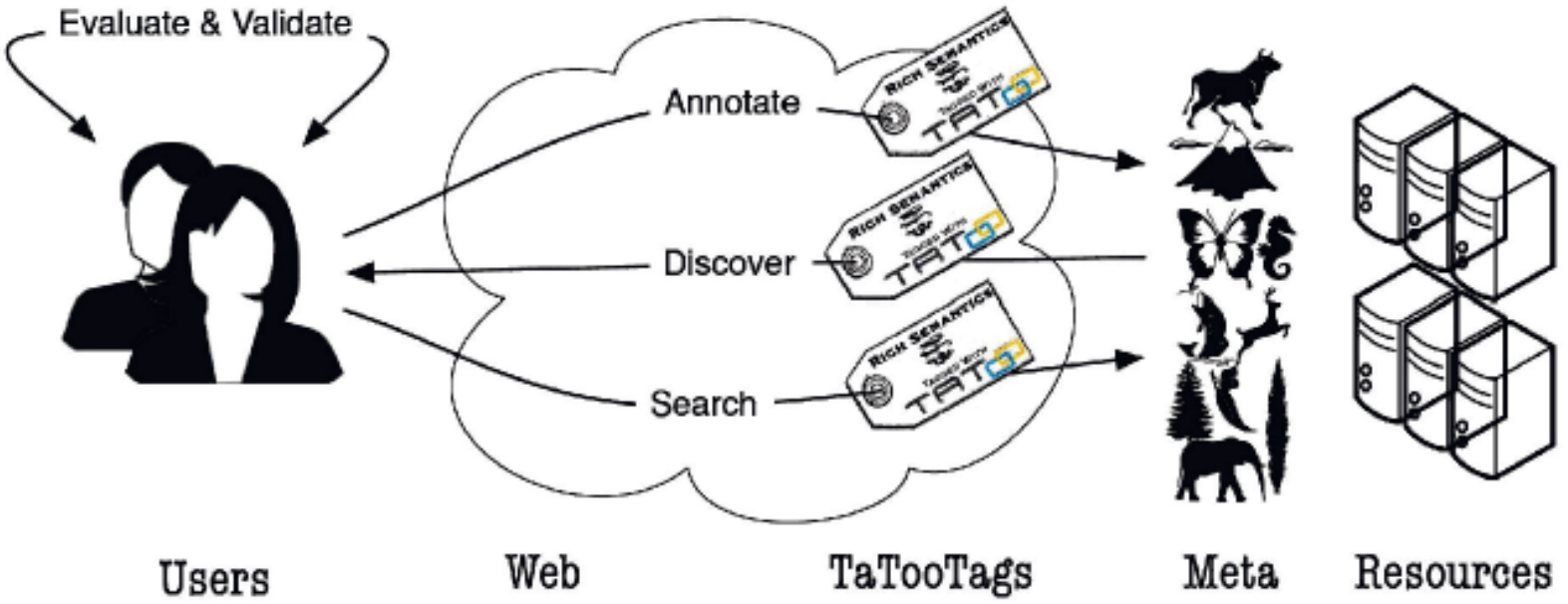
  This information is published in a non coordinated way using **different standards** and **formats**

Project Overview

- **TaToo** (**Ta**gging **Too**ls based on a Semantic Discovery Framework) tries to build **Tools** allowing users to **Discover** and **Tag** resources of interest in order to facilitate their discovery
- The focus is on environmental information resources (both data and services)
- **Tagging** process consists of adding **Semantic meta-information**, with the goal of **improving** the **Discovery** process
- TaToo aims at creating an **Information Enrichment Cycle** of continuous resources discovery, enrichment (tagging), and publishing in order to encourage communities to setup, use, extend and promote their knowledge

Project Overview

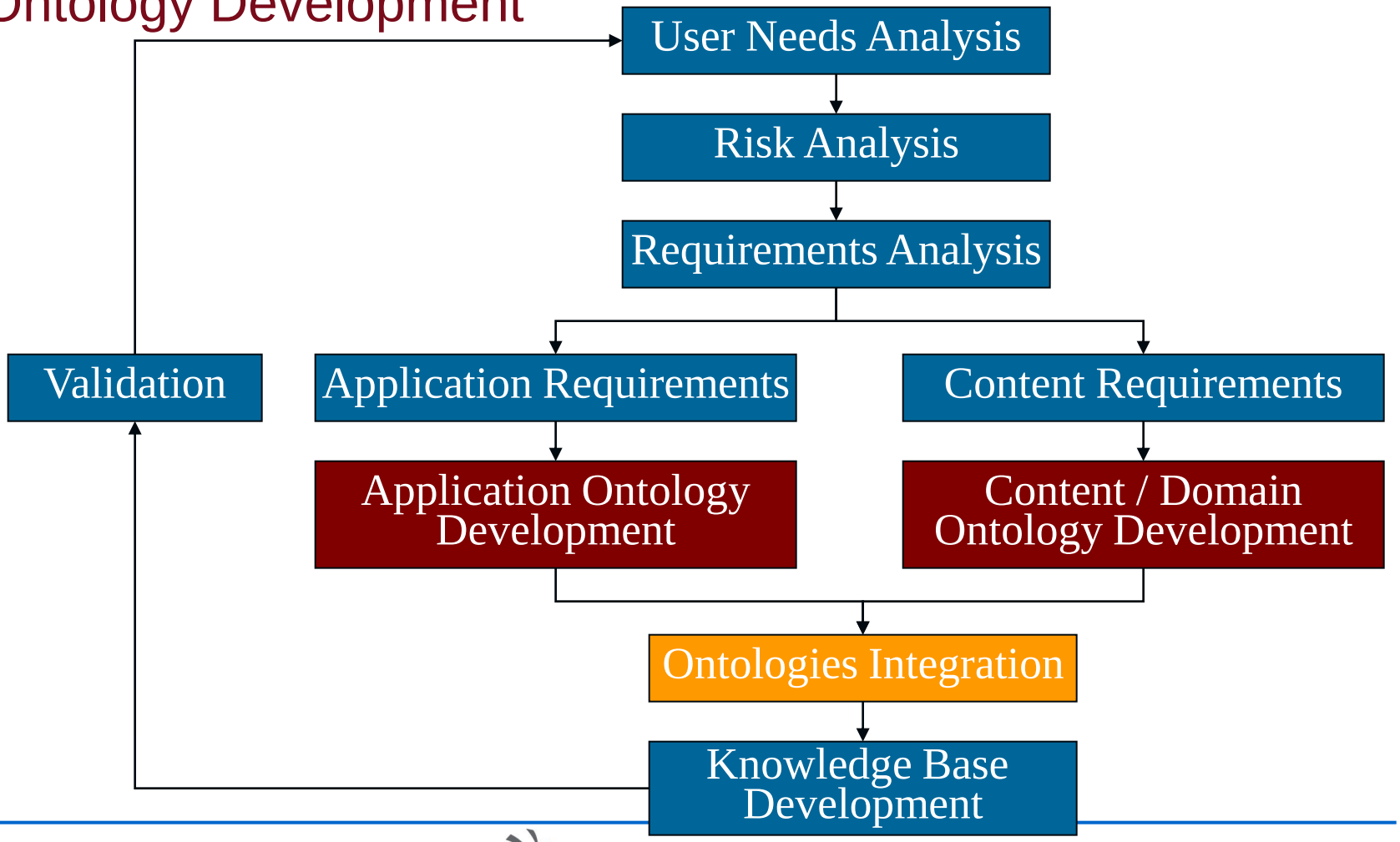
- Tagging of resources by the end user make possible the **Information Enrichment Process**; searches will be more and more effective as each time based on a larger amount of available metadata



Project Overview

- TaToo foresees to deal with different types of **environmental information resources**, such as **catalogues**, environmental **models**, **Web services**, or **Web pages**
- **Cross-domain** discovery of resources, meaning that resources annotated with different purposes and possibly different ontologies
- **Semantic heterogeneity** problem: allowing multi-domain and multi-lingual annotation schema implementing an extensible discovery mechanism

Ontology Development



Ontology Development

- Start from already **available ontologies**
  - Modelling what is missing (removing what is not required)
  - Changing what does not suite TaToo
- Ontologies Integration: *Merging*, *Alignment*, and *Mapping*
- Identification of how the content should be annotated
- Vocabulary e.g. **Dublin Core**, **FOAF**, **SIOC**
- Ontologies e.g. **GeoNames**
- Thesaurus e.g. **GEMET** (multi-linguality)

Ontology Development

- Two kinds of ontologies to be considered and integrated
  - **Application Ontology**

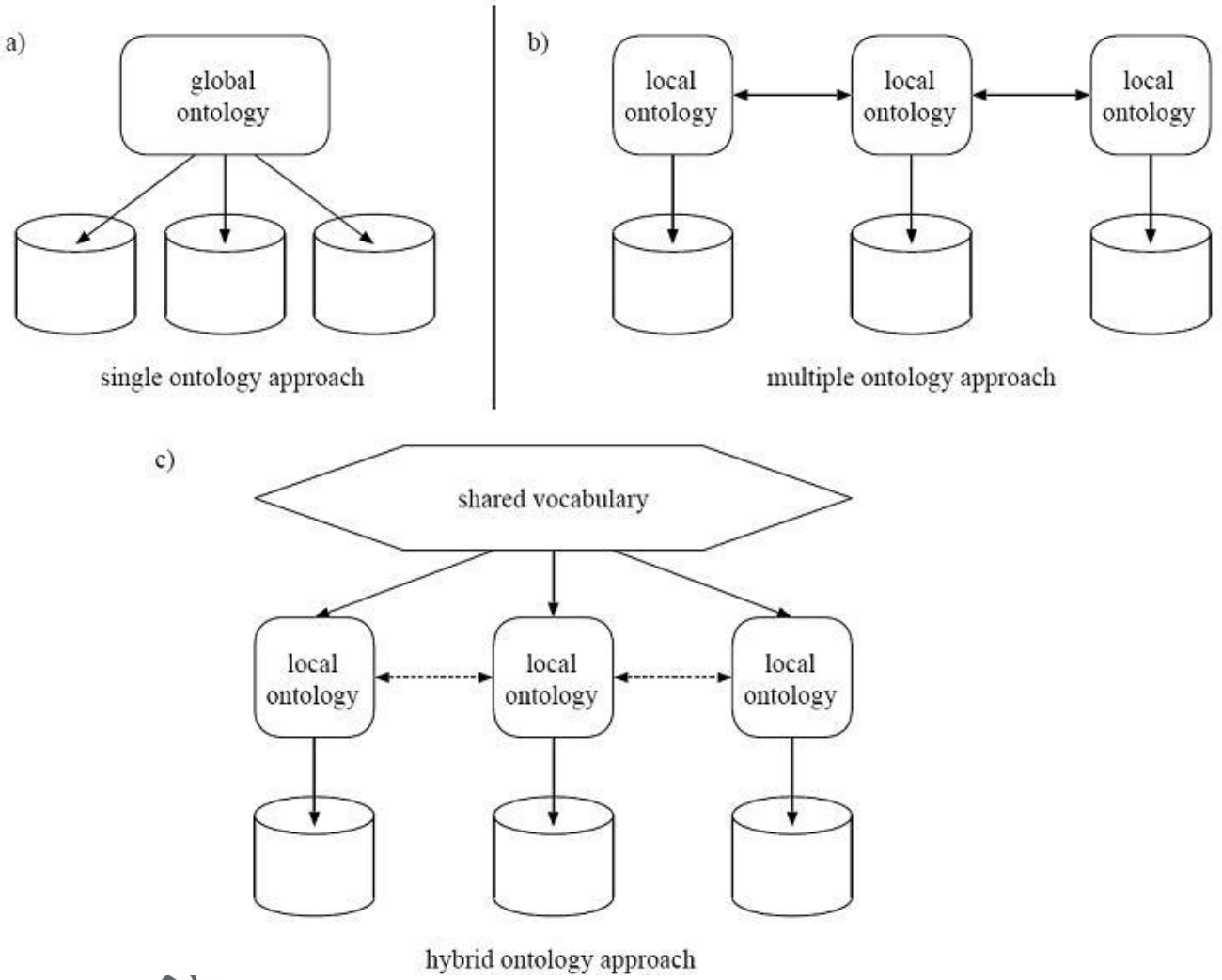
    Describes the classes of contents handled by the application and the RDF properties
  - **Content Ontology** (Domain Ontology)

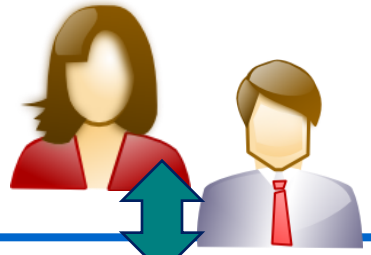
    Describes possible values for the RDF properties

- TaToo adopts
  - The **NeOn methodology** to model ontologies
  - The **Hybrid approach** for **Ontology Integration**

Ontology Development

Ontology integration approaches overview *in Wache, 2001*





Portlets, Applications, Browser plug-ins / toolbars, …

Integrated Ontology

Dublin Core, SKOS

Application Ontology

Bridge Ontology

AIT

Content Ontology 1

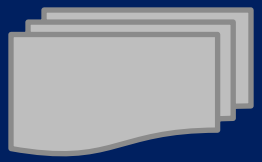
Content Ontology 2

…

Content Ontology n

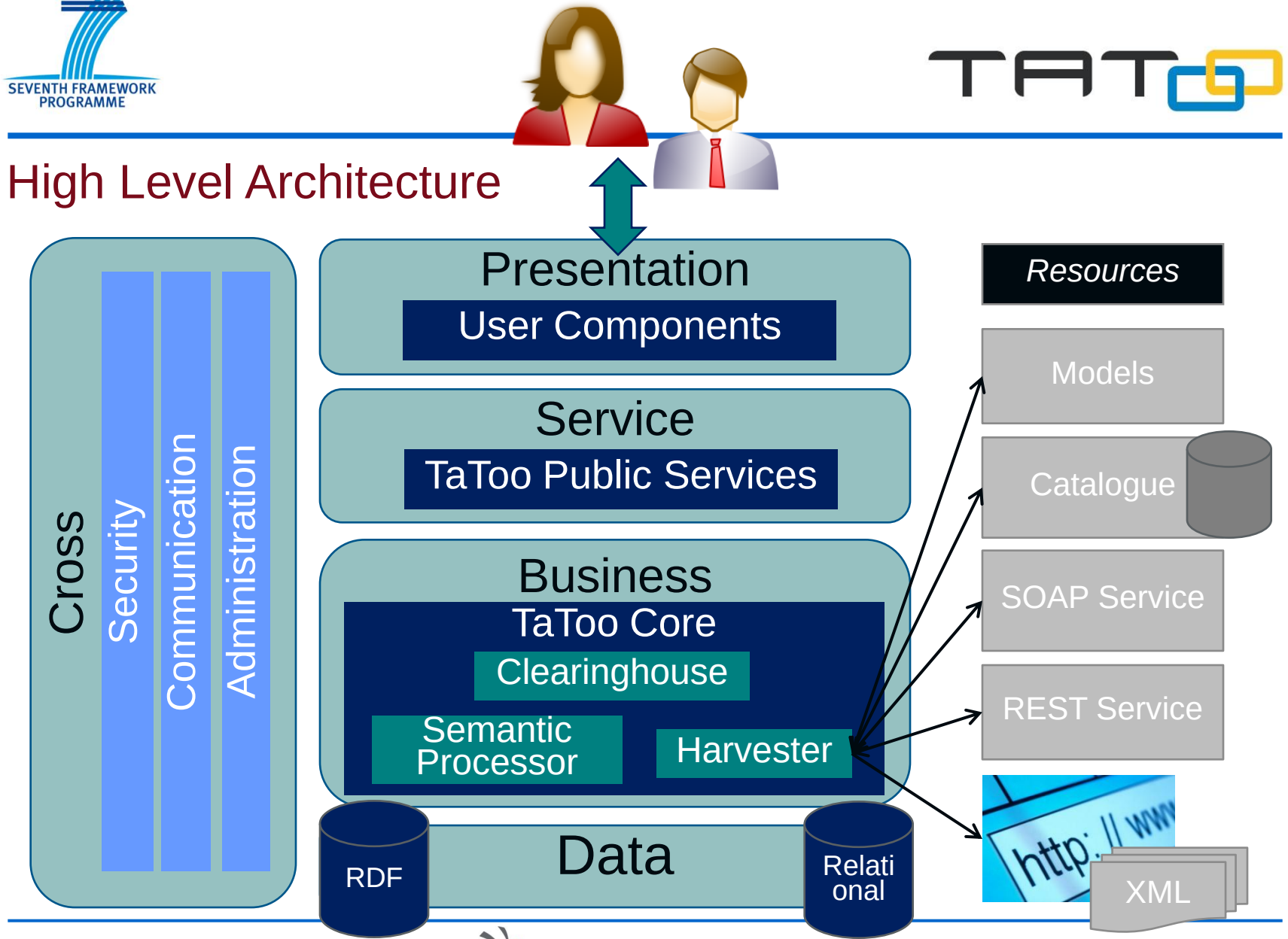
MU

Data / Services



SOAP/ REST

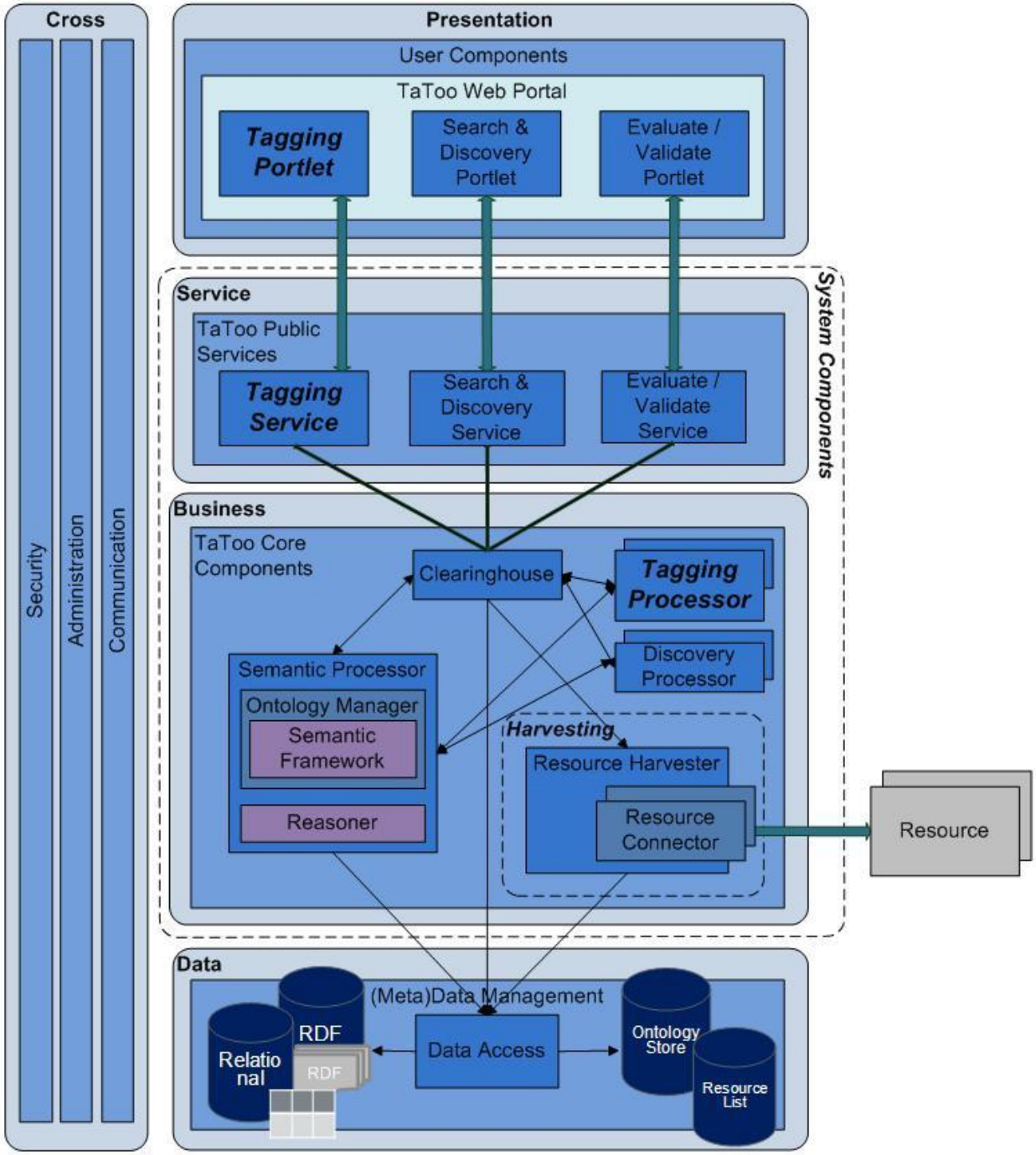
High Level Architecture



Core Components

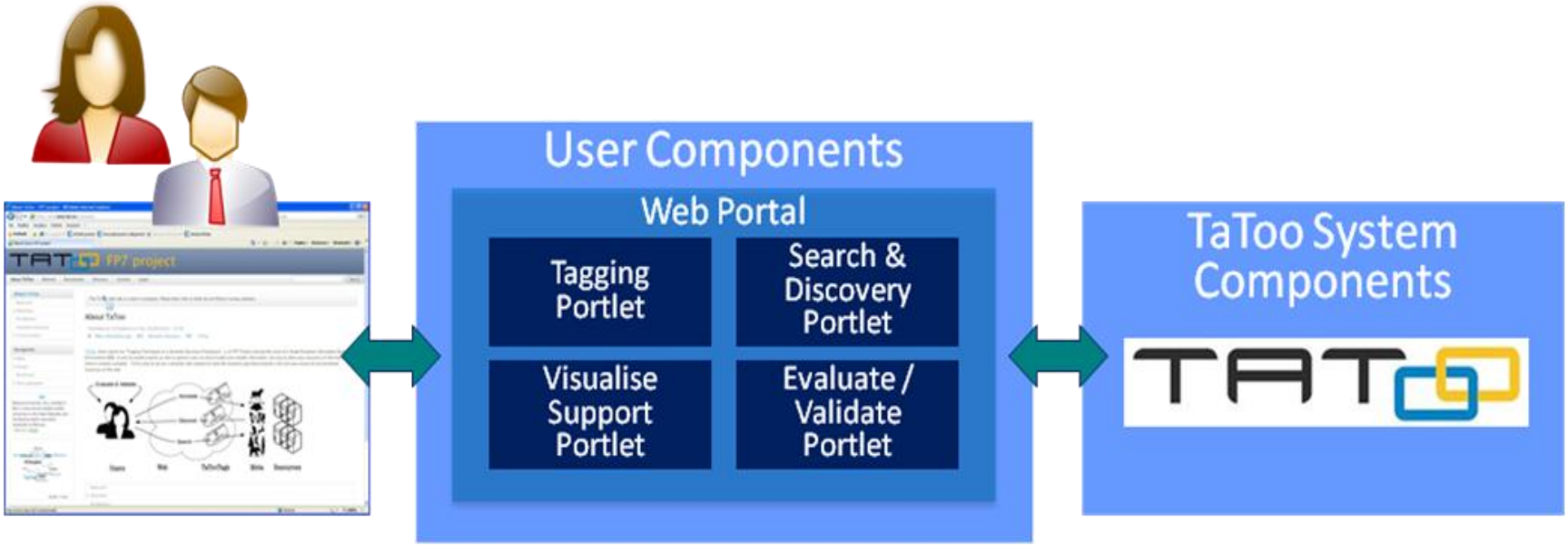
- The **Clearinghouse** is a central component for **accessing** the **metadata** storage and serves also as an information exchange support between the core system components
- The **Semantic Processor** is the fundamental component dealing with **Semantics**. It uses a set of (pluggable) ontologies (in the environmental domain) to provide functionality based on semantics. In general, it relies on a **Semantic Framework** and a **Reasoner** to provide its functionality
- The **Harvester** is the component capable of retrieving external resources (and associated metadata) that could be either data or associated metadata stored in catalogues, Web services or information contained in Web pages

Architecture Overview



Web Portal

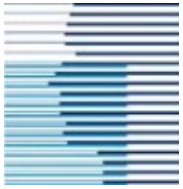
- TaToo aims at providing accessible and easy to use GUIs in order to facilitate and encourage users in the process of tagging (*taggers*).
- The TaToo Web Portal to take advantage of Web ubiquity



Communities and Validation Scenarios

- **Promote the framework**: relevant **scientific communities** such as the International Environmental and Modelling Society (**iEMSs**), the International Federation of Information Processing (**IFIP**), and members of the Central and Eastern European Centre for Persistent Organic Pollutants (**CEEPOPsCTR**)
- TaToo results will be applied to solve particular problems in three **Validation Scenarios** embedded in highly complex environmental domains: **climate change**, **agriculture**, and **anthropogenic impacts of pollution**

Project Partners



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TaToo

TAGGING TOOL BASED ON A SEMANTIC DISCOVERY FRAMEWORK

VISION

TaToo, which stands for "Tagging Tool based on a Semantic Discovery Framework", is an FP7 Project sharing the vision of a Single European Information Space for Environment (SISE). It aims to enable experts as well as general users to share trusted and reliable information, but also to allow easy discovery of information which is already available.

OBJECTIVES

The core of the project will focus on the development of tools allowing third parties to easily discover environmental resources (data and/or services residing on different information nodes) on the web and to add valuable information in the form of semantic annotations to these resources, thus facilitating future usage and discovery, and kicking off a beneficial cycle of information enrichment.

The proposed TaToo framework will allow the integration of semantics, taking into account the challenges of different domain-ontologies in a multi-domain and multilingual context. TaToo provides three complex and extensive validation scenarios and therefore foresees skilled or expert users as the primary target user group.

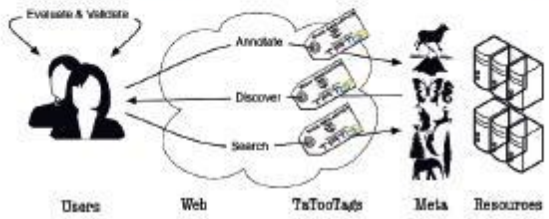
CHALLENGES

A hot issue in environmental modelling is the efficient discovery of high quality and meaningful information. Metainformation attached to current environmental data repositories have been collected, structured and stored in forms that are meant for human users. Yet, it is hard, if not impossible, to machine process such metainformation.

As a result, significant human intervention is required for discovering environmental information: (a) The process of locating appropriate sources, querying and exploiting environmental data cannot be automated. (b) Human experts are required to undertake such tasks. Finally (c) the generation of metainformation, just for documenting existing data, turns out to be too heavy a burden for all kinds of users, and more so for data owners.

CLOSE THE GAP

What is needed, is a middleware infrastructure to fill the gap between environmental resources, resources and end-users. This framework must facilitate the life-cycle of environmental information from its collection and persistent storage up to its discovery and purpose-oriented exploitation.



Therefore TaToo's objective is to help close the discovery gap in the Single Environmental Information Space in Europe for the Environment by developing easy to use tools within a semantic framework for discovery and access to environmental resources in a multilingual and multi-domain context.

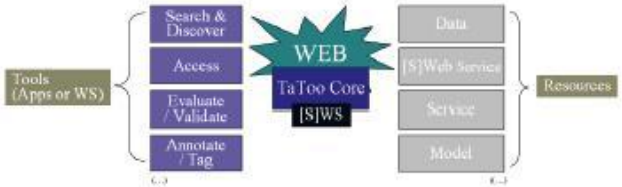
TaToo

TAGGING TOOL BASED ON A SEMANTIC DISCOVERY FRAMEWORK

RESULTS

TaToo will provide a semantic framework for discovery and access to environmental resources in a multilingual and multi-domain context. Therefore, it will provide:

- Tools for
  - Discovery of Information
  - Semantic Interpretation of Information
  - Annotation of Information
  - Information Enhancement – Tagging and Annotation
  - Visualisation of Information



- Services (based on standards where possible) for
  - Integration and Processing of Information (e.g. a semantic processor)
  - Storing/Archiving of TaToos (e.g. semantically enriched information objects)

CONTACT

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PROJECT COORDINATES

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Duration: 36 months
Project End: 31.12.2012
Total Budget: ~3.8 MEuro
Total Funding: ~2,5 MEuro

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PARTNERS

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Masaryk University, Czech Republic
Joint Research Centre, Italy

BACKUP

- BACKUP

Project Overview

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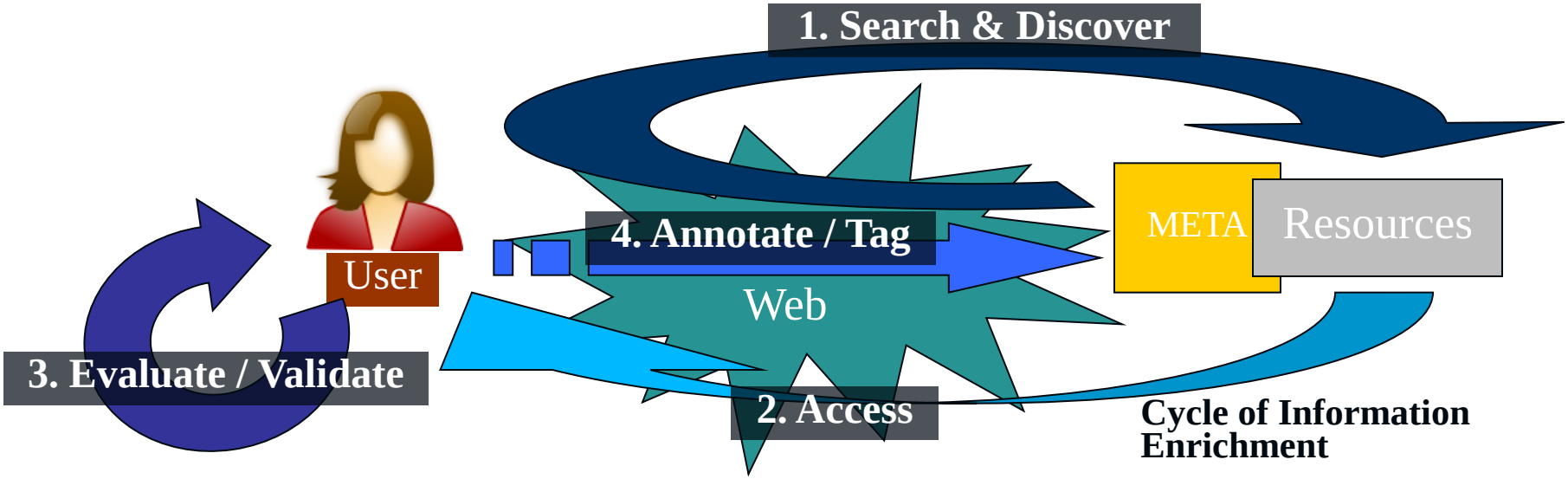
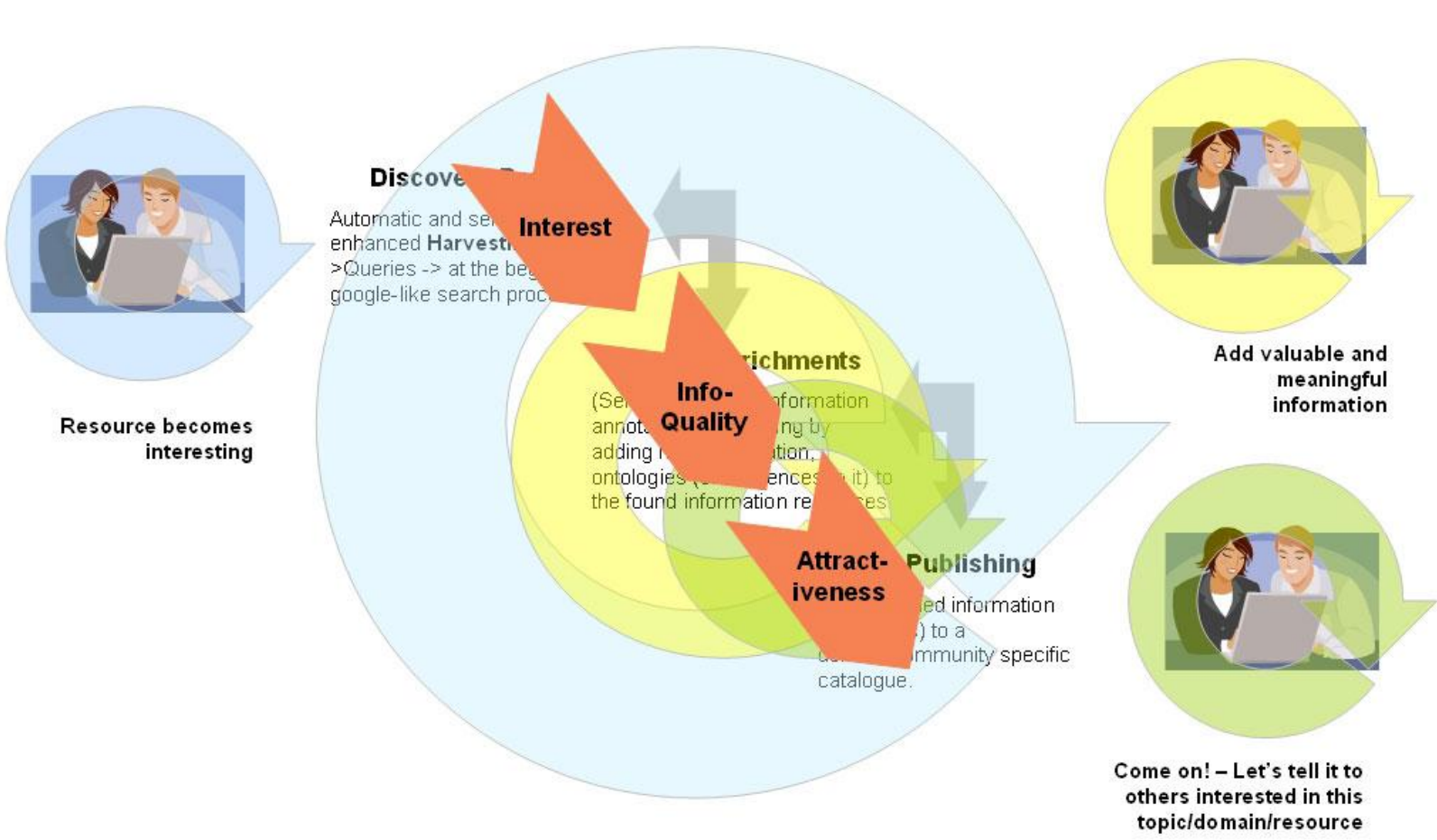
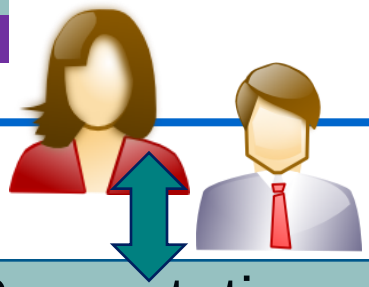


Project Overview





Cross
Security
Communication
Administration

Presentation
User Components

Service
TaToo Public Services

Business
TaToo Core
Clearinghouse
Semantic Processor
Harvester

Data
RDF
Relational

Resources
Models
Catalogue
SOAP Service
REST Service
http://www
XML

Initial Considerations

- Resources (data, services, etc.) have to be **Auto Descriptive** i.e. they have to be [semantically] described by a *proper* set of Metadata
- A **format** for the **TaToo Metadata** have to be defined
  - Elements belonging to this format have to be identified by URIs
  - Attributes and Values related to Ontology Concepts
- Possible elements have to be well identified and shared (wide accepted dictionary)
- Tags / Annotations are provided by users to catch **'The wisdom of crowds'** (*social tagging → user generated content → Taxonomies - Folksnomies*)
- Tags / Annotations provided by resource owners to be considered as well (e.g. external catalogues)