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UKOLN



Ontology Servers and Metadata Vocabulary Repositories

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re:source The Council for
Museums
Archives
and Libraries

Joint Information
Systems Committee



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Overview

- agentcities.NET deployment grant
- Background work at UKOLN
- Terminology
- Motivation
- A meta-model for vocabularies
- Architecture
- Deployment on agentcities.NET network
- Interactive and software interfaces
- openNet workplans
- Collaboration

An Ontology Server

... for the agentcities.NET project

- Review architectures, software toolkits, encoding formats
- Mechanism for populating the server
- Development of interactive and machine interfaces
- Deployment of service on agentcities.NET

Deployment grant: Sept 2002 – Feb 2003

Background work at UKOLN

UKOLN has been involved in several projects in the area of metadata vocabulary repositories or knowledge bases (mainly from the perspective of digital libraries):

DESIRE II (ended June 2000) –interactive browsing by users

<http://www.ukoln.ac.uk/metadata/desire/>

SCHEMAS (ended Feb 2002) –machine processible format

<http://www.ukoln.ac.uk/metadata/schemas/>

DCMI Registry (on-going) –management of DC vocabulary

<http://dublincore.org/dcregistry/index.html>

MEG Registry (on-going) –UK Education domain

<http://www.ukoln.ac.uk/metadata/education/regproj/>

CORES (ended June 2003) –annotation service

<http://www.ukoln.ac.uk/metadata/cores/>

Terminology

Metadata is

- structured data about data

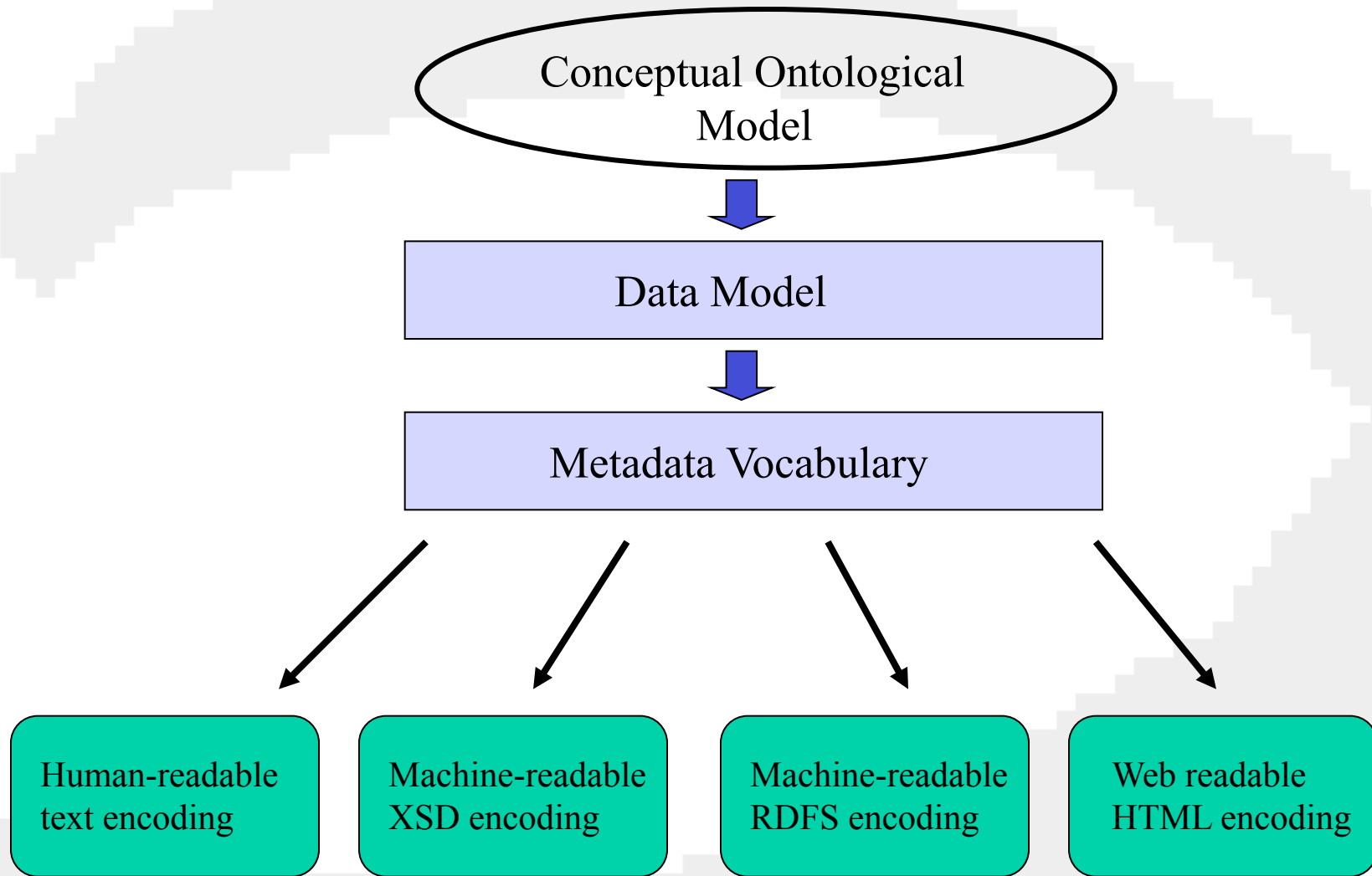
A metadata **vocabulary** or **schema**:

- declares a set of concepts or terms and their associated definitions and relationships
- the terms are often known as elements, attributes and qualifiers
- the definitions provide the semantics, ideally these are both human and machine readable
- in effect a manifestation of ontology

A **scheme**:

- controlled vocabulary or enumerated type

Ontology & Schema



Motivation

- **Disclosure** of metadata vocabularies
- **Investigation** of individual terms as well as whole vocabularies for adaptations, local usages and relationships with other vocabularies
- **Interoperability** -convergence within specific domains e.g. education, cultural heritage, publishing, rights management etc.
- **Reasoning and inference** -automated querying of metadata vocabularies by software agents to acquire the semantics associated with specific terms

Types of vocabularies

Vocabularies range from canonical international standards to implementation specific schemas

- Single element sets
- Combinations of vocabularies
- Cross-domain (Dublin Core)
- Specific domains (IEEE LOM/IMS, OAIS, MPEG, INDECS)
- Particular applications or implementations (OAI protocol)

A Meta-Model for Vocabularies

Element sets: **declare** a unique set of elements and definitions

- ideally, addressed on the Web with a URI
- may be expressed in XSD, RDFS etc.

Application profiles: **declare** which terms are **used** by a particular application or project

- may mix-and-match terms from multiple element sets
- may specify dependencies e.g. mandate schemes
- may adapt existing definitions for local purposes
- may declare rules for content (usage guidelines)
- may specify whether an term is mandatory, optional or repeatable

Further Details: An Ontology Server for Agentcities.NET

<http://www.agentcities.org/note/00008>

Server Contents

- Notion of *Application Profiles* as basis for vocabulary encodings (internal data model)
- Specification language currently used is RDF Schemas
- Classes or entities recorded:
 - Agency
 - Element Set
 - Application Profile
 - Element
 - Element Usage
 - Encoding Scheme

Encoding formats

XSD

(lacks underlying data model)

RDFS

(lacks explicit data typing,
structuring and constraint
modeling)



OWL

DAML+ OIL

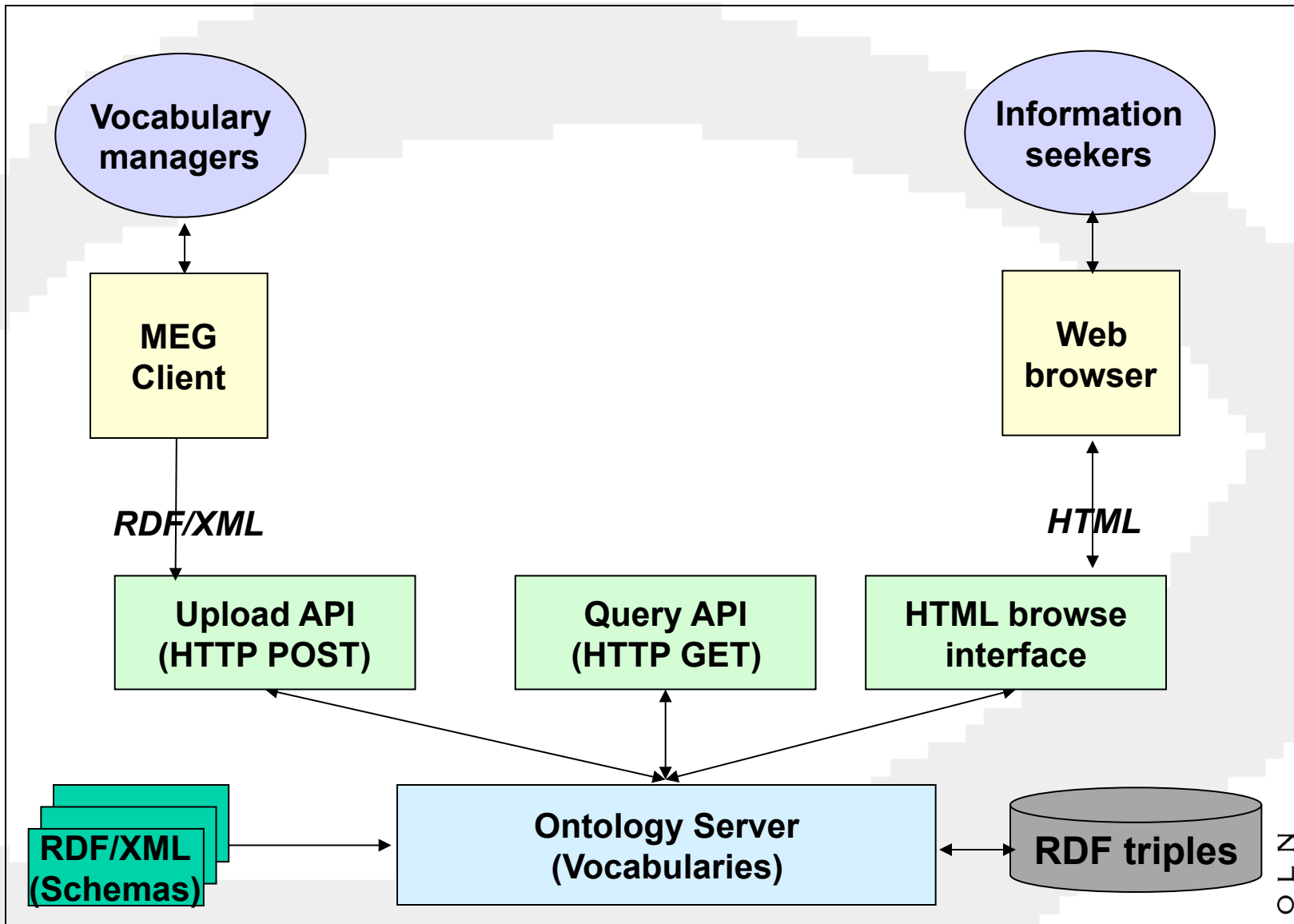
WebOnt WG

RDFcore

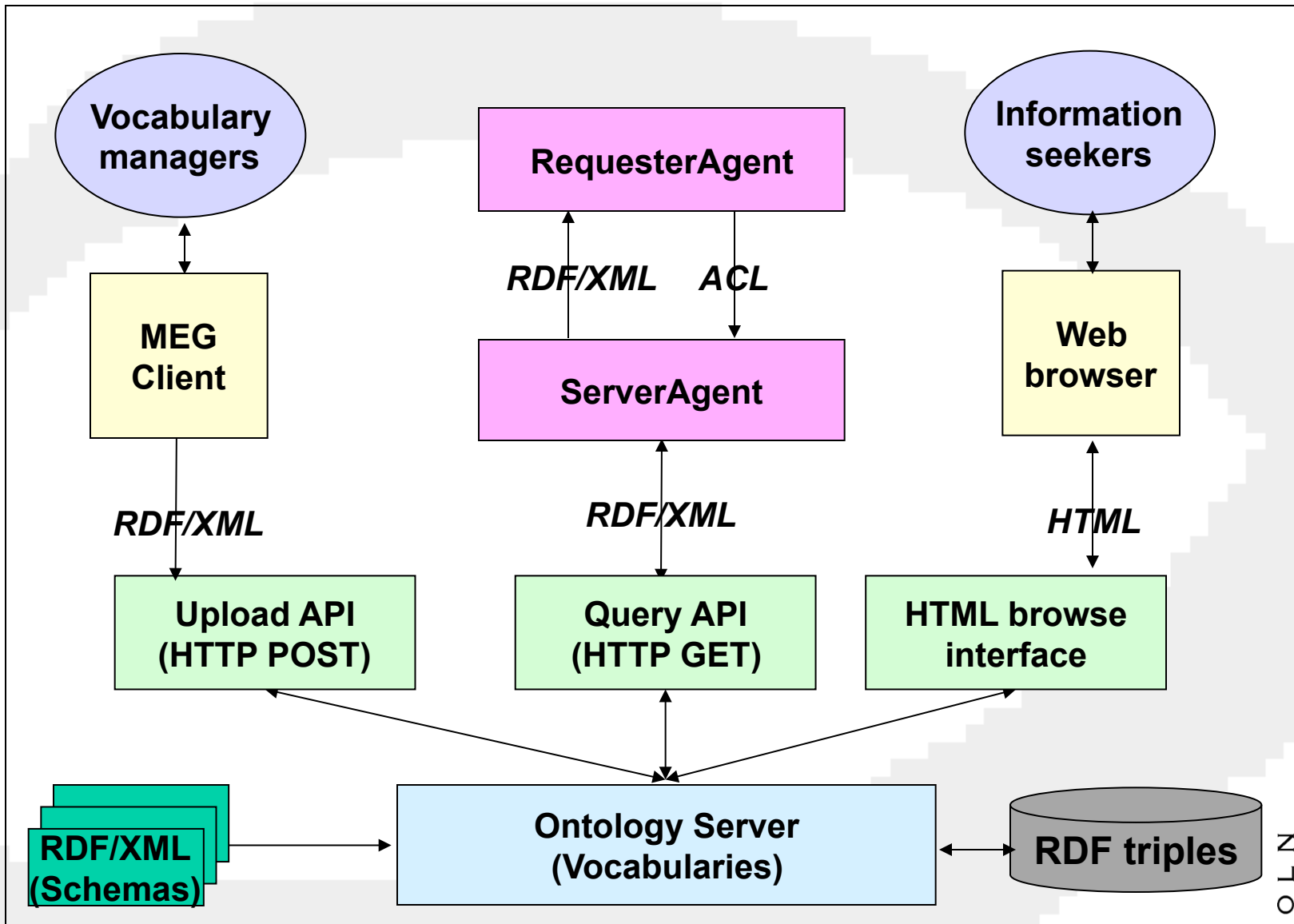
Architecture

- Centralised -heavy maintenance burden
e.g. ISO/IEC 11179 based registries
(Environmental Protection Agency, Australian Health Information Knowledgebase), Dublin Core Metadata Initiative(DCMI), DESIRE
- Distributed -content and maintenance of vocabularies is distributed, based on a harvesting model
e.g. SCHEMAS, MEG and CORES

MEG Registry Architecture



Deployment in an Agents Environment



Interactive interface

- Support for ontological engineering
- Disclosure or publication environment for vocabularies
- Enable queries across a whole range of vocabularies
- Clarify relationships between vocabularies
- Encourage sharing of existing vocabularies to help avoid duplication of effort
- Encourage convergence and harmonisation within single domains
- Promotion of standards to improve potential for cross-domain interoperability
- Web-interface:

<http://solo.ukoln.ac.uk/agents/server/>

Machine interface

- Provision of semantics in a machine-readable format to enable effective function of software agents
- Software interface allows agents to query, search and navigate metadata vocabularies
 - Enables retrieval of semantics
 - Allows performance of inference and reasoning tasks
- Essential infrastructure for the composition and coordination of automated services over the Web
- JADE platform
 - Requests in ACL
 - Results in INFORM slot of return message

OpenNet Workplans

- Version tracking -metadata vocabularies evolve over time:
 - Semantics change
 - New terms need to be added
- Vocabulary Data Models
 - Not all vocabularies have a data model!
 - Differing data models are a challenge to reconcile!
- Annotation –important for
 - Trust, Authority, Provenance
- Rights management –important for
 - Sharing and reuse
- Software toolkits
 - JENA
<http://www.hpl.hp.com/semweb/tools.htm>
 - SESAME
<http://sesame.aidministrator.nl/>

Collaboration

JISC IE Metadata Schema Registry

- JISC IE –JISC Information Environment
- Jan 2004 –18 month project
- Partners: UKOLN, ILRT (CETIS, BeCTa)
- UK Education Domain: Dublin Core and IEEE LOM (Learning Object Metadata)
- Rachel Heery, Pete Johnston