

"Valuing the Role of Semantic Web Technologies - A Ten Year Reflection "

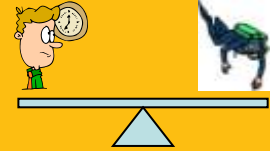
ICSC 2011

Fifth IEEE International Conference on Semantic Computing

September 19-21, 2011

Stanford University, Palo Alto, CA, USA

**Ralph Hodgson
TopQuadrant CTO**

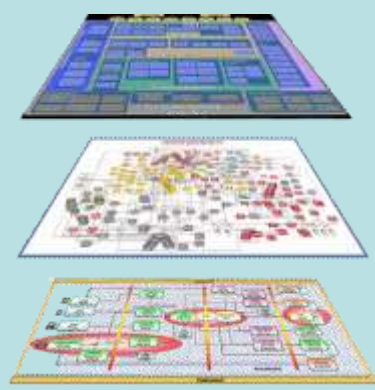
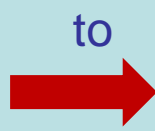
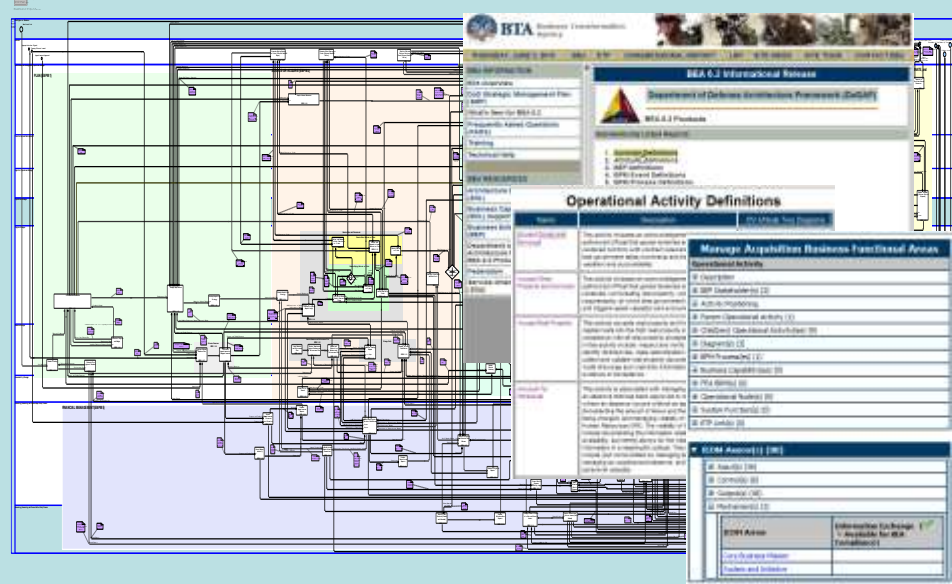


Ralph Hodgson

- *co-founder and CTO of TopQuadrant, Inc., a US-headquartered company that specializes in semantic technology consulting, training, tools and platforms;*
- *Lead Ontologist for the NASA NEXIOM Ontologies.*
- *Prior to starting TopQuadrant in 2001, Executive Consultant at IBM Global Services and founding member of the Portal and Object Technology Practices;*
- *Co-authored \Adaptive Information, published by John Wiley in 2004, and Capability Cases: A Solution Envisioning Approach, published by Addison-Wesley in July 2005.*
- *Member of INCOSE, and participates in the Model-Based Systems Engineering Initiative.*

What I care about:

From Complex information Spaces



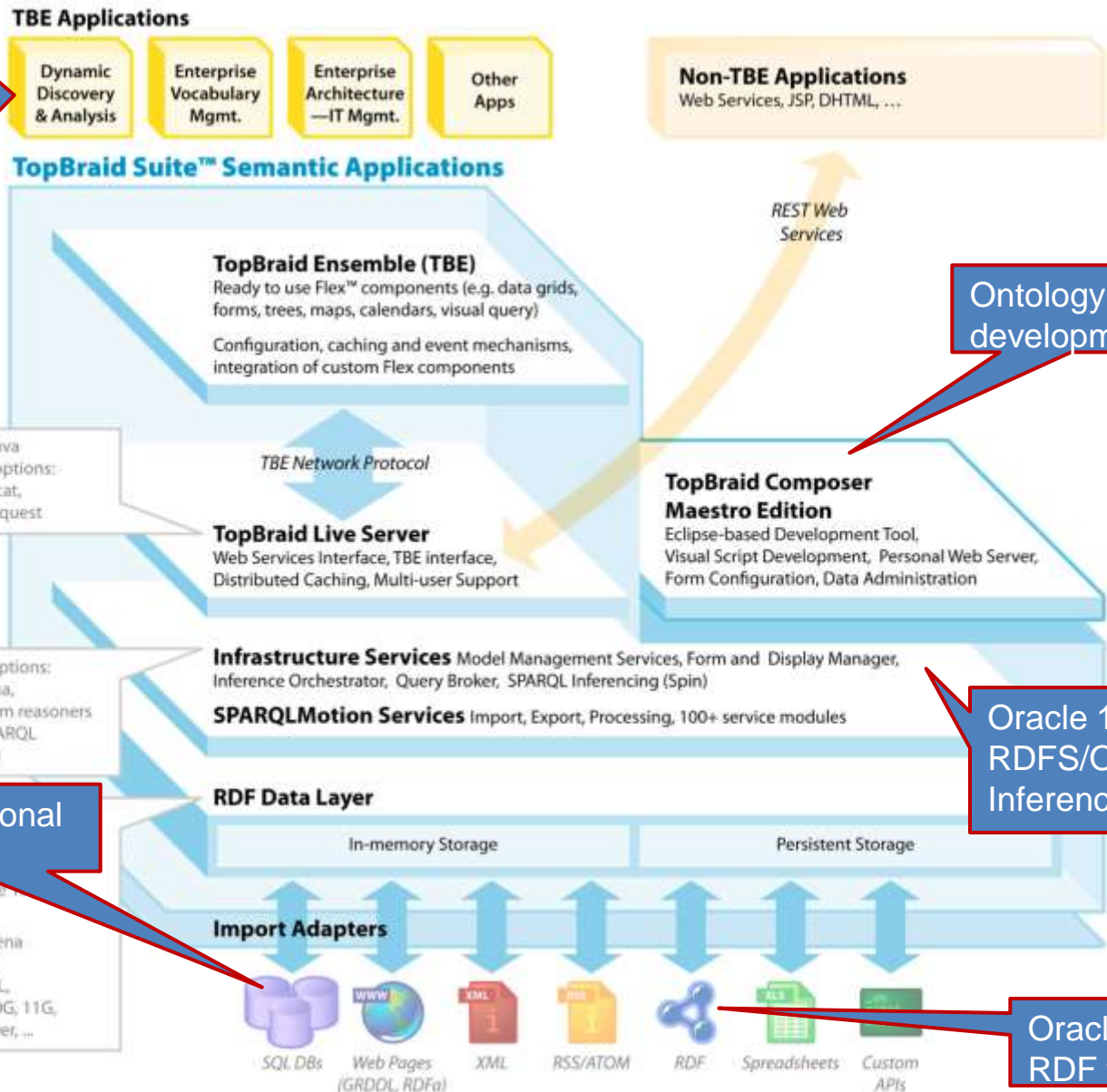
Layered Information Spaces with
 “Fitness for Purpose” and
 “Filtered to Context”



TopBraid Suite™

TopBraid Suite Components

Domain-specific applications (Finance, Life Sciences, Engineering, Health Care, National Security,



Ontology development

Oracle 11g Native RDFS/OWL/Rules Inferencing

Oracle Relational DBs

Oracle 11g RDF triple



TopBraid Suite



DESIGN



TopBraid Composer™

Models

TopBraid Composer™ is the leading professional enterprise-class semantic web modeling and application development environment.

ASSEMBLE



TopBraid Ensemble™

Web apps

TopBraid Ensemble™ is a semantic web application assembly toolkit for rapid configuration and delivery of dynamic business applications.

INTERACT



TopBraid Live™

Application server

TopBraid Live™ is an enterprise semantic web application platform optimized for rapidly implementing solutions that require integration of data, content, application services and user interactions.

TopBraid Suite Architecture Stack

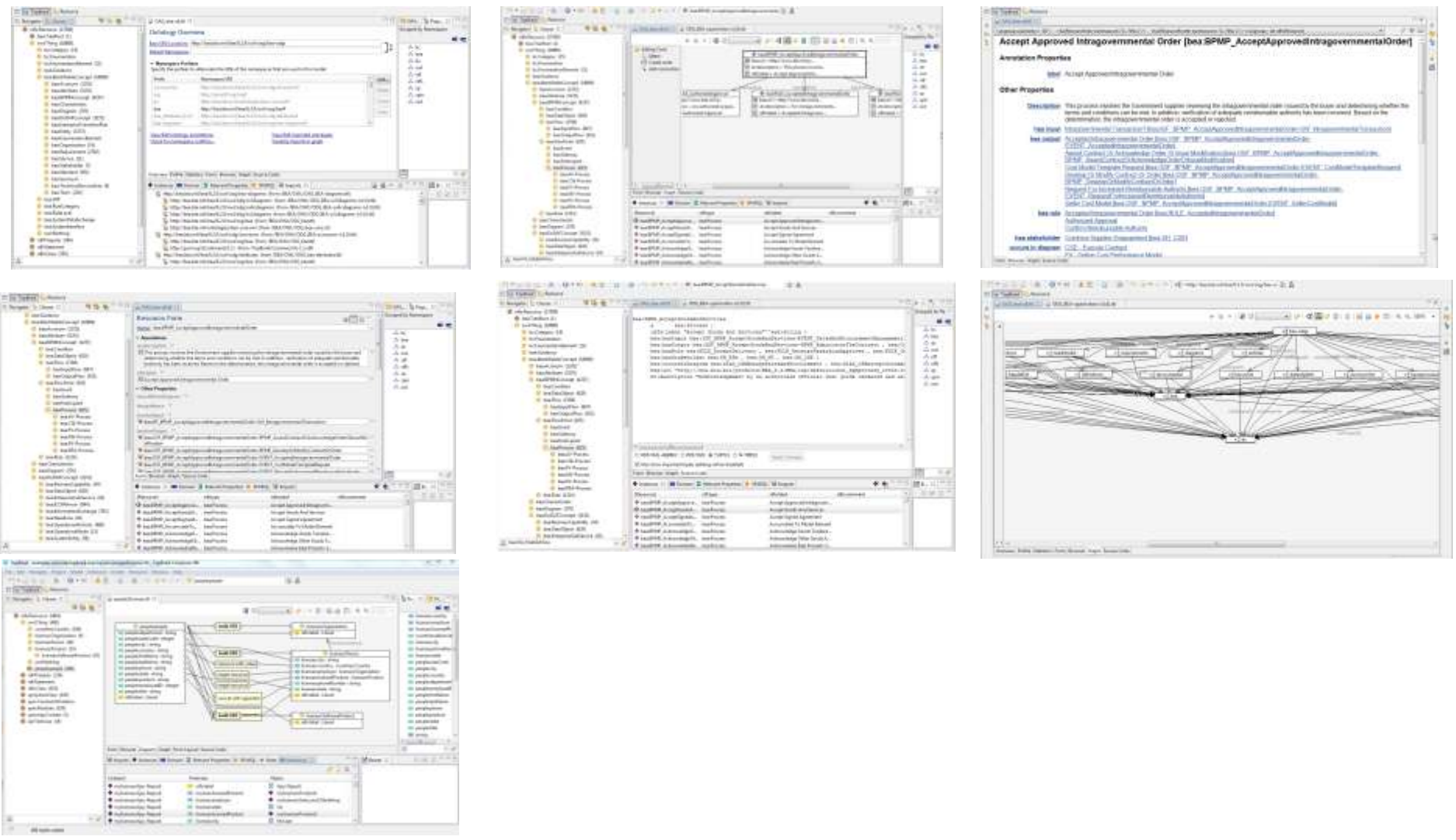
TopBraid Suite capabilities



TopBraid Suite seamlessly fits into existing IT environments by providing customer-specific approaches to complete semantic application



TopBraid Composer



An RDF/OWL IDE with many powerful editing, importing, exporting, inferencing and integration capabilities.



TBS - an Integrated Standards-based Platform (1)

- Personal server on Composer Maestro Edition (TBC-ME)
 - Test TopBraid Live applications on localhost
 - open TBC-ME, then open a browser to: <http://localhost:8083/tbl>

TopBraid Live

Google Calendar TopBraid Composer ... TopQuadrant TQ - Bugzilla Main P... Most Visited Weather WebMail 2.0 Login

TopBraid Suite™

TopBraid Suite Console version 3.2.2.v20091223-2155R

TopBraid Live

TopBraid Ensemble Application Assembly & Deployment

Completed Applications	Applications Under Development
Default Application (configurable)	Family Tree Viewer
Multi Page Example (configurable)	Platt Taxonomy Management II
New Application	REI Categories Final
	Workflow Enforcer IV

[Component Upload](#)

[Project Upload](#)

[Project Delete](#)

[Download SDK](#)

[TopBraid Live Server Administration](#)

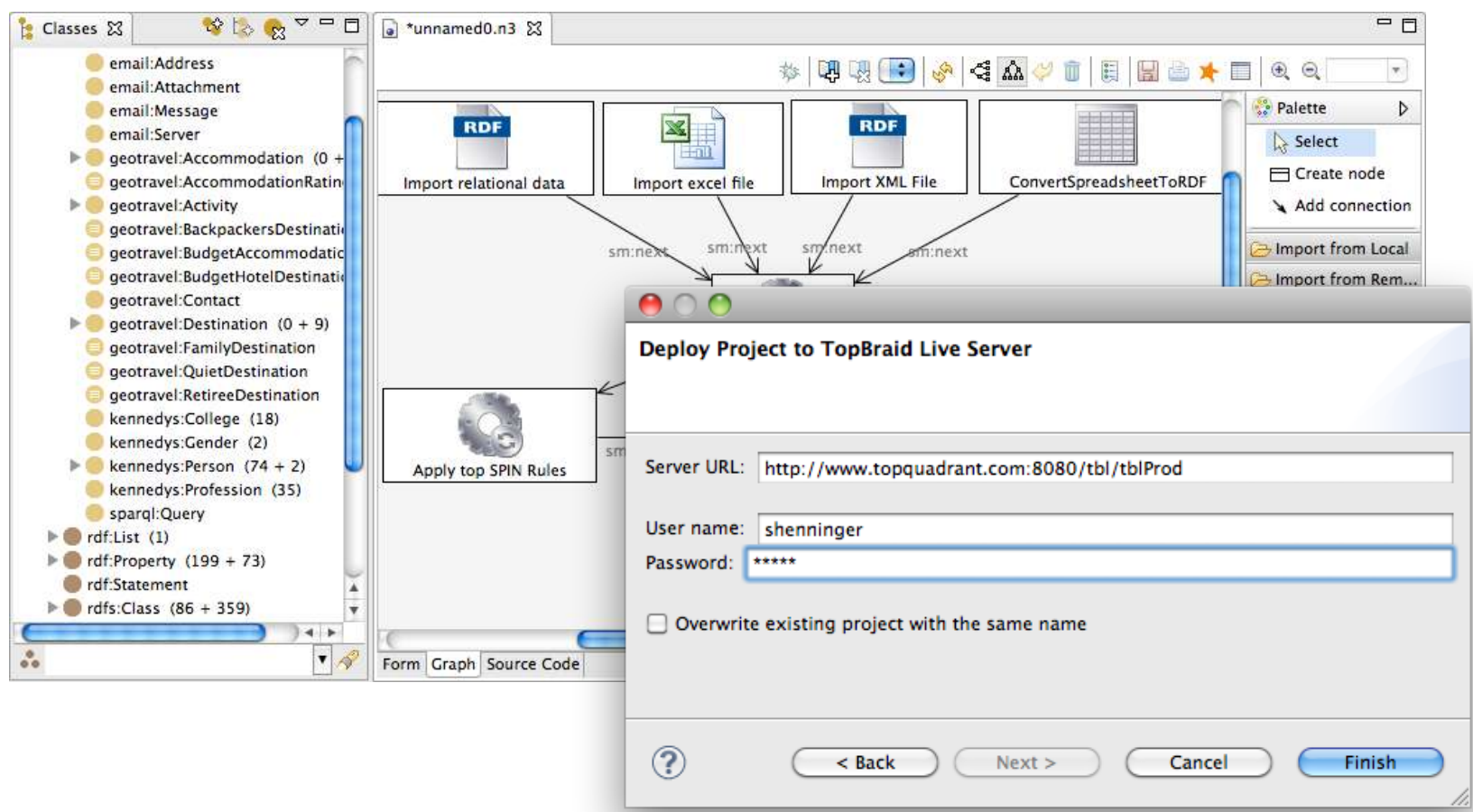
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View any model in TBC-ME workspace with Default Application



TBS - an Integrated Standards-based Platform (2)

- Develop model, scripts, etc. in Composer
 - deploy project to TopBraid Live server



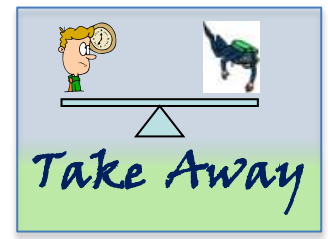
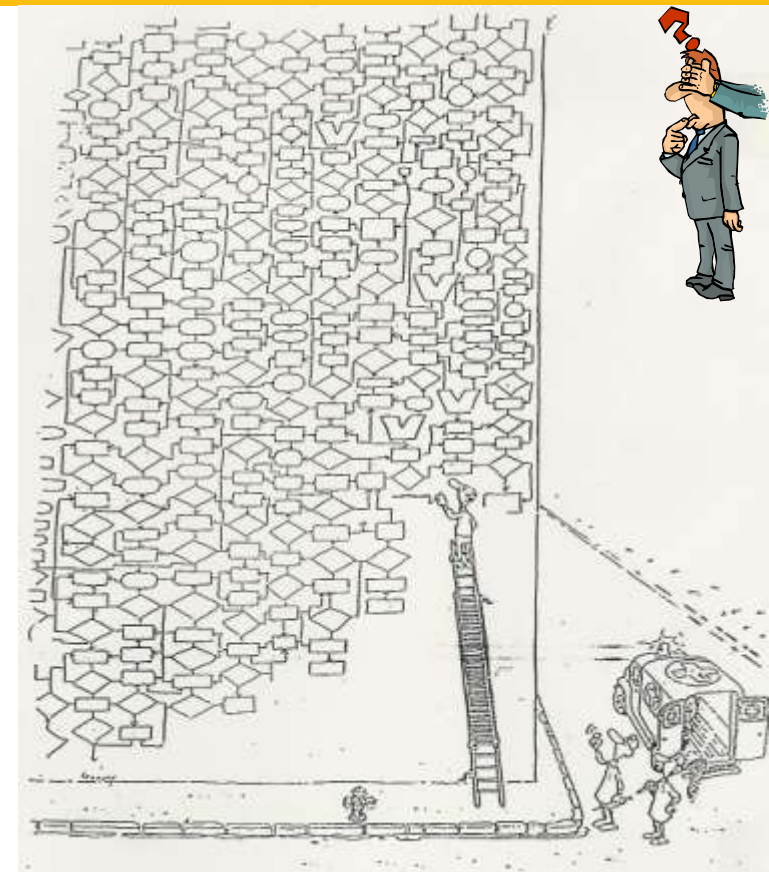


How Semantic Web Technologies Deliver Value

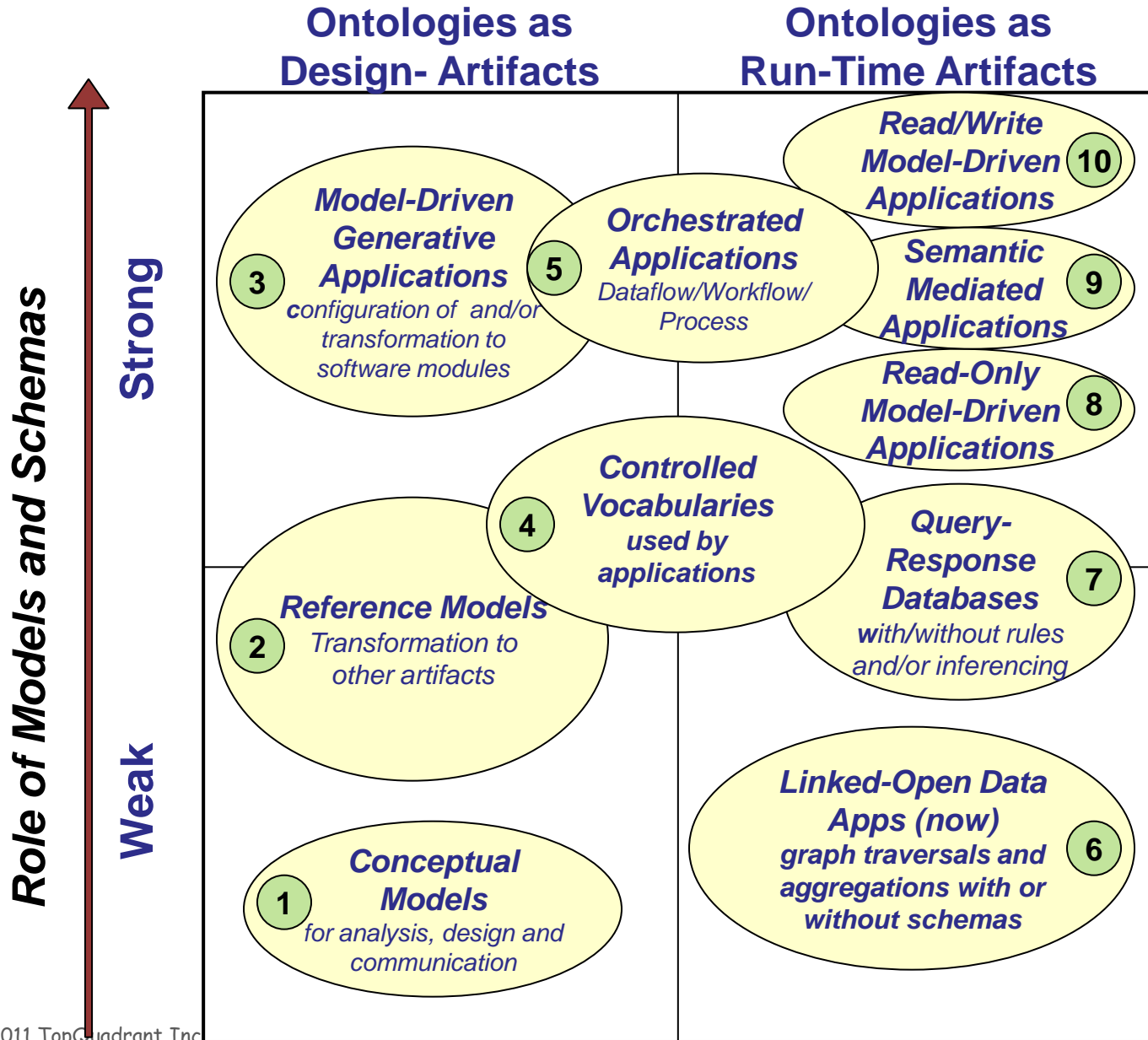
1. Canonical data → Subject-Predicate-Object Triples
2. Identifiers → Composition Construct for Aggregations
3. Schemas are also expressed in Triples and can be queried using same query language – SPARQL
4. Evolvability – schemas, vocabs and datasets can readily evolve

Some of the Questions that are asked

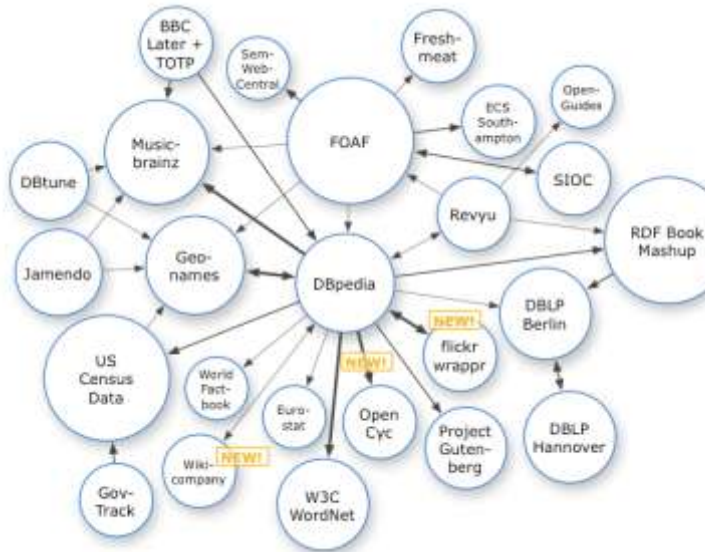
- ❑ "What does the use of semantic technology mean to users of data?"
- ❑ "Can semantic web technologies really 'connect the dots' and break down data silos?"
- ❑ "What does it mean to link data?"
- ❑ "How can data access and visualization be improved?"
- ❑ "How can RDF and OWL co-exist with XML?"
- ❑ "What has to happen in an organization for semantic web technologies to be put to work effectively?"
- ❑ "What are the criteria for choosing technologies for implementing solutions?"
- ❑ "When to know when to stop modeling?"



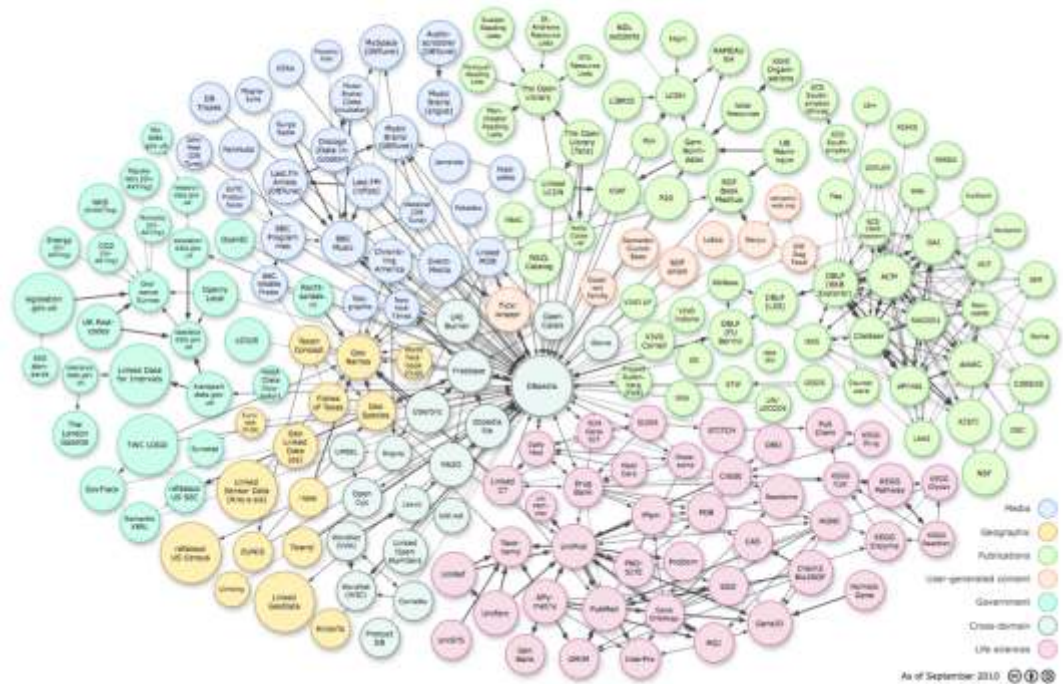
Putting Ontologies to Work



Linked Open Data



2007

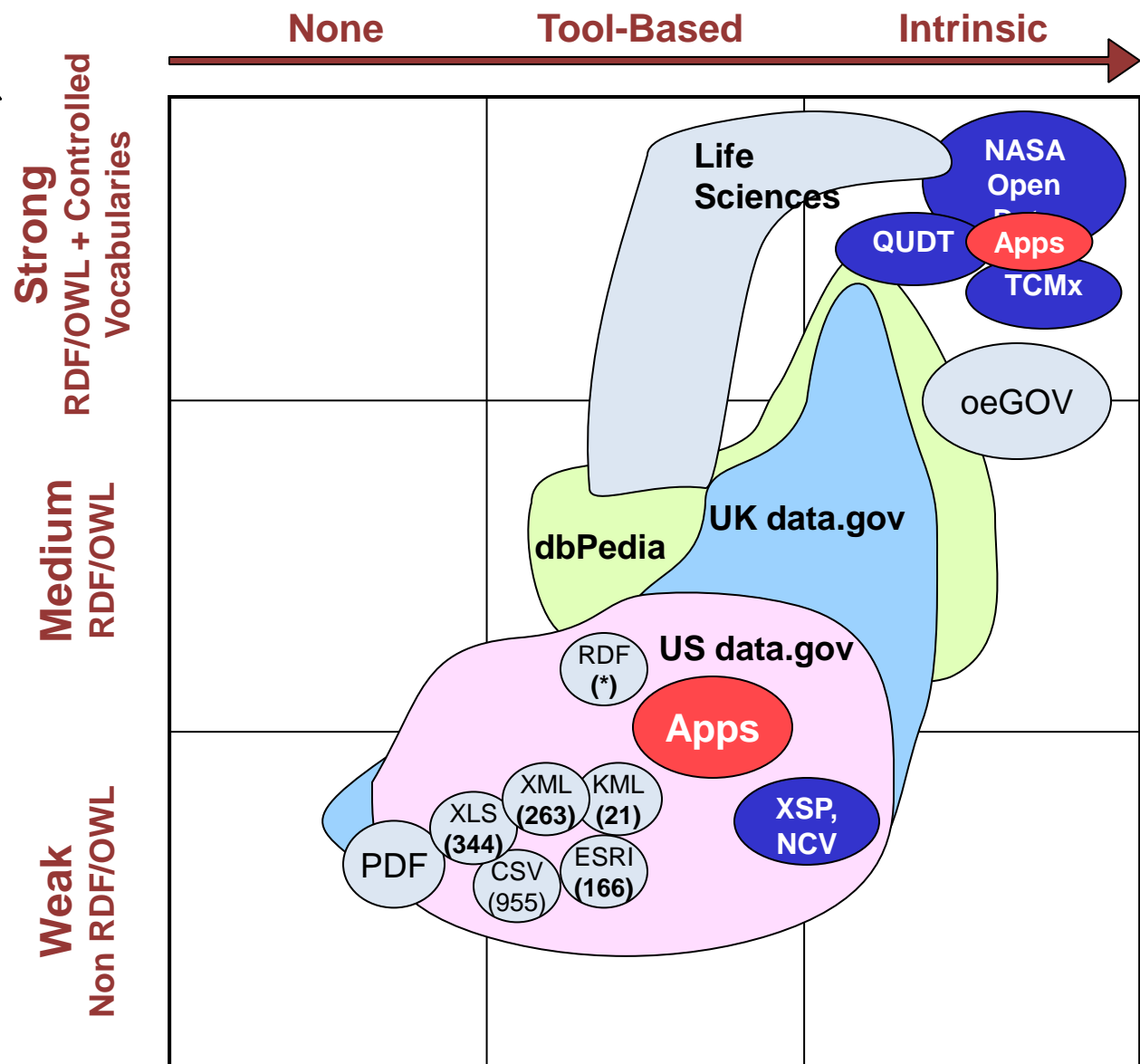


2011

ref1: <http://www.readwriteweb.com/cloud/2011/01/the-concept-of-linked-data.php>
 ref2: <http://richard.cyganiak.de/2007/10/lod/>

The Linked Open Data World

Information Architecture



“Link-ability”



F (#) Based on data.gov June 2009

2001 – Birth of TopQuadrant

Formed in 2001, TopQuadrant is a well-established tools, products, solutions, training, ontology development and consulting company with more than 100 person years experience in Semantic Web Technologies.

Training

TopQuadrant has trained many people in Semantic Web Technologies perhaps more than any other company in the world.

Tools

TopQuadrant has the leading RDF, OWL and SPARQL tool suite that integrates with a number of triple stores and databases, including ORACLE-11G.

Platforms and Solutions

TopQuadrant has a semantic platform, a rapid application builder, and solutions for vocabulary and metadata management

Consulting

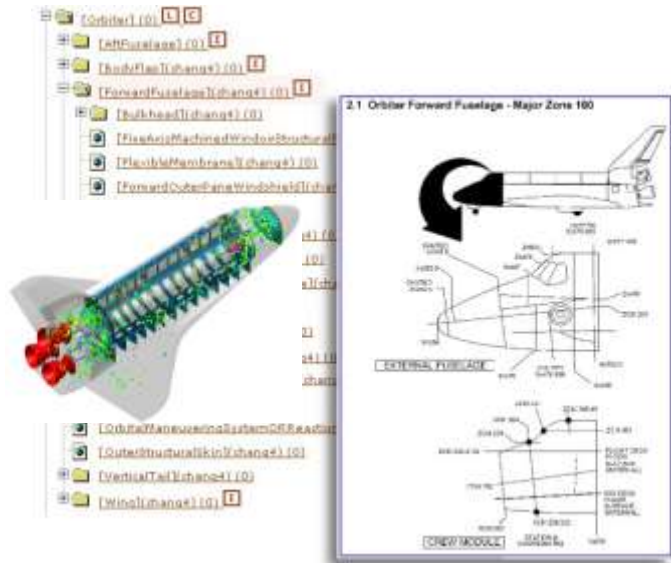
TopQuadrant has consultants that have worked, both in TQ and in previous companies (notably IBM), on many consulting projects. At TQ we do: Jumpstarts, Competency Development, Solution Envisioning Workshops, Ontology Modeling, Semantic Application Development



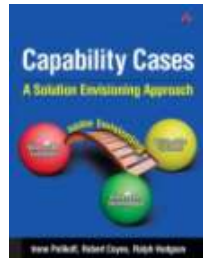
2002 – Digital Shuttle Project



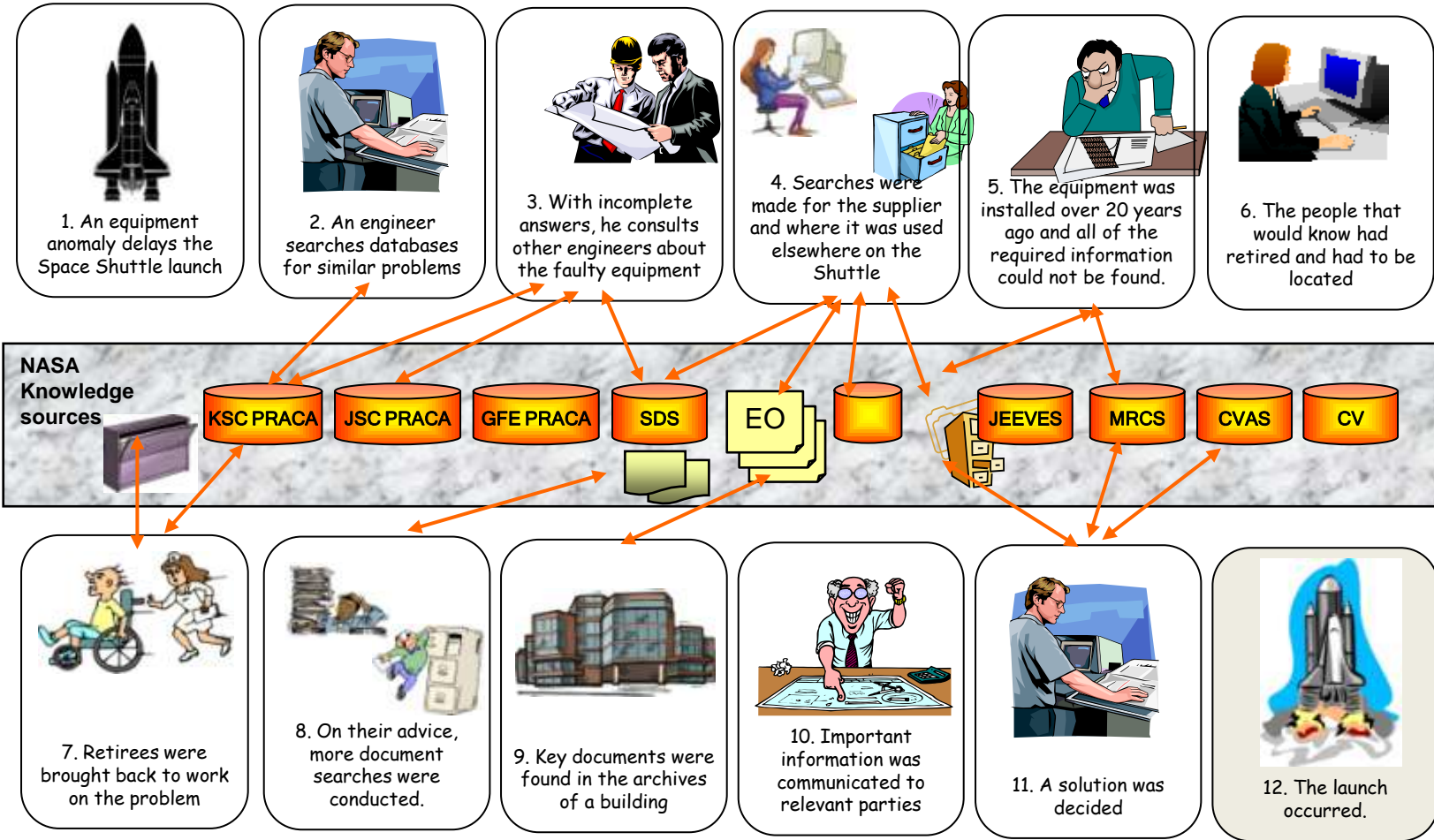
“We never know exactly what we want ...



... until we see what is possible.”



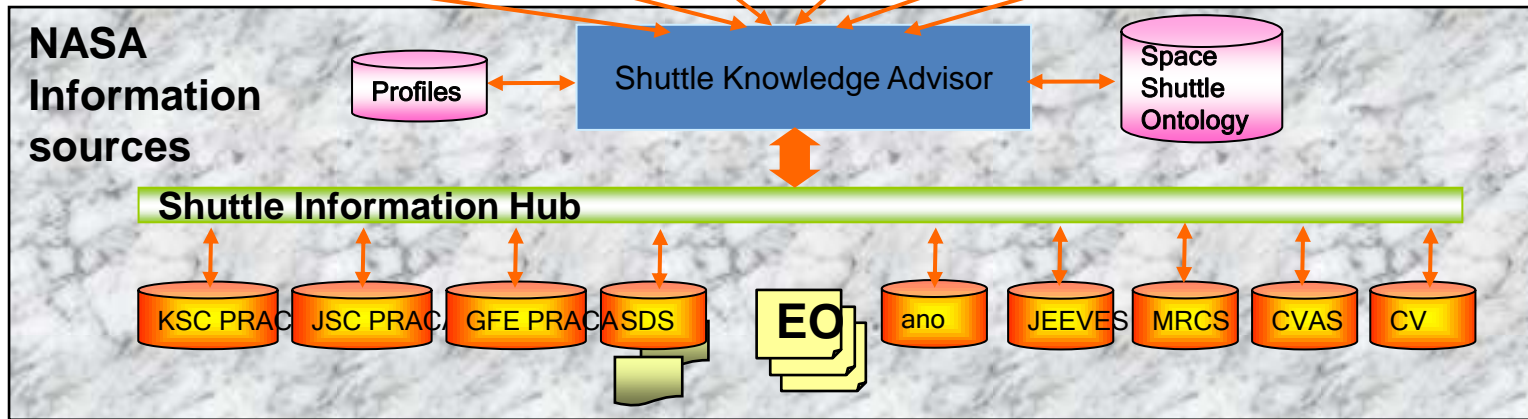
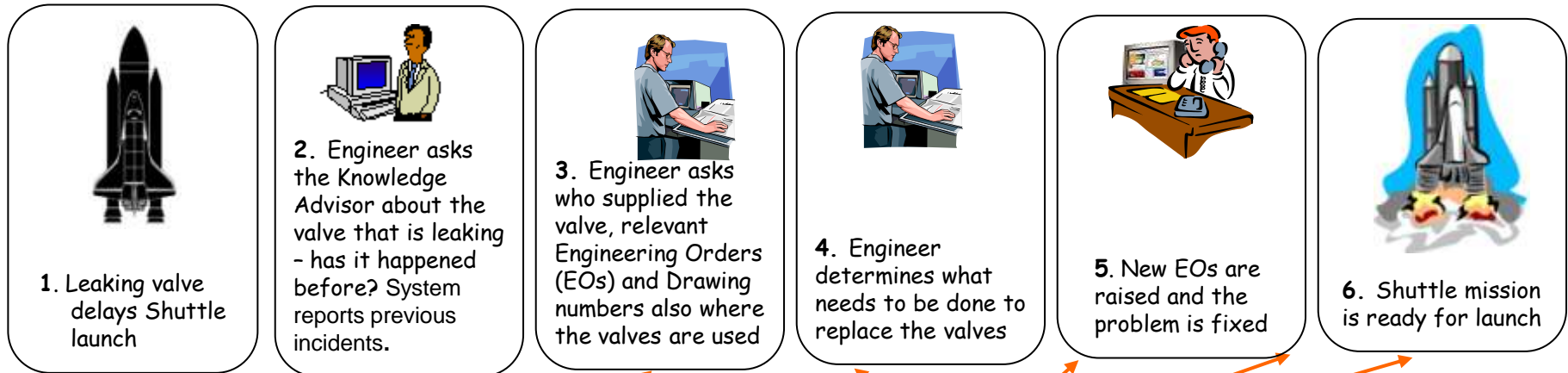
2002 Illustrative Scenario – Leaking Valve

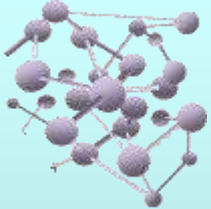


Disclaimer

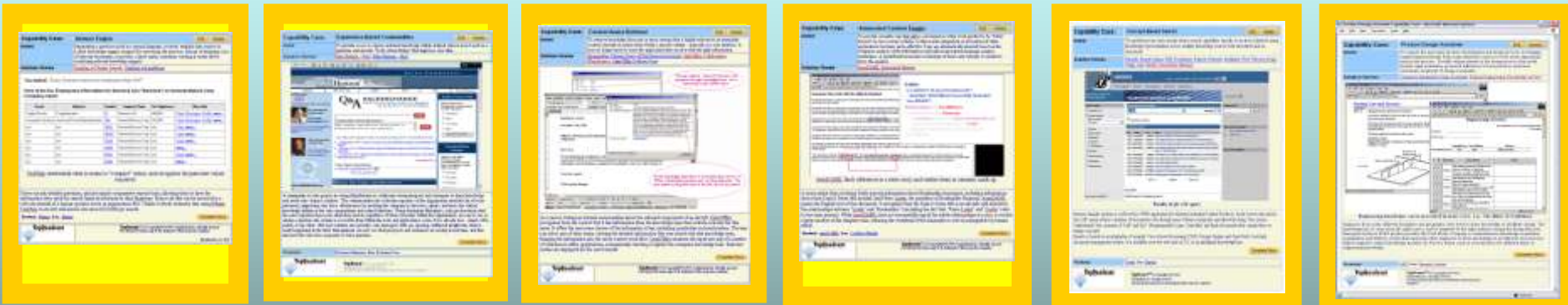
This scenario is fictitious and is not based on any actual occurrences on the Space Shuttle. It is inspired by the movie entitled "The Space Cowboys".

Future Scenario – Leaking valve is discovered on STS-*nnn*

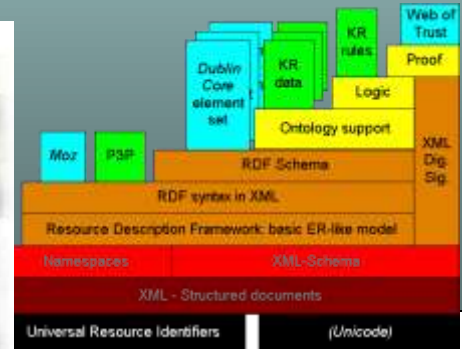




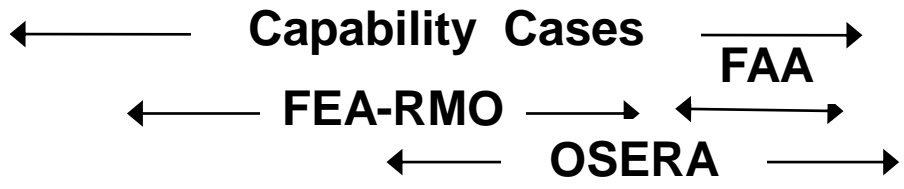
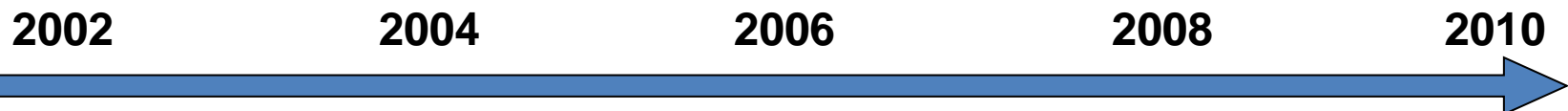
"Semantic Technologies for e-Government" White House Conference Center, Washington D.C., September 8th, 2003



Keynotes
Capability Cases Gallery
Panel Sessions



Brief History of TQ's in RDF/OWL for Semantic-Enabled Enterprise Architecture



FAA

← NASA NEXIOM →

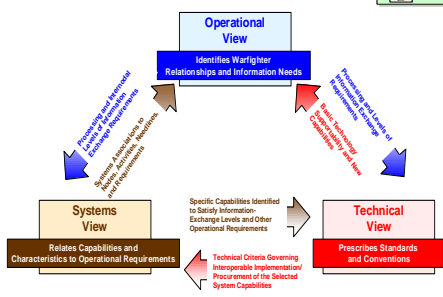
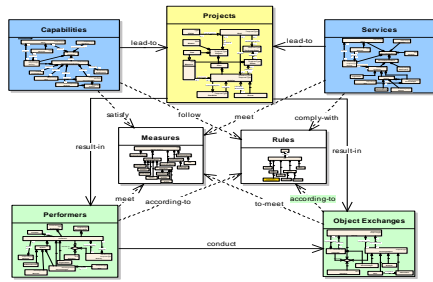
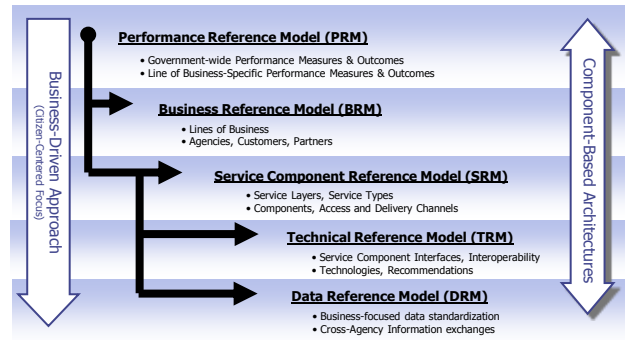
← NATO →

← DoDAF →

BEA
 ↔

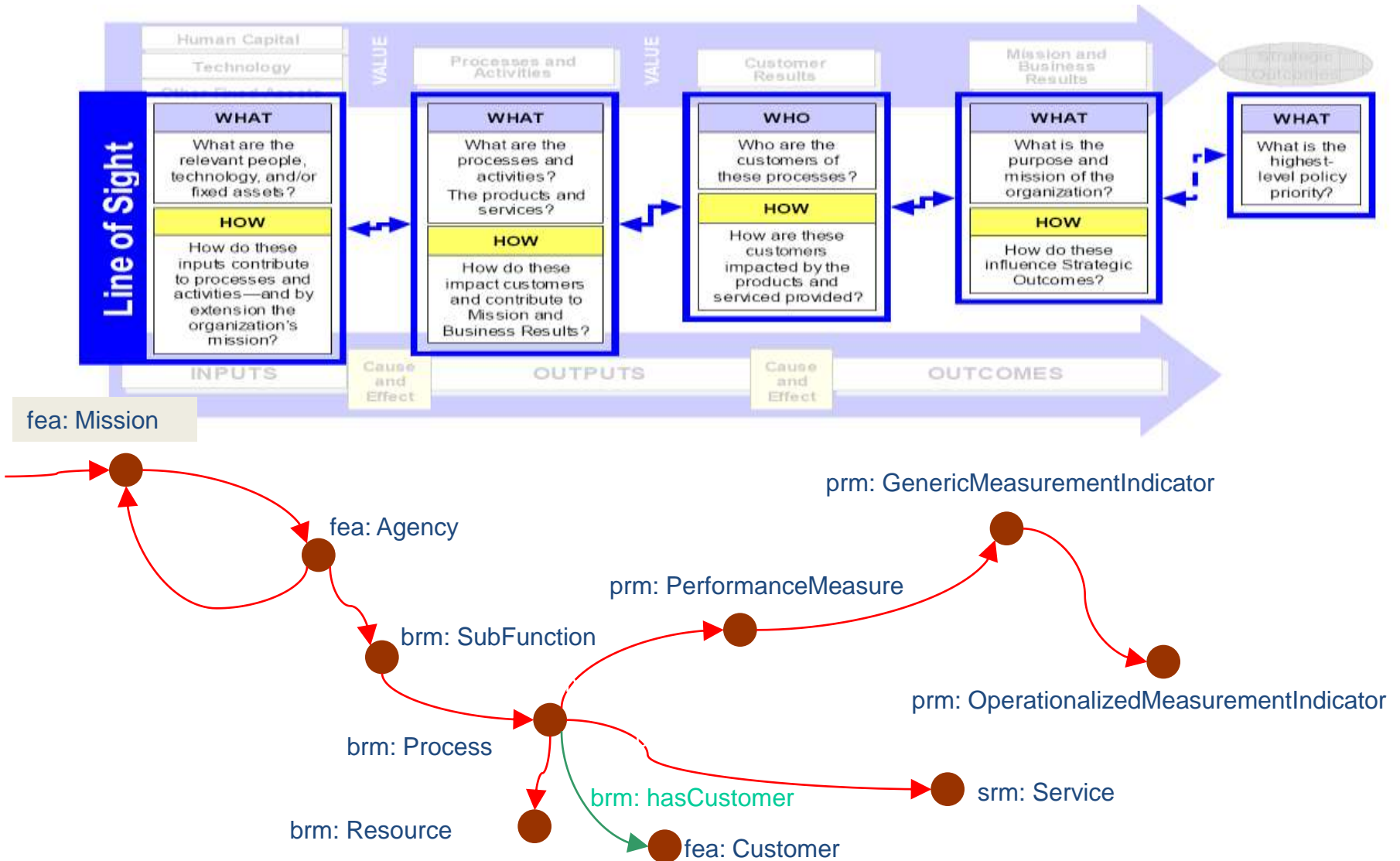
← CCTS →

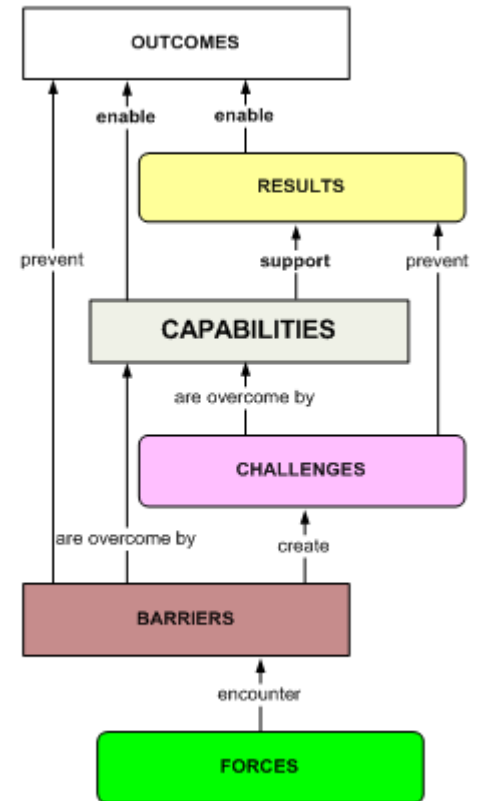
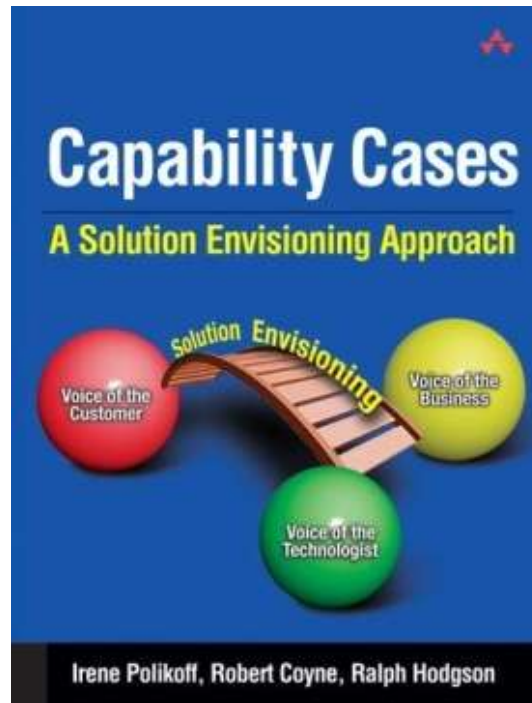
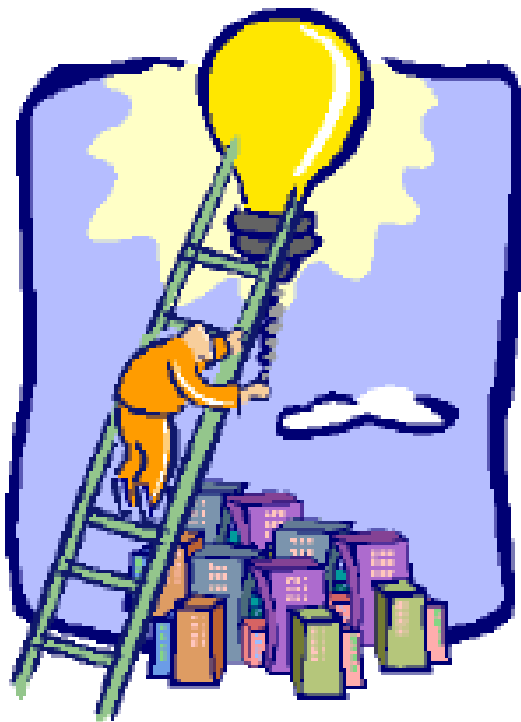
oeGOV
 ↔



References: (1) SKOS-based FEA-RMO Ontologies are at http://www.oegov.us/blog/?page_id=102
 (2) oeGOV ontologies are at <http://www.oegov.us>

2004 - FEARMO





Need

Strategy

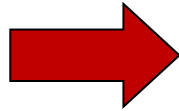


Solution

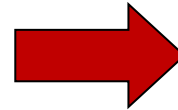
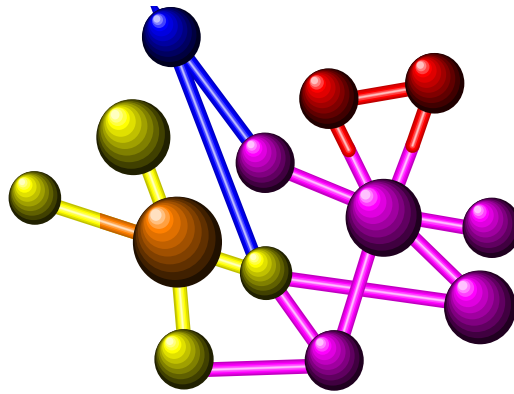
Outcome

www.capabilitycases.org

from hierarchies



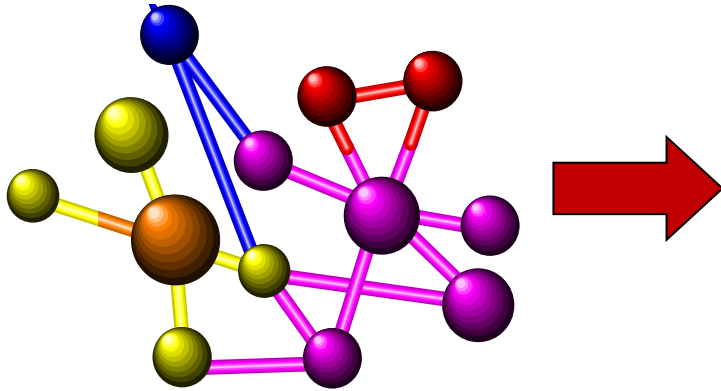
to Graphs



from Graphs

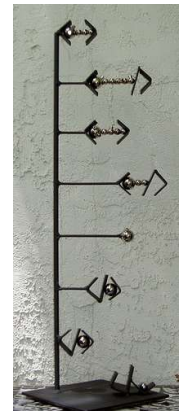


to hierarchies



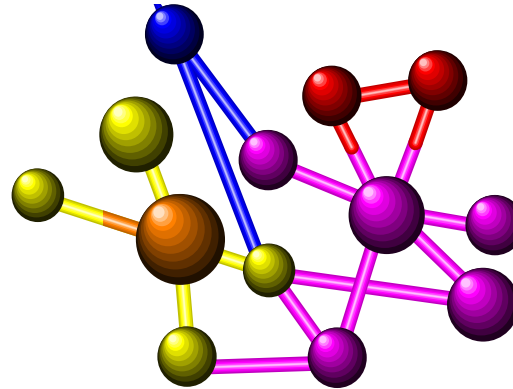
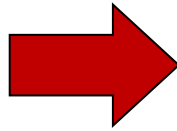
from Graphs

to Documents



to XML

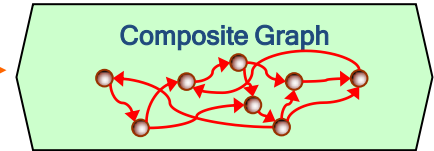
from databases and spreadsheets



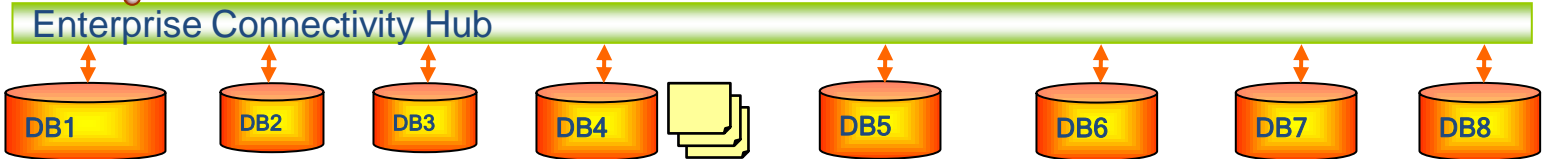
to Graphs



*Query Brokering through an
Ontology-Driven "Switchboard"*



*Different
Data in
Different
Places*



NASA NExIOM, QUDT, TCMX and Information Architecture Ontologies

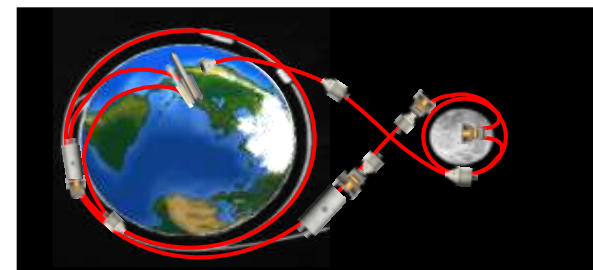
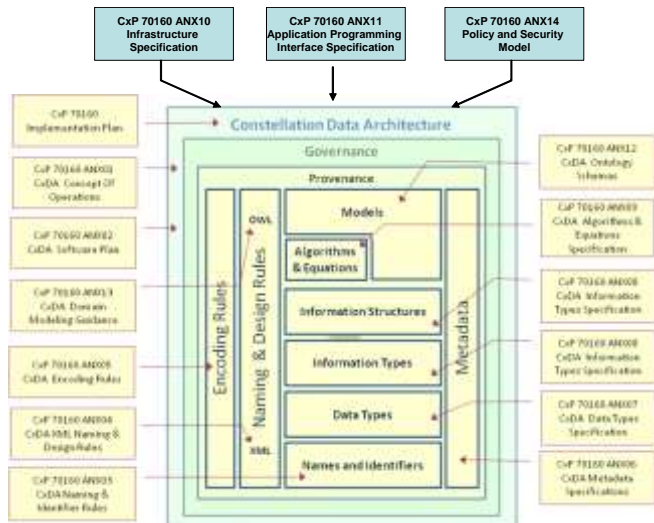




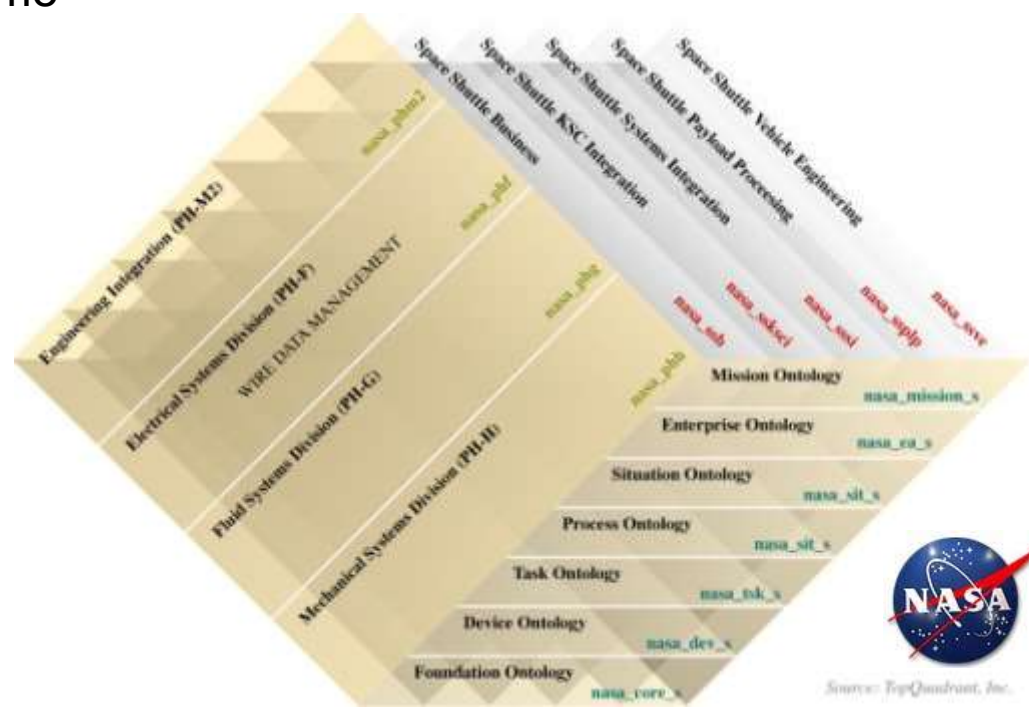
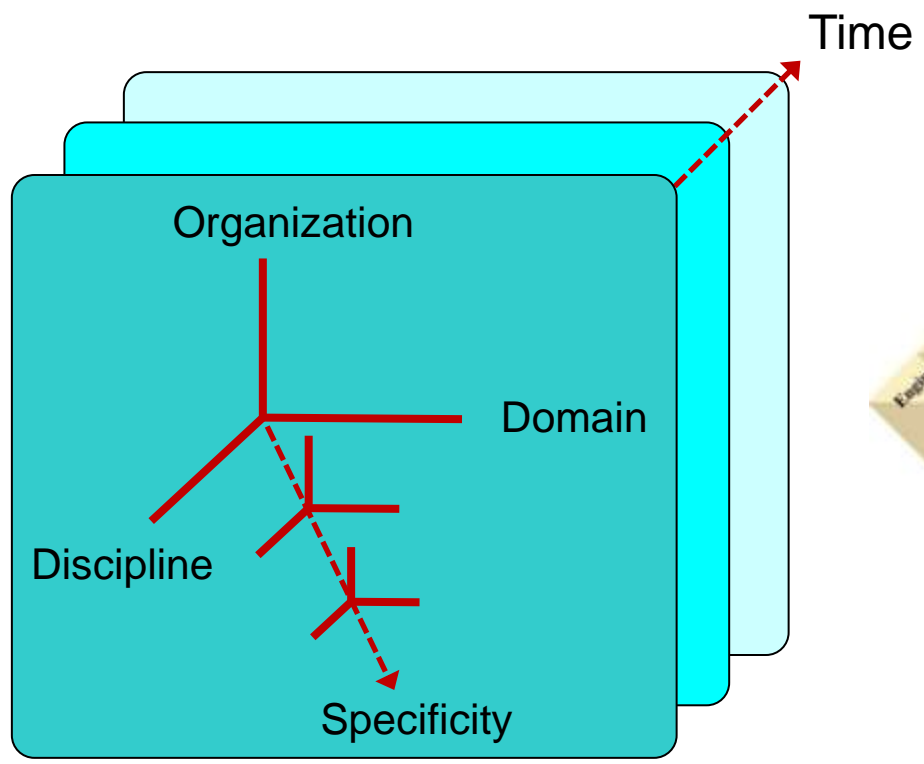
NASA Constellation Program



Constellation Program Data Architecture and Interoperability through the use of OWL Ontologies with strategies for co-existence with XML and other data formats.



Key to Success is an Ontology Architecture – Five Dimensions turned out to be important

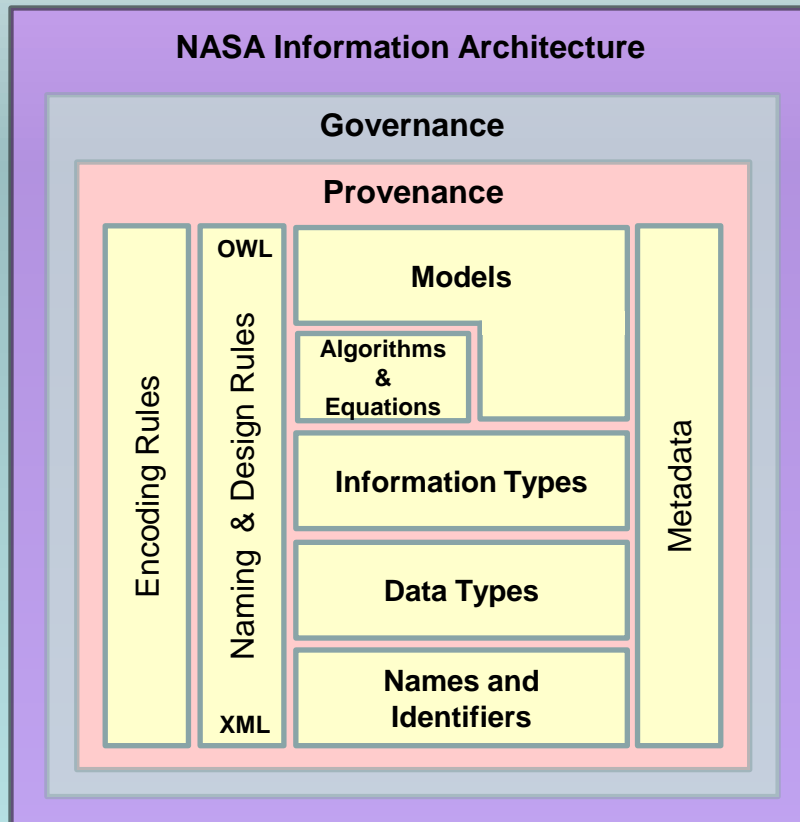


- Ontologies partitioned by domains, disciplines, organizations, specificity and time;
- Named graphs aggregated using configuration ontologies according to need;
- Three other dimensions also important: aspect, viewpoint and perspective.

Information Architecture



Information architecture (IA) defines a model, processes and services for how information is represented, governed and used in systems, applications, databases, documents and activities in order to ensure compliance to naming and identifier rules, standard data and information types, controlled vocabularies and coding schemes.

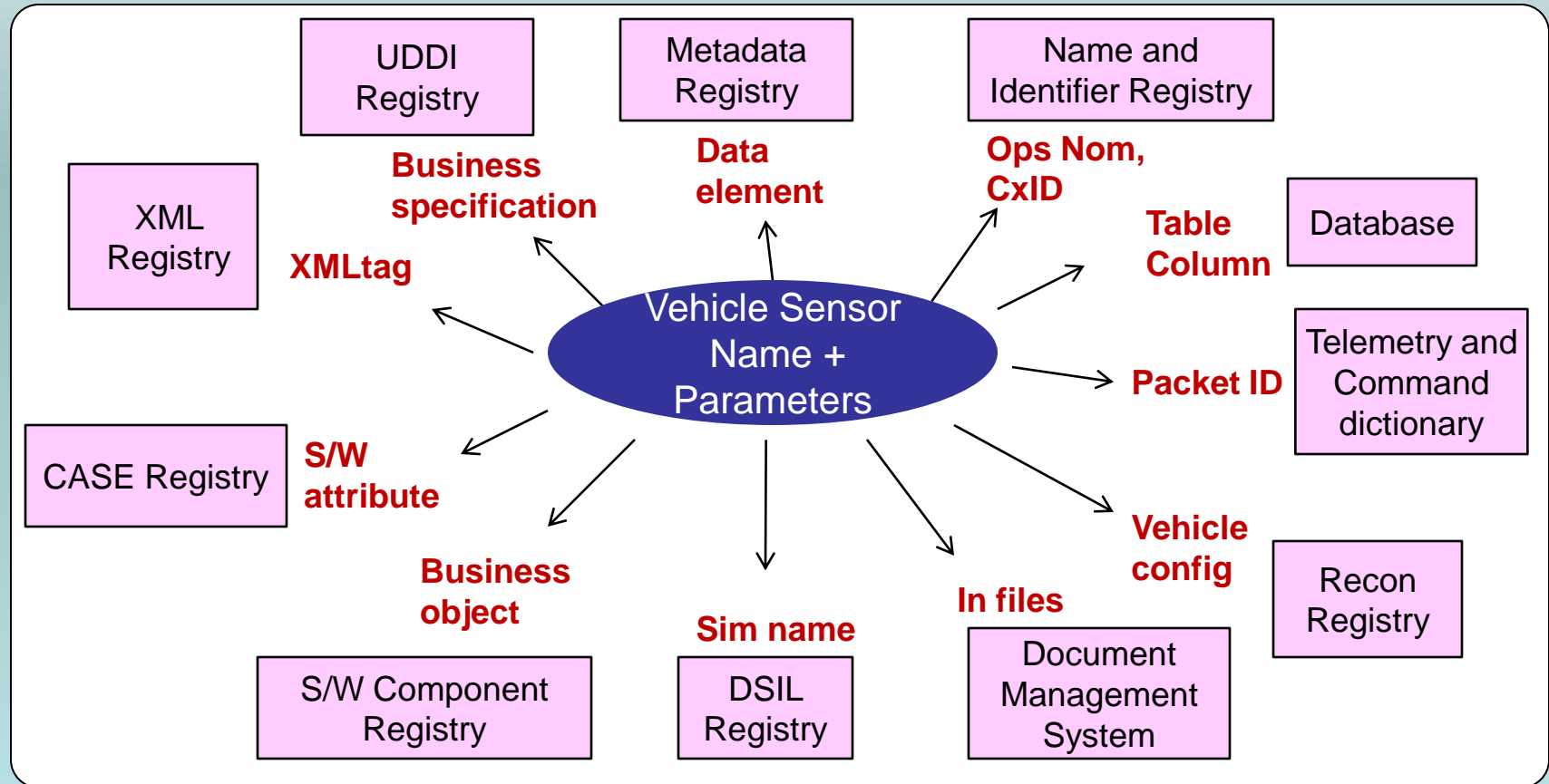


"Among these activities are library systems, Content Management Systems, web development, user interactions, database development, programming, technical writing, enterprise architecture, and critical system software design. Information architecture has somewhat different meanings in these different branches of IS or IT architecture. Most definitions have common qualities: a structural design of shared environments, methods of organizing and labeling websites, intranets, and online communities, and ways of bringing the principles of design and architecture to the digital landscape."

Operational Roles of an Information Architecture



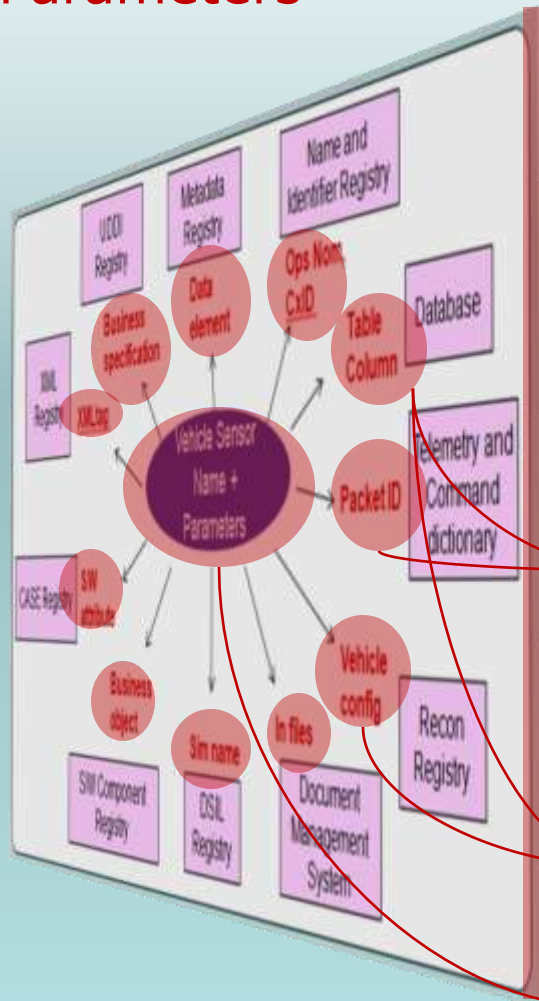
IA serves as a “Rosetta Stone” for finding authoritative information. Instead of reading documents, specifications of models and schemas can be queried by both software and people. For example, a Sensor and its parameters is named and encoded differently across systems and applications.



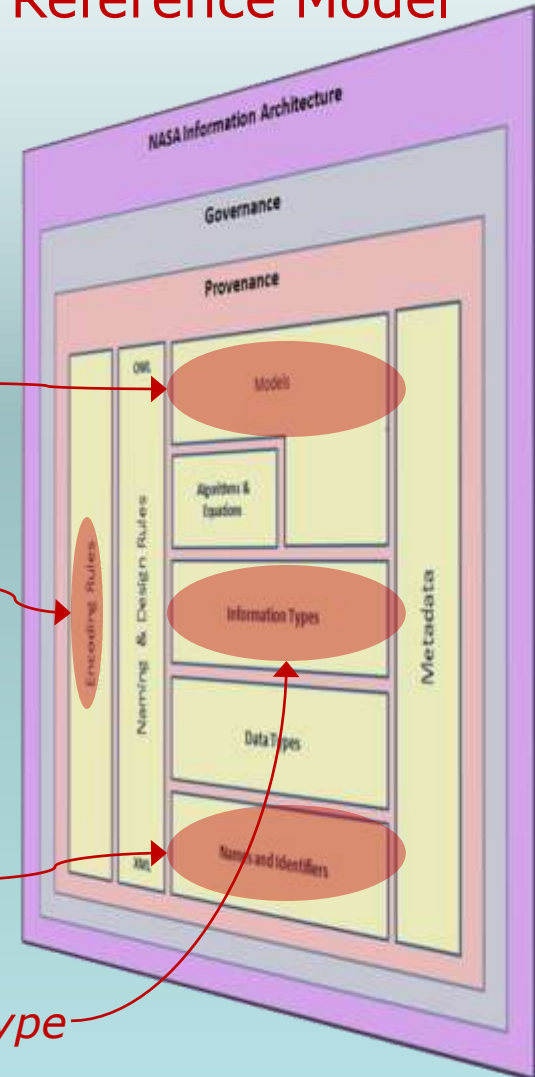
IA resolves the meanings of all Sensor information objects irrespective of their locality.



Sensor and its Parameters



Information Architecture Reference Model



is a Model

conformant with Encoding Rules

compliant with Name and Identifier Rules

is an Information Type

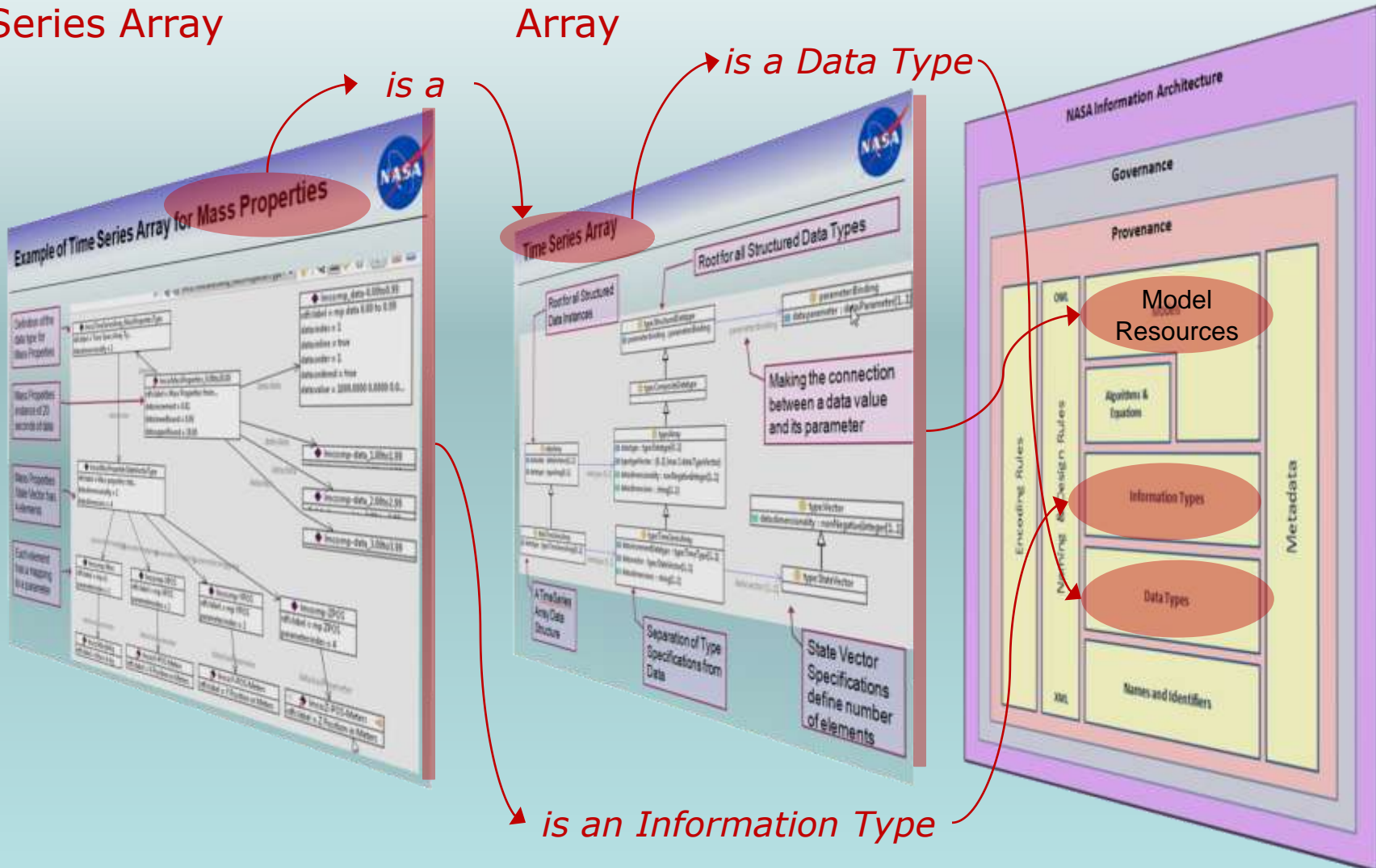
IA and Ontologies, Time Series Array Example: Mass Properties



Mass Properties
Instance of a Time
Series Array

Ontology Model
for Time Series
Array

Information Architecture
Reference Model



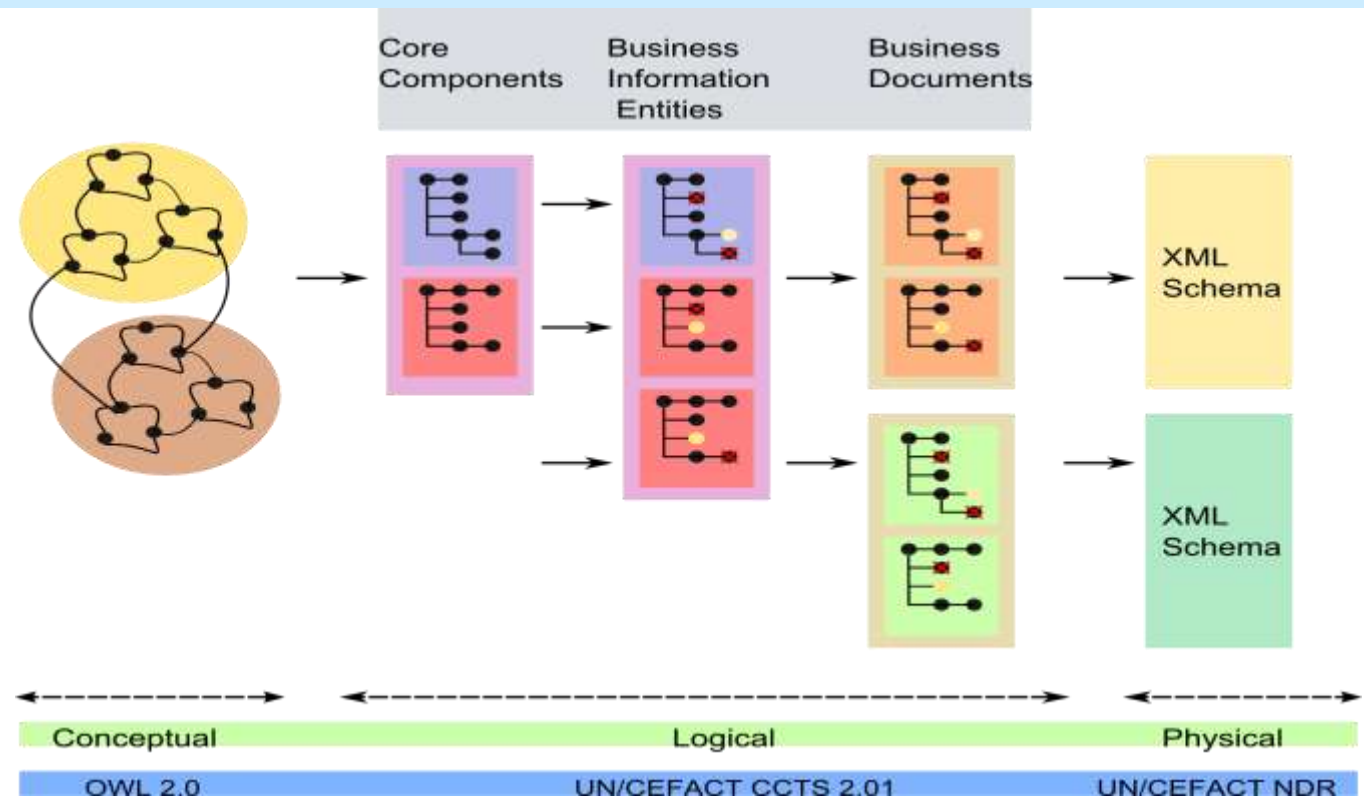
Netherlands MoJ Approach to Message Design for Interoperability

Problem: Seamless information sharing is challenging:

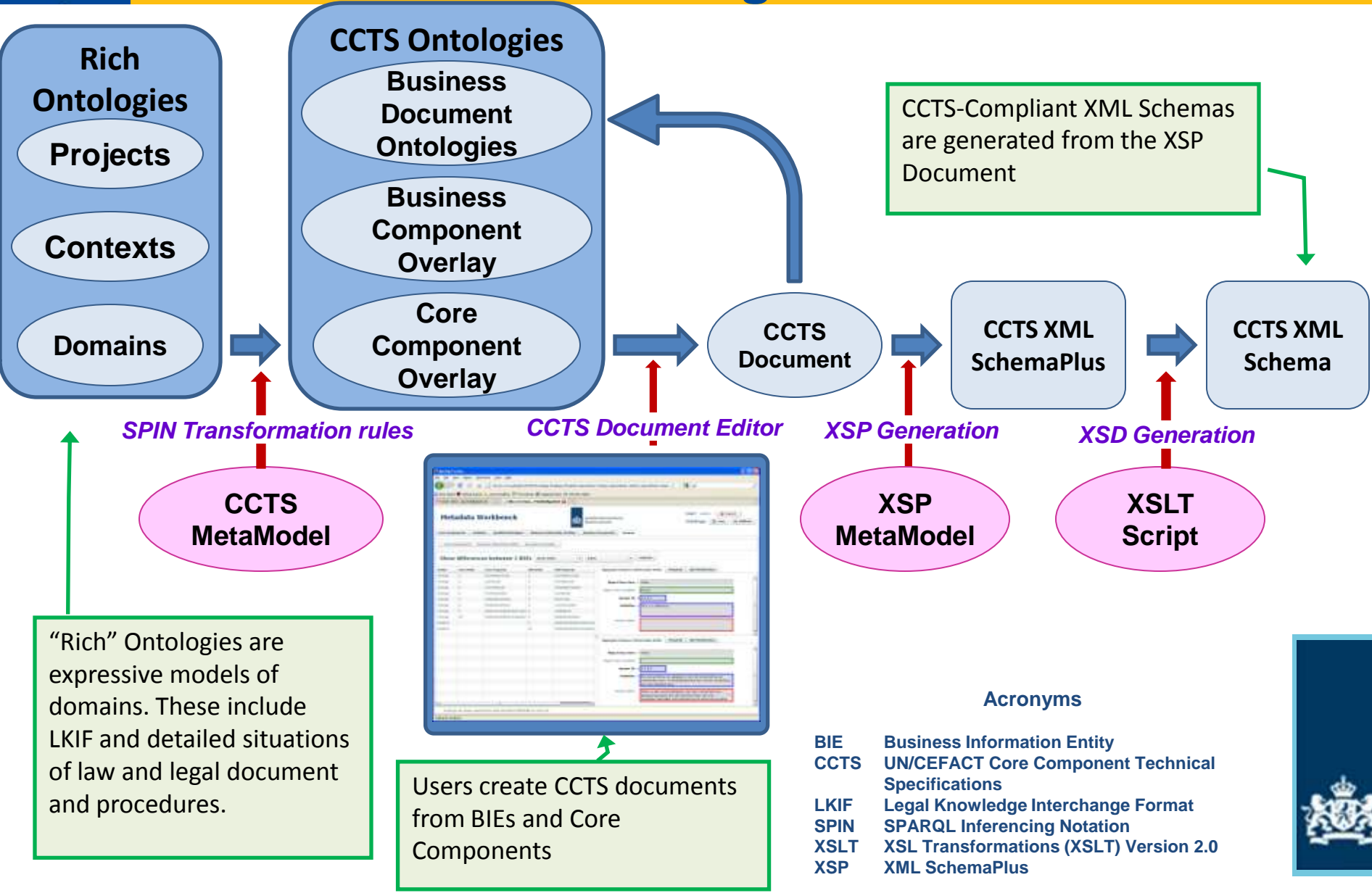
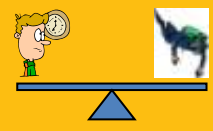
Data resides in many diverse systems supporting unique operation requirements of courts, police, hospitals, border control, motor vehicle, local and federal offices.

Solution: Ontology-Based Metadata Workbench:

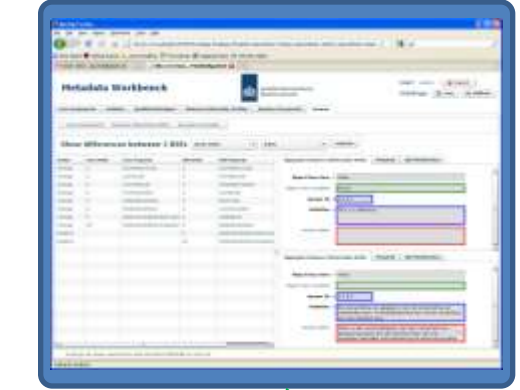
Transform “Rich” Ontologies into CCTS Ontologies and allow Business Analysts to assemble business documents for electronic messages from Component Parts.



Netherlands MoJ – Creation of XML Message Schemas



“Rich” Ontologies are expressive models of domains. These include LKIF and detailed situations of law and legal document and procedures.



Users create CCTS documents from BIEs and Core Components

CCTS-Compliant XML Schemas are generated from the XSP Document

Acronyms

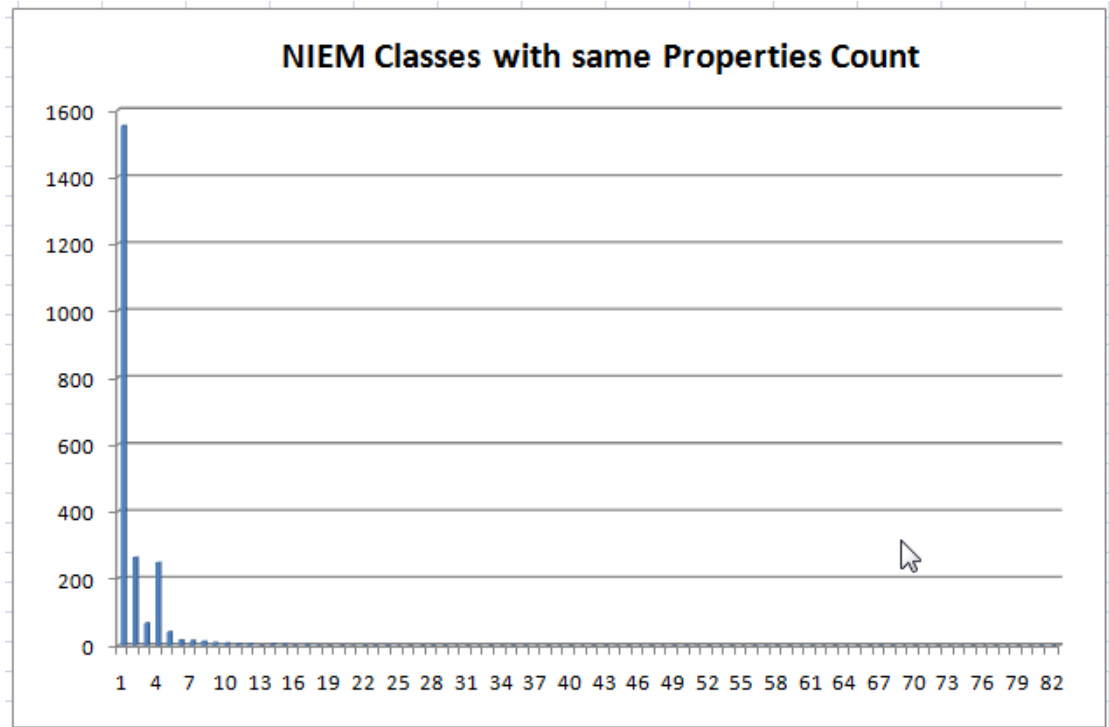
- BIE Business Information Entity
- CCTS UN/CEFACT Core Component Technical Specifications
- LKIF Legal Knowledge Interchange Format
- SPIN SPARQL Inferencing Notation
- XSLT XSL Transformations (XSLT) Version 2.0
- XSP XML SchemaPlus



NIEM JXDM to OWL Transformation

Metrics on the NIEM OWL Model

Class	Properties
Person	81
Document	66
Vehicle	32
Metadata	27
Organization	26
Item	23
nist:Transaction	22
Location	21
Biometric	19
Locale	17
ItemTitle	16
TangibleItem	16
Obligation	15
TelecommunicationDevice	14
PersonEmploymentAssociation	14
nist:NISTImage	14
DriverLicenseWithdrawal	13
Program	13
ItemRegistration	13
nist:ImageCapture	13
Binary	12
PersonEncounter	11
Insurance	11
Injury	11



```

SELECT ?class ?restrictionCount
WHERE {
  ?class a owl:Class .
  LET ( ?restrictionCount := smf:countResults( "SELECT
DISTINCT ?property WHERE { ?class rdfs:subClassOf
?restriction . ?restriction a owl:Restriction . ?restriction
owl:onProperty ?property }" ))
}

```

NIEM Person (Proto) OWL Model

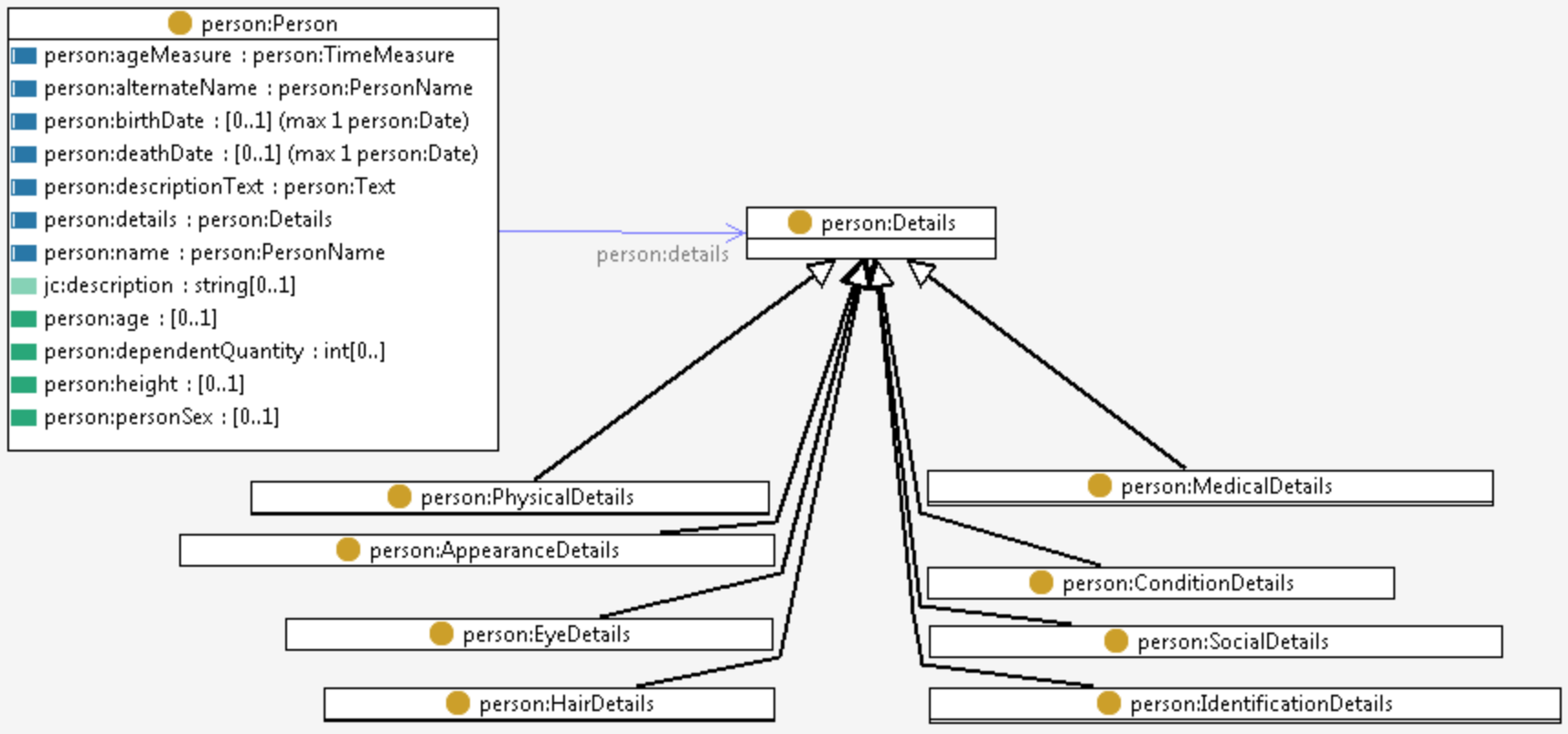
- Person
- hasPersonAccentText : Text
- hasPersonAgeDescriptionText : Text
- hasPersonAgeMeasure : TimeMeasure
- hasPersonAlternateName : PersonName
- hasPersonBirthDate : Date
- hasPersonBirthLocation : Location
- hasPersonBloodType : PersonBloodType
- hasPersonBodyXRaysAvailable : PersonBodyXRaysAvailable
- hasPersonBuildText : Text
- hasPersonCapability : Capability
- hasPersonCircumcisionIndicator : xsd1:Boolean
- hasPersonCitizenship : PersonCitizenship
- hasPersonClothing : Clothing
- hasPersonComplexionText : Text
- hasPersonDNA : DNA
- hasPersonDeathDate : Date
- hasPersonDependentQuantity : Quantity
- hasPersonDescriptionText : Text
- hasPersonDigitalImage : Image
- hasPersonDigitizedSignatureImage : Image
- hasPersonDisguiseDescriptionText : Text
- hasPersonDonorOrgan : PersonDonorOrgan
- hasPersonEducationLevelText : Text
- hasPersonEthnicity : PersonEthnicity
- hasPersonEyeColor : PersonEyeColor
- hasPersonEyewearDescriptionText : Text
- hasPersonFacialHairText : Text
- hasPersonFingerprintSet : FingerprintSet
- hasPersonGeneralAppearanceDescriptionText : Text

- hasPersonHairAppearanceText : Text
- hasPersonHairCategoryText : Text
- hasPersonHairColor : PersonHairColor
- hasPersonHairLengthText : Text
- hasPersonHairStyleText : Text
- hasPersonHandednessText : Text
- hasPersonHeightDescriptionText : Text
- hasPersonHeightMeasure : LengthMeasure
- hasPersonHumanResourceIdentification : Identification
- hasPersonInjury : Injury
- hasPersonIntoxication : Intoxication
- hasPersonJewelryDescriptionText : Text
- hasPersonLanguageEnglishIndicator : xsd1:Boolean
- hasPersonLearningDisabilityText : Text
- hasPersonLicenseIdentification : Identification
- hasPersonLivingIndicator : xsd1:Boolean
- hasPersonMaritalStatusText : Text
- hasPersonMedicalCondition : MedicalCondition
- hasPersonMedicalDescriptionText : Text
- hasPersonMedicalFileIndicator : xsd1:Boolean
- hasPersonMedicationRequiredText : Text
- hasPersonMentalStateText : Text
- hasPersonMilitarySummary : MilitarySummary
- hasPersonMoodDescriptionText : Text
- hasPersonName : PersonName
- hasPersonNationalIdentification : Identification
- hasPersonNationality : PersonNationality
- hasPersonNationalityText : Text
- hasPersonOrganDonatorIndicator : xsd1:Boolean
- hasPersonOtherIdentification : Identification

- hasPersonPassportIdentification : Identification
- hasPersonPhysicalDisabilityText : Text
- hasPersonPhysicalFeature : PhysicalFeature
- hasPersonPrimaryLanguage : PersonLanguage
- hasPersonRace : PersonRace
- hasPersonReligionText : Text
- hasPersonResident : PersonResident
- hasPersonSSNIdentification : Identification
- hasPersonSecondaryLanguage : PersonLanguage
- hasPersonSecurityClearance : PersonSecurityClearance
- hasPersonSex : PersonSex
- hasPersonSexualOrientationText : Text
- hasPersonSkinTone : PersonSkinTone
- hasPersonSpeechDescriptionText : Text
- hasPersonStateIdentification : Identification
- hasPersonTaxIdentification : Identification
- hasPersonTooth : Tooth
- hasPersonUSCitizenIndicator : xsd1:Boolean
- hasPersonVisionPrescriptionText : Text
- hasPersonWeightDescriptionText : Text
- hasPersonWeightMeasure : WeightMeasure
- hasPersonXRayImage : Image

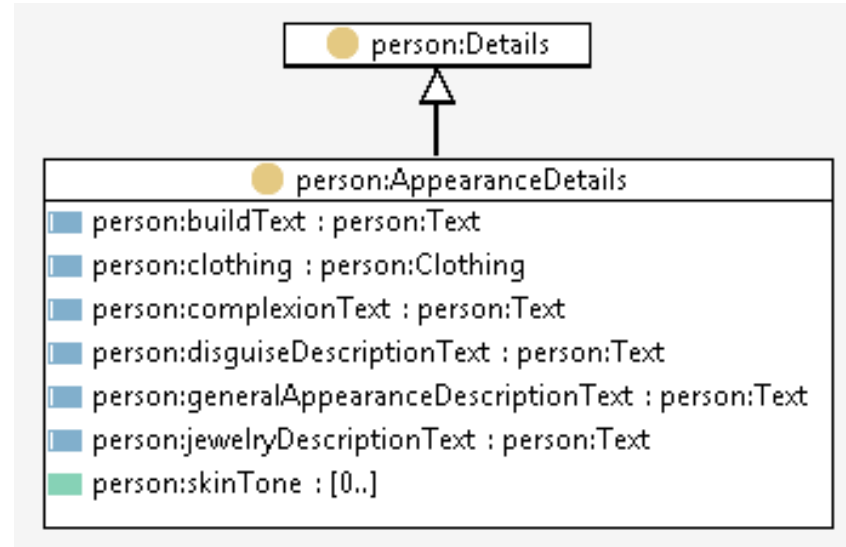
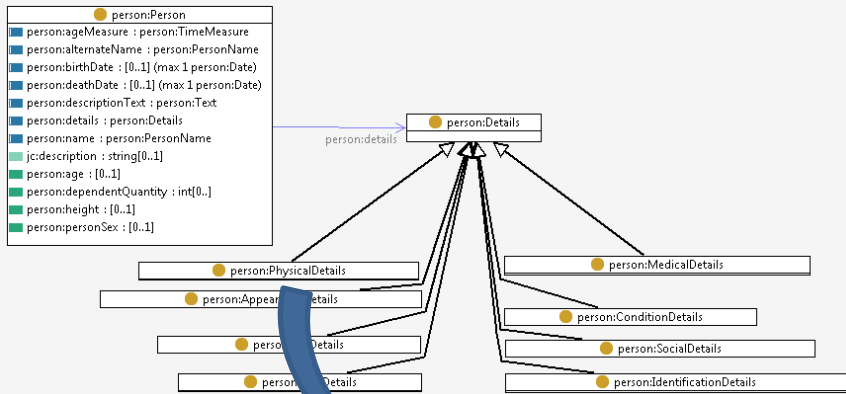
To address the reusability required in the MoJ work, the NIEM Person was re-factored into individual ‘Details’ classes.

Refactoring of NIEM Person into an OWL Model with reusable Concepts (person:Details)



Depending on the context of use, concepts describing different details about a person can be selected for the UBL Business Documents and Messages.

Refactoring of the NIEM Person into an OWL Model with reusable Concepts (person:AppearanceDetails)



A Person's 'Appearance Details' will be needed for criminal investigations.

NIEM JXDM Complex Type Example

```

<xsd:complexType name="CrashType">
  <xsd:annotation>
    <xsd:documentation>A data type for a traffic accident.</xsd:documentation>
    <xsd:appinfo>
      <i:Base i:name="DrivingIncidentType"/>
    </xsd:appinfo>
  </xsd:annotation>
  <xsd:complexContent>
    <xsd:extension base="j:DrivingIncidentType">
      <xsd:sequence>
        <xsd:element ref="j:CrashServiceCall" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashFirstHarmfulEventCode" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashFirstHarmfulEventLocationCode" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashMannerCode" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashInformationSource" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashWeatherConditionCode" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashLightConditionCode" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashRoadSurfaceConditionCode" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashEnvironmentContributingCircumstancesCode" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashRoadContributingCircumstancesCode" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashJunctionRelationCode" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashSchoolBusRelatedCode" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashWorkZone" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashVehicle" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashNonMotorist" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashPerson" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element ref="j:CrashLocation" minOccurs="0" maxOccurs="unbounded"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

```

```

<xsd:element name="Crash" type="j:CrashType" nillable="true">
  <xsd:annotation>
    <xsd:documentation>A traffic accident.</xsd:documentation>
  </xsd:annotation>
</xsd:element>

```

DrivingIncident	
hasDrivingAccidentSeverity	: DrivingAccidentSeverity
hasDrivingIncidentCMV	: DrivingIncidentCMV
hasDrivingIncidentCollisionIndicator	: xsd1:Boolean
hasDrivingIncidentDriverOwnershipIndicator	: xsd1:Boolean
hasDrivingIncidentFemalePassengerQuantityText	: core:Text
hasDrivingIncidentHazMat	: DrivingIncidentHazMat
hasDrivingIncidentJurisdiction	: core:Jurisdiction
hasDrivingIncidentLaserDetectionIndicator	: xsd1:Boolean
hasDrivingIncidentLegalSpeedRate	: core:Measure
hasDrivingIncidentLocatorReferenceIdentification	: core:Identification
hasDrivingIncidentMalePassengerQuantityText	: core:Text
hasDrivingIncidentMobilePhoneIndicator	: xsd1:Boolean
hasDrivingIncidentPassenger	: core:Person
hasDrivingIncidentPassengerDescriptionText	: core:Text
hasDrivingIncidentPassengerQuantityText	: core:Text
hasDrivingIncidentRadarDetectionIndicator	: xsd1:Boolean
hasDrivingIncidentRecordedSpeedRate	: core:Measure
hasDrivingIncidentRoadCategoryText	: core:Text
hasDrivingIncidentRoadDescriptionText	: core:Text
hasDrivingIncidentTrafficDescriptionText	: core:Text
hasDrivingIncidentWeatherDescriptionText	: core:Text

Crash	
hasCrashEnvironmentContributingCircumstancesCode	: mmucc:CrashEnvironmentContributingCircumstancesCode
hasCrashFirstHarmfulEventCode	: mmucc:CrashFirstHarmfulEventCode
hasCrashFirstHarmfulEventLocationCode	: mmucc:CrashFirstHarmfulEventLocationCode
hasCrashInformationSource	: CrashInformationSource
hasCrashJunctionRelationCode	: mmucc:CrashJunctionRelationCode
hasCrashLightConditionCode	: mmucc:CrashLightConditionCode
hasCrashLocation	: core:Location
hasCrashMannerCode	: mmucc:CrashMannerCode
hasCrashNonMotorist	: CrashNonMotorist
hasCrashPerson	: CrashPerson
hasCrashRoadContributingCircumstancesCode	: mmucc:CrashRoadContributingCircumstancesCode
hasCrashRoadSurfaceConditionCode	: mmucc:CrashRoadSurfaceConditionCode
hasCrashSchoolBusRelatedCode	: mmucc:CrashSchoolBusRelatedCode
hasCrashServiceCall	: ServiceCall
hasCrashVehicle	: CrashVehicle
hasCrashWeatherConditionCode	: mmucc:CrashWeatherConditionCode
hasCrashWorkZone	: CrashWorkZone

S rdfs:comment = A data type for a tr...

S rdfs:comment = A traffic accident.



August 1, 2009 – “Data Independence Day”



Ontologies for e-Government

What is oeGOV?

oeGOV is making and publishing W3C [OWL](#) ontologies for eGovernment. This initiative is born out of the idea: ["Use small OWL ontologies to model recovery and deploy across all government"](#) posted at [TheNationalDialogue.org](#) and Tim Berners-Lee's vision of ["Linked Open Data"](#).

The blog for oeGOV is www.oegov.us/blog

Why build ontologies for eGovernment?

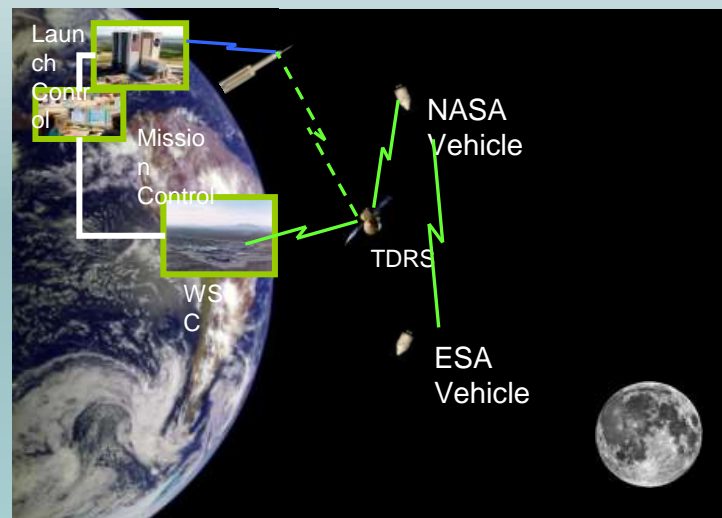
By having ontologies for eGovernment we enable:

1. distributed creation and maintenance of information on data, about where it is used, and the government data itself;
2. standardization of neutral models for data exchange and transformation;
3. aggregation of data through the use of RDF/OWL formats;
4. interpretation of data through precise semantics and controlled vocabularies, including geospatial and temporal aspects;
5. navigation over who is publishing what in what format;
6. provenance and trust in the sources of data;
7. correlations and comparisons of data;
8. accountability of the political process with policy making;
9. transparency of government efficiencies and effectiveness;
10. citizen awareness and appreciation of government initiatives.

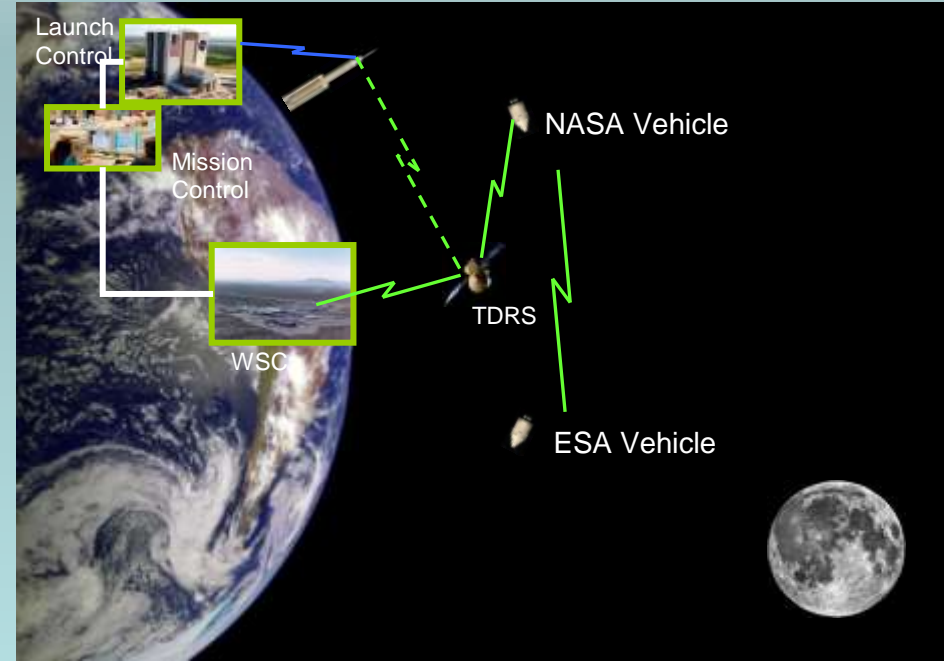
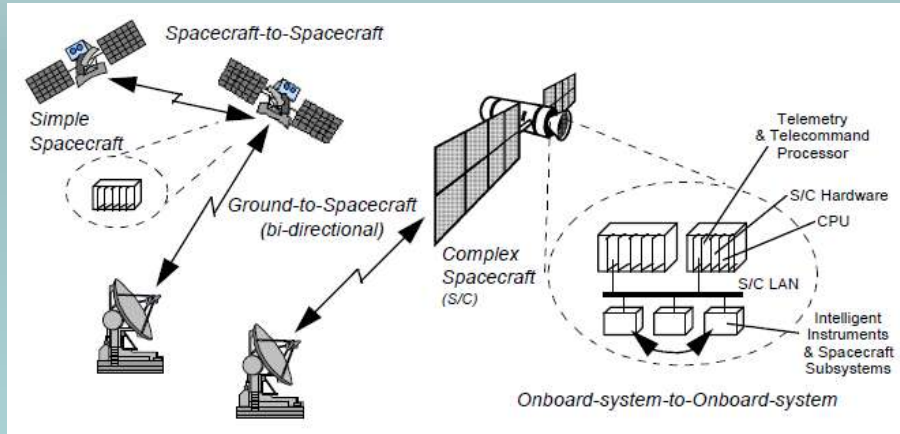
www.oegov.org

2010

NASA Work on Telemetry, Messaging and Commanding (TMC) of Space Vehicles and Systems for Space Interoperability



TMC - Paradigms



TMC - a Choice of Paradigms



Fixed

Re-configurable

Dynamic

Programmable

Autonomous

T&C is static with all measurements, messages and commands pre-configured at design time

T&C can be changed for each mission and/or flight before launch

T&C can be changed during each flight by uploading commands and telemetry packet definitions

T&C systems are smart and can be instructed to do event monitoring, tasks, journaling and other jobs on-demand.

Space systems are capable of making their own decisions using agent-based technologies

Manned

Unmanned

← APOLLO →

← MARS Rovers →

← SHUTTLE →

← MSL →

← ISS →

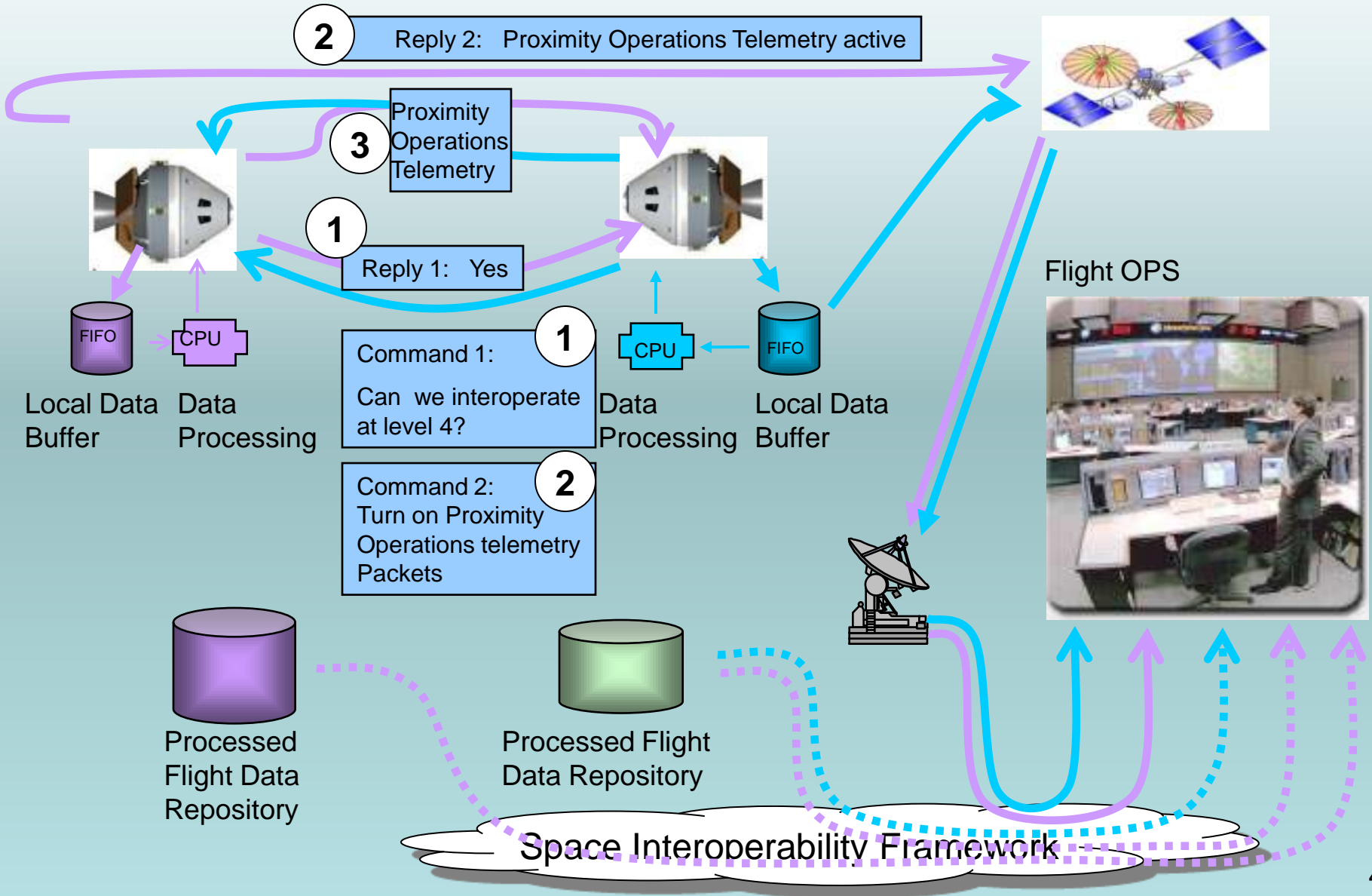
← MEX, VEX, Rosetta →

← ARES, ORION →

← Proba-2, Aeolus →

← *Future Space Systems* →

Space Interoperability Scenario 1: Proximity Operations Between 2 Space Vehicles

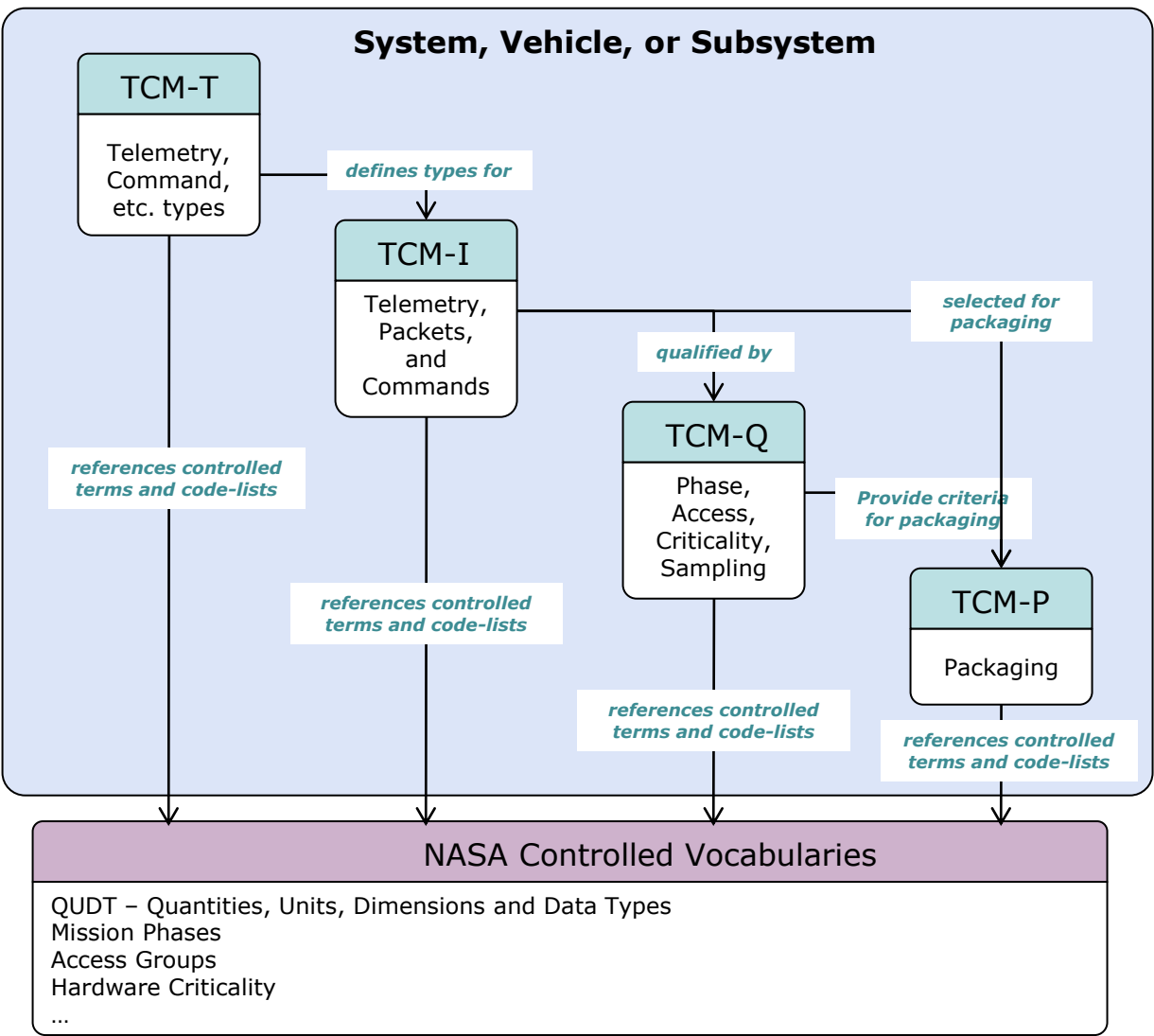


NASA TCMX: Ontology-Based Telemetry, Commands and Messaging



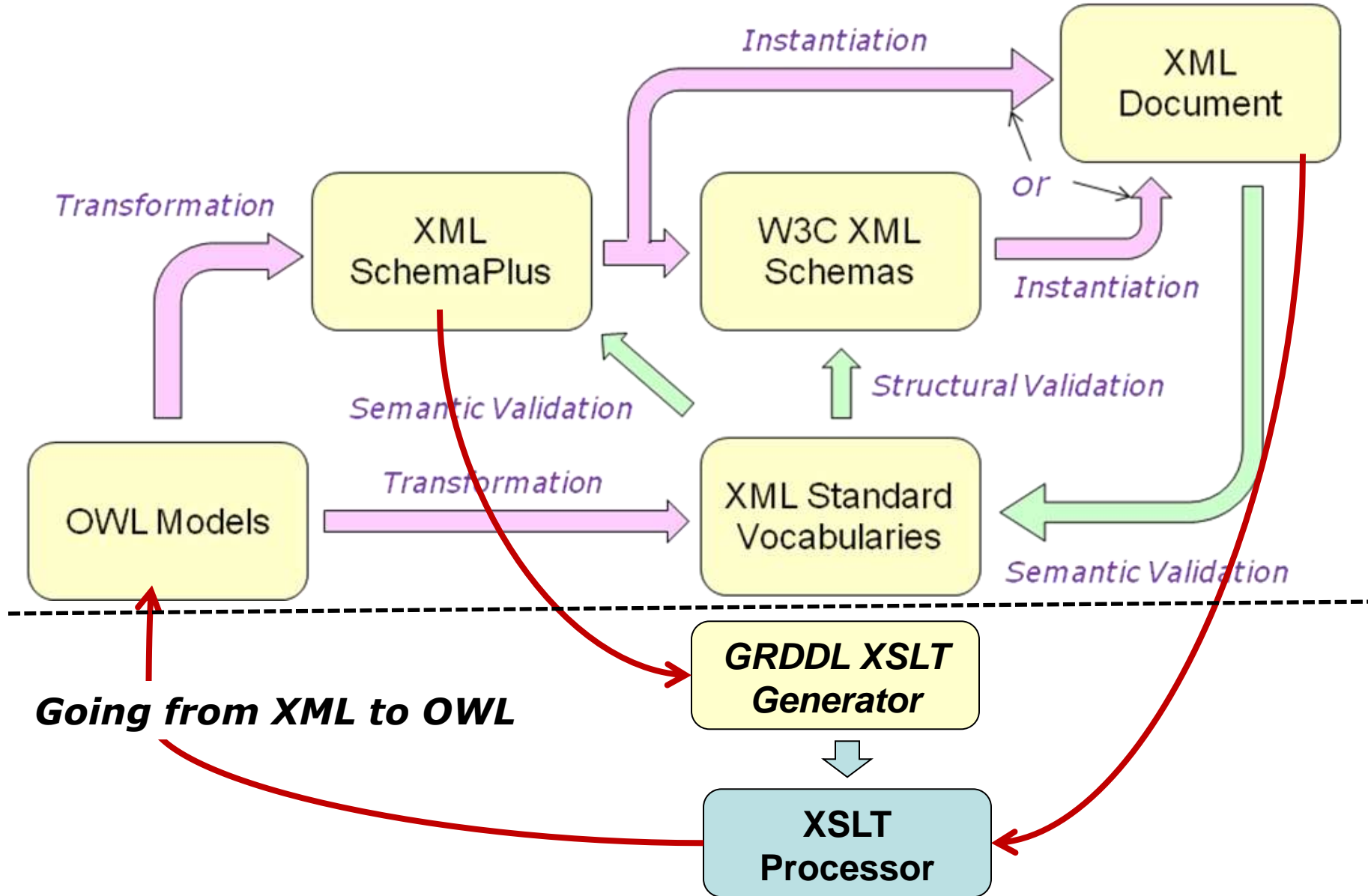
Types ➤ Instances ➤ Qualification ➤ Packaging

Workflow



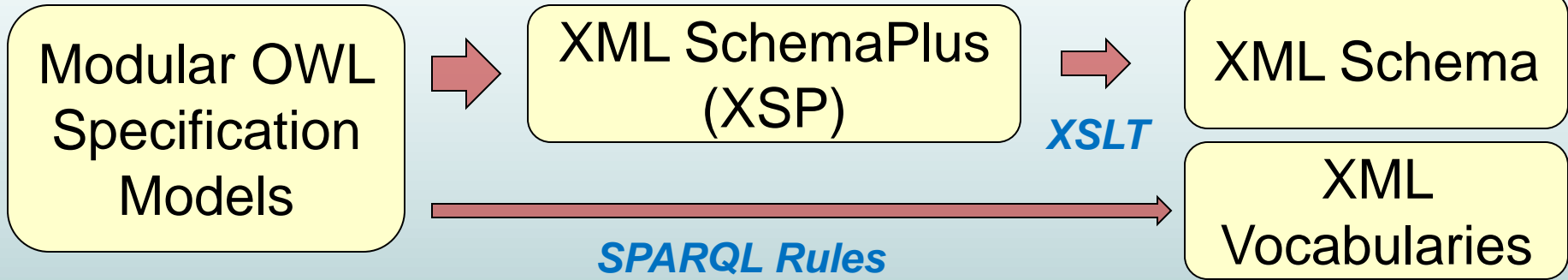
Ontology and Schema Components

Generating XML Schemas and Controlled Vocabularies





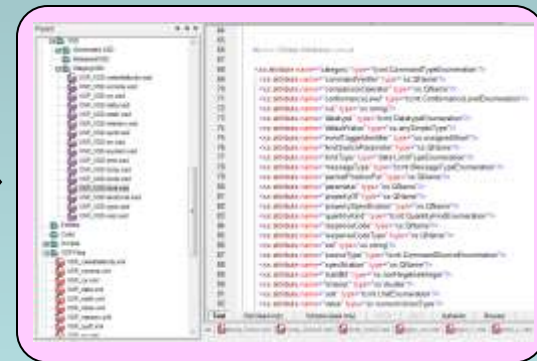
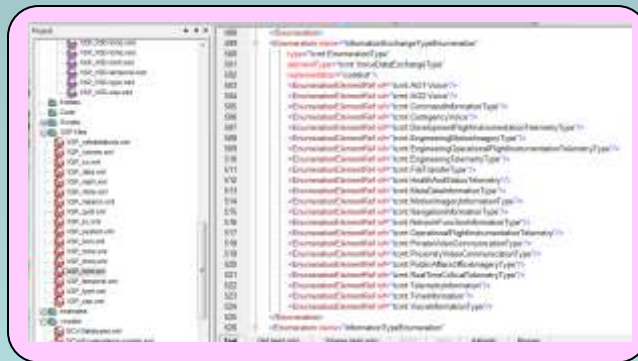
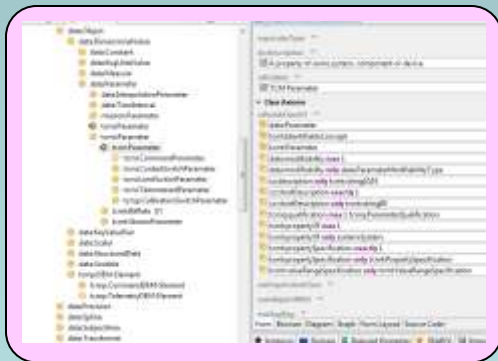
TCMX – Generating XML Schemas and Vocabularies from OWL Models for Space Systems Interoperability



Modular TCMx, QUDT and System Ontologies are transformed through annotations to an intermediate language XSP for controlling the XML Schema Generation

XMLSchemaPlus (XSP) is an XML Dialect for specifying how an XML Schema should look. An XSLT script ensures compliance with XML Naming and Design Rules

XML Schemas use controlled vocabularies to ensure semantic consistency of referenced concepts such as units of measure, quantities and codelists.



TopBraid Composer

Altova XMLSpy

TCMX Ontology Architecture builds of System SBFI and QUDT Ontologies

Telemetry Parameter and Command Qualifications

Telemetry Parameter and Command Types

System Ontology - Functional Aspect (af)

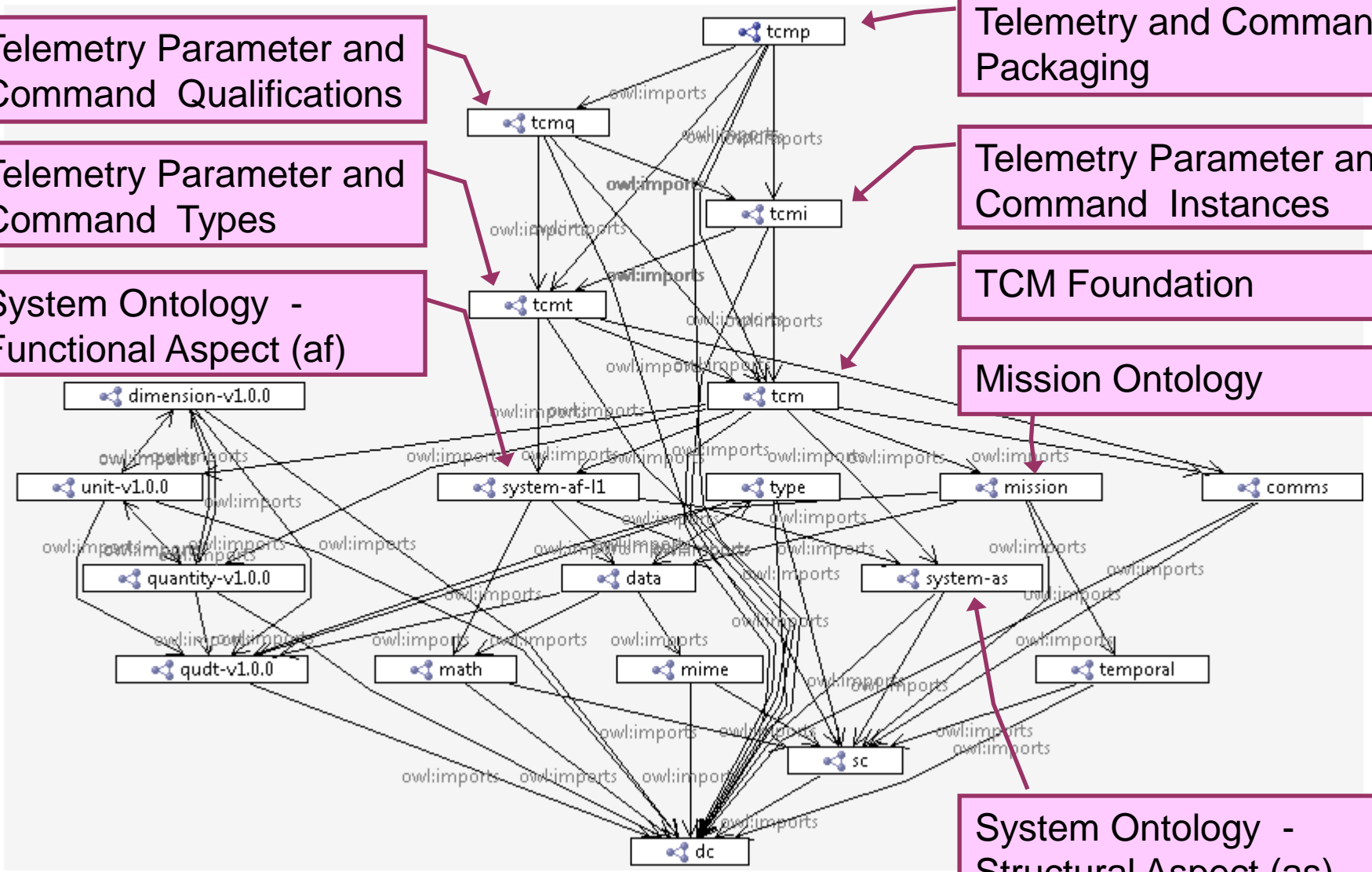
Telemetry and Command Packaging

Telemetry Parameter and Command Instances

TCM Foundation

Mission Ontology

System Ontology - Structural Aspect (as)

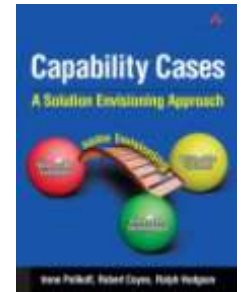
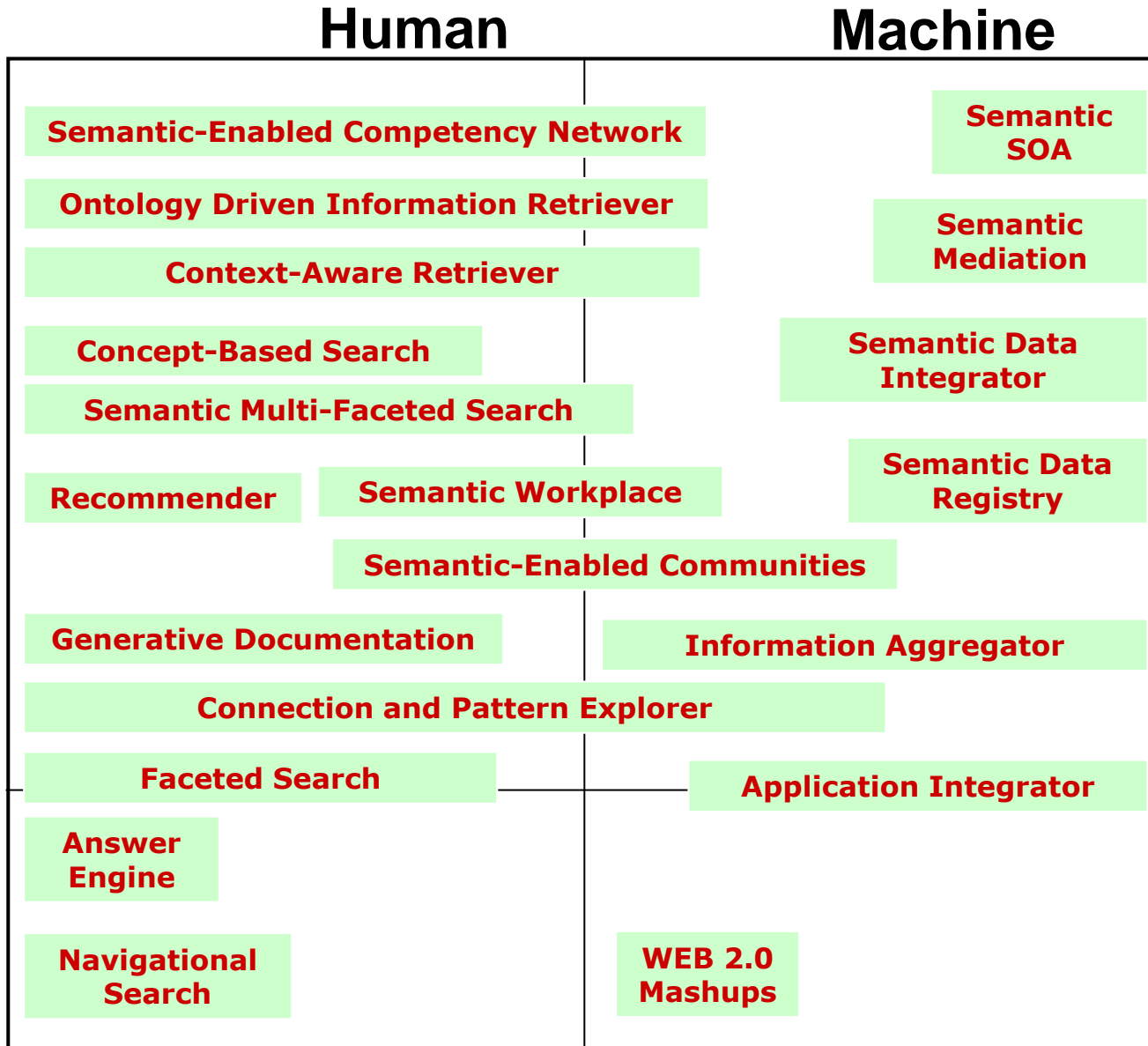


2011 – Helping People Make Sense of Semantic Web Technologies

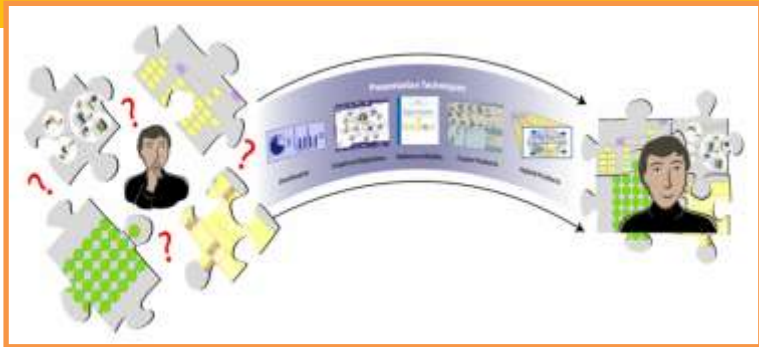
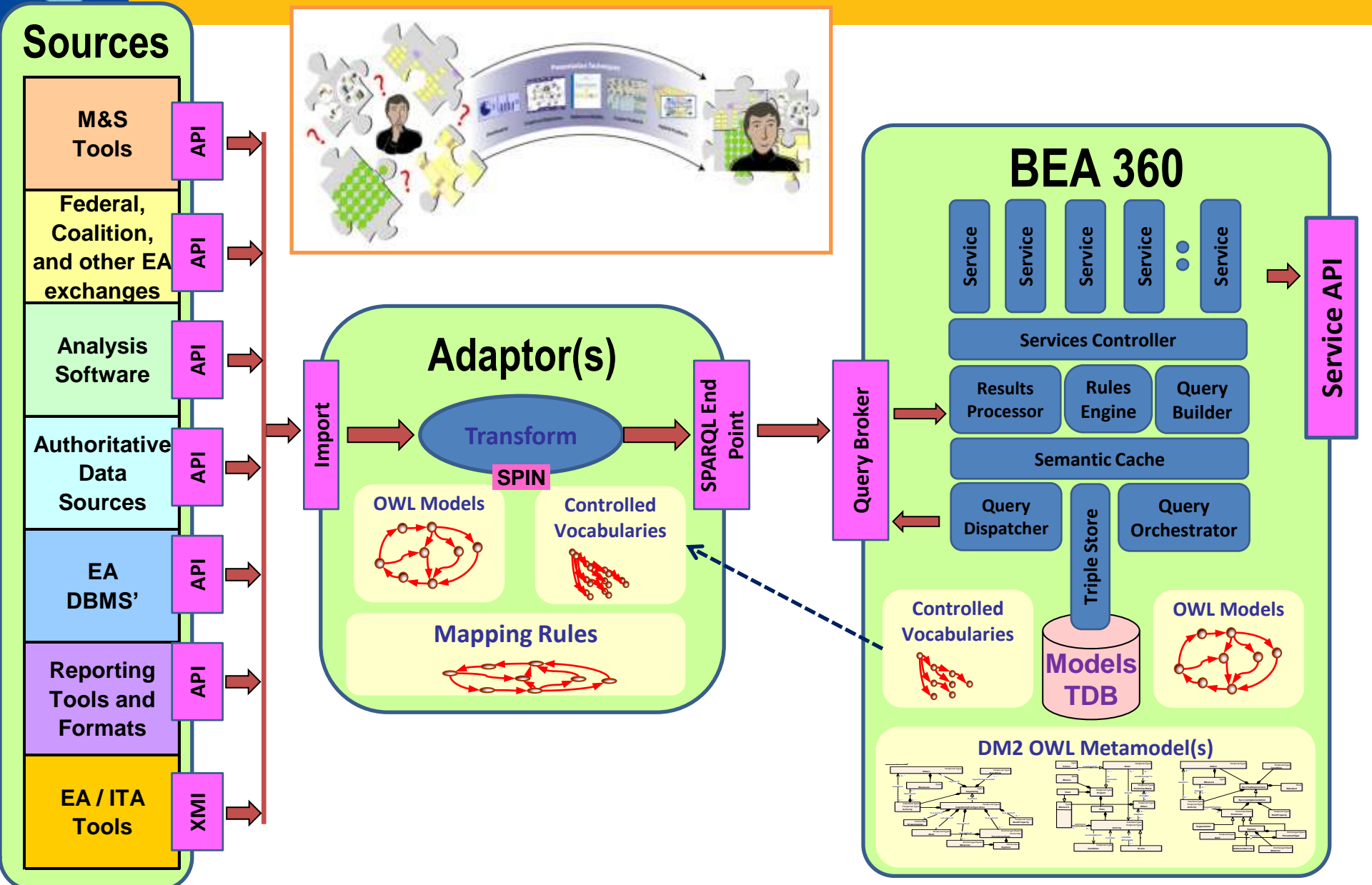
Expressivity

Formal

Informal



DoD BEA 360 - Solution Concept





DoD BMA BEA Explorer – a TopBraid Ensemble Demonstrator

Operational Activities Explorer

http://localhost:8083/tbl/app/BEA/user-applications/BEA%201.n3/-/BEA/OWL/OAG_bea-all.ttl#

FEARMO ontologies

Operational Activities Explorer

Navigate | Visual Query | Search

Operational Activities

- ▼ Manage The Department Of Defense Business Mission (8)
 - ▶ Execute DoD Acquisition (3)
 - ▶ Execute The DoD Decision Support System (3)
 - ▼ Manage Property And Materiel (6)
 - ▶ **Conduct Logistics Business Planning (4)**
 - ▶ Deliver Property And Forces (6)
 - ▶ Dispose Or Return Property And Materiel (4)
 - ▶ Perform Asset Accountability (3)
 - Perform Build And Make And Maintenance And Sustainment
 - Perform Installations Support
 - ▼ Monitor Performance Of The Department Of Defense Business Mission (3)
 - ▼ Perform Executive Cost Performance Management (3)
 - Define Cost Performance Model
 - Perform Cost Performance Analysis
 - Populate Cost Performance Model
 - Perform Executive Management
 - ▶ Perform Environment Safety And Occupational Health Service (4)
 - ▶ Perform Financial Management (4)
 - ▶ Perform Human Resources Management (9)
 - ▶ Provide Information Management Services (2)

Description

The development and issuing of courses of action over specified time periods that represent a projected appropriation and allocation of logistics resources and capacity to meet projected requirements in carrying out the movement and maintenance of forces. This activity balances strategic objectives and available resources against anticipated demand and historical performance. The output is functional logistics business plans that guide execution of supply chain activities.

Data Inp... Loaded 8 results

dataObject	fromOpNode
Deliver Plan	MSSM
Contract Modif	MSSM
Awarded Cont	MSSM
Acknowledged	MSSM
Approved Sour	MSSM
Return Plan	MSSM
Supply Plan	MSSM
Contract Or Or	MSSM

From Activi... Loaded 10 results

activity
Conduct Logistics Business Planning
Process Supplier Information
Process Other Government Agency Information
Process GSA Information
Establish Sourcing Vehicle
Manage Acquisition Business Functional Areas
Manage Request And Sourcing Strategy
Conduct Sourcing

Data Outp... Loaded 3 results

dataObject	toOpNode
Return Plan	MSSM
Supply Plan	MSSM
Deliver Plan	MSSM

To Activit... Loaded 6 results

activity
Dispose Or Return Property And Materiel
Conduct Logistics Business Planning
Authorize Return Or Disposal
Identify And Reserve Supply Chain Resources

Activity Details

© Copyright 2011 TopQuadrant Inc.

Slide 53

2011

LinkedModels.org
EPIM Project
NASA Work



2011 - LinkedModels.org



OWL Ontologies and SKOS Vocabularies for Linked Models of Industry and Government Standards

What is "Linked Models"

Linked Models will be a site for publishing RDF/OWL models of commonly used industry and government standards. The work is motivated by the desire to use Semantic Web Technologies for interoperability, information aggregation and validation of specifications that have been created using UML tools and/or XML Schema tools.

As you can see from the image at the top of the page on the right, the site is not quite ready, some Web 3.0 driven Web 2.0 work has to be completed. In the meantime, the following links will take you to some examples of the content that will be organized at the site:

1. [VAEM - Vocabulary for Attaching Essential Metadata](#)
2. [VOAG - Vocabulary of Attribution and Governance](#)
3. [DTYPE - Datatype Ontology](#)
4. [QUDT - Quantities, Units, Dimensions and Types Ontologies and Vocabularies \[Catalog Example\]](#)

The next ontologies and vocabularies to be released include:

1. Industry Codes:
2. [oeGOV - Ontologies and Vocabularies of democracy and the US Government](#)
3. [U.S. Constitution Ontology \[Turtle File\]](#)
4. [FEA Ontologies](#)
5. NIEM Ontologies and Vocabularies
6. DoDAF Ontologies
7. FpML Bank Ontologies

2011 - QUDT

Catalog QUDT

Like Send 3 people like this.

Quantities, Units, Dimensions and Types Catalog

The QUDT, or 'Quantity, Unit, Dimension and Type' collection of ontologies define base classes, properties, and instances for modeling physical quantities, units of measure, and their dimensions in various measurement systems. The goal of the QUDT collection of models is to provide a machine-processable approach for specifying measurable quantities, units for measuring different kinds of quantities, the numerical values of quantities in different units of measure and the data structures and data types used to store and manipulate these objects in software. A simple treatment of units is separated from a full dimensional treatment of units. Vocabulary graphs will be used to organize units for different disciplines.

[Architecture](#) | [Schemas](#) | [Vocabularies](#) | [Rules](#) | [Functions](#) | [Scripts](#)

QUDT Ontology Architecture

The ontology architecture depicts the dependencies between the vocabularies and schemas of the QUDT release 1.1 set of OWL graphs.

Yellow rectangles depict vocabularies and blue rectangles depict schemas. Clicking on a node in the diagram takes you to the catalog entry for the graph. The links represent import relationships. Every graph imports 'VAEM'.

[Architecture](#) | [Schemas](#) | [Vocabularies](#) | [Rules](#) | [Functions](#) | [Scripts](#)

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using [SPARQL Web Pages](#)

[Architecture](#) | [Schemas](#) | [Vocabularies](#) | [Rules](#) | [Functions](#) | [Scripts](#)

Prefix	Base URI	Catalog Entry	SPIN Services	RDF/OWL (XML)	TURTLE
dtype	http://www.linkedmodel.org/1.0/schema/dtype				
dimension	http://qudt.org/1.1/schema/dimension				
quantity	http://qudt.org/1.1/schema/quantity				
qudt	http://qudt.org/1.1/schema/qudt				
vaem	http://www.linkedmodel.org/1.2/schema/vaem				
voag	http://voag.linkedmodel.org/1.0/schema/voag				

[Architecture](#) | [Schemas](#) | [Vocabularies](#) | [Rules](#) | [Functions](#) | [Scripts](#)

Prefix	Base URI	Catalog Entry	SPIN Services	RDF/OWL (XML)	TURTLE
qudt-dimensionalunit	http://qudt.org/1.1/vocab/dimensionalunit				
qudt-dimension	http://qudt.org/1.1/vocab/dimension				
qudt-quantity	http://qudt.org/1.1/vocab/quantity				
unit	http://qudt.org/1.1/vocab/unit				

Documentation for QUDT Dimensions Vocabulary

Powered by [TopQuadrant Logo](#) and [SPARQL Web Pages](#)

[Overview](#) | [Classes](#) | [Properties](#) | [Ontology](#)

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z :

- Category (12)
- Metadata Enumerated value (496)
- Quantity
- Quantity value
- System of Quantity Kinds (7)
- Unit (796)
- VAEM Enumeration (4)
- Value Reference

QUDT Dimensions Vocabulary

Annotation Properties

creator James E. Masters
Ralph Hodgson

label QUDT Dimensions Vocabulary

rights The QUDT Ontologies are issued under a (States License. Attribution should be made Inc.

subject Dimension systems for physical quantities ;

title QUDT Dimensions Vocabulary Version 1.1

versionInfo \$Id: OVG_dimensions-qudt-(v1.1) 4968 ;

Other Properties

acronym QUDT

date created Dec 30, 2010 9:08:12 PM

description QUDT Dimensional units is a vocabulary its dimensional entities. A dimension is a real

EPIM REPORTINGHUB (ERH)



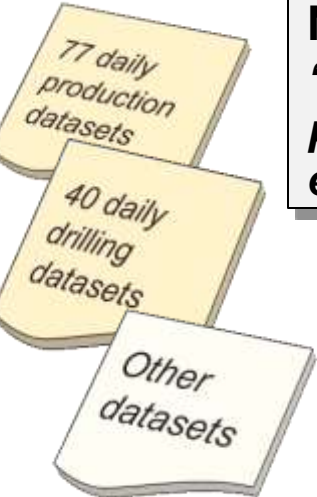
- TECHNOLOGY

- SEMANTIC WEB
- NPD FACT PAGES/
E&P ONTOLOGY
- WEB SERVICES

ReportingHub Vision

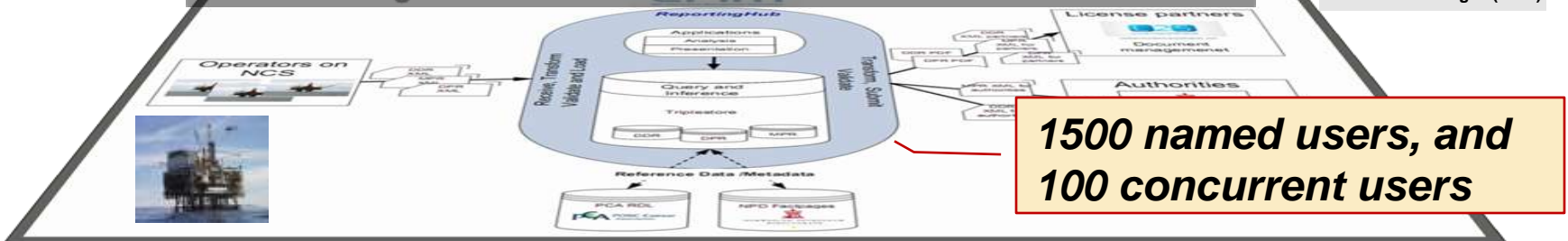
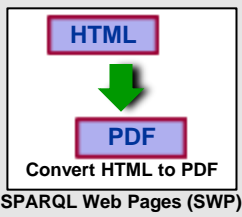
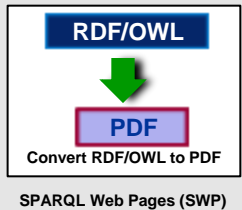
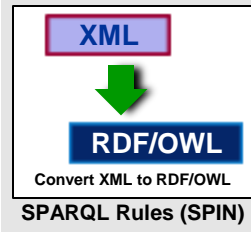
Need:
“Reporting to authorities and partners on the NCS in a cost efficient and secure manner”

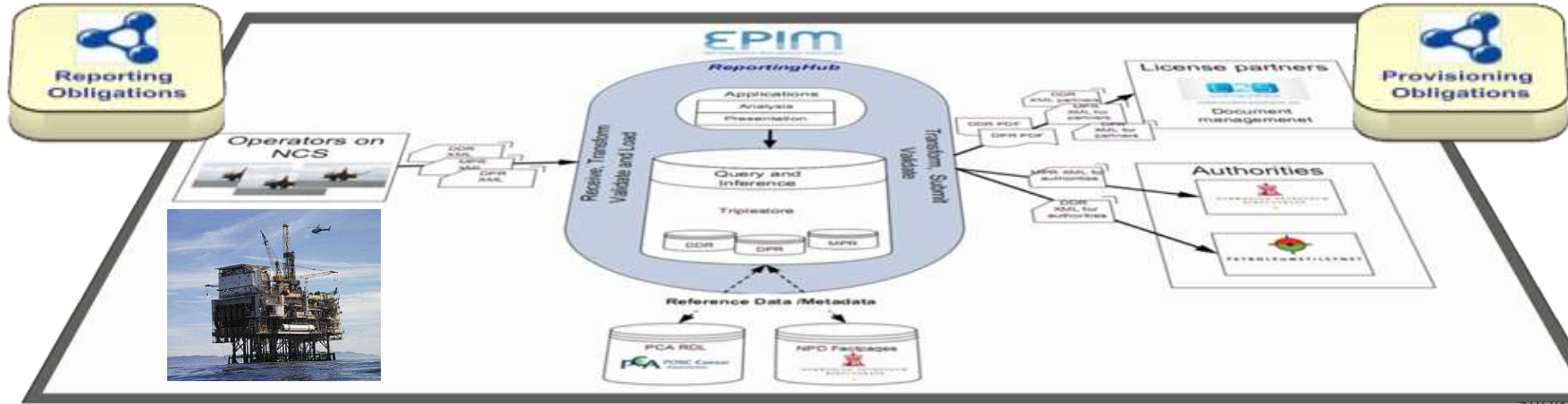
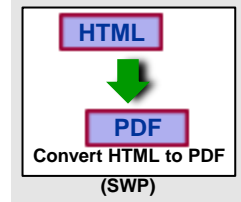
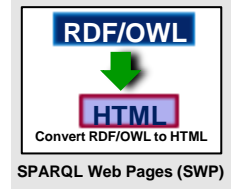
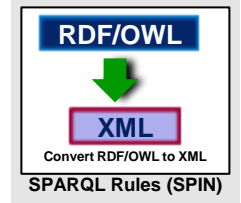
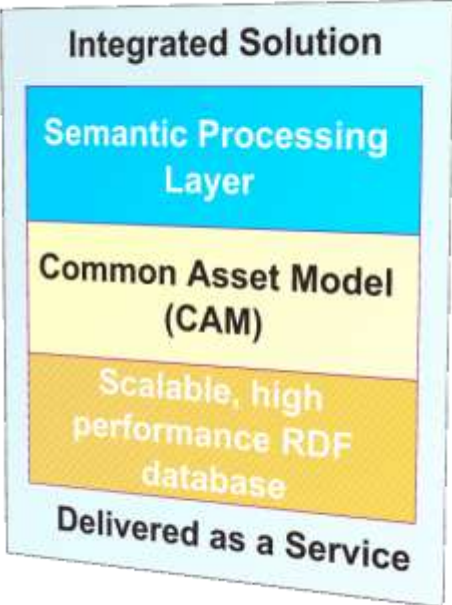
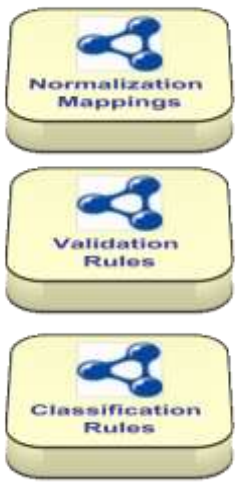
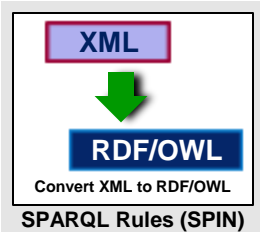
Outcome:
“Improved Information Integration and Exchange”
“Faster and better decisions”



Enablers:

- “A Field Specific Asset Model based on the Common Asset Model – ISO 15926, PCA RDL and NPD Facts”*
- “SPARQL as a way to query the data in a triple store and reason about data using appropriate inference engine(s)”*
- “Web Services for hiding the complexity of SPARQL Queries”*
- “Machine driven creation of new data relationships without restructuring the data model”*





1991-2021

1991

2001

2011

2021



Ethernet

Timeshare
DARPA Net



The Web



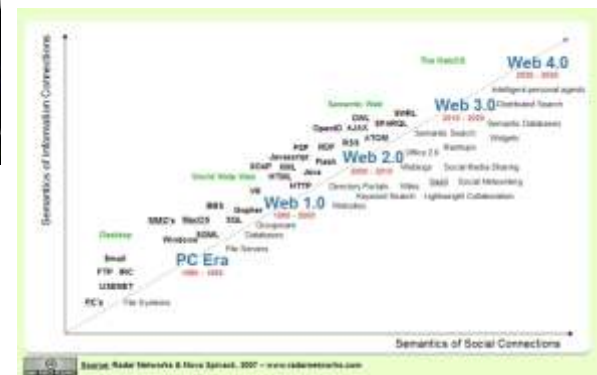
Web 3.0 **The Cloud**



“The One”
Web of Things



The Mesh

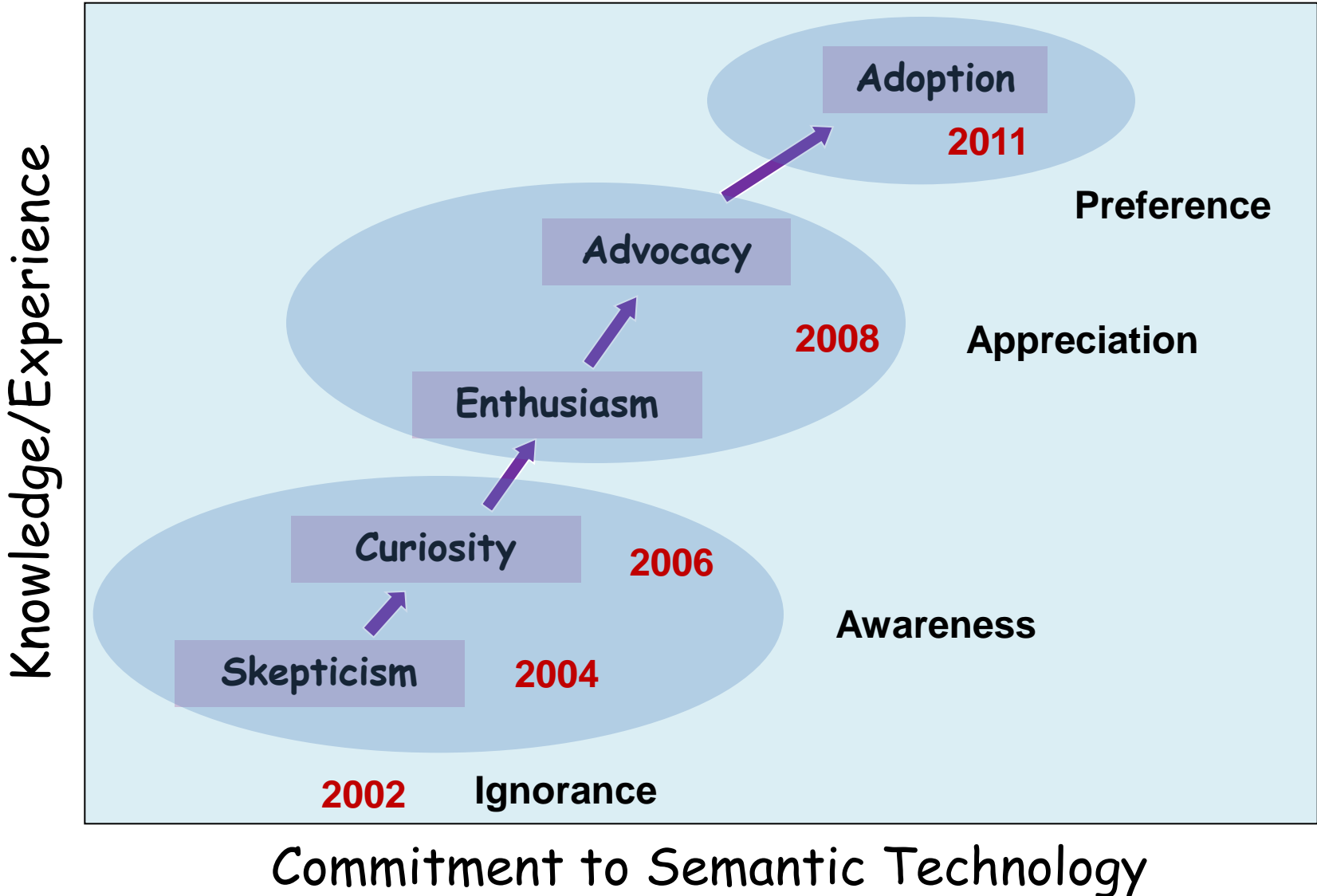


“WebOS”

References

- [The One] "Kevin Kelly on the next 5,000 days of the Web" - http://www.ted.com/talks/kevin_kelly_on_the_next_5000_days_of_the_web.html. at 11:23 - Semantic Web vision - from Linking Pages to Linking Data.
- [Web Of Things] Web Architecture Fall 2009 — INFO 290 (CCN 42593), Erik Wilde, UC Berkeley School of Information, 2009-12-03 -- [http://dret.net/lectures/web-fall09/trends#\(1\)](http://dret.net/lectures/web-fall09/trends#(1))
- [Cybermaps] <http://www.december.com/web/text/cyberatlas.html>
- [The Mesh] Lindsay Lush, gravityshack.com - <http://www.gravityshack.com/blog/?cat=60>

Semantic Technology Adoption



2011-2021 Trends and Needs

❑ Immediate Trends

1. Data in RDF
2. Increase in RDFa use
3. Preference for OWL-lite
4. Rules shake-out
5. “Frictionless” Data
6. Ontology Explosion

❑ Future Trends

7. From Data to Apps
8. Composite Apps
9. Internet of Things
10. SBFI on the Web

❑ Needs

1. Linked Models
2. Registries
3. Governance
4. URI Standards
5. Ontology Design Profiles and Patterns
6. Ontology Architecture
7. Ontology Alignment Methods and Tools
8. Ontology Metrics and Reuse Assessment Methods and Tools
9. API Standards
10. Standards for Transforms



2011-2021 Outcomes and Challenges

❑ Outcomes

1. Accurate Information Provisioning
2. Frictionless Data Gathering
3. Compliance Checking
4. Rule Making

❑ Challenges

1. Vendors
2. System Integrators
3. Governance
4. Standards Confusion

Thank You

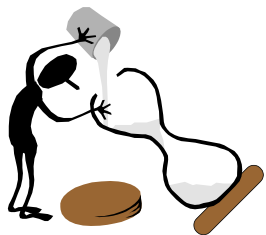


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Some References

