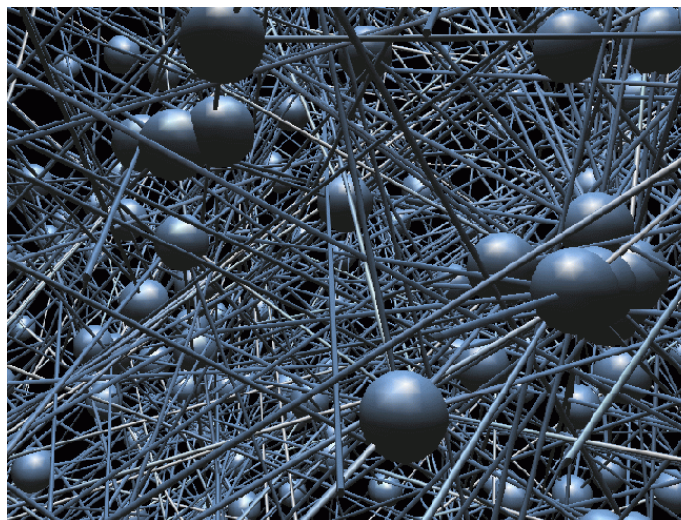
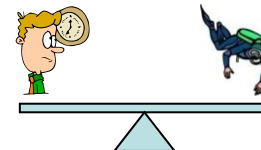




Semantic Web Technologies



~~Valuing harvested Ontologies~~

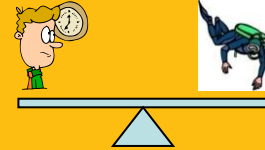


Valuing *the Harvest from using* Ontologies

A Personal Appreciation

Ralph Hodgson
TopQuadrant CTO

February 11, 2011



Ralph Hodgson

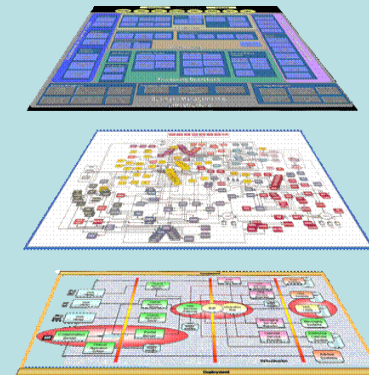
- co-founder and CTO of TopQuadrant, Inc., a US-headquartered company that specializes in semantic technology consulting, training, tools and platforms;
- Lead Ontologist for the NASA NEXIOM Ontologies.
- Prior to starting TopQuadrant in 2001, Executive Consultant at IBM Global Services and founding 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

The screenshot shows a complex information space interface with a sidebar on the left containing navigation links like 'BEA INFORMATION', 'BEA RESOURCES', and 'Operational Activity Definitions'. The main content area displays a 'Department of Defense Architecture Framework (DoDAF)' and a table of 'Operational Activity Definitions'.

Name	Description	DV/Mode/Tree Diagram
Operational Activity	This activity includes an administrative authorized official that goods, services, information, and resources required for government tasks, activities, and information and accountability.	
Operational Activity	This activity includes an administrative authorized official that goods, services, information, and resources required for government tasks, activities, and information and accountability.	
Operational Activity	This activity includes an administrative authorized official that goods, services, information, and resources required for government tasks, activities, and information and accountability.	



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



Introducing 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 more people in Semantic Web Technologies than any other company in the world.

Tools

TopQuadrant has the leading RDF, OWL and SPARQL tool suite that integrates with 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 hard data interoperability, information architecture and vocabulary management problems

Oracle Partnership



Alexandria, VA



Mountain View, CA



Typical Solutions

Enterprise Vocabulary Management

Flexible solutions for managing business vocabularies in support of content delivery, search, navigation, data integration and disambiguation of terms

Semantic-XML Message Builder Workbench

Enables XML-based data exchanges that are specific to the local context while remaining compliant with industry and enterprise standards

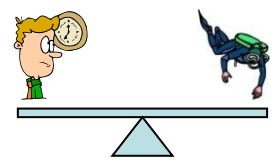
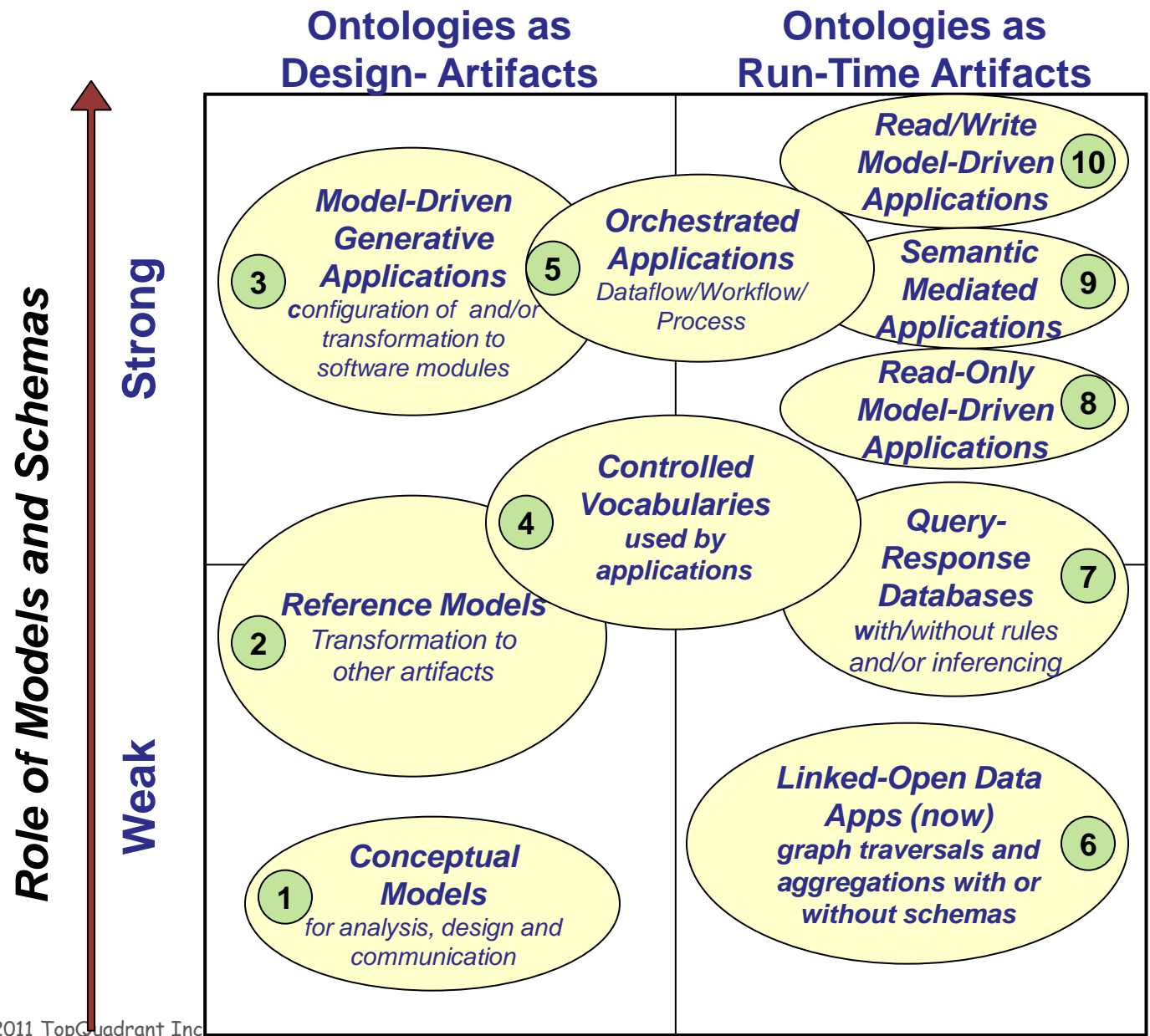
Data Integration

Federated access to disparate information sources

Enterprise Architecture

Solutions for IT governance and management

Putting Ontologies to Work





Some Case Studies

- ❑ Intelligence Agencies – (Cyber Terrorism, Counter Terrorism)
- ❑ Air Force – Enterprise Vocabulary Team
- ❑ FAA – NextGen
- ❑ Pharmaceutical Company- Antibodies Discovery
 - Dynamically federate data from relational databases, web sources, LDAP servers, etc.
 - Before: multiple queries through multiple user interfaces to multiple systems were required to get “360 degree” view of an antibody
- ❑ J&J Vistakon – Predictive Quality Assurance
- ❑ Innovatia – Call Center Support
- ❑ TopQuadrant



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



Capability Cases

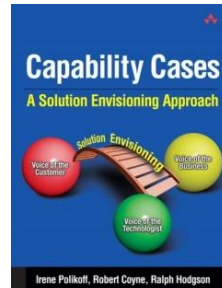
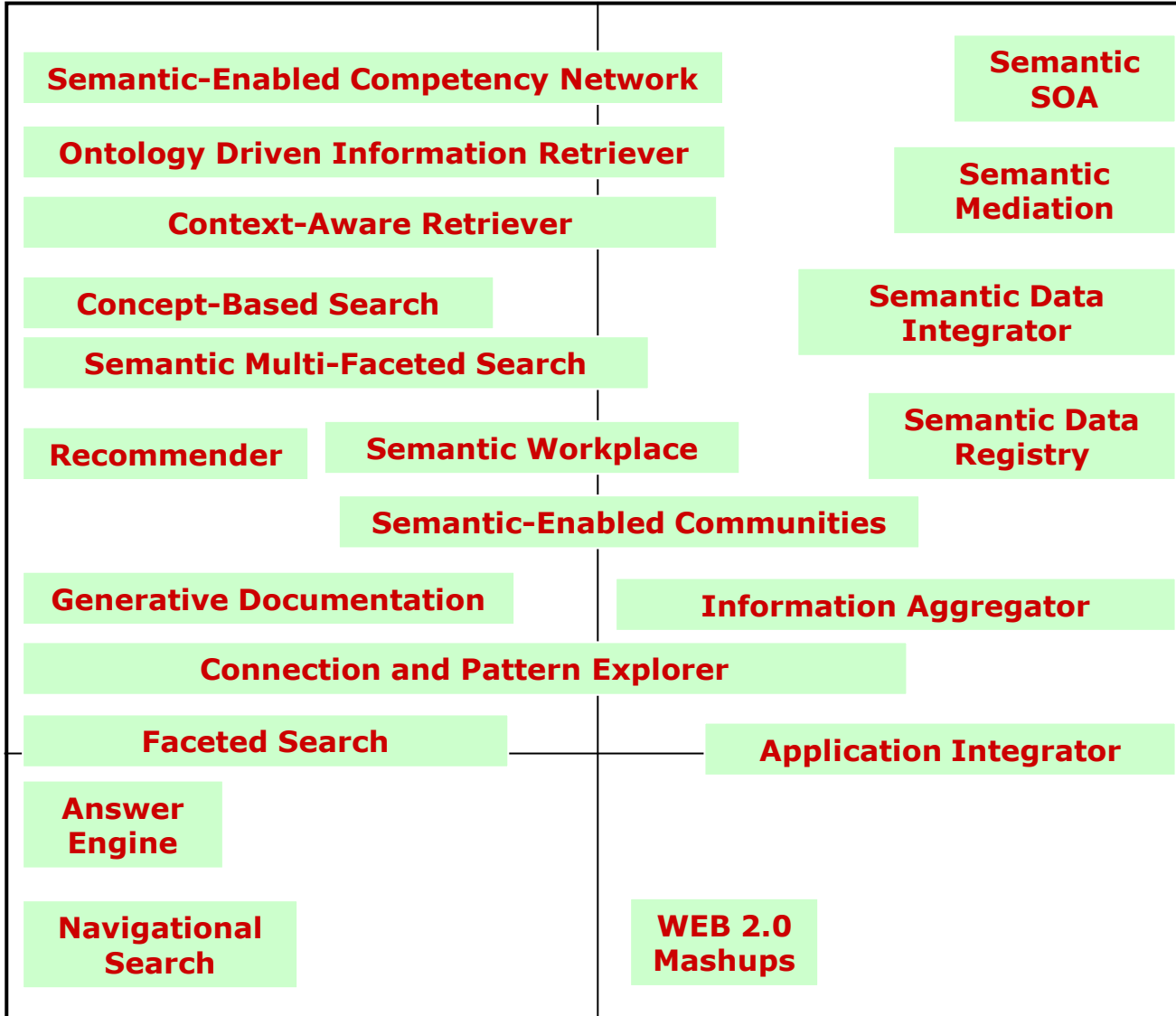
Expressivity

Formal

Informal

Human

Machine

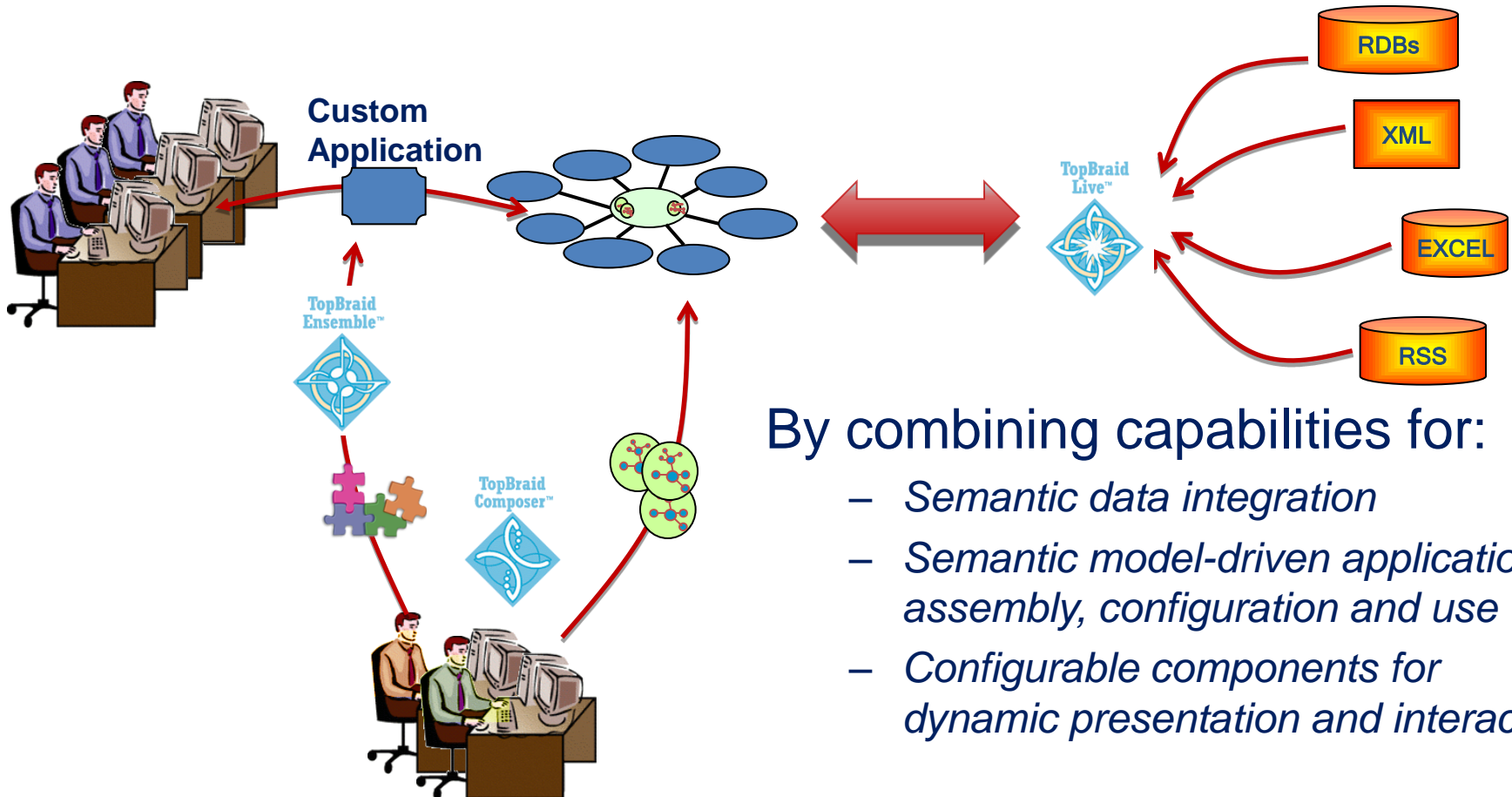




Semantic Applications

Rapid Deployment of Agile, Evolvable Applications

“Designed for users ... Built for change”

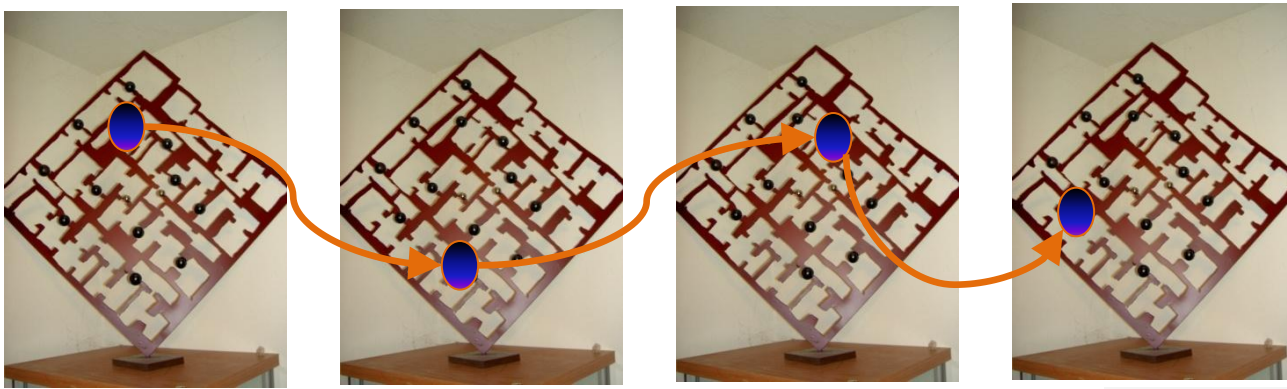


By combining capabilities for:

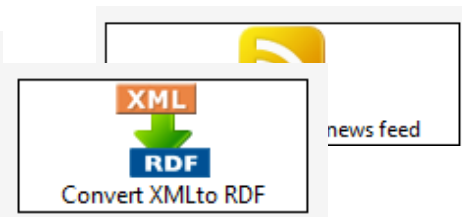
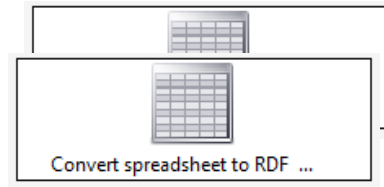
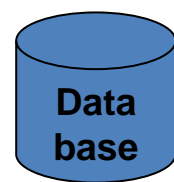
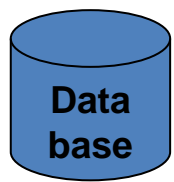
- *Semantic data integration*
- *Semantic model-driven application assembly, configuration and use*
- *Configurable components for dynamic presentation and interaction*

How Semantic Web Technologies help “Connect the Dots”

- They capture, align and resolve the data semantics of different data sources through:
 - Flexibility of the RDF data model and
 - Rich modeling formalisms of OWL and
 - A standards-based approach



ORACLE



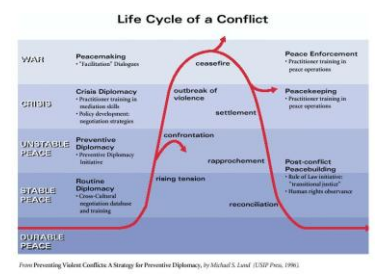
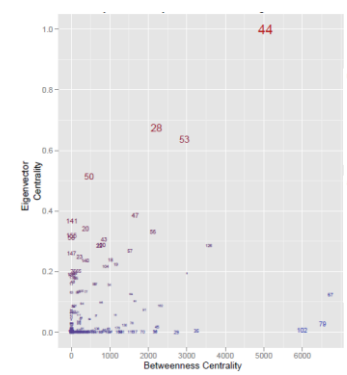
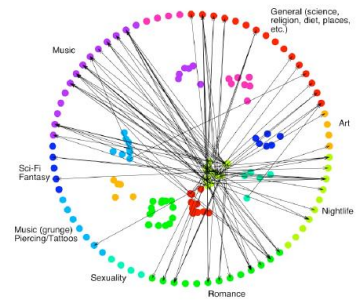
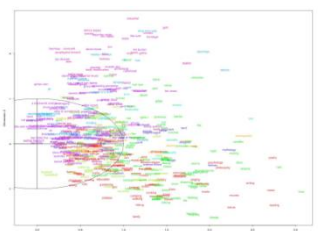
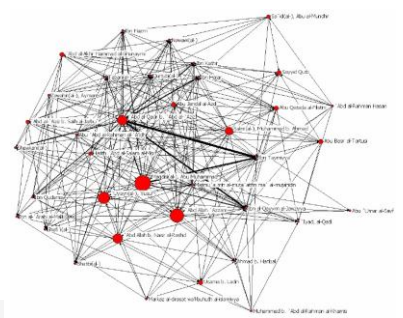
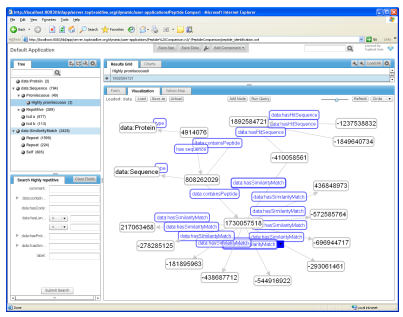


Ingest → Normalize → Explicate → Decide → Act

I.N.E.E.D.A.

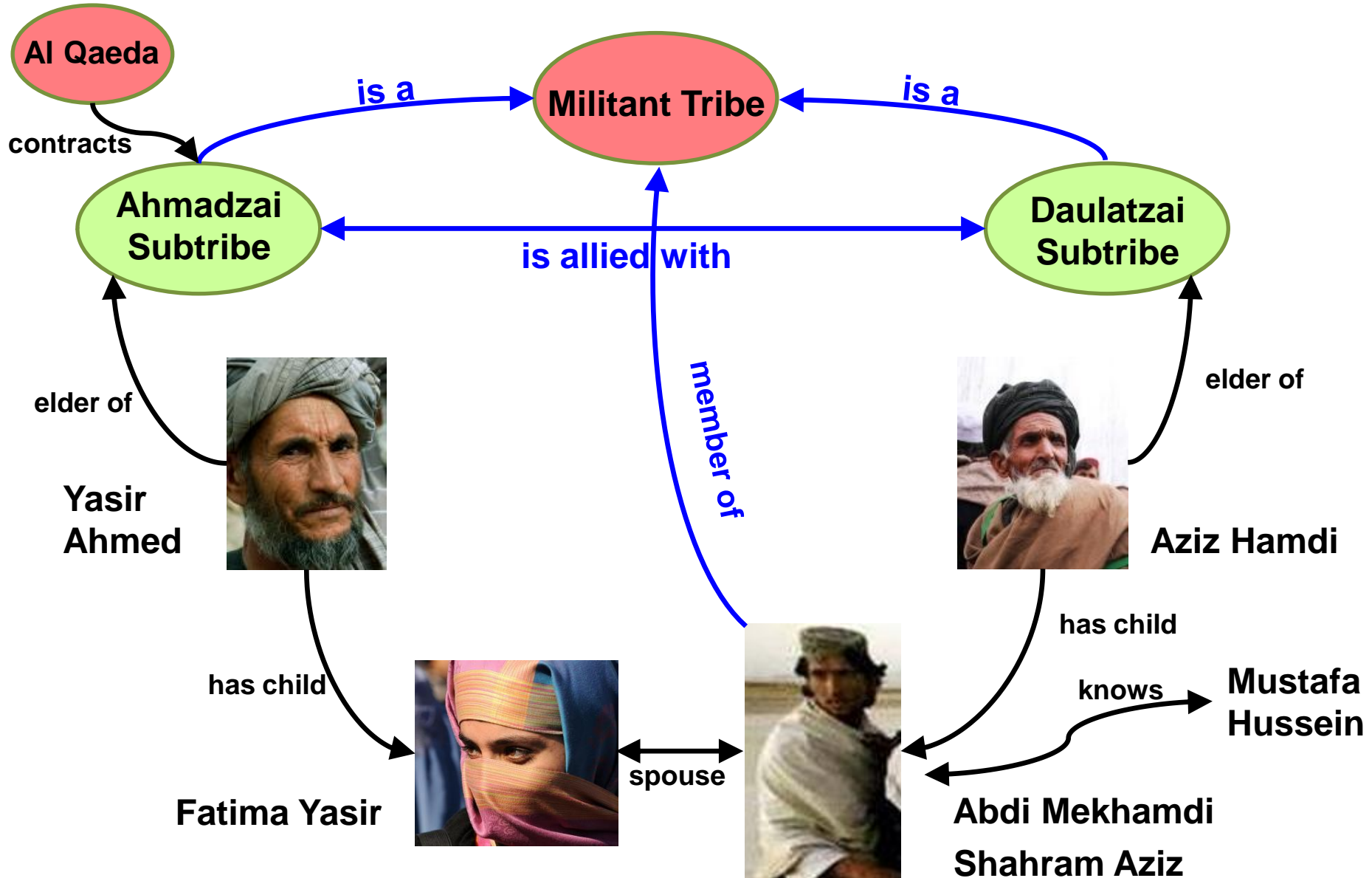


- Convert spreadsheet to RDF ...
- Convert XML to RDF
- Convert spreadsheet to RDF ...
- Convert XML to RDF
- Import jamestown news feed
- Import E-mails
- Import oracle RDFDatabase





(1) Terrorism Information Insight





Creating the DEMO Terrorist Database Content

- 1 Dept. of State Wanted List
- 2 South Asia Terrorist Portal
- 3 Tracking The Threat
- 4 Minorities at Risk
- 5 Wikipedia
- 6 Global Terrorist Database
- 7 United Nations (consolidated list)
- 8 Militant Ideology Atlas

Convert spreadsheet to RDF ...

Convert spreadsheet to RDF ...

Convert spreadsheet to RDF ...

Convert spreadsheet to RDF ...

Convert spreadsheet to RDF ...

Convert spreadsheet to RDF ...

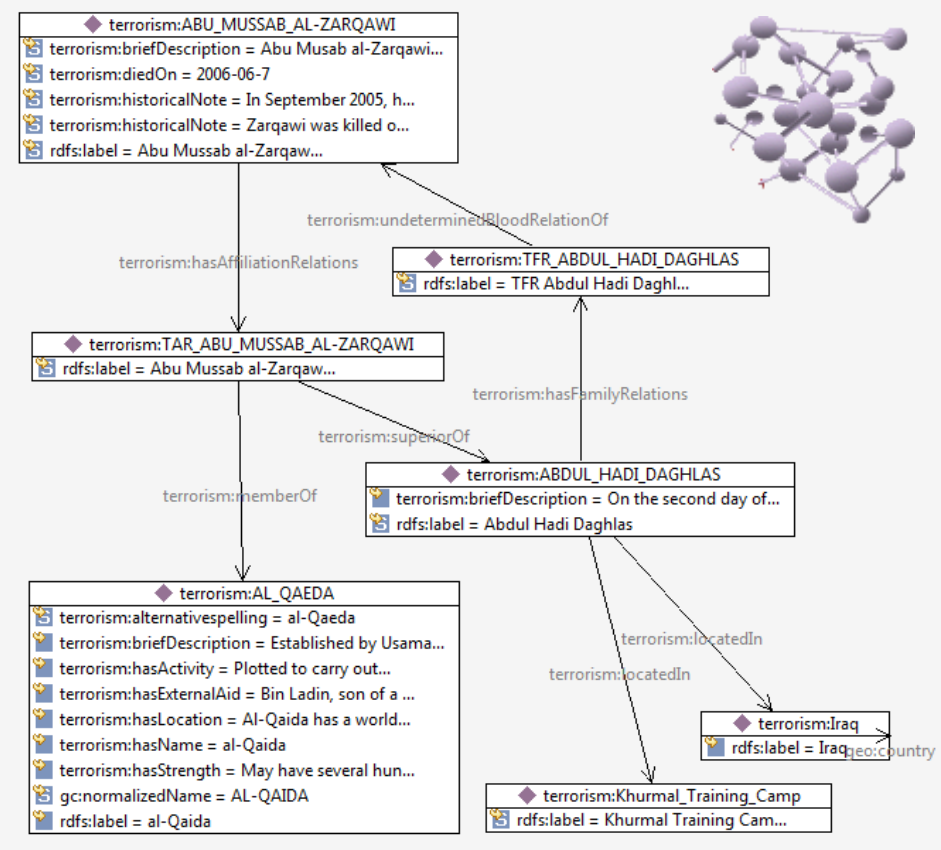
XML
↓
RDF
Convert XMLto RDF

XML
↓
RDF
Convert XMLto RDF

TopBraid Importers

SPARQL Rules Conversion to OWL Graphs

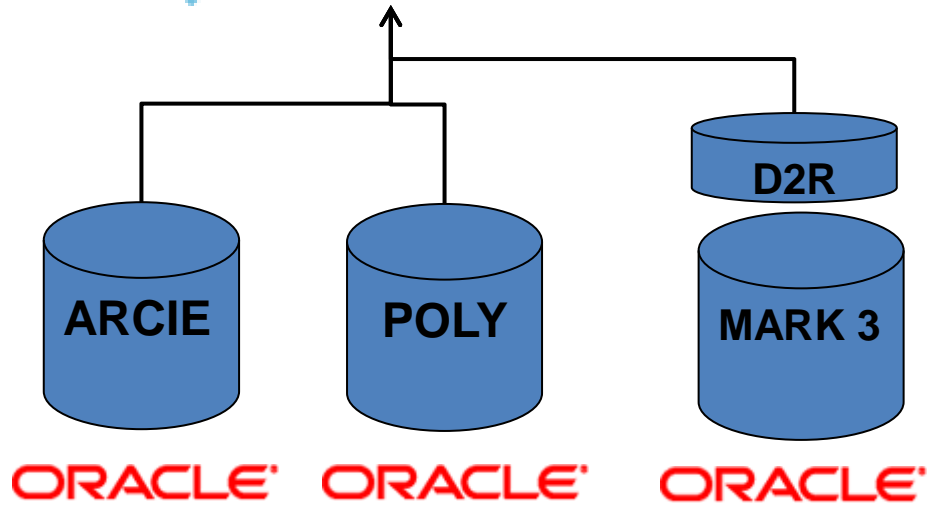
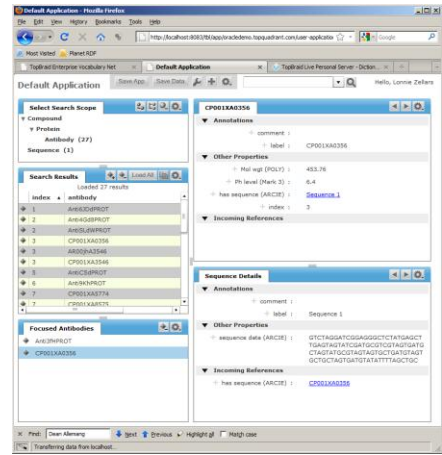
OWL provides the 360° view



Demo "INEDA"

(2) Dynamic 360 Degrees View of Data

- ❑ A Pharmaceutical Company uses TopBraid Suite and Semantic Web standards to dynamically federate data
- ❑ Several databases contain information related to “antibodies”
- ❑ Instead of multiple queries and multiple user interfaces to multiple systems, the Semantic approach has a single view to a single virtual information space



Visual Data Exploration

http://localhost:8083/tbl/app/server.topbraidlive.org/dynamic/user-applications/Peptide Compari - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://localhost:8083/tbl/app/server.topbraidlive.org/dynamic/user-applications/Peptide%20Comparison.n3/-/PeptideComparison/peptide_identification.owl

Default Application Save App Save Data Add Component

Tree

- data:Protein (2)
- data:Sequence (794)
 - Promiscuous (40)
 - Highly promiscuous (3)
 - Repetitive (389)
 - tcd a (677)
 - tcd b (113)
 - data:SimilarityMatch (2428)
 - Repeat (1599)
 - Repeat (224)
 - Self (605)

Search Highly repetitive Clear Fields

comment:

data:contain...

data:hasCode:

data:hasLen...

data:hasProt...

data:hasSim...

label:

Submit Search

Results Grid Charts

Highly promiscuous0

1892584721

Form Visualization Yahoo Map

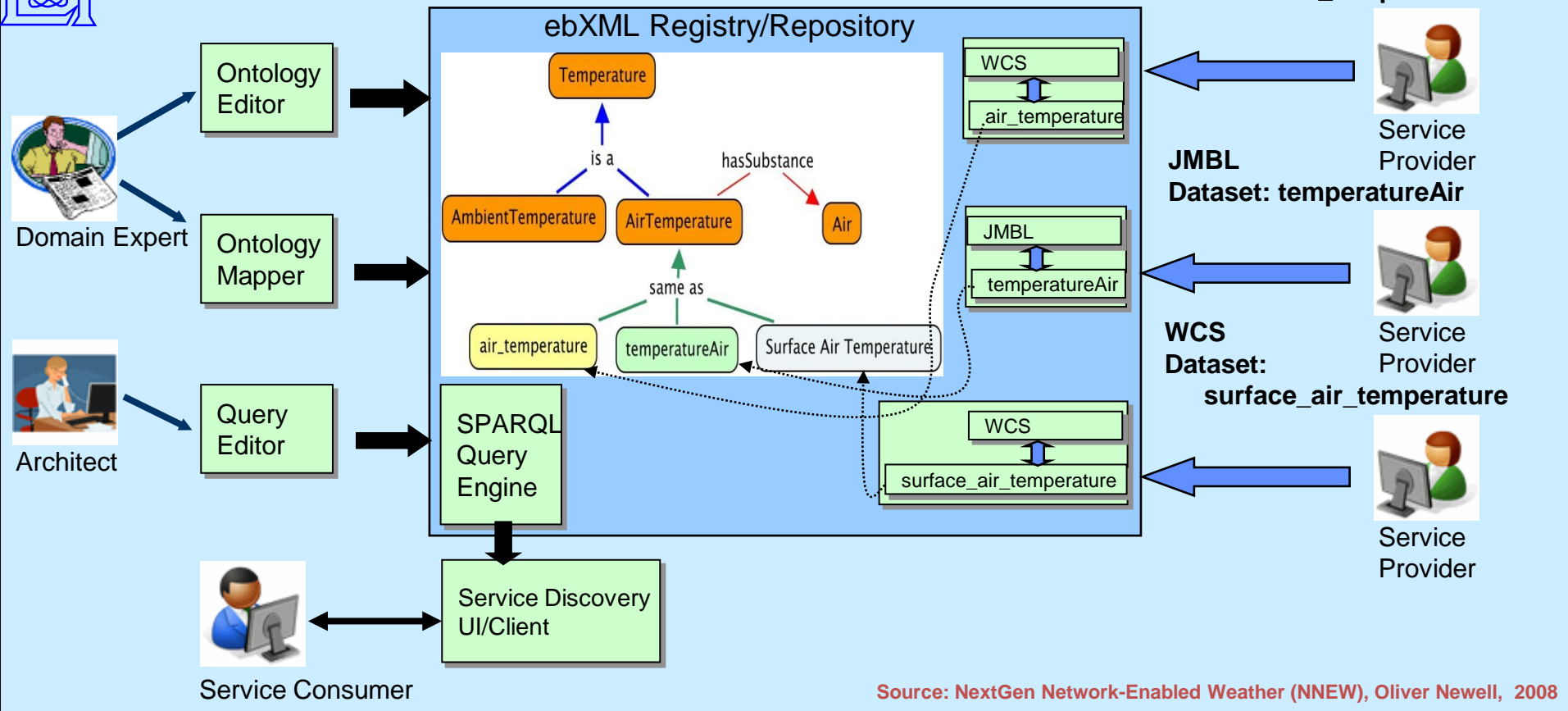
Loaded: data Load Save as Unload Add Node Run Query Refresh Circle

Done Local intranet

(3) Semantically Enhanced Discovery of Datasets from NextGen - NNEW¹

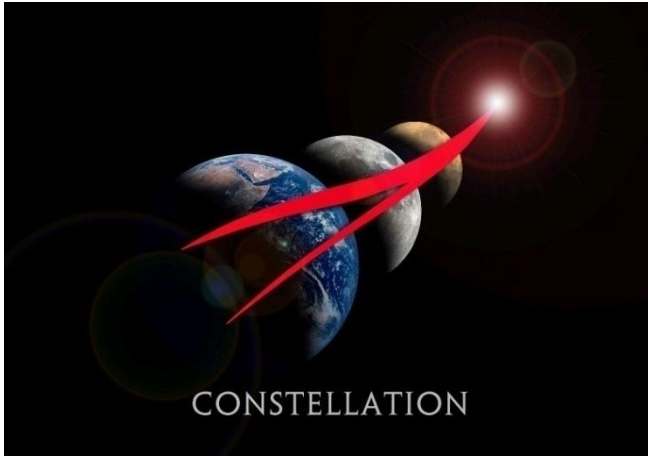


MIT Lincoln Laboratory

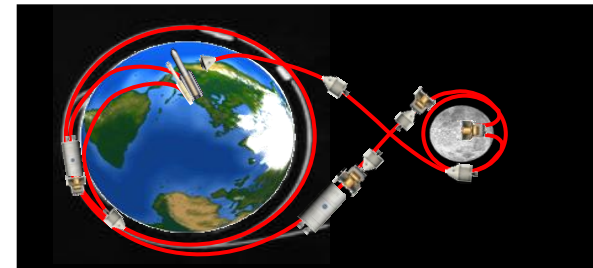
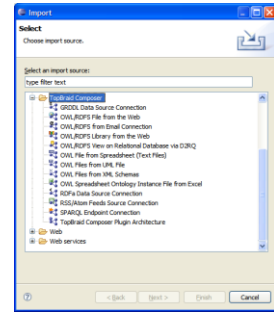
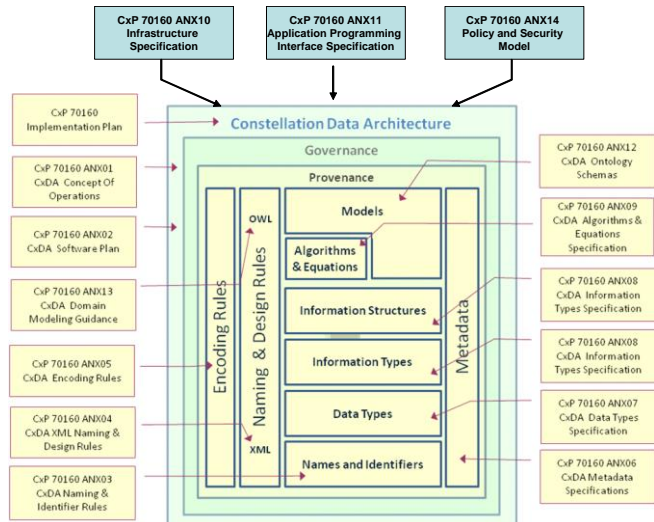
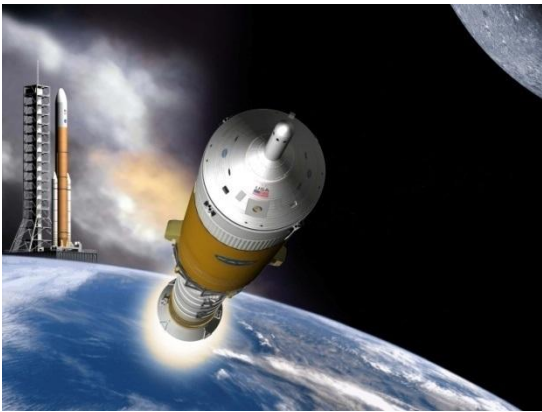


Source: NextGen Network-Enabled Weather (NNEW), Oliver Newell, 2008

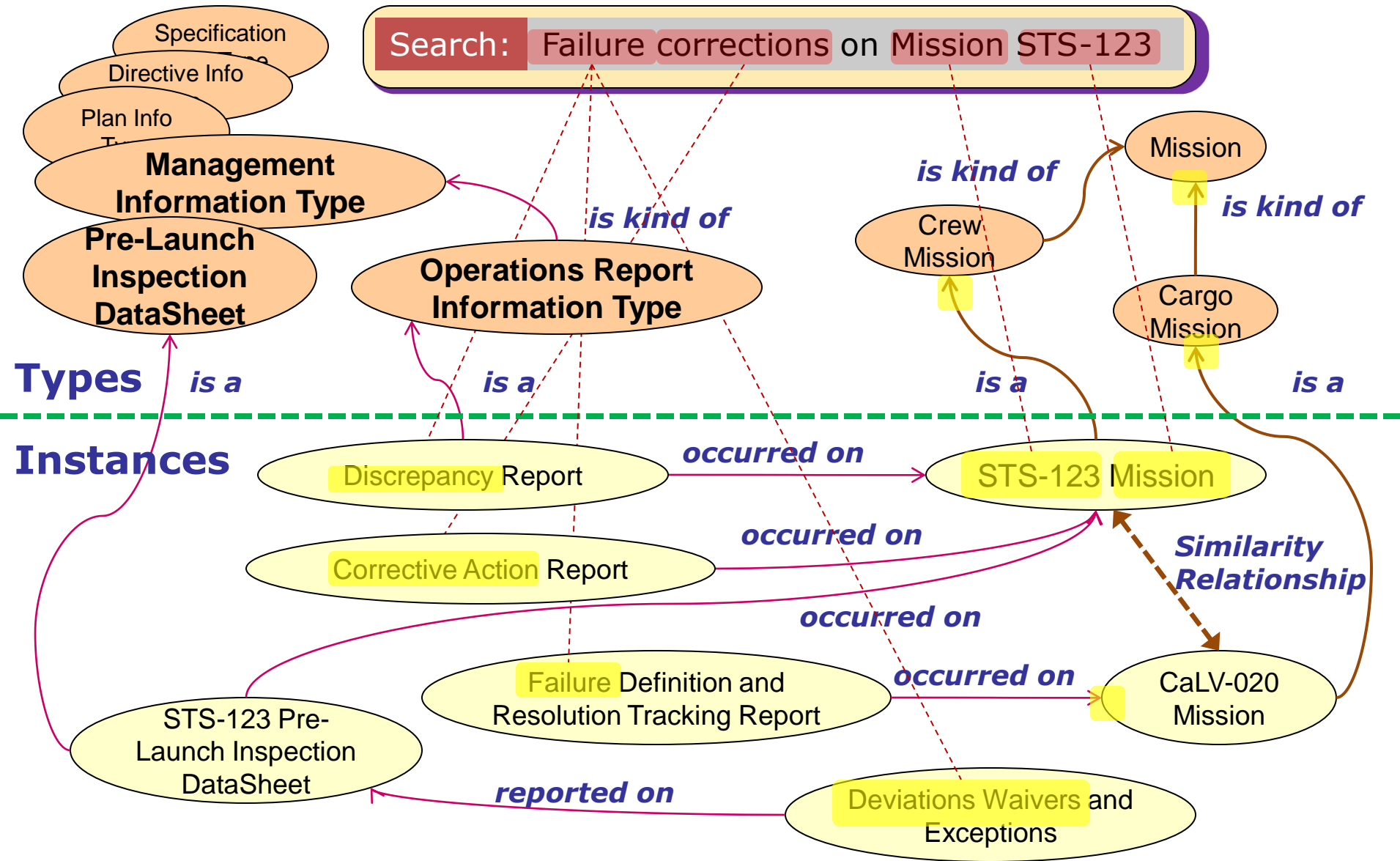
¹NNEW – NextGen Network Enabled Weather



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



Context/Concept-Based Search finds information based on similarity measures

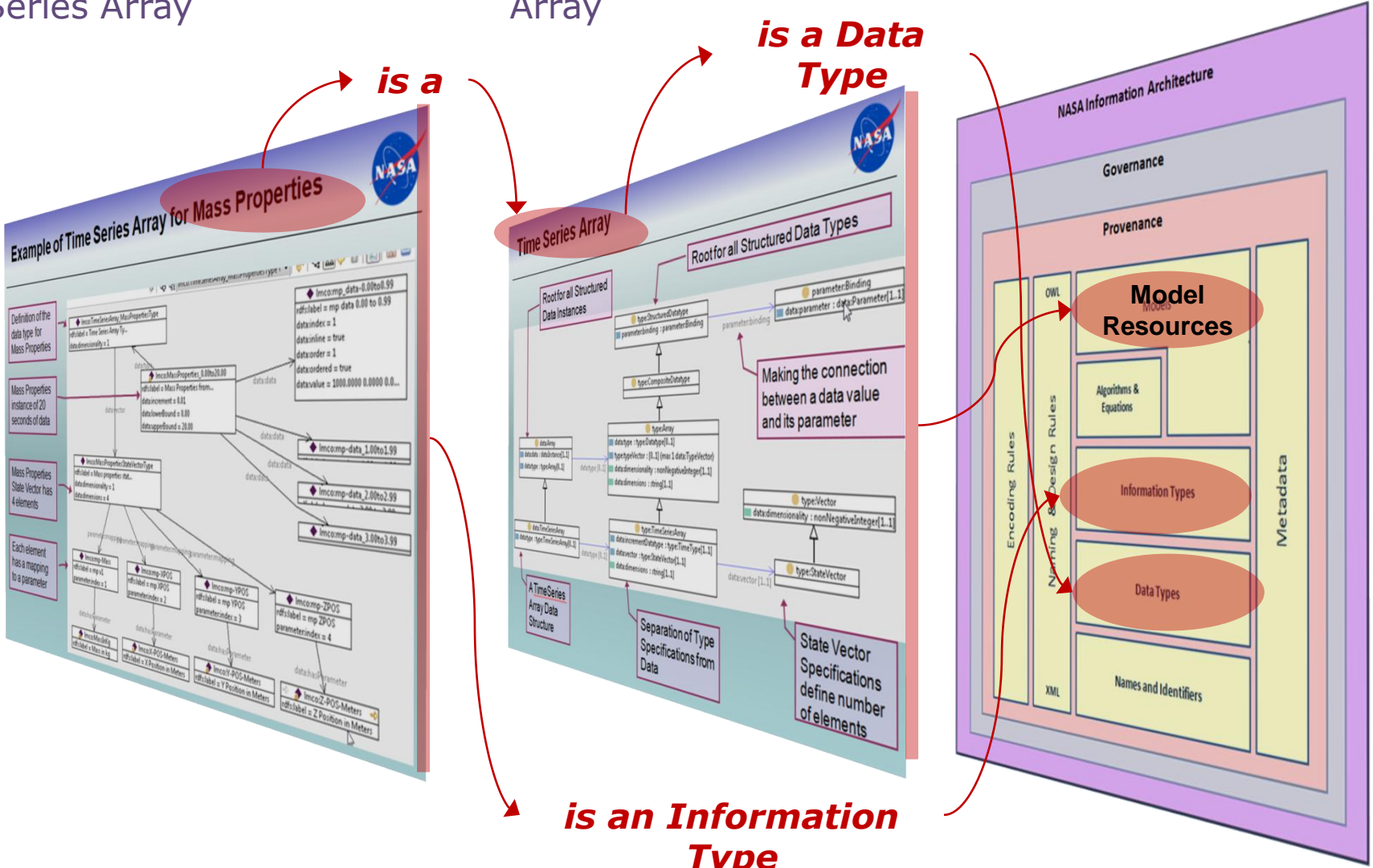


IA and Ontologies, Time Series Array Example: Mass Properties

Mass Properties
Instance of a Time Series Array

Ontology Model
for Time Series Array

Information Architecture
Reference Model



Modular OWL Specification Models

XML SchemaPlus (XSP)

XSLT

XML Schema

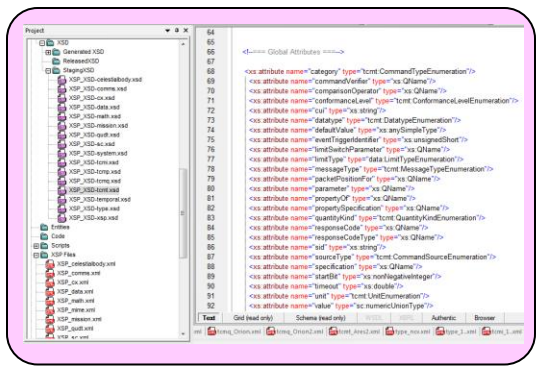
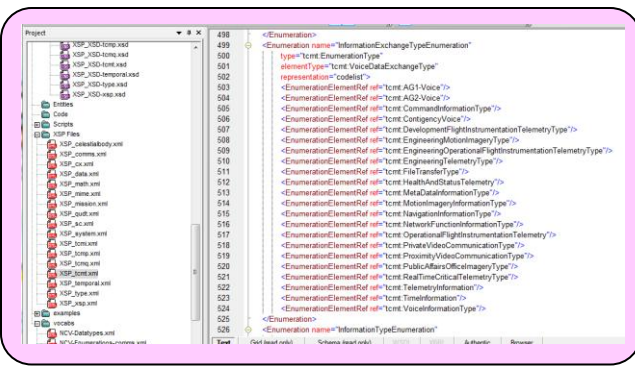
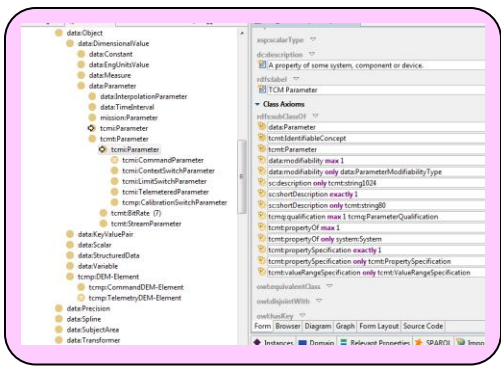
XML Vocabularies

SPARQL Rules

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.

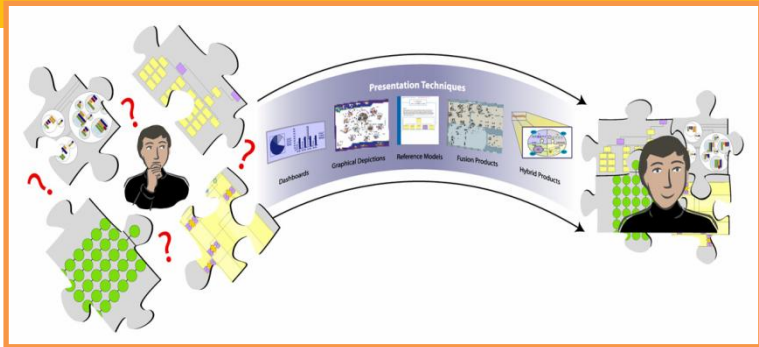
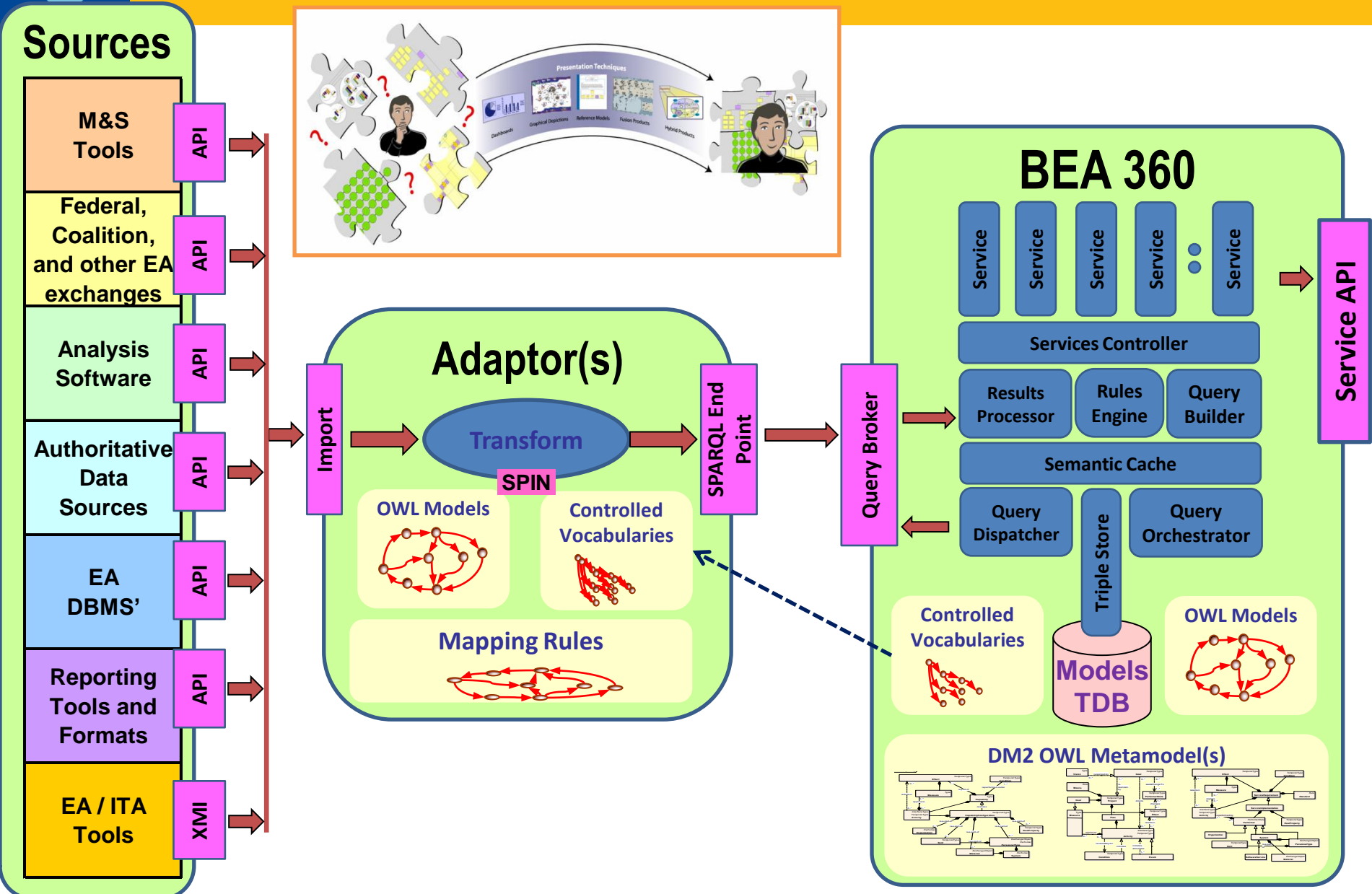


TopBraid Composer

Altova XMLSpy



(6) 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 Contr	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

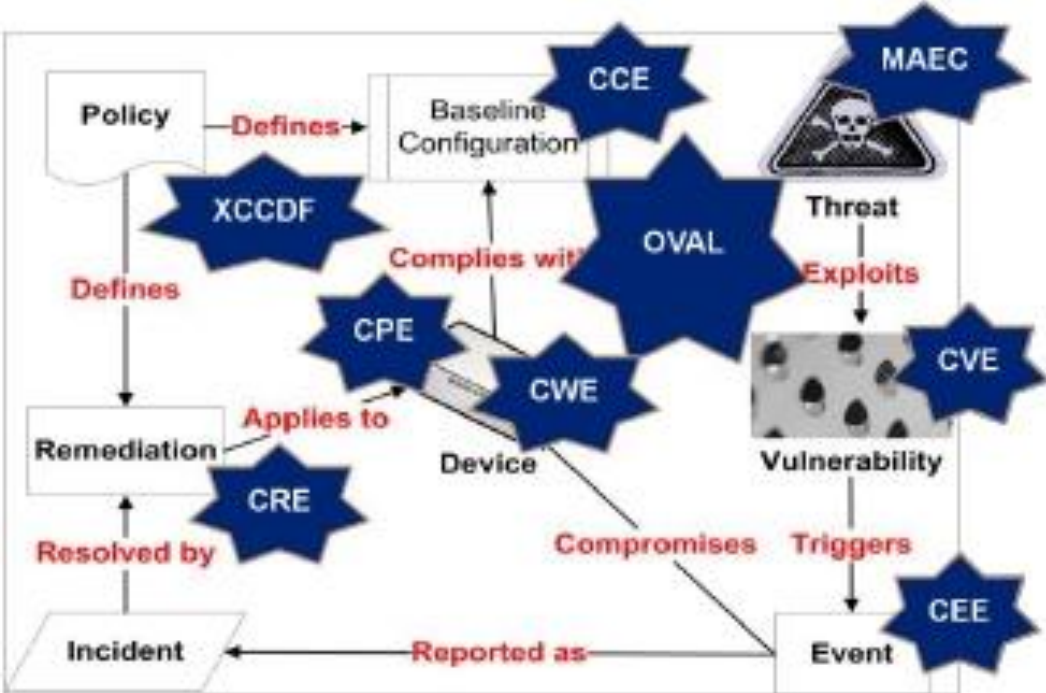
activity
Dispose Or Return Property And Materiel
Conduct Logistics Business Planning
Authorize Return Or Disposal
Identify And Reserve Supply Chain Resources

Activity Details



(7) Cyber-Security Information and Event Management (CSIEM)

Cyber-Security Ontology Architecture Concept



CCE Vocabulary Management Web Application

The screenshot shows the CCE Vocabulary Management Web Application interface. It includes a tree view on the left and a detailed description of a selected CCE entry on the right.

Tree View:

- Tree
 - Agents
 - CCE Description (3568)
 - CCE ID (5788)
 - CCE Resource (42)
 - Configuration Concept
 - CCE Candidate
 - CCE Entry (5719)
 - Parameter (306)
 - Person Name (1)
 - Platforms (13)
 - Reference (8735)
 - Role
 - Submission (1)
 - Technical Mechanism (2850)
 - global status (4)

CCE Description:

Name:

- The "Allow access to e-mail attachments" setting should be configured co
- Auditing of 'DS Access: Detailed Directory Service Replicator' events on fe
- The "Configure Outlook object model prompt When accessing the Formu
- The /etc/grub.conf file should be owned by the appropriate user.
- The rpcsvcsd service should be enabled or disabled as appropriate
- /etc/pam.conf file permissions should be set appropriately
- Rights to access DCOM applications should be assigned as appropriate.
- The "Account: Limit local account use of blank passwords to console log
- The /etc/iron.d/iron.allow file should be owned by the appropriate user.
- The "Disable commands - View | Macros | Macros" setting should be confi
- The "Disable UI extending from documents and templates" setting should
- operator account should be present or not as appropriate
- The Terminal Services DisableClip setting should be set correctly.
- The RARP service should be enabled or disabled as appropriate.
- rpc service should be enabled or disabled as appropriate
- The "User Account Control: Virtualize file and registry write failures to per

Associations:

- Content Label : /etc/pam.conf file permissions should
- comment :
- label : CCE Description 201.

Other Properties:

- Status : #Approved
- hasContactPerson :

Incoming References:

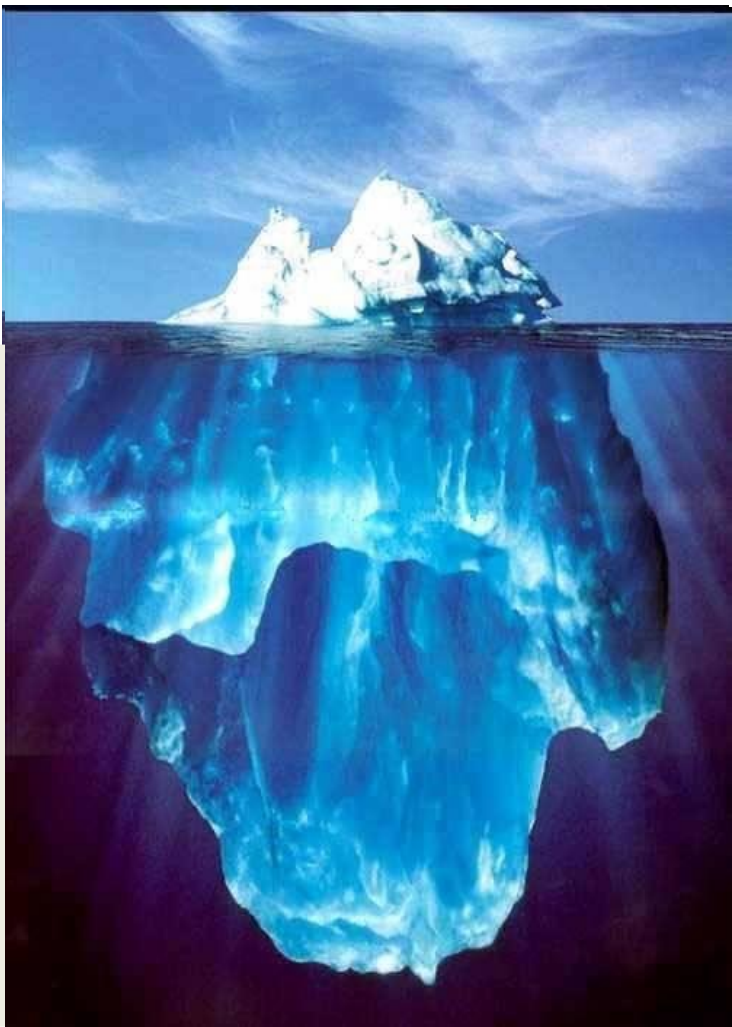
- approved CCE Description : [Configuration Concept 1401](#)
- [Configuration Concept 202](#)
- [Configuration Concept 2059](#)
- [Configuration Concept 3533](#)

Developed with TopBraid Suite

ref: "Toward an Ontology Architecture for Cyber-Security Standards", Mary C. Parmelee, The MITRE Corporation

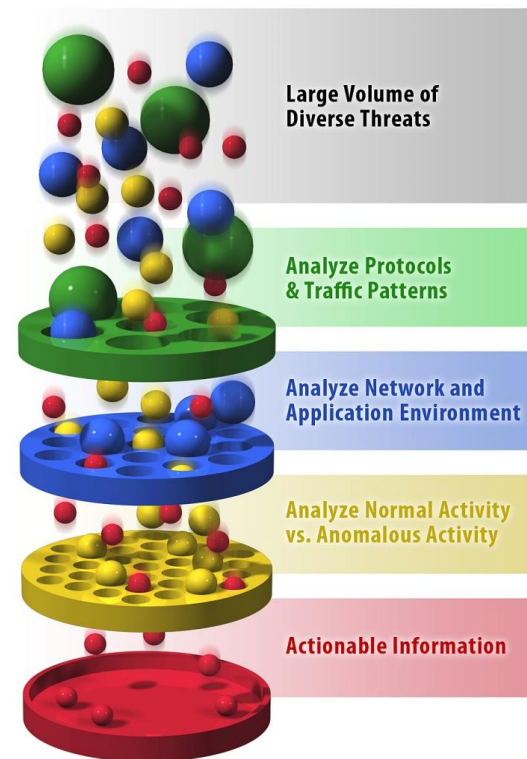
How Semantic Technology has Delivered/will Deliver Value

What Problem to Solve?



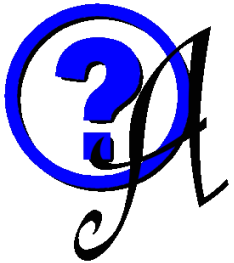
Common Themes:

- 1) Align Vocabularies
- 2) Improve Search
- 3) Connect the Dots
- 4) Actionable Intelligence
- 5) Generative Information Structures





Thank You



Ralph Hodgson

E-mail: rhodgson@topquadrant.com

Presentations: <http://www.scribd.com/ralphtq>

Twitter: @topquadrant, @ralphtq, @oegovnews



Some References

