

Harmonization of Sensor Standards in Semantic Wikis: Sensor Standards Harmonization Working Group Meeting

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Key Questions*

- 1. How to achieve the harmonization of sensor standards, primarily among the IEEE 1451, ANSI N42.42, SensorML, TransducerML, CBRN Data Model?
 - These standards need to be mapped to each other, in this case, harmonized, and the CAP, EDXL-DE etc., are standards that work with the data from these.
- 2. What information and technical help you need from each of the standards groups listed in 1.
- 3. Can you do this?

* Kang Lee, February 23, 2007.

Brief Answers

- 1. I have IEEE 1451, ANSI N42.42, and the CBRN Data Model in the SSHWG Knowledgebase and need URLs for SensorML and TransducerML to add them to the SSHWG Knowledgebase. I have CAP and EDXL-DE in the SSHWG Knowledgebase, What is the etc. that I need to add?
- 2. I need a commitment from the technical representatives for each of these standards in 1 to work in the Semantic Wiki to help with the harmonization and even more fundamentally, define collectively what harmonization means, e.g. that we have the universal core of elements across all the standards, that we have a new standard with the mapped elements, etc.?
- 3. Yes, see recent SICoP Special Conference at http://colab.cim3.net/cgi-bin/wiki.pl?SICoPSpecialConference_2007_02_06

Overview

- 1. Current SSHWG Knowledgebase
- 2. Semantic Wikis
- 3. SICoP
- 4. Key Questions
- 5. Some Next Steps

1. Current SSHWG Knowledgebase

- Have: IEEE 1451, ANSI N42.42, and the CBRN Data Model, and CAP and EDXL-DE.
 - Note: Just added IEEE 1451 (December 2006) 225 pages!
- Need: SensorML and TransducerML
 - Note: Others besides CAP and EDXL-DE?
- A Knowledgebase supports four functionalities (see next slide) and is what the SCoP Semantic Wikis produce in support of the CIO Council's Strategic Plan (FY 2007-2009) Data Reference Model 2.0-3.0 (see sections 2 and 3).

1. Current SSHWG Knowledgebase

- Metadata:
 - Full text of standards, meeting notes, etc.
- Harmonization
 - Different ways in which the same words are used.
- Enhanced Search:
 - Across all standards and showing context (e.g. words around the term or concepts)
- Mashups:
 - A website or application that combines content from more than one source into an integrated experience (repurposing).

1. Current SSHWG Knowledgebase

NextPage
Search:
Select Search Form

Information Sharing of Trusted Referen
Semantic Wiki Pilots
Agile Financial Data Services Cor
National Information Exchange M
National Science Foundation Poli
Net-Ready Sensors: SICO P Sema
Net-Ready Sensors: SICO P Se
DRM 2.0 - Compliant Sema
Standards
Standards Harmonization
Content
Net-Ready Sensors: The Wa
ANSI N42.42
Common Alerting Protocol (C
Emergency Data Exchange L
CBRN Data Model Version 1
IEEE 1451.5
IEEE 1512.3-2002
OGC SAS
EPA's 2007 Report on the Environ
The Quality of Our Nation's Water
Transportation Statistics Annual F
Transportation Research Board 8
Health, United States, 2005
2004 State of the Future
Semantic Technologies & Internera

Prev Doc | Next Doc | Reference | Svc TOC | Prefs

Standards

- [1. Final Draft ANSI N42.42 May 02, 2006](#)
The purpose of the ANSI N42.42 standard is to facilitate manufacturer-independent transfer of information from radiation measurement instruments for use in Homeland Security. This standard specifies the XML data format that shall be used for both required and optional data to be made available by radiation instruments. The structure of the data is described by an XML Schema (.xsd) file. The schema file allows XML parsers to validate the format of instrument data files: it defines the standard names for data elements and attributes, whether or not they are optional or required for each class of instrument, and the hierarchical relationships between them.
- [2. Common Alerting Protocol \(CAP\), v. 1.1](#)
The Common Alerting Protocol (CAP) is a simple but general format for exchanging all-hazard emergency alerts and public warnings over all kinds of networks. CAP allows a consistent warning message to be disseminated simultaneously over many different warning systems, thus increasing warning effectiveness while simplifying the warning task. CAP also facilitates the detection of emerging patterns in local warnings of various kinds, such as might indicate an undetected hazard or hostile act. And CAP provides a template for effective warning messages based on best practices identified in academic research and real-world experience.
- [3. Emergency Data Exchange Language \(EDXL\) Distribution Element, v. 1.0](#)
This Distribution Element specification describes a standard message distribution framework for data sharing among emergency information systems using the XML-based Emergency Data Exchange Language (EDXL). This format may be used over any data transmission system, including but not limited to the SOAP HTTP binding.
- [4. DoD CBRN Data Model](#)
Represents a conceptual model of CBRN Battlespace relationships and common semantics and syntax. The model does not represent a canned software solution for system interoperability.
Entities: 446, **Attributes:** 3611, and **Relationships:** 1317

http://web-services.gov

1. Current SSHWG Knowledgebase

The screenshot shows a Windows Internet Explorer browser window displaying the IEEE 1451.5 draft standard page. The browser's address bar shows the URL: <http://web-services.gov/lpBin22/lpext.dll/Folder5/Infobase1/1?fn=main-j.htm&f=templates&2.0>. The browser's search bar contains the text "Google". The browser's toolbar includes buttons for "Go", "Bookmarks", "108 blocked", "Check", "AutoLink", "AutoFill", "Send to", and "Settings". The browser's address bar also shows "Site pop-ups allowed".

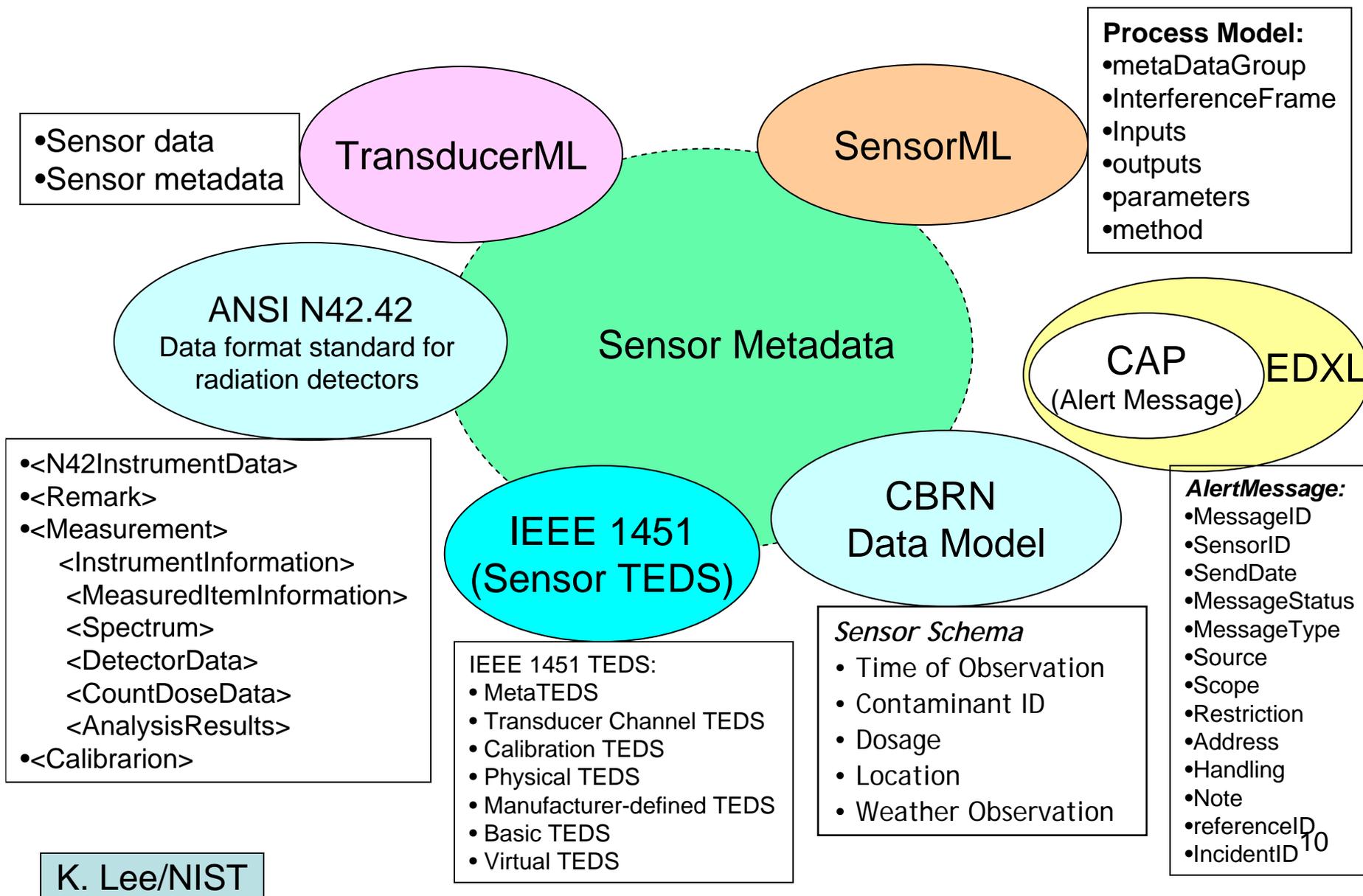
The page content is displayed in a yellow-themed layout. On the left side, there is a search bar with the text "Search:" and a "Go!" button. Below the search bar is a dropdown menu labeled "Select Search Form". The main content area is divided into two columns. The left column contains a table of contents for the document, with "IEEE 1451.5" selected. The right column contains the main text of the document, which includes the title "IEEE 1451.5 Draft Standard for a Smart Transducer Interface for Sensors and Actuators - Wireless Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats", the sponsor "IEEE P1451.5/D10.8", and the sponsor "Sponsored by the Technical Committee on Sensor Technology TC-9 of the IEEE Instrumentation and Measurement Society". The page also includes a "Contents" section with links to "Abstract", "Introduction", "Participants", "Patents", "1 Overview", "1.1 Scope", "1.2 Purpose", "1.3 Conformance", "2 Normative References", "3 Definitions, Acronyms and Abbreviations", "3.1 Acronyms and Abbreviations", "3.2 Definitions", "4 Data types", and "4.1 Unsigned octet integer".

<http://web-services.gov>

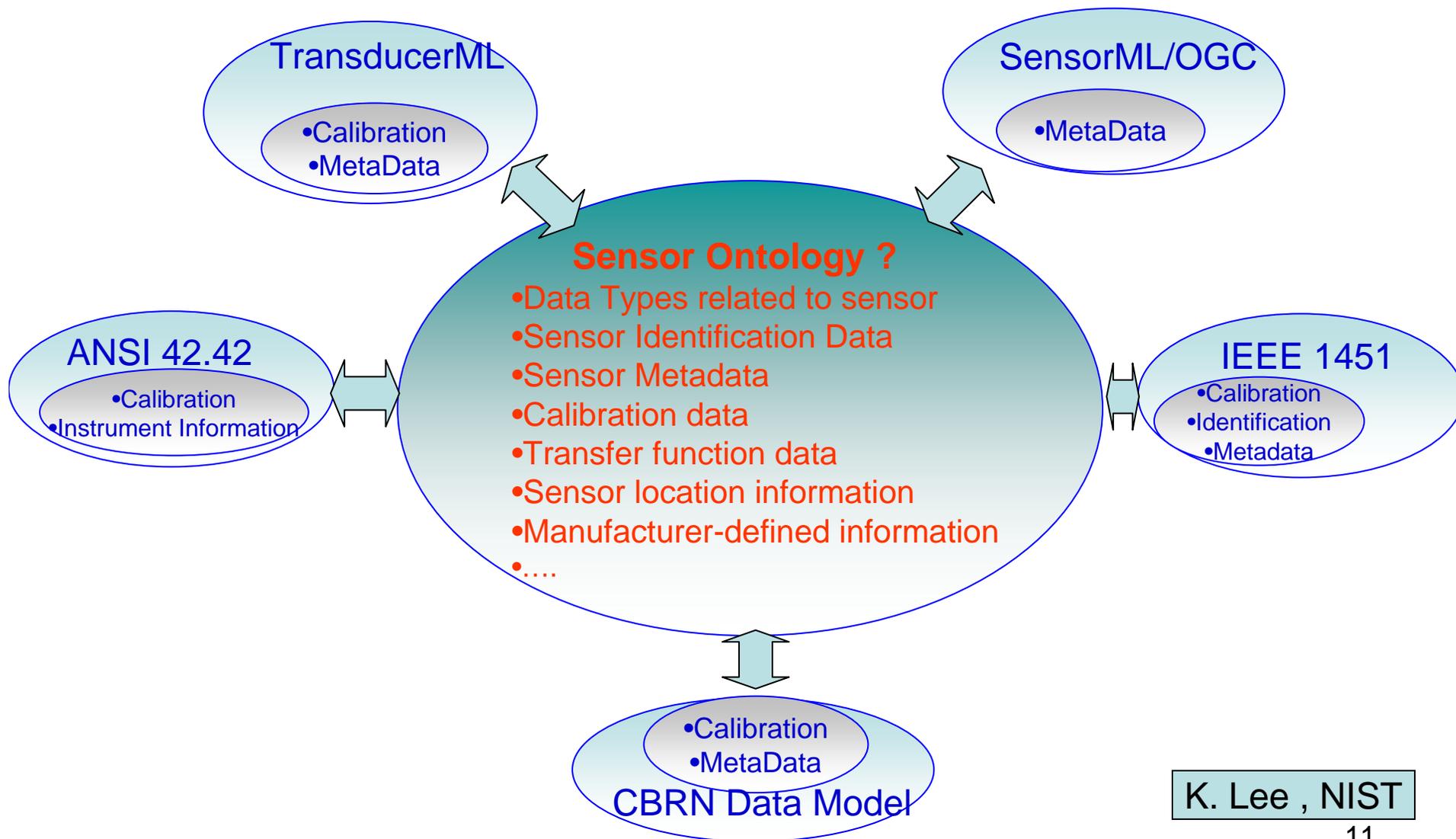
1. Current SSHWG Knowledgebase

- Sensor Standard Harmonization, Kang Lee, August 29, 2006:
 - Solution of Sensor Standard Harmonization-Slides 10-11:
 - The sensor standard harmonization is to **extract the common terminologies, properties used by many of the sensor standards, and create a common sensor data model** which could be a new standard to be developed or an existing sensor standard to be revised.
 - A common set of sensor terminology and sensor classification.
 - Common Properties or Characteristics of Sensors.
 - Extract common properties of sensors from the existed sensor standards.
 - Add additional information or specified information to sensor common data model.
 - Map and translate common sensor model to each of existed sensor standard.

Sensor Standards Harmonization



Sensor Standard Harmonization Using Ontology?



1. Current SSHWG Knowledgebase

- Harmonization Approaches:
 - Subject Index
 - Data Model (e.g. CBRN)
 - Basic Concepts from Upper Ontologies (e.g., time)
 - Commonality / Variability (i.e., what's in common and what's not)
 - Model (or Ontology) In Mind (i.e., Kang Lee)
 - Concept Map (e.g. Cmaps)

1. Current SSHWG Knowledgebase

The screenshot shows a web browser window titled "NextPage LivePublish - Windows Internet Explorer". The address bar shows a URL from "http://web-services.gov". The browser's search bar contains "Google". The main content area displays a "Subject Index" table with the following data:

Subject	IEEE 1451.5 (December 2006)	ANSI N42.42 (5/2/2006)	CAP V 1.1 (October 2005)	EDXL-DE 1.0 (May 2006)
Applications (also see Examples)	Purpose	Purpose	Applications	Applications
Document Object Model	None	Organization of an N42 File Containing a Spectrum and Analysis Results	Document Object Model	Document Object Model
Data Types	Data Types	Data types and enumerations		
Data Dictionary	Definitions	Definitions	Data Dictionary	Data Dictionary
Definitions	Definitions	Definitions	Structure of CAP Message	Structure of EDXL Distribution Element
Examples		Simple Spectrometer File Radionuclide Identifier File Gross Counting Portal Monitor	Homeland Security Advisory System Alert Severe Thunderstorm Warning Earthquake Report	EDXL-DE With CAP Payload EDXL-DE With Multiple Encrypted Payloads

The browser's left sidebar shows a tree view of the knowledgebase structure, with "Subject Index" highlighted. The browser's address bar and search bar are also visible.

Common Subject Index

1. Current SSHWG Knowledgebase

Welcome to the Web Site of **IHMC CmapTools** IHMC - A University Affiliated Research Institute

CmapTools knowledge modeling kit

The IHMC CmapTools software empowers users to construct, navigate, share, and criticize knowledge models represented as Concept Maps

Institute for Human and Machine Cognition (IHMC)

Support

Concept Maps

Documented

CmapTools Program

CmapServers

Downloaded

Software Toolkit

The Knowledge Model in this Web Site

1. Clicking on one of the icons under a Concept

2. Selecting one of the choices that is Displayed

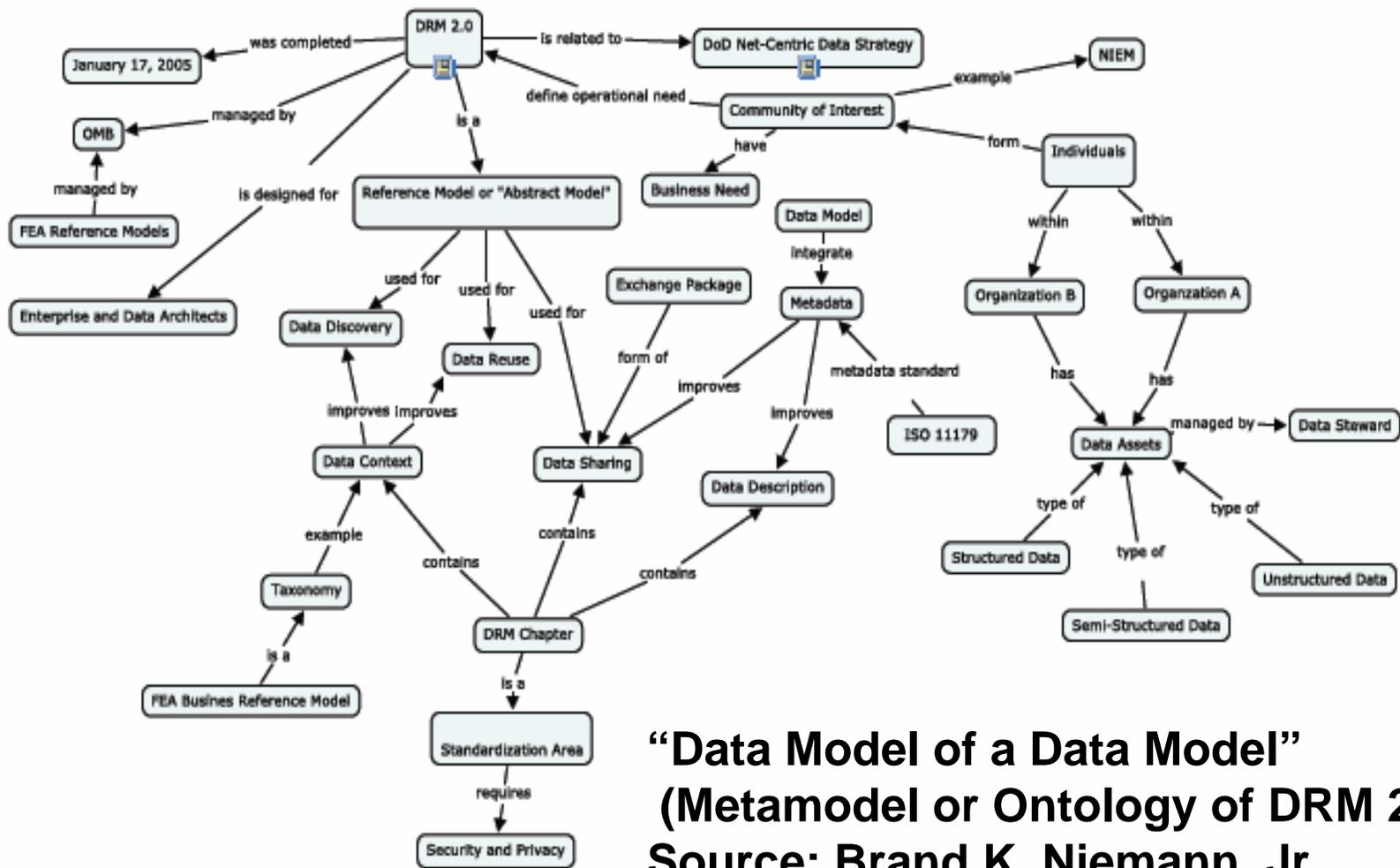
3. Open the Selected Concept Map, Image, Video, Web Page, etc

Relationships shown in the diagram:

- IHMC CmapTools was developed at Institute for Human and Machine Cognition (IHMC)
- IHMC CmapTools facilitates the manipulation of Concept Maps
- IHMC CmapTools is a Software Toolkit
- IHMC CmapTools was used to build The Knowledge Model in this Web Site
- Concept Maps are built using the CmapTools Program
- Documented is composed of CmapTools Program and CmapServers
- The Knowledge Model in this Web Site is navigated by 1. Clicking on one of the icons under a Concept
- 1. Clicking on one of the icons under a Concept and then 2. Selecting one of the choices that is Displayed
- 2. Selecting one of the choices that is Displayed will 3. Open the Selected Concept Map, Image, Video, Web Page, etc
- 1. Clicking on one of the icons under a Concept for example IHMC CmapTools
- 2. Selecting one of the choices that is Displayed for example IHMC CmapTools
- CmapTools Program can be Downloaded
- Institute for Human and Machine Cognition (IHMC) provides Support
- Software Toolkit runs on CmapServers
- Software Toolkit is Documented

<http://cmap.ihmc.us/>

1. Current SSHWG Knowledgebase



**“Data Model of a Data Model”
(Metamodel or Ontology of DRM 2.0)
Source: Brand K. Niemann, Jr.**

3.6 Concept Map

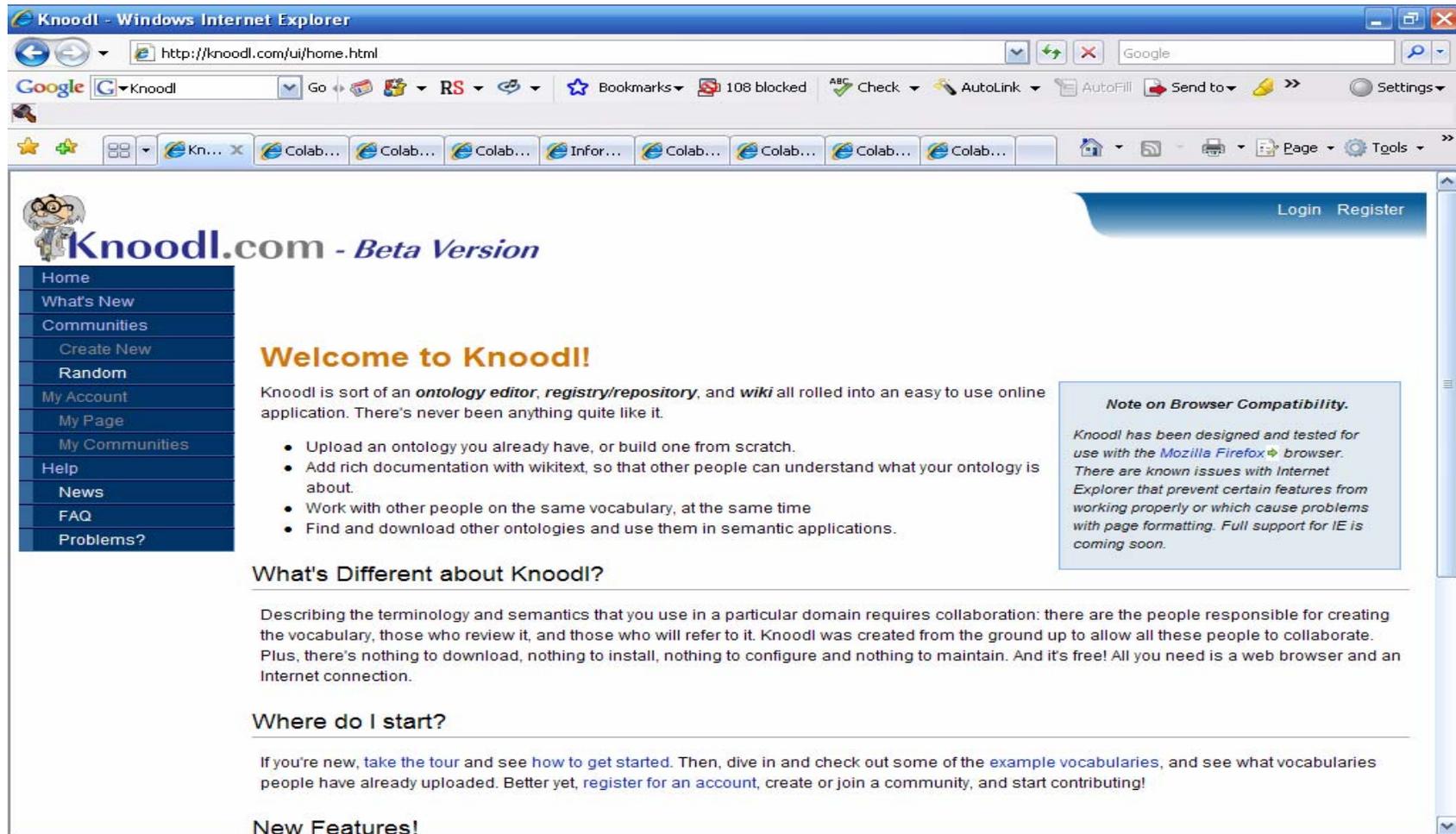
1. Current SSHWG Knowledgebase

- Use Cmaps:
 - <http://cmap.ihmc.us/>
- Output in Multiple File Formats:
 - PDF Version for Use in Document
 - SVG Version for Use on the Web
 - XML Version for Structure
 - OWL Version for Semantic Relationships
 - Simple Text Version
- Data Model for DRM 2.0:
 - See <http://colab.cim3.net/cgi-bin/wiki.pl?EPADataArchitectureforDRM2#nid3BEP>

1. Current SSHWG Knowledgebase

- So the result can be:
 - An sensor ontology built from the concepts in slide 11 which references the standards;
 - An interlinked interface like slide 13; and/or
 - A formal ontology information system using a tool like Cmaps (slide 14).
- Question: Is this what we are expecting and can use? (wait until sections 4 and 5)

2. Semantic Wikis



The screenshot shows a Windows Internet Explorer browser window displaying the Knoodl.com website. The browser's address bar shows the URL <http://knoodl.com/ui/home.html>. The website header includes the Knoodl logo and the text "Knoodl.com - Beta Version". A navigation menu on the left lists: Home, What's New, Communities, Create New, Random, My Account, My Page, My Communities, Help, News, FAQ, and Problems?. In the top right corner, there are links for "Login" and "Register". The main content area features a "Welcome to Knoodl!" heading, followed by a paragraph describing Knoodl as an ontology editor, registry/repository, and wiki. A bulleted list of features includes: uploading ontologies, adding documentation, collaborative work, and downloading ontologies. A "Note on Browser Compatibility" box states that Knoodl is designed for Mozilla Firefox and that there are known issues with Internet Explorer. Below this, sections titled "What's Different about Knoodl?", "Where do I start?", and "New Features!" are visible.

Knoodl.com - Beta Version

Login Register

Welcome to Knoodl!

Knoodl is sort of an *ontology editor*, *registry/repository*, and *wiki* all rolled into an easy to use online application. There's never been anything quite like it.

- Upload an ontology you already have, or build one from scratch.
- Add rich documentation with wikitext, so that other people can understand what your ontology is about.
- Work with other people on the same vocabulary, at the same time
- Find and download other ontologies and use them in semantic applications.

Note on Browser Compatibility.

Knoodl has been designed and tested for use with the Mozilla Firefox browser. There are known issues with Internet Explorer that prevent certain features from working properly or which cause problems with page formatting. Full support for IE is coming soon.

What's Different about Knoodl?

Describing the terminology and semantics that you use in a particular domain requires collaboration: there are the people responsible for creating the vocabulary, those who review it, and those who will refer to it. Knoodl was created from the ground up to allow all these people to collaborate. Plus, there's nothing to download, nothing to install, nothing to configure and nothing to maintain. And it's free! All you need is a web browser and an Internet connection.

Where do I start?

If you're new, [take the tour](#) and see [how to get started](#). Then, dive in and check out some of the [example vocabularies](#), and see what vocabularies people have already uploaded. Better yet, [register for an account](#), create or join a community, and start contributing!

New Features!

<http://knoodl.com/>

2. Semantic Wikis

The screenshot shows a Windows Internet Explorer browser window displaying a Semantic Wiki page. The browser's address bar shows the URL: <http://www.visualknowledge.com/wikikey/A8953959062800>. The page title is "VKWiki NEW Concept Details".

The main content area features a navigation menu with tabs for "Concept", "Edit", "About", "Issues", "Discussion", and "History". The current page is titled "Net-Ready Sensor Standards Harmonization". Below the title, it indicates the page type is "Community" and was last edited on December 11, 2006, at 20:10:03.000. The page content includes a section titled "Pilot Project Using DRM 2.0 and the VK Test Semantic Wiki" and a list of items:

- 1. Presentation
- 2. Demonstration
- 3. Semantic Wiki Pilot Framework:
 - a. Demonstrate compliance of Sensor-1 with Standard-A
 - b. Demonstrate design of new Sensor-2 that complies with a harmonized standard (e.g. Standard-A, Standard-B, and Standard-C).
 - c. Demonstrate that Sensors-1, 2 & 3 are interoperable with one another in a real world application.
- 4. Next Meeting is February 27, 2007

Below the list, there is a date "September 20, 2006" and a section titled "Background" with the text: "Invited to participate in the August 2-3, 2006, Summer Workshop on Net-Ready Sensors: The Way Forward".

The left sidebar contains a search box, navigation views (Main, History, Cloud), and a list of links: Home, RecentChanges, Models, People, Documents, Events, News, and Help.

The browser's status bar at the bottom shows "Done" and "Internet" with a zoom level of 100%.

<http://vkwiki.visualknowledge.com/wiki/sensors>

3. SICoP

- CIOC Strategic Plan FY 2007-2009. Pages 10-11 Re Goal 2: Information securely, rapidly, and reliably delivered to our stakeholders:
 - Provide updates to the FEA Data Reference Model (DRM) and establish DRM implementation strategies, best practices, and success stories. The purpose of these activities is to contribute to the usability of the DRM by maintaining an effective process for modifying the DRM and sharing strategies for success.



Source: Pages 21-22, Federal Chief Information Officer Council Strategic Plan: FY 2007-2009, 28 pp. <http://www.cio.gov/documents/CIOCouncilStrategicPlan2007-2009.pdf>

3. Highlights of SICoP Special Conference, February 6, 2007

- Building DRM 3.0 and Web 3.0 for Managing Context Across Multiple Documents and Organizations:
 - Therefore it is possible to unify the Data Description and Data Contents by creating an **intelligent *Directory Interchange Format*** type structure which will be used to build a knowledge base. **This would be the model in the DRM 3.0.**
 - This is Web 3.0 Technology because it reasons about content and adds it.
 - Source: Lucian Russell, DRM 2.0 Author – see slides 6-7.

DRM 2.0 Reference Model

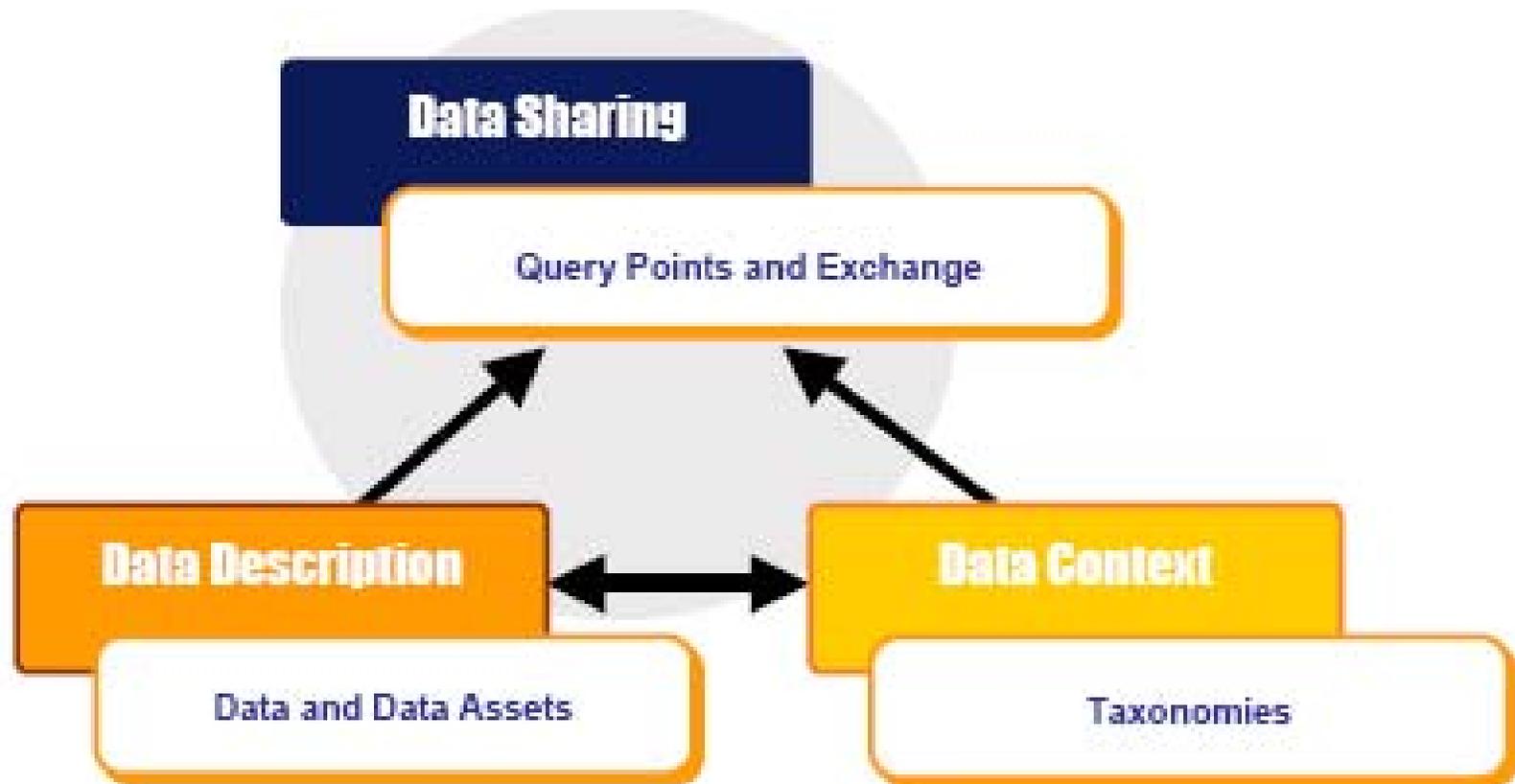


Figure 2-1 DRM Standardization Areas

Data Reference Model 3.0, Web 3.0 & SOAs

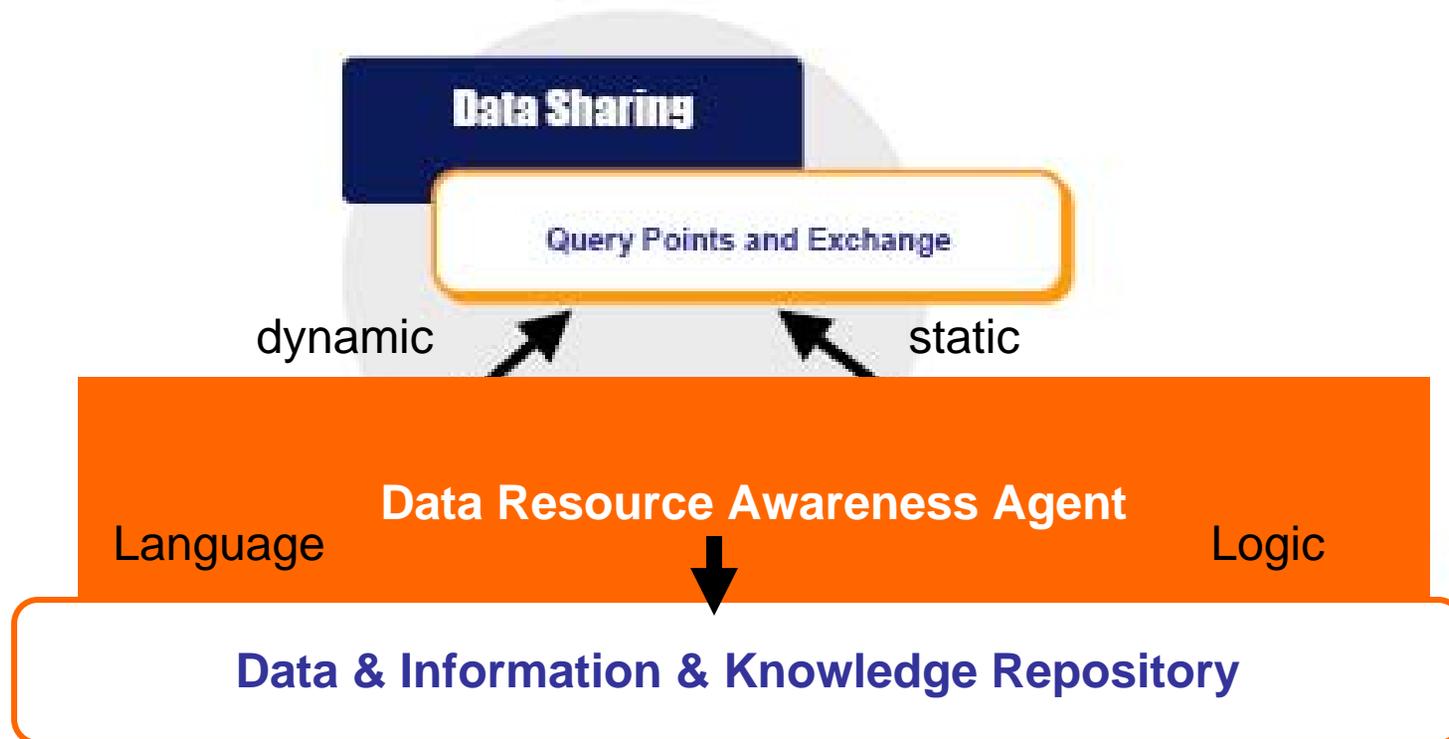


Figure 3-1 DRM standardization Areas

3. Highlights of SICoP Special Conference, February 6, 2007

- Tools for Semantic Data Modeling (WordNet).
- Tools for Building WordNets of Documents (Semantic Wikis).
 - Work with knowledge in three forms: documents, models, and software behaviors.
- Tools to Extract Semantic Relationships from Unstructured Text and Build Ontologies (Language Computer Corporation).
- Tools to Reason Over Knowledgebases (CYCORP).
- Conference Captured as a “best practice” by the CIOC Best Practices Committee.

4. Key Questions

- What should be the next standard (s) to add to the knowledgebase?
 - SensorML and TransducerML
 - Others like CAP and EDXL-DE?
- Who would like to volunteer to participate in a virtual harmonization meeting?
 - WebEx of Semantic Wiki like for NCOIC, February 6th Conference, etc.
- Define collectively what harmonization means, e.g. that we have the universal core of elements across all the standards, that we have a new standard with the mapped elements, etc.?

5. Some Next Steps

- Select the next standard (s) to include in the knowledgebase.
- Schedule a virtual harmonization meeting.
- Report at the March 29-30, 2007, NCOIC Meeting Session on Net-Centric Operations 2.0 (sensors, mobile platforms, devices)
 - <http://colab.cim3.net/cgi-bin/wiki.pl?SOACoPDemo3>

5. Some Next Steps

- Continue work on the multiple harmonization approaches.
- Build the Concept Map.
- Implement Five Steps for SSHWG CoP:
 - CoP Mission Statement
 - CoP Membership List
 - CoP Strategy
 - Training Conference Call (with items 1-3 entered into the Semantic Wiki space)
 - Commitments to collaboratively publish and edit trusted reference knowledge sources in the Semantic Wiki space.

5. Some Next Steps

Need help with populating this matrix

	Std-A	Std-B	Std-C
Sensor-1			
Sensor-2			
Sensor-3			

The diagram illustrates a data flow from three standard conditions (Std-A, Std-B, Std-C) to three sensors (Sensor-1, Sensor-2, Sensor-3). Arrows indicate the following connections: Std-A to Sensor-1 (labeled 1), Std-B to Sensor-2 (labeled 2), and Std-C to Sensor-2 (labeled 3). A large circle encloses the matrix.

See next slide for explanation

5. Some Next Steps

- Semantic Wiki Pilot Framework:
 - 1 – Demonstrate compliance of Sensor-1 with Standard-A
 - 2 – Demonstrate design of new Sensor-2 that complies with a harmonized standard (e.g. Standard-A, Standard-B, and Standard-C).
 - 3 – Demonstrate that Sensors-1, 2 & 3 are interoperable with one another in a real world application.