

# Region 4 Semantic Technologies Pilot: Update

Brand Niemann

Chair, Semantic Interoperability Community of Practice (SICoP)  
Best Practices Committee (BPC), CIO Council, and  
Enterprise Architecture Team, Office of Environmental Information  
U.S. Environmental Protection Agency  
June 9, 2005 (Updated June 20, 2005)

# List of Demonstrations

- Phase I:
  - Demonstration Available on Secure Internal Oracle Server by Invitation.
  - <http://www.logidexassetcenter.com/assetcenter.jsp>.
- Phase II:
  - <http://web-services.gov>, Dynamic Knowledge Repository.
- Phase III:
  - Demonstration available through Richard Hammond, EPA Region 4 and their contractors.
- Phase IV:
  - <http://web-services.gov>, Dynamic Knowledge Repository.
- Phase V:
  - <http://www.georesponse.com> and by arrangement with the Broadstrokes Group.
- Phase VI:
  - Just begun with Oracle 10.2 at the First DRM Public Forum, June 13<sup>th</sup>.

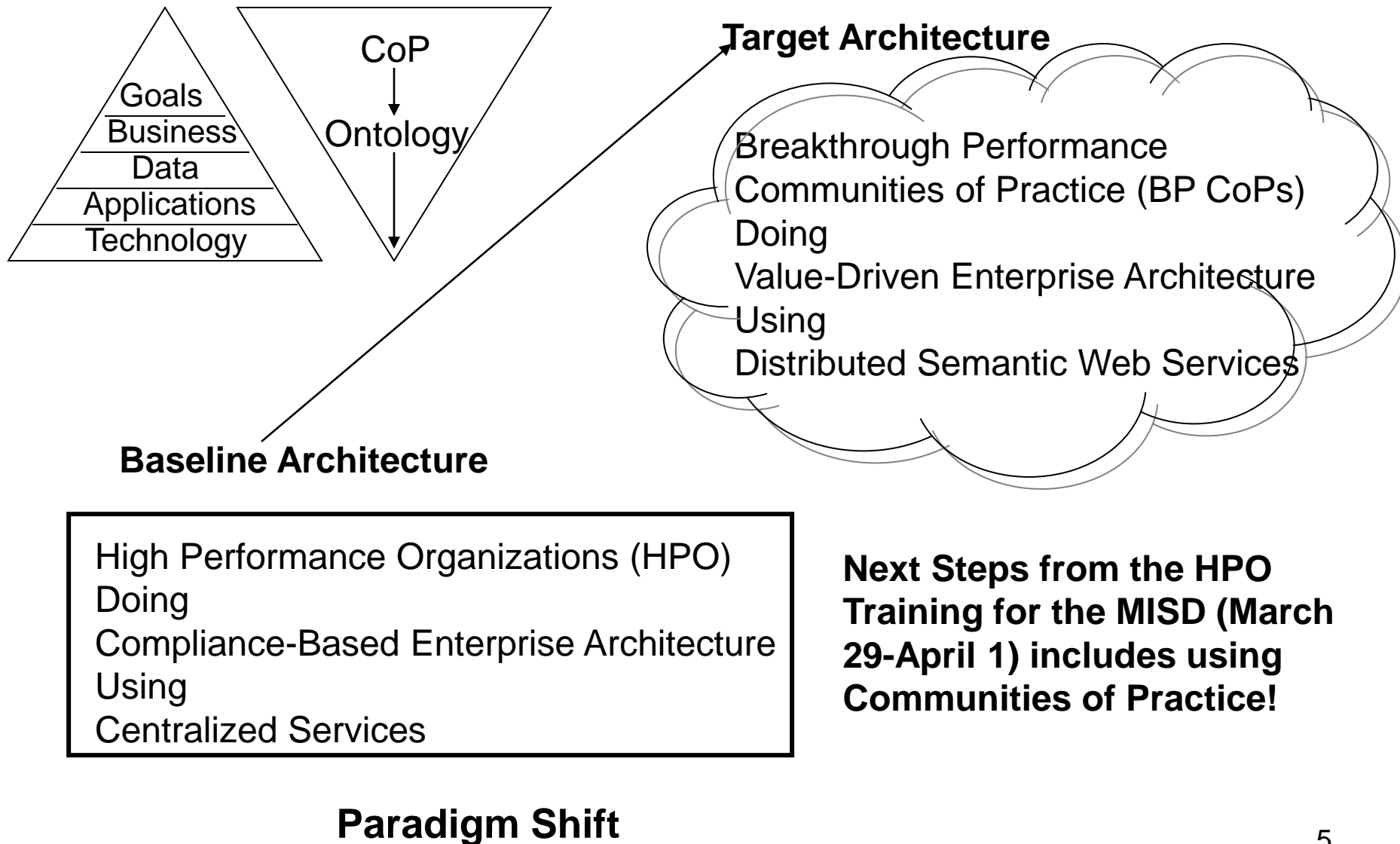
# Overview

- 1. Background
- 2. Phases
- 3. Some Next Steps
- Appendix – Region 4 Pilot History

# 1. Background

- My Roles:
  - 1. Member of the Enterprise Architecture Team, OTOP's Mission Investment Solution Division (MISD) (see next slide):
    - John Sullivan, Chief Architect.
  - 2. Support the OEI Portal Project:
    - Mike Cullen, Project Manager.
  - 3. Serve the Federal Chief Information Officer Council (CIO) as Chair, Semantic Interoperability Community of Practice (SICoP) of the Best Practices Committee (BPC), and as Member of the Emerging Technology Subcommittee of the Architecture and Infrastructure Committee:
    - David Wennergren, Navy CIO, and Charles Havekost, HHS CIO, Co-Chairs, and Kim Nelson, EPA CIO, and Ren Cahoon, NARA, CIO, Co-Chairs, respectively.

# 1. Background



# 1. Background

- Kent Greenes who is considered to be an unparalleled CoP practitioner, says:
  - "An idea that emerged earlier this year in a conversation I had with the CompanyCommand team is that conversation, content, and context need to be tightly coupled and integrated. They feed off each other. You create content from meaningful conversation. Content attracts more people. The people engage in more conversation, often about existing content, generating more context and new content. The most powerful use of content is to spark more informed conversations, because that is what gets people actually transferring knowledge so they can use it right now."

Source: Knowledge Management Conference, April 20-22, 2005, Leveraging Knowledge and Experience for High Performance, Opening Keynote.

# 1. Background

- Requested by:
  - CIO Council's Best Practices Committee, Knowledge Management Working Group, April 2004 (Phase I):
    - Chartered SCoP to conduct Semantic Interoperability Pilot Projects Using "Open Collaboration with Open Standards" Like OASIS's Web Services for Remote Portlets (WSRP).
  - Wandal Johnson, August 2004, and February 17, 2005 (Phase I):
    - Director of OTOP's Mission Investment Solution Division (MISD) (on 120-day detail as Acting Deputy Assistant Regional Administrator for Human Capital and Resource Management, EPA Region 4) to Support Region 4 Baseline Enterprise Architecture Assessment and the OEI Portal Project.
  - Kelly Sisario, December 1, 2004 (Phase I and Requested Phase II):
    - Staff to the Assistant Regional Administrator for Human Capital and Resource Management, EPA Region 4, to Support Need for **Solutions Architecture for Information Management** Beyond the Baseline Enterprise Architecture Assessment Work.
  - Russ Wright, February 23, 2005 (Phases I & II & Requested Phase III):
    - Deputy Assistant Regional Administrator for Human Capital and Resource Management, EPA Region 4, **Who Wanted Me to Come to Work for Him on This He Liked It So Much!**

# 1. Background

- Requested by (continued):
  - Kim Nelson, March 2, 2005 (Phases I and II):
    - Assistant Administrator, Office of Environmental Information and CIO, U.S. EPA, for OEI Board of Directors Meeting on Suggestions for the 2005 Data Agenda.
  - Richard Hammond, March 3, 2005 (Phase III):
    - Six-month Detail from EPA Region 4 to OSWER That Produced a Graphical Interface-Knowledge Management Application of Considerable Interest to the National Infrastructure for Community Statistics (NICS) CoP, and a member of the NICS CoP, the National Association of Regional Councils (NARC).
  - Nancy Wentworth, April 4, 2005 (Phase IV):
    - Director, Information Analysis Division, OEI, for Environmental Indicators/State of the Environment Reporting Team Was Intrigued by the Ontology Approach and Regional and Local Indicators.
  - SCoP and the DoD DARPA DAML Program for the Semantic Web Applications for National Security Conference, April 7-8, 2005 (Phase V):
    - The Broadstrokes Group of five vendors was one of 40 vendors selected for the Trade Show requiring RDF/OWL applications.



# 1. Background

- Semantics – not new
- Web – not new
- Semantic Web – putting semantics on the Web is new:
  - Sir Tim Berners-Lee:
    - "The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation."
    - "A new form of web content that is meaningful to computers [that] will unleash a revolution of new possibilities."
    - "OWL is an important step for making data on the Web more machine processable and reusable across applications."
- Just as databases tables are connected through "joins", multiple distributed information representations can be strung together through "semantic joins."
  - Lee Lacy, OWL – Representing Information Using the Web Ontology Language, Trafford, 2005, 282 pages.
    - See <http://www.trafford.com/robots/04-1276.html>

# 1. Background

- Sir Tim Berners-Lee at the SWANS Conference, April 7, 2005, on the Government Role:
  - Making public data available in standard Semantic Web formats.
  - Requiring funded data to be available in Semantic Web formats
  - Encouraging flagship applications.
  - Supporting Web Science research for advanced tools.
- Substance of the Semantic Web, Deborah McGuinness, Stanford and Mike Dean, BBN, at the SWANS Conference, April 7, 2005, on the Selected Technical Benefits:
  - 1. Integrating Multiple Data Sources
  - 2. Semantic Drill Down / Focused Perusal
  - 3. Statements about Statements
  - 4. Inference
  - 5. Translation
  - 6. Smart (Focused) Search
  - 7. Smarter Search ... Configuration
  - 8. Proof and Trust

{	OWL-S Profile		UDDI			ebXML Registries	Discovery
	SWSL					ebXML CPA	Contracts and agreements
	OWL-S Process Model		BPEL4WS		BPML		Process and workflow orchestrations
	SWSL (?)		WS-AtomicTransaction and WS-BusinessActivity		BTP		QoS: Transactions
	OWL-S Process Model		WS-Reliable Messaging	WS-Coordination	WSCI	ebXML BPSS	QoS: Choreography
	OWL-S Grounding		WS-Security	WSCL			QoS: Conversations
	OWL	PSL	WS-Policy	WSDL		ebXML CPP	QoS: Service descriptions and bindings
	RDF	SOAP				ebXML messaging	Messaging
	XML, DTD, and XML Schema						Encoding
	HTTP, FTP, SMTP, SIP, etc.						Transport

## SWS: towards an expressive, comprehensive, unified framework for reasoning about services

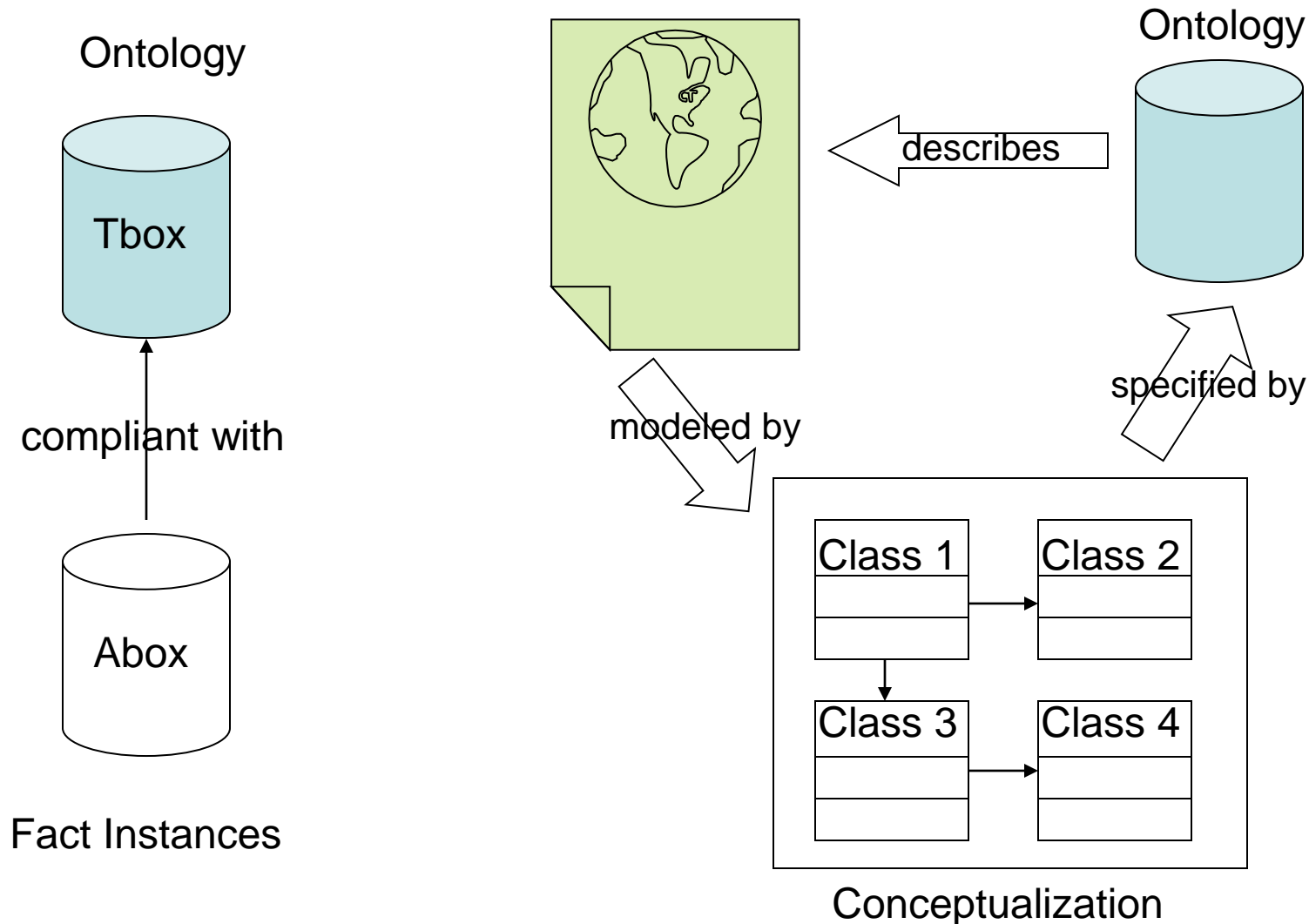
Derived From M. Singh and M. Huhns: *Service-Oriented Computing: Semantics, Processes, Agents*

# 1. Background

## Ontologies – Enablers of the Semantic Web

### Computer Science

### Gruber Ontology Definition

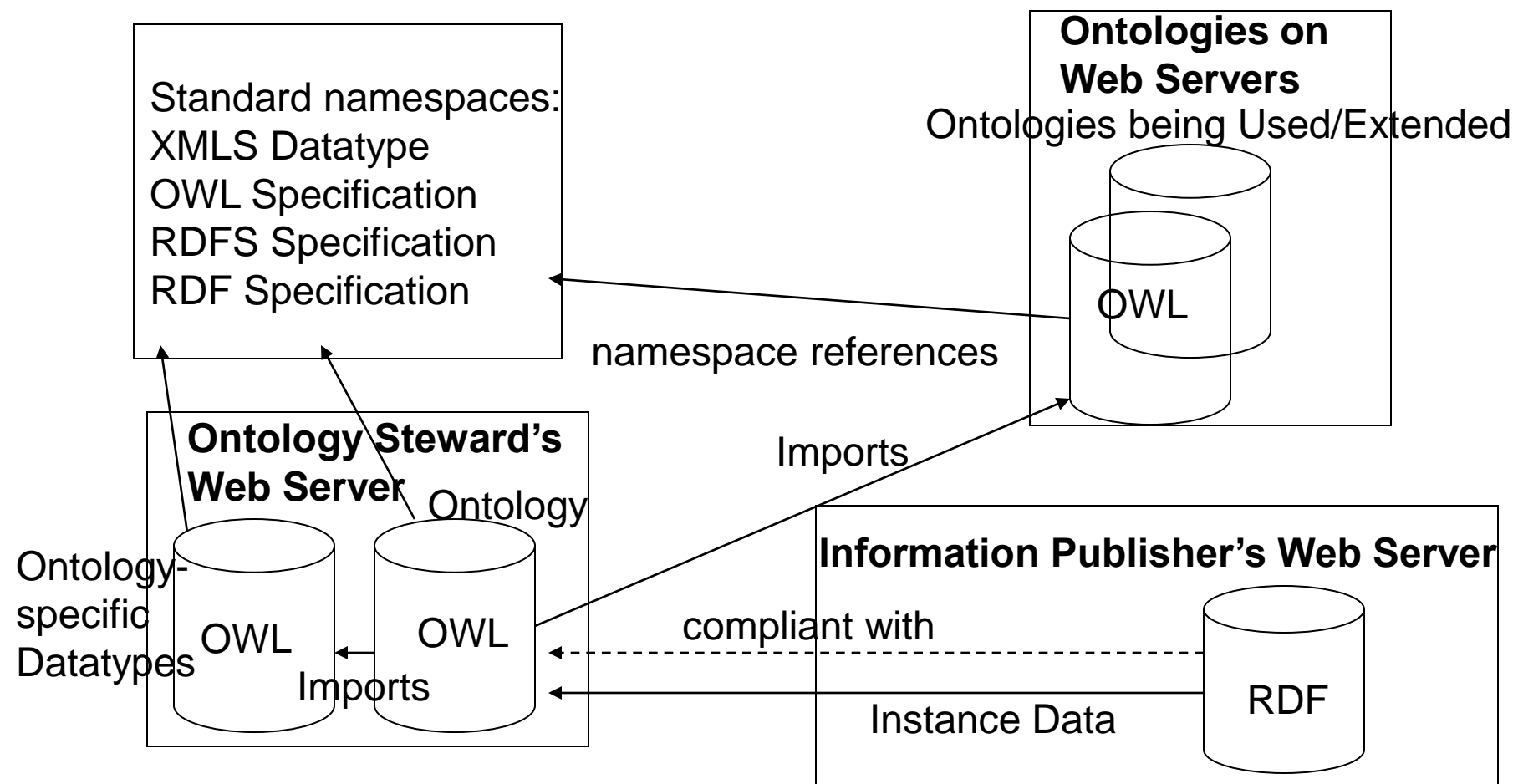


# 1. Background

- Ontologies – Enablers of the Semantic Web:
  - Computer Science:
    - Tbox vocabularies define concepts that have associated Abox facts that represent a knowledgebase.
  - Thomas Gruber:
    - An ontology is a “formal specification of a conceptualization.”
  - Deborah McGuinness:
    - A continuum of ontology formalisms.
  - Web Ontology Language (OWL):
    - An OWL-encoded web-distributed vocabulary of declarative formalisms describing a model of a domain.
      - So focuses on Tbox part and extends Gruber’s definition.

# 1. Background

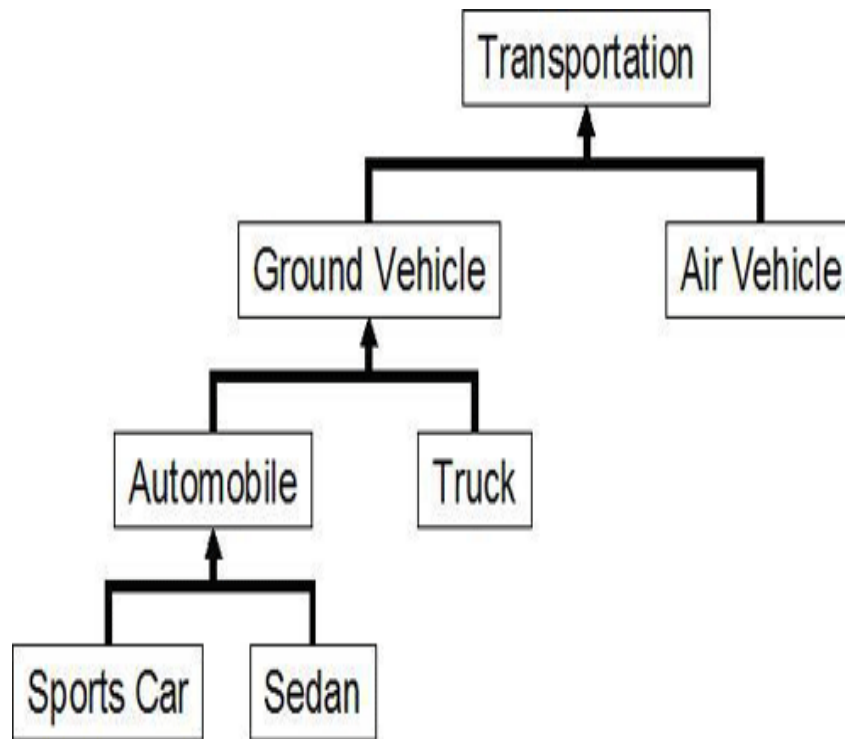
## Ontologies – Enablers of the Semantic Web



Source: Lee Lacy, OWL – Representing Information Using the Web  
Ontology Language, Trafford, 2005, page 144.

# 1. Background

## Transportation Class Hierarchy



OWL Listing:

```
<?xml version="1.0"?> <rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:daml="http://www.daml.org/2001/03/daml+oil#"
  xmlns="http://www.owl-ontologies.com/unnamed.owl#"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xml:base="http://www.owl-ontologies.com/unnamed.owl"> <owl:Ontology
  rdf:about=""/> <owl:Class
  rdf:ID="Transportation"/> <owl:Class
  rdf:ID="AirVehicle"> <rdfs:subClassOf
  rdf:resource="#Transportation"/> </owl:Class>
<owl:Class rdf:about="#GroundVehicle">
<rdfs:subClassOf
  rdf:resource="#Transportation"/> </owl:Class>
<owl:Class rdf:about="#Automobile">
<rdfs:subClassOf> <owl:Class
  rdf:ID="GroundVehicle"/> </rdfs:subClassOf>
Etc.
```

Source: Formal Taxonomies for the U.S. Government, Michael Daconta, Metadata Program Manager, US Department of Homeland Security, XML.Com, <http://www.xml.com/pub/a/2005/01/26/formtax.html>

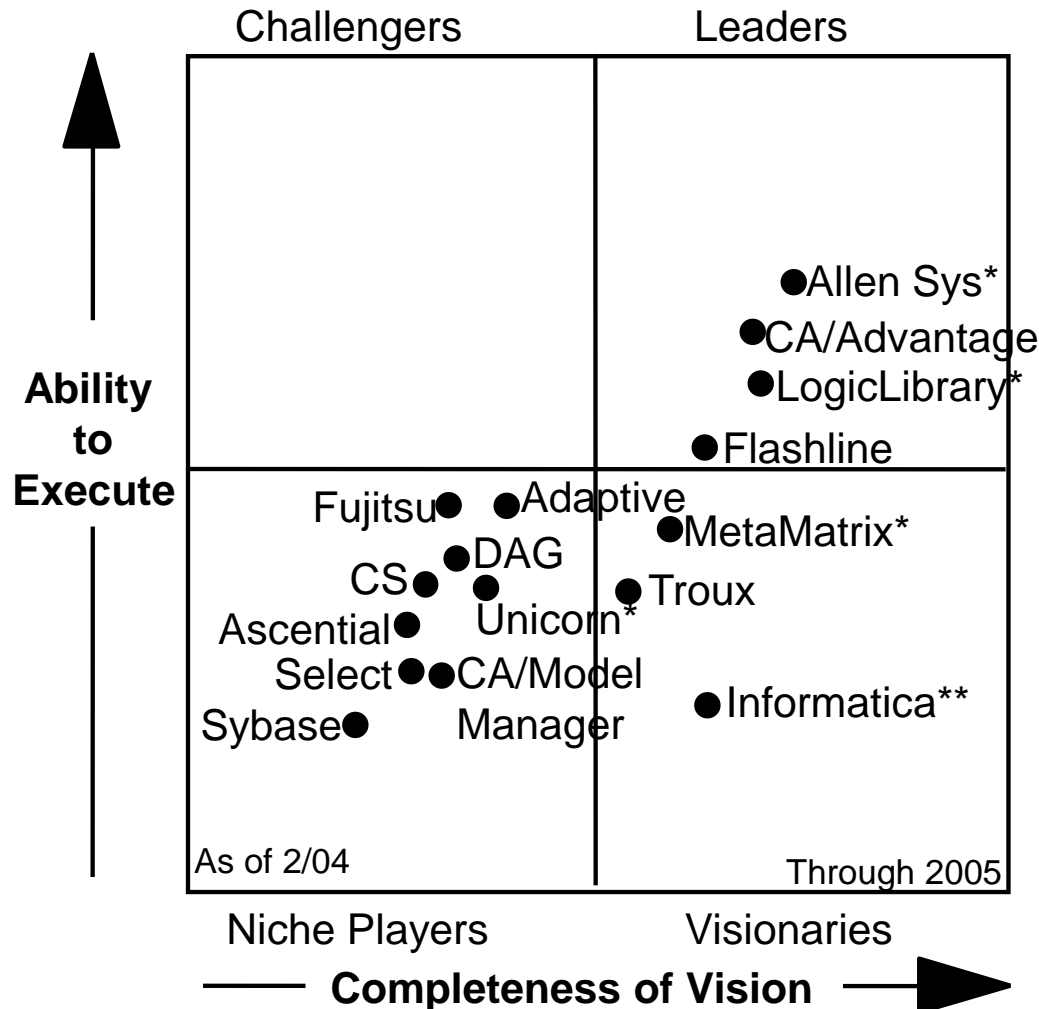
# 1. Current Ontology for Region 4 Pilot

Current Ontology(new in bold)	Initial Instances	Next Instance (s)
Enterprise Architecture & <b>Planning</b>	<ul style="list-style-type: none"> <li>• Business and Technology Infrastructure Baseline Assessment (11/16/2004)</li> <li>• 2004 Strategic Plan</li> <li>• National Association of Regional Councils</li> </ul>	Federated Repository (See LogicLibrary Pilot at <a href="http://www.logidexassetcenter.com/assetcenter.jsp">http://www.logidexassetcenter.com/assetcenter.jsp</a> )
Environmental <b>Science</b> & Indicators	<ul style="list-style-type: none"> <li>• EPA Science Forum 2004: Healthy Communities and Ecosystems</li> <li>• State of Florida Bay Water Quality, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Southeastern Ecological Framework-<b>GeoBook</b> on the Web</li> <li>• <b>State of Region 4 Report</b></li> <li>• Local Indicator Data Reports and Systems.</li> </ul>
Exchange Network	<ul style="list-style-type: none"> <li>• Web Services for Remote Portlets (WSRP) Whitepaper, 2003</li> <li>• Building Enterprise Architecture through Web Services for Remote Portlets (WSRP) in a Sample EPA Regional Portal</li> </ul>	<ul style="list-style-type: none"> <li>• Add use of Common Alerting Protocol (<b>CAP</b>)</li> <li>• European Interoperability Framework – Public Services Broker-ReachServices <a href="http://www.reach.ie">http://www.reach.ie</a></li> </ul>
<b>Everyday</b> & Emergency Operations	<ul style="list-style-type: none"> <li>• EPA Region 4 Press Releases 2004</li> <li>• Emergency Operations Database (1/6/2005)</li> </ul>	<ul style="list-style-type: none"> <li>• GeoResponse.com (Train Derailment Scenario - <b>Emergency Response Architecture</b>)</li> </ul>



# 1. Background

## Gartner Magic Quadrant 2004 for Metadata Tools



**\*DHS MCOE  
Vendor Proof  
of Concept  
for Metadata  
Repository  
Selection**

**\*\*ETL Tool Used by  
EPA for Data Marts**

*Note: For 2005  
CA is removed  
from the Leader  
Quadrant.*

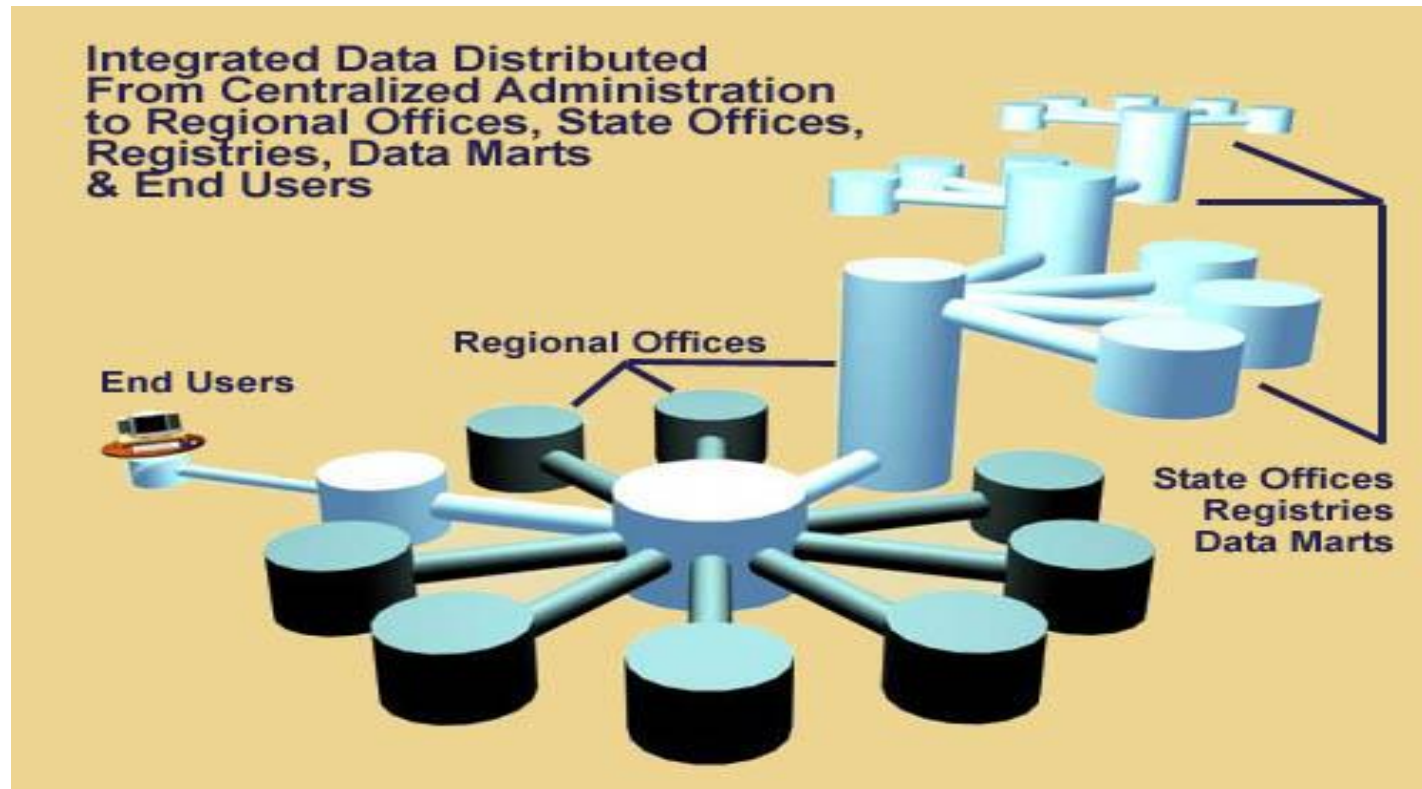
# 1. Background

- **Extract, Transform, and Load Tool:**
  - Integrates data from multiple program office systems into a set of integrated data marts that are optimized for reporting cross-media information (see <http://pmo.sra.com>).
- **Unblock the data clog: Most common integration options and their strengths and weaknesses** (see <http://fcw.com/article88578-04-18-05-Print>):
  - **Extract, transform, and load** – expensive and only for structured data, but benefits can outweigh costs and is preferred method for building data warehouses.
  - **Enterprise information integration** – requires less data movement of data than ETL and far less data transformation, but requires close attention to data modeling and metadata management.
  - **Database replication** – popular with geographically dispersed organizations and standard feature in modern databases, but doesn't work well with across different vendors and massive databases.
  - **Web Services and data services** – Uses Web Services Standards and a data integration layer in the Service-Oriented Architecture (SOA), but requires semantic mapping (ontology) between the various data services and security to operate outside the firewall.
  - **Hardware-based integration** – Estimated to be one-fifth the cost of software-based approaches and works well with simple applications and interfaces, but not good for situations with many manual processes that require custom coding.
- **Comment:**
  - EPA is using ETL, but concerns about the expense, limitation to just structured data, and lack of interoperability with other data sharing organizations.

## 2. Phases

Phase	Focus	Standards	Community of Practice	Comments
I	Workplace Portal & Asset Reuse	OASIS WSRP, Web Services, etc.	Oracle, Starbourne, LogicLibrary, & Noblestar	Presented to CIO Council Committees & Participants
II	Ontology-driven Information Management	W3C, etc.	Brand Niemann, etc.	Demos to Russ Wright and OEI Board of Directors!
III	Watershed Knowledge Management	W3C (SVG and XML)	Richard Hammond, NARC, etc.	Demos
IV	Enterprise Search on Distributed Content	W3C, etc.	Brand Niemann, etc.	Supports NICS & KNII Need for SOE/Indicators Data Engine
V	Emergency Response	W3C, Composite Application, etc.	Broadstrokes Group	Featured at SWANS Conference

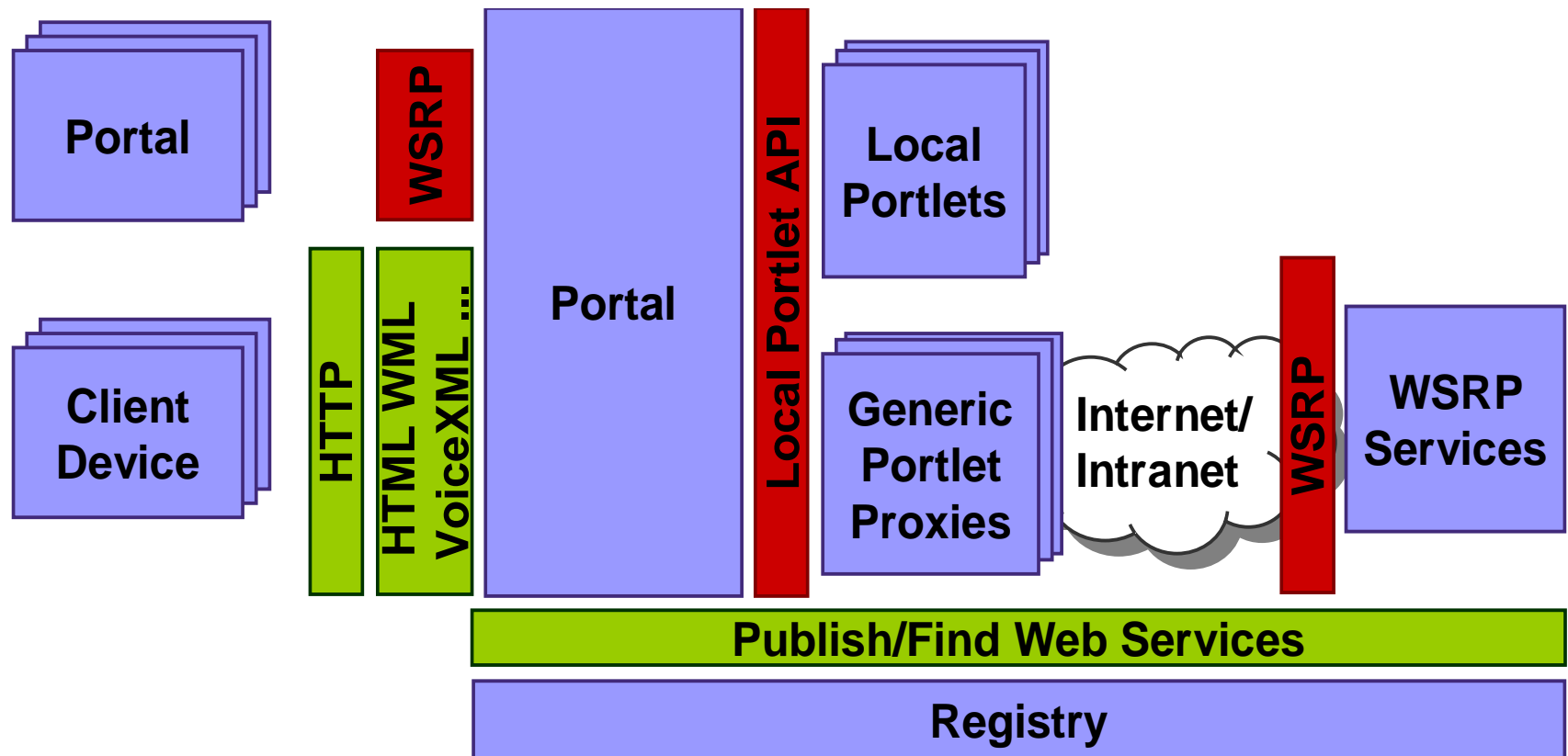
## 2. Phase 1: Workplace Portal & Asset Reuse



Source: Building Enterprise Architecture through Web Services for Remote Portlets (WSRP) in a Sample EPA Regional Portal, Rex Brooks, OASIS, and Ali Naizi, Oracle, October 19 and 25, 2004.

## 2. Phase 1: Workplace Portal & Asset Reuse

### OASIS Web Services for Remote Portlets



OASIS Web Services for Remote Portals Web Site: <http://oasis-open.org/committees/wsrp>

## 2. Phase 1: Workplace Portal & Asset Reuse

### Oracle 10g Demonstration Shows WSRP Producer-Consumer-User Roles



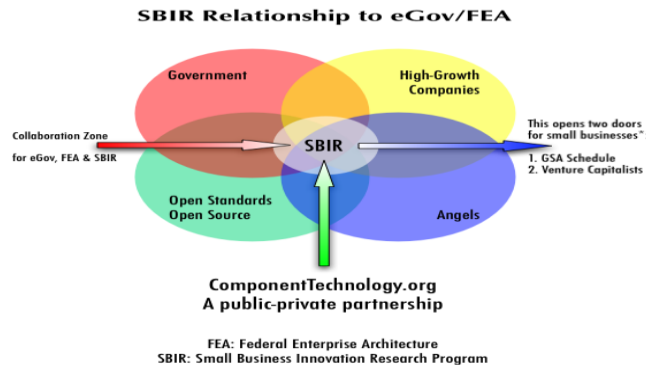
Demonstration Available on Secure Internal Oracle Server by Invitation

## 2. Phase 1: Workplace Portal & Asset Reuse

Componenttechnology.org

*Special Recognition for “Break Through” Performance*  
Presented at the Fifth Quarterly Emerging Technology  
Components Conference, October 25, 2004, MITRE, McLean, VA.

The **Starbourne Communications Design/Oracle Team**, A Partnership of Two Successful Businesses with Commercialization & Profitability of Products & Services, That Saw The Potential for Collaboration Between a New OASIS Standard (WSRP) and a New Oracle Release (10g) and Acted Decisively to Deliver the Web Services for Remote Portlets (WSRP) Pilot Portal for the US EPA and Others in Both Powerful Graphics and Software: Rex Brooks, Starbourne Communications Design, and Ali Naizi, Oracle, with support from Russ Ruggerio and Ranjeeth Kumar Thunga.



\* Meets Competition and Contractual Requirements in SBIR Phase I and II allowing for sole-source contracts and pre-vetted Venture Capital Support in Phase III

### Presentations and Milestones on:

October 19, 2004, Collaborative Expedition Workshop #36 at NSF, Building Enterprise Architecture through Web Services for Remote Portlets (WSRP) in Sample EPA Regional Portal.

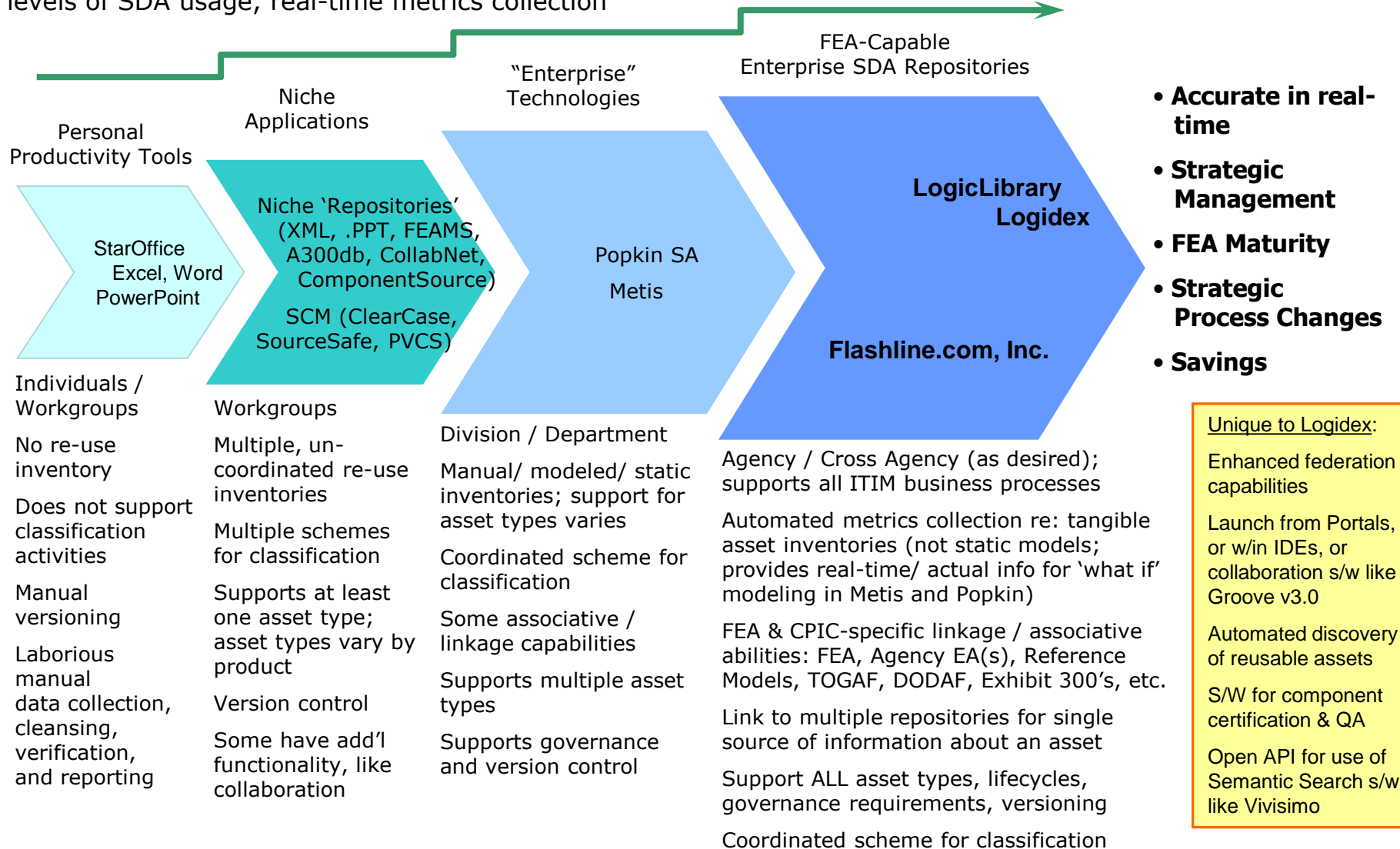
September 20, 2004, Enterprise Architecture and Service-Oriented Architecture: Fad of Foundation? and March 24, 2004, Synergy Between Emerging Technologies and EII.

December 9, 2003, Collaboration Expedition Workshop #30, How can Human Markup Language advance social needs understanding by intergovernmental process teams as they determine how to support multi-jurisdictional users and their increasingly interdependent tasks? Incubating New Kinds of Collaborations through Emerging XML/RDF Technologies: Proof of Concept for Public Healthcare Preparedness Portal for the New York Academy of Medicine using the Common Alerting Protocol, Rex Brooks, Co-chair, OASIS Human Markup Technical Committee.

# 2. Phase 1: Workplace Portal & Asset Reuse

## Federated Repository Pilot

Increasing levels of support for the strategic management of ITIM initiatives; automating all levels of SDA usage, real-time metrics collection



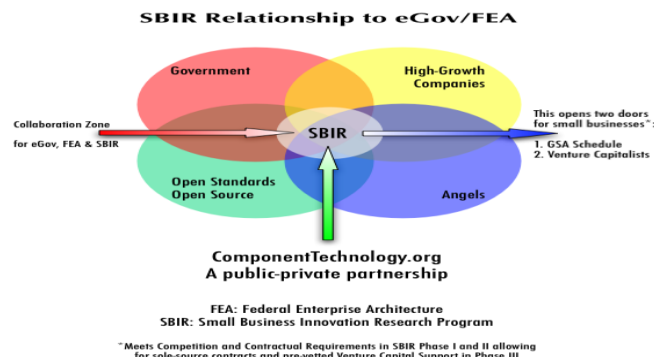


## 2. Phase 1: Workplace Portal & Asset Reuse

Componenttechnology.org

*Special Recognition for “Break Through” Performance*  
Presented at the Fifth Quarterly Emerging Technology  
Components Conference, October 25, 2004, MITRE, McLean, VA.

The **Noblestar/LogicLibrary Team**, A Partnership of Two Successful Businesses with Commercialization and Profitability of Products and Services, That Delivered the Federated Repositories FEA-Compliant Reference Models Web Site Launched with Nearly 200 High-Quality Components Using the Logidex Asset Center: Jana Crowder, Ai Metrix (formerly with Noblestar) and Steve Oesterle and Brent Carlson, Logic Library with support from Kenny Lew and Ursula Karber, Noblestar, and Don Imhoff and Martha Sherman, Logic Library.



### **Presentations and Milestones on:**

September 16, 2004, Federated Repositories FEA-Compliant Reference Models Web Site Launched with Nearly 200 High-Quality Components Using Logidex Asset Center (follows more a "push model" than the "pull model" of Core.Gov).

August 16, 2004, Demonstration of Support for Multiple Roles in the Federated Repositories Pilot by Noblestar and LogicLibrary to EPA Senior Managers.

May 11, 2004, Collaboration Expedition Workshop #32 in Cooperation with Componenttechnology.Org, at NSF, Panel Moderator for Advances in Software Components Management and LogicLibrary Demo and Case Study.

March 23, 2004, at FOSE, The Federated Repository: Revolutionizing Management, Collaboration, & Reporting (Vendor Positioning). One of the Six First CT Awardees.

## 2. Phase 2: Ontology-driven Information Management

### EPA Region 4 Current Ontology and Web Services Nodes

Note: The folder names are either the ontology or the knowledgebase instances.

The screenshot shows a web browser window titled "NextPage LivePublish - Internet Explorer Provided by Cox High Speed Internet". The address bar shows the URL: <http://web-services.gov/lpBin22/lpext.dll?f=templates&fn=main-j.htm&vid=10.1048/Enu&2.0>. The page features a yellow sidebar with the "NEXTpage" logo and a search bar. The main content area displays the "U.S. EPA Region 4 2004 Strategic Plan" for April 2004, accompanied by a map of Florida. Below the map is a "Contents" link and a table titled "In Process - February 25, 2005".

Time	Geography	Topic	Word Usage
2000 10	"Florida": 30 hits	Water Quality	*water*: 172 hits
2001 9	<a href="#">Population</a>	"water": 141 hits	with examples of each

Below the table is a "Search Results" section with the text: "There is currently no active search. After performing a search, the resulting list of documents will be displayed here."

Ontology-based search by time, geography, topic, & "word usage".

## 2. Phase 2: Ontology-driven Information Management

### EPA Region 4 Press Releases 2004 Database-Web Service Node

NextPage LivePublish - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Reload Print View Source

Address <http://web-services.gov/pBin22/pext.dll?f=templates&fn=main-j.htm&2.0> Go Links

**NEXTpage**

Search:  Go!

Select Search Form

Best Practices Dynamic Knowledge Re

- Data Reference Model (DRM)
- Indicators
- Biodiversity & Ecosystem Informatics
- EPA Region 4
  - Enterprise Architecture
  - Everyday & Emergency Operations
  - EPA Region 4 Press Releases
    - EPA Region 4 Press Releases
      - December 2004
      - November 2004
      - October 2004
      - September 2004
      - August 2004
      - July 2004
      - June 2004
      - May 2004
      - April 2004
      - March 2004
      - February 2004
      - January 2004
    - Environmental Indicators
    - Environmental Data Exchange

Months:

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

"Florida": 73 hits

- Dade County
- Eglin
- Flagler
- Fort Myers
- Marianna, Jackson
- County
- Miami
- Middleburg
- Pensacola
- Pinellas County
- Polk County
- Shamrock
- State: Brownfields
- State: Energy Star
- Partners

Water Quality

"water": 159 hits

"quality": 72 hits

"water quality": 31 hits in 17 documents

1

2

3

4

5

6

7

8

9

10

11

12

\*water\*: 183 hits with examples of each

- groundwater - 12 hits
- safewater - 2 hits
- stormwater - 1 hit
- wastewater - 4 hit
- water - 159 hits
- waterfronts - 7 hits
- waters - 11 hits
- watershed - 11 hits
- watersheds - 4 hits
- waterside - 2 hits
- waterways - 5 hits

(1-9 of 9 matches)

Prev Hit Doc Next Hit Doc Clear Search

1 EPA Region 4 Press Releases 2004 Database

...Brownfields...

...State: Energy Star Partners Water Quality...

..."water": 159 hits...

Internet

Ontology-based search by month, geography, topic, & "water semantics". 27

## 2. Phase 2: Ontology-driven Information Management

### EPA Region 4 Press Releases 2004 Database-Expert Web Search

NextPage LivePublish - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print Mail Print Preview

Address <http://web-services.gov/pBin22/lpext.dll?f=templates&fn=searchform-frames.htm&id=10.1048%2FExpertSearch&> Go Links

☐ Best Practices Dynamic Knowledge Repository-  
☐ Data Reference Model (DRM)  
☐ Indicators  
☐ Biodiversity & Ecosystem Informatics  
☐ EPA Region 4  
☐ Enterprise Architecture  
☒ Everyday & Emergency Operations  
☒ EPA Region 4 Press Releases 2004  
☒ EPA Region 4 Press Releases 2004  
☐ Environmental Indicators  
☐ Environmental Data Exchange  
☐ Lines of Business  
☐ American Council for the United Nations Unive  
☐ E-Government Legislation  
☐ OMB  
☐ Chief Information Officer Council  
☐ Chief Architects Forum Exchange  
☐ XML Working Group  
☐ CORE Gov Repository  
☐ Federal Agencies  
☐ Industry Advisory Council EA SIG  
☐ Semantic Technologies & Interoperability  
☐ Global Justice  
☐ National Association of State CIOs (NASCIO)  
☐ NextPage

### LivePublish Search Form

## Expert Search

You can **search a subset** of the site by choosing sections in the table of contents (in the frame on the left).

### Query terms:

Show context in the search results list

### Query Syntax Summary

Operator	Example	Result
And	one two one & two one and two	Finds documents with both 'one' and 'two'.
Or	me   you me or you	Finds documents with either 'me' or 'you'.

Note that search can be focused by both node hierarchy and/or semantics.

# 2. Phase 2: Ontology-driven Information Management

## EPA Region 4 Press Releases 2004 Database

The screenshot shows a web application titled "EPA Region 4 Press Releases 2004 Database". The interface includes a sidebar with a tree view of months from January to December 2004. The main content area displays a table with four columns: Time, Geography, Topic, and Word Usage. The "Topic" column is currently selected, showing results for "Water Quality".

Time	Geography	Topic	Word Usage
Months: 1	"Florida": 73 hits	Water Quality	*water*: 183 hits
• January	Dade County	"water": 159 hits	with examples of each
• February	Egin	"quality": 72 hits	groundwater - 12 hits
• March	Flagler	"water quality": 31 hits	safewater - 2 hits
• April	Fort Myers	in 17 documents	stormwater - 1 hit
• May	Marianna, Jackson	1	wastewater - 4 hits
• June	County	2	water - 159 hits
• July	Miami	3	waterfronts - 7 hits

Below the table, there is a "Hit Reference" section showing a list of documents related to the query. The status bar at the bottom indicates "Record: 1 / 13", "Hit: 1 / 18", and "Query: 'water quality'".

The screenshot shows an "Advanced Query" dialog box. It has a "Word:" field on the left with a list of words including "971", "9751", "979", "99", "9,900.00", "a", "abandoned", "abate", "abatement", "abbi", "abdominal", and "ability". The "Records with hits - 18" field on the right shows a summary of hits for "water" (159) and "quality" (72). The "Query For:" field contains the text "water quality". There are buttons for "Prev", "Next", "Apply To All", "Help", "OK", and "Cancel". A checkbox labeled "Checked branches" is also present.

Ontology (left) is designed by access to the semantics (right) which is updated automatically with the addition of new content (not like ETL).

## 2. Phase 2: Ontology-driven Information Management

### EPA Web Search Results for Region 4 Press Releases

**U.S. Environmental Protection Agency**

**Region 4 : Southeast**  
Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee

[Contact Us](#) | [Print Version](#) | Search:  [GO](#)

[EPA Home](#) > [Region 4](#) > Search Results

### Search Results

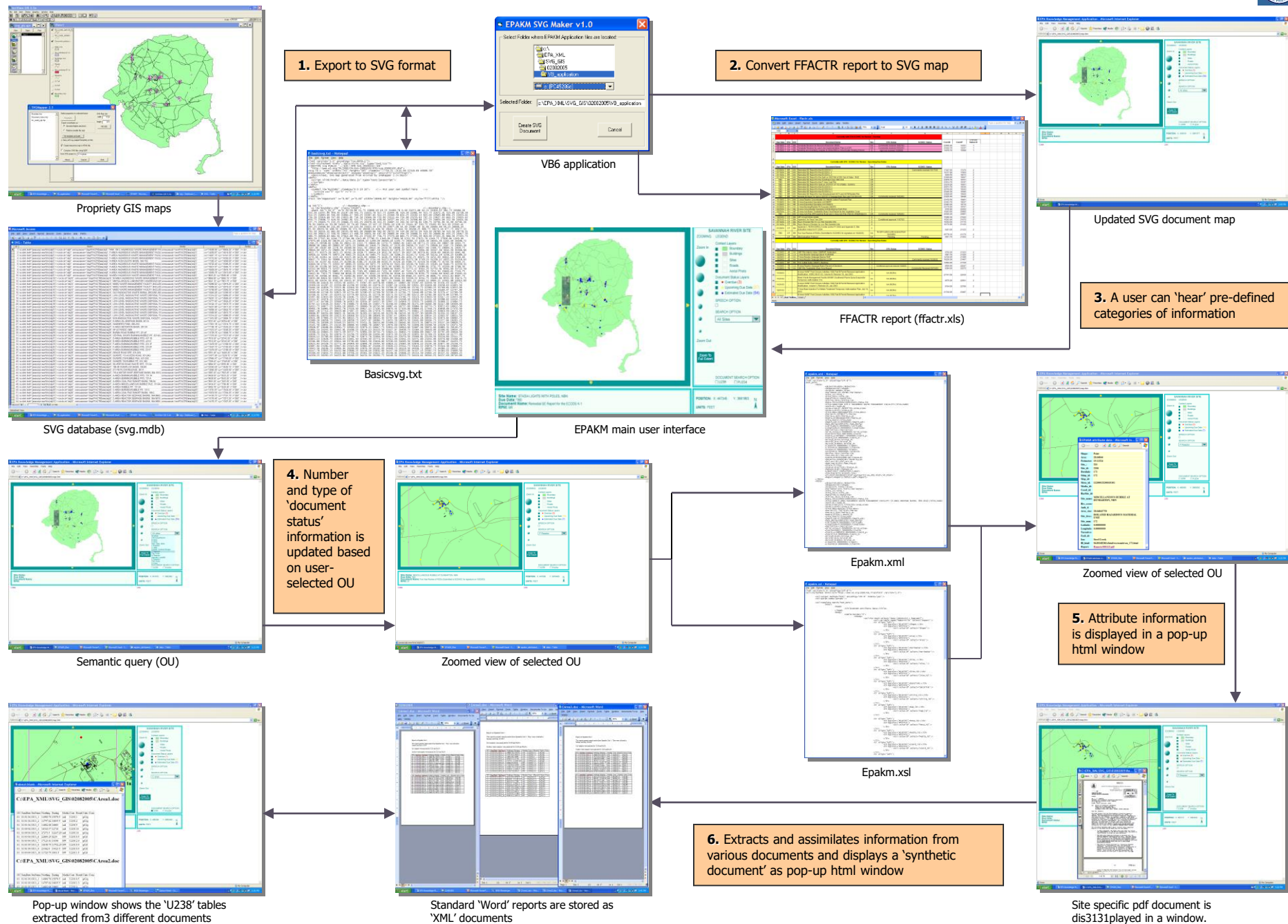
Your query "(water quality)" matched 42 documents out of 533.  
10 documents displayed.

Rank	Score	Title and URL of Document
1	1.00	<a href="http://www.epa.gov/region04/oeapages/02press/11-15-02.htm">EPA PROPOSES WATER QUALITY STANDARDS FOR WATERS IN THE COMMONWEALTH OF KENTUCKY</a> <a href="http://www.epa.gov/region04/oeapages/02press/11-15-02.htm">http://www.epa.gov/region04/oeapages/02press/11-15-02.htm</a>
2	0.94	<a href="http://www.epa.gov/region04/oeapages/03press/061703.htm">EPA Administrator Christie Whitman Presents Beach Monitoring Grant to Florida Department of Health</a> <a href="http://www.epa.gov/region04/oeapages/03press/061703.htm">http://www.epa.gov/region04/oeapages/03press/061703.htm</a>
3	0.93	<a href="http://www.epa.gov/region04/oeapages/00press/000313.htm">EPA to Hold Stakeholder Meeting to Discuss Nutrient Criteria</a> <a href="http://www.epa.gov/region04/oeapages/00press/000313.htm">http://www.epa.gov/region04/oeapages/00press/000313.htm</a>
4	0.93	<a href="http://www.epa.gov/region04/oeapages/99press/052699.htm">EPA APPROVES TOUGH PHOSPHOROUS LIMIT FOR TRIBAL WATERS IN EVERGLADES</a> <a href="http://www.epa.gov/region04/oeapages/99press/052699.htm">http://www.epa.gov/region04/oeapages/99press/052699.htm</a>
5	0.92	<a href="#">EPA Announces Regional Sustainable Development Challenge Grant Winners</a>

The results is 42 documents out of 533 which then have to be read and digested!

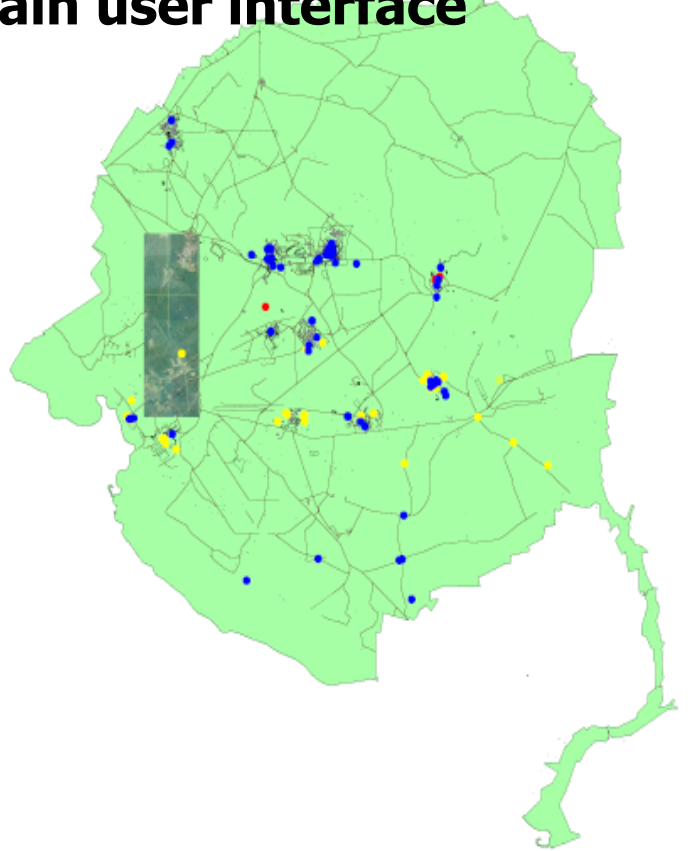


## 2. Phase 3: Watershed Knowledge Management



## 2. Phase 3: Watershed Knowledge Management

### EPAKM main user interface



#### SAVANNAH RIVER SITE

##### ZOOMING

##### Zoom In



##### Zoom Out

Zoom To  
Full Extent

##### LEGEND

##### Context Layers

- ☒ Boundary
- ☒ Buildings
- ☒ Sites
- ☒ Roads
- ☒ Aerial Photo

##### Document Status Layers

- ☒ Overdue (3)
- ☒ Upcoming Due Date (37)
- ☒ Estimated Due Date (54)

##### SPEECH OPTION



##### SEARCH OPTION

All Sites

##### DOCUMENT SEARCH OPTION

- ☐ U238
- ☐ PU234

**Site Name:** STADIA LIGHTS WITH POLES, NBN  
**Due Date:** TBD  
**Document Name:** Remedial SE Report for the ECODS K-1  
**RPM:** BR

**POSITION:** X: 447345 Y: 3681863

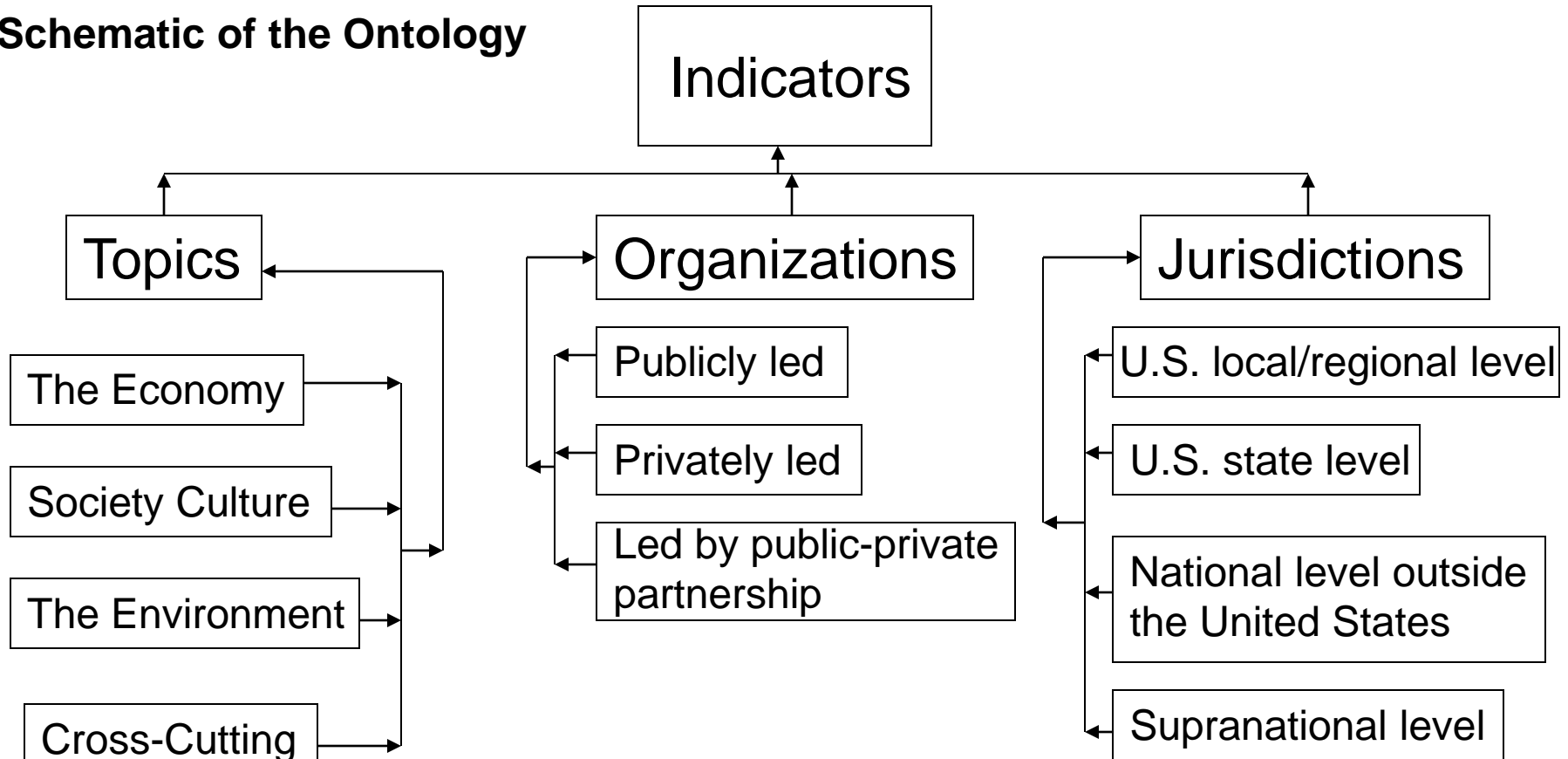
**UNITS:** FEET





## 2. Phase IV: Ontology for Indicators

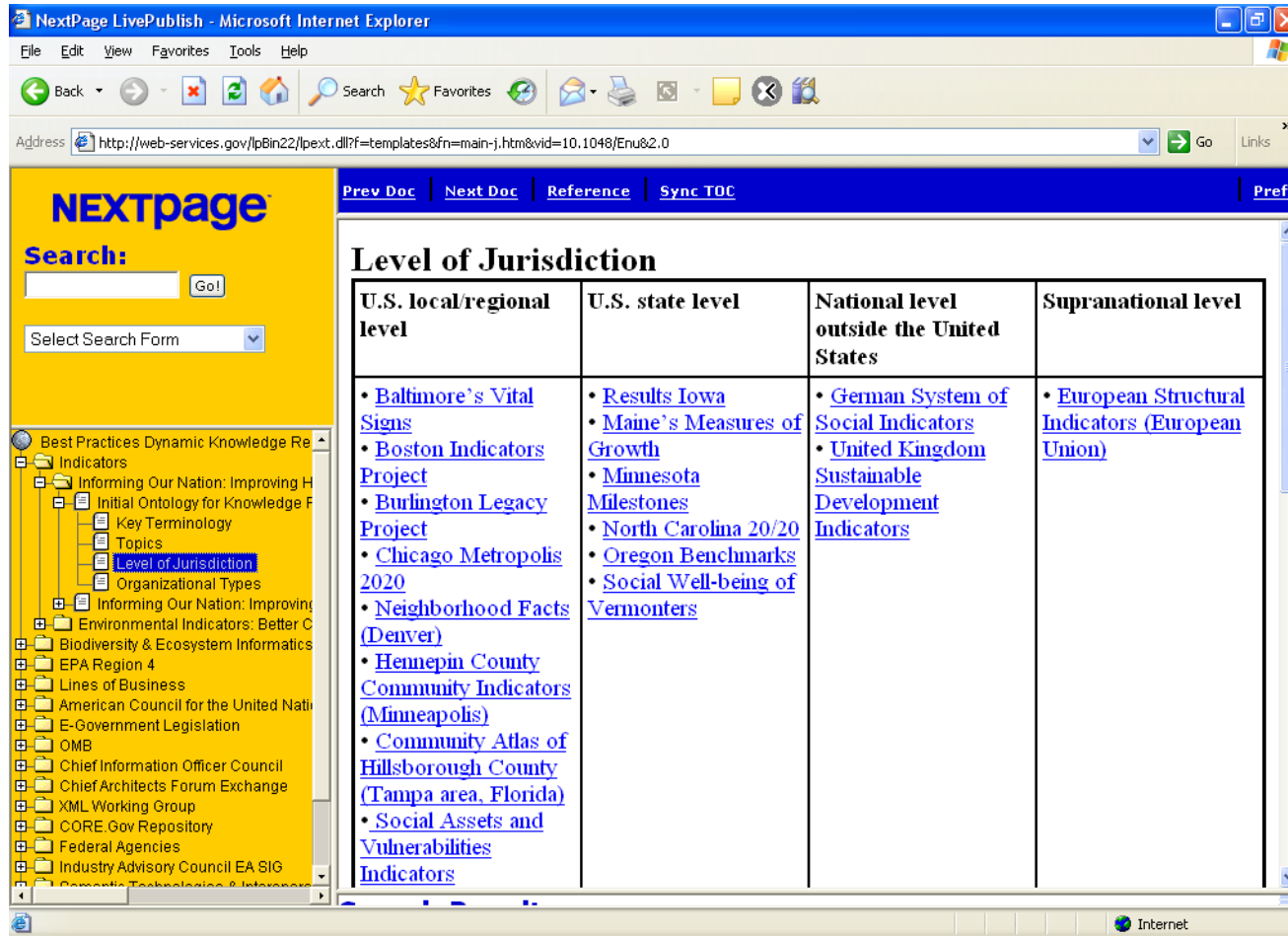
### Schematic of the Ontology



Note that each of these classes can and do have multiple instances underneath them, etc.

## 2. Phase IV: Ontology for Indicators

The folder names are either the ontology or the knowledgebase instances.



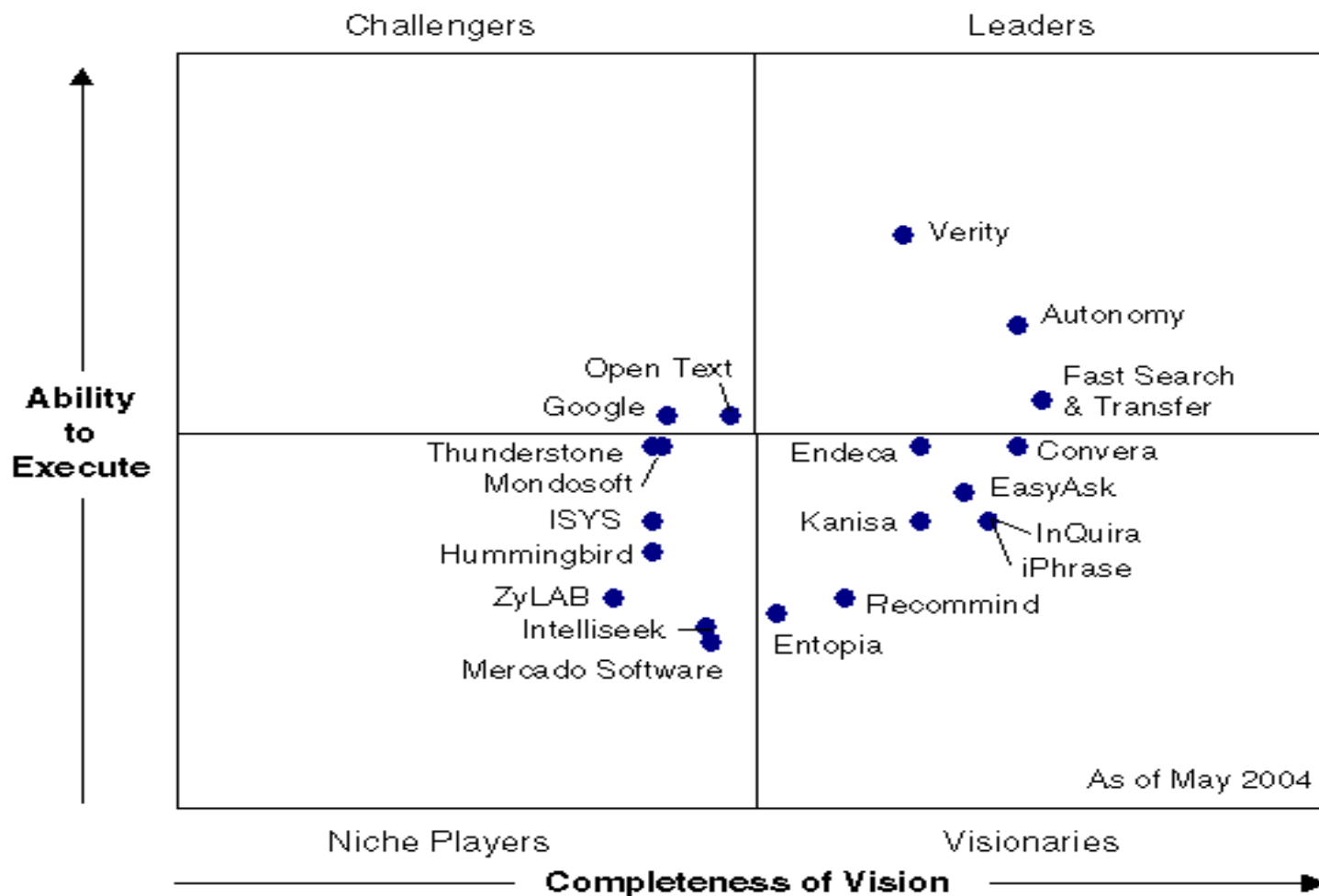
The screenshot shows a web browser window titled "NextPage LivePublish - Microsoft Internet Explorer". The address bar displays the URL: <http://web-services.gov/lpBin22/lpext.dll?f=templates&fn=main-j.htm&vid=10.1048/Enu&2.0>. The page features a yellow sidebar on the left with a search bar and a tree view of folders. The main content area has a blue header with navigation links: "Prev Doc", "Next Doc", "Reference", "Sync TOC", and "Prefs". Below the header, the title "Level of Jurisdiction" is displayed above a table with four columns representing different levels of jurisdiction.

U.S. local/regional level	U.S. state level	National level outside the United States	Supranational level
<ul style="list-style-type: none"><li>• <a href="#">Baltimore's Vital Signs</a></li><li>• <a href="#">Boston Indicators Project</a></li><li>• <a href="#">Burlington Legacy Project</a></li><li>• <a href="#">Chicago Metropolis 2020</a></li><li>• <a href="#">Neighborhood Facts (Denver)</a></li><li>• <a href="#">Hennepin County Community Indicators (Minneapolis)</a></li><li>• <a href="#">Community Atlas of Hillsborough County (Tampa area, Florida)</a></li><li>• <a href="#">Social Assets and Vulnerabilities Indicators</a></li></ul>	<ul style="list-style-type: none"><li>• <a href="#">Results Iowa</a></li><li>• <a href="#">Maine's Measures of Growth</a></li><li>• <a href="#">Minnesota Milestones</a></li><li>• <a href="#">North Carolina 20/20</a></li><li>• <a href="#">Oregon Benchmarks</a></li><li>• <a href="#">Social Well-being of Vermonters</a></li></ul>	<ul style="list-style-type: none"><li>• <a href="#">German System of Social Indicators</a></li><li>• <a href="#">United Kingdom Sustainable Development Indicators</a></li></ul>	<ul style="list-style-type: none"><li>• <a href="#">European Structural Indicators (European Union)</a></li></ul>

See Best Practices Repository at <http://web-services.gov>

## 2. Phase 4: Enterprise Search on Distributed Content

### Gartner Magic Quadrant for Enterprise Search, 2004



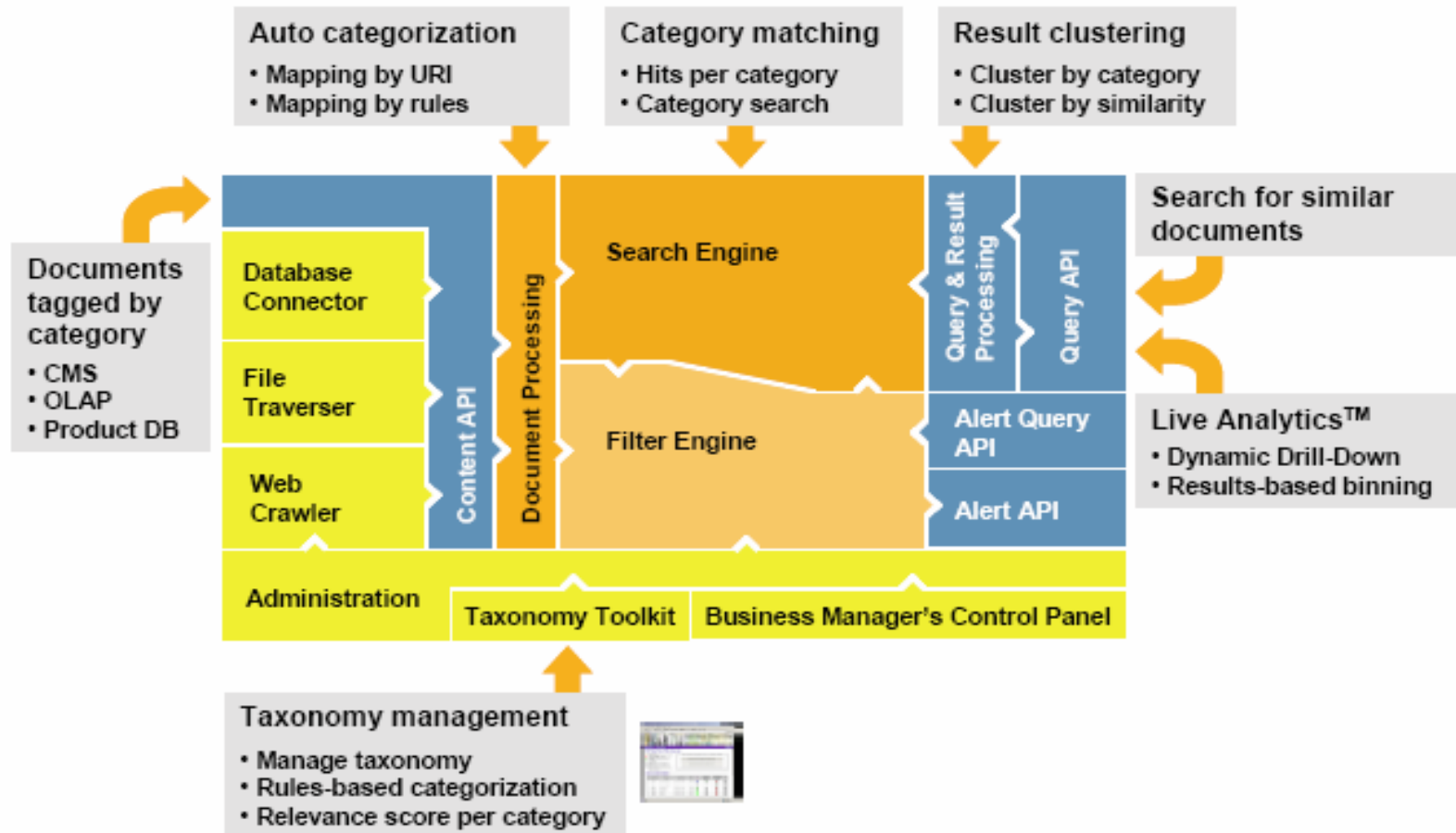
## 2. Phase 4: Enterprise Search on Distributed Content

### Gartner Analysis: Leaders

- **Fast Search & Transfer (FAST)** now is counted in the Leaders quadrant, moving from the Visionaries quadrant. The vendor has experienced explosive growth, providing better-than-average means and an expanding list of approaches of determining relevancy. **Its architecture is superior among search vendors**, and sales are strong. (Sales of enterprise search technology were \$42 million in 2003, up from \$36 million in 2002.) Its acquisition of the remainder of AltaVista's business has had no real impact on operations.
- Critical questions include whether FAST will:
  - 1) remain a specialist in search technologies;
  - 2) pursue "search-derivative applications" — FAST's term for the general application category founded on search platforms, including customer relationship management (CRM) knowledge base support tools and scientific research managers; or
  - 3) focus on original equipment manufacturer arrangements or on a broader suite of applications, such as those included in a smart enterprise suite. Search vendors typically follow an arc that leads to their acquiring a company, to failure or to a position as an enduring leader. FAST has the opportunity to pursue the last path.
- Note added by Brand Niemann: FAST acquired NextPage in December 2004 which provides electronic publishing software to 6 of the 9 leading electronic publishers in the world. **I have used NextPage in the pilots to date. The NextPage Infobases are converted to XML for use in FAST.**

## 2. Phase 4: Enterprise Search on Distributed Content

### FAST Data Search: Categorization and Taxonomy Support



## 2. Phase 4: Enterprise Search on Distributed Content

### Building a National Health Information Network Ontology

**FDS Simple Search Page - Microsoft Internet Explorer**

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Print Mail News RSS Feeds

Address [http://bos-840loan2-lt.ad.fast.no:16089/wqt/search.jsp?moreHitsFromSite=&category=&similarTo=&similarType=find&breadcrumb=&query=&old\\_query=&sortBy=default&](http://bos-840loan2-lt.ad.fast.no:16089/wqt/search.jsp?moreHitsFromSite=&category=&similarTo=&similarType=find&breadcrumb=&query=&old_query=&sortBy=default&) Go Links

**FAST Query Toolkit**

Search Setup

Submit Query

Sort By: default Descending Collection: organizations1

Advanced

**Navigation**

**Taxonomy**  
[Reset Categories](#)

**Drill Down**

Encoding

NIME

Languages

Size

**KeyWords**

- health information (14.0)
- health care (7.04)
- information technology (6.32)
- national health (3.22)
- common framework (3.16)
- healthcare information (2.46)
- information exchange (2.31)
- nhin rfi (2.22)
- clinical data (2.22)
- rfi response (2.20)
- information network (2.06)
- federal government (1.95)
- national coordinator (1.66)
- rhio-level clearinghouse (1.49)
- interoperability standards (1.24)
- data exchange (1.21)
- collaborative response (1.14)
- vendor association (1.13)
- health plans (1.04)
- legal action (1.0)
- consumer principles (1.0)
- joint commission (1.0)

**292 Results found in 0.319s**

1.	2.	3.	4.	5.
collection: organizations1	collection: organizations1	collection: organizations1	collection: organizations1	collection: organizations1
<b>title</b> Microsoft Word - NHIN_RequestForInformation_Final.doc <b>body</b> NHIN: .....4 1. OVERVIEW OF 2. PROPOSED NHIN MODEL ..... <b>url</b> <a href="#">organizations1/iowa_foundation_for_medical_care-2of2.pdf (new window)</a> <b>processingtime</b> 2005-03-22T14:39:31Z <b>size</b> 796618 <b>Similar</b> <a href="#">Find</a> <a href="#">Refine</a> <a href="#">Exclude</a>	<b>title</b> PRIME OBJECTIVE <b>body</b> knu.ac.kr Secretariat, ISO/TC 215 HIMSS C/O Audrey Dickerson, RN, MS Manager of S Secretary of ISO/TC 215 & US TAG for ISO/TC 215 HIMSS 230 East Ohio Street, Suite 60611 TEL: 312-915-9233 E-mail: adickerson@himss. <b>url</b> <a href="#">organizations1/iso_tc_215-health_informatics_response.doc (new window)</a> <b>processingtime</b> 2005-03-22T14:39:54Z <b>size</b> 129536 <b>Similar</b> <a href="#">Find</a> <a href="#">Refine</a> <a href="#">Exclude</a>	<b>title</b> January 18, 2005 <b>body</b> January 18, 2005 David Brailer, MD, PhD Office of the National Coordinator Health Infor Department of Health and Human Services Attention: NHIN RFI Responses Hubert H. Hu Room 517D 200 Independence Avenue, S.W. <b>url</b> <a href="#">organizations1/joint_commission_on_accreditation_of_healthcare.doc (new window)</a> <b>processingtime</b> 2005-03-22T14:39:54Z <b>size</b> 74752 <b>Similar</b> <a href="#">Find</a> <a href="#">Refine</a> <a href="#">Exclude</a>	<b>title</b> Microsoft Word - 41ED1874-0536-208994.doc <b>body</b> David J. Brailer, M.D., Ph.D. Office of the National Coordinator for Health Information T Department of Health & Human Services Attention: NHIN RFI Responses Hubert H. Hum Room 517D 200 Independence Avenue SW Washington DC 20201 Dear Dr. <b>url</b> <a href="#">organizations1/joint_response_surescripts_and_rxhub.pdf (new window)</a> <b>processingtime</b> 2005-03-22T14:39:55Z <b>size</b> 327836 <b>Similar</b> <a href="#">Find</a> <a href="#">Refine</a> <a href="#">Exclude</a>	<b>title</b> Question 1 <b>body</b> January 18, 2005 Office of the National Coordinator for Health Information Technology Health and Human Services Attn: NHIN RFI Responses Hubert Humphrey Building 200 I Avenue , S.W. Washington, D.C. <b>url</b> <a href="#">organizations1/kaiser_foundation_health_plan_burnett.doc (new window)</a> <b>processingtime</b> 2005-03-22T14:39:57Z <b>size</b> 108032 <b>Similar</b> <a href="#">Find</a> <a href="#">Refine</a> <a href="#">Exclude</a>

Internet

## 2. Phase 4: Enterprise Search on Distributed Content

- Paradigm Shifts:
  - From Indicator Frameworks to ...
  - Ontologies for and of Indicators based on..
  - Enterprise Search of Everything, Everywhere!
- Explanation:
  - Ontologies of and for Indicators provide the structure that make indicators more useful and reveal the gaps.
  - “Everything, Everywhere” is achieved by a Search Platform Architecture that supports both Crawl (Pull) and API (Push).
  - Of special interest to EPA: Children’s Health, Mercury, etc.

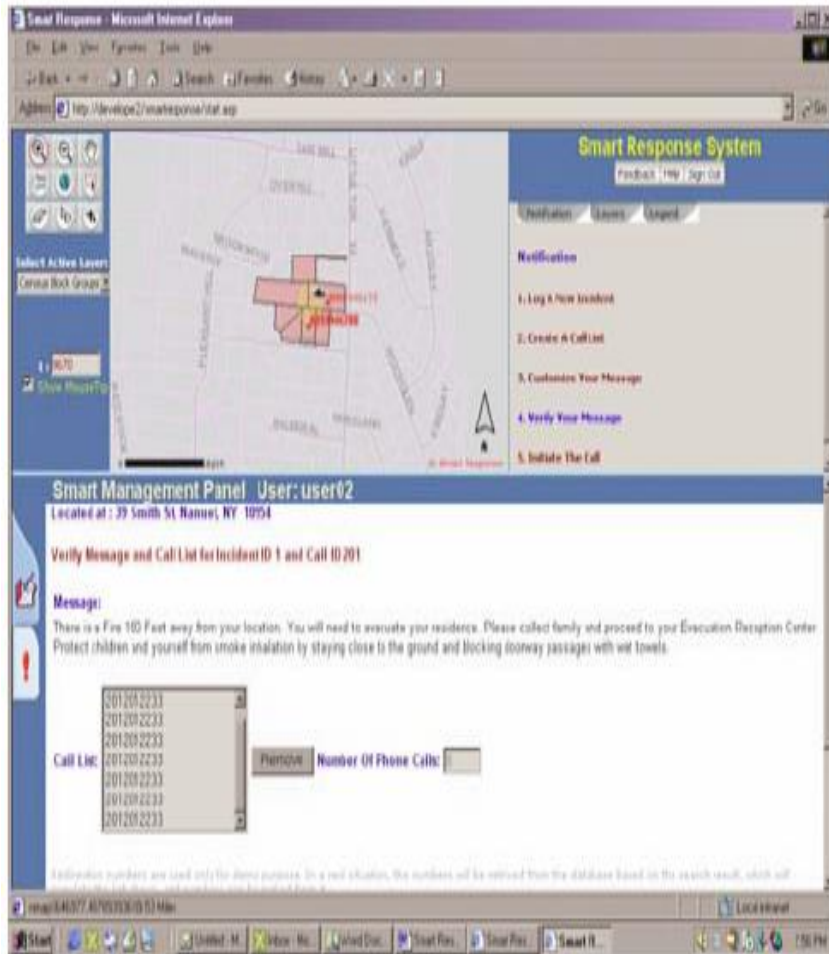
## 2. Phase 4: Enterprise Search on Distributed Content

### Public Domain Database

Content Source	Content Type	Pilot Example
Web Site	Topics	Children's Health, Mercury, Etc.
Web Site	Registries	Substance
Exchange Network	Nodes	Pacific Water Quality
E-Gov	E-Rulemaking	Samples
Data Mart	TBD	TBD
Indicators	Reports on the Indicators	EPA, Heinz, Etc.
GIS	Maps	Region 4 GeoBook
GIS	Metadata	Clearinghouse



## 2. Phase 5: Emergency Response

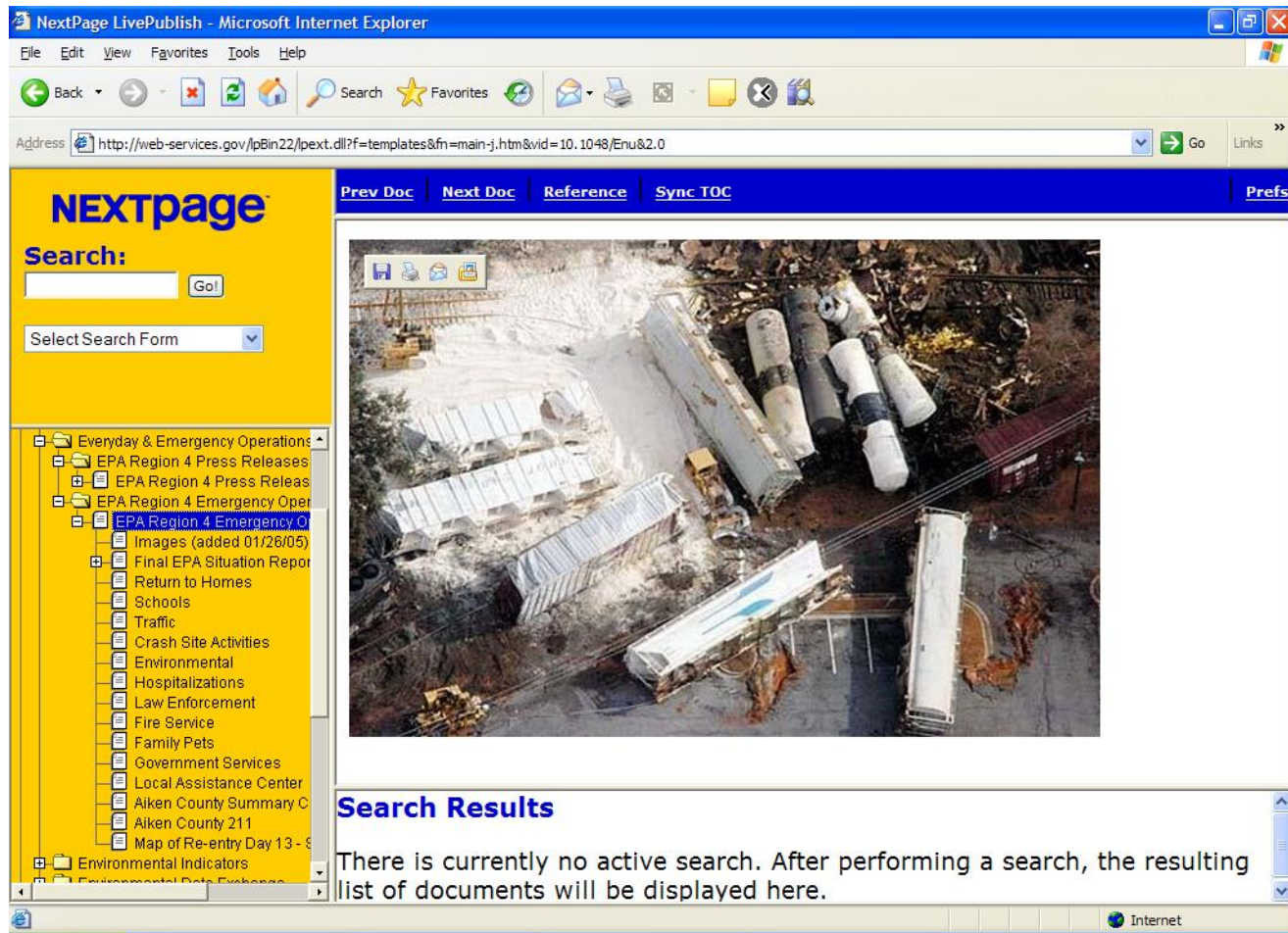


- GeoResponse.Com Features:
  - Report an Event
  - Geocode the Event
  - Define the Call List
  - Customize your Message
  - Make the Call
  - Track and Map Responses
  - Trigger another Process
- Award-winning VoiceXML Web Service from Broadstrokes at GeoResponse.com to be featured at the SWANS Conference Trade Show, April 7-8, 2005.
- Recently integrated with WSRP/CAP in cooperation with Starbourne/Oracle Team.

Implementing the Norfolk Southern Graniteville Derailment Scenario for the new Emergency Response Architecture!

# 2. Phase 5: Emergency Response

## EPA Region 4 Emergency Operations Database



Norfolk Southern Graniteville Derailment Thursday, January 6, 2005 42

## 2. Phase 5: Emergency Response

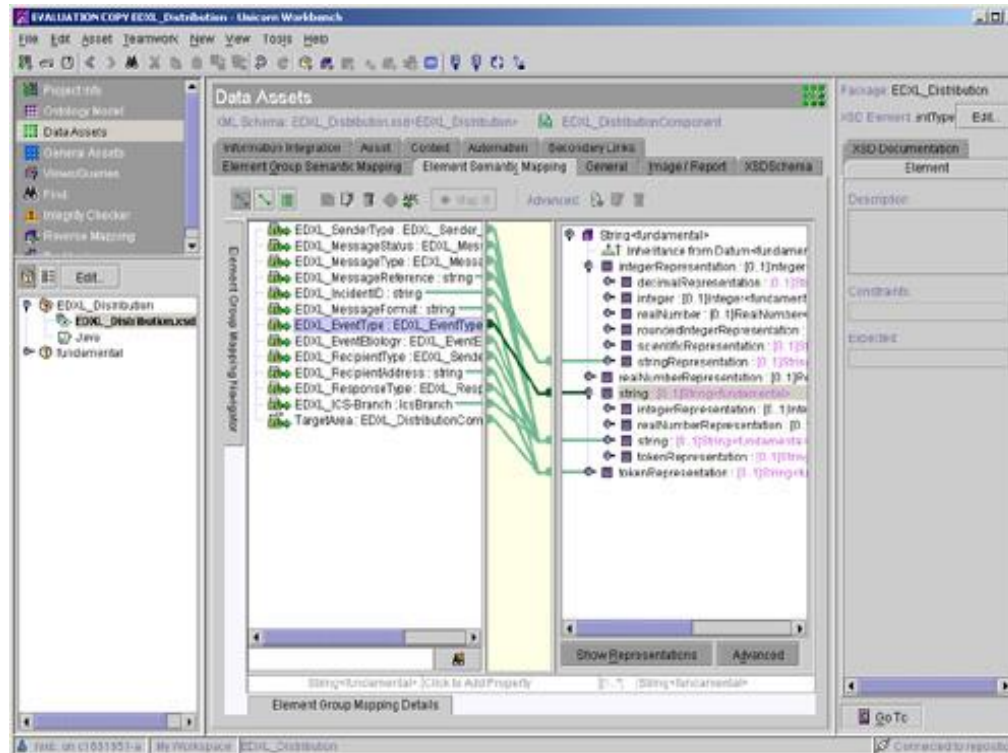
- Composite Application Solution with Semantic Technologies:
  - Train Derailment Example:
    - 6 January 2005, 3:50 A.M. Graniteville, SC.
    - Chlorine Tank Car Toxic Release.
  - Matching ResponseType with EventType.
  - Using Open Public Standards.
  - Getting the Right Information to the Right People at the Right Time.

Source: Putting Context to Work: Semantic Keys to Improve Rapid First Response, Semantic Web Applications for National Security Conference, April 8, 2005, Trade Show, Broadstrokes, ImageMatters, MyStateUSA, Starbourne, and TargusInfo.

# 2. Phase 5: Emergency Response

## Event Type Ontology in Context:

Application in Unicorn Workbench: <http://www.unicorn.com>



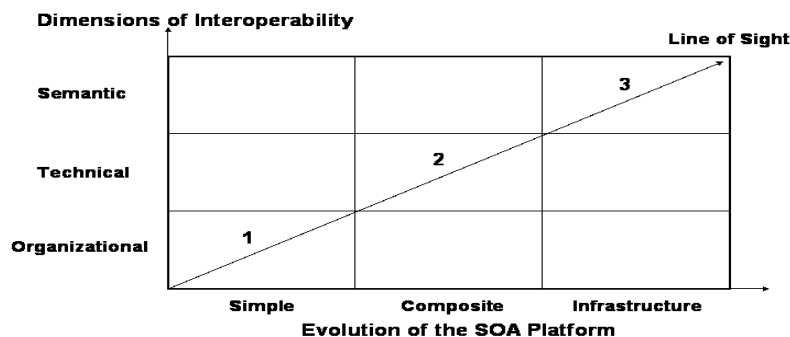
Source: Putting Context to Work: Semantic Keys to Improve Rapid First Response, Semantic Web Applications for National Security Conference, April 8, 2005, Trade Show, Broadstrokes, ImageMatters, MyStateUSA, Starbourne, and TargusInfo.

# *Special Recognition*

**Putting Context to Work: Semantic Keys to Improve Rapid First Response**  
by the **Broadstrokes Group** — Broadstrokes, Inc.: Adam Hock; MyStateUSA: Claudia Bitner;  
Image Matters: Mike Alexander; Starbourne: Rex Brooks; and Targus Info: David Win. A  
Composite—Infrastructure Application with An Event Ontology First Shown at the **SWANS**  
Conference, April 7-8, 2005, as “an end-to-end Semantic Web application.”

Presented at the First Data Reference Model Public Forum and Sixth Emerging Technology  
Components Conference, June 13, 2005, MITRE Corporation, McLean, VA, by SICoP Chair,  
Brand Niemann, U.S. EPA.

## Suggested Roadmap to SOA/SIA



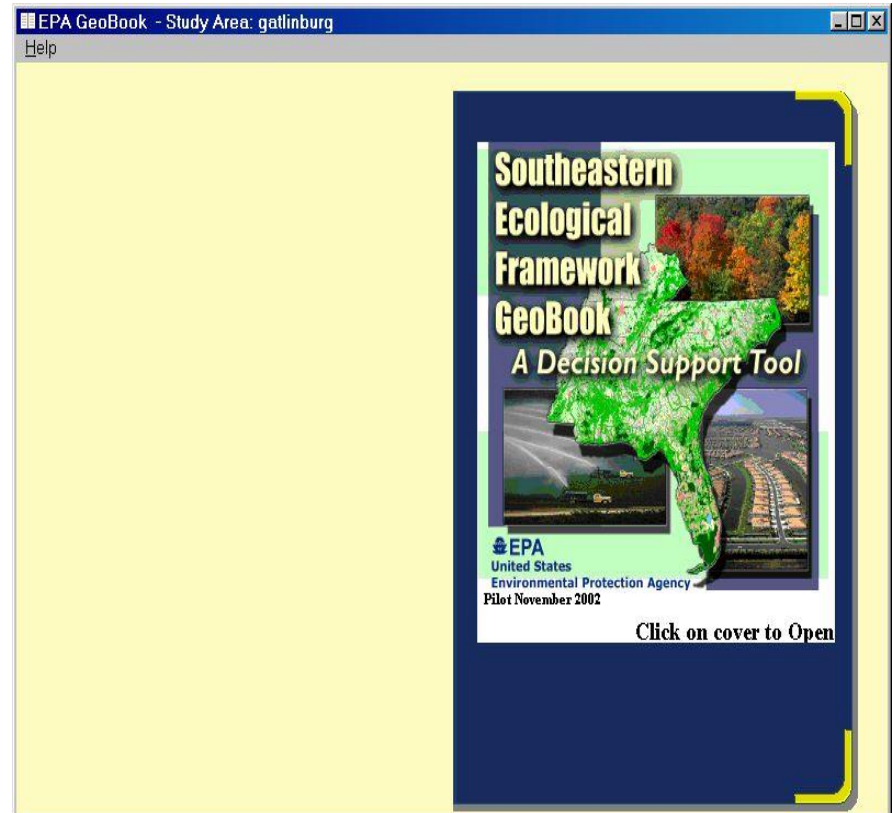
**SICoP**

**KM.GOV**



# 3. Some Next Steps

- The Ontology-driven Information System is the “Target Architecture”!
  - Use the CoP-Wiki-SUMO to build more ontology definitions, hierarchy, instances, and associations.
  - This provides the evolving structure and gaps to fill – clearly shows what we have and what we need.
  - Region 4 and its partners have excellent content! (see example to right)



# Appendix – Region 4 Pilot History

- EPA Region 4 - Implementing a Service-Oriented Architecture: Pilot Project Design and Initial Results, October 1, 2004
  - <http://web-services.gov/region4soa10104.ppt>
- Building Enterprise Architecture Through WSRP in Sample EPA Regional Portal, October 19, 2004
  - [http://colab.cim3.net/file/work/Expedition\\_Workshop/2004-10-19\\_BPforFEA\\_DRM\\_XML/Brooks\\_2004\\_10\\_19/WSRP-4-EPA-Portal-1.0.ppt](http://colab.cim3.net/file/work/Expedition_Workshop/2004-10-19_BPforFEA_DRM_XML/Brooks_2004_10_19/WSRP-4-EPA-Portal-1.0.ppt)
- Portals from Nodes, Portlets and Distributed Content Networks, October 22, 2004
  - [http://web-services.gov/portalsbrand2004\\_10\\_22.ppt](http://web-services.gov/portalsbrand2004_10_22.ppt)
- Federal Region 4 Semantic Interoperability Pilot Project: Community of Practice and Plans, October 28 and November 4, 2004
  - <http://web-services.gov/region4cop102904.ppt>
- The FEA Data and Information Reference Model (DRM): Information Sharing, November 10, 2004
  - <http://web-services.gov/EPADRM11102004.ppt>

# Appendix – Region 4 Pilot History

- Connecting the Dots: CAP-WSRP, November 18, 2004
  - <http://web-services.gov/ConnectDots-CAP-WSRP-XML2004.ppt>
- Toward an EPA Data Reference Model DRM, November 22, 2004
  - <http://web-services.gov/EPADRM11222004.ppt>
- Semantic Interoperability Community of Practice Enablement (SCOPE) for the EPA Region 4 Pilot, February 10, 2005
  - <http://web-services.gov/scope02102005.ppt>
- Adding Value While having Fun with EPA Data!, February 23, 2005, and March 2, 2005
  - <http://web-services.gov/scope03022005.ppt>
- Region 4 Semantic Technology Pilot, March 2, 2005
  - <http://web-services.gov/scope03022005A.ppt>
- Data Reference Model: Update on Status, March 7, 2005
  - <http://web-services.gov/scope03072005.ppt>
- Semantic Technology Pilots: Indicators and Search, March 23, 2005
  - <http://web-services.gov/scope03222005.ppt>