

Ontology Applications in Emergency Response (Take 2)



Sugar Refinery Fire, Savannah, Georgia, 7 February 2008

Resolved: Effective Emergency Response Requires

- **Ontology as an Organizing Principle**
- **Ontology Applications in Practice**

Ontology Applications Also Means the Application of Ontology



What do these images have in common beyond their Dateline?

Ontology Applications Needed

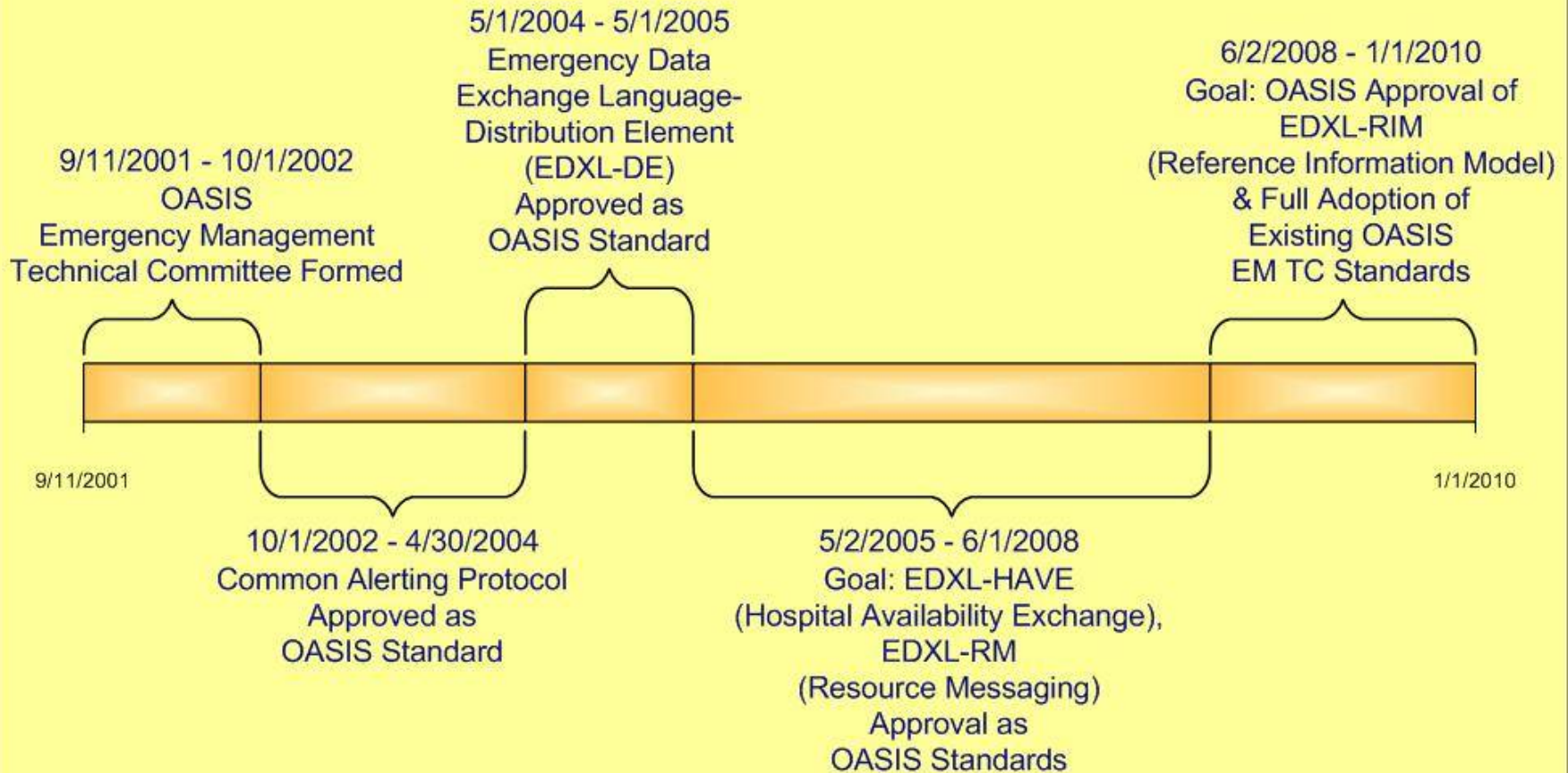


**Ontologies Needed:
Unstructured Data, Incident Lifecycle, EventType ...**

Resolved: Ontology Needed

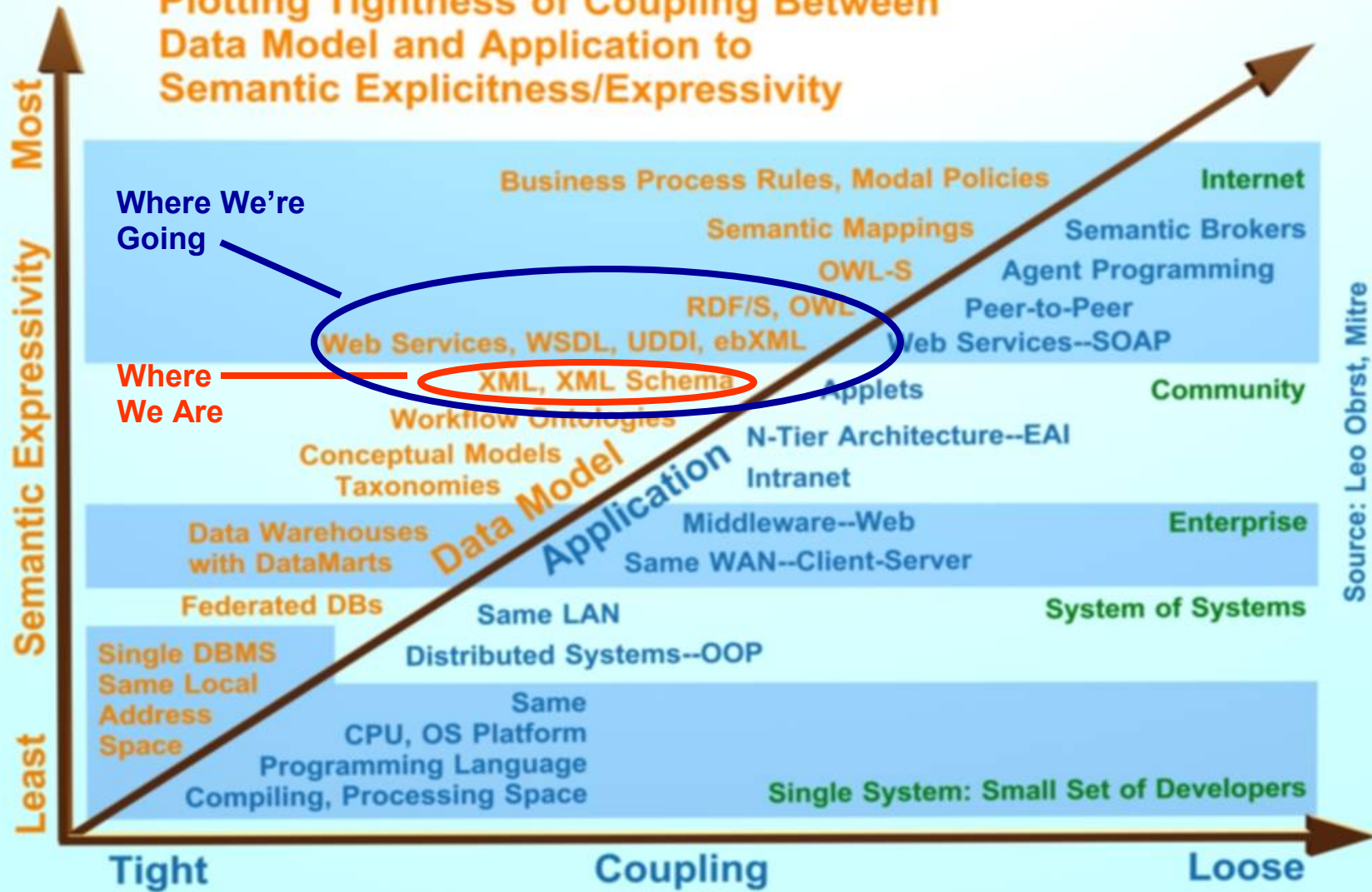
- ◆ **Since 9/11 We've Moved to More Expressive Representations in Emergency Management IT Standards**
 - But We Still Need 'Computability' of Less Expressive, More Constrained Representations
- ◆ **We're Aiming for the "Sweet Spot" Between Theory and Practice**
 - We Have Important Choices to Make
- ◆ **Opportunities Exist for Ontology to Make Important Contributions**

Timeline of OASIS Emergency Management Technical Committee Standards Work



Semantic Spectrum

Plotting Tightness of Coupling Between Data Model and Application to Semantic Explicitness/Expressivity



Source: Leo Obrst, Mitre

Recap: Take 1

- ◆ **Information Sharing More Critical**
 - NIMS Deployment on Slow Timeline
 - NIEM at v2.0 with Support
 - EDXL-HAVE and EDXL-RM Moving Forward
- ◆ **Fail-Points Still Avoided**
 - Lack of Sirens make Tornados More Devastating
- ◆ **SOA More Hype Than Ever**
 - Marketplace Confusing for Non-Technical Audience
- ◆ **Interoperability Still Difficult**
 - CAP is an Exception
- ◆ **Situational Awareness Standards Still in Discussion Stage**

Recap: Take 1

- ◆ **Decision Support More Critical**
 - Uptake of IT in Healthcare Relatively Unimproved
 - Tracking Decisions Against Results Lacking
- ◆ **AHIC 2 Now in Private Sector (LMI and Brookings Institute)**
 - Status of HITSP, CCHIT and National Disaster Medical System (NDMS) Uncertain
- ◆ **Semantic Interoperability in Health Informatics Problematic**

Recap: Take 1

◆ **Emergency Response Management Systems**

- **Local Offices of Emergency Services (OESs)**
- **Uptake of Standards Difficult to Budget**

◆ **Emergency Response Systems Management**

- **NIMS & NIEM Could Be Important Steps Forward**
- **National Disaster Medical System (NDMS)**

Intro: Take 2

- ◆ **Applications of Ontology & Ontology Applications Both Needed**
- ◆ **Decision Support Ontology (DSO)**
 - Decision Types
 - Decision Points
- ◆ **Ontology Applications using DSOs Needed for ERMS & ERSM**
 - Should work with Governmental & Private SOAs
 - Should Automate Marshalling Data Resources
 - Should Apply Rules per Jurisdiction

Intro: Take 2

◆ **Ontologically Consistent (ISO 11179-XMDR) Taxonomies Needed**

- **Emergency Event Types**
- **Emergency Organization Command Systems**
- **Emergency Equipment Names and Descriptions**
- **Geospatial Coordinate Systems (OGC Work Ongoing)**
- **Units of Measurements (ISO, OGC, etc Work Ongoing)**
- **Contact Information (OASIS CIQ (Ongoing), HumanML (Dormant), BPEL4People (Getting Started))**
- **Scheduling/Temporal Systems**

Intro: Take 2

◆ **OASIS EDXL Family (Now and Growth)**

- **Message Exchange Management**
- **Hospital Specific Data Support**
- **Resource Messaging Support**
- **Reference Information Model**
- **Situation Reporting**
- **Compatible Specifications and Interoperability**
- **Exigencies**

Next Slide Set

◆ **Elysa Jones, Warning Systems, Inc., Chair, OASIS Emergency Management Technical Committee (EM TC)**

- **Overview of EM TC, Emergency Interoperability Consortium**
- **CAP**
- **EDXL-DE**
- **EDXL Family**
- **EM TC Process**

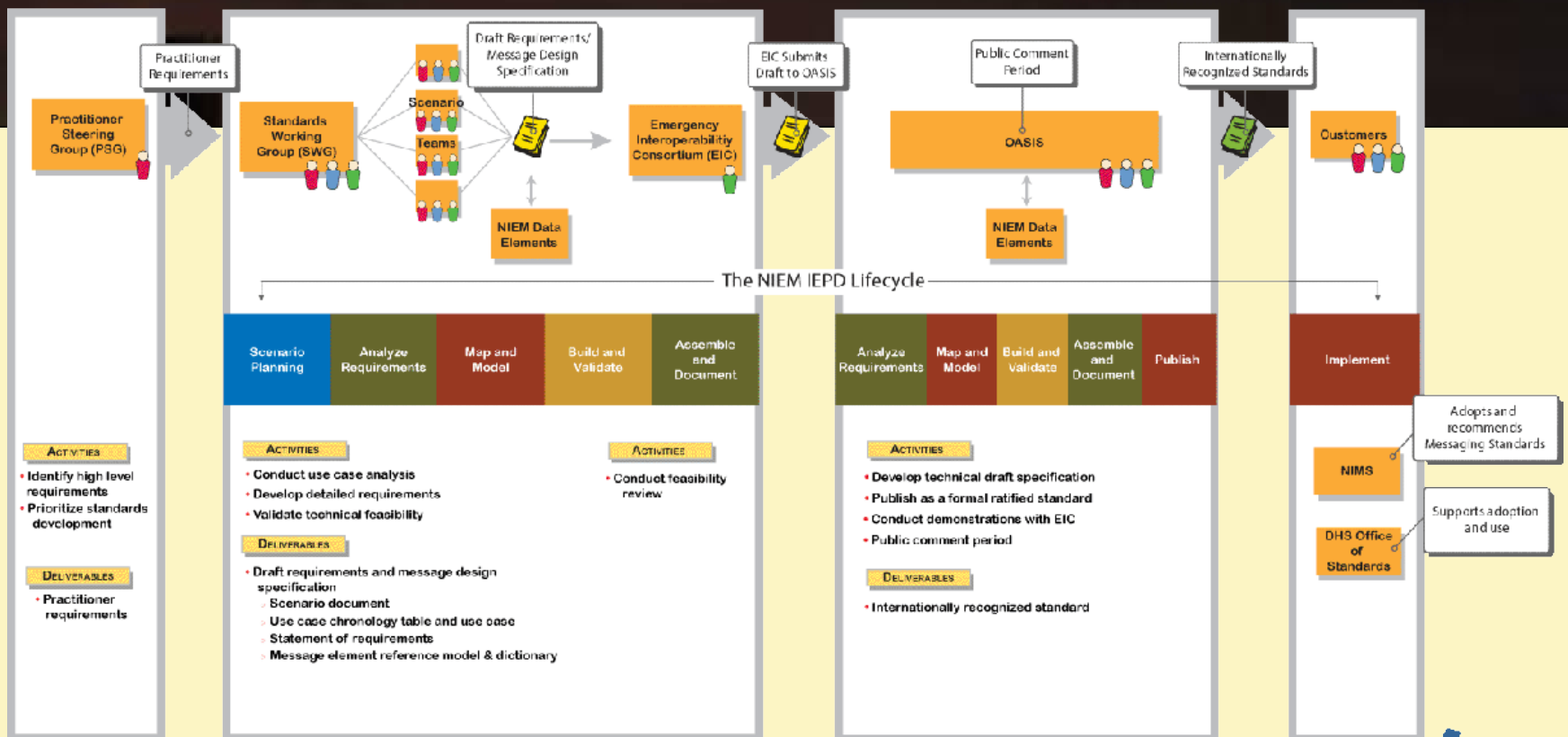
Summary

- NIMS messaging standards authority aligning NIMS, DM/EDXL, and NIEM
- UICDS / NIMS alignment and simplification
- MOU / SLA's
- Grant Language
- Practitioner driven - Coordinated groups
- Standards Messaging Repository housed by NIMS
- EDXL & NIEM EM domain common data dictionary.
- NIEM IEPD's where standards lacking – NIMS evaluate standards candidates

- ***Better served Practitioners***
- ***One-stop-shop for incident management systems and standards***
- ***Simplify grant language / compliance requirements***

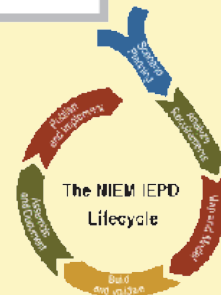
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OIC Emergency Data Exchange Language Standards Development Process



*Multi-Disciplinary: Law Enforcement, Fire, Emergency Management, Health/Medical, Transportation, Other Emergency Response Agencies

Office of Interoperability Services (OIC) Emergency Data Exchange Language Standards Development Process



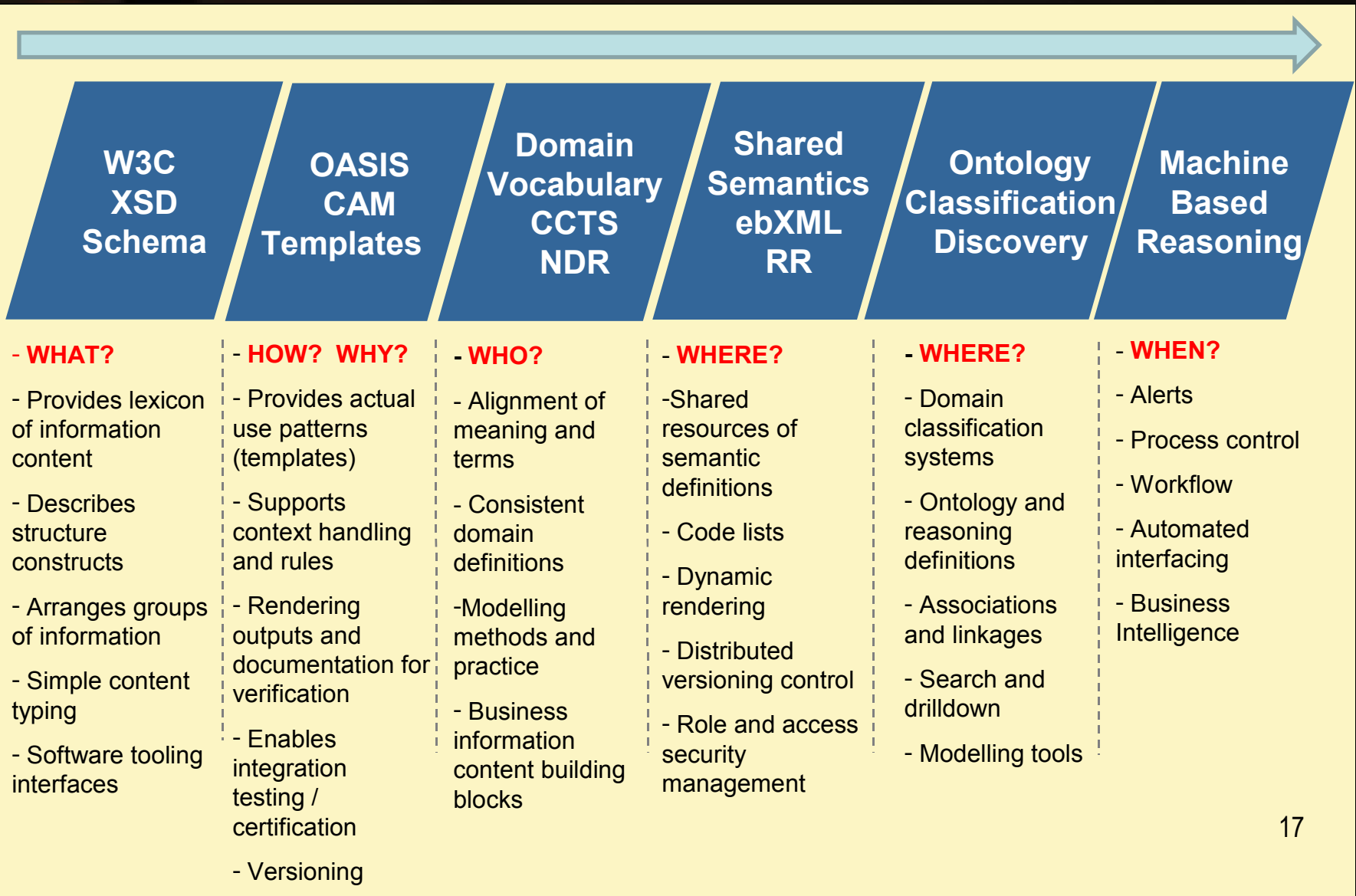
Next Slide Set

◆ **David Webber, IntegrityOne Partners, Chair, OASIS Content Assembly Mechanism Technical Committee (CAM TC)**

■ **Overview of Integration Technologies**

- **XML Schema**
- **CAM**
- **CCTS**
- **ebXML, ebXML-RR**
- **Ontology**

Integration Technologies



CAM Eclipse Environment

The screenshot displays the CAM Eclipse environment with several tool windows:

- 1 Available structures:** A table listing available structures. The table has columns for ID, Reference, Taxonomy, and Taxonomy Other. The first row shows 'PersonInfo' with 'XML' in the Taxonomy column.
- 2 Structure Rule Viewer:** A tree view showing the structure rule for 'PersonInfo'. It includes elements like <pires:RequestID>, <pires:CommonsUserID>, <pires:DUNS>, <pires:AffiliationType>, <pires:PersonAffiliationInfo>, <Name>, <ContactInformation>, <pires:PreferredAddressCode>, <pires:Degree>, <pires:PositionTitle>, and <pires:PriorGrant>.
- 3 Rule Details:** A table showing rule details. The table has columns for Category, Action, and Item. The first row shows 'DEFAULT', 'setLength(1-12)', and '//pires:PersonInfoRespons'.
- 4 Validation Process:** A dialog box titled 'Run JCam' with instructions: 'From this wizard the JCam Processor can be run. Choose the XML file you require. If more than one structure exist choose the required structure.' It includes fields for Template, XML File, and Structure ID (set to 'PersonInfo'). It also has 'Run Time Options' with radio buttons for VALIDATE, TRIM, and DOCUMENT, and a checkbox for 'Transform results'.
- 5 Results Viewer:** A window for viewing the results of the validation process.

Example: Hospital EDXL to Report

```
<ns7:OrganisationName ns7:Type="Tri-State Hospital" ns7:OrganisationID="PA-TSH1"
ns7:OrganisationIDType="Hospital" ns1:LanguageCode="en-US" />
- <ns6:Addresses>
- <ns6:Address ns5:Type="Hospital" ns5:ID="ID1" ns3:type="simple" ns3:href="http://www.oxy
ns1:LanguageCode="en-US">
- <ns5:FreeTextAddress>
<ns5:AddressLine ns5:Type="Street">100 Emergency Drive</ns5:AddressLine>
<ns5:AddressLine ns5:Type="City">OurTown</ns5:AddressLine>
<ns5:AddressLine ns5:Type="State">PA 20901</ns5:AddressLine>
</ns5:FreeTextAddress>
+ <ns5:Country>
+ <ns5:AdministrativeArea ns5:Type="State">
+ <ns5:Thoroughfare>
+ <ns5:PostCode>
</ns6:Address>
</ns6:Addresses>
- <ns6:ContactNumbers>
+ <ns6:ContactNumber ns6:CommunicationMediaType="Cellphone" ns6:Status="Active" ns6:Usage="
ns6:ContactHours="Any">
+ <ns6:ContactNumber ns6:CommunicationMediaType="Pager" ns6:Status="Active" ns6:Usage="All"
ns6:ContactHours="Any">
</ns6:ContactNumbers>
+ <ns6:ElectronicAddressIdentifiers>
+ <ns6:Revenues>
- <ns6:Vehicles>
- <ns6:Vehicle ns6:Type="Ambulance" ns6:Status="Active">
<ns6:VehicleElement ns6:Type="Ford">Aerostar</ns6:VehicleElement>
</ns6:Vehicle>
- <ns6:Vehicle ns6:Type="Ambulance" ns6:Status="Active">
<ns6:VehicleElement ns6:Type="GMC">Sprinter</ns6:VehicleElement>
</ns6:Vehicle>
- <ns6:Vehicle ns6:Type="Ambulance" ns6:Status="Active">
<ns6:VehicleElement ns6:Type="Ford">E-350/Horton Type III Remo
</ns6:Vehicle>
</ns6:Vehicles>
<ns6:OrganisationInfo ns6:Type="CityHospital" ns6:CategoryType="Hosp
ns6:NumberOfEmployees="270" />
</OrganizationInformation>
</Organization>
- <EmergencyDepartmentStatus>
- <EMSCapacity>
- <TriageCode>
<TriageCodeValue>Green</TriageCodeValue>
<TriageCountQuantity>12</TriageCountQuantity>
</TriageCode>
</EMSCapacity>
```

1 Content (EDXL)

OASIS

Advancing open standards for the information society

EDXL Report: Hospital Example

Organization	Hospital	Date: 2008-01-01T18:13:51.0Z
Web site	Tri-State Hospital http://www.townhospitals.org/ We are the Tri-State Hospital	
Address	100 Emergency Drive OurTown PA 20901	
Contact	1-787-333-4141 (cellphone) 1-787-333-4100 (pager) admin@tsh.org (email) 787334100@txt.tsh.org (textmsg)	hours = Any hours = Any status = Active status = Active
Facility Details	Type = CityHospital Category = Hospital Status = Open Employees = 270	

3 Report (HTML)

CAPABILITIES

Emergency Facilities

EMS Census Triage Blue, Count 5
EMS Capacity Triage Green, Count 12

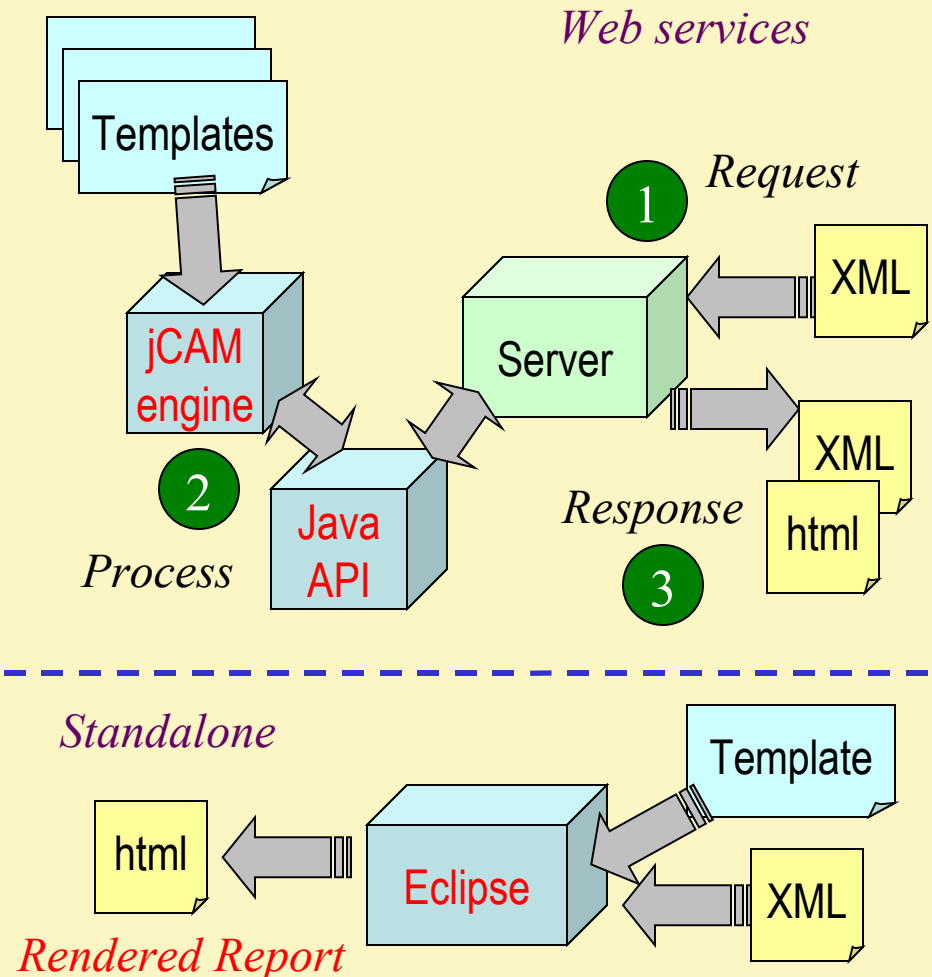
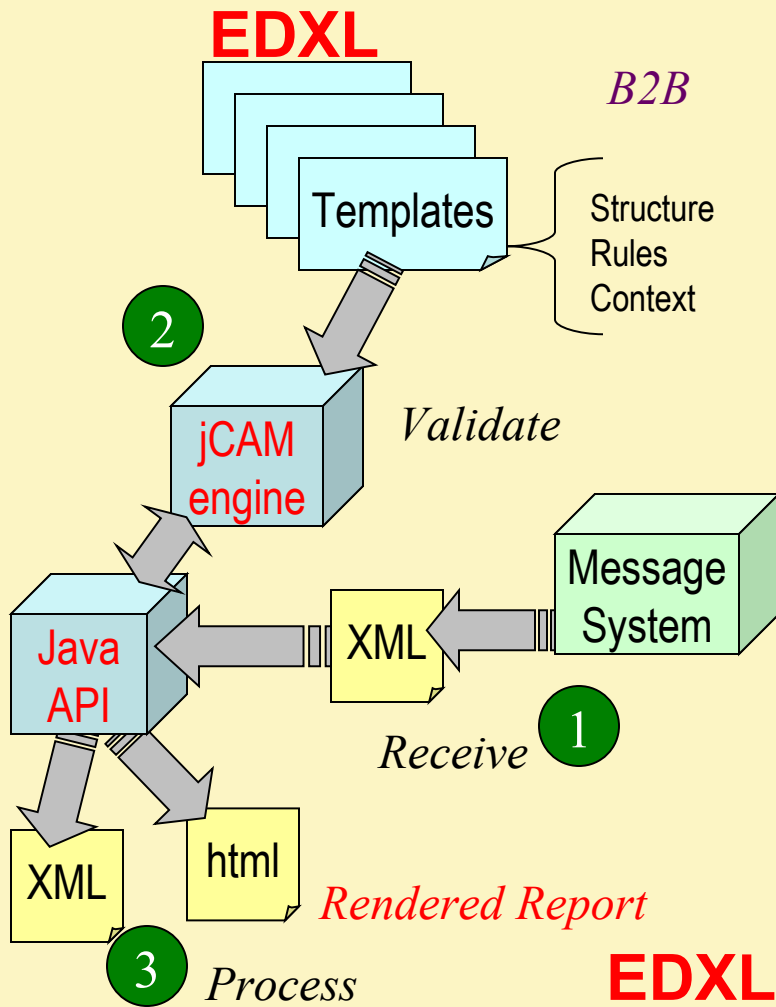
Facilities Status

Done
<as:HospitalFacilityStatus>
<as:HospitalResourcesStatus>
<as:Staffing>Adequate</as:Staffing>
<as:FacilityOperations>Adequate</as:FacilityOperations>
<as:ClinicalOperations>Adequate</as:ClinicalOperations>
<as:ResourcesInformationText>
%</as:ResourcesInformationText>
<as:CommentText>CommentText</as:CommentText>
</as:HospitalResourcesStatus>
<as:LastUpdateTime>2006-05-04T18:13:51.0Z</as:LastUpdateTime>
</as:Hospital>

2 Rules (CAM + XSLT)

```
Documentation
file:///C:/Documents%20and%20S
</as:Mo
<as:Morque
</as:MorqueC
<as:Facility
<as:Security
<as:Activity
<as:Admisa
%</as:Ad
<as:Discha
%</as:Di
<as:Deatht
%</as:De
</as:Activit
<as:Comment
</as:HospitalFacilityStatus>
<as:HospitalResourcesStatus>
<as:Staffing>Adequate</as:Staffing>
<as:FacilityOperations>Adequate</as:FacilityOperations>
<as:ClinicalOperations>Adequate</as:ClinicalOperations>
<as:ResourcesInformationText>%
%</as:ResourcesInformationText>
<as:CommentText>CommentText</as:CommentText>
</as:HospitalResourcesStatus>
<as:LastUpdateTime>2006-05-04T18:13:51.0Z</as:LastUpdateTime>
</as:Hospital>
</as:HospitalStatus>
</as:Structure>
</as:AssemblyStructure>
<as:BusinessUseContext>
<as:Rules>
<as:default>
<as:context>
<as:constraint
condition="//ns5:AdministrativeArea/bs5:Type='State'"
action="lookup(//ns5:AdministrativeArea/ns5:NameElement,US-Full-Valid-State-Codes)"/>
<as:constraint
action="restrictValues(//as:HospitalResourcesStatus/as:Staffing,'Adequate'|'Insufficient')"/>
<as:constraint
action="restrictValues(//as:HospitalResourcesStatus/as:FacilityOperations,'Adequate'|'Insufficient')"/>
<as:constraint
action="restrictValues(//as:HospitalResourcesStatus/as:ClinicalOperations,'Adequate'|'Insufficient')"/>
<as:constraint
action="restrictValues(//as:ServiceCoverageStatus/as:Burn,'true'|'false')"/>
```

CAM Deployment Options



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- David Webber

Next Slide Set

◆ **Rex Brooks, Starbourne Communications Design, Co-Chair, OASIS Emergency Messages and Notification Subcommittee (EM TC)**

■ **The Evolution of the Emergency Data Exchange Language Family of Specifications**

- **EDXL-DE—Distribution Element**
- **EDXL-HAVE—Hospital AVailability Exchange**
- **EDXL-RM—Resource Messaging**
- **EDXL-RIM—Reference Information Model (Planned)**
- **Possible Future Specs**

EDXL: Evolving the Need for Ontology in Emergency IT Standards

- ◆ **Emergency Data Exchange Language Distribution Element (EDXL-DE) Followed Common Alerting Protocol (CAP)-2004**
 - CAP Brought into OASIS Emergency Management Technical Committee (EM TC) at Start of TC
- ◆ **EDXL-DE First EM TC Standard Created from Inception to Approval**
 - Process Different from CAP
 - Scoping & Requirements New Factors for TC
 - TC Task Divisions Developed over Course of Work
 - **Subcommittees Formed for Infrastructure, Messages & Notification, GIS-Geospatial Concerns**

EDXL: Evolving the Need for Ontology in Emergency IT Standards

- ◆ **EDXL-DE Created to Provide Uniform Emergency Message Routing**
 - Staying in Scope a Challenge
 - Finding Appropriate Levels for Information Units
 - CAP Becomes One Kind of Payload
- ◆ **Created in the Context of CAP Adoption**
 - Lack of Standards in Emergency Management IT
 - Unintended Uses of CAP

EDXL: Evolving the Need for Ontology in Emergency IT Standards

◆ **EDXL-DE 1.0 Lessons Learned:**

- **Get Scope & Requirements Clear at Start**
- **Document Object Model: Method to Define Levels of Information**
- **ValueListURN Developed as Way to Avoid Problems of Lists from Different Jurisdictions/Organizations:**
 - **Types of Emergencies**
 - **Organization System Position Names**
 - **Location Specifiers, e.g. Street/Postal Addresses**
- **ISO 11179 Extended Metadata Registry (XMDR) Offers Solution to ValueListURN Specifier**

EDXL-HAVE & EDXL-RM

- ◆ **EDXL-HAVE (Hospital AVAILability Exchange) Brought to OASIS as a Candidate Specification: HavBed**
 - **Another EDXL-DE Message Payload**
 - **A Snapshot Report of Hospital or Hospital System Capabilities-Recommended by HITSP**
 - **Represents the Intersection of Emergency Management and Health Informatics**
 - **EDXL-HAVE Reuses:**
 - **ValueListURN for Lists**
 - **geo-oasis:WhereType for GeoLocation Info**
 - **CIQ for Contact Info, Person Names, Addresses**

EDXL-HAVE & EDXL-RM

◆ **EDXL-RM (Resource Messaging) Brought from Practitioner Steering Group (PSG)**

- **Another EDXL-DE Message Payload**
- **Brought as a Candidate Specification, Recast as Requirements Document-Step Forward (Maybe)**
- **EDXL-RM Reuses:**
 - **ValueListURN for Lists**
 - **geo-oasis:WhereType for GeoLocation Info**
 - **CIQ for Contact Info, Person Names, Addresses**

EDXL-HAVE & EDXL-RM

- ◆ **EDXL-RM 1.0: 16 Specific Message Types & Flexibility for Unspecified Messages**
- ◆ **EDXL-HAVE & EDXL-RM Represent Message Exchange Patterns (MEPs)**
 - Can be Represented by Ontologies or Taxonomies
 - Can be Specified in SOA-RR Service Descriptions as Text or WSDL
 - Can be Included in BPM for SOA Choreographies
 - Can be Handled by Ontology Applications
- ◆ **EDXL-DE, EDXL-HAVE & EDXL-RM Lessons Learned:**

EDXL-HAVE & EDXL-RM

◆ EDXL-DE, EDXL-HAVE & EDXL-RM

Lessons Learned:

- Reuse Message Elements & Information Units
- Reuse Specification Processes

◆ Next Step: Emergency Data Exchange Language Reference Information Model (EDXL-RIM)

- More Abstract Than EDXL-DE, -HAVE, -RM, but Less Abstract than Reference Model such as SOA-RM
- Represent as XML Schema, RDF Schema and OWL-DL
- Provide Guidance for Future EDXL Specifications, Versions of Existing Specifications

Next Slide Set

- ◆ **Rex Brooks, Prepared by Danny Thornton, OASIS SOA Reference Model Technical Committee (SOA-RM TC), Reference Architecture Subcommittee**
 - **Overview of Example OASIS SOA-RM TC Reference Architecture**
 - **Integrated Response Services Consortium (IRSC)**
 - **ebXML Registry-Repository, FreebXML Open Source Project**
 - **Federated RRs for Emergency Management & Health Informatics Domains**

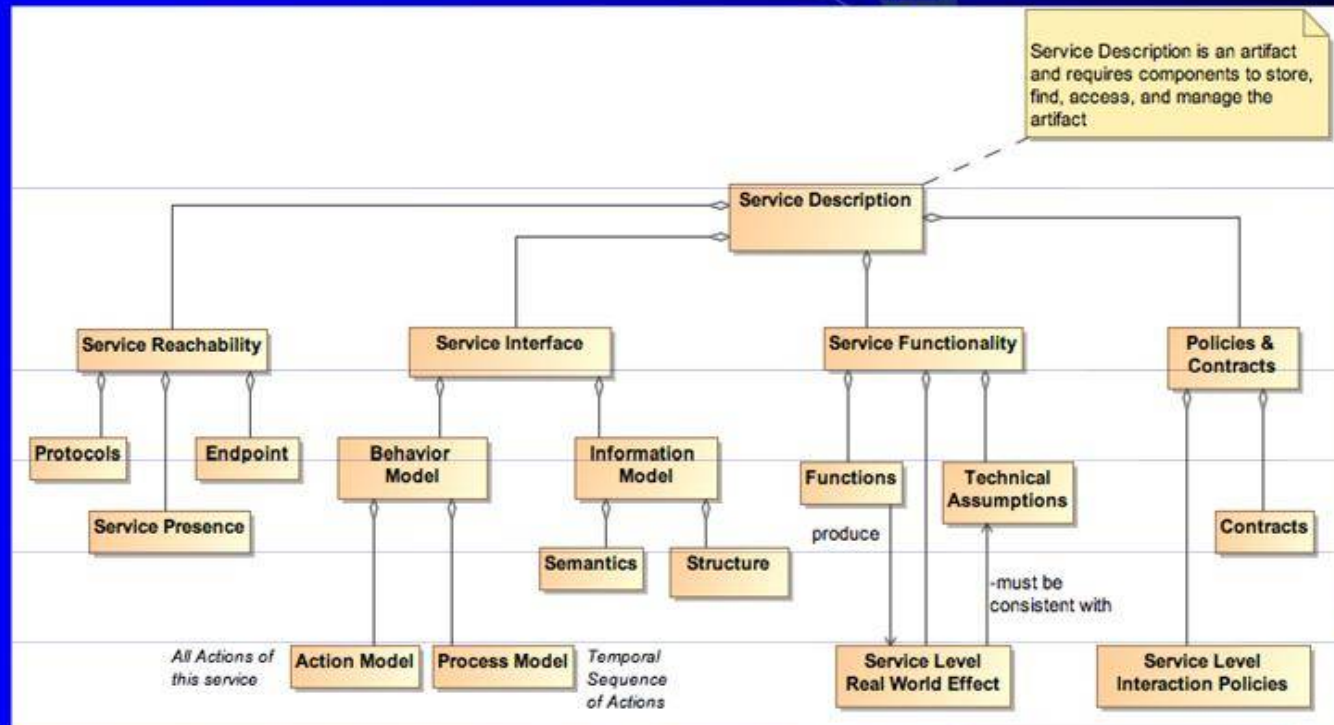
Integrated Response Services Consortium (IRSC)

Service Oriented Architected
(SOA) Registry-Repository (RR)
and Ontology Support

SOA Registry-Repository (RR) and SOA Service Visibility

- SOA RR can provide SOA service visibility as defined by the OASIS SOA Reference Model and OASIS SOA Reference Architecture
- OASIS SOA service visibility expressed as
 - **Awareness** – Provide centralized (mediated) search and access of service descriptions for relevant domains
 - **Willingness** – Service descriptions contain information that allow a consumer to determine the applicability of a provider's service
 - **Reachability** – Service descriptions provide information to establish automated or other types of communication with the service

Advertising SOA Services – Service Descriptions



- Based on ongoing work for the OASIS SOA Reference Architecture

Implementation of IRSC SOA Service Visibility

- Visibility of IRSC Emergency Management and Health Informatics services offered through standards-based IRSC SOA RR
 - Service Descriptions published to IRSC SOA RR
 - SOA RR complies with electronic business XML (ebXML) standard
 - Based on FreebXML open source project
 - FreebXML representation in Open Ontology Repository Initiative

Where is the Ontology Support in SOA RRs?

- Open Ontology Repository Initiative will determine additional ontology support for SOA RRs
- This community will likely take ontology support in SOA RRs to the next level

Underlying Ontology Support and an ebXML SOA RR

- Standards and classification schemes part of the the standard ebXML and FreebXML SOA RR
- FreebXML SOA RR can be loaded with classification schemes, concepts, and their relationships
- Service Descriptions and their artifacts can be stored and classified in the FreebXML SOA RR

Example Search of an ebXML SOA RR

The screenshot displays a web browser window with two panes. The left pane is a search interface for a Service Registry, and the right pane shows the search results as a tree view of classification nodes.

Search Interface (Left Pane):

- URL: <http://www.integratedresp...>
- Navigation: Tasks, Search, Explore
- Select Predefined Query: Basic Query
- Basic query for selecting registry objects by name, description and classification
- Export Repository Content As Zip File:
- Dependency Resolution Depth: 0 Levels
- Object Type: ...Organization
- Name:
- Description:
- Status: StatusType
- Select Classification Node...:
- Value: /urn:uuid:2ac531c8-39ce-4441
- Buttons: Search, Clear, Help
- Use % as wildcard character

Search Results (Right Pane):

- WSRPVersion (2)
- iso-ch:3166:1999 (9)
- ntis-gov:naics:1997 (20)
 - Accommodation and Food Services (2)
 - Administrative and Support and Waste Management and Remediation Services (2)
 - Agriculture, Forestry, Fishing and Hunting (5)
 - Arts, Entertainment, and Recreation (3)
 - Construction (3)
 - Educational Services (1)
 - Finance and Insurance (5)
 - Health Care and Social Assistance (4)
 - Information (7)
 - Management of Companies and Enterprises (1)
 - Manufacturing (21)
 - Mining (3)
 - Other Services (4)
 - Professional, Scientific, and Technical Services (1)
 - Public Administration (8)
 - Administration of Economic Programs (1)
 - Administration of Environmental Quality Programs (1)
 - Administration of Housing Programs, Urban Planning, and Community Development (1)
 - Administration of Human Resource Programs (1)
 - Executive, Legislative, and Other General Government Support (1)
 - Justice, Public Order, and Safety Activities (1)
 - Justice, Public Order, and Safety Activities (7)
 - Correctional Institutions (1)
 - Courts (1)
 - Fire Protection (1)
 - Fire Protection (0)
 - Legal Counsel and Prosecution (1)

Integration With ebXML RR

- Standard JAXR interface for programmatic integration of ebXML compliant RRs

Example Web Application Using JAXR to Front ebXML RR

The screenshot displays the 'EMERGENCY MANAGEMENT REGISTRY' web application. At the top, there is a navigation menu with tabs for 'Service Providers', 'Services Info', 'Contact Info', 'Standards Info', 'SDOs Info', and 'Transactions'. Below the menu, there are search and navigation options: 'Search Providers', 'Create Provider', 'Select Registry' (set to 'Emergency Management Registry'), and a search listing of integrated response service providers.

The main content area is titled 'Service Providers Listing' and contains a table with the following data:

Provider Listing		Name	Description
Details	Update	Alameda County Water District	Organization Type: nullAgency: null
Details	Update	CDF - Alameda/Santa Clara	Organization Type: nullAgency: Fire
Details	Update	California Department of Public Health	Organization Type: nullAgency: null
Details	Update	Gilroy Fire Department	Organization Type: Local GovernmentAgency: Fire
Details	Update	Lockheed Martin Fire Department	Organization Type: nullAgency: Fire
Details	Update	Los Gatos Police Department	Organization Type: nullAgency: null
Details	Update	Milpitas Fire Department	Organization Type: Local GovernmentAgency: Fire
Details	Update	Mountain View Fire Department	Organization Type: Local GovernmentAgency: Fire
Details	Update	NASA Ames Fire Department	Organization Type: nullAgency: Fire
Details	Update	Onizuka AFS Fire & Emergency Services	Organization Type: nullAgency: Fire

At the bottom of the table, there is a pagination control showing 'Page: 1 of 3' and a 'Go' button. The footer of the page contains the copyright notice: '©2007-2008 Integrated Response Services Consortium'.

Next Slide Set

◆ **Michelle Raymond, Principle Research Scientist, Honeywell ACS Labs, Knowledge Services**

- **Examining Emergency Management Needs Across Domains for Data Exchange Support**
- **National Building Information Model Systems (NBIMS)**
- **OASIS Open Building Information eXchange TC (oBIX)**
- **Using oBIX with EDXL-DE**
- **Using SOA-RR Framework**
- **Ontology Needs**

In the Face of Disaster



In Emergencies, Information must Flow Smoothly in Detection, Response, Mitigation & Recovery for ALL.

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- Michelle Raymond

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Emergency Management Information Needs

◆ **Cleanly Cross Domains**

- **Connect correct information NOW!**
- **Information services**
- **Reasoning services**
- **Action services**

◆ **Data Exchange Support**

- **Sharing policies**
- **Distribution assignment**
- **Creating Common Operating Picture**
- **Scope and view accounting**

National Building Information Model Standard (NBIMS) Vision

- ◆ **NBIMS Vision: Improved process**
 - using a standardized machine-readable information model
 - containing all appropriate information about a facility
 - formatted to be useable throughout its life-cycle
 - for all participants needing knowledge about the facility.

Vision Statement: An improved planning, design, construction, operation, and maintenance process by using a standardized machine-readable information model for each facility, new or old, which contains all appropriate information created or gathered about that facility in a format useable throughout its life-cycle by all.

National BIM Standard Definition of BIM – buildingSMART

Official Definition:

A Building Information Model (BIM) is a digital representation of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle from inception onward.

NBIMS Business Processes

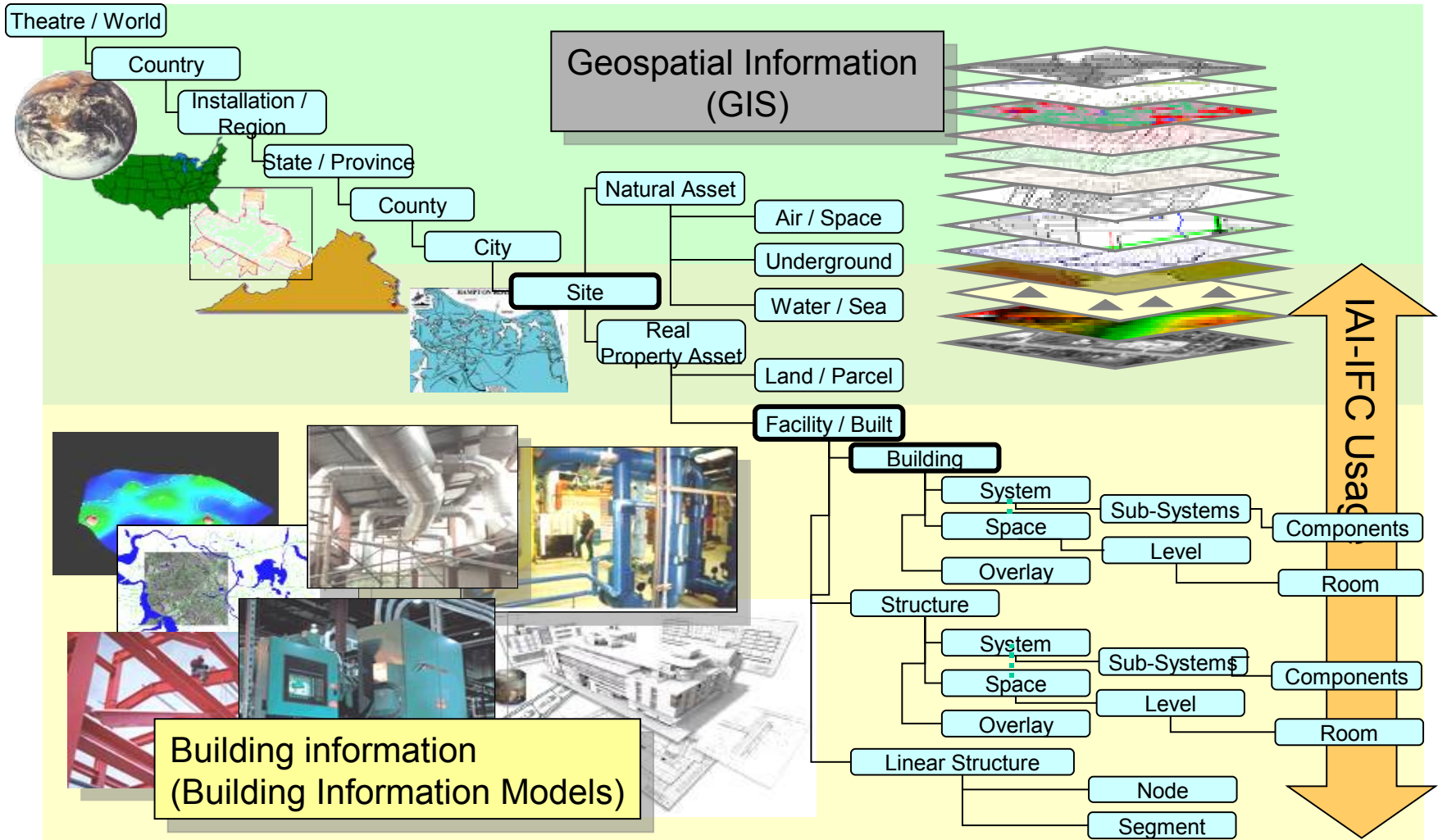
◆ Business Processes

- Interfaces to business processes at the core of NBIMS
- Standardizing commonly-recognized relationships
- Identify information needing to flow through the model
- Make information available to appropriate parties

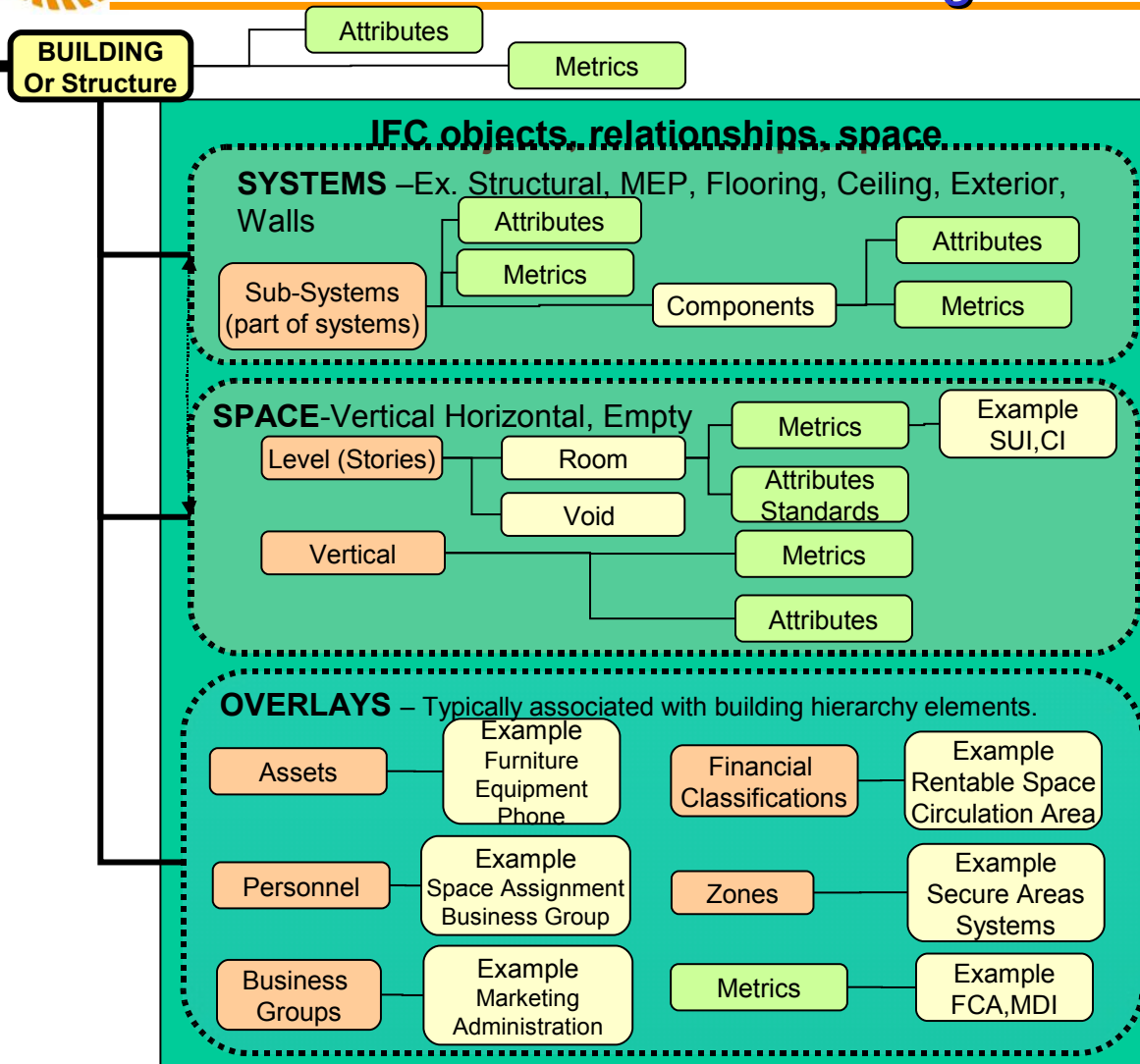
Formalizing information flows will:

- Identify authoritative sources for information
- Ensure that correct data is collected
- Data need only be entered once into the model

Hierarchical Information Relationships



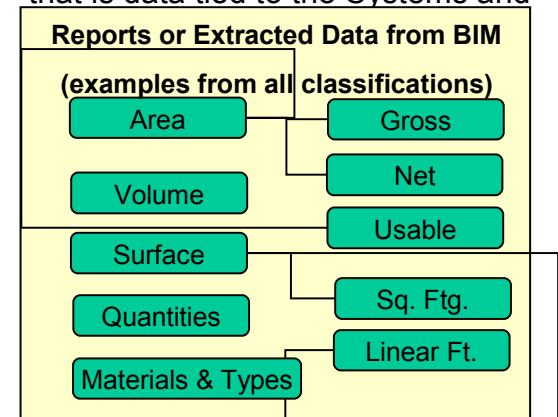
Hierarchical Building Information Relationships



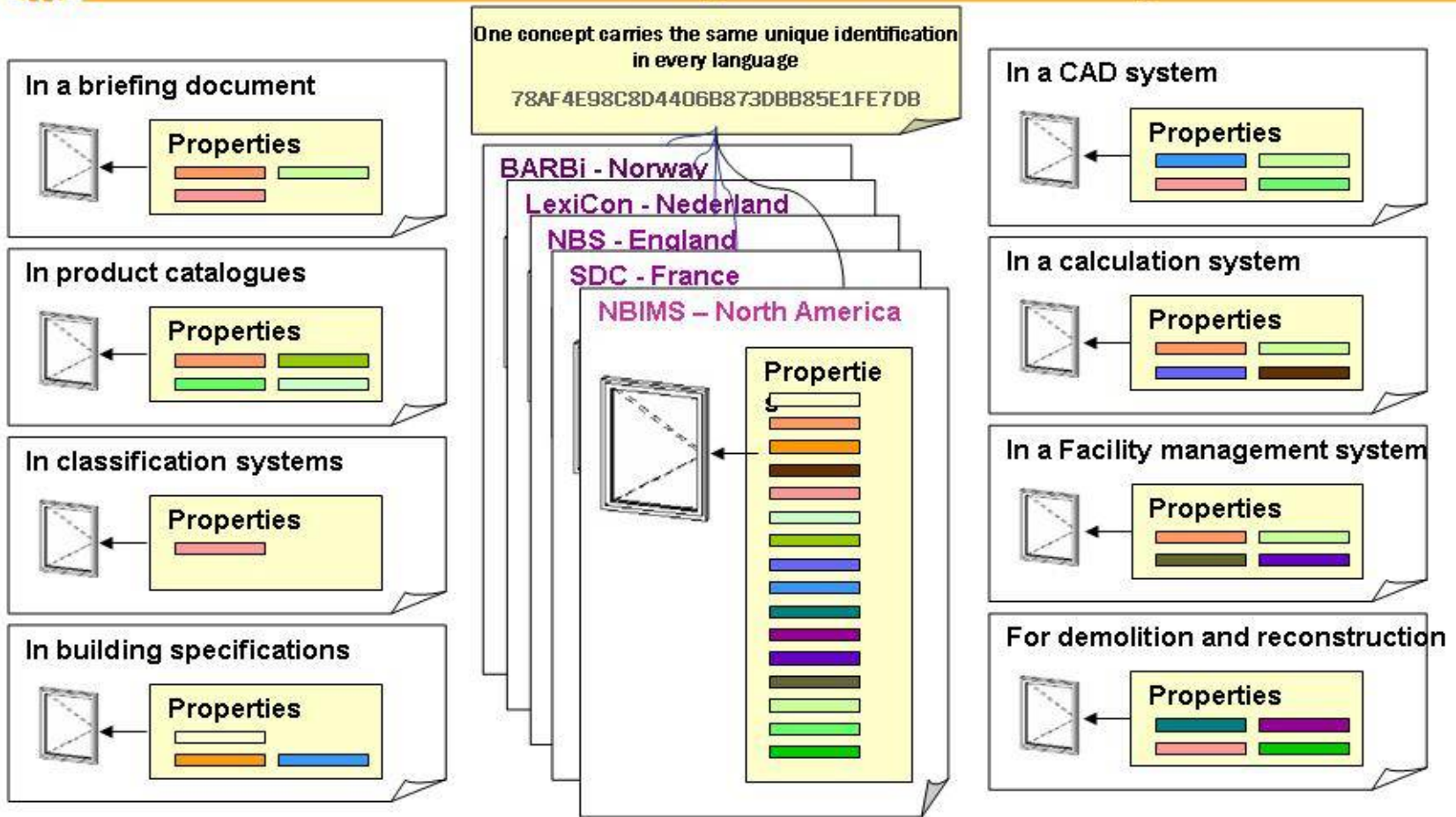
Systems represent the physical entities of the building. Systems use NA classifications such as Omni-Class and Unifomat and are transported/exchanged via IFCs

Space is physical in nature, but can be unbounded (have no or cross physical boundaries) but it will always be tied to the physical structure or systems in some way

Overlays are more abstract data - organizational, operational, functional, financial, non-fixed assets, resources, personnel, etc. that is data tied to the Systems and



One object exists in multiple contexts



Courtesy of Lars Bjørkhaug, Norwegian Building Research Institute

© BIMS 2006

oBIX – Open Building Information eXchange

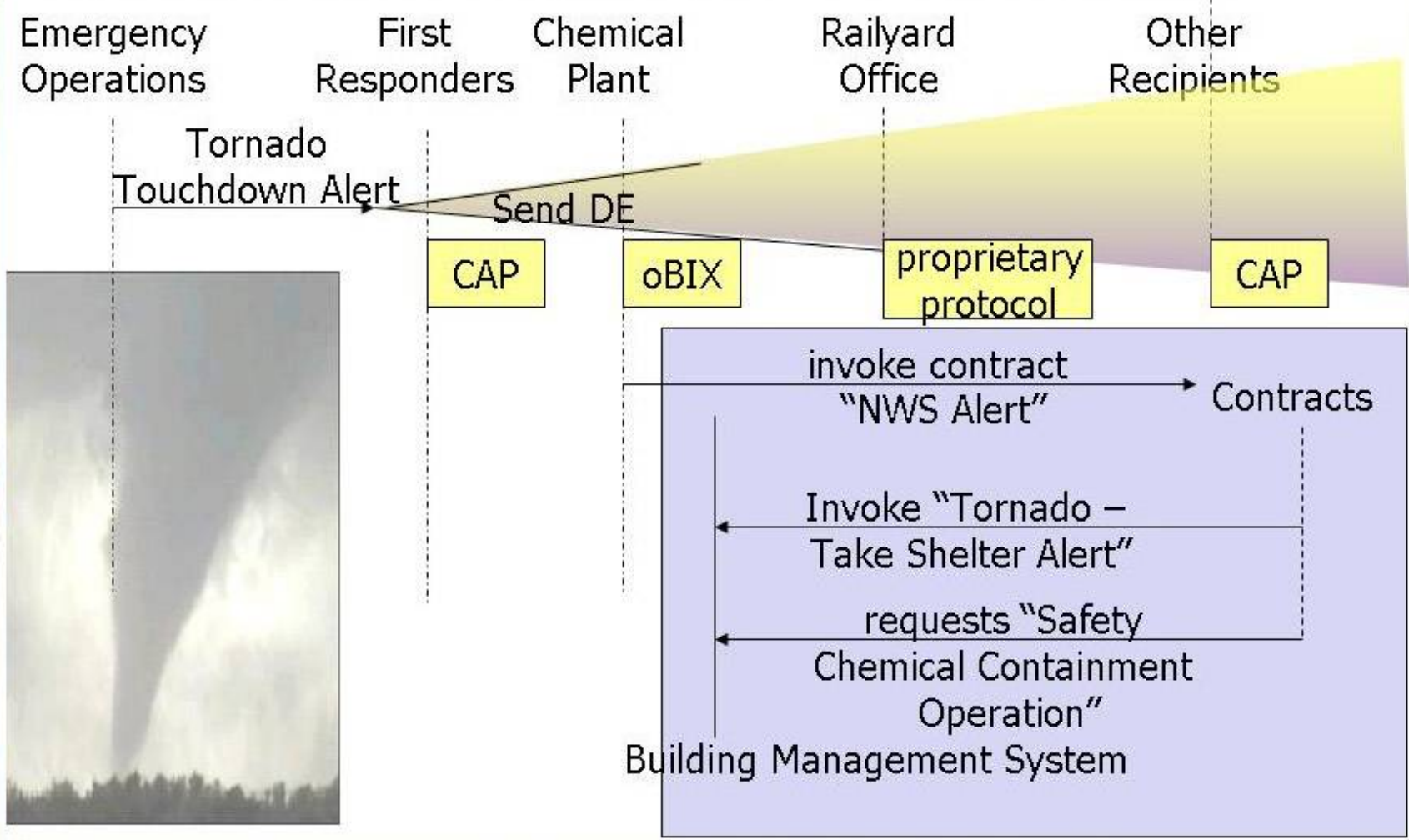
- Enables Building Management Systems to communicate with external services
- Represents information in a standardized format
- Enables defining specialized contracts to invoke operations based on security permission and situation awareness
- Provides for changing permissions based on alarm states

oBIX Architecture objectives provide means for reliable, extensible, safe interoperability.

oBIX 2.0 Stack

oBIX Building <ul style="list-style-type: none">• HVAC equip• Fire• Elevator, etc	oBIX Energy <ul style="list-style-type: none">• Meter• Price structures	oBIX Security <ul style="list-style-type: none">• Users/badges• Doors/readers• Cameras/video	oBIX Industrial <ul style="list-style-type: none">• Process• 1131/1499• Batch/recipes
oBIX Enterprise <ul style="list-style-type: none">• Distributed database: query, search, navigation, caching• Ontology: site, building, story, equipment, space, relationships			
oBIX 1.0 Foundation <ul style="list-style-type: none">• Object model• XML• Contracts• Web Services• Watches, points, histories, alarming			

oBIX payloads in Distribution Element example



Knowledge Solutions needed

◆ **Cleanly Cross Domains**

- Know where to get data – SOA-RR
- Domain Information Structure - Ontology
- Reasoning Systems
- Ontology based API

◆ **Data Exchange Support**

- EventTypes in Policy Management within SOA
- Incident Lifecycle - Ontology
- Ontology to Ontology – Semantic clustering
- Data slicing – Metadata for scope and view

Links and References

- ◆ **(NBIMS)** National Building Information Model Standard
 - Project page: <http://www.facilityinformationcouncil.org/bim/>
 - BIMS Slide Show:
www.facilityinformationcouncil.org/bim/docs/BIM_Slide_Show.ppt
- ◆ **(oBIX)** Open Building Information Exchange
 - OASIS oBIX Technical Committee: http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=obix
 - oBIX TC Press links: <http://www.oasis-open.org/committees/obix/press.php>
- ◆ **(EDXL)** Emergency Data eXchange Language
 - OASIS EMTC Technical Committee: http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=emergency
 - Associated EMTC Standards: http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=emergency#technical

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Next Slide Set

◆ **Dr. Bob Smith, Professor Emeritus, California State University Long Beach, OASIS Open Building Information Exchange**

- **Overview of Necessity for Ontology in ERMS & ERSM**
 - **Top-Down, Bottom-Up Approach**
 - **Roadmaps, Baselines and Benchmarks**
 - **Aligning Scope and Scale**
 - **Fail Points & The Critical Path for Success**
 - **The Public-Private Interface**
 - **Opportunities to Help Integrate Ontology**

Response Service Life Cycle Management

Evidence from A Tale of Two Sectors of Ontology Management Success

◆ **My Objectives: Marshall Evidence**

- Identify important opportunities for the Ontolog Forum Community members
- Identify relevant next steps towards common goals via Ontology Management methods
- Reframe Evidence of Ontology driven Response and Emergency Response Frameworks in key Industrial Sectors

◆ **Outline (Top Down And Bottom Up approach with 3 layer model)**

- Layer 1: Aligning Engineering and Management Functions in Mega Projects (\$1/3 Billion and up, 1-5 years of design integration)
- Layer 2: Roadmaps, Baselines and Benchmarks in Response Management Methods in Mega Projects (OOR * OR = Rx)
- Layer 3: How are Mega Projects in the Architecture-Engineering-Construction Sectors aligning with the Health Information Technology Sectors? (Evidence of success and V*V agents in OOR)

Layer 1: Aligning Engineering and Management

- ◆ **Alignment tensions of large organizations with many domains and diverse stakeholders:**
 - **Simple organizations evolve under stressors such as**
 - technology and standards change (OASIS, OGC, OMG, UN)
 - environmental change (Energy Crisis, Climate Crisis, Water Crisis)
 - Political and Regulatory change (IPCC, AB-32 in CA, CERES)
 - **Organizations “studied” intensively with**
 - limited taxonomies and common frameworks (Simon, Mintzberg, Carley, Strategy Maps, Leontief)
 - very limited open computer based modeling
 - ❖ ontology based simulations (Paul Fishwick)
- ◆ **New Patterns of organizational adaptations**
 - nodes on the Global Information Grid (OMG-GAO Ent. Arch.,NC)
 - functional-structural modeling of resource dependencies
- ◆ **Evidence of Ontology Management evolving with Ontology Engineering?**
 - Challenge of Perspective, Process, Input-Output/Results, Value Alignment, Knowledge formalization, Internal Control/Audit and Governance distinctions
 - Ontology Resilience and Maintenance issues in Mega Projects dictates
 - Rules for Rulemaking and Agents that can say “No”

Layer 1: Comparison and Convergence: OE and OM "Persona"

◆ **Ontology Engineering**

- **Education: Philosophy-ICS**
- **Focus on Project Internals**
- **Available metrics: Technical Performance**
- **Professional Judgments well codified in academic values**
- **Network Communication flows dominate**
- **Wiki or Current Communication flows**
- **Semantic Technology well developed; Project Management Ontologies emerging (?)**

• **Ontology Management**

- **Education: Business School, Civil Engineering**
- **Focus on Project Context & Legal Constraints (RFP/Contracts)**
- **Available metrics: Productivity & Results (Time, \$\$ in SoW, RFP Contracts)**
- **Hierarchy mindset → Nets**
- **Project Tools well developed but require emerging Semantic Technology to be effective**

Layer 2: Roadmaps, Baselines, Benchmarks: Tasks, Tools, and OOR

- ◆ **Evidence of Evolving Ontology Management Tasks:**
 - **Vision (Feasible and stretch Goals; Alternative pathways; valuation criteria embedded within Organizational Decision Support Systems)**
 - **Funding Resilience (Explicit priorities and ability to recover from expected and unexpected challenges)**
- ◆ **Requisite Ontology Management Tools & OOR:**
 - **Sector Roadmaps and Sector Node Evolution of Goal-oriented baselines and benchmarks (NHIN-NBIMS)**
 - **metrics on ontology based dimensions**
 - **Fail points Awareness in Critical Paths on Roadmaps**
 - **Exposing Hidden Assumptions:**
 - **“Reality Checking” processes,**
 - **Smart Sensor Integration**
 - **Expressed in open *and* proprietary models**
 - **Developed on legacy frameworks as service component**

Layer 3: Evidence of Convergence in Healthcare & Building Sectors

- ◆ **Roles of evolving OOR Design and Governance**
- ◆ **Sectors: Architecture-Engineering-Construction and Health Information Technology**
 - Fallon & FIATECH-NIST value implications
 - RAND, Partners NHIN-HIE value implications
 - BIMStorm value implications
- ◆ **Expected Mega project <--> OOR effects**
 - **Ontology critical, ontology based standards obviously key**
 - **Challenge is framing task opportunities in productive terms**
 - **Since some sectors are far ahead of others, which management patterns and technology knowledge is being transferred where needed?**
- ◆ **Convergence between Facilities & Functions-All Hazards Belief Networks**
 - **An evolving concept: More distinctions needed: 2 x 2 table enough?**
 - **Convergence defined and illustrated (Popper vs Kuhn vs Feyerabend)**
 - **Facilities perform Functions: Physical Architects when designing structures balance many trade-offs within scope of many standards**
 - BPS&J's Gupta: 2-3 years ahead of time
 - BIMStorm success with demonstration using ICF
- ◆ **Session Speaker's Evidence of Convergence?**
 - **oBIX→ Expansions with many related physical and virtual objects**
 - **SOA Frameworks of Standards viewed from Functional-Process perspective NOT Vendor**

Mega Projects and RFP Mechanisms

- ◆ **Integrated Roadmaps, Blueprints, and RFPs**
 - Evidence of Semantic Interoperability between
- ◆ **SOA Maturity and RFP Templates**
 - Basic use of ontology projects and products
 - Legal aspects of an RFP in Mega Projects
 - Legal-Technical metrics and up front loading of performance expectations
- ◆ **Scope, Objectivity, OODA Loops capabilities**
 - Obvious opportunities for proper RFP Templates to accommodate dynamic semantics
- ◆ **Life Cycle dynamics and Nodes on GIGs**
 - The long term view needs to be better connected to current Mega Project initiatives

Visions and Values: EDXL & SOA Frameworks in Mega Projects

- ◆ **Small component and role (IF Any) in Mega Projects today**
- ◆ **Where does a sponsor obtain the highest knowledge leverage?**
 - Very early in design modeling
 - Very early in RFP development
 - Very early institutionalizing of SOA-RR recursiveness (GSA and NBIMS; USGBC and green entrepreneurs or greenwashers)
- ◆ **Public-Private Partnership Scenarios**
 - David Bain's Empire Express lessons learned
- ◆ **Opportunities for Ontolog Forum Members to participate in the Response Vision -→Blueprint Visibility**

Roadmaps and SOA-RR Response Blueprints: Mega Project Lifecycles

◆ Simple high level Time Lanes

- (Converting Roadmaps to Blueprints to RFPs to Intelligently Built Life Cycle Systems...) Person in Lane; Roles, Functions : Actions results, impacts, fail points, lessons learned
 - Elysa Jones
 - David Webber
 - Rex Brooks
 - Danny Thornton
 - Michelle Raymond
 - Bob Smith
 - Missing Roles 1
 - Missing Roles 2
 - Missing Roles 3

Resolved: Ontology Needed

- ◆ **Since 9/11 We've Moved to More Expressive Representations in Emergency Management IT Standards**
 - But We Still Need 'Computability' of Less Expressive, More Constrained Representations
- ◆ **We're Aiming for the "Sweet Spot" Between Theory and Practice**
 - We Have Important Choices to Make
- ◆ **Opportunities Exist for Ontology to Make Important Contributions**

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