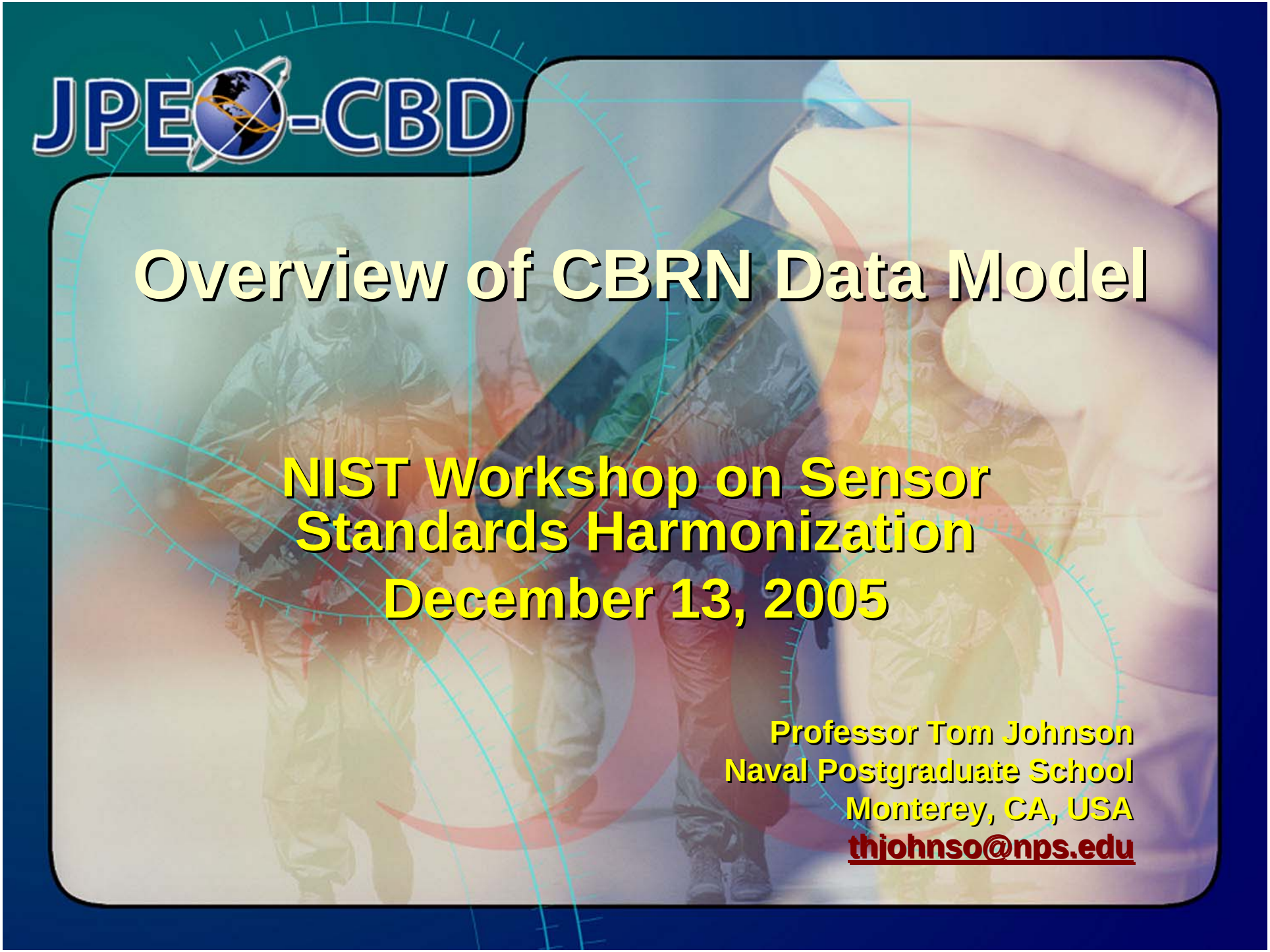


Overview of CBRN Data Model

NIST Workshop on Sensor Standards Harmonization
December 13, 2005

Professor Tom Johnson
Naval Postgraduate School
Monterey, CA, USA
thjohnso@nps.edu

Our Methodology

- Bring together stakeholders in sensor development, sensor data, and sensor data networking to start the process…
  - Starts with common data specification
- Sensor Interface Data – Derived from two abstract classifications:
  - Status Representations
  - Commands
- Security and Information Assurance (IA)
  - Data tagging and attribution support IA requirements, support NCES Security service, consider guidance from NSA, etc.
- Leverage existing standards for reuse / mapping
  - SensorML, IEEE 1451.X series, Common Alerting Protocol (CAP), EDXL, etc.

Goals and Guidance

- Develop common configuration of sensor and sensor data:
  - Web-based access
    - Common web-page based on the CBRN XML Schema
  - Logging and reporting of data
  - Configuration of logging and reporting of data
  - Common sensor-side and host-side drivers and configuration software

To the Engineers…
Developer Guidance

- Utilize systems and technical views of DoDAF architectures that:
  - Specify technology standards
  - Explain how systems communicate and data passed
  - Explain how data are represented
- Support the W3C WS-I (Web Services Interoperability) Basic Profile (e.g. XML, SOAP, WSDL, UDDI, HTTP(S))
- Support configuration controlled components and artifacts:
  - E.g. Architecture and Data Models, Engineering Reference Model Specifications, Technical Specifications, Common Software Services, and Common Hardware platforms
  - Modularity to enhance compatibility across versions
  - *Joint CBRN (JCBRN) Architecture Working Group, Data Working Group, and Configuration Management Plan Established…*

Ensuring interoperability and portability starts with the specifications…

Ultimate Goal: Net-Ready Sensors

- **Common CBRN Sensor Platform** – *the fully encapsulated net-centric reusable software service that communicates securely via the CBRN XML Schema using a common protocol…*
- All CBRN sensor data that can be transmitted, received, and stored will use the CBRN Data Model as the basis for data representation!
  - *Specification of sensor data entities and attributes in the CBRN Data Model is underway NOW, being lead by JPM IS Data Team.. Other specifications will follow…*

Standardization of the interfaces across all CBRN sensors/devices!

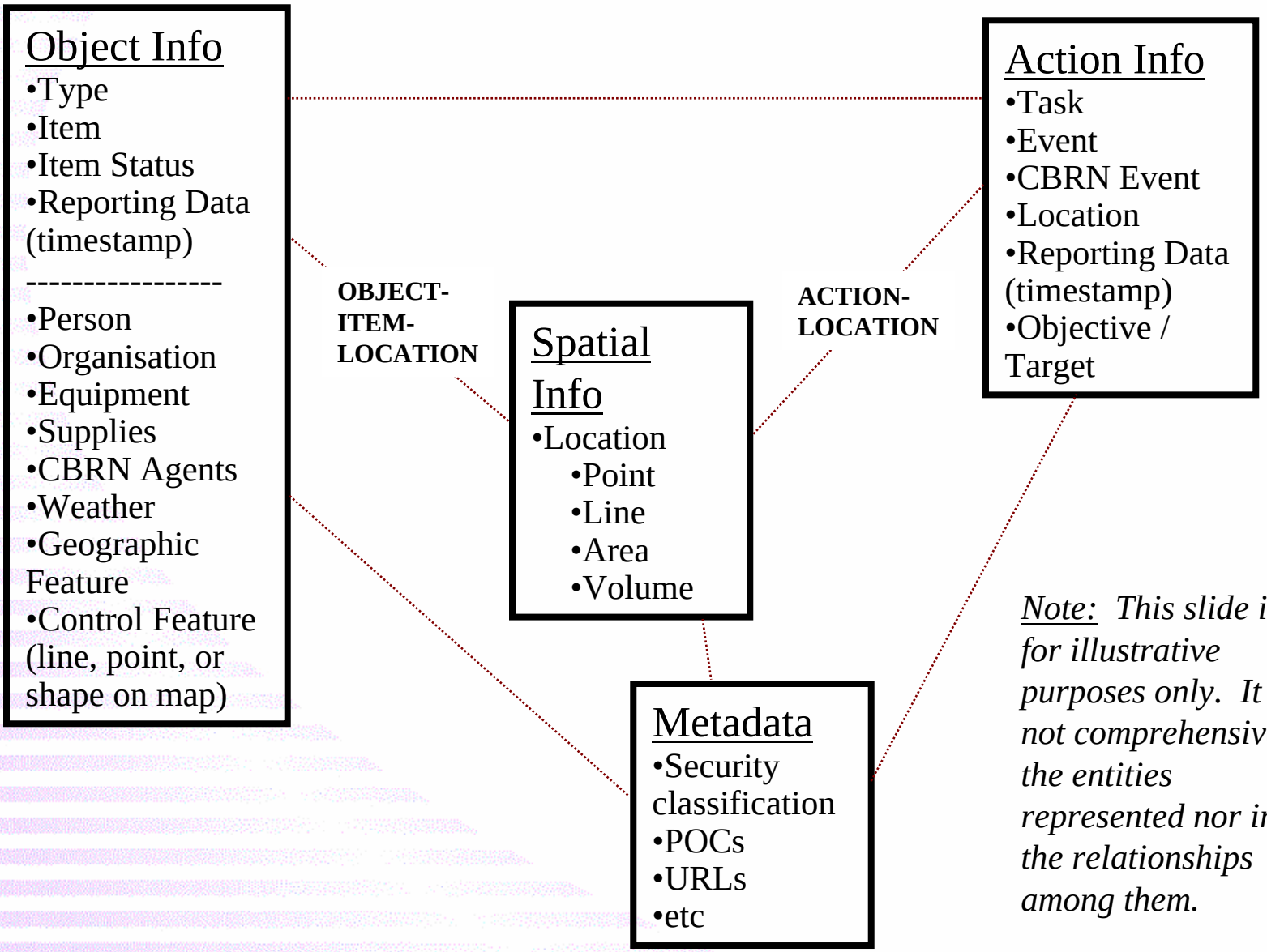
CBRN Data Model Vision

- Establish timely and accurate CBRN data that are interoperable across US (JWARN, JEM, JOEF, and other JPEO) Programs and NATO that enhance CBRN situational awareness and decision making.
- Leverage the benefits of standardization of language/syntax, and information assurance.
- Work with other organizations to establish standard processes, interfaces, policies, protocols, artifacts, metrics and templates for CBRN interoperability.
- Standardize the parameters used for modeling and simulation to predict CBRN hazards.
- Prescribe and coordinate CBRN use of common communication protocols for connectivity between different US systems and national CIS.

Data Model Responsibilities

- **Develop CBRN COI common semantics and syntax and equivalent XML namespace**
  - **Standardizing CBRN requirements for ATP-45 W&R and other CBRN Information Exchange Requirements (IERs). Submit change proposals with NDAG to MIP for JC3IEDM, encompassing CBRN data requirements for ATP-45(B) Change 2 by Dec 05 and for ATP-45(C) by Dec 07.**
  - **NBC CIS W&R Panel is authorized by NSA NBC WG to coordinate all CBRN IERs with other organizations. Recognized by NDAG and MIP as the CBRN Community of Interest (COI), this panel specifies data descriptions of all CBRN elements.**

CBRN Data Model Simplified View



Note: This slide is for illustrative purposes only. It is not comprehensive in the entities represented nor in the relationships among them.

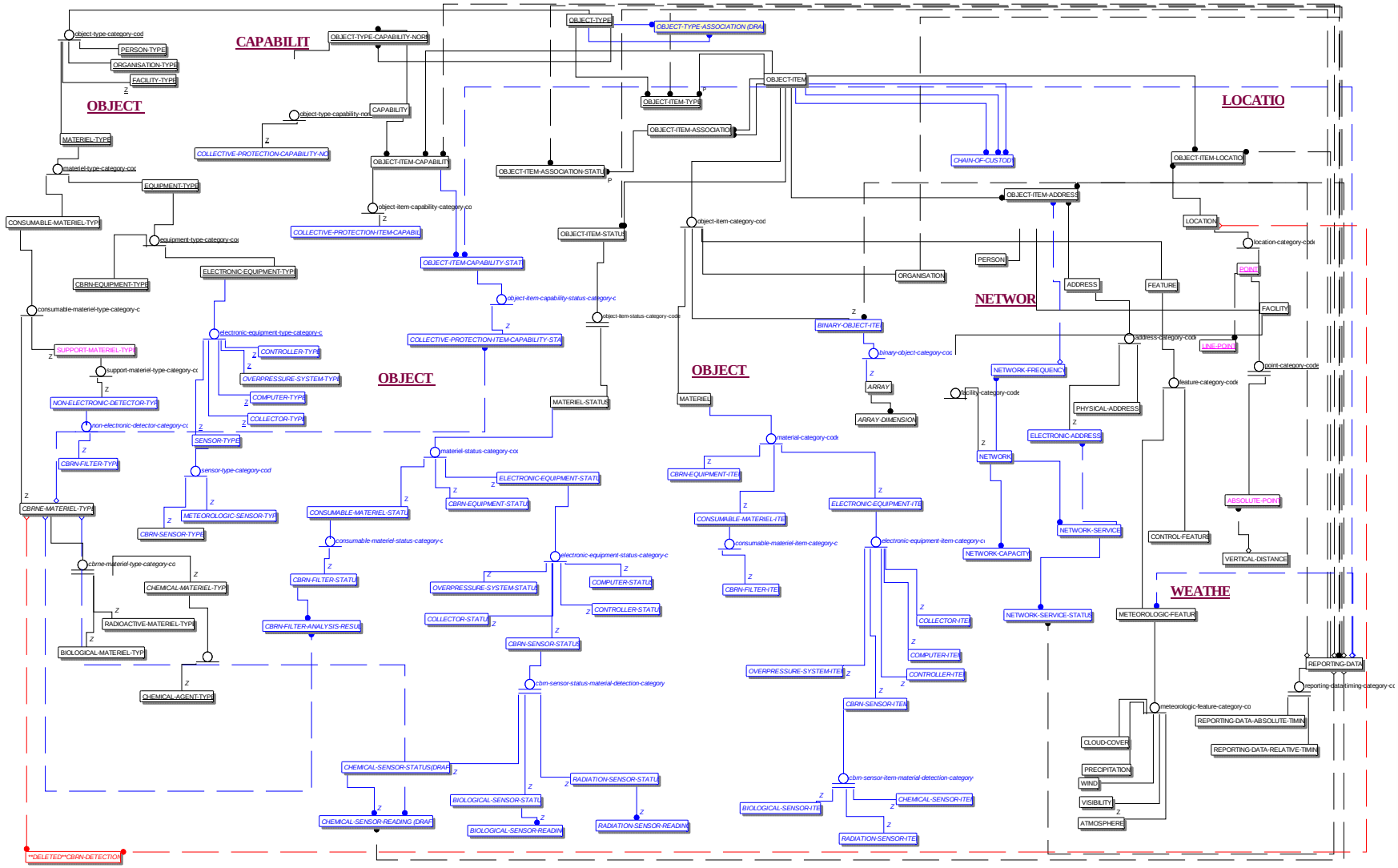
Present Sensor Representation

- JPM Guardian focused
- Created many new types: COLLECTOR-*TYPE*, COMPUTER-*TYPE*, CONTROLLER-*TYPE*, OVERPRESSURE-SYSTEM-*TYPE*, SENSOR-*TYPE* and CBRN-FILTER-*TYPE*
- Added corresponding ITEM and STATUS sections
- Sensor READING entities added to capture sensor measurements
- Added CHAIN-OF-CUSTODY entity to support the custodianship tracking of biological filters
- Raw sensor data can be captured using the BINARY-OBJECT entity
- Included Disposable sensors (Paper Strips)
- Included Network and Electronic Addressing

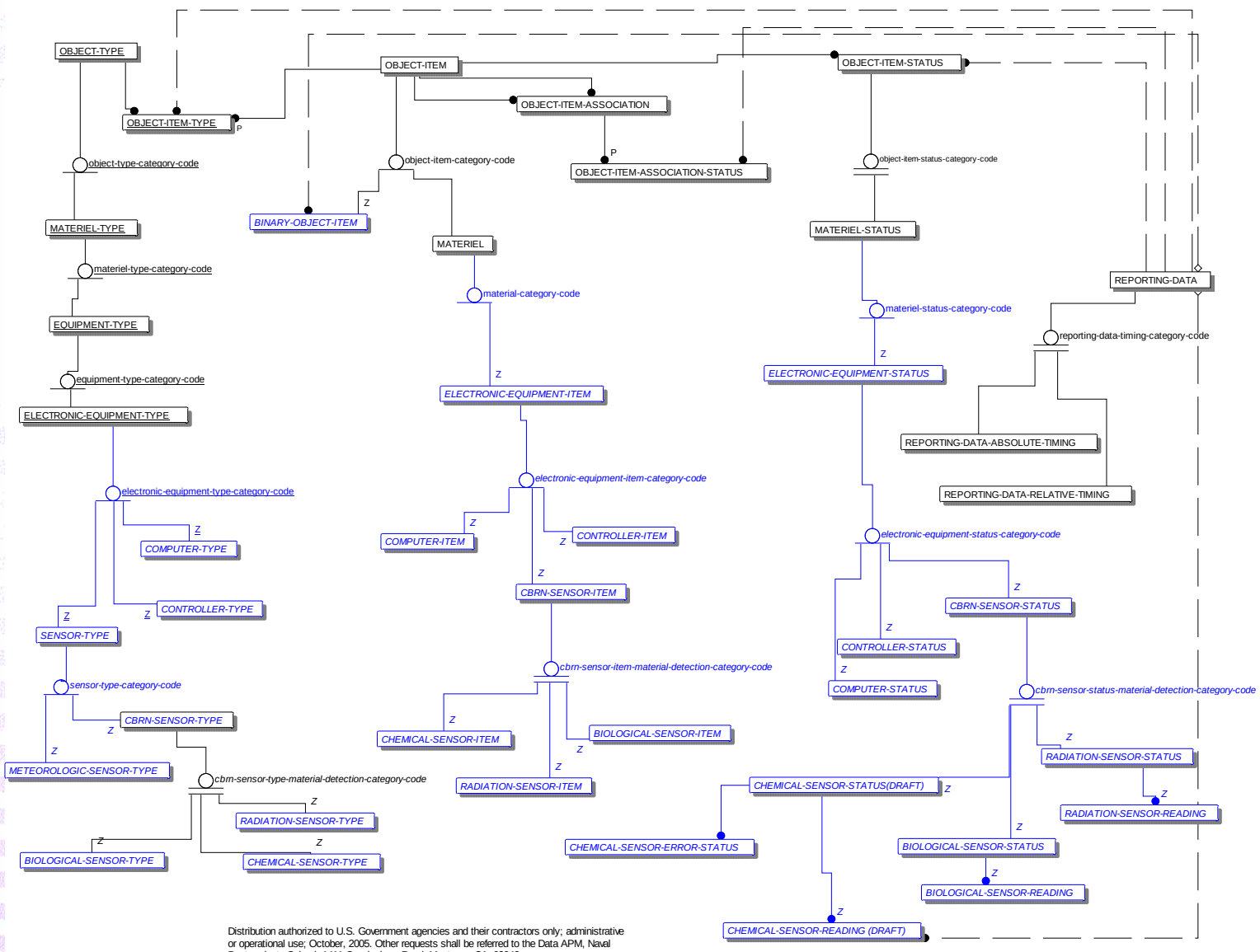
Planned Changes (Sensors)

- Update open action items resulting from the Nov 2005 technical review
- Enhance the Radiation Sensor attributes
- Sensor Signatures
- Sensor Detection
- Review JWARN sensor data
- Analyze JWARN Interface Requirement Specifications (IRS)

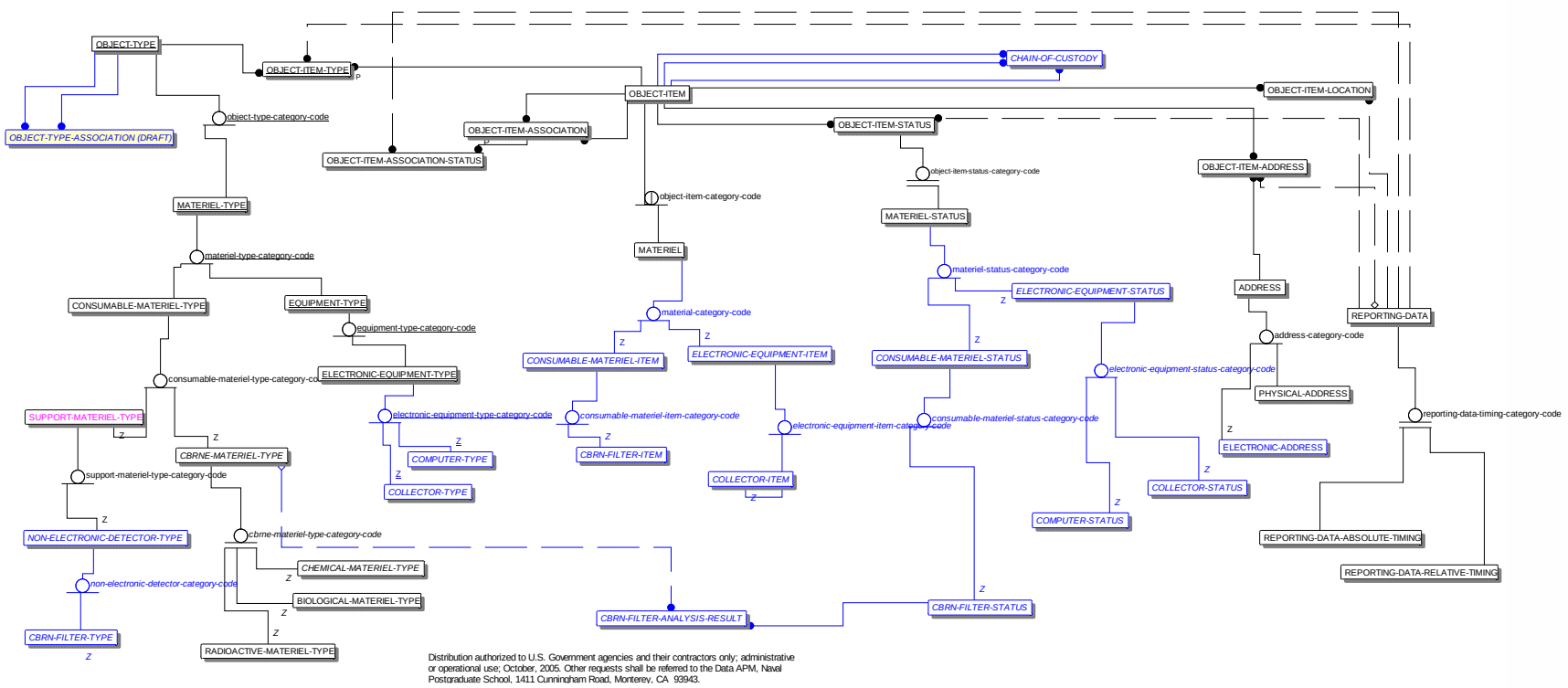
Sensor Overview Entities subject area of Data Model



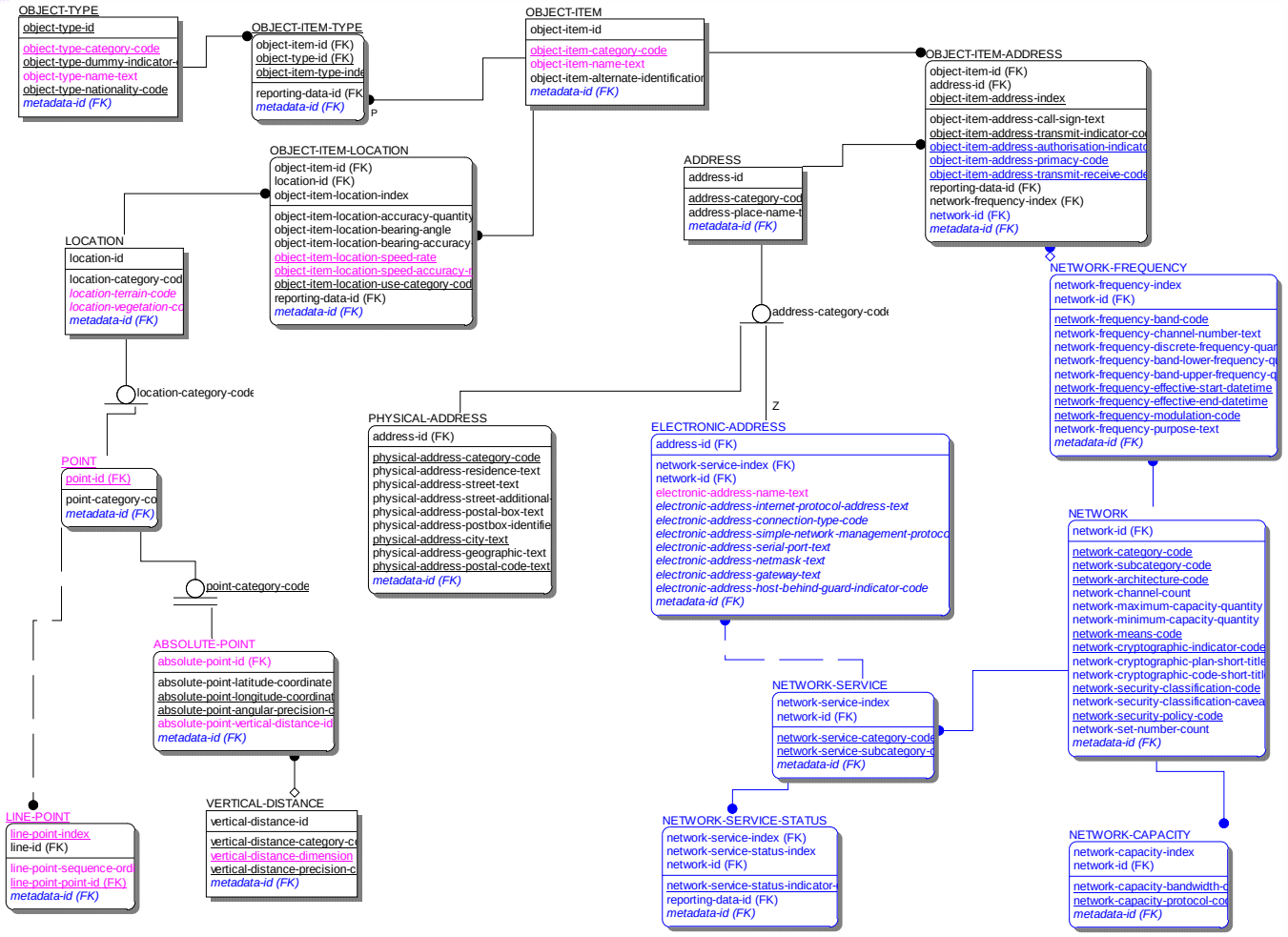
Chemical Sensor Entities subject area of Data Model



Biological Sensor Entities subject area of Data Model



Network Location Entities subject area of Data Model



CBRN Sensor Data Repository

- Problem
  - CBRN Sensor Data Repository Does Not Exist
  - We have not collected and organized the information that we have
- Solution
  - Create a repository (Current Target for repository is JPEO-CBD IDE)
  - Version controlled
  - To Contain
    - Interface and Data Specifications
    - Performance Specifications
    - Reusable Drivers
    - XSLT Translators
- Requires
  - Cooperation and Participation
  - Utilization of common configuration management process
  - Alignment of common sensor software and firmware with the CBRN Data Model for “sensor specific data”

Back Up Slides

Sensor Representation of the Data Model

Introduction

The Chemical, Biological, Radiological, Nuclear (CBRN) Data Model has added additional material related to sensor representation for Release 1.3. The overall goal is to create a harmonized sensor section that provides generalized attributes that are not specific to a single sensor or program but representative of the concepts of each sensor type. However, because of the short time frame for system fielding required by Joint Program Manager (JPM) Guardian, the CBRN Data Model has initially focused on supporting the sensor needs of the JPM Guardian program. The present entries do reflect the interests of that program. These entities also support some of the interests of the JPM Information Systems Joint Warning and Reporting Network (JWARN) and Joint Operational Effects Federation (JOEF) programs.

The CBRN Data Team has created a sensor portion of the CBRN Data Model to capture information about all sensors of a specific type (TYPE entities), information about specific sensors (ITEM entities), and time-dependent sensor status information. Chemical and biological systems are currently modeled. Radiation sensors are not modeled in detail in Release 1.3.

Other entities have been added to the CBRN Data Model. Strictly speaking, these entities do not describe sensors, but the entities are related to sensor description and therefore will be discussed here. These entities describe computers, control equipment, networking, collective protection, and devices used to collect samples of material.

One interest of JPM Guardian is the ability to store raw sensor data in order that a database application may parse it. This is done with the entity BINARY-OBJECT-ITEM.

Sensor Representation of the Data Model continued

Identification Data

These entities are used to describe the properties of the equipment.

OBJECT-TYPE entity

- The OBJECT-TYPE entity and associated entities capture information such as name of the equipment, manufacturer, model number, and serial number and embedded software version of different types of equipment.
- COLLECTOR-TYPE, COMPUTER-TYPE, CONTROLLER-TYPE, OVERPRESSURE-SYSTEM-TYPE, SENSOR-TYPE and CBRN-FILTER-TYPE are subtypes (through a few intermediary subtypes) of OBJECT-TYPE (parent entity). They describe individually identified classes of objects.

OBJECT-ITEM entity

- Every OBJECT-TYPE used must have a related OBJECT-ITEM entity, which deals with a specific sensor.
- COLLECTOR-ITEM, COMPUTER-ITEM, CONTROLLER-ITEM, OVERPRESSURE-SYSTEM-ITEM, SENSOR- ITEM and CBRN-FILTER- ITEM are subtypes (through a few intermediary subtypes) of OBJECT-ITEM (parent entity).

Sensor Representation of the Data Model continued

OBJECT-STATUS entity

- COLLECTOR-STATUS, COMPUTER- STATUS, CONTROLLER- STATUS, OVERPRESSURE-SYSTEM-STATUS, SENSOR- STATUS and CBRN-FILTER-STATUS are subtypes (through a few intermediary subtypes) of OBJECT-STATUS and contain the record of the perceived condition of a specific OBJECT-ITEM at a specific date and time as determined by the reporting organization. This includes data about the sensor mode code, error codes, lamp codes, and so on.

- The actual sensor measurement data for sensors are captured in whichever of the following entities is appropriate: CHEMICAL-SENSOR-READING, BIOLOGICAL-SENSOR-READING, or RADIATION-SENSOR-READING. These entities are children of the [CHEMICAL/BIOLOGICAL/RADIATION]-SENSOR-STATUS entities, and they contain the parsed sensor output. Some examples are the Automatic Chemical Agent Detector and Alarm (ACADA) G bar reading, H bar reading, error code, and fault code.

LOCATION and ADDRESS entities

- ELECTRONIC-ADDRESS captures the network service address information, such as Internet Protocol address, netmask, and gateway.
- PHYSICAL-ADDRESS captures the physical location of the sensors.

Sensor Representation of the Data Model continued

Sample Collection

These entities have been added to support sample collection.

- CBRN-FILTER-TYPE, CBRN-FILTER-STATUS, CBRN-FILTER-ITEM, CBRN-FILTER-ANALYSIS-RESULT, CHAIN-OF-CUSTODY.

Collective Protection

JPM Guardian has an expressed an interest in monitoring some aspects of collective protection facility status. These entities have been added in order to support this interest, and in order to support the JOEF program.

- COLLECTIVE-PROTECTION-CAPABILITY-NORM, COLLECTIVE-PROTECTION-ITEM-CAPABILITY, COLLECTIVE-PROTECTION-ITEM-CAPABILITY-STATUS