M&S and C2 Interoperability

Moving Forward Together

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Aim

Proposition:

Future operational capability and the natural direction of information technology development suggest the confluence of Modeling and Simulation and Command and Control communities.

Question:

What steps can be taken now to anticipate and take advantage of this probability?
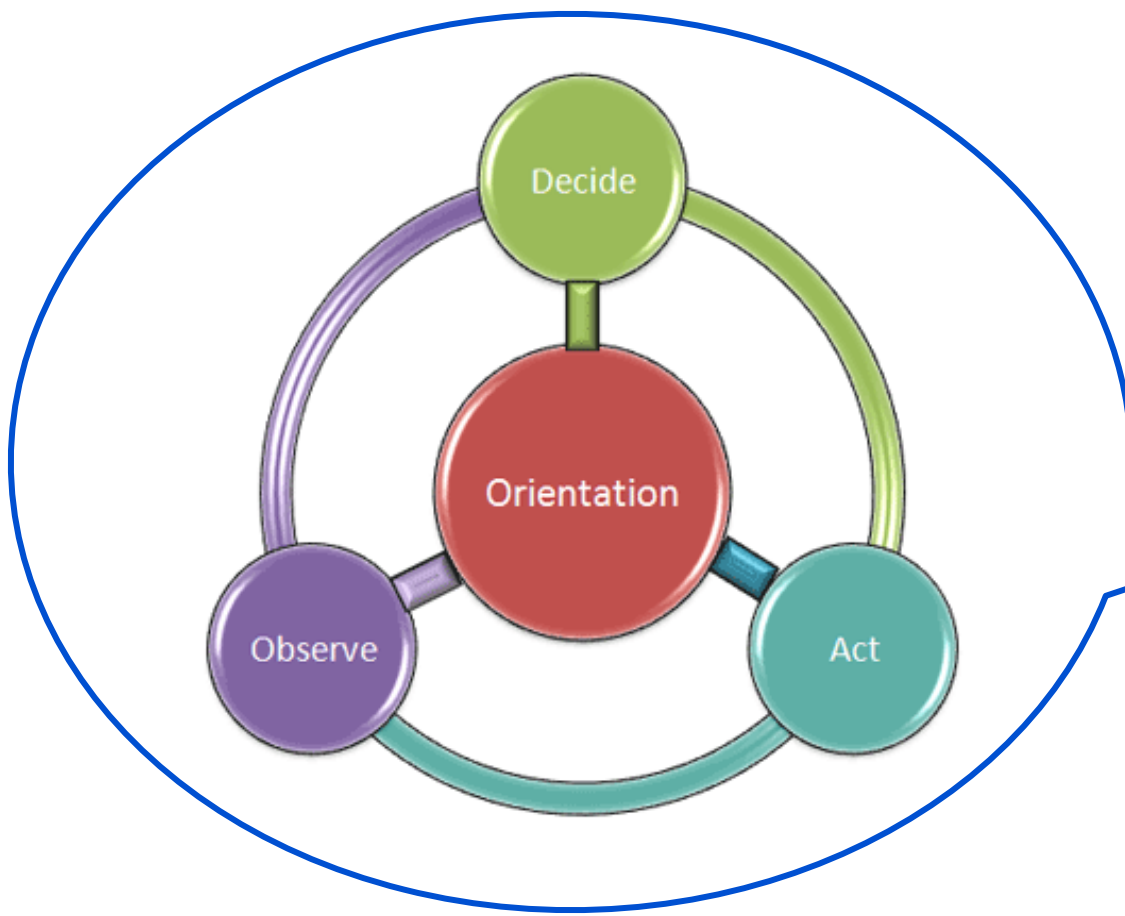
The Nature of M&S and C2

Modeling and Simulation and Command and Control
share the same parents

C2
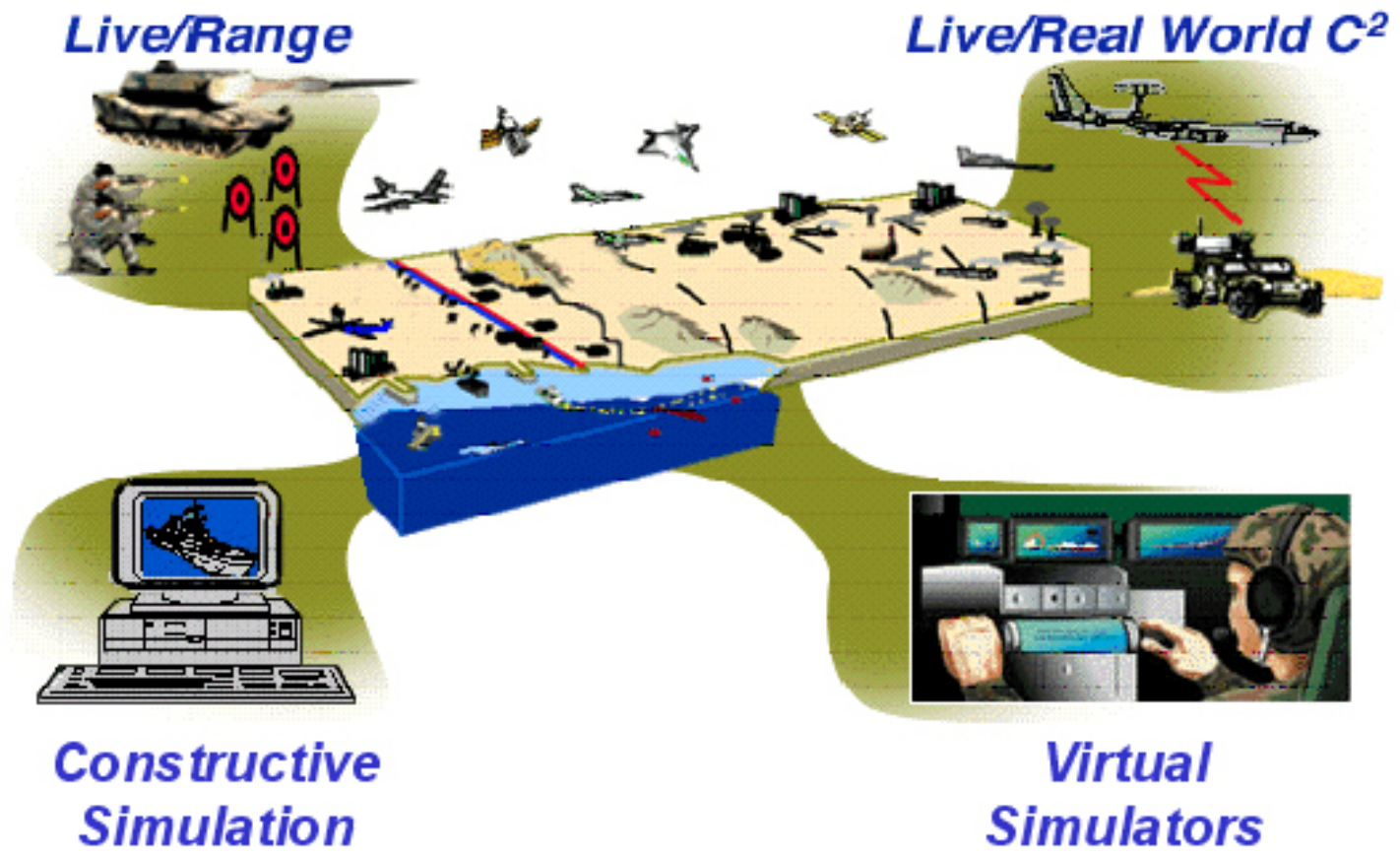
M&S

Unintended Outcome

Objective: Trained and Ready

The "OODA" Loop

The Commander

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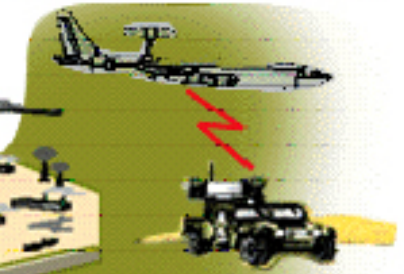
Live, Virtual, Constructive Training Environment

Live/Range

Live/Real World C²

Constructive Simulation

Virtual Simulators

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Getting More From Simulations

Live/Range

Live/Real World C²

Constructive
Simulation

Virtual
Simulators

Holistic View
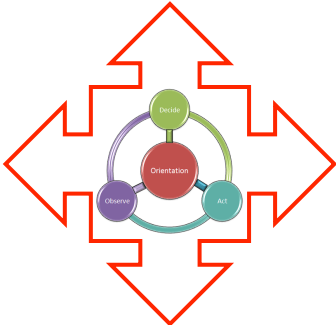
Training

Operations

Planning, Preparation, Execution

Planning, Preparation, Execution

Live Ranges

Combat

Virtual Simulators

Real World C2

Real

Constructive Simulation

Constructive Simulation

Holistic View
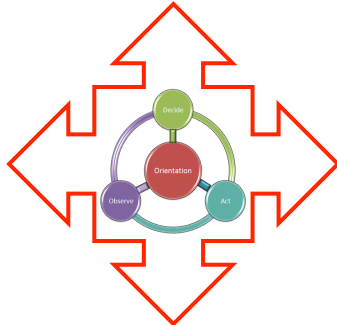
Training

Operations

Planning, Preparation, Execution

Planning, Preparation, Execution

**Options?
Courses of
Action?**

Live Ranges

Combat

**How am
I doing?**

Virtual Simulators
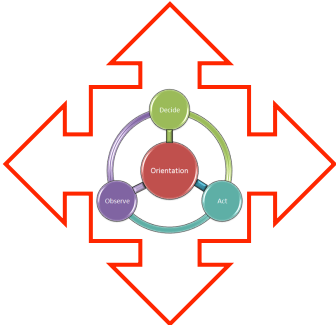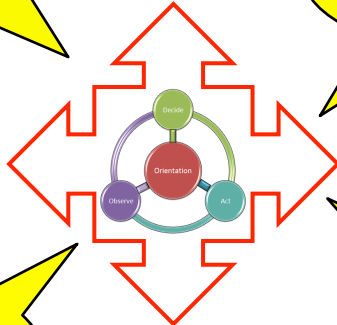
Real World
C2

Real

What if?

Rehearsals?

**Constructive
Simulation**

**Constructive
Simulation**

Holistic View

Training

Operations

Planning, Preparation, Execution

Planning, Preparation, Execution

Live Ranges

Combat

Virtual Simulators

Real World C2

Real

Constructive Simulation

Constructive Simulation
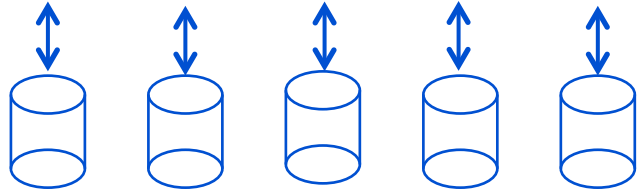
Authoritative Data Sources

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Shared Interoperability Challenge

- **M&S and C2 interoperability challenges**

- **All interoperability starts and ends with users**

- **Current data exchange approaches fail due to significant challenges**

  - Pair-wise point-to-point

  - N-squared problem

  - Single, large common vocabulary

  - Parsing into disparate Communities of Interest

- **These approaches do not fully support**

  data-centric management tenets

  - Visible

  - Accessible

  - Understandable

  - Trusted

  - Interoperable

  - Secure

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What is Needed
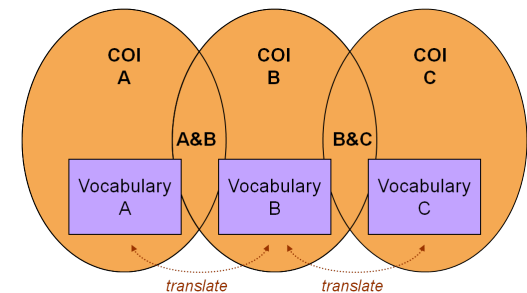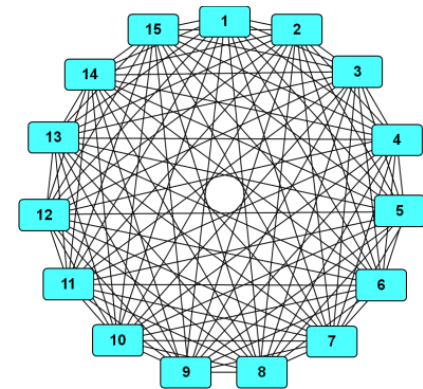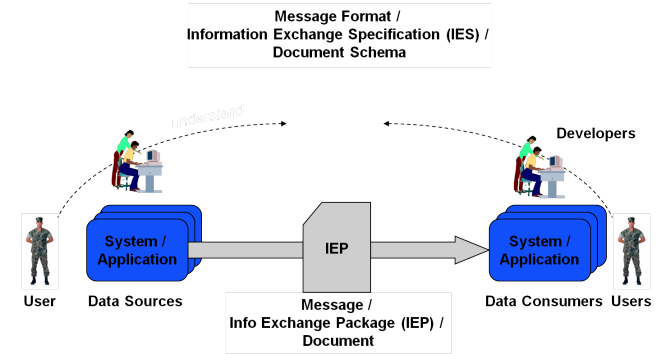
Future information exchange solutions   must:

- Respond to warfighter needs

- Be data standards driven

- Allow agile implementation

- Be easily composable

- Be easily scalable

- Accommodate a diverse user community

- Quickly integrate unanticipated users

Standards-Based Approach for Information Exchanges

The National Information Exchange Model (NIEM) provides a potential way forward

- Not a military "invention"

- Repeatable process for designing an information exchange

- Uses a collection of agreed, reusable data components

- XML-based

- Allows machine-to-machine data exchange to be implemented faster and at lower cost

- Approach already successfully demonstrated in a Mission Partner Environment

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NIEM Construct
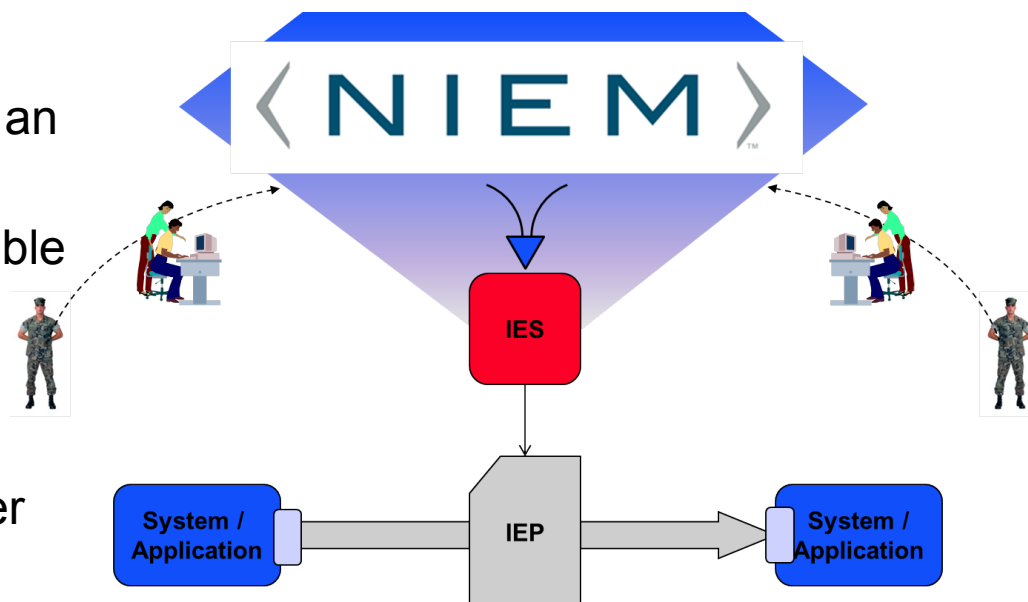
- **Each "petal" represents a functional domain**

  - Contains common reusable data components

  - Associated steward to manage each

- **New Military Operations Domain with relevant military content for use by the NIEM community and mission partners**

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NIEM Lifecycles

NIEM uses a collection of agreed, reusable data components

- Create data components by consensus among data exchange designers

- Each domain changes on its own schedule, under its own control

- Changes in the core or in a domain do not force changes in other domains or in any data exchange

Common Language

Repeatable, Reusable Process
(Exchange Specification Lifecycle)

- Repeatable process for designing an information exchange

- A system does not simply "implement NIEM" and thereby become completely interoperable with every other system "implementing NIEM"

- A system can implement a particular NIEM-conforming information exchange specification

- All systems implementing a particular IES are interoperable with each other, for that exchange

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Building Upon Previous Mission Partner Successes

> **Tactical Edge Data Solutions (TEDS)**
> **Joint Capability Technology Demonstration (JCTD)**
> **Coalition Warfare Program (CWP)**

- Successful NIEM-based mission partner effort

- Used NIEM repeatable process to develop six information exchanges for shared coalition SA

- Five partner nations and NATO

- CWIX 11 and CWIX 12

- Lessons learned leveraged in latest NIEM update

TEDS JCTD/CWP CWIX 12 OV-1

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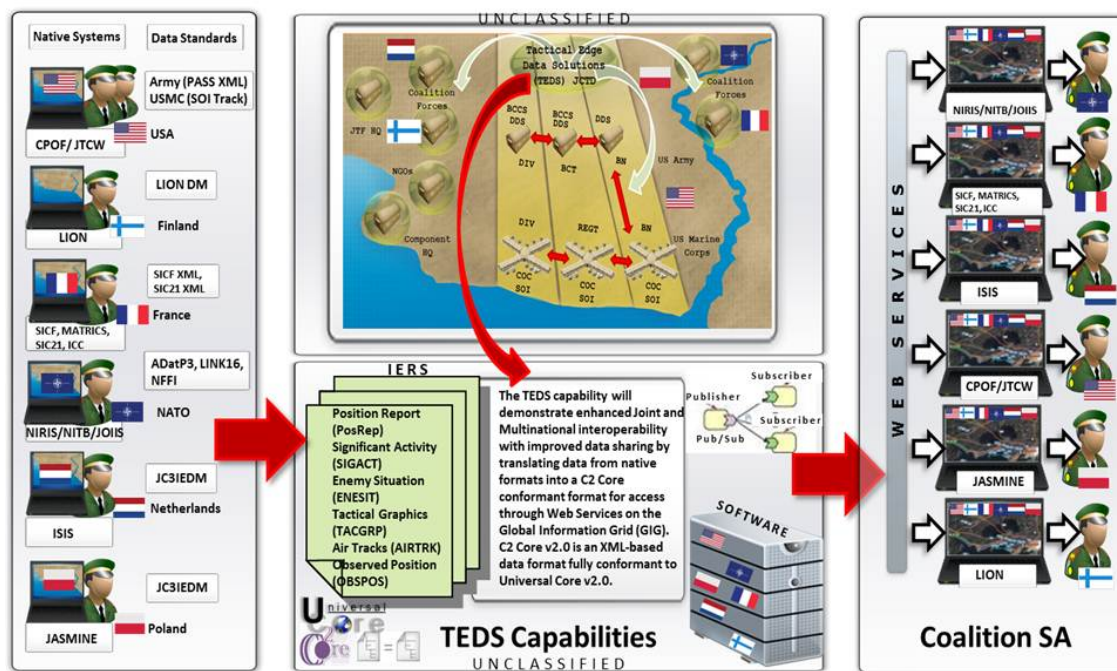
Building Upon Previous Mission Partner Successes
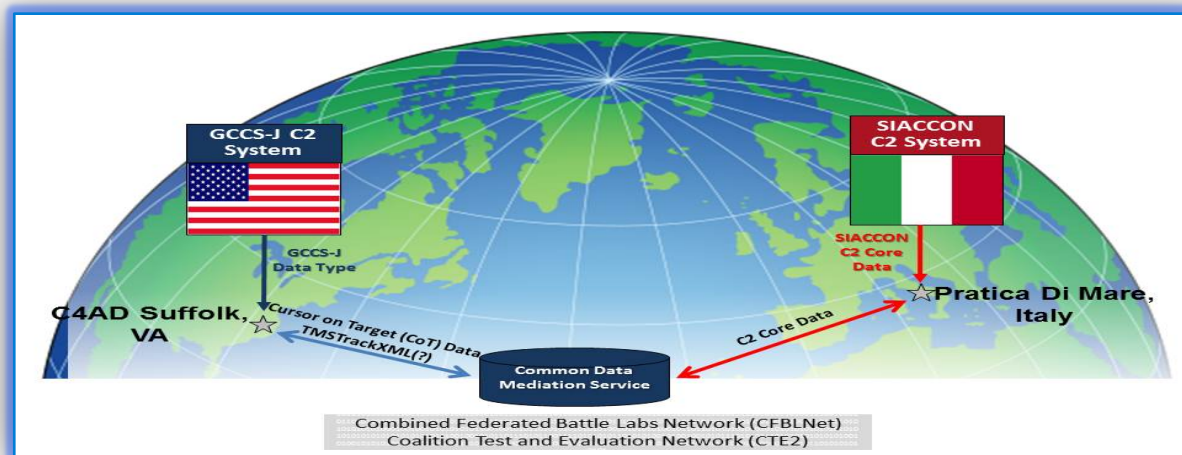
NATO M&S COE-USA C2 Interoperability Assessment

- Objective 1: Establish CFBLNet/CTE2 connectivity for GCCS-J at JS J6 (C4AD) and SIAACON at the NATO M&S COE
- Objective 2: Assess interoperability of SIAACON to GCCS-J by transmitting C2 Core –formatted messages using CDMS
- Objective 3: Leveraged the DISA CDMS and improved CDMS capabilities (CDMS+)
- Successfully executed three exercises covering Objectives 1-3
- Presented execution demonstration at CWIX13 with success in all use cases

Quick-Win Next Step

Tactical Infrastructure Enterprise Services (TIES)
Coalition Warfare Program (CWP)

IdAM Data

Person Entities (PE)

Non-Person Entities (NPE)

Request Access with credentials

Authenticated?   yes   Authorized?   yes

Access Accountability   Access Accountability

no   no

Access Denied

Contact Data Lookup

IT-Based Resource or Physical Resource
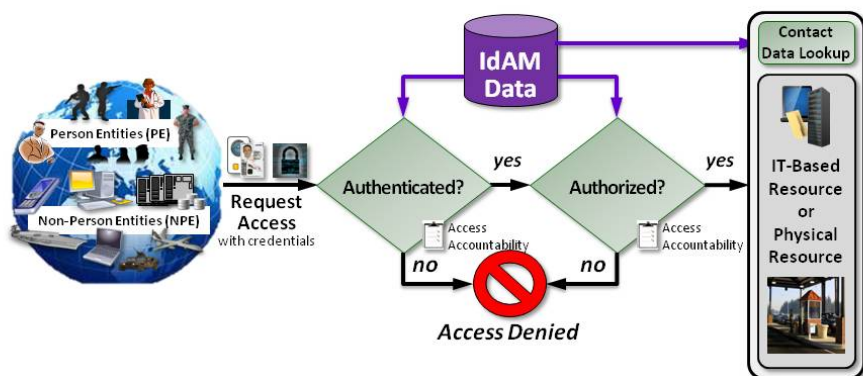
-Securely access authorized resources (NIEM conformant data) using a federated Identity and Access Management (IdAM) solution.
-Implement security meta data tagging solution with NIEM data to facilitate improved information sharing with coalition partners.

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- Leverage latest NIEM version
- US / France open to additional participants
- CWIX 14 and CWIX 15
- Objectives:
  1. Exchange NIEM-conformant data
  2. Implement interoperable IdAM capability
  3. Apply security metadata tags, to NIEM-conformant messages that facilitate fine-grained access control of data

Conclusion

For both training and operational communities to leverage emerging technology to advantage, we must focus on the common DNA: information exchanges.

By standardizing the exchanges we can integrate within and between communities; moreover, set the conditions for the services both communities will use in the future.

Questions ?

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Backup Slides

NIEM Reference Material

Normative Specifications

Naming and Design Rules (NDR)
Specifies principles and enforceable rules for NIEM data components and schemas. Schemas and components that obey the rules set forth here are considered to be NIEM-conformant.

Type Augmentation Supplement to NDR 1.3
Describes the manner in which augmentations may be applied within a domain schema to support that domain's Information Exchange Package Documentation (IEPD) developers. It defines augmented types and elements, which are domain-specific data components designed to support a single-domain IEPD.

Model Package Description (MPD) Specification
Defines terminology, identifies required and optional artifacts and metadata, specifies normative rules, schemes, syntax, and provides non-normative guidance to support the creation of NIEM MPDs. MPDs include IEPDs, Business Information Exchange Components (BIEC), Enterprise Information Exchange Models (EIEM), Domain Updates, and Core Updates.

Domain Update Specification
This specification builds on the MPD Specification, providing both normative rules and non-normative guidance for the packaging, content, and publication of domain updates.

High-Level Tool Architecture
Establishes a strategy and architecture that can efficiently satisfy the need for NIEM-supporting software tools and capabilities.

High-Level Version Architecture
Describes how NIEM governance bodies update the data components and schemas that comprise NIEM.

Non-Normative Guidance and References

Business Information Exchange Component Whitepaper
Describes the Business Information Exchange Component (BIEC). Enterprise Information Exchange Model (EIEM) constructs. A collection of closely related business organized at an object level and defined as extension data components are referred to as BIEC, because they are either specific to an organization's business or they represent a more general line of business that crosses organizational lines.

Concept of Operations *(Note: this document is being updated)*
Enables readers to understand the processes, resources, and structures that support NIEM.

Quality Assurance Strategy and Plan
Defines the goals, metrics, reviews, and procedures that will improve the quality of the NIEM data model and its artifacts.

Techniques for Building and Extending NIEM XML Components
Discusses the key NIEM data model concepts, and then outlines the basic techniques for extending and augmenting the NIEM provided data components, for creating meaningful links between new and existing data items and for adapting external standards for use in the NIEM framework.

User Guide *(Note: this document is being updated)*
Provides detailed guidance about how to develop information exchanges utilizing this model through a detailed description of the rationale for the creation of NIEM, an architectural overview, and technical concepts.

Using IC-ISM with NIEM
Describes requirements and actions needed to enable use of IC-ISM with NIEM.

https://www.niem.gov/technical/Pages/references-specs.aspx