NIEM 101 -Technical Introduction to NIEM

This course will introduce business and technical architects, program analysts and information exchange designers and implementers to the National Information Exchange Model (NIEM) and its role in information sharing. The business value of NIEM will be conveyed to participants as well as its history and current use. Participants will be exposed to the structure of NIEM and how it is used across organizations. The role of Information Exchange Package Documentation (IEPDs) will be discussed along with their use in the development of NIEM-conformant information exchanges. The reuse and sharing of IEPDs, both partial reuse and total reuse, will also be discussed.

Course Details

Duration: 2 hours	**Target Audience:** Architects, Analysts, Implementers and Designers
Prerequisites: None	

National Information Exchange Model (NIEM) Training

Technical Introduction to NIEM

NIEM 101

Presenter Name
Presenter's Organization
Date

NIEM 101 Agenda

Information Sharing

NIEM Overview

NIEM Governance

NIEM IEPD Overview

NIEM Implementation

NIEM Value Proposition

Conclusion

Learning Objectives

This course will inform Architects, Analysts and Implementers about the value and structure of the National information Exchange Model (NIEM).

After this course, you should be able to…

- Identify the origin of information sharing and NIEM
- Explain how NIEM facilitates greater information sharing between organizations
- Describe the governing structure of NIEM and its responsibilities
- Recognize the deliverables associated with NIEM development
- Distinguish the scope of NIEM and its relation to implementation
- Recognize the value that NIEM provides to an organization

Information Sharing

What is Information Sharing?

Information Sharing refers to the combination of policies, governance, procedures, and technologies that allow different organizations to share important data with each other.

The Need for Information Sharing

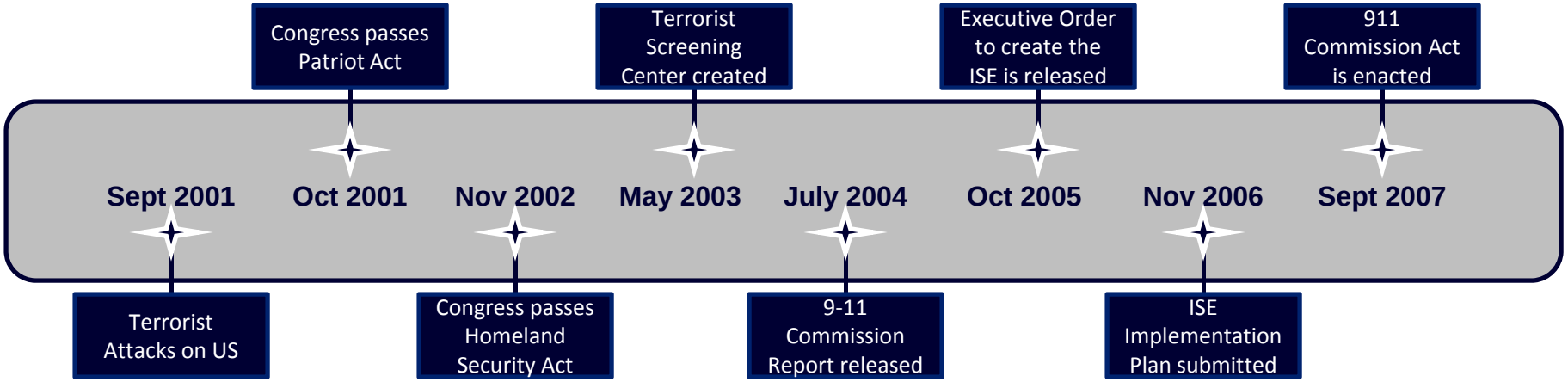
Efficient and comprehensive information sharing environments will help organizations…

- **Improve** decision making capabilities by providing more timely and reliable data
- **Increase** organizational agility in response to problems and changing environments
- **Avoid** costs associated with redundant processes and data

Information sharing can improve an organization's ability to fulfill its mission goals

Information Sharing Progress

Information Sharing efforts became highly visible following the September 11th terrorist attacks, with legislation reaching its peak between the years of 2001 – 2007.



Despite these policy shifts, barriers to information sharing still exist, including:

- Lack of consistent policies, standards and practices across government organizations
- Costly, redundant processes
- Lack of a common understanding of data definitions
- Lack of consolidated data for agency-level reporting and decision support
- Lack of trust between government organizations due to poorly communicated data management strategies

The Need for Standards

Lack of standards

will increase cost and redundancy

Inconsistent data definitions

will increase ambiguity and inefficiency

Deficient governance

will increase inconsistencies and limit reuse

National Information Exchange Model

Discussion Question:

What problems can NIEM address in your organization?

NIEM Overview

The Need for NIEM

The National Information Exchange Model enables…

Collaboration	Consistency	Development	Support
Brings stakeholders together through reuse and community engagement	Establishes standards for sharing and governance	Supplies tools to aid in discovery and implementation	Provides technical assistance and training

Which Lead To

Lower Development Costs	Enhanced Mission Capabilities	Common Vocabulary	Reduced Maintenance Costs

Background of NIEM

Global Justice XML Data Model (GJXDM), a Justice-based information sharing standard, was released in 2003

Department of Justice (DOJ) and Department of Homeland Security (DHS) leveraged the GJXDM as a basis for the creation of NIEM in 2005

NIEM was launched on February 28, 2005

GJXDM is a Legacy Model

NIEM is the Standard

Current State of NIEM

Leadership enables the progressive nature of NIEM to stay the course and meet its objectives.

Leadership is Committed

The Executive Steering Council (ESC) is in charge of the NIEM Program Management Office (PMO) and has representatives from many different agencies

Infrastructure is Growing

At the Federal, State, Local, Tribal and Private level there are….

- Training Programs
- Communications and Outreach
- Technical and Business Support

Model is Continuously Evolving

- Versioning system that continuously updates the NIEM data model
- Iterative process of review; NIEM is never in its "final" state

NIEM is Continuously Improving

NIEM PMO and other stakeholders are constantly assessing and improving the program

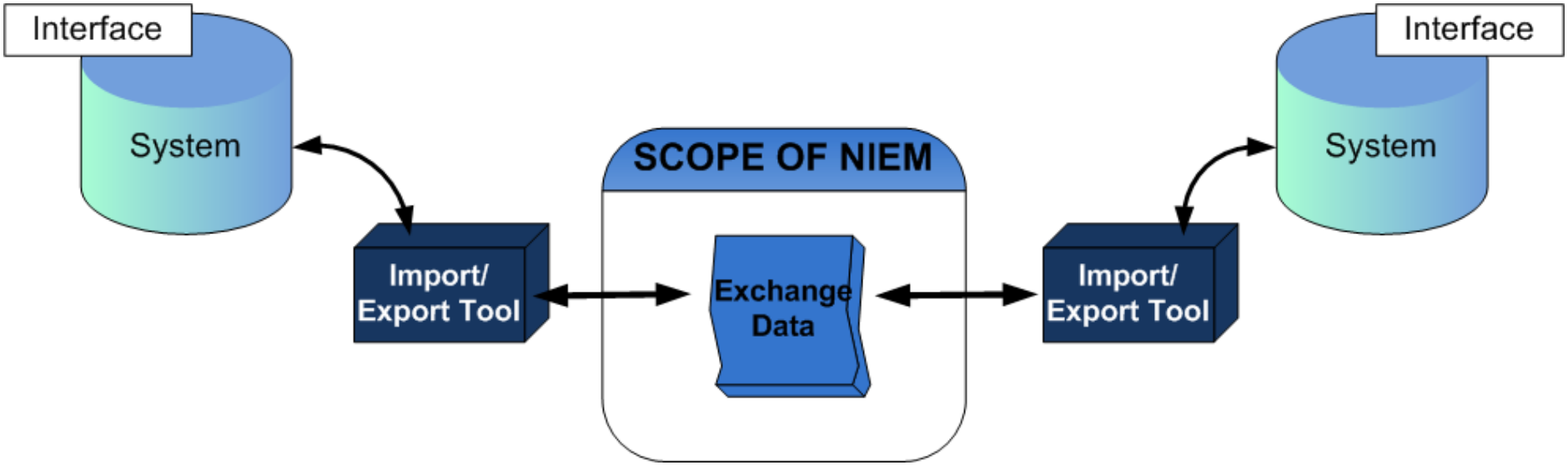
NIEM at a Glance

NIEM is a Federal, State, Local ,Tribal and Private inter-agency initiative providing a foundation for seamless information exchange. NIEM is more than a data model, it is a community and has a technical and support framework.

Community	Technical Framework	Support Framework
Formal Governance Processes	Data Model	Tools for Development and Discovery
Online Repositories	XML Design Rules	Established Training Program
Mission-Oriented Domains	Development Methodology	Implementation Support
Self-Managing Domain Stewards	Predefined Deliverables (IEPD)	

Scope of NIEM

NIEM is a data layer standard and intentionally does not address all of the necessary technologies needed for information sharing.



The NIEM Data Model

NIEM's data model is a set of common, approved XML data elements and definitions vetted through the Federal, State, Local, Tribal and Private Sectors.

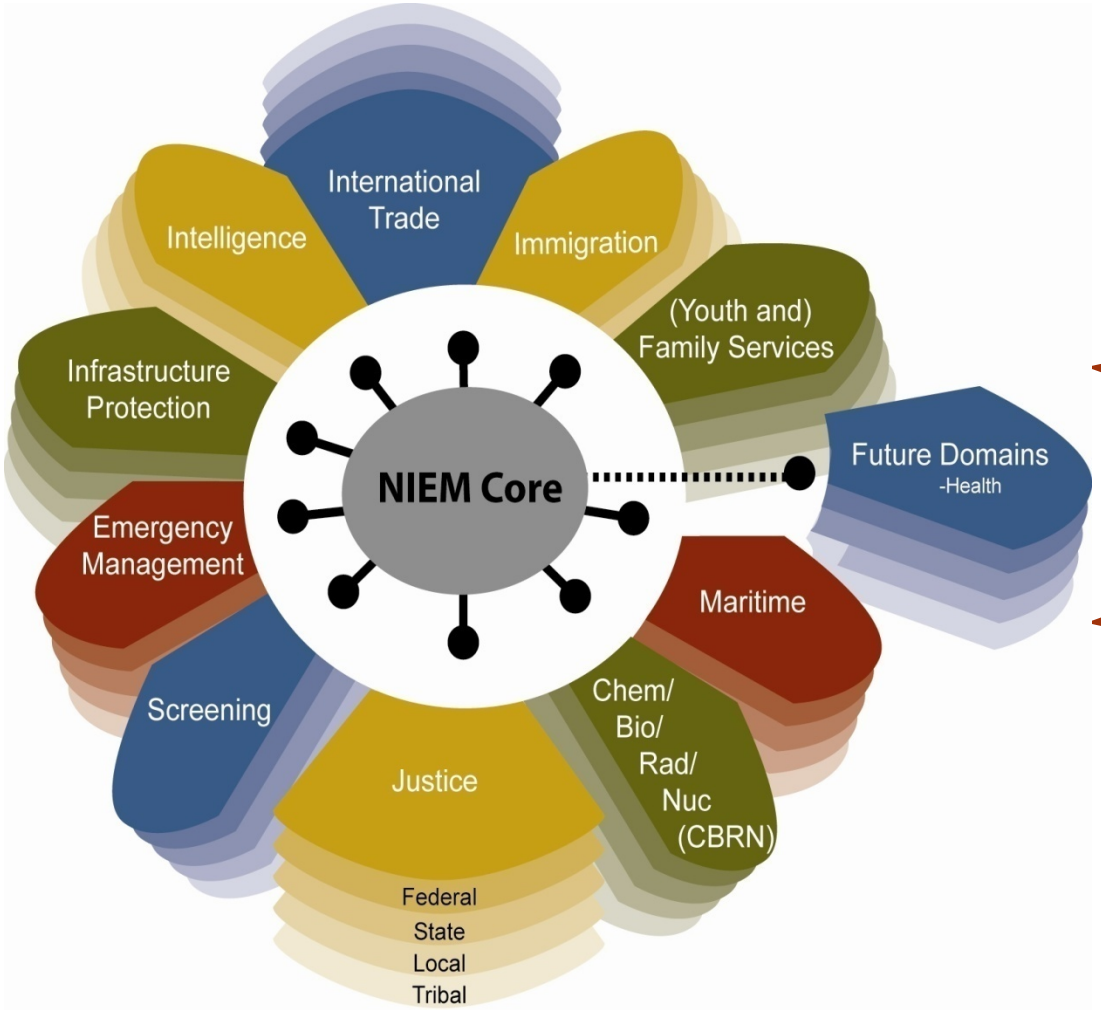
Data elements are organized into core and domain-specific components

Core components are used by multiple domains and can be described by structure, semantics, and definition universally

Domain-specific components are continually updated by subject matter experts that are actual NIEM participants and industry experts for their particular domain

NIEM Naming and Design Rules (NDR) specify how each of these components are defined and utilized

NIEM Technical Architecture



NIEM Core consists of data elements that are commonly understood across domains

NIEM Domains include mission specific data that is managed through independent stewards

Future Domains are added to NIEM as necessary based on an established need

NIEM Core Components

Some important, practical NIEM Core components

<nc:Person>
<PersonSexCode>
<PersonBirthDate>
<PersonEyeColorText>
<PersonHairColorText>
…

Has the most fields

<nc:Activity>
<ActivityDate>
<ActivityCategoryText>
<ActivityDescriptionText>
<ActivityDisposition>
…

The most often derived component

<nc:Item>
<ItemName>
<ItemDescriptionText>
<ItemConditionText>
<ItemValue>
…

Has the deepest inheritance chain

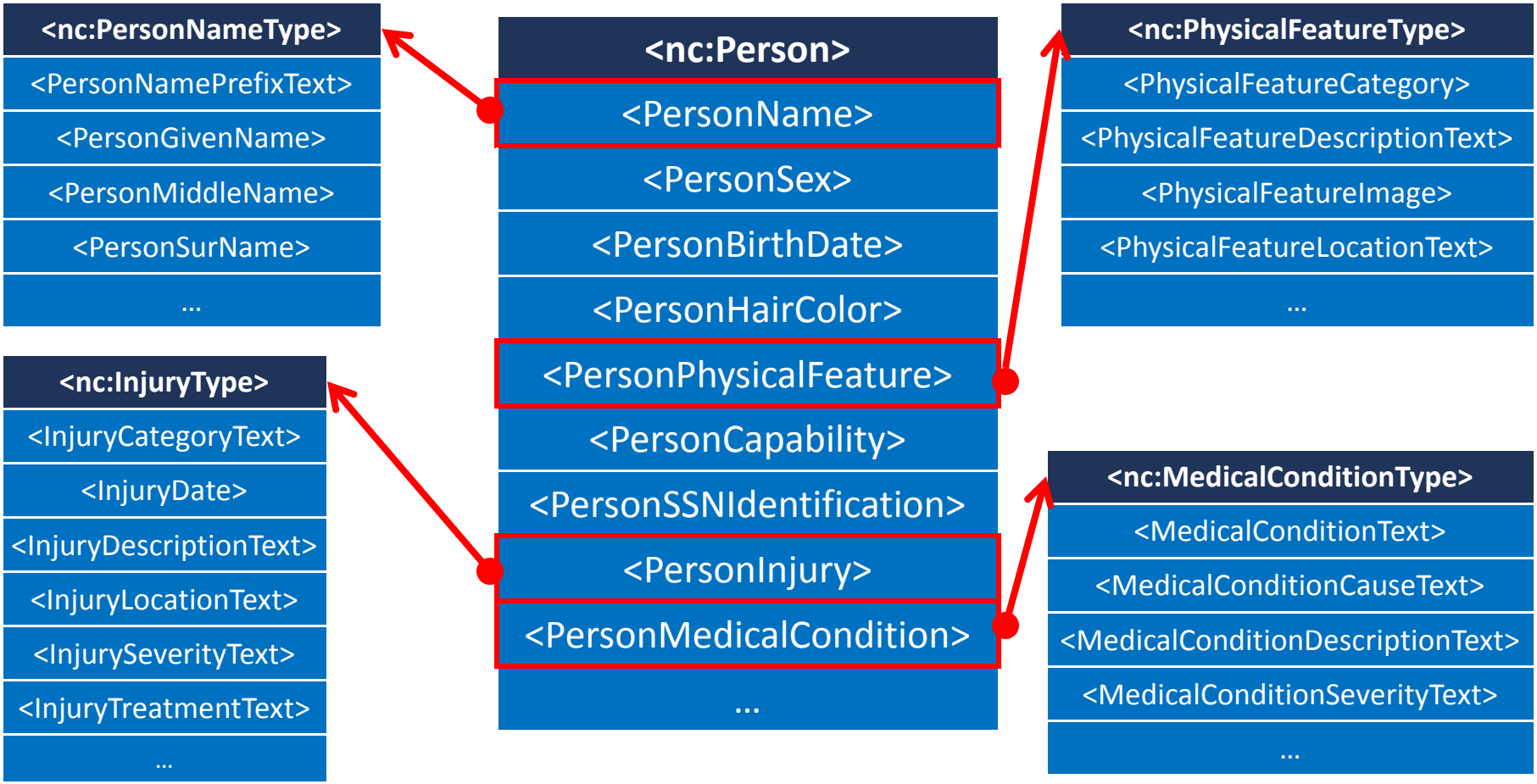
<nc:Identification>
<IdentificationID>
<IdentificationJurisdictionText>
<IdentificationEffectiveDate>
<IdentificationStatus>
…

<nc:Location>
<LocationDescriptionText>
<LocationAddress>
<LocationCategoryCode>
<LocationName>
…

<nc:Organization>
<OrganizationName>
<OrganizationDescriptionText>
<OrganizationCategoryText>
<OrganizationEstablishedDate>
…

NIEM Core Component – <nc:Person>

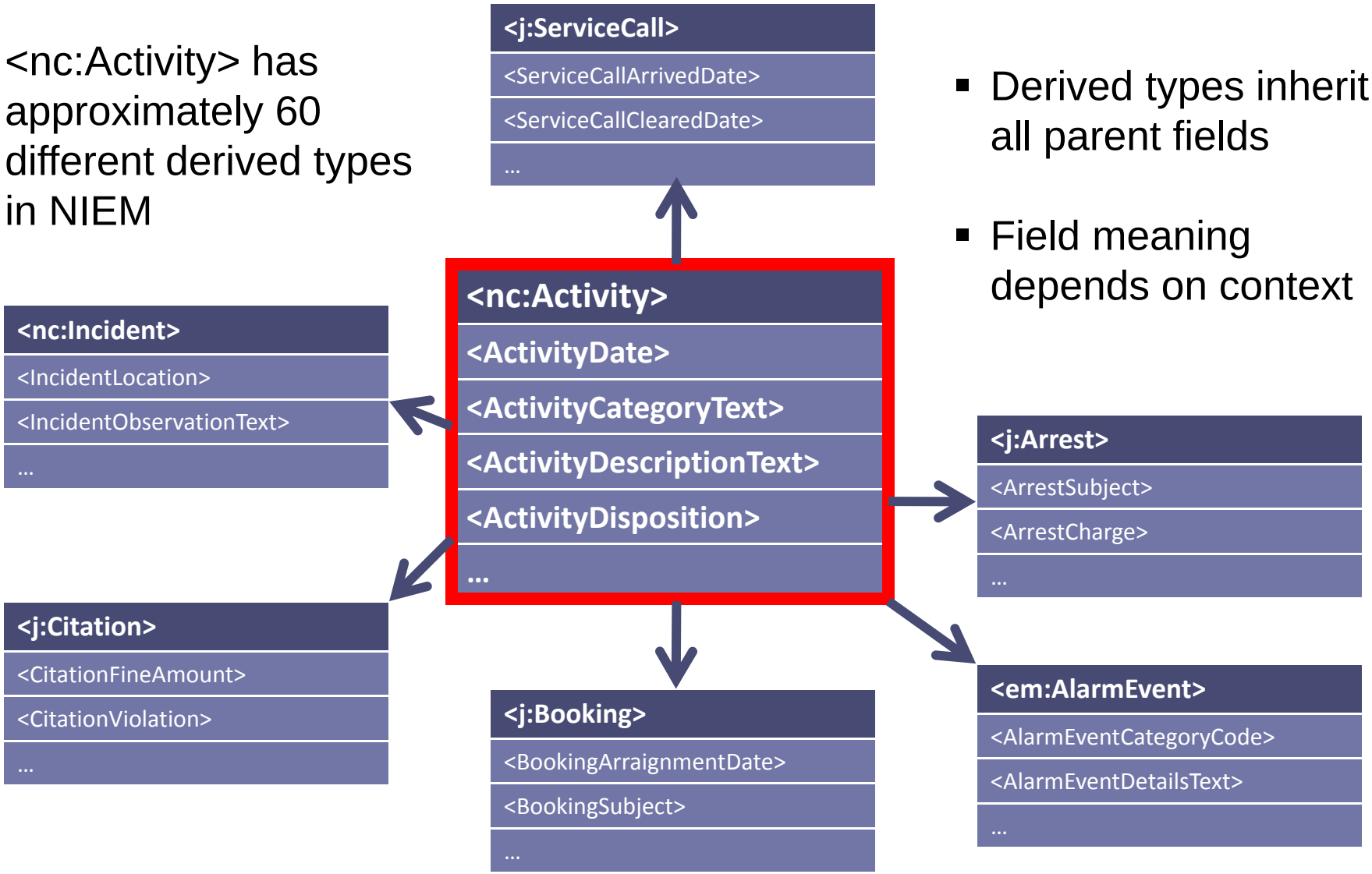
Approximately 200 discreet fields for Person information across all domains



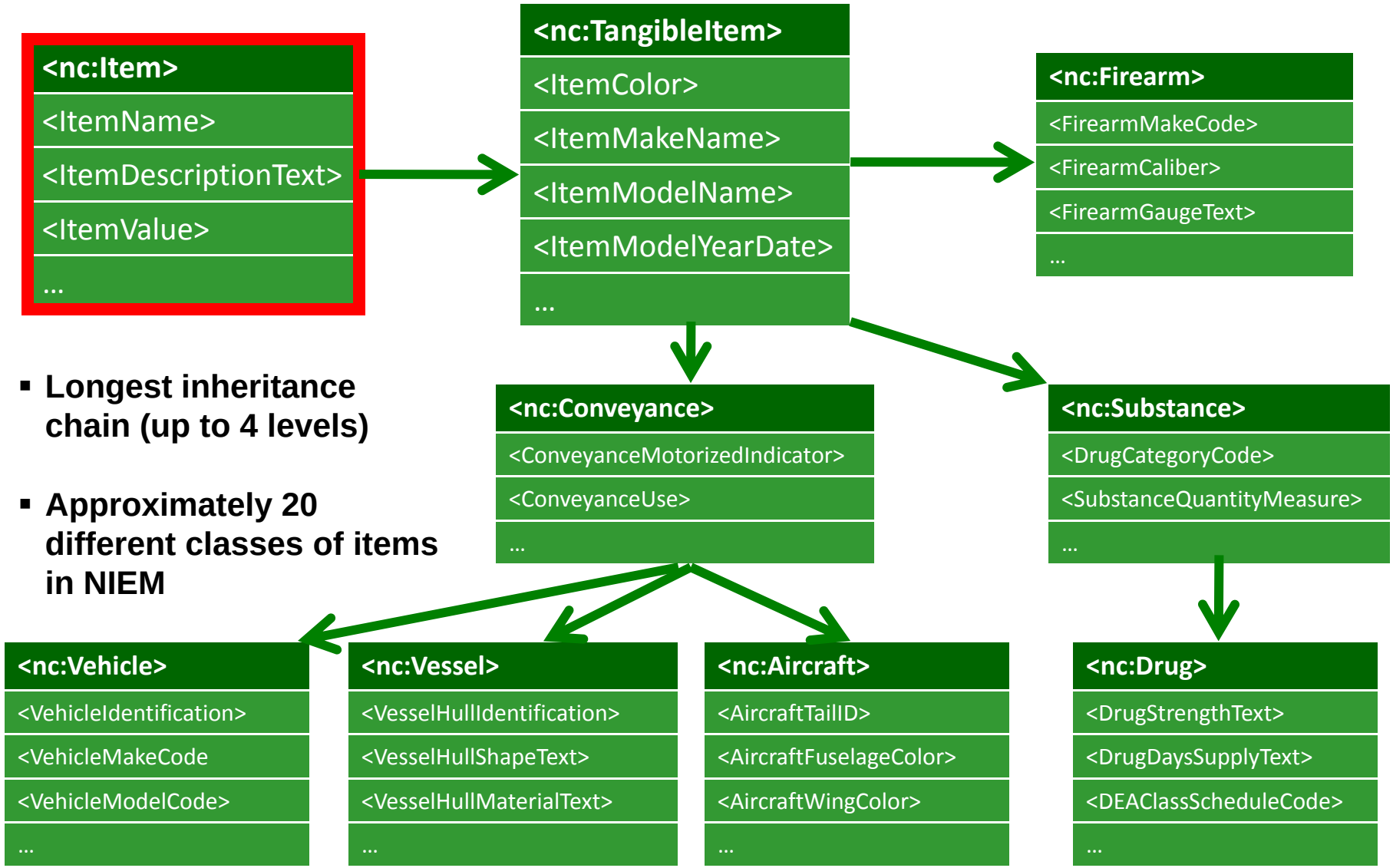
NIEM Core Component – <nc:Activity>

<nc:Activity> has approximately 60 different derived types in NIEM

- Derived types inherit all parent fields
- Field meaning depends on context



NIEM Core Component – <nc:Item>

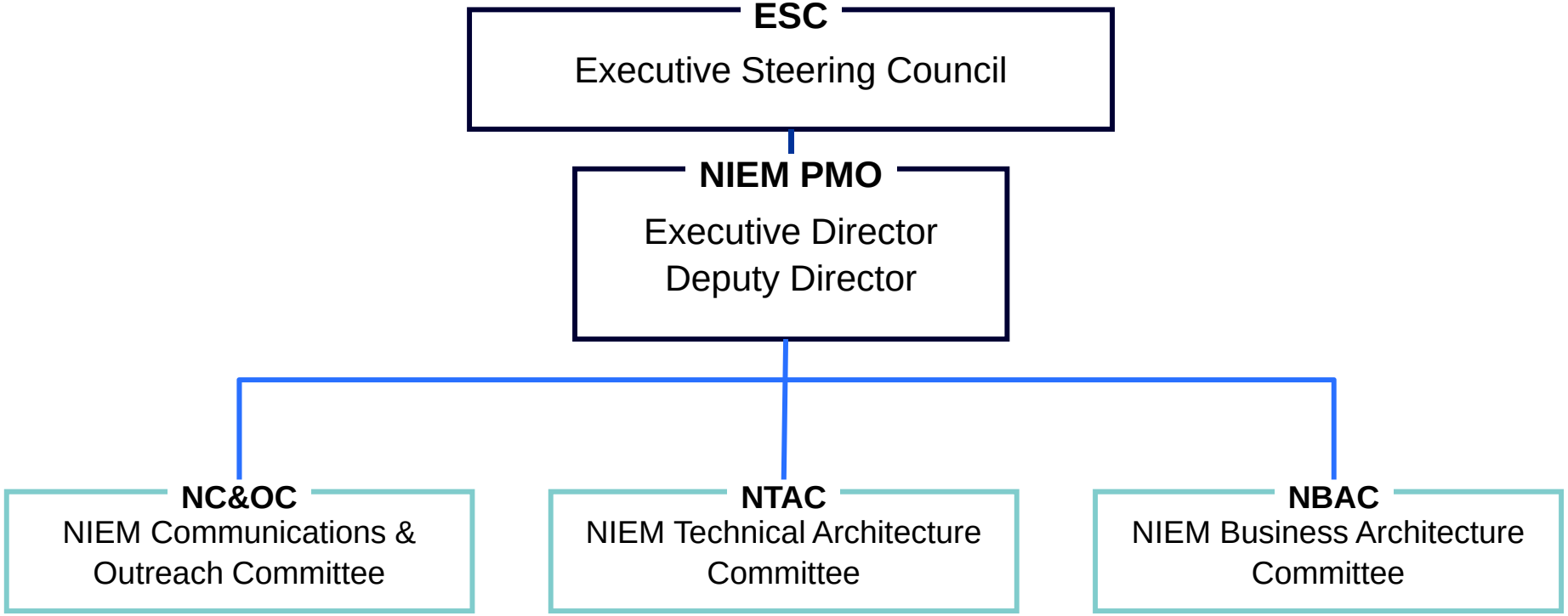


- **Longest inheritance chain (up to 4 levels)**
- **Approximately 20 different classes of items in NIEM**

NIEM Governance

NIEM Governing Structure

- NIEM's governing structure is comprised of Federal, State, Local, Tribal and Private organizations
- NIEM is jointly managed at an executive level by the Department of Homeland Security (DHS) and the Department of Justice (DOJ)



Communities of Interest

Communities of interest (COIs) are collaborative groups of users who exchange information in pursuit of shared goals, interests, missions, or business processes and who, therefore, must have a shared vocabulary for the information they exchange.

Coordination is an important aspect of NIEM

- COIs reuse data components and artifacts found in NIEM to document their information exchanges
- One or more COIs can coordinate to develop new domain content needed for documenting information exchanges

Domain Governance

Domain refers to a business enterprise broadly reflecting the agencies, units of government, operational functions, services, and information systems that are organized or affiliated to meet common objectives.

NIEM domains are mission-based and organized to facilitate governance, and each has some measure of compliance

Domain stewards are community members responsible for actively managing and updating their community's data model

Each domain traditionally includes a cohesive group of domain stewards who are part of a Community of Interest

Discussion Question:

Why is NIEM governance so important?

What problems can arise without a governance structure in place?

NIEM IEPD Overview

What is an IEPD?

An **I**nformation **E**xchange **P**ackage **D**ocumentation (IEPD) is a collection of artifacts that describe the construction and content of an information exchange

A. Developed to provide the business, functional, and technical details of the information exchange through predefined artifacts
B. Created with a core set of artifacts in a prescribed format and organizational structure to allow for consistency
C. Designed to be shared and reused in the development of new information exchanges through publication in IEPD repositories

Scope of IEPDs

IEPDs contain design specifications for an information exchange but may not include supplementary information such as implementation decisions.

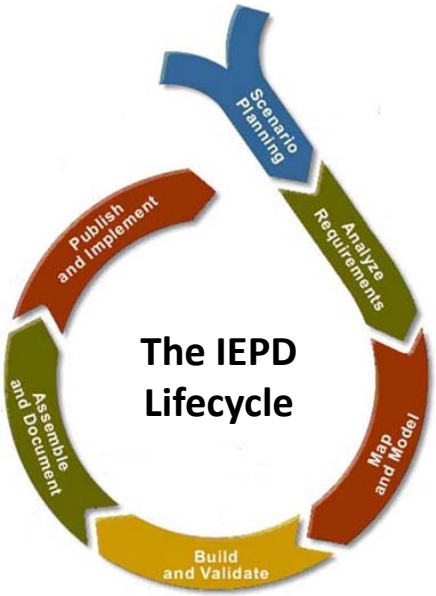
IEPDs do

- Include the XML schemas that define the XML message structure
- Contain standardized artifacts that document an information exchange
- Have a defined development methodology (IEPD Lifecycle)
- Ease the documentation process for reuse

IEPDs do not

- Specify how exchange data is physically transferred between entities
- Describe an interface or Interface Control Document (ICD)
- Specify any technical information outside of the message structure

The IEPD Lifecycle



Scenario Planning	Plan the project, establish the process, and identify information exchange business requirements
Analyze Requirements	Selected information exchange is further elaborated to understand and document the business context and data requirements
Map & Model	Associate local objects with types and elements in NIEM. This process is called *mapping* an exchange content model to NIEM
Build & Validate	Create a set of exchange-specific NIEM conformant XML schemas that implement the data model created for the exchange
Assemble & Document	Prepare and package all related files for this IEPD into a single self-contained, self-documented, portable archive file
Publish & Implement	Publish IEPD for search, discovery, and reuse

The IEPD Artifacts

IEPDs contain both required and recommended artifacts

Required : Bold
Recommended : Italic

Note: Best practices for most organizations include many of the optional artifacts listed here

Scenario Planning	• *Business Processes* • *Use Cases*	• *Sequence Diagrams*
Analyze Requirements	• *Business Rules*	• *Business Requirements*
Map & Model	• *Exchange Content Model*	• *Mapping Document*
Build & Validate	• **Subset Schema** • **Exchange Schema** • **XML Wantlist**	• *Constraint Schema* • *Extension Schema*
Assemble & Document	• **Main Document** • **IEPD Catalog** • **IEPD Metadata**	• *Sample XML Instances* • *XML Stylesheets*
Publish & Implement	*No required artifacts. Publish the IEPD to a repository and implement the exchange*	

Systems Development Life Cycle

The Systems Development Life Cycle (SDLC) is a common methodology used for creating software

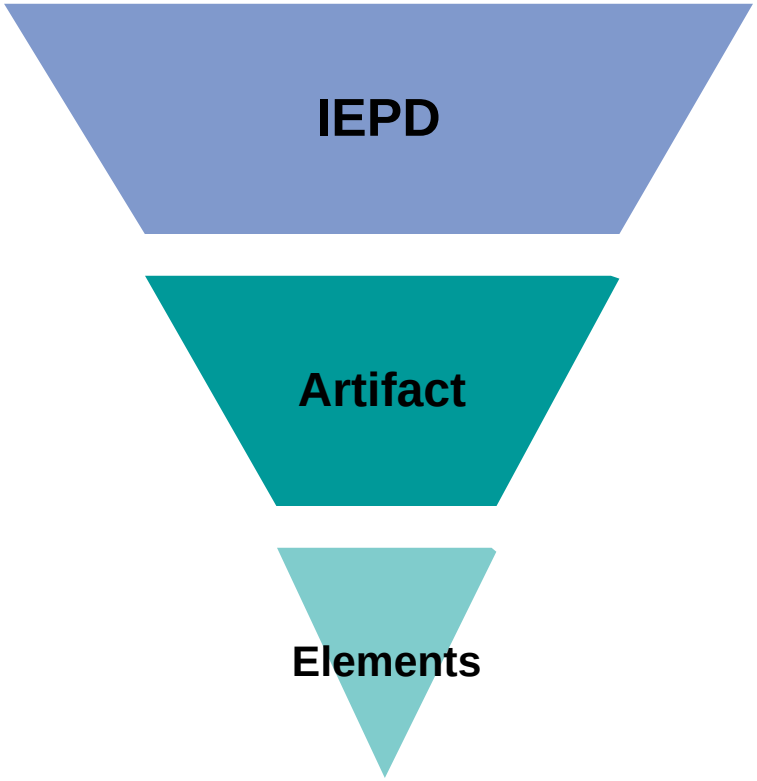
The IEPD Lifecycle integrates closely with the phases of the SDLC

Scenario Planning	Plan	Develop high level scope and goals of intended system
Analyze Requirements	Requirements	Analyze goals and break them down into exact requirements
Map & Model	Design	Transform requirements into detailed system capabilities
Build & Validate	Develop	Develop system per design specifications
Assemble & Document		
Publish & Implement	Implement	Test and deploy system and develop future plan
	Maintain	Sustain system per future plan and eventually move to disposition

IEPD Reuse and Sharing

Existing IEPDs, after publication, can be reused in the creation of new IEPDs which can:

- Decrease IEPD development time
- Increase consistency of data definitions

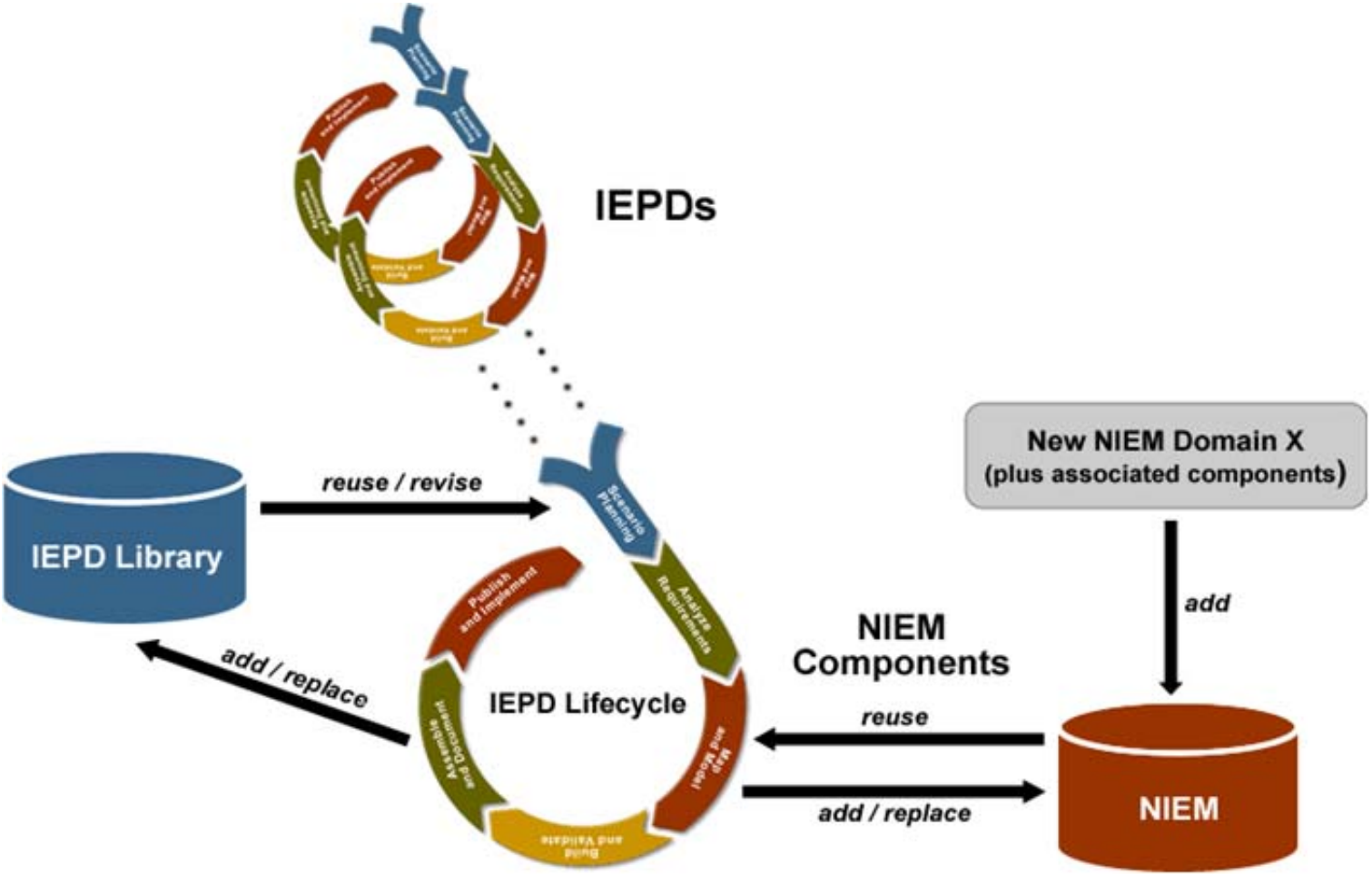


IEPD repositories (DHS Data Architecture Repository (DAR), IEPD Clearinghouse, etc.) can be leveraged to search and reuse existing IEPDs

Artifacts within IEPDs can be leveraged to facilitate development and ease the burden on resources

Elements in the NIEM data model can be reused within specific exchanges; domain governance efforts add new elements to the model

IEPDs and the NIEM Architecture



NIEM continues to grow and evolve with practitioners' contributions

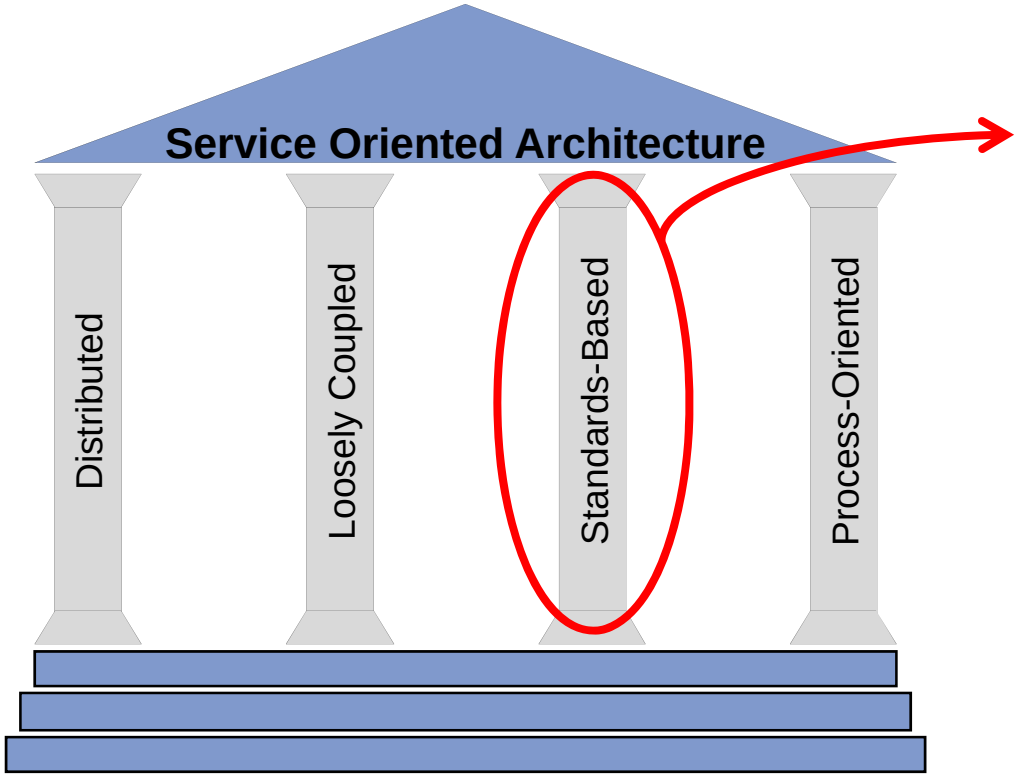
NIEM Implementation

NIEM and Implementation

- **In order to provide infrastructure flexibility, NIEM does not define implementation specifications**
- NIEM defines the format and structure of data in transit
- Exchange partners decide how to store and process the NIEM-conformant data being exchanged
- NIEM can be established within an organization's Service Oriented Architecture (SOA) as a data standard for all information exchanges
- Security and privacy should be key considerations when implementing an exchange

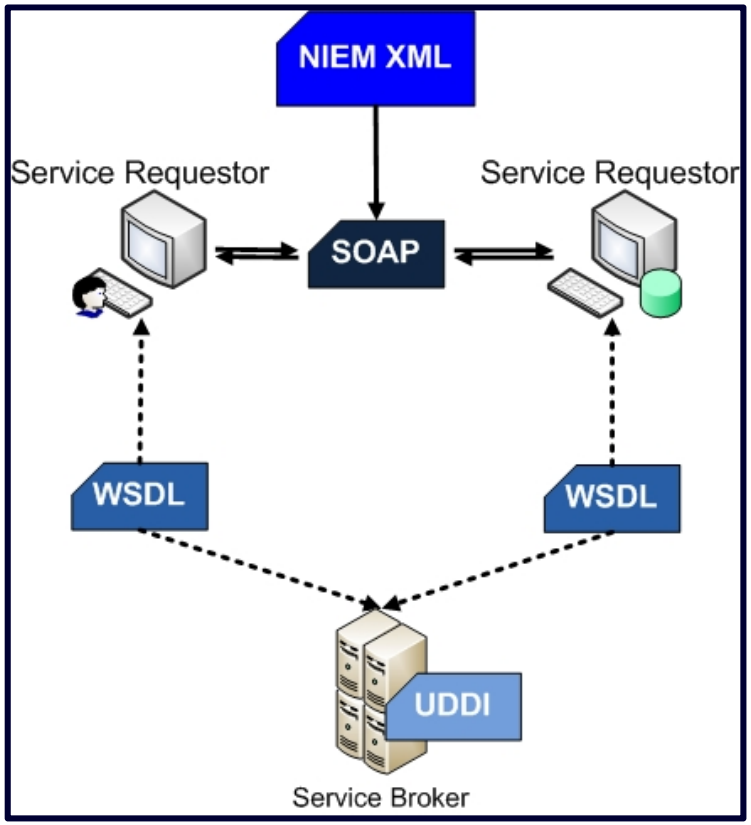
SOA and NIEM

Service **O**riented **A**rchitecture (SOA) is an architectural style whose goal is to achieve loose coupling among interacting software agents.



- NIEM provides the standard for data layer **interoperability among services** in SOA
- NIEM can be used to **standardize and structure** the messages passed between services in SOA
- NIEM can **decrease development time** of new services in SOA through reuse of similar IEPDs

Information Exchange Implementation



The diagram above represents only **one** of the ways to implement an information exchange

NIEM XML

NIEM-conformant XML instance that contains the actual data to be shared between web services

SOAP

Simple **O**bject **A**ccess **P**rotocol is an XML-based protocol for exchanging messages in web services

WSDL

Web **S**ervices **D**escription **L**anguage is an XML-based language that provides a model for describing Web services

UDDI

Universal **D**escription, **D**iscovery, and **I**ntegration is an XML-based registry of web services

Best Practices in Implementation

Architecture	Systems on either side of the exchange can use different implementation architectures (i.e. different programming languages, operating systems)
Consistency	All participants in an exchange must agree on the definition and structure for the data in the exchange - NIEM provides this standard
Development	IEPD Lifecycle should be used to guide development of NIEM-conformant exchange to make sure all of the necessary artifacts are created
Reuse	Elements already defined within NIEM should be used whenever possible; exchange elements outside of NIEM should also be reused whenever possible

Security and Privacy

Security

- Intelligence Community Metadata Standard for Information Security Marking (IC-ISM) sets standards for security marking metadata and classified information
- Metadata mechanism in NIEM 2.1 provides a method for using IC-ISM attributes
- Encryption of information exchanges is not within the scope of NIEM. NIEM can be used to structure the XML before encryption

Privacy

- Avoid transmission of sensitive or personally identifiable information (PII) whenever possible
- Privacy Offices in many federal agencies set detailed standards and guidelines for the sharing of PII

NIEM Value Proposition

Value through Community Growth

- Increasing adoption by government agencies as the standard for information exchanges
  - OMB Mandates requiring the use of NIEM in many Federal Agencies
  - Majority of states use NIEM

- NIEM PMO and other NIEM committees continue to grow and evolve to serve the community
- Increasing participation leads to growth in the NIEM data model and increased ability to share information and reuse existing data components

Growth of community further solidifies NIEM as a standard and increases its value

Value Proposition - Interoperability

The interoperable nature of NIEM establishes:

Common Language and Vocabulary	Agnostic Implementation
Eliminates confusion by providing consistency of data definitions between agencies	NIEM does not dictate how agencies' systems are implemented, but enables these systems to work together

Core Biographic (Department of Homeland Security)

- The Core Biographic Person Identify Data Elements (CBPIDE) IEPD was created as a standard base set of person data available for reuse both within and outside of DHS
- The interoperability of the Core Biographic IEPD has given components of DHS the ability to share information using common vocabulary without limiting its use by promoting a specific implementation specification

Value Proposition - Reusability

The reuse of IEPDs, in part and whole, within NIEM will:

Decrease Development Time	Increase Consistency
Decreases the development time for information exchanges that use similar sets of data	Allows practitioners to increase the level of consistency in data definitions across their information exchanges

Texas Path to NIEM

- Completion of 28 NIEM-conformant information exchanges to serve as the foundation for statewide information sharing using NIEM
- State and local organizations can reuse these 28 critical exchanges to implement systems that support these exchanges and facilitate greater information sharing
- Reuse of common business data components across the 28 exchanges resulted in a high level of consistency of data definitions

Value Proposition - Standardization

The formalization of NIEM as a standard enables:

Large Support Community	Structured Approach
NIEM Practitioners can leverage NIEM's large support community to decrease development time for exchanges and increase conformance	Repeatable approach that decreases the inconsistencies and duration of development

Pennsylvania JNET (Justice Network)

- Converted existing data exchanges from GJXDM to NIEM, providing project and development methodology guidance on JNET message development projects
- Created repeatable NIEM message development process
- Contributed documentation back to NIEM community to guide future NIEM implementation efforts

NIEM's Overall Value:

Organizations with vastly different IT systems and data models can share information with ease.

A Call to Action

Interoperability
is enabled through two different organizations bridging gaps to share information

Reusability
is only possible when there are people publishing AND discovering information

Standardization
is made possible through large groups of end users working together to form a common language

NIEM is established, continues to grow, and is the answer to information sharing only because of…

Architects, Analysts and Implementers like **YOU!**

Discussion Question:

What value will NIEM bring to your organization?

Conclusion

Learning Recap

This course should have informed Architects, Analysts and Implementers about the value and structure of the National information Exchange Model (NIEM).

You should be able to…

- Identify the origin of information sharing and NIEM
- Explain how NIEM facilitates greater information sharing between organizations
- Describe the governing structure of NIEM and its responsibilities
- Recognize the deliverables associated with NIEM development
- Distinguish the scope of NIEM and its relation to implementation
- Recognize the value that NIEM provides to an organization

Additional NIEM Resources

Documentation and Standards

NIEM.gov contains a collection of essential NIEM documents

- Introduction to NIEM
- Concept of Operations
- User Guide
- NIEM Naming and Design Rules
- Many other documents

Training and Technical Assistance

Many resources are available to provide support and assistance

- NIEM website offers recorded sessions and lecture material
- NIEM Training is Available
- National Information Sharing Standards (NISS) Knowledge Base and Help desk

Tools

- Lifecycle artifact templates
- Subset Schema Generation Tool & Graphical Browser (NIEM Tools)
- Exchange Repositories
  - NIEM.gov IEPD Repository
  - DHS Data Architecture Repository (DAR)
  - DOJ IEPD Clearinghouse

End of Course