



# **National Information Exchange Model (NIEM)**

*Technical Introduction to NIEM*

*NIEM 101*

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Department of Homeland Security

Date

# NIEM 101 Agenda

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Information Sharing

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NIEM Overview

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NIEM Governance

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NIEM IEPD Overview

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NIEM Implementation

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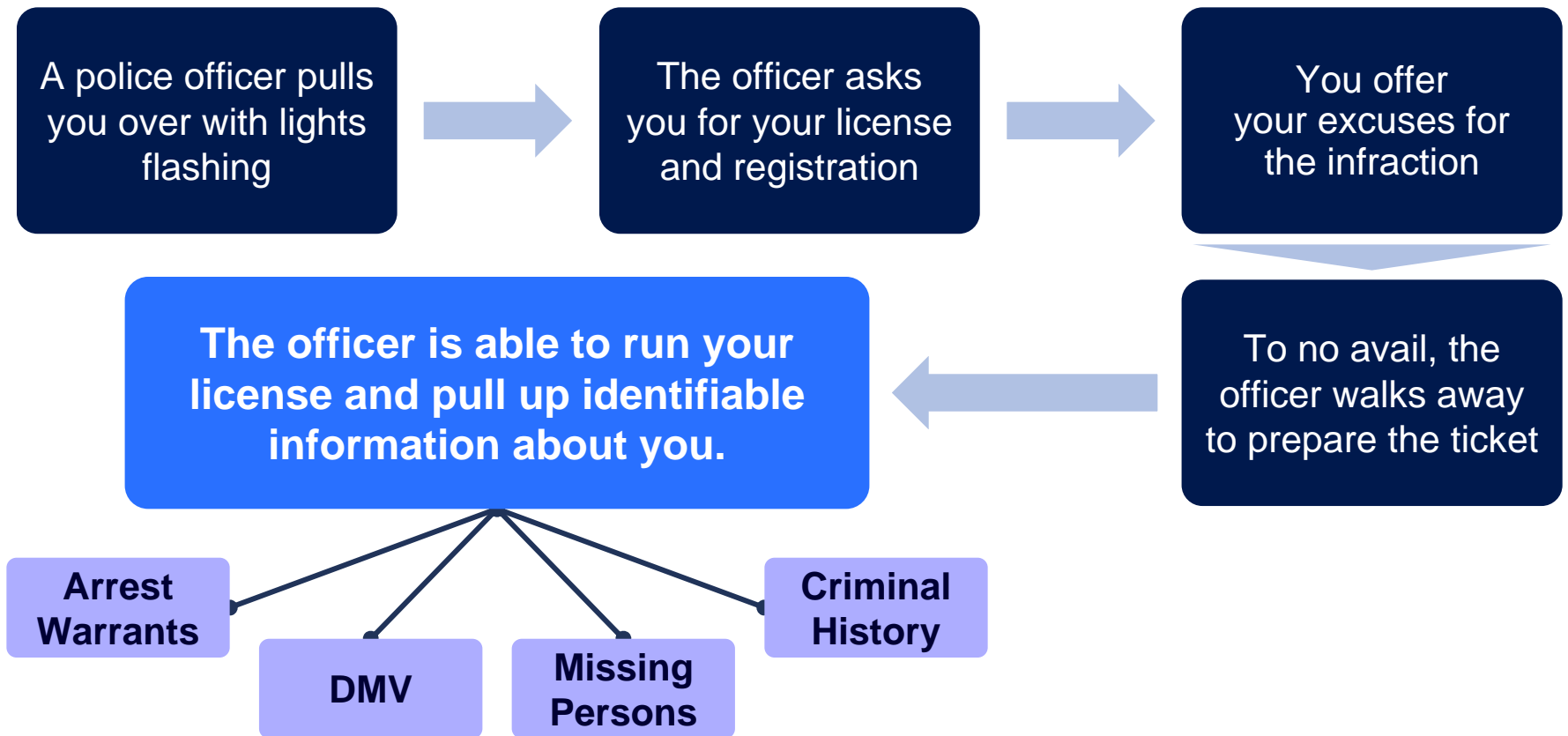
NIEM Value Proposition

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Conclusion

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# 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

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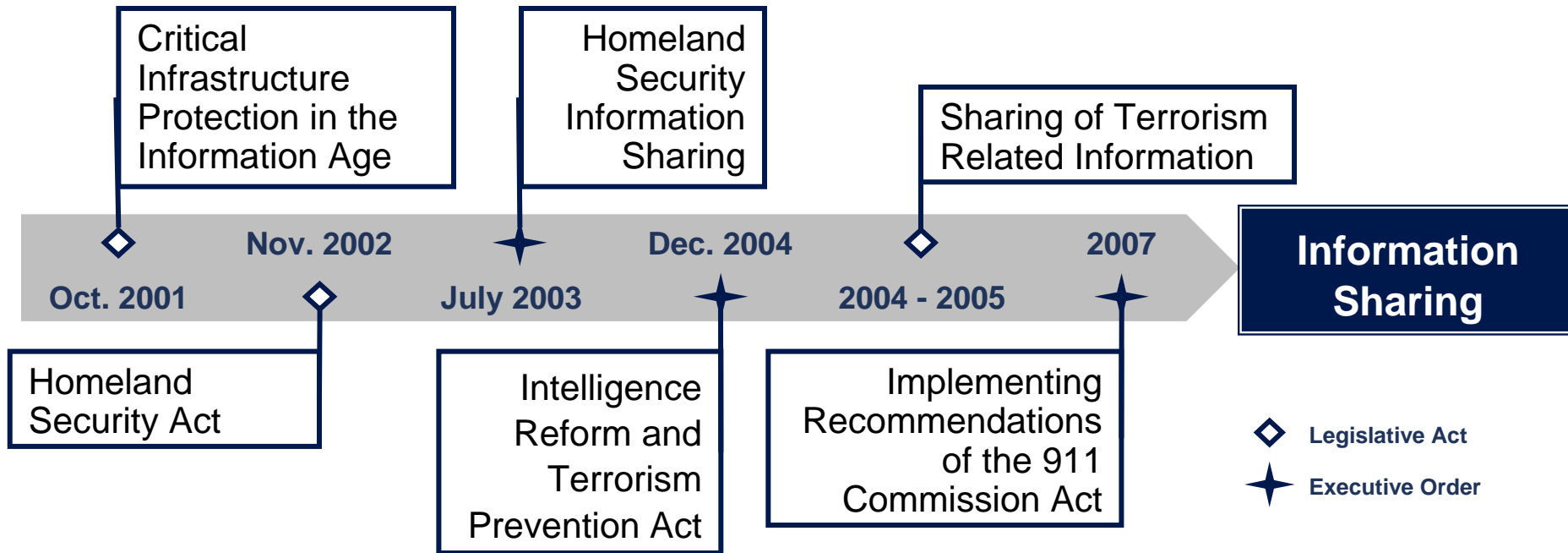


Efficient and comprehensive information sharing environments will help organizations...

- **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



## 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

A large, light blue downward-pointing arrow that connects the three boxes above to the box below.

**National Information Exchange Model**

# The Need for NIEM



The National Information Exchange Model enables...

**Collaboration**

Brings stakeholders together through reuse and community engagement

**Consistency**

Establishes standards for sharing and governance

**Development**

Supplies tools to aid in discovery and implementation

**Support**

Provides technical assistance and training

Which Lead To

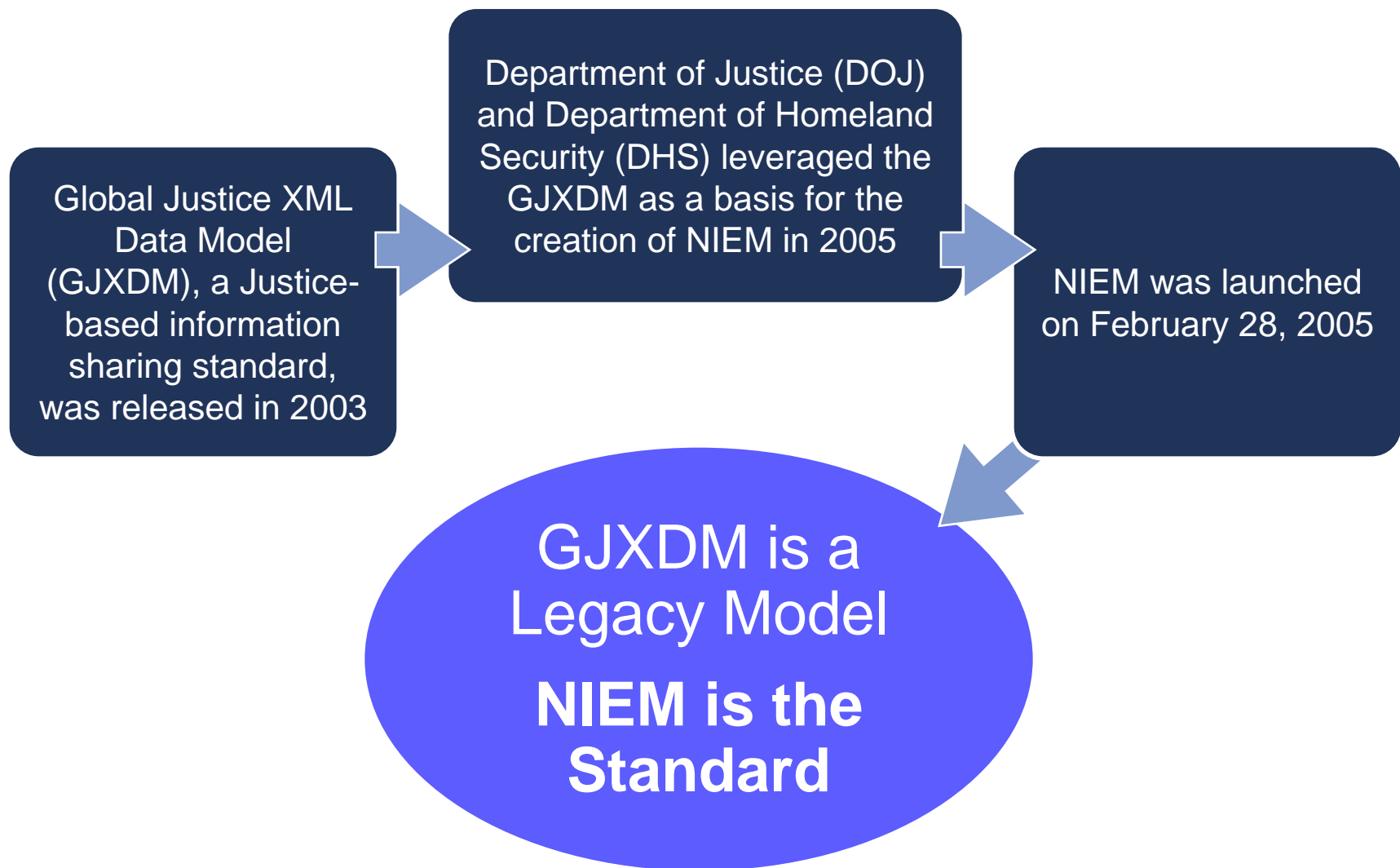
**Lower Development Costs**

**Enhanced Mission Capabilities**

**Common Vocabulary**

**Reduced Maintenance Costs**

# Background of NIEM



# 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 Committee (ESC) oversees the NIEM Project 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

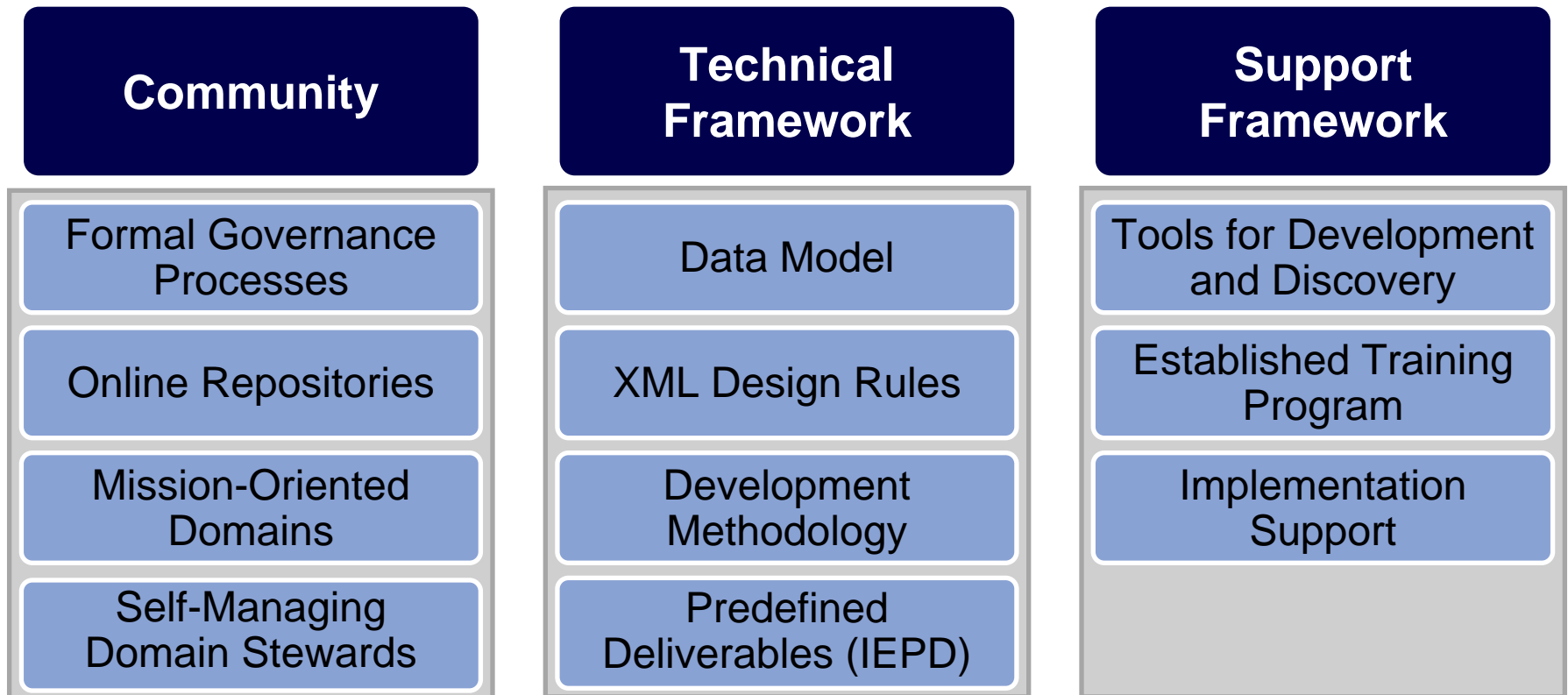
## NIEM is Continuously Improving

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

# NIEM at a Glance



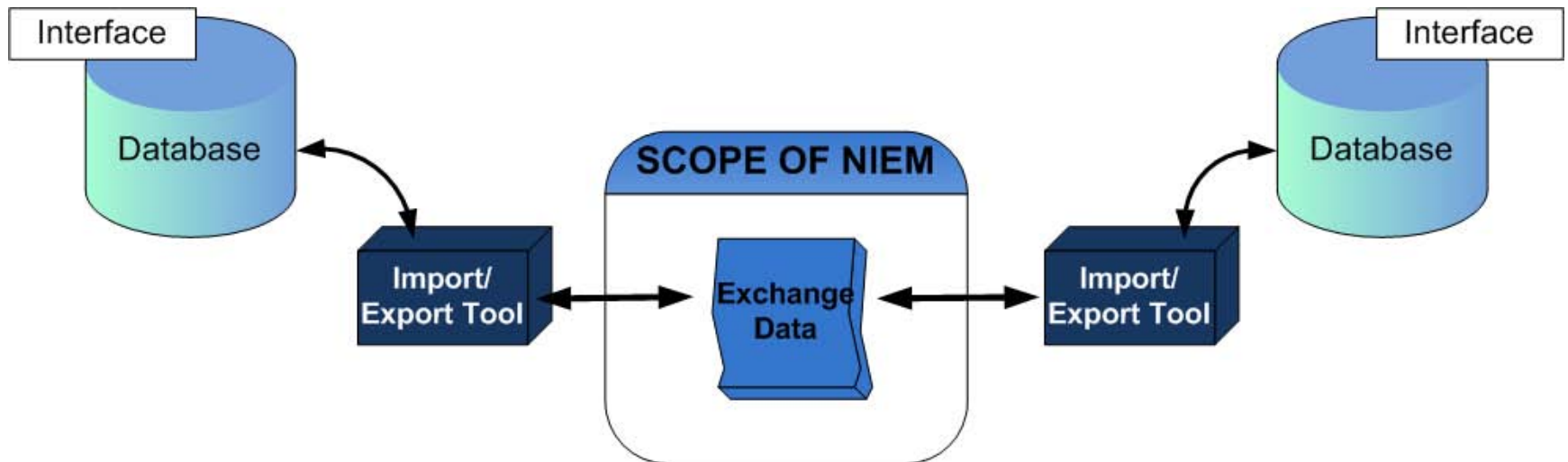
NIEM is a Federal, State, Local, Tribal and Private inter-agency initiative providing a foundation for seamless information exchange. NIEM is more than a data model, it is a community and has a technical and support framework.



# 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.

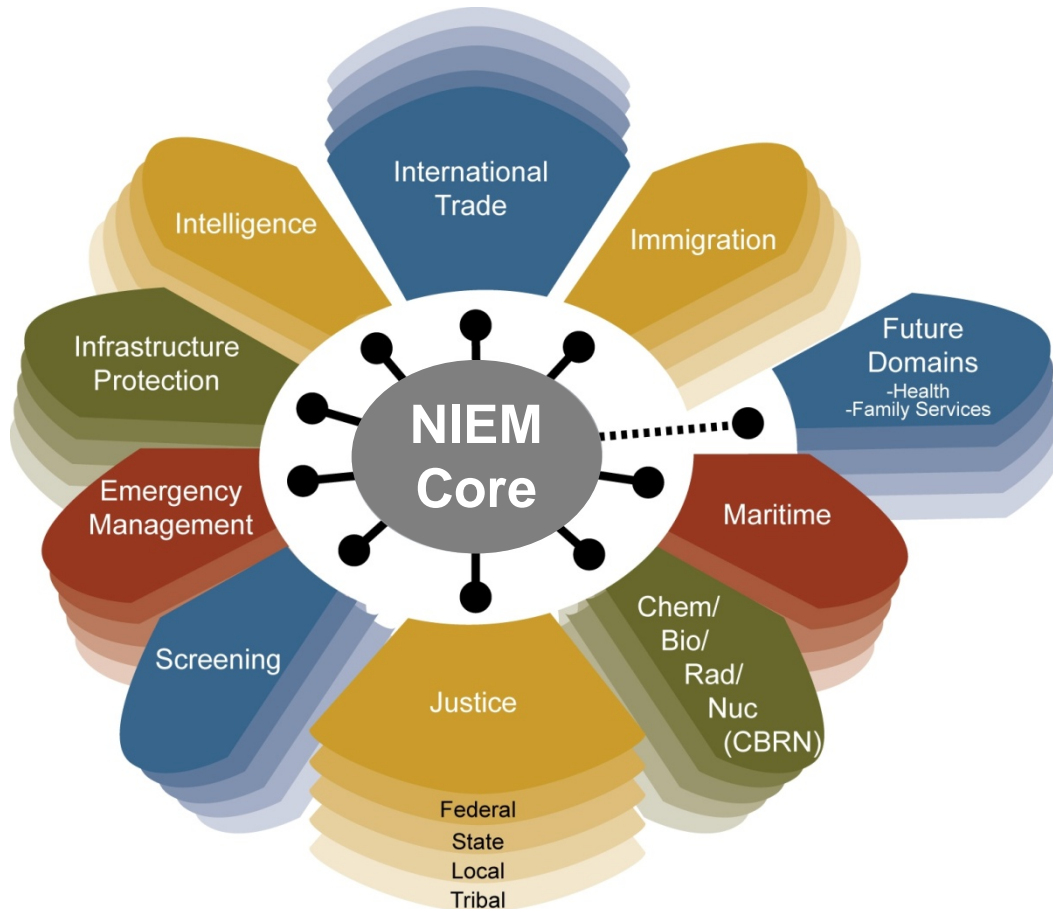
Data elements are organized into core and domain-specific components

**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>

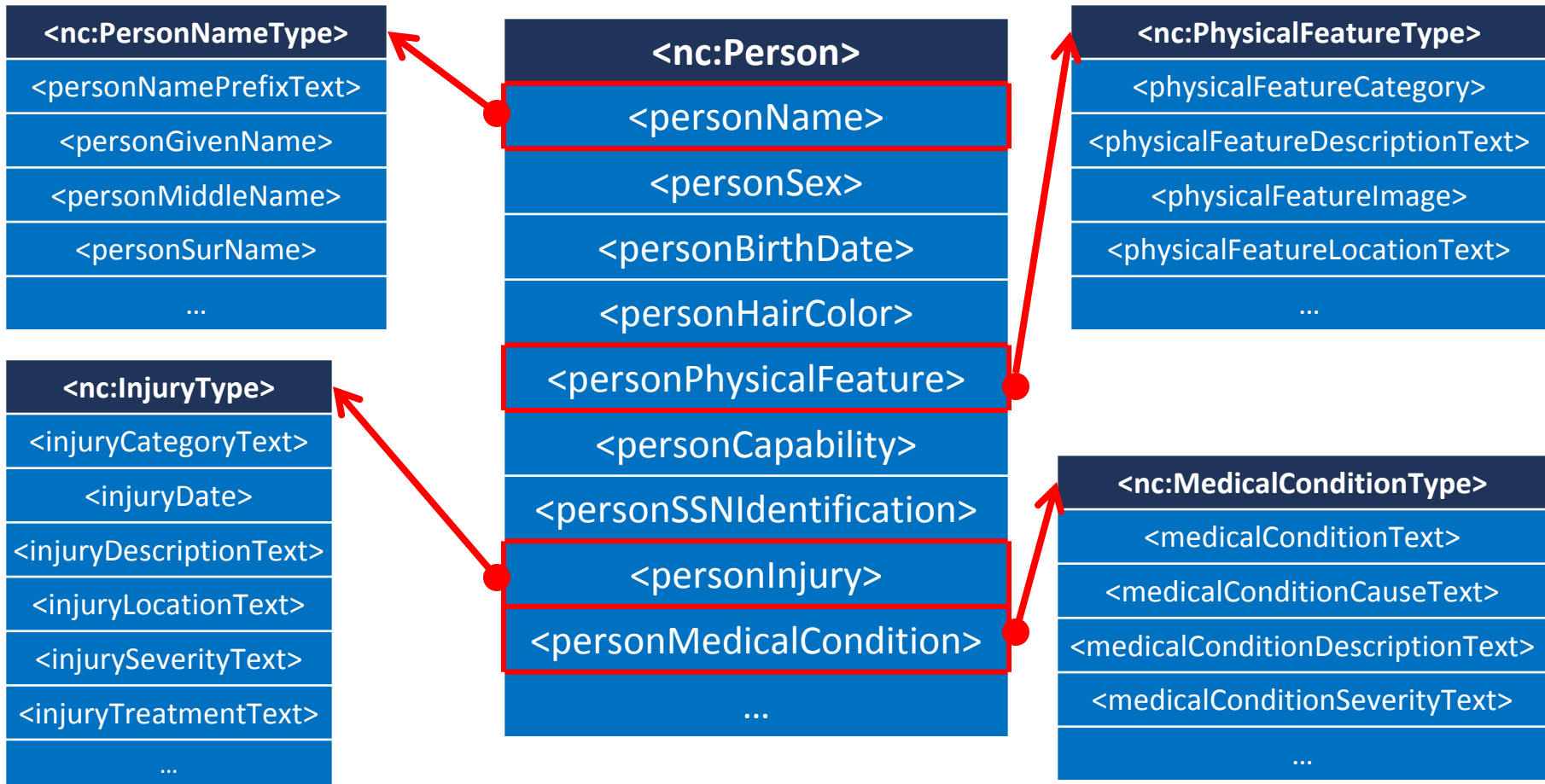
<organizationEstablishedDate>

...

# NIEM Core Component – <nc:Person>



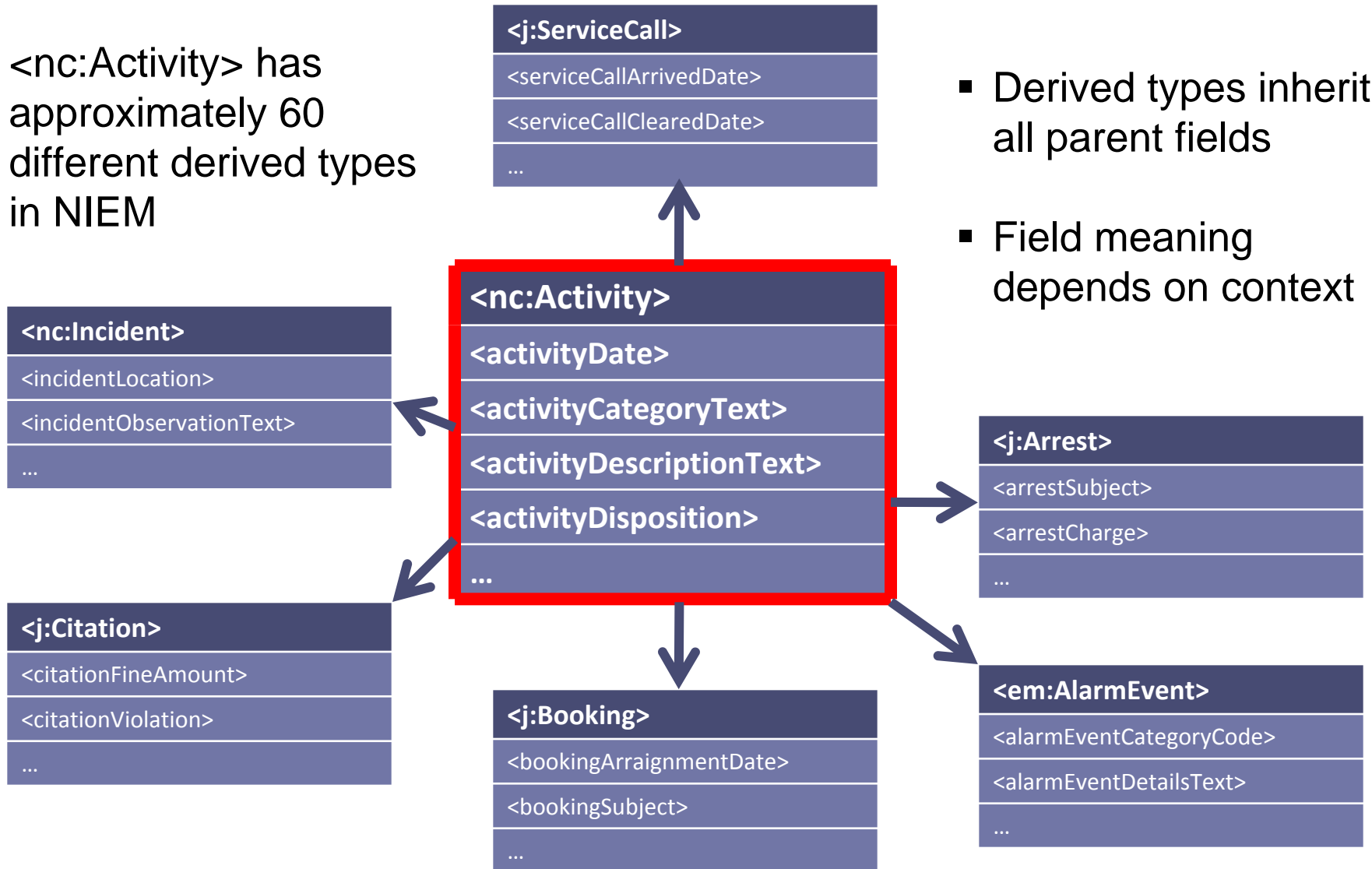
Approximately 200 discreet fields for Person information across all domains, some repeating



# NIEM Core Component – <nc:Activity>

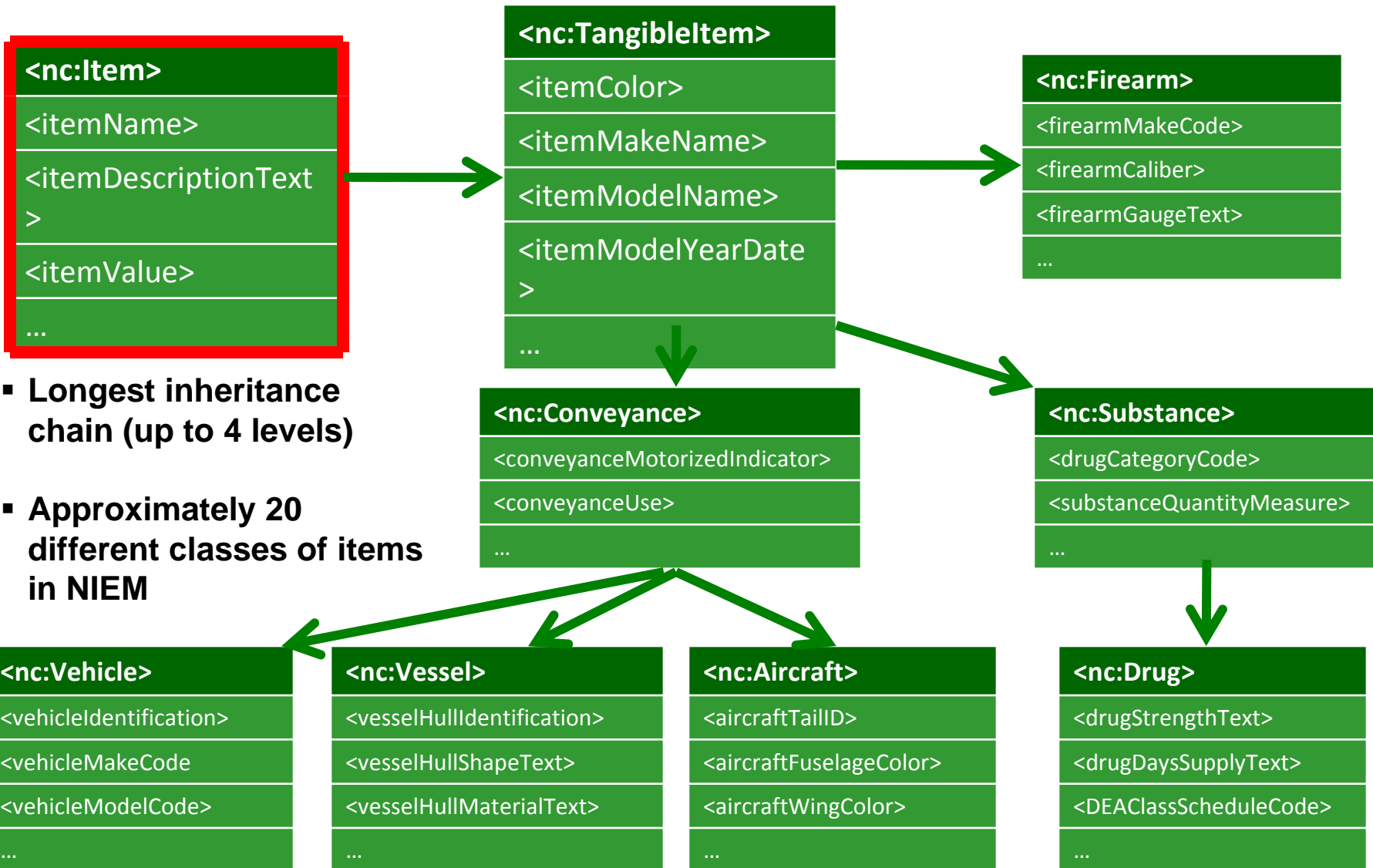


<nc:Activity> has approximately 60 different derived types in NIEM



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

# NIEM Core Component – <nc:Item>



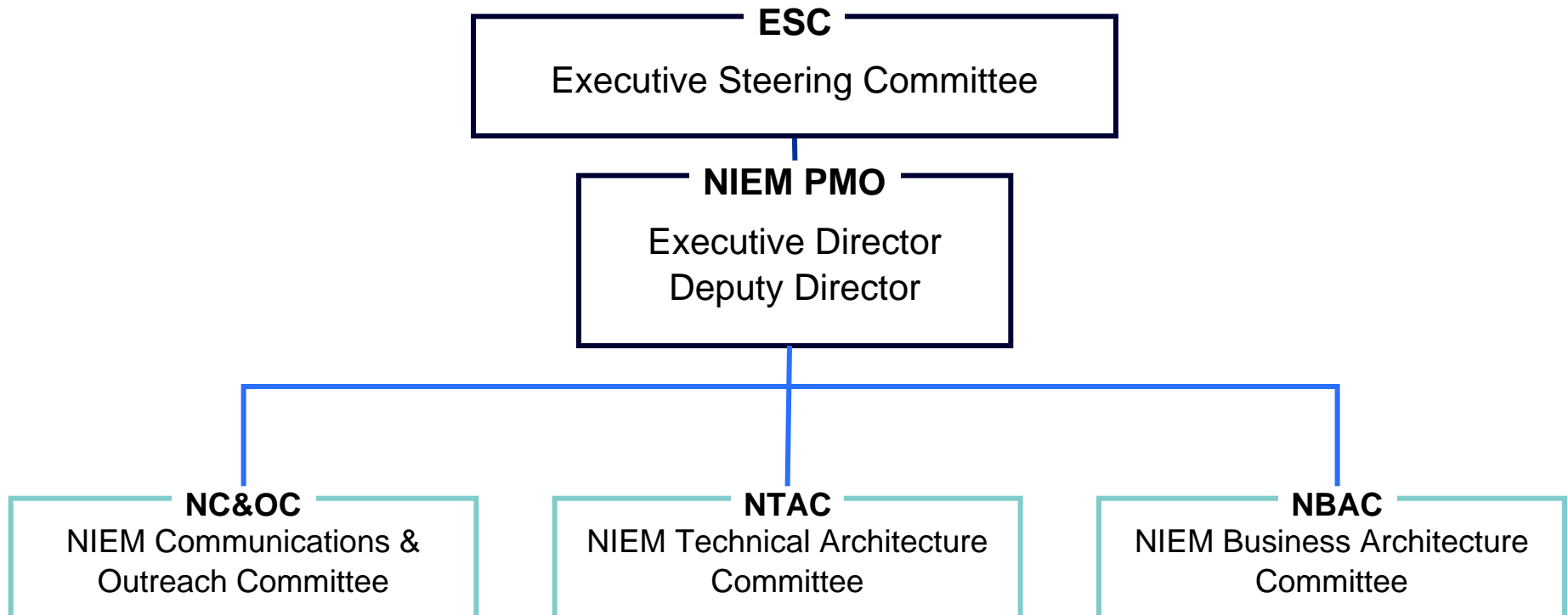
- Longest inheritance chain (up to 4 levels)

- Approximately 20 different classes of items in NIEM

# NIEM 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

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**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**

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- 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

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**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

# What is an IEPD?



An Information Exchange Package Documentation (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

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

## IEPDs do

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- 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

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- 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



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

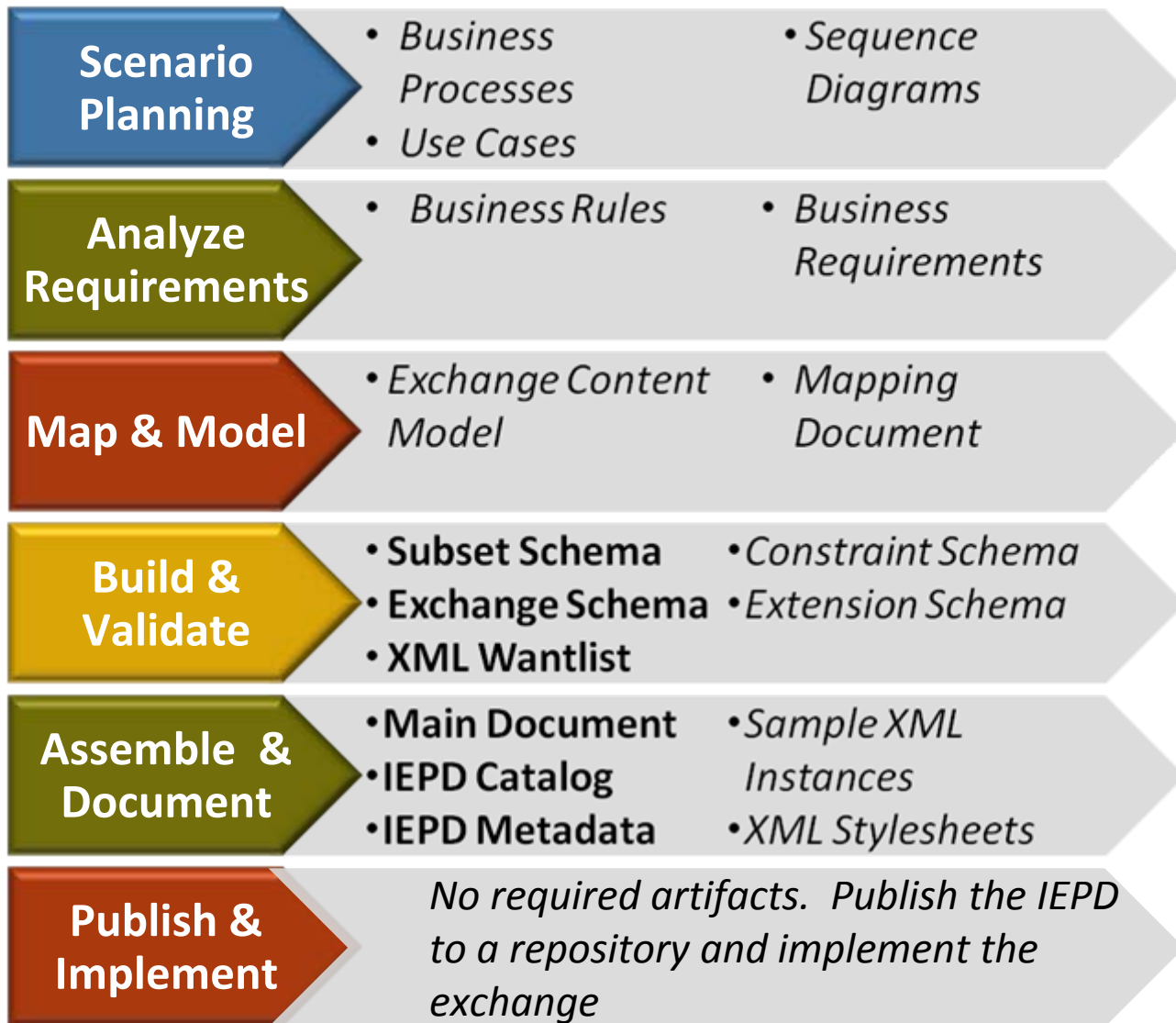
# The IEPD Artifacts



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



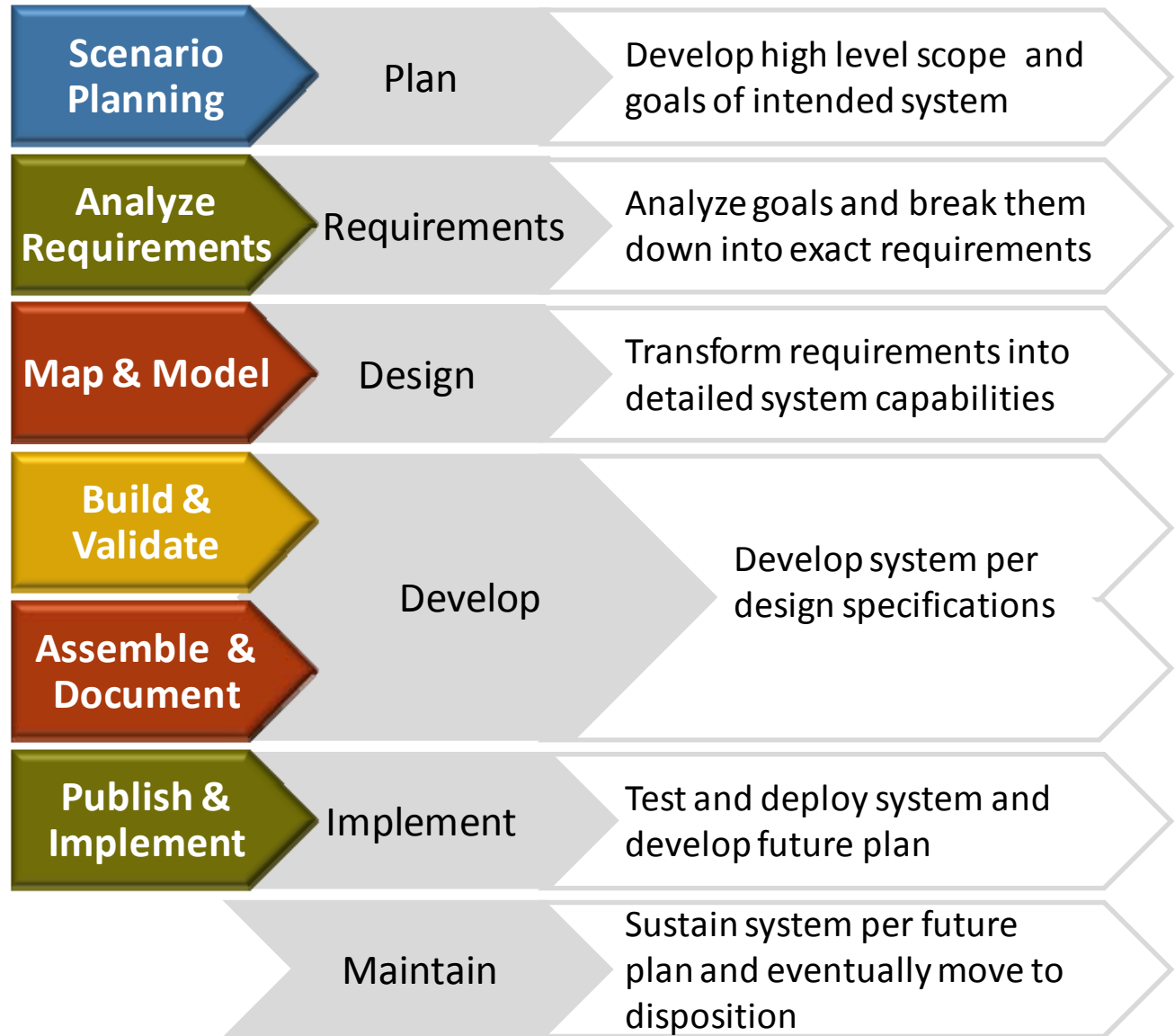
# Systems Development Life Cycle



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

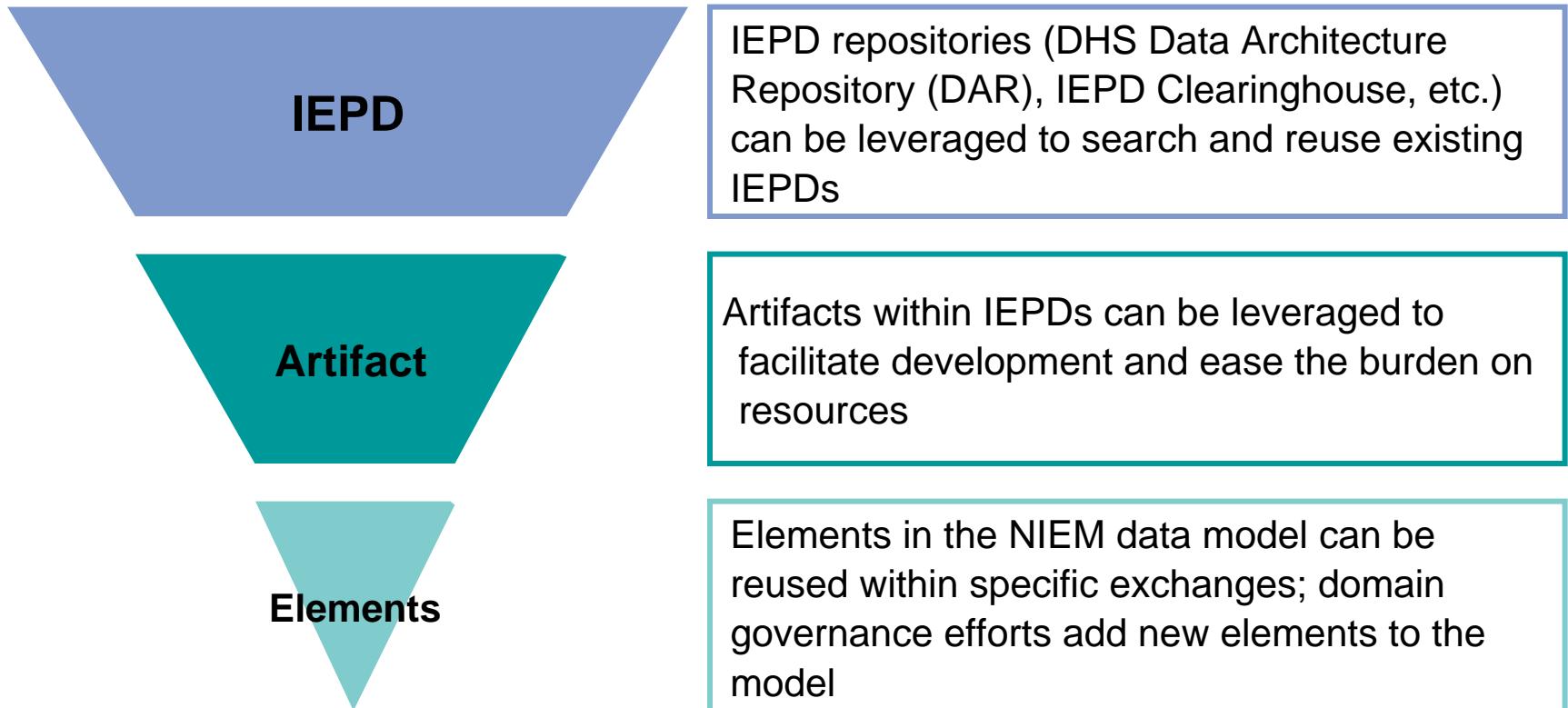


# IEPD Reuse and Sharing

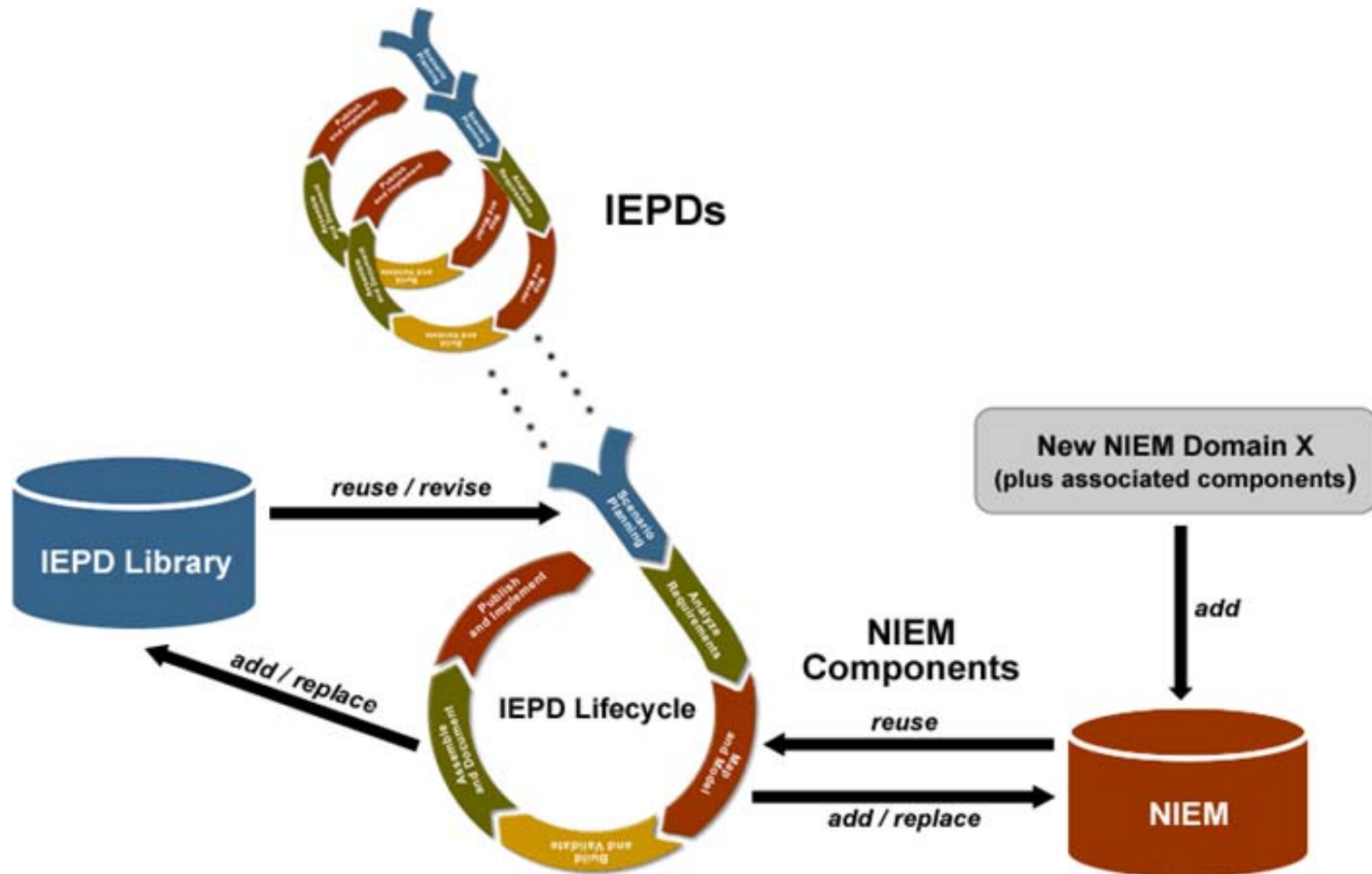


Existing IEPDs, after publication, can be reused in the creation of new IEPDs which can:

- Decrease IEPD development time
- Increase consistency of data definitions



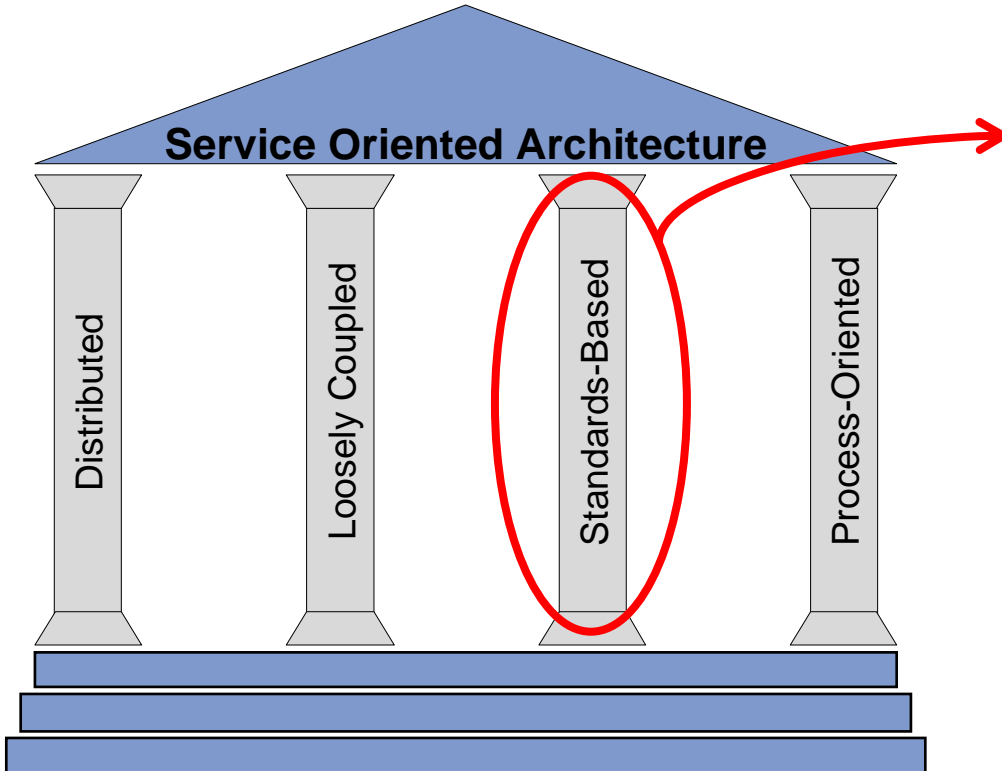
# IEPDs and the NIEM Architecture



NIEM continues to grow and evolve with practitioners' contributions

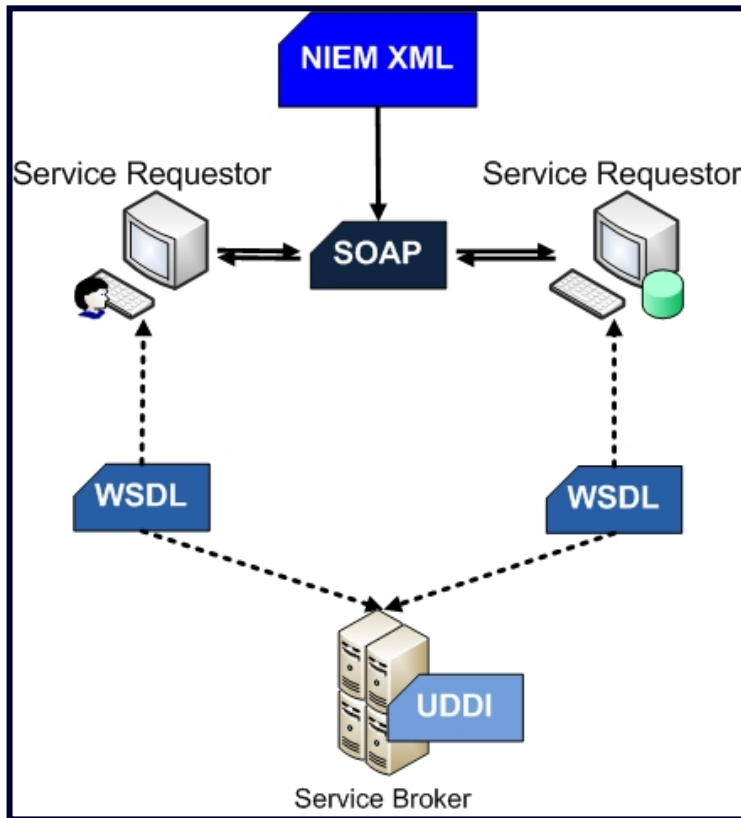
- **In order to provide infrastructure flexibility, NIEM does not define implementation specifications**
- NIEM defines the format and structure of data in transit
- Exchange partners decide how to store and process the NIEM-conformant data being exchanged
- NIEM can be established within an organization's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

**S**ervice **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 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

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

## UDDI

**U**niversal **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 2.0 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

- 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

## Privacy



# Value through Community Growth



- Increasing adoption by government agencies as the standard for information exchanges
  - DHS adoption at 35% of major IT programs, 60% for end of FY09
  - 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

Eliminates confusion by providing consistency of data definitions between agencies

## Agnostic Implementation

NIEM does not dictate how agencies' systems are implemented, but enables these systems to work together



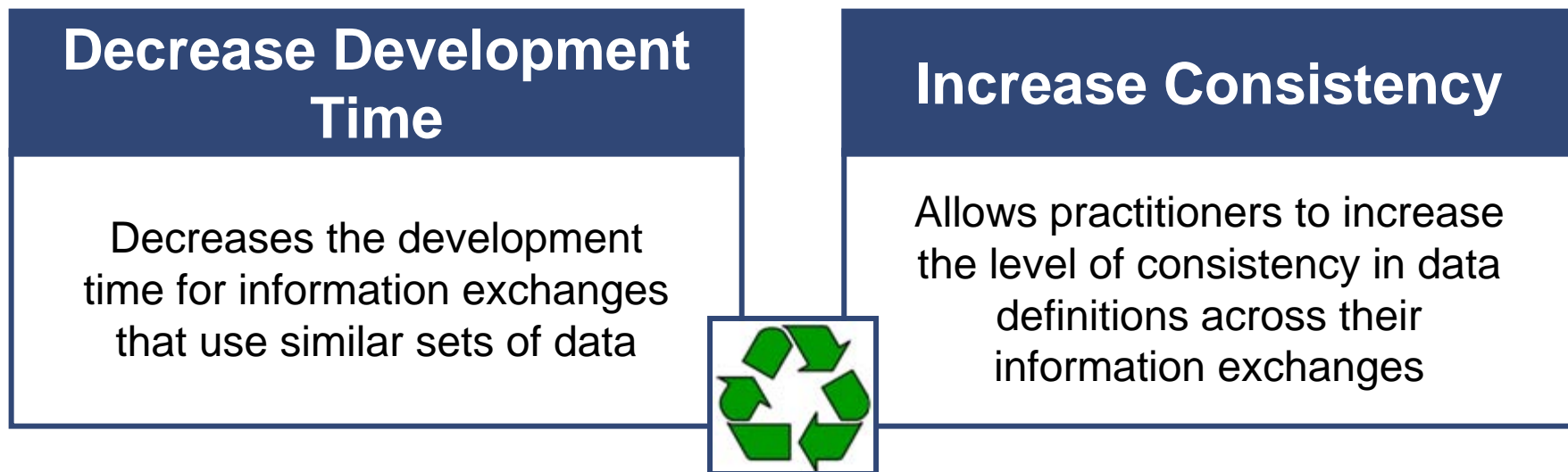
## Core Biographic (Department of Homeland Security)

- 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:



## 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

NIEM Practitioners can leverage NIEM's large support community to decrease development time for exchanges and increase conformance



## Structured Approach

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!**

# Learning Recap

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*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...**

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- Identify the origin of information sharing and NIEM
- Explain how NIEM facilitates greater information sharing between organizations
- Describe the governing structure of NIEM
- 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
- Exchange Repositories
  - NIEM.gov IEPD Repository
  - DHS Data Architecture Repository (DAR)
  - DOJ IEPD Clearinghouse
- Subset Schema Generation Tool & Graphical Browser (NIEM Tools)