



**Homeland  
Security**



# **NIEM Biometrics Domain Standards Development Plan**

**February 2021**

## Approval

The NIEM Biometrics Domain: Standards Development Plan was signed by the NIEM Biometrics Domain Executive Committee in February 2021.

A copy of this approved document is on file with DHS Office of Biometric Identity Management (OBIM).

## Record of Changes

No.	Date	Reference: Page, Table, Figure, Paragraph	A = Add. M = Mod. D = Del.	Change Description
1	1-24-2018	All	A	Initial version
2	1-23-2019	P 2,16	M	Updated ESC Member names
3	3-11-2020		M	Updated due to DNA developments, NIEM 4.2 release, upcoming NIEM 5.0 release, NIST release, updates to data exchange approach, NIEM UML approach, NIEM PMO changes, added IXM version matrix, updated reference documentation, and added definitions.
4	4-13-2020		M	Updated to reflect most recent IXM Version matrix
5	08-1-2020	All	M	NIEM PMO to NMO Changes. Latest NIEM Release updates, NBDEC update.

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## 1. Executive Summary

The Office of Biometric Identity Management (OBIM) within the Department of Homeland Security (DHS) Management Directorate, supports the DHS mission to protect our nation by providing biometric identification services to federal, state, and local government decision makers to help them accurately identify the people they encounter and determine whether those people pose a risk to the United States.

As the lead DHS entity for biometric identity management services, OBIM provides DHS and its mission partners enterprise-level biometric identity information. OBIM operates and maintains the Automated Biometric Identification System (IDENT) and provides identity services expertise as a service provider for customers across DHS, at other federal agencies, in state and local law enforcement, and globally. OBIM also focuses on improving biometric sharing in support of national security and public safety. By matching, storing, sharing, and analyzing biometric data, OBIM provides partners on the front lines of homeland security rapid, accurate, and secure identification.

This plan contains detailed information pertaining to the National Information Exchange Model (NIEM) structure and architecture for efficient information exchange. The plan also addresses how to ensure that the development of NIEM Domain content minimally disrupts OBIM architecture and maximizes the efficiency and effectiveness of OBIM plans and execution.

## 2. Purpose

OBIM provides backend services for collecting and storing biometric data, provides analysis, updates its watch list, and ensures the integrity of the data. OBIM has 30,000 users across federal, state, and local government agencies.

NIEM is a common vocabulary that enables efficient information exchange via a community-driven, standards-based approach to exchanging information. In support of interoperability, the NIEM development principles encompass the development, publication, maintenance, and application of the NIEM Biometrics Domain (NBD) standardization, together with OBIM leadership in domestic and international standardization. NIEM as a tool, empowers agencies to create and maintain meaningful data connections across information technology (IT) systems and the stakeholder base of federal, state, local, tribal, territorial, and international partners.

In its role as the steward of the NBD, OBIM manages all domain activities, including biometrics schema development and harmonization, data quality tiger team operations, technical analysis (biometrics data review), and community of interest (COI) outreach.

### 2.1 Audience

This document's intended audience comprises several federal agencies, including NIEM Business Architecture Committee (NBAC), NIEM Technical Architecture Committee (NTAC), NIEM Executive Committee, NIEM Management Office (NMO), and OBIM stakeholders, including Immigration and Customs Enforcement, U.S. Customs and Border Protection, U.S. Citizenship and Immigration Services, Transportation Security Administration, Department of

Justice (DOJ), Department of Defense (DOD), and Department of State. The audience also includes state, local, tribal, territorial, and Collaborative Organizations (Division/Branch) of OBIM.

### 2.2 Planning

OBIM leads the biometric standards development enterprise in DHS and expands collaboration and coordination with interagency groups and international partners, while overseeing DHS-wide standards for the biometric programs and promulgating the standards across the U.S. government. NIEM planning is intended to support the development of high-quality deliverables meeting the needs of users in implementing standards, while benefiting from best-practice IT support planning.

The objectives of planning are to:

- Communicate the specific requirements of building NIEM-conformant exchanges to promote compatibility and consistent development
- Create ancillary artifacts addressing the information needs of a broad range of project stakeholders, including project sponsors, business experts, business and IT managers, and technologists
- Establish a mechanism for synthesizing the domain/business knowledge of subject matter experts
- Provide artifact reuse across projects by improving artifact consistency
- Leverage open industry standards familiar to most business analysts, architects, and other technology professionals
- Work with standards-based tools readily available in the public domain or at low cost, enabling integration projects to avoid high licensing costs and vendor lock-in
- Share valuable lessons learned and best practices from reference Information Exchange Package Documentation (IEPD) development projects

NIEM Information Exchange Packages can be developed to share information within a single domain (intra-domain exchange) or across multiple business domains (cross-domain exchange). Unless otherwise noted, the activities and tasks outlined in this plan apply to intra-domain and cross-domain modeling.

NIEM strategic planning activities include creation of documentation to support domain and/or governance activities; meetings with key stakeholders within the same domain; and the creation of artifacts in the first two planning stages of the IEPD Lifecycle (detailed in Section 3), including Scenario Planning and Analyze Requirements.

To begin exchanging information, partners need to develop data exchanges, also known as Information Exchange Packages, which are then documented as Information Exchange Package Documentation (IEPD). An IEPD is a complete definition of an IEP—a compilation of documentation that can be understood by the producer and the receiver of the information exchange. Generally, it is composed of schemas for data exchange and documentation for understanding the business context and usage. The process described for the development of IEPs and IEPDs is a guideline and is intended to be customized, as necessary. It provides a

useful starting point for project planning and can help in setting high-level expectations regarding timelines, milestones, and resources.

**2.3 Development Activities**

OBIM uses its role as the steward of the NBD and its connections with National Institute of Standards and Technology (NIST) biometric efforts to ensure alignment between NIEM and ANSI/NIST-ITL. The NBD chair and the OBIM NIEM development team meet frequently (quarterly at a minimum) and participate in all NBAC meetings, reviews, and collaboration efforts across NIEM domains.

OBIMs role includes:

- Coordinating and facilitating the development of standards for the NBD based on business context
- Coordinating and facilitating the development of Information Exchange Package Documentation

Through its stewardship of the NBD, OBIM oversees the outreach, training, data model, and protocol harmonization and provides technical assistance within the domain. Specifically, OBIM intends to advance IDENT Exchange Messages (IXM) through implementation of the Homeland Advanced Recognition Technology (HART) system. HART will be developed with a service-oriented architecture (SOA) and standards-based interfaces. The system redesign and development will address the current gaps, including those relative to capacity, security, privacy protections, interoperability, cost sustainability, performance, and availability. The system will address the gaps related to accuracy, surety of matching results, and interoperability of additional biometric identity modalities beyond fingerprints.

The NBD has been a key asset in maintaining close linkage to biometrics standards development, and updates to the American National Standards Institute (ANSI)/NIST-Information Technology Laboratory (ITL) Biometric Standard. The NIST 2015 Update enables alignment with the NIEM 4.0.1 version.

The NIST site provides a tool which helps conversion of NIEM 2.1 to NIEM 4. It can be found at: <https://www.nist.gov/document/ansinist-itl-standard-mapping-toolkit>.

It is best to think of NIEM as a community and standards-like organization similar to the World Wide Web Consortium (W3C) or Open Geospatial Consortium (OGC), whose members voluntarily cooperate to define and employ its technical specifications, data model, etc. Some illustrative parallels are:

<b>Organization</b>	<u>NIEM</u>	<u>OGC</u>
<b>Technical specifications</b>	<u>NIEM Naming and Design Rules, etc.</u>	<u>Geography Markup Language (GML) Encoding Standard, etc.</u>
<b>Data model</b>	<u>XML schemas for NIEM model, etc.</u>	<u>XML schemas for GML, etc.</u>

**Figure 1** shows a general overview of the stages of standards development, which we detail in the following paragraphs.



*Figure 1: Stages of Standards Development*

*New (or Revised) Task:* In order to revise or amend an existing document, or to develop a new Standard, it must undertake an acceptance process to ensure that the work is necessary and that the resources are in place to carry out the effort. Each member body votes on the proposal. Standards Committees vote during a meeting or via correspondence.

*Drafting and Consensus Building:* Once a task has been accepted, the core work of developing the Standard begins—often in a working group (also called a project team or maintenance team), which consists of experts nominated by Standards Committees working together to develop a draft. When the working group is satisfied that the draft is ready for wider review, it is circulated to the broader audience for comment and/or vote. During the consensus stage, a development work may go through several drafts.

*Consultation:* If the draft is approved at the Standards Committee stage, it is made available for public consultation.

*Development of Final Text:* After public consultation, the Standards Committee sends its comments to the working group, which decides whether to accept the comments (editorial, technical, or general) and modifies the draft accordingly. Once the comments have been resolved, the updated draft is circulated to Standards Committee for a vote, with a version showing the decisions made during the resolution of comments. If the draft undergoes significant technical change, it may be sent for a second consultation. If the draft passes the vote, it proceeds to the approval stage.

*Adoption:* The document is ready for adoption in its revised final version.

*Approval of Publication:* The document is submitted to the Standards Committee for approval, by vote, to publish.

*Publication:* Following formal approval, the Standard may be implemented as a Development Standard, at which point any conflicting Standards are withdrawn. Any information the committee believes will support the use of an adopted Standard may be published in the Standards Committee repository.

*Maintenance:* A Standard is reviewed periodically to ensure its currency. The review considers whether the Standard should be retained, amended, withdrawn, or revised.



From the practitioner's perspective in the context of NIEM, the IEPD Lifecycle (detailed in Section 3) is the primary process for development of the artifacts that define an information exchange specification. The lifecycle guides the understanding of how IEPDs are ideally built and published.

Typical responsibilities of a developer are to:

- Develop the product in compliance with approved Data Standards
- Support the NIEM Biometrics Domain steward, Executive Management Committee, and other standing committees or working groups, as needed
- Assist in completion of individual or group tasks
- Work in accordance with the priorities of the program goals and tasks related to the Biometrics Domain effort
- Develop a common vocabulary, and an online repository of exchange standards to support information sharing
- Follow the same technical framework (detailed in section 3.1) of other NIEM exchange developers, to borrow from and reuse each other's work

### 2.4 Review Cycle

The review cycle enables a broader audience to view the business context and proposed draft to ensure transparency and acceptability of the resulting IEPD. All external data components incorporated in the NIEM Core are subject to review and approval by the NBAC and NTAC. For example, the NIEM model provides several geospatial components which are adopted from Geographic Markup Language (GML). The NIEM Domain follows a cross-jurisdictional governance structure that reviews, edits, and provides impact assessments on changes, and promotes the use of and adherence to the following standards, specifications, and best practices:

- DHS IXM
- DOJ Federal Bureau of Investigation (FBI) Electronic Biometric Transmission Specification (EBTS) 10.0
- DOD EBTS 4.1
- NIEM
- ANSI/NIST-ITL
- International Committee for Information Technology Standards M1 Subcommittee 37 which is the biometrics standardization subcommittee at ISO

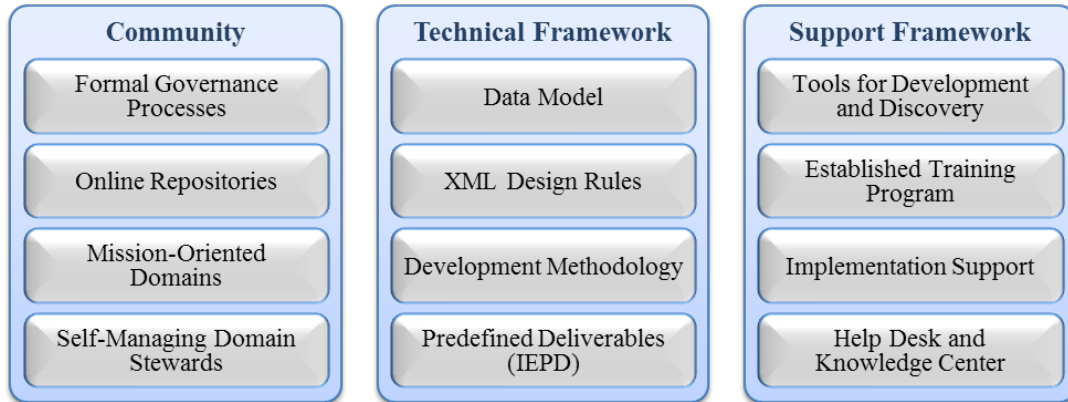
Information shared with and gained from the committees and working groups informs the Domain's current and future operations. Whenever there is a modification, change, or addition, COI members and stakeholders participate in the review and editing, and they provide comments before release to the community and/or posting to the Domain reference websites.

The Electronic Biometric Transmission Specification (EBTS) version 4.1 will enable the DoD's Automated Biometric Identification System (ABIS), DHS's IDENT, and the FBI's NGI (Next Generation Identification) system to communicate natively, "in their own language while DHS is preparing to upgrade from its IDENT system to the new Homeland Advanced Recognition Technology (HART) in order to handle expanded scale and capabilities.

### 3. NIEM Architecture Reference

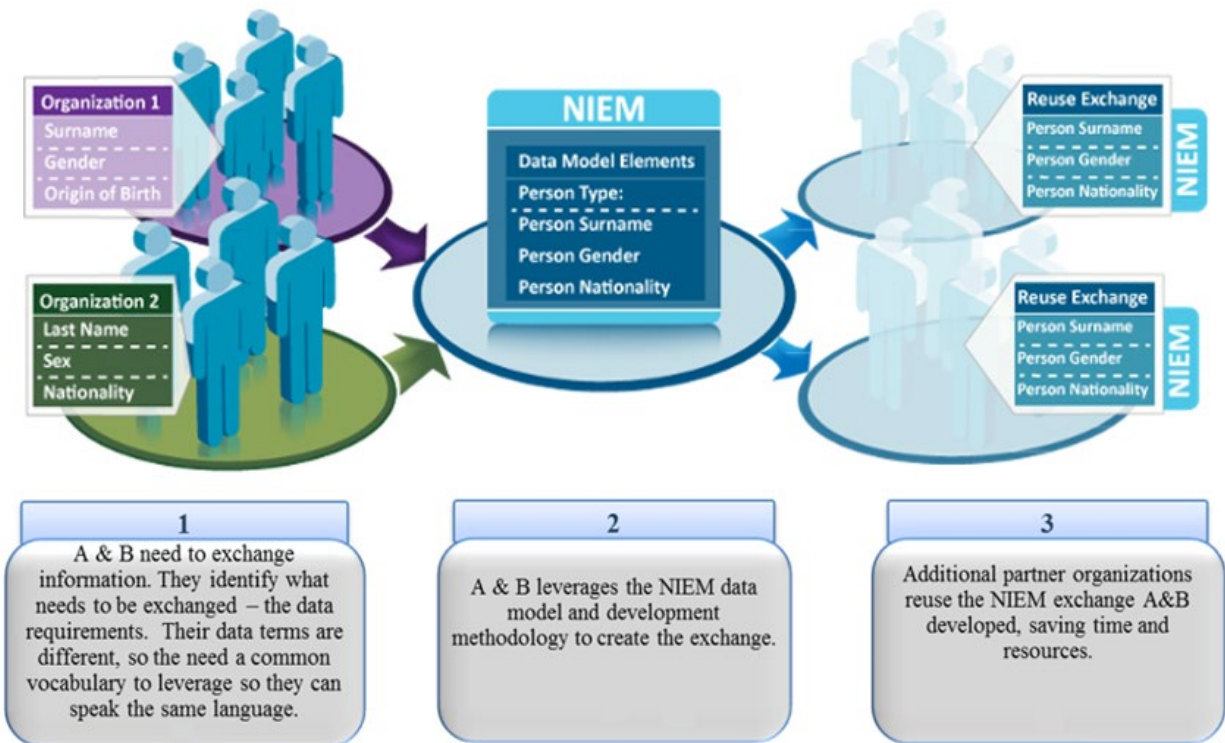
#### 3.1 NIEM Framework

NIEM connects communities of people who share a need to exchange information to advance their mission, and it provides a foundation for seamless information exchange among federal, state, local, and tribal agencies. NIEM is characterized by an active user community and a technical and support framework, as shown in **Figure 2**.



*Figure 2: NIEM Framework*

Reusability and standardization can be achieved using NIEM to exchange information, as shown in **Figure 3**.



*Figure 3: How NIEM Works*

NIEM defines the format and structure of data in transit. Exchange partners decide how to store and process the NIEM-conformant data being exchanged.

As of 2020, the NIEM release version is NIEM 4.2 which included DNA related attributes within the NIEM Biometrics Domain. The NBAC and community are finalizing the NIEM 5.0 release candidate planned for August 2020. For these release cycles, the NBAC forms a Harmonization Working Group to focus on Core and cross-domain harmonization and quality assurance (QA) issues in order to reduce overlap and improve the quality and consistency of the NIEM model.

### 3.2 IEPD

A NIEM IEPD is a package that describes the construction and content of a NIEM information exchange. It contains all of the schemas necessary to represent and validate the data content of the exchange. It also contains supplemental artifacts, such as documentation, business rules, search, discovery metadata, and sample instances.

There are three core functions of IEPD development:

- To provide the business, functional, and technical details of the information exchange through predefined artifacts
- To create a core set of artifacts in a prescribed format and organizational structure to allow for consistency
- To design in order to share and reuse in the development of new information exchanges through publication in IEPD repositories

There may be one or more IEPDs for one information exchange. A NIEM-conformant IEPD must conform to the following formats:

1. NIEM Naming and Design Rules (NDR) – The NDR specifies rules to standardize schema development and provides a blueprint for NIEM conformance. It also provides rules for NIEM reference schemas, NIEM Extensible Markup Language (XML) elements, and other NIEM XML documents, including sample XML instances. NIEM, through NDR, aligns with the standards of the World Wide Web Consortium and the International Organization for Standardization.
2. IEPD Specification – Similar to any systems development lifecycle, IEPD creation has a complete lifecycle, as shown in **Figure 4**.



**Figure 4: IEPD Phases**

- *Scenario Planning*: Planning of the project, establishing the process, and identifying exchange business requirements
- *Analyze Requirements*: Elaboration and documentation of the business context and data requirements
- *Map and Model*: Association of local objects with types and elements in NIEM, a process called mapping and exchange content model to NIEM

- *Build and Validate*: Creation of a set of exchange-specific, NIEM-conformant XML schemas that implement the data model created for exchange
- *Assemble and Document*: Preparation and packaging of all related files for this IEPD into a single self-contained, self-documented, portable archive file
- *Publish and Implement*: Publication of IEPD for search, discovery, and reuse

IEPDs have a defined development methodology. Best practices for most organizations include many of the artifacts shown in **Figure 5**. IEPDs contain required and recommended artifacts.

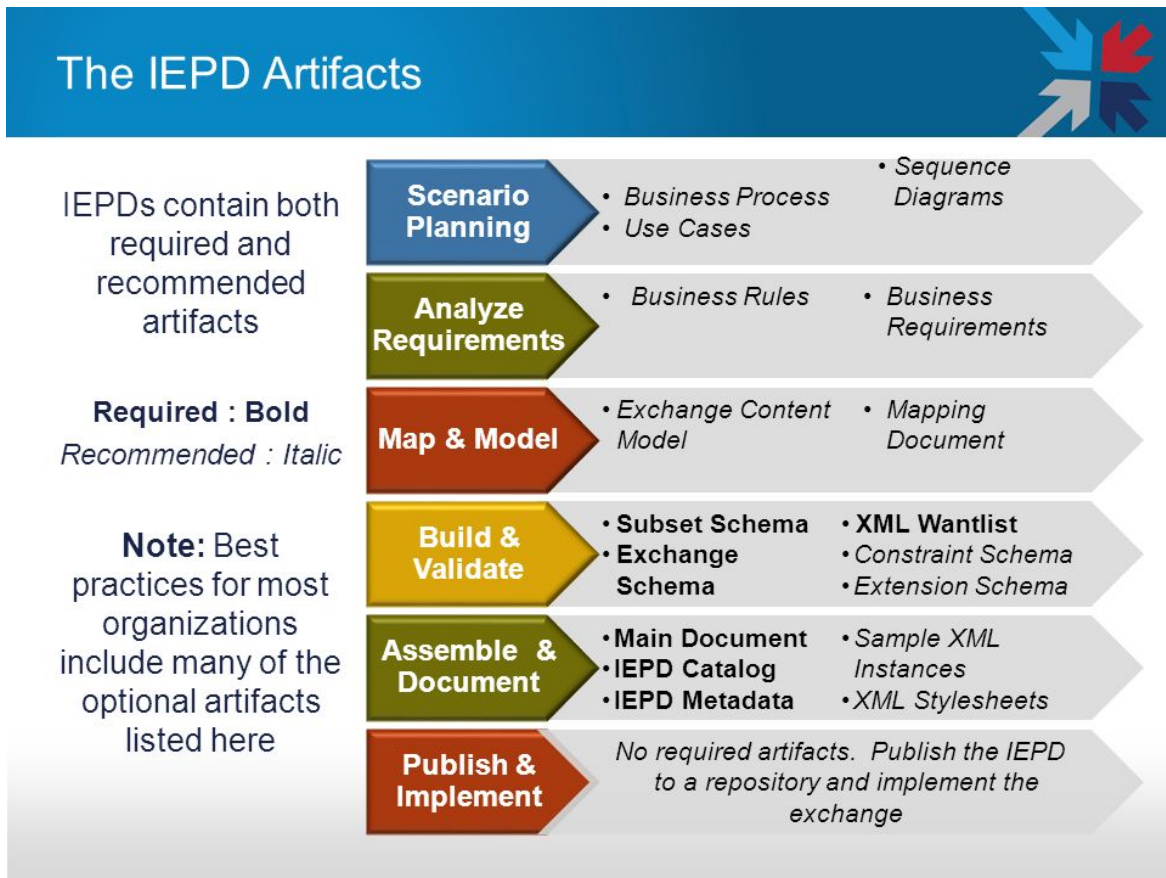
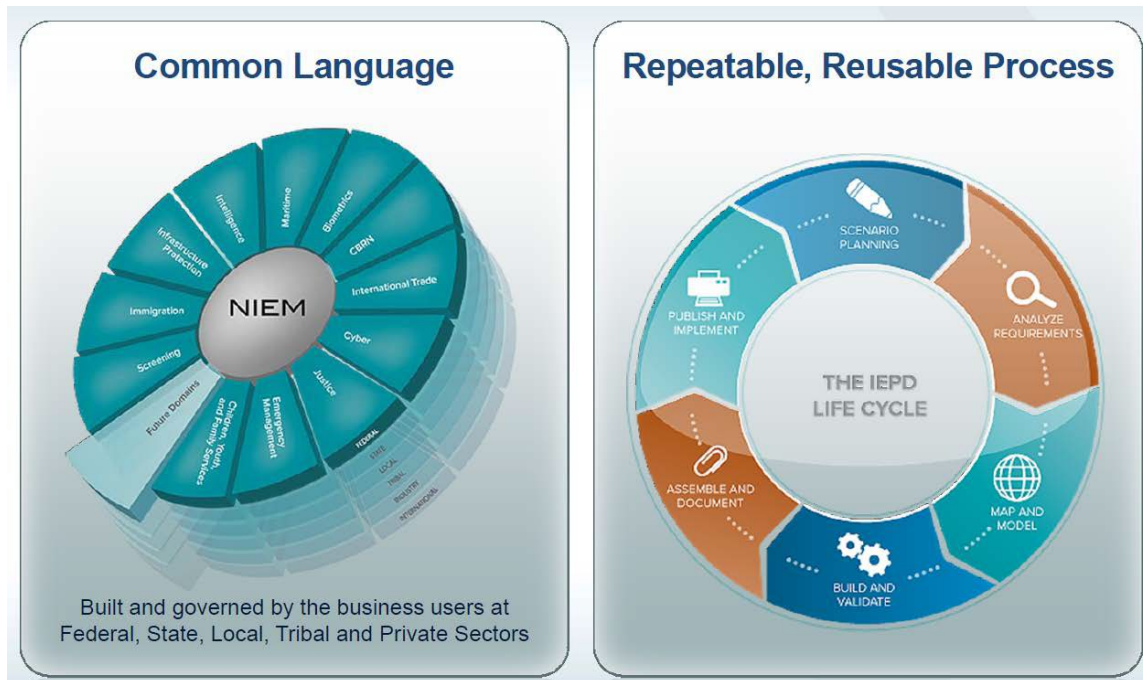


Figure 5: IEPD Artifacts

### 3.3 NIEM Domain

The NIEM Core consists of data elements that are commonly understood across all domains. NIEM Domains include mission-specific data managed through independent stewards.

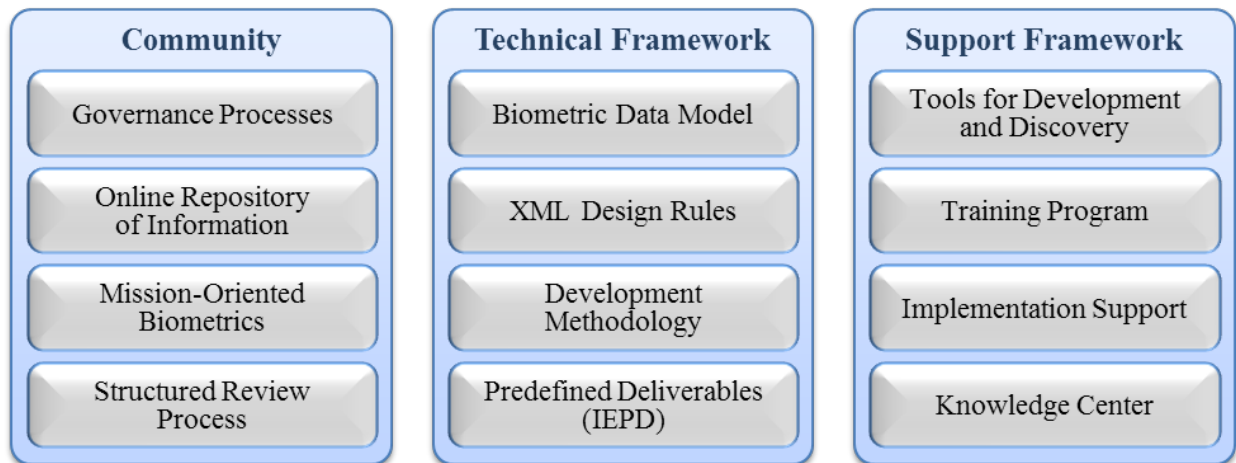


**Figure 6: NIEM Domain and IEPD Lifecycle**

The NIEM Common Language consists of the NIEM Core, NIEM Domains, and Future Domains and follows a repeatable, reusable IEPD lifecycle process, as shown in **Figure 6**.

**3.4 NIEM Biometrics Domain**

Operating under the stewardship of DHS OBIM, the NBD supports biometric-related services and mission-based activities, such as national defense, border management, immigration benefits, and global law enforcement, and credentialing through the joint development and alignment of XML Biometric Standards. **Figure 7** depicts the NIEM Biometrics Framework.



**Figure 7: NIEM Biometrics Framework**

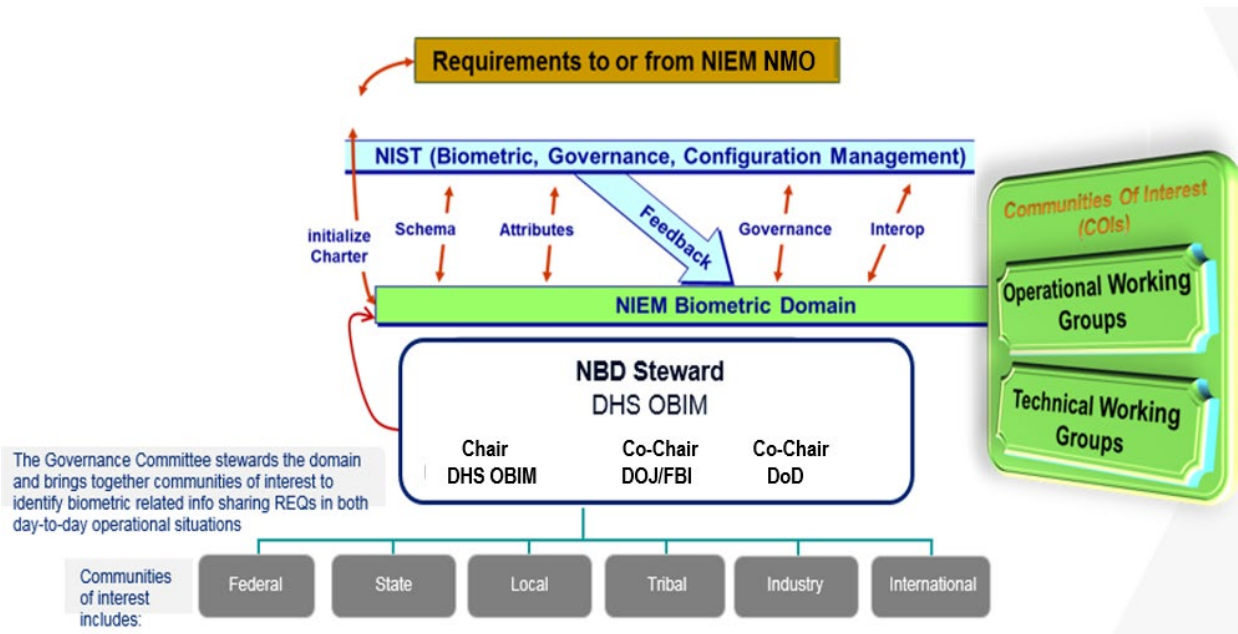
The biometric domain follows a self-service model which allows for independence. Domain independence enables the domain to have the authority, autonomy, and capability to maintain its

own content development and management. This ensures proactive engagement within the domain and benefits NIEM scalability while also decoupling the domain from the NIEM Core development timeline.

**3.4.1 Biometrics Domain Organization**

The Biometrics Domain is organized in alignment with domain governance as suggested by NIEM. Information concerning the Biometrics Domain, and the associated issues of domain management and standing working groups, will be communicated regularly to the NIEM Management Office (NMO) and NBAC to apprise stakeholders of development and activities. Such communication will be a primary responsibility of the domain steward and the NIEM Biometrics Domain Executive Committee (NBDEC).

OBIM serves in the domain steward role for Biometrics. The Biometrics Domain engagement workflow is shown in **Figure 8**.



**Figure 8: Biometrics Domain Organization**

**3.4.2 Leveraging NIEM for Biometrics**

NIEM offers a proven approach for developing standardized, reusable information exchange packages and is being adopted across federal, state, and local government. The NIEM Biometrics Domain leverages the NIEM tools and processes that are reusable for new exchange development efforts, enabling content to be modeled in an agile and interoperable manner. Using NIEM for data exchanges allows disparate systems to speak the same language. It creates a seamless transfer of information instead of a point-to-point architecture, which is a challenge to maintain.

Further, because NIEM is based on SOA (through reuse of similar IEPDs), it provides a more agile system, and implementing changes is easier and faster, avoiding cost to the government.

Meanwhile, NIEM IEPDs can be leveraged to help develop exchanges within the Biometrics COI. The experience and knowledge of NIEM practitioners will also help accelerate adoption. As a primary tool, a NIEM data dictionary enables definition of terms across domains or COIs. A NIEM data dictionary contains the NIEM Core, which consists of data elements that are commonly understood across domains, and NIEM domain(s) that include mission-specific data managed through independent stewards. Leveraging NIEM provides for the establishment of a common vocabulary, forms a business and technical framework, promotes sharing and reuse, encourages data exchange standards development, enables creation of standard data structures, and improves operational efficiency and effectiveness.

The goal of NIEM conformance is for the sender and the receiver of information to share an unambiguous understanding of the information. Conformance to NIEM ensures that basic information (the NIEM components) is well understood and has a consistent meaning across communities. The result is a level of interoperability that would be unachievable with the proliferation of custom schemas and dictionaries.

### 3.5 NIEM-UML

NIEM offers two ways to develop information exchanges—through XML schema and through Unified Modeling Language (UML) tooling. NIEM also offers the ability to transform XML schema to other data formats, such as JavaScript Object Notation (JSON) and Java objects.

The NIEM-UML Profile is based on the Object Management Group's (link is external) international Model-Driven Architecture standards.

NIEM-UML provides a way for creating NIEM-conformant information exchanges in UML rather than directly coding XML schema. In addition, resources who build NIEM exchanges don't need to worry as much about the technology details, as outlined in the NIEM Naming and Design Rules (NDR) and the Model Package Description (MPD) Specifications. These specifications and rules are already written into the profile, minimizing complexity. When implemented in a tool, NIEM-UML generates NIEM-conformant exchanges and provides a visual representation that is understandable to technical and business users alike. That visual representation of UML diagrams helps developers collaborate closely with business users to drive requirement definition and validation.

The NIEM-UML has several approaches to data exchanges:

- XML schema definition schemas
- Web Services - SOAP (Simple Object Access Protocol) or REST (Representational State Transfer)

XML is a platform independent language and allows different systems to talk to each other seamlessly irrespective of underlying technology. Most of the systems have data stored in various platforms like relational databases (RDBMS), mainframes, and Information Management Systems (IMS).

In order to integrate with NIEM, the approach would be to use a Commercial off-the shelf (COTS) product and customize it to extract data from all the underlying sources and generate

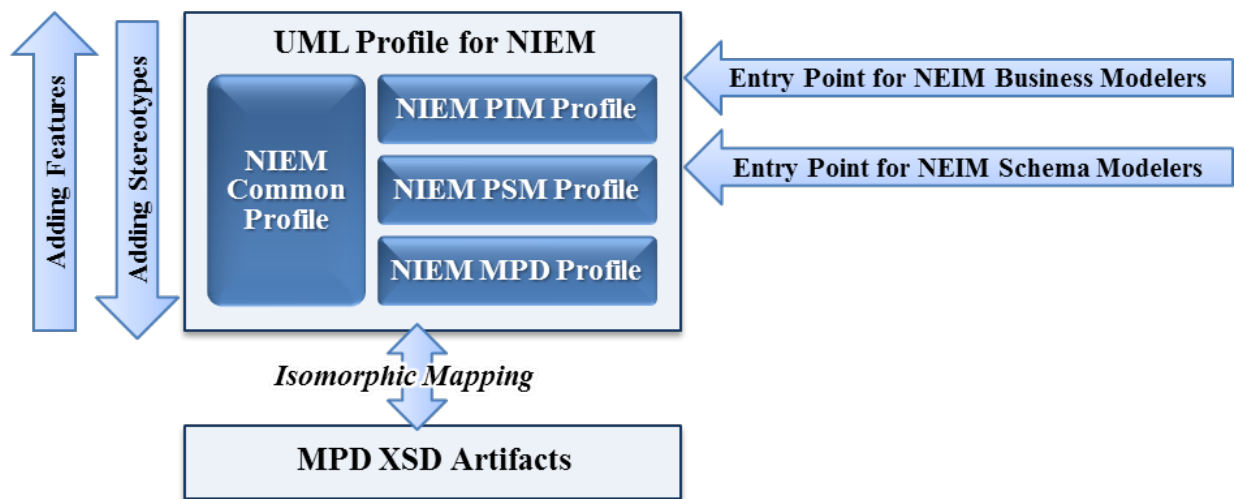
NIEM conformant XML files. Another approach is to build reusable web services to extract data from the underlying sources and output it to an XML Schema Document (XSD)-schema mapping the NIEM UML specifications of the NIEM Core and Domain specific attributes.

### 3.5.1 UML Profile for NIEM

The use of UML to represent NIEM is part of the NMO strategy in support of the NIEM community to broaden adoption and align industry standards. NIEM-UML embraces the Model Driven Architecture (MDA) standards and facilitates the separation of concerns between business needs and technology implementations.

The NIEM-UML profile consists of four sub-profiles, as shown in **Figure 9**. Each sub-profile is a subset of UML 2.4.1 constructs that are extended by UML stereotypes. The subset identifies the NIEM concepts for which an analogous representation exists in UML.

Use of a subset ensures that a model produced by one user will be interpreted as expected by another user. The UML extensions define the NIEM concepts without an analogous representation in UML. All NIEM-UML models use the standard XML exchange format specified for UML 2.4.1 and may exchange NIEM models between conforming UML tools.



**Figure 9: Components of the NIEM-UML Specification**

These sub-profiles have distinct purposes and relationships:

- The NIEM Platform Independent Model (PIM) Profile provides stereotypes that enable NIEM business modelers to model an information exchange in a technology-agnostic way and to create a NIEM PIM.
- The NIEM Platform Specific Model (PSM) Profile provides stereotypes that enable NIEM technical modelers—more precisely, NIEM schema modelers—to model the technical aspect of an information exchange represented in a NIEM PSM.
- The NIEM Common Profile, leveraged by the PIM and PSM profiles, contains the core stereotypes used to represent NIEM structures in UML.
- The Model Package Description (MPD) Profile provides stereotypes for modeling NIEM MPDs, which are the final artifacts representing NIEM information exchange, based on either a PIM or a PSM model.



As indicated in **Figure 9**, the structure for the NIEM-UML profile provides direct “entry points” for NIEM modelers who are primarily business oriented and for NIEM modelers who are primarily technically oriented. It allows modelers to use a common set of profile concepts.

### 3.6 NIEM Governance and Extension

NIEM is governed by federal, state, local, tribal, and private organizations, groups, and committees that support its development, day-to-day operations, and evolution. The governance model includes:

*NIEM Executive Steering Committee (ESC):* The ESC serves as NIEM’s decision-making body regarding membership, funding requirements, program and technical direction, personnel appointments, and other organizational decisions supporting NIEM management.

The primary sponsors of NIEM are the Department of Defense (DoD), Department of Homeland Security (DHS), Department of Justice (DOJ) and Department of Health and Human Services (HHS) who support NIEM with designated SES principles for the Executive Steering Committee (ESC).

Extended Membership on the ESC includes but is not limited to CDOs, CTOs, CIOs from the following organizations:

- Department of Homeland Security
- Department of Justice
- Department of Health and Human Services
- Veterans Affairs
- NASCIO
- Advisory stakeholders include but not limited to:
  - All the NIEM Domain Stewards
  - National Association of State Chief Information Officers
  - Office of Management and Budget

*NIEM PMO:* The NMO (previously the NIEM PMO) executes the ESC’s vision for NIEM while managing the program’s day-to-day operations, encouraging adoption and use of NIEM, and overseeing all working group and committee activities. The NMO also coordinates with COIs, principal stakeholders, and other information-sharing initiatives to promote collaboration and interest in NIEM priorities.

*NBAC:* The NBAC mission is to set the NIEM business architecture and requirements, to manage the NIEM Core, and to facilitate the processes for the regulation and support of NIEM domains.

The NBAC focuses on the following areas:

- Business Architecture—The NBAC oversees and validates the construction, maintenance, and use of the business architecture framework for NIEM.
- NIEM Core—The NBAC provides management and oversight of the NIEM Core, the central part of the NIEM data model that’s commonly understood across all domains.

- Community—The NBAC serves as the forum for the admission of new domains and interactions between domains, and coordinates action to maintain the NIEM community.

The committee's specific responsibilities are to:

- Maintain the integrity, usability, and maturity of the NIEM Core, and engage in any requisite harmonization and issue resolution activities
- Determine the need for new data model releases, as necessary, such as to accommodate new domains and content, or to provide business requirements to the NTAC
- Submit recommendations to the ESC concerning the admission of a new domain into the NIEM data model

The NBAC comprises stakeholders of diverse communities. NIEM's domains, communities established to manage and govern a portion of the NIEM data model, form the foundation of the committee. The NBAC is led by co-chairs and includes voting members, a NIEM PMO liaison, observers, and invited participants.

*NTAC*: The primary mission of the NTAC is to define and support the technical architecture that governs NIEM. In addition, the NTAC:

- Documents and maintains NIEM's technical specifications
- Provides robust, effective development of the NIEM Core structure and complementary processes supporting and enabling users to efficiently develop, use, and reuse NIEM-conformant model package description components
- Delivers and maintains a tool strategy that meets stakeholder requirements in support of information exchange across organizations

The committee's specific responsibilities are to:

- Establish and support the NIEM technical architecture
- Establish mechanisms and processes for publishing NIEM content artifacts
- Ensure that all content in the NIEM data model conforms to NIEM specifications
- Maintain communication and interaction with other NIEM program entities, such as the help desk, NBAC, and NMO
- Analyze and assess emerging technologies and how they relate to NIEM, and develop a roadmap for future capabilities
- Establish goals, milestones, and desired outcomes, and measure performance

NTAC members represent operational practitioners and subject matter experts, key stakeholder agencies, domains, and systems developers throughout the levels and branches of government, as well as solution providers. Membership types include co-chairs, voting members, NMO liaison, lead developers, and observers/invited participants.

**Figure 10** presents the NIEM governance structure.

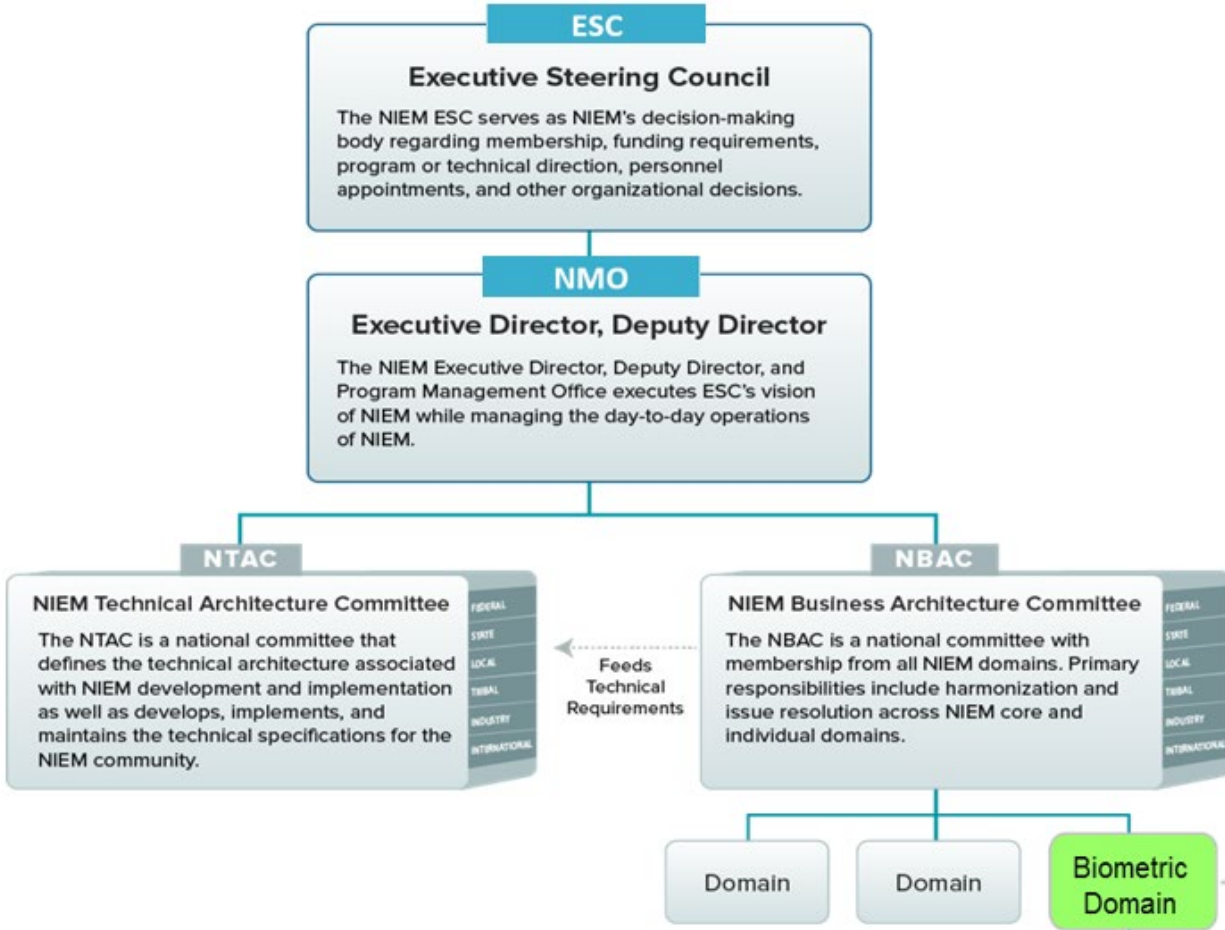


Figure 10: NIEM Governance Structure

4. NIEM Architecture Strategies

Table 1 summarizes the major goals and objectives of the NIEM implementation.

Table 1: NIEM Implementation Goals and Objectives

Goal/Objective	Desired Outcome	Measurement	Impact
<b>Standardization</b>	Enterprise-wide standards	Adopted by inter-/intra-agencies and programs	Improved efficiency
<b>Reusability</b>	Shared and reused data	Adopted as a model by other states	Reduced development time
<b>Reduced data redundancy</b>	Less data redundancy	Adopted by inter-/intra-agencies and programs	Improved data integrity and reduced errors
<b>Governance</b>	Policies and procedures	Adopted by inter-/intra-agencies and programs	Conformance to standards
<b>Conformance to NIEM framework</b>	Standardization	Adopted by inter-/intra-agencies and programs	Conformance to standards, reusable services
<b>Improved cost</b>	Streamlined services to reduce cost	Adopted by inter-/intra-agencies and programs	Low cost, reduced errors, and reusable services

#### 4.1 Improved Service Delivery for Clients

Client service delivery is improved with the updated Biometrics Domain schema, better aligning to modifications and corrections within the NIEM data model, providing for updates, and setting the stage for harmonization efforts between major stakeholders in NIEM (including updates to DOD/DOJ EBTS/DHS IXM).

As Biometrics Domain steward, OBIM enjoys important benefits with respect to client service delivery:

- Managed Data Model harmonization and the ability to rapidly update and adjust to changes in partner/stakeholder messaging protocols (IXM vs. DOD EBTS vs. DOJ EBTS)
- Direct engagement with all COI members of the Biometrics Domain (federal, state, and local organizations)
- First stop for international partners approaching NIEM for information exchange tools and best practices for identity management
- Close working relationship with all standards organizations

#### 5. NIEM Development Actions

NIEM has had a major impact in the public sector and is beginning to gain traction in other arenas, including state, local, and international entities. NIEM has the opportunity to extend its resources, platforms, communities, and technical prowess to a much broader audience, reducing barriers to information exchange and unleashing the potential of rapidly advancing technology.

Essential elements to NIEM planning and associated activities include:

- Program Maturation – Program maturation makes possible solidified policies, processes, platforms, tools, and community engagement practices, and creates the opportunity to refine, streamline, and broaden (when warranted) outreach and capabilities. As NIEM moves toward such maturity, new domains that closely reflect the real-world business and operational landscape are expected to emerge and to absorb the content of the initial domains via one or more of the domain interaction methods.
- Program Expansion and Evolution – As DHS OBIM upgrades its identity management system, IDENT, with HART, an enhanced, scalable, modular, multimodal identity management system. HART system design will provide for the expansion of interoperable services similar to those provided to FBI and DOD systems, including additional federal agency biometric systems and non-federal customers, without requiring modifications to its foundational system architecture. HART Increments 1 and 2 will support IXM 6.1 and IXM 6.2 respectively, which are backward-compatible with IXM 6.0.9. IXM 6.0.x data elements are based on NIEM attributes and is largely conformant to NIEM 2.1. IXM 6.0.9 is approximately 10-12% conformant to NIEM 4.0 and as the Agile development proceeds, it will be made as NIEM conformant as possible. Future versions of IXM should continue to be based on NIEM constructs, as applicable. The current version of IXM is 6.0.9.0.9. Below in **Table 2** is the IXM version matrix mapping IXM to ITL and NIEM alignment.

## NIEM Biometrics Domain: Standards Development Plan

IXM Version	Modality Supported							Release Date mmm-yy	Biometric Standard Compliance		XML Vocabulary			
	Identification				Not Used for Identification				ANSI-NIST ITL Versions		NIEM 2.1	NIEM 4.x	Biometric Domain 1.0	Biometric Domain 4.x
	2p	10p	Face	Iris	Mug	SMT	Palm		2011	2015				
6.0.9	x	x	x	x	x	x	x	Jan-17	x		x		x	
6.0.9.0	x	x	x	x	x	x	x	17-Sep	x		x		x	
6.0.9.1	x	x	x	x		x	x	17-Oct	x		x		x	
6.0.9.0.2	x	x	x	x		x	x	17-Nov	x		x		x	
6.0.9.0.3	x	x	x	x		x	x	18-Jan	x		x		x	
6.0.9.0.4	x	x	x	x		x	x	18-May	x		x		x	
6.0.9.0.5	x	x	x	x		x	x	18-Jun	x		x		x	
6.0.9.0.6	x	x	x	x		x	x	19-Jul	x		x		x	
6.0.9.0.7	x	x	x	x		x	x	19-Aug	x		x		x	
6.0.9.0.8	x	x	x	x		x	x	19-Oct	x		x		x	
6.0.9.0.9	x	x	x	x		x	x	19-Nov	x		x		x	
6.1 (draft)	x	x	x	x		x	x	20-Jan	x		x		x	
6.2 (plan)	x	x	x	x		x	x	TBD	x		x		x	
7 (plan)	TBD							TBD	TBD			x		x
Most Current Version														
Draft/Planned Versions														

**Table 2: IXM Version Matrix**

The NIEM vision is to evolve the program through improved integration across technologies with a more simplified user experience. Some of the priority areas include:

- Utilization of JSON in addition to XML.
- Simplification of NIEM to lower the barrier of entry for NIEM users and improve the technical resources available for implementers.
- Increasing reach of customer engagement.
- Improving brand awareness through documentation of NIEM success stories.
- Advancement of the integration with the international community including additions to NIEM Core in version 5.0.

The NIEM Data Model maturity is achieved through continuous development and refinement of IEPDs, prompting identification of new data components, refinement of existing data components, and identification of candidates for harmonization. The NBAC and NTAC provide technical assistance to guide organizations through the IEPD process and recommend strategies for partnering on similar efforts. NIEM 5.0 (and beyond) provides ample opportunity to make core and domain data models more useful. The Domain also supports tiger teams comprised of members of the community of interest to address specific issues in support of either working group or the domain at large.

### 5.1 Biometrics Domain Activities

There are a variety of activities surrounding the Biometrics Domain which include maintenance and operation of the domain, operational support, data dictionary updates, and harmonization and reconciliation. Some of the specific tasks and activities include:

- Participation in all required NIEM Activities which include the monthly NBAC meeting, NIEM Face2Face and Tiger Teams, as well as community outreach, NBAC technical review and mentorship activities
- Ongoing outreach through the NIEM Facilitator to support major releases and events
- Support of the NIEM 5.0 major release which is under development and has primary planned updates to NIEM core.
- Internal OBIM IXM Review and Alignment
- Support DoD EBTS development team with ongoing NIEM alignment analysis
- Participation in ANSI/NIST-ITL Working Group to refine ITL schema with major stakeholder requirements
- Technical assistance relating to request by Information Sharing and Services Office (IS2O)
- Monitoring of the NIEM Biometrics Facilitator account.
- Internal OBIM IXM review and alignment including IXM 6.0.9.0.9 Agile support with updates to the existing NIEM IXM/XML data dictionary spreadsheet as required, and identification of elements for possible inclusion in NIEM for 5.1, e.g. DNA attributes
- NIST Biometrics standards evolution
- Biometrics Domain support of the XML working group, with continued refinement of ANSI/NIST-ITL standards and collaboration with the ITL XML Working Group
- NBD schema enhancement
- Resolution and tracking of NIEM technical issues using issues tools provided by NMO and NIEM help desk
- Provision of a common data dictionary of elements to be included in NIEM, spanning federal, state, local, tribal, private, and international boundaries represented by the COI
- Support of domain reconciliation and cross-domain harmonization, resulting in future NIEM releases (major and minor), as needed
- Understanding and incorporation of related external data standardization initiatives, as appropriate
- Ongoing identification of data requirements based on exchange/data modeling and development efforts

## 6. Risks

The risk mitigation step involves development of mitigation plans designed to manage, eliminate, and /or reduce risk to an acceptable level.

The risk mitigation would involve following steps:

1. Development of mitigation plans designed to manage, eliminate, or reduce risk to an acceptable level.
2. Implement risk mitigation plan
3. Continually monitor and assess its efficacy
4. Review and suggest actions, to revise or change the course-of-action as needed
5. Periodically revisit the basic assumptions and premises of the risks
6. Scan the environment to see whether the situation has changed in any way that affects the nature or impact of the risk
7. Identify the new risks as project evolves

The risks and corresponding mitigations associated with Biometrics Domain development are as follows:

Risk	Mitigation
Maintaining real-time harmonization via incremental releases of biometric schema during a period within which several major stakeholders are updating internal messaging platforms	Continued participation of identity management COI ensures harmonization across systems in existence and under development.
Continuing implementation and usage of biometrics beyond the public sector shows need for engagement extending past traditional NIEM audiences for emerging data exchange scenarios	Program maturation leads to solidified policies, processes, platforms, tools, and community engagement practices, and provides the opportunity to refine, streamline, and broaden (where warranted) outreach and capabilities. As NIEM moves toward program maturity, new domains beyond the public sector are expected to emerge and to absorb the content of the initial domains via one or more of the domain interaction methods.
Identification of issues late in the project delivery lifecycle	Using an Agile development approach facilitates continuous involvement from the stakeholders, reducing the likelihood of misunderstandings. Additionally, because of frequent delivery and inspection, problems will be detected early in the project.
Legal compliance concerns	The primary sources of legal compliance risk—contracts, regulations, and litigations—can be mitigated by communicating the results to and seeking advice from the broader enterprise.
Funding issues	To secure full funding, sponsors must have confidence that the project will deliver and that the benefits of adopting NIEM are worth the investment. Sponsor input should be continually incorporated in the architecture strategy, and emphasis should be placed on upfront long-term commitments to increase the likelihood of full funding. If funding gaps appear, opportunities for fundraising from traditional and non-traditional sponsors and other sources should be explored.
Governmental changes including compliance requirements	Continual evaluation of processes and lifecycle in accordance with new policies and compliance requirements following the risk mitigation steps.

## 7. Dependencies

Maturity of the Biometrics Domain depends on the following factors:

- Sufficient access; timely and actionable information
- Adequate data to decide what information to share with whom
- Ability to obtain and share data in readily consumable formats
- Collection of complete and accurate data in support of the mission

## 8. Success Factors and Measurements

OBIM collaborates within DHS, with other federal agencies, and with the private sector and academia to conduct research, establish standards, prioritize identity services in DHS, and

advance the science of biometric identification. Homeland Security Presidential Directive 12 (HSPD-12), HSPD-5, and National Security Presidential Memorandum 7 require interoperability among all agencies and participation in ongoing biometrics development, test, and evaluation.

Performance measures are required to fulfill the responsibilities of OBIM and DHS under the Government Performance and Results Act, P.L. 103-62, and applicants who receive funding under this effort must provide data that measure the results of their work.

Performance measures for developing, testing, or evaluating enhanced biometric tools or technologies for DHS applications are as follows.

Objective	Performance Measure(s)	Data Grantee Provides
NIEM conformance	<ol style="list-style-type: none"> <li>Facilitation of NIEM adoption during successful development, maintenance, and testing of Biometrics Domain as related to IXM and the IXM schema</li> <li>Ensure that NDR specified rules and standardized schemas are developed, providing the blueprint for NIEM conformance</li> <li>Ensure that OBIM systems and applications are prepared to respond to data messaging or data interoperability standards developed for the Domain</li> <li>Ensure that NIEM is accessible and understandable to all stakeholders</li> <li>Ensure that it is transparent for all decision-making authorities</li> <li>Ensure that it operates efficiently</li> <li>Ensure that it maintains conceptual integrity</li> </ol>	<ol style="list-style-type: none"> <li>A final NIEM conformance report indicating what part of Biometrics Domain, as related to IXM and the IXM schema, is NIEM compliant</li> <li>Final report indicating number of rules specified and number of NIEM-conformant schemas developed</li> <li>Number (percentage) of applications prepared to respond to data messaging or data interoperability standards developed for the Domain</li> <li>Available and accessible to all stakeholders</li> <li>Transparent for all decision-making authorities</li> <li>Able to operate as specified</li> <li>Able to provide conceptual integrity</li> </ol>
Semantic integrity of NIEM information exchange standards	<ol style="list-style-type: none"> <li>Ensure that exchange standards are reflected in the model in a coherent and consistent manner</li> <li>Ensure that governance constructs are consistent with and documented in a complete and actionable manner</li> </ol>	<ol style="list-style-type: none"> <li>Results of data content reflect allowable values</li> <li>Invalid data entered results in error; maintain data integrity</li> </ol>
Clarity and consistency	<ol style="list-style-type: none"> <li>Make sure that information presented is reasonable, understandable, measurable, and obtainable</li> <li>Ensure consistency with basic program</li> </ol>	<ol style="list-style-type: none"> <li>Remove any ambiguity or unclear or duplicate information</li> <li>Complies with legislative and other programs defined by agency</li> </ol>
Compliance	<ol style="list-style-type: none"> <li>Ensure compliance with DHS program development rules and regulations or legislative requirements</li> </ol>	<ol style="list-style-type: none"> <li>Provide report of compliance</li> </ol>

NIEM embodies attributes and values ensuring successful operational use and relevance:



- *Accessibility*: NIEM is practitioner based. It is designed to address operational requirements for information sharing among practitioners at all levels of and across the branches of government. Practitioners are encouraged to participate in NIEM in a variety of ways. The governance and operations of the NIEM program are transparent and responsive. Additionally, NIEM must be accessible and understandable to stakeholders, given reasonable investment of time and energy. NIEM is based on well-established principles that reflect transparent decision making, effective operations, and conceptual integrity, providing a framework for broad understanding of the program.
- *Semantic Integrity*: NIEM information exchange standards are reflected in the model in a coherent and consistent manner, use the model and governance constructs in a consistent manner, and are documented in a complete and actionable manner. The result is a model that ensures semantic integrity by guaranteeing that data content reflects allowable values.
- *Low Total Cost of Ownership*: Consistent use of NIEM delivers measurable cost savings (initially and ongoing) as a consequence of a) using standardized analysis, development, and implementation methodologies; b) effectively reusing common data exchange specifications and data components; and c) leveraging the economy-of-scale savings realized by shared governance, training, technical assistance, engineering, and outreach resources.
- *Scalability*: NIEM processes, tools, and information exchange standards are scalable, and apply to information sharing with equal force regardless of the breadth or scope of information sharing contemplated and irrespective of the level, unit, or branch of government.

Assessing NIEM's operational performance, strategic value, business benefits realization, and return on investment is a fundamental activity across the NIEM program. As part of a comprehensive performance management program, key performance indicators associated with the NIEM program will be thoughtfully developed, consistently monitored, and regularly reported to ensure effective outcomes, efficient operations, and appropriate value for the investment.

Example performance measures include:

- Number of federal agency signatories to the NIEM Memorandum of Understanding
- Number of relevant domains, COIs, and stakeholders actively engaged in developing, using, and/or reusing NIEM-conformant information exchange package documentation and universal and common core components
- Measures of community awareness, engagement, support, adoption, and use of the NIEM program, including surveys demonstrating NIEM awareness, understanding, and support
- Metrics associated with NIEM website page views, including characteristics of website use (e.g., number of page views, duration of visit, navigation during visit, documents and models downloaded)
- Number of NIEM training programs conducted, number of persons trained, and assessments of the quality and operational relevance of the training provided
- Metrics associated with instances of technical assistance provided, help desk calls resolved, NIEM-related conference presentations made, and assessments of the quality of assistance and presentations

- Number of NIEM universal and common core components registered, and measures associated with the stability of these components
- Number of components harmonized
- Number of NIEM-conformant IEPDs registered
- Number of domain components registered
- The nature, volume, and business value associated with reuse of NIEM universal and common core components and IEPDs
- The extent of use and implementation of NIEM universal and common core components and NIEM-conformant IEPDs among key domains (i.e., those addressing strategic national priorities)
- Cost savings achieved by using NIEM universal and common core components and NIEM-conformant IEPDs among users/participants at all levels of government
- Improvement in the number, timeliness, and effectiveness of exchanges operationally achieved using NIEM universal and common core components and NIEM-conformant IEPDs
- The number of information systems actively sharing information using NIEM universal and common core components and NIEM-conformant IEPDs, leading to improved quality of decision making

## 9. List of Acronyms

COTS	Commercial off-the shelf
DOD	Department of Defense
DHS	Department of Homeland Security
DOJ	Department of Justice
EBTS	Electronic Biometric Transmission Specification
FBI	Federal Bureau of Investigation
GJXDM	Global Justice XML Data Model
HART	Homeland Advanced Recognition Technology
IDENT	Automated Biometric Identification System
ITL	Information Technology Laboratory
IXM	IDENT Exchange Messages
JSON	JavaScript Object Notation
MDA	Model Driven Architecture
NBAC	NIEM Business Architecture Committee
NBD	NIEM Biometrics Domain
NBDEC	NIEM Biometrics Domain Executive Committee
NIEM	National Information Exchange Model
NGI	Next Generation Identification
NIST	National Institute of Standards and Technology
NMO	NIEM Management Office
NTAC	NIEM Technical Architecture Committee
REST	Representational State Transfer
SOAP	Simple Object Access Protocol

QA	Quality Assurance
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## 10. Additional References

- NIEM normative and non-normative documents - <https://reference.niem.gov/niem>
- Object Management Group (OMG) UML Profile for NIEM - <https://www.omg.org/spec/NIEM-UML/3.0/PDF>
- NIEM Concepts of Operations - <https://reference.niem.gov/niem/guidance/concept-of-operations/0.5/>
- BSI Pocket Guide to Standards Development <https://www.bsigroup.com/Documents/about-bsi/NSB/BSI-pocket-guide-to-standards-development-UK-EN.pdf>

## 11. Glossary

Concept	Definition
Community of Interest (COI)	Collectives of people composed of practitioners and technical representatives (government and private sector) who, by virtue of their organizational affiliation, day-to-day operational responsibilities, or provision of services and programs, have a stake in NIEM information exchanges and who authoritatively represent their respective domains.
Data Dictionary	A set of metadata that contains definitions and representations of data elements.
Data Element	A basic unit of data having definition, identification, representation, and values; the lowest level of physical representation of data.
Data Harmonization	The process of comparing two or more data component definitions and identifying commonality among them that warrants their being combined, or harmonized, into a single data component.
Data Model	A graphical or lexical representation of data, specifying their properties, structure, and interrelationships.
Data Standards	The structure for representing data in machine-readable format, often used to facilitate information exchange through common understanding and recognition of the data elements used.
Domain	Business enterprise broadly reflecting the COIs, agencies, units of government, operational functions, services, and information systems which are organized or affiliated to meet common objectives.
Global JXDM (GJXDM)	A data model and dictionary sponsored by the U.S. Department of Justice and governed by the Global Justice Information Sharing Initiative. The GJXDM and its related processes are the basis on which NIEM was built, in partnership with the U.S. Department of Homeland Security.

## NIEM Biometrics Domain: Standards Development Plan

Governance	Establishment of policies, and continuous monitoring of their proper implementation, by the members of the governing body of an organization.
Information Exchange	The transfer of information from one organization to another, specifically in concert with NIEM IEPD exchange processes and recommended procedures.
Information Exchange Package (IEP)	An actual exchange instance; usually an XML instance; the real data and metadata transmitted using a data transmission network.
Information Exchange Package Documentation (IEPD)	A collection of artifacts that define and describe the structure and content of an IEP.
Interoperability	The ultimate goal of any information sharing exercise that refers to the seamless interconnection between disparate systems for the purposes of sharing information relevant to either party. Interoperability is both a prerequisite for and a result of efficient information sharing.
NBAC	The NBAC oversees and validates the construction, maintenance, and use of the business architecture framework for NIEM.
NIEM Core	The core refers to the NIEM data model, composed of the universal and common namespaces, containing all data components that are determined to be relevant and semantically agreed upon by some or all participating domains. NIEM core could be said to contain all reusable data components that are not domain-specific and are governed by NIEM processes and policies regarding promotion and maintenance of those data components.
NIEM Schema	The NIEM reference schemas are a set of interrelated schemas that define NIEM data components. Each schema defines its own target namespace. In general, domain reference schemas import schemas from the Core. The NIEM reference schema set represents the full set of data components in NIEM.
NTAC	NTAC defines and governs the technical specifications, technical and structural architecture associated with NIEM development and implementation.
SOA	Service-Oriented Architecture is an architectural approach in which applications make use of services available in the network. In this architecture, services are provided to form applications, through a communication call over the internet.
UML	Unified Modeling Language is a general-purpose modelling language. The main aim of UML is to define a standard way to visualize the way a system has been designed. It is quite similar to blueprints used in other fields of engineering.