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NIEM CONCEPT OF OPERATIONS

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1 INTRODUCTION

NIEM, the National Information Exchange Model, represents a collaborative partnership of agencies and organizations across all levels of government (federal, state, tribal, and local) and with private industry. The purpose of this partnership is to effectively and efficiently share critical information at key decision points throughout the whole of the justice, public safety, emergency and disaster management, intelligence, and homeland security enterprise.¹ NIEM is designed to develop, disseminate, and support enterprise-wide information exchange standards and processes that will enable jurisdictions to automate information sharing during emergencies as well as to become a natural part of the daily operations of agencies throughout the nation.

NIEM is not a software program, database, network, or computer system. NIEM is designed to facilitate the creation of automated enterprise-wide information exchanges which can be uniformly developed, centrally maintained, quickly identified and discovered, and efficiently reused. The result is more efficient and expansive information sharing between agencies and jurisdictions; more cost-effective development and deployment of information systems; improved operations; better-quality decision making as a result of more timely, accurate, and complete information; and, as a consequence, enhanced public safety and homeland security.

1.1 NIEM: Supporting Enterprise-Wide Information Sharing

NIEM does not attempt to normalize data components across all information systems. Instead, NIEM focuses only on those data components that cross organizational boundaries and only that subset of data needed for inter- and intra-agency information exchange. NIEM is predicated on identifying operational information exchanges between participating agencies and the communities of interest (COIs) and domains they represent. This is accomplished by examining current practice (i.e., by documenting business requirements for information exchange between agencies and the various domains they represent) and by modeling new and innovative information

¹ As described in detail later in this document, NIEM was initially created pursuant to a memorandum of understanding (MOU) signed in April 2005 by the Chief Information Officers of the U.S. Departments of Justice and Homeland Security. Although DOJ and DHS were the original signatories of the MOU creating NIEM, the expectation is that other agencies and domains (such as the Office of the Director of National Intelligence (ODNI), Department of Defense (DOD), and potentially others) may also actively invest and participate in NIEM as full partners.

exchange opportunities to achieve greater efficiency, effectiveness, return on investment (ROI), and new operational capabilities.

In an emergency situation, such as a building collapse, local first responders, fire departments, emergency medical services, disaster management teams, law enforcement, health officials, and other city, county, state, and perhaps federal agencies need to securely share critical information in real time, whether the situation is the result of a terrorist attack, a natural disaster, a large-scale criminal incident, or simply a catastrophic structural failure. Recognizing that the information exchange requirements of agencies involved in these and similar situations are comparable in countless jurisdictions across the nation (also, perhaps, in jurisdictions beyond our national borders), NIEM can facilitate the uniform and rapid development and deployment of information sharing standards to expedite these critical and ubiquitous information exchanges.

NIEM is designed to facilitate information sharing among different agencies and the domains and COIs they represent.² NIEM standards will enable different information systems to exchange information irrespective of the technology being used. Moreover, creating and adopting NIEM standards means that federal, state, local, and tribal agencies and organizations avoid the problem of building inefficient point-to-point interfaces with a myriad of other agencies or entirely rebuilding or rewriting their systems to share information. Instead, NIEM allows each agency to focus on building standards that facilitate the discrete exchanges that commonly occur among different information systems. Consequently, the investments governments have already made in existing information systems can be leveraged so that these systems can efficiently participate in a truly national information sharing environment.

NIEM will provide the information sharing framework to enable first responders and operational decision makers to have accurate information to prepare for, prevent, and respond to major terrorist events and natural disasters. NIEM also enhances the day-to-day operational capabilities of practitioners at all levels of government in making crucial decisions about border enforcement, passenger screening, port security, intelligence analysis, local law enforcement operations, judicial processing, correctional supervision and release, and a variety of other governmental functions. Information exchange standards developed using NIEM will facilitate seamless sharing in both horizontal venues (i.e., among agencies and organizations at the same level of

² Domains and COIs are described in detail later in this document.

government) and vertical venues (i.e., among local, regional, state, tribal, and federal governments).

1.2 Key NIEM Attributes

NIEM embodies a number of attributes and values to ensure 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 and across all branches of government. As a consequence, 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, the understanding of which provides a framework for broad understanding of the program.
- **Semantic Integrity**—NIEM information exchange standards a) are reflected in the model in a coherent and consistent manner, b) use the model and governance constructs in a consistent manner, and c) 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 results in measurable cost savings (both initially and ongoing) as a consequence of a) utilizing 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. They 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.

1.3 NIEM Program Management Office

The NIEM Program Management Office (PMO) operates to:

- Bring stakeholders, agencies, and the domains and COIs that they represent together to identify information sharing requirements in daily operational and emergency situations;
- Develop information sharing standards, a common lexicon, and an online repository of information exchange package documentation and data components that support information sharing;
- Provide technical tools, processes, and methodologies to support the analysis, development, discovery, dissemination, and reuse of exchange standards and documents; and
- Provide training, technical assistance, communication, outreach, and implementation support services for NIEM-based information sharing.

1.4 NIEM Performance Measures

Assessing NIEM's operational performance, strategic value, business benefits realization, and return on investment is a fundamental activity that permeates the whole of the NIEM program. Key performance indicators (KPIs) associated with the NIEM program will be thoughtfully developed, consistently monitored, and regularly reported to ensure effective outcome, efficient operations, and appropriate value for money as part of a comprehensive performance-management program.

Example performance measures will include:

- Number of federal agency signatories to the NIEM MOU;
- Number of relevant domains, COIs, and stakeholders actively engaged in developing, using, and/or reusing NIEM-conformant information exchange package documentation (IEPDs) and *universal* and *common* core components;
- Measures of community awareness, engagement, support, adoption, and use of the NIEM program, including surveys demonstrating awareness, understanding, and support of NIEM;
- Metrics associated with NIEM Web site page views, including characteristics of those accessing the Web site (e.g., number of page views, duration of visit, navigation during visit, documents and models downloaded);

- Number of NIEM training programs conducted, persons trained, and assessments of the quality and operational relevance of the training provided;
- Metrics associated with technical assistance provided, help-desk calls addressed, conference presentations made regarding NIEM, and assessments of the quality of assistance and presentations;
- Assessments of the 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;
- Measures of the nature, volume, and business value associated with reuse of NIEM *universal* and *common* core components and IEPDs;
- Number of domain components registered;
- Measures of 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);
- Measures of cost savings achieved by using NIEM *universal* and *common* core components and NIEM-conformant IEPDs among users/participants at all levels of government;
- Measures of improvement in the number, timeliness, and effectiveness of exchanges operationally achieved using NIEM *universal* and *common* core components and NIEM-conformant IEPDs; and
- Measures of improvement associated with the quality of decision making based on the number of information systems actively sharing information using NIEM *universal* and *common* core components and NIEM-conformant IEPDS.

1.5 Organization of the NIEM Concept of Operations

This *Concept of Operations (ConOps)* provides a high-level conceptual view of NIEM and its operation. The *ConOps* is designed to address the three pillars of NIEM: governance, architecture, and processes (*Figure 1: Three Pillars of NIEM*³).

³ Graphic modified from Data Reference Model Management Strategy, August 2006.

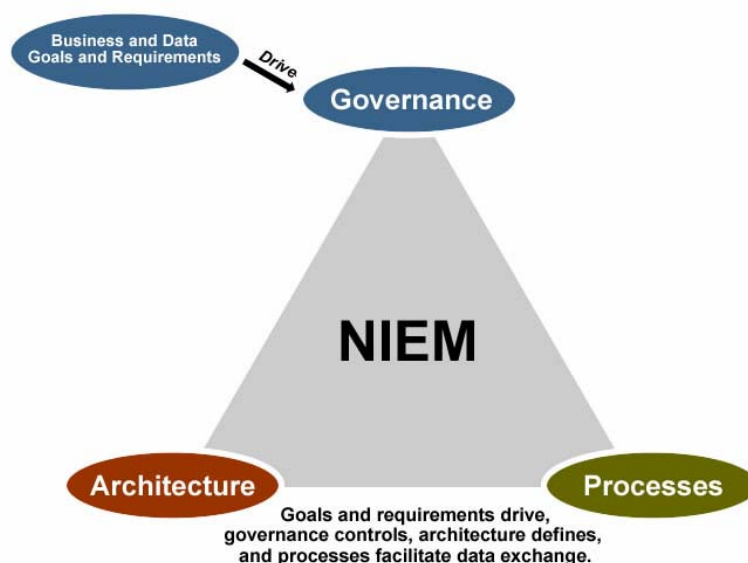


Figure 1: Three Pillars of NIEM

Governance refers to the decision-making structure and authority to support initial development, continuing operation, and future evolution of NIEM. **Architecture** refers to the technical structure and content of NIEM. **Processes** describe the technical and operational procedures and methodologies for interacting with NIEM and for discovering, developing, and reusing NIEM data components, such as IEPDs. They also provide a description of relevant NIEM life cycles.

NIEM is stakeholder-driven. As new business goals, priorities, and requirements are identified, they are captured and tracked through the NIEM governance structure and reflected in the NIEM architecture and processes.

This version of the *ConOps* represents concepts and capabilities in place to support the current NIEM release. All existing tools and documentation are available on the NIEM Web site at www.NIEM.gov.

1.6 NIEM Reading Road Map

As shown in *Figure 2: Reading Road Map*, the *ConOps* is the second in a series of four documents which are recommended for understanding and implementing the core capabilities of NIEM. The first in the series, *Introduction to NIEM*, is designed to provide a general description of and background on NIEM, the need for and value of NIEM as an enabler of information sharing, and the near-term goals of NIEM. It is strongly recommended that readers begin with the *Introduction to NIEM* before proceeding with

this document. The third document, the *User Guide*, provides detailed user instructions, a more comprehensive discussion of technical architecture, standards, development life cycle, and outreach and support mechanisms. It is targeted towards users and technical developers. The fourth in the series of documents, the *NIEM Naming and Design Rules (NDR)*, provides the technical principles and rules for NIEM XML conformance. Its primary audiences are the practitioners and developers who employ NIEM for information exchange and interoperability.

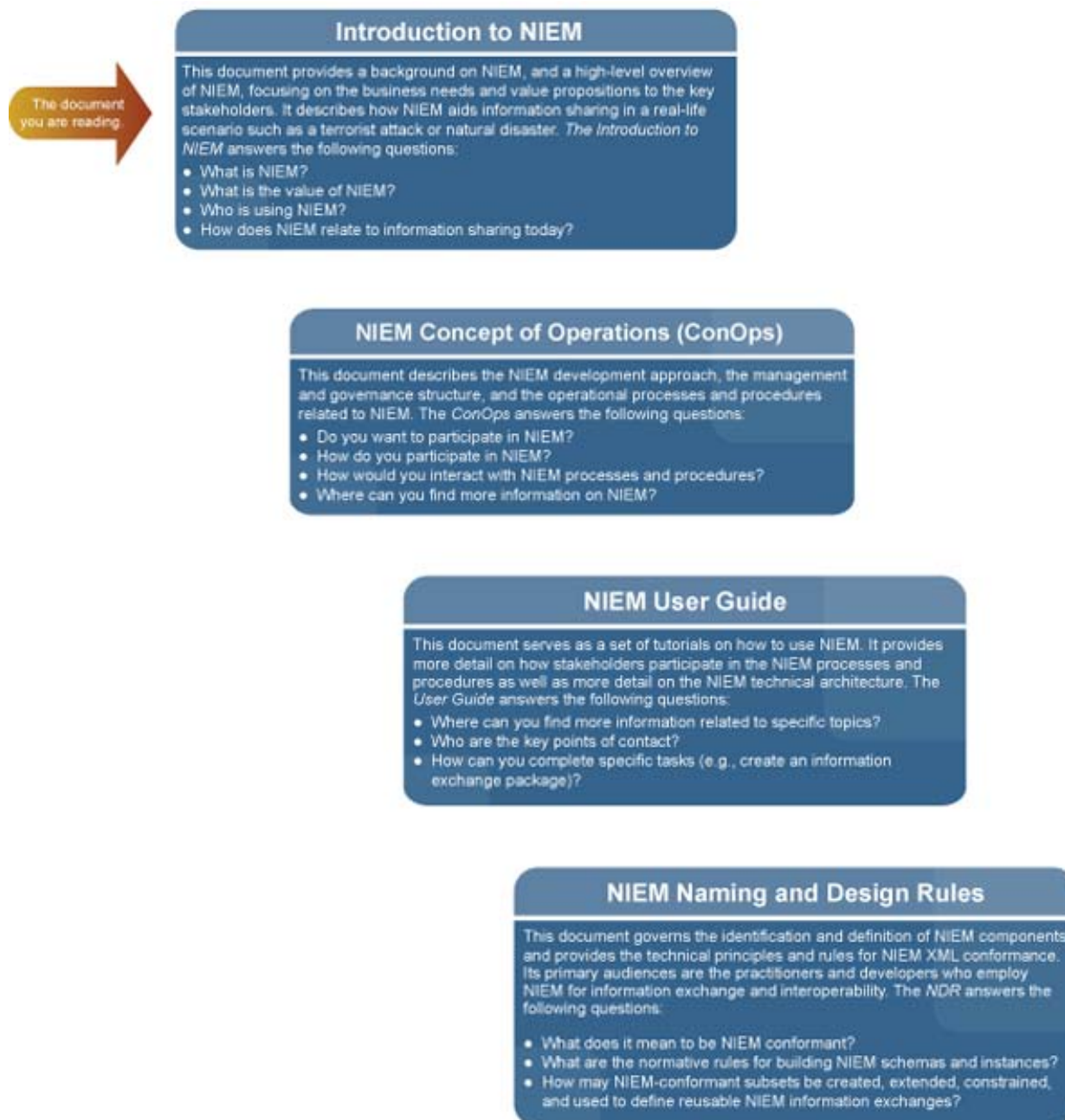


Figure 2: Reading Road Map

The *ConOps* is organized into the following sections:

Section 1 provides a brief introduction to NIEM and its purpose and describes the purpose of the *ConOps* and its relation to the *Introduction to NIEM* and *NIEM User Guide*.

Section 2 provides an overview of the NIEM governance structure and interactions between the governance entities.

Section 3 describes the key architectural concepts underlying NIEM, including the NIEM data model and namespaces.

Section 4 provides an overview of NIEM technical standards, including the *NIEM Naming and Design Rules* (NDR).

Section 5 describes the operational processes behind NIEM, including domain management, IEPD development, and data model maturity life cycle processes. It also describes support processes, such as configuration management, quality assurance, issue resolution, and conflict escalation.

Section 6 identifies the tools and training available to stakeholders.

Appendix A provides a high-level definition of technical concepts further elaborated in the *NIEM NDR* and *NIEM User Guide*.

Appendix B provides sample use-case scenarios.

Appendix C provides a list of terms and definitions.

Appendix D provides a list of acronyms.

2 NIEM ORGANIZATION AND GOVERNANCE

NIEM represents a working and collaborative partnership directed by key governmental agencies and supported by operational practitioners, technologists, systems developers, private sector solution providers, and stakeholders in federal, state, local, and tribal governments. The strategic information sharing landscape of NIEM is the justice, public safety, emergency services, disaster management, intelligence, and homeland security enterprises. Governance of NIEM is designed to be flexible enough to deal with new challenges as improved, cross-domain information sharing matures to address requirements of agencies and the domains and COIs they represent in response to evolving operational requirements and legislative and policy priorities. NIEM governance will remain agile in order to respond to the emerging needs of an ever-expanding community of users through a program under national scope and federal sponsorship of the NIEM program, while actively engaging federal, state, local, and tribal agencies, organizations, and practitioners.

Effective governance requires executive support and investment in the program, senior policy guidance, strategic partner engagement, operational support and direction, and technical development and implementation, as well as broad communication, outreach, and support activities. The initial governance structure of NIEM, as shown in *Figure 3: NIEM Governance Structure*, reflects these broad and diverse responsibilities and supporting committees.

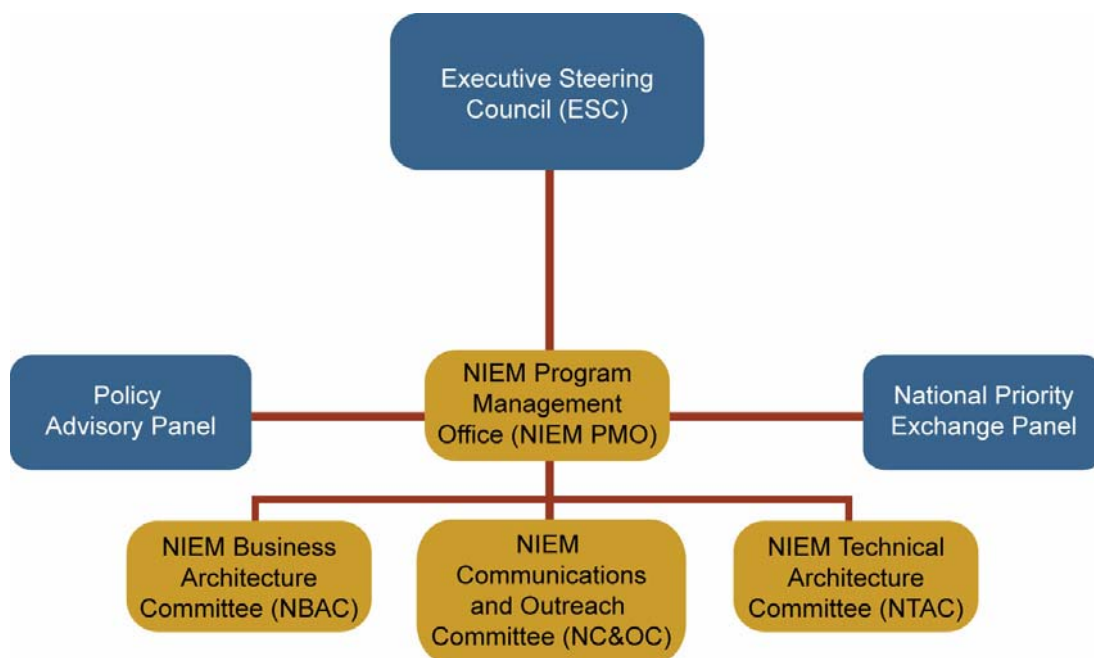


Figure 3: NIEM Governance Structure

2.1 Roles, Responsibilities, Membership, and Performance

The **Executive Steering Council (ESC)** is designed to provide executive leadership, vision, direction, and fundamental support for the NIEM program. The ESC sets policy and strategy, secures funding, appoints key personnel to the NIEM PMO, approves the *NIEM ConOps*, and makes other decisions as required. The ESC advocates for NIEM at senior levels of government and among key constituencies.

Membership of the ESC is composed of federal agency signatories of a memorandum of understanding (MOU) for NIEM users who have officially agreed to participate in and support NIEM through a) active engagement, operational implementation, and enforcement of NIEM standards in a comprehensive manner consistent with the goals of supporting information sharing among government and private sector organizations, b) financial investment sufficient to cover the costs of core activities as established by the NIEM PMO and approved by the ESC, and c) personal contributions associated with bringing together required stakeholders and decision makers, providing expertise and making timely decisions, and participating in governance structures and decisions made by the NIEM PMO, associated committees, and panels. Organizations formally organized under the Federal Advisory Committee Act (FACA)⁴ and affiliated with the federal agency MOU signatories may also execute the NIEM MOU and serve as full participating members of the ESC.

The ESC is presently organized with representatives of the U.S. Department of Justice (DOJ), U.S. Department of Homeland Security (DHS), and the Global Justice Information Sharing Initiative (Global) ESC. Other relevant federal agencies will be actively solicited to join NIEM and execute the NIEM MOU, and each engaged agency will thereafter be invited to appoint a representative for membership in the ESC.

The **NIEM Program Management Office (NIEM PMO)** is the operational arm for NIEM. Led by an Executive Director, who is appointed by the ESC, the NIEM PMO is responsible for execution of the vision defined by the ESC, strategic planning to support the program, and day-to-day management and operations. In addition to the Executive Director, the NIEM PMO includes a Business and Outreach Director, a Technical Director, and support staff and contractors.

The NIEM PMO is responsible for developing programs and managing committee activities to facilitate evangelization of NIEM with appropriate local, state, tribal, federal, and national partner agencies and programs through business-driven COIs and

⁴ Federal Advisory Committee Act, Pub. L. 92-463, Sec. 1, Oct. 6, 1972, 86 Stat. 770.

for supporting the ESC in securing partners, agencies, and the domains and COIs they represent. The NIEM PMO will secure funding and other resources to facilitate successful development and implementation of NIEM information exchange standards; manage and monitor contractors supporting the NIEM program; ensure alignment between NIEM and other information sharing initiatives at federal and national levels; and establish and implement a comprehensive program of development, technical support, training, outreach, and performance management to ensure effective and efficient implementation and appropriate ROI.

Key performance indicators will address the number of agencies and the domains and COIs they represent who are actively engaged in NIEM; the growth and evolution of NIEM core data components and NIEM-conformant IEPDs; the scope and scale of NIEM implementation among local, state, tribal, and federal agencies and national programs; the nature, volume, and business value of data component reuse among stakeholder participants; and objective measures of user satisfaction and engagement.

The **Policy Advisory Panel** is designed to identify policy issues of concern to the NIEM community, analyze them, resolve them when appropriate, provide policy recommendations, and address emerging policy issues associated with NIEM planning, operations, and implementation.

The Chair of the NIEM Policy Advisory Panel will be appointed by and serve at the pleasure of the NIEM program Executive Director. The panel will be appointed by and serve at the pleasure of the Policy Panel Chair in consultation with the NIEM program Executive Director. Consideration will be given to expanding the panel to ensure that new domains that are signatories to an MOU are properly represented. Panel members will represent organizations that are signatories to NIEM MOUs. Provision will be made for appropriate representation of local, state, tribal, and federal interests. Panel members will serve as liaison to the NIEM Business Architecture Committee (NBAC), NIEM Technical Architecture Committee (NTAC), National Priority Exchange Panel (NPEP), and NIEM Communications and Outreach Committee (NC&OC).

The panel develops recommendations for NIEM program target outcomes and the related spending plan for approval by the ESC through the NEIM PMO. The panel also makes recommendations for approval through the NIEM PMO by the ESC regarding the requirements for funding and potential sources.

The **National Priority Exchange Panel (NPEP)** is designed to facilitate and expedite the development of national priority information exchanges. As part of the ongoing NIEM strategic planning process, the NPEP is empowered by the ESC to advise the ESC in

formulating guidance for the NIEM PMO. The NPEP membership shall include and involve representation from all levels of government and may, at the discretion of the ESC, include private industry and international representation.

The NPEP is specifically charged with identifying national priority information exchanges based on legislative, policy, and operational priorities and strategic direction provided by the ESC and the NIEM PMO. NPEP will establish factors to be weighed in determining the designation of national priority information exchanges, addressing a) federal information exchanges (i.e., those primarily involving federal agencies, such as DOJ, DHS, and the Office of the Director of National Intelligence [ODNI]), b) national information exchanges (i.e., those involving agencies at all levels of government and perhaps private industry, which may also involve exchanges with critical national programs such as National Data Exchange (N-DEx), Nlets—The International Justice and Public Safety Information Sharing Network, and intelligence fusion centers), c) high-volume, high-business value, and ubiquitous information exchanges that are common among justice, public safety, emergency services, intelligence, and homeland security agencies at all levels of government (e.g., local law enforcement exchanges of arrest information with prosecutors to support charging decisions, or court-sentencing decisions that are exchanged with criminal history record repositories and correctional institutions, and other exchanges that research has demonstrated are common in jurisdictions around the nation), and d) international information exchanges that are critical to transnational investigations of terrorism, organized crime, and human and drug trafficking.

NPEP will rely on a variety of factors in designating specific exchanges as national priority information exchanges, including legislative mandates, evolving policy requirements, and strategic, operational, and tactical prioritization among participating entities. National priority information exchanges presently identified include a) incident reporting, b) people screening, c) suspicious activity reporting, d) cargo screening, e) emergency and disaster management, and f) case management.

The NPEP will engage authoritative representatives of agencies that participate in national priority information exchanges to ensure active engagement and achievement of strategic priorities. It is anticipated that national priority information exchanges will evolve over time, as will membership of the panel. The NPEP will address new and emerging policy, legislative, and operational priorities as others are achieved and successfully implemented.

Key performance indicators will focus on satisfactory development and implementation of national priority information exchanges utilizing NIEM reusable data components;

effective expansion and extension of NIEM *universal* and *common* core components (where necessary); development of effective and reusable methodologies to support analysis, development, and implementation of priority exchanges; and ongoing support to identify, develop, and implement new and emerging national priority information exchanges.

The **NIEM Business Architecture Committee (NBAC)** is designed to guide the development, harmonization, evolution, and implementation of NIEM core data components and operating processes from a business architecture perspective. The committee is led by a chairperson and vice chairperson who coordinate their work with the NIEM Business and Outreach Director; it is supported by staff resources provided by the NIEM PMO Sponsoring Agency. Committee members are appointed by the NIEM PMO, in consultation with the ESC, key stakeholders, and representatives of engaged COIs. They represent operational practitioners and subject-matter experts (SMEs), key stakeholder agencies and the domains and COIs they represent, and systems developers across levels and branches of government, as well as solution providers.

The NBAC is responsible for advising and supporting the NIEM PMO on operational and business issues associated with a) building NIEM *universal* and *common* core data components, b) managing, harmonizing, and reusing NIEM *universal* and *common* core data components across NIEM domains, c) developing and implementing processes to ensure that NIEM meets the diverse and evolving business needs of relevant agencies and the domains and COIs they represent, and d) expanding the scope of NIEM to incorporate additional agencies and the domains and COIs they represent to reflect the evolution and expansion of NIEM.

Key performance indicators will focus on the number of NIEM *universal* and *common* core data components registered; the number of NIEM-conformant IEPDs developed and implemented; the number of agencies and the domains and COIs they represent who are actively engaged and contributing or using NIEM data components; metrics assessing the level and value of development, use, and reuse of NIEM data components and IEPDs; and periodic objective program participant satisfaction surveys.

The **NIEM Communications and Outreach Committee (NC&OC)** is designed to ensure that information regarding NIEM is consistently and effectively presented to key decision makers, agency executives, legislative and elected officials, investors, practitioners, agency representatives, and relevant COIs that include local, state, tribal, and federal entities, as well as the general public. A program of regular and structured communications and outreach is required in order to maintain enthusiasm among

participants, leverage momentum that is created during research and development, and ensure consistent and articulate messaging regarding the goals, benefits, and operations of NIEM.

Open and free-flowing communication with key stakeholders and COIs is an important element of the communication and outreach strategy for NIEM. Communication is decidedly bidirectional: the NC&OC is responsible not only for pushing information but also for serving as a central point of contact for users, developers, and those interested in learning more about NIEM. The NC&OC will enable active participation and advise the ESC and NIEM PMO on strategies for engaging new participation.

In addition to managing communication regarding NIEM, the NC&OC is responsible for a comprehensive program of training, technical assistance, and help-desk functions to support active engagement by a broad array of users and practitioners. Training activities include development of formal training seminars, utilization of online training resources, development of training curricula and materials, and recruitment and management of a cadre of training service providers. Technical assistance and National Information Sharing Standards (NISS) help-desk functions will be managed by the NC&OC. Help-desk, training, and technological-assistance operations will focus on providing technical and operational support for stakeholders, practitioners, and developers to ensure their effective use and adoption of NIEM information sharing standards, as well as capturing and eliciting feedback to ensure ongoing operational relevance and effective implementation and support.

Sharing information regarding NIEM; monitoring and communicating performance measures that assess the business value, effectiveness, and efficiency of NIEM; and building mechanisms that give a broad array of diverse users an active and persuasive voice in communicating their needs and concerns regarding the direction of the NIEM program to the ESC and NIEM PMO are fundamental elements of the NC&OC. In addition, NC&OC is responsible for regularly assessing the needs of current and potential stakeholders, identifying appropriate communication channels and mechanisms, and delivering audience-specific messaging tailored to the strategic directions established by the ESC and the NIEM PMO.

The committee is led by a chairperson, advised by the NIEM Business and Outreach Director, and supported by NIEM PMO staff and contractors. The NC&OC directly supports the NIEM PMO. Committee members are appointed by the NIEM PMO (in consultation with the ESC) and represent operational practitioners and SMEs, key stakeholder agencies and the domains and COIs they represent, and systems developers

across levels and branches of government, as well as private-industry solution providers.

Key performance indicators for the NC&OC will focus on the number, nature, and scope of communications initiatives undertaken with key stakeholders and COIs (e.g., the number of press releases, Web site announcements, Web site visits, published brochures, conference presentations, and online stakeholder briefings). The number of training courses or workshops hosted, trainers trained, technical-assistance requests addressed, help-desk calls fielded, and periodic objective user-satisfaction surveys will be included in these key performance indicators.

The **NIEM Technical Architecture Committee (NTAC)** is designed to address technical and structural details associated with NIEM development and implementation. This committee is led by a chairperson. It is staffed by the NIEM Technical Architecture Director and supporting staff. Committee members are appointed by the NIEM PMO (in consultation with the ESC) and include the Policy Advisory Panel, key stakeholders, and representatives of engaged COIs. They represent technical SMEs engaged in key stakeholder agencies and the domains and COIs they represent, systems developers across levels and branches of government, and solution providers. In addition, NTAC may include representation from other key information exchange standards-setting bodies and technical working groups to ensure interoperability and coordinated development.

NTAC is structured to coordinate closely with the NBAC and to provide the technical support, tools, and methodologies to implement the business-driven exchanges that NBAC proposes. In addition, NTAC will operate to ensure robust and effective development of the NIEM *universal* and *common* core structure, technical architecture, and processes to support NIEM and enable users to efficiently develop, use, and reuse NIEM data components and NIEM-conformant IEPDs. In addition, NTAC will coordinate with contractors and advise the NIEM PMO in the development and enhancement of tools that will facilitate broad-based use and implementation of NIEM. NTAC will also reconcile data security, privacy, and sensitivity issues through technical solutions that enable data sharing among key agencies, the domains and COIs they represent, and other stakeholders.

Key performance indicators will be focused through the operations of the NIEM Configuration Control Board (CCB). Measures such as the number of issues closed, how the committee sets and clears its technical agenda (e.g., versioning, lineage, and tools strategy), and how effectively measures indicate effective reuse of the *universal* and *common* core components will reflect a healthy and effective NTAC.

2.2 Key Governance Principles

Several key principles reflect the strategic role that governance plays in the NIEM program. The governance structure outlined above, and the processes embedded throughout this *ConOps*, are designed to provide an effective voice in virtually all aspects of NIEM for engaged agencies, the domains and COIs they represent, and other stakeholders. In addition, transparency of operations and decision making are fundamental elements designed to ensure effective operations and accountability.

Governance is structured around MOU signatories in recognition that these organizations are making profound participation, conformance, and resource investments in support of NIEM. Governance is designed to be lightweight (i.e., not burdened by unnecessary bureaucracy), graduated (i.e., incorporating only that level of governance necessary to provide sufficient support, direction, and guidance), evolutionary (to meet evolving needs of the expanding user community), and inclusive (to provide mechanisms to reach the broadest level of participants). These principles are reflected throughout the NIEM processes. The appropriate level of governance is applied so as to not burden stakeholders but to ensure that NIEM operates as efficiently as possible.

3 NIEM MODEL AND NAMESPACES

A broad overview of the NIEM program, underlying concepts, and supporting processes is provided in the document *An Introduction to the National Information Exchange Program (NIEM)*.⁵ Among other elements of the NIEM program is the NIEM data model, which provides the reference vocabulary for consistent and reusable intra- and interdomain information exchanges. The structure and meaning of NIEM data are defined by the model and dictionary and are represented as Extensible Markup Language (XML) Schema, thereby providing a common framework for information exchange. As part of the NIEM 1.0 release, the model is also represented in the form of a spreadsheet and a database.⁶

The model is independent of any particular technology. In the future, it could be depicted in any number of representations (e.g., Resource Definition Framework (RDF) or Web Ontology Language (OWL)), in order to stay abreast of technological developments and continue to aid in the production of semantically consistent, interoperable information sharing. It is anticipated that future versions of NIEM will migrate to new and evolving forms as technology advances.

It should be noted that NIEM relates to and supports the Federal Enterprise Architecture (FEA) Business Reference Model (BRM) and Data Reference Model (DRM). The BRM drives the business requirement-based taxonomy and domain identification; NIEM, which focuses on message content, is an implementation of the DRM information sharing layer.⁷

NIEM provides reusable data components and access to previously defined IEPDs for reuse by practitioners; information exchanges can use NIEM in constructing new IEPDs to address business requirements. In constructing IEPDs, users can constrain, extend, and augment data components as necessary. As illustrated in *Figure 4: Relation of NIEM Model and IEPD to a Data Exchange*, IEPD development results in XML exchange schemas and XML instance documents that define the information content (payload) of data exchanges. Specific exchanges may contain metadata regarding security policies associated with the exchange (e.g., classifications such as SECRET or Secret But Unclassified—SBU), but it remains the responsibility of the applications, networks, and

⁵ See NIEM PMO, *An Introduction to the National Information Exchange Program (NIEM)*, (Washington, DC: U. S. Department of Justice, November 2006).

⁶ The current version of NIEM and supporting spreadsheet, database, and other relevant documents can be accessed at: <http://www.niem.gov/library.php>

⁷ More information on the FEA can be found at <http://www.whitehouse.gov/omb/egov/a-1-fea.html>

information systems that actually transact the exchanges to implement security services, transport, etc. IEPDs are themselves reusable, modifiable, and extendable.

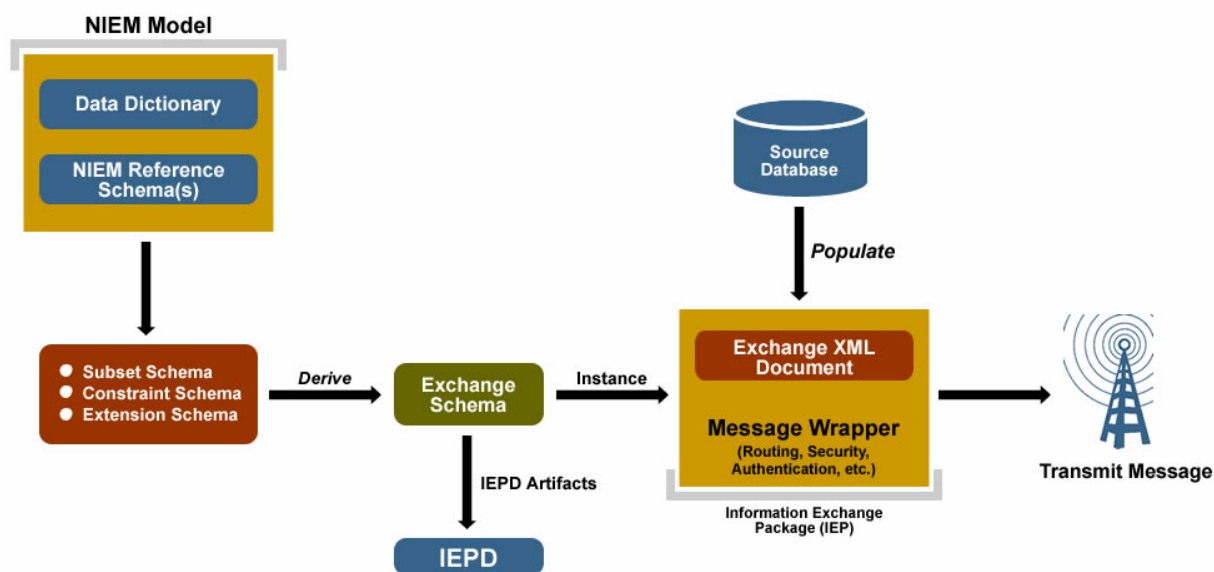


Figure 4: Relation of NIEM Model and IEPD to a Data Exchange

Exchanges using NIEM may occur between agencies and the domains and COIs they represent entirely within a specific NIEM domain, or entirely external to NIEM-managed domains. Search and discovery of IEPDs and data components is facilitated by taxonomies that correlate IEPDs to lines of business (LoB), business functions, and business processes which are organized into NIEM domains.

The NIEM architecture consists of a NIEM *core* (containing *universal* and *common* data components) and individual NIEM *domains*, which contain domain-specific data components. As illustrated in *Figure 5: NIEM Core and Domains*, the domains of Emergency Management, Justice, Infrastructure Protection, Intelligence, International Trade, and Immigration are currently participating in NIEM. Additional domains will be added as policy evolves and operational requirements emerge. Section 5.1 describes in more detail how domains and representative COIs can be added to NIEM.

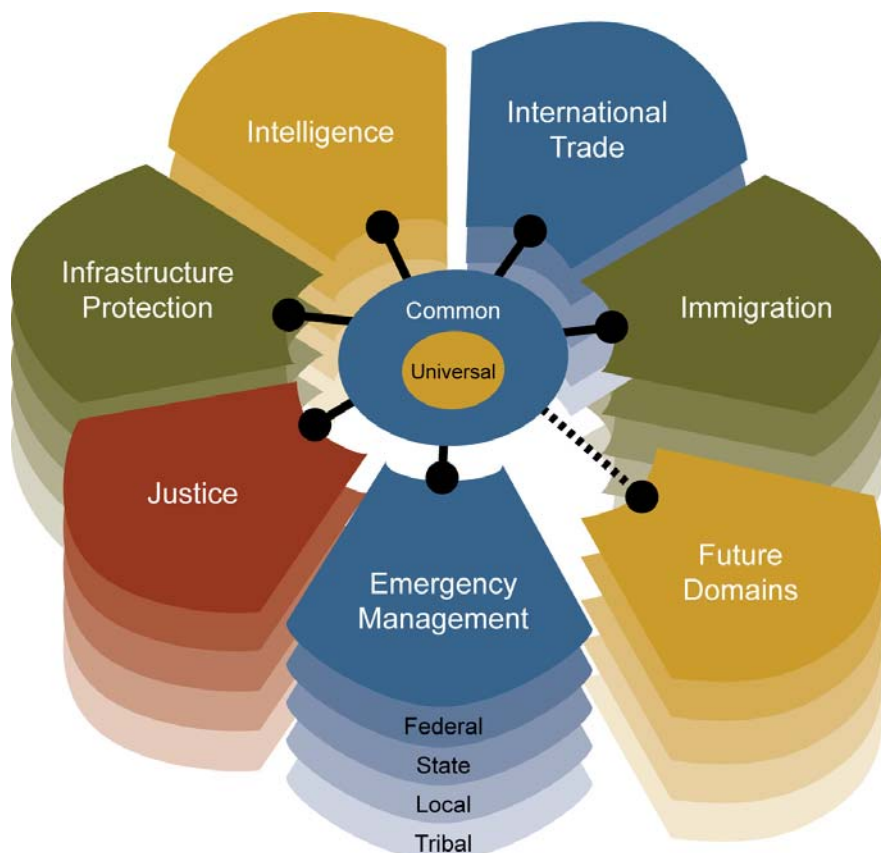


Figure 5: NIEM Core and Domains

The NIEM architecture is designed to facilitate the IEPD development life cycle (see Section 5.2), and the NIEM data model maturity life cycle (see Section 5.3) addresses how a new data component is identified so that it can be evaluated for conformance with the *NIEM NDR*. This evaluation will ensure that new data components are a) NIEM-conformant, b) harmonized with the current structure and relationships, and c) institutionalized into the NIEM model. The new data component is added to the appropriate *core* or *domain* namespace after being vetted through a structured governance process that applies the minimum level of control required commensurate with data-component sharing requirements.

NIEM is closely aligned with and complementary to the technologies involved, such as Web services and data transformation used to provide routing, security, and authentication. The focus of NIEM, however, is on the standardization of vocabularies to be used in the message data content. As NIEM-based exchanges proliferate, COIs that use NIEM will be encouraged to provide reusable data components for harmonization, standardization, and posting in libraries, making them accessible to other NIEM users.

3.1 NIEM Namespaces

A namespace is an XML mechanism for uniquely identifying a collection of element types and attribute names and associating them with a specific COI or NIEM domain. All elements in a given namespace must be uniquely named. The combination of a unique namespace and a unique element name allows data components to exist with identical base names by distinguishing them by their namespaces. This domain-based namespace structure is the solution to data-component naming conflicts in XML.

As shown in *Figure 6: NIEM Namespace Architecture*, NIEM consists of two classes of namespaces: NIEM core and NIEM domains. NIEM also uses separate namespaces for code tables.

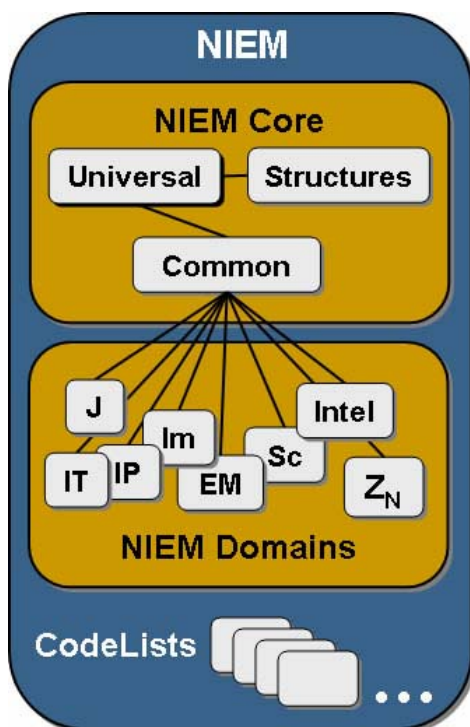


Figure 6: NIEM Namespace Architecture

Core namespaces contain data components that are under NIEM configuration control. Domain-specific namespaces are organized by domain and are controlled by representatives from COIs participating in the domain. NIEM core consists of:

Universal: The *universal* namespace contains a set of data components that conform to the *NIEM NDR* and are universally understood, stable, and relatively small. To ensure consistency and maintain integrity, *universal* falls under full NIEM governance, which requires semantic consensus from all NIEM domains. In NIEM the *universal* namespace is written as:

[xmlns:u=http://niem.gov/niem/universal/1.0](http://niem.gov/niem/universal/1.0).

Common: The *common* namespace contains data components that are harmonized and used regularly by two or more (but not *all*) domains. Data components are approved for addition to this namespace upon achieving consensus among stakeholders who are actively engaged in exchanging the data component based on the common semantics and structure for each such data component. A NIEM domain may be considered authoritative for a data component; therefore, not all data components used by more than one domain must be in common. However, a data component in a domain must not semantically conflict or overlap with any other data component in *universal*, *common*, or a NIEM domain. In NIEM the *common* namespace is written as:

[xmlns:c=http://niem.gov/niem/common/1.0](http://niem.gov/niem/common/1.0).

Structures: The *structures* namespace contains data components that do not carry information content or have specific semantic meaning but are imported into other namespaces to be used for associations and other supporting infrastructure. In NIEM the *structures* namespace is written as:

[xmlns:s=http://niem.gov/niem/structures/1.0](http://niem.gov/niem/structures/1.0).

NIEM domains have established namespaces within the NIEM model. For example, the Intelligence domain is [xmlns:intel=http://niem.gov/niem/domains/intelligence/1.0](http://niem.gov/niem/domains/intelligence/1.0). They fully conform to the *NIEM NDR* and are managed by authorized representatives of the specific NIEM domain (domain stewards), as shown in Section 5.1, Domain Management.

NIEM includes separate namespaces for shared and reusable code tables from authoritative sources. The code tables in NIEM are enumerated values for coded data elements. A simple example is a list of states. Every coded data element has a set of code values (e.g., a two-letter abbreviation for each state, such as MD for Maryland). If the values themselves are not self-evident, they may also have corresponding literals or definitions. For example, “Maryland” is the literal for the code value “MD.” Code lists are taken from the external agency that has been identified as the authoritative source for the specific code list. Code values are translated and then inserted as schemas within NIEM. Since multiple existing code tables relate to a specific information

exchange and are critical to interfaces with specific databases, NIEM accommodates them as options. An example of how code table namespaces are referred to is: [xmlns:ncic=http://niem.gov/niem/ncic_2000/1.0](http://niem.gov/niem/ncic_2000/1.0), for code tables associated with NCIC 2000.

4 TECHNICAL STANDARDS

NIEM adopts standard XML Schema constructs and methods, such as roles, associations, and augmentation from industry standards, such as the World Wide Web Consortium (W3C) XML Schema language. Nonessential features of the XML Schema language that inhibit preciseness and restrict interoperability are precluded. Its reference and import features save time and effort in dealing with existing standard and legacy data by enabling use of data components from an external standard schema or namespaces, even though they do not conform to the *NIEM NDR*. The NTAC is responsible for remaining cognizant of external standards and the organizations that are responsible for the management of external standards. The NTAC will, as required and appropriate for the NIEM standards, make recommendations for incorporating external standards within NIEM.

4.1 NIEM Schemas

XML Schemas express shared vocabularies and allow computers to follow precise business rules. An XML Schema defines and dictates what content is permitted in an XML document. Using an XML Schema, systems can automatically determine, via validation, whether the contents of an XML document are acceptable and in proper order and relationship. Schemas may be quite general, but they may also be very exact and sophisticated when defining the content of an XML document. With its ability to represent hierarchical relationships and its extensibility, XML provides a powerful method for representing complex collections of data.

The NIEM reference schemas are a set of interrelated schemas that define NIEM data components. Each schema defines its own target namespace. Schemas in the reference set may import one another by namespace in order to use (or reuse) components they define. In general, domain reference schemas import schemas from the core (such as *common* and/or *universal*). The NIEM reference schema set represents one release (version) of the full set of data components in NIEM. The reference schema set is available for use by all NIEM IEPDs.

There is no support for user customizations of the reference schema(s). Customization occurs in the IEPD development process (see Section 5.2) by extending and constraining a subset schema derived from the reference schema.

4.2 NIEM Naming and Design Rules (NDR)

The NIEM modeling concepts are documented in greater detail in the *NIEM NDR*, which governs the definition of NIEM data components and provides a basis for NIEM conformance. The *NIEM NDR* is based on published and established standards including:

- Standard specifications from public standards organizations;
- Specifications from government bodies;
- Preexisting data systems; and
- De facto standards and common usages by the community.

NIEM is based on several concepts from the International Standards Organization (ISO) 11179 (through latest version), which provides guidelines for the naming and definition of data elements, as well as information about the metadata captured about data elements. Part 5 of the ISO 11179 standard establishes a methodology for naming items in data dictionaries.⁸

The ISO 11179-based *NIEM NDR* naming convention uses object class, property, and representation terms to constitute a multiple-part name as shown in *Figure 7: Sample ISO Naming Convention* and as follows:

- *Object Class Term*: Represents the object to which the property is applicable. In NIEM, we interpret that object to be the real-world object. (An object class refers to a group of objects that share the same attributes, operations, methods, relationships, and semantics.)
- *Property Term*: Identifies the property that the data element represents (e.g., last name, expiration date, height, total).
- *Representation Term*: Describes the *form* of the data represented. This term is taken from a list of electronic business XML (ebXML) representation terms, including amount, code, date, time, graphic, identifier, indicator, measure, name, percent, picture, quantity, rate, time, and numeric.

⁸ Freely available at

http://isotc.iso.org/livelink/livelink/fetch/2000/2489/Ittf_Home/PubliclyAvailableStandards.htm

- *Qualifier Term*: The object class and property terms can have qualifiers; i.e., a word or words that help define and differentiate the element name.⁹

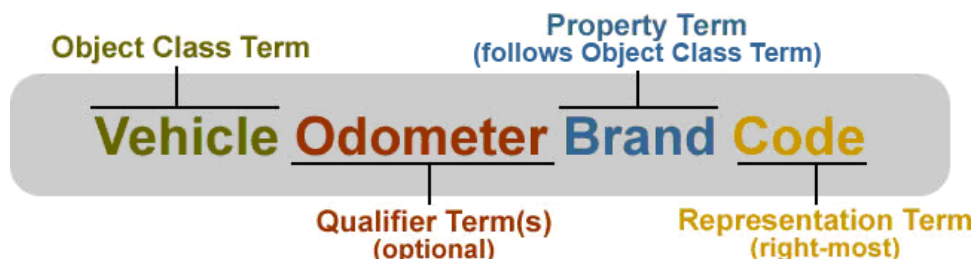


Figure 7: Sample ISO Naming Convention

The *NIEM NDR* consists primarily of principles that provide guidance and may be the basis for rules, and normative rules that are enforceable. *Figure 8: NIEM NDR Examples* is a snapshot excerpted from the *NIEM NDR* that illustrates a few simple examples.

The figure shows a screenshot of the NIEM NDR document with two yellow callouts highlighting specific sections:

- Principles (Unenforceable)**: Points to the '3.3.9. Multi-pass Validation' section, which discusses systems operating on XML data and performing multiple layers of processing.
- Rules (Enforceable)**: Points to the '8.1. User Information ("documentation") Elements' section, which includes rules like [Rule DOC3] and [Rule DOC4] regarding structured XML data and the use of the `xml:lang` attribute.

Other visible sections include '3.3.10. No Mix', '3.3.11. Application Information ("appinfo") Elements', and '8.2. Application Information ("appinfo") Elements'.

Figure 8: NIEM NDR Examples

⁹ Definitions from <http://www.idealliance.org/proceedings/xml04/papers/150/How-US-Govt-Using-XML-1YL.html#S8.1.6>

Data components from external domains not built under *NIEM Naming and Design Rules* (*NIEM NDR*) will likely validate against schemas other than NIEM-conformant schemas. However, such data components can be included in NIEM domains by encapsulating them in a NIEM-conforming wrapper (see Section 5.1, Domain Management). The *NIEM NDR* describes the technical rules and procedures for wrappers. All external data components incorporated into NIEM core are subject to review and approval by the NIEM Business Architecture Committee (NBAC) and NIEM Technical Architecture Committee (NTAC).

The NIEM PMO is aware of a major NDR effort under way by the National Institute of Science and Technology (NIST) and the XML Schema Interoperability Working Group (XSIWG) of the Chief Information Officer (CIO) Council's Architecture and Infrastructure Committee's (AIC) Data Architecture Subcommittee (DAS). The NIEM technical staff will contribute the *NIEM NDR* and test cases to the emerging NIST-developed Quality of Design (QOD) system where reuse of NDR-like rules will benefit everyone who chooses to use the environment, such as to leverage *NIEM NDR* rules, as well as rules from the Department of the Navy (DON) and Internal Revenue Service (IRS) in creating COI-specific rules, test cases, and NDR documents.

5 NIEM OPERATIONAL PROCESSES

This section identifies the core processes for domain management, IEPD development, and data model maturity. This section also describes a variety of support processes relevant to NIEM. As shown in *Figure 9: NIEM Processes*, these processes are the foundation for managing the development of NIEM product releases and deploying quality products. The timeline for process steps will vary according to the data model impact, governance requirements, degree of harmonization required, and stakeholder and developer priorities. Changes within a domain will be accomplished at the pace and with the priorities pertaining to that domain.

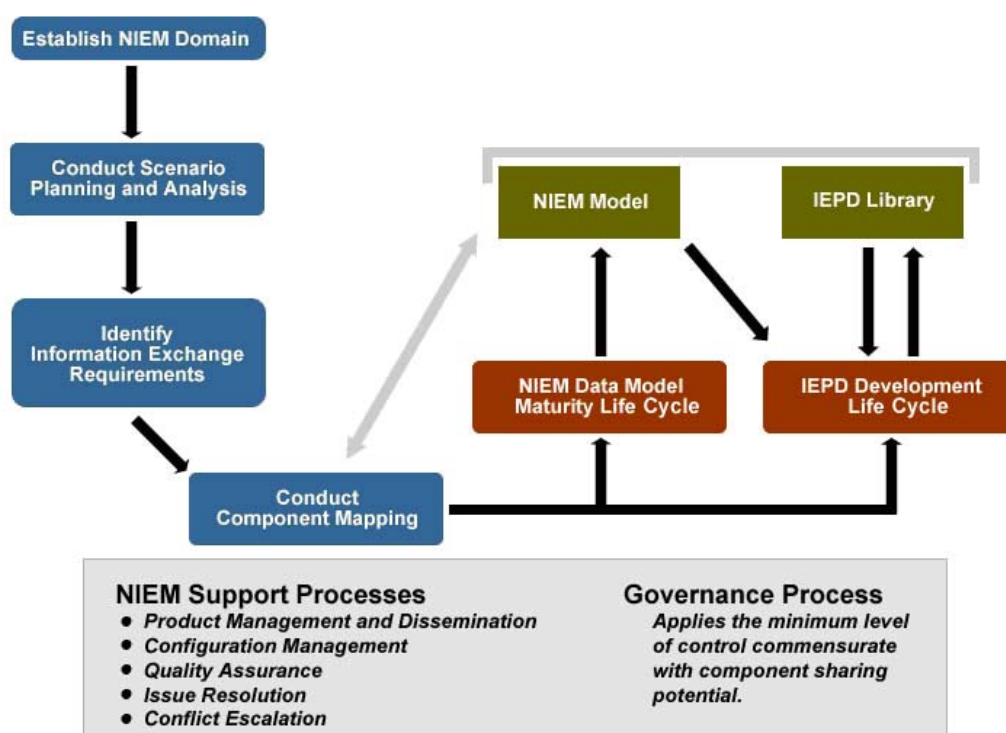


Figure 9: NIEM Processes

5.1 Domain Management

A domain refers to a business enterprise broadly reflecting the agencies, units of government, operational functions, services, and information systems which are organized or affiliated to meet common objectives. NIEM domains are organized to facilitate governance, and each has some measure of persistency. Each domain traditionally includes a cohesive group of data stewards who are SMEs, have some level of authority within the domains they represent, and participate in the processes related to harmonizing conflicts and resolving data-component ambiguities.

Domains are expected to:

- Provide content to NIEM;
- Provide domain subject-matter expertise to support content development;
- Have existing COIs or the ability to enroll or create representative and authoritative COIs;
- Possess the ability to perform outreach to relevant COIs;
- Support their own governance;
- Participate in NIEM governance as appropriate;
- Maintain strategic alignment within the scope of NIEM;
- Agree to the principles and practices of NIEM (including conformance to NIEM Naming and Design Rules (NDR));
- Maintain alignment with the NIEM taxonomy; and
- Authoritatively support internal and external harmonization.

NIEM domains are logical groupings of the data components that support the business needs of a line of business (LoB) or COI. The approach to establishing *NIEM domains* considers business requirements, governance issues, and technical factors associated with the implementation and use of XML namespaces to satisfy broad stakeholder requirements in effecting both intra- and interdomain information sharing. In the NIEM architecture, each *NIEM domain* is wrapped in a namespace that constitutes its primary taxonomy.

NIEM domains facilitate self-governance. A prerequisite to the establishment of a *NIEM domain* is that it have an authoritative data source (i.e., an associated organizational entity) to govern its data. An example of an authoritative data source is the Global Justice XML Standards Task Force (XSTF). The XSTF is a well-established, cohesive group of data stewards for the Justice domain. Groups represented on the XSTF do not have exclusive authority over the data components, but they collaborate to make decisions regarding the content of the Justice domain. Because there is extensive interaction and overlap between these groups, they have benefited from organizing themselves through the XSTF for data management, and they also have their own groups to build IEPDs.

In order to quickly jump-start NIEM development, the initial approach to establishing *NIEM domains* and associated namespaces was to build upon the existing Global Justice

XML Data Model (Global JXDM) by designating shared data components as NIEM *common* and *universal core*, and then migrating the remaining data components into the NIEM Justice domain.

Additional NIEM domains were rapidly established by leveraging existing COIs and groups of practitioners that already existed to give NIEM a reasonable set of data components for pilot programs, early adopters, and stakeholder feedback. As NIEM moves forward through data model maturity, new domains that closely reflect the real-world business and operational landscape are expected to emerge and absorb the content of the initial domains by one or more of the domain interaction methods described below.

5.1.1 NIEM Domain Interaction Methods

The interrelationship between the NIEM core and NIEM domains, as well as domains outside the NIEM architecture (i.e., external domains), are illustrated in *Figure 10: Domain Interactions*.

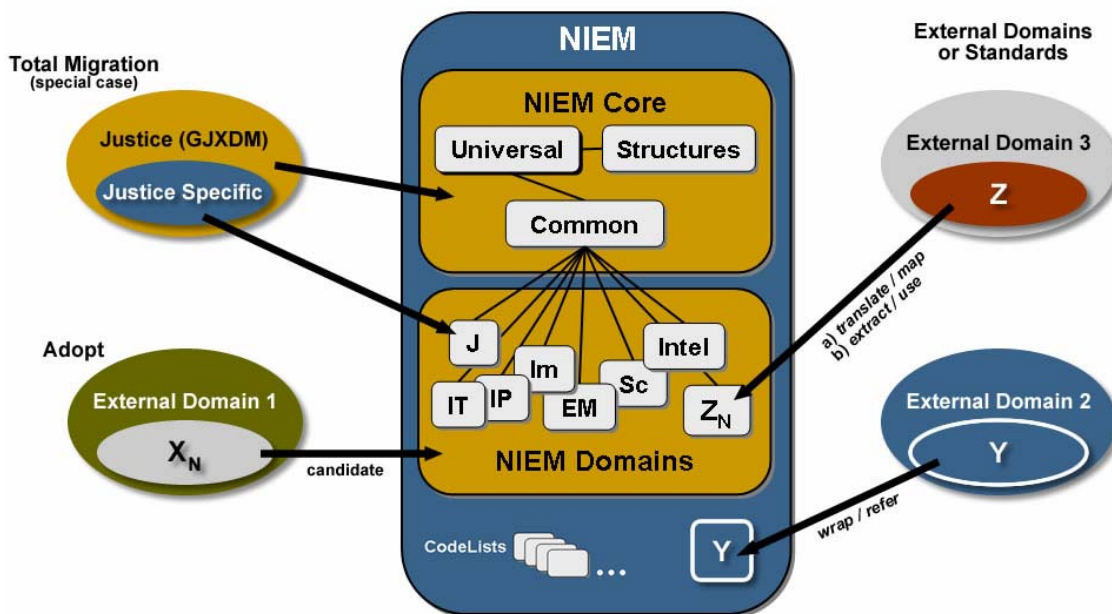


Figure 10: Domain Interactions

External domains do not fall under NIEM governance; consequently, they are not bound by the *NIEM NDR*. There are multiple ways for an external domain to interact with NIEM, such as total migration and wrapping external standards in NIEM-conformant elements to contain them and thus establish NIEM conformance. With each

of these processes, there is a possibility that what is done or leveraged from an external domain could become a NIEM domain.

The following table describes each box in Figure 10 and relates it to the graduated approach to governance, which is designed to provide only that level of governance needed to facilitate the process.

Table 1: NIEM Domain Interactions

Identification	Interaction/Description	Governance Requirements
Universal	<ul style="list-style-type: none"> • Baseline migrated from Global JXDM • New data components promoted from <i>common</i> that are applicable to all NIEM domains 	<ul style="list-style-type: none"> • Data steward is the NBAC • Harmonized across all domains • Approved for incorporation into NIEM by NBAC and PMO • General stakeholder and public review conducted as part of NIEM release process
Common	<ul style="list-style-type: none"> • Baseline migrated from Global JXDM • New data components harmonized through data model maturity process • The <i>common</i> namespace schema imports the <i>universal</i> namespace schema 	<ul style="list-style-type: none"> • Data steward is the NBAC • Harmonization among several (but not all) domains • Approved for incorporation into NIEM by NBAC and PMO • General stakeholder and public review conducted as part of NIEM release process
Structure	<ul style="list-style-type: none"> • Provides data structures for associations, roles, metadata, type augmentation, content references, etc. 	<ul style="list-style-type: none"> • Data steward is NTAC • Approved for incorporation into NIEM by NTAC and PMO • General stakeholder and public review conducted as part of NIEM release process
XSD (not shown in figure)	<ul style="list-style-type: none"> • Incorporates basic types from the XML Schema specification for use in NIEM 	<ul style="list-style-type: none"> • Controlled by W3C Consortium • Version reference in NIEM schemas declaration
Justice	<ul style="list-style-type: none"> • Initial content migrated from Global JXDM and content created as a NIEM namespace • New content additions or content modifications incorporated into the Justice domain through data model maturity process 	<ul style="list-style-type: none"> • Data steward is Global XSTF • Harmonization among Justice COIs and stakeholders • Approved for incorporation into NIEM by NBAC and PMO • General stakeholder and

Identification	Interaction/Description	Governance Requirements
	<ul style="list-style-type: none"> Justice imports <i>common</i> and <i>universal</i> namespaces 	public review conducted as part of NIEM release process
Initial NIEM domains created directly for NIEM (IT, IP, IM, EM, SC, and INTEL)	<ul style="list-style-type: none"> Initial content incorporated from pilots and created as a NIEM namespace; initial NIEM domains created as NIEM-conformant namespaces NIEM content additions or modifications incorporated into domain through data model maturity process Imports <i>common</i> and <i>universal</i> namespaces 	<ul style="list-style-type: none"> Data steward is authoritative source representing domain COIs and stakeholders Harmonization among domain COIs and stakeholders Approved for incorporation into NIEM by NBAC and PMO General stakeholder and public review conducted as part of NIEM release process
External Domain 3 Subset or standards (Zn)	<ul style="list-style-type: none"> Translate/map—Translate a subset of an external domain or standard to be <i>NIEM NDR</i>-conformant and include it as a NIEM domain or part of a NIEM domain. Subset is also mapped back to the external domain to maintain consistency. 	
	<ul style="list-style-type: none"> Extract/use—Translate a subset of an external domain or standard to a NIEM <i>NDR</i>-conformant domain as above, but external domain then uses that domain rather than maintaining the original subset. 	
Code List	<ul style="list-style-type: none"> Translate with <i>NIEM NDR</i> Create with <i>NIEM NDR</i> Wrap/refer or extract/use 	
External Domain 1	<ul style="list-style-type: none"> A subset in a domain is identified and actually maintained as <i>NIEM NDR</i>-conforming, but the domain does not choose to be a NIEM domain. Since the data components in the domain are NIEM-conformant, NIEM participants can use these data components, but they won't bear a NIEM namespace or fall under any NIEM governance, and they may not be found in NIEM unless the external domain later becomes a NIEM domain. Adopt NIEM rules, i.e., translate all or a part of external domain to be <i>NIEM NDR</i>-conformant. Exists entirely outside NIEM (i.e., NIEM 	<ul style="list-style-type: none"> External domains establish their own data stewards and governance processes NIEM has no governance over external domains; may have no knowledge of their use of NIEM data components Subsets or data components can be offered as candidate NIEM additions in the future and would then become subject to NIEM domain governance requirements.

Identification	Interaction/Description	Governance Requirements
	may be unaware that domain exists)	
External Domain 2 Subset or standard that does not conform to <i>NIEM NDR</i>	<ul style="list-style-type: none"> • Wrap/refer— Wrap a subset of the external domain's data components in a <i>NIEM NDR</i>-conformant element (container or adapter types) to make them discoverable for NIEM IEPDs. 	<ul style="list-style-type: none"> • Wrapper element(s) are NIEM-conformant and governed as NIEM domains (See Table 2) • Data steward for data components is domain authoritative source

5.2 IEPD Development Life Cycle

Figure 11: IEPD Life Cycle shows a series of steps for building an IEPD. The IEPD life cycle is the primary process from the practitioner's perspective for development of the artifacts that define an information exchange specification. The life cycle provides a guide to understanding how IEPDs are ideally built and published. This life cycle is not intended to be prescriptive, and IEPD builders may enter the life cycle at any particular step, as well as adjust the scope of the life cycle to support the level of effort required for their individual IEPD development.

The initial trigger for developing an IEPD may be operationally driven (bottoms-up) or strategically driven (top-down). An example of an operationally driven approach is practitioners in the field building an IEPD to meet specific business requirements, such as the exchange of an incident report or arrest report. Strategically driven examples include initiatives driven by legislation, administrative requirements, or strategic priorities identified by the NPEP, ESC, and PMO in order to support priority and targeted national information exchange standards, such as people screening, cargo screening, or suspicious activity reporting.

NIEM recognizes the inherent value of building information exchanges to address the operational requirements among agencies nationwide, whether they are identified through a top-down or bottoms-up approach. With either approach, specific information exchanges are part of an operational scenario that clearly defines the operational context and real business value associated with the exchange. Moreover, it is recognized that most scenarios will incorporate multiple discrete information exchanges, each of which can be built following the process described below.

Although formal specifications for the inputs and outputs of the NIEM IEPD life cycle are not mandatory, they are recommended to:

- Ensure consistency across IEPDs;
- Capture business context that facilitates search and discovery of NIEM data components and IEPDs;
- Provide both machine-readable and -processable versions to automate support for the IEPD life cycle; and
- Encourage and facilitate commercial tool development and value-added capabilities.

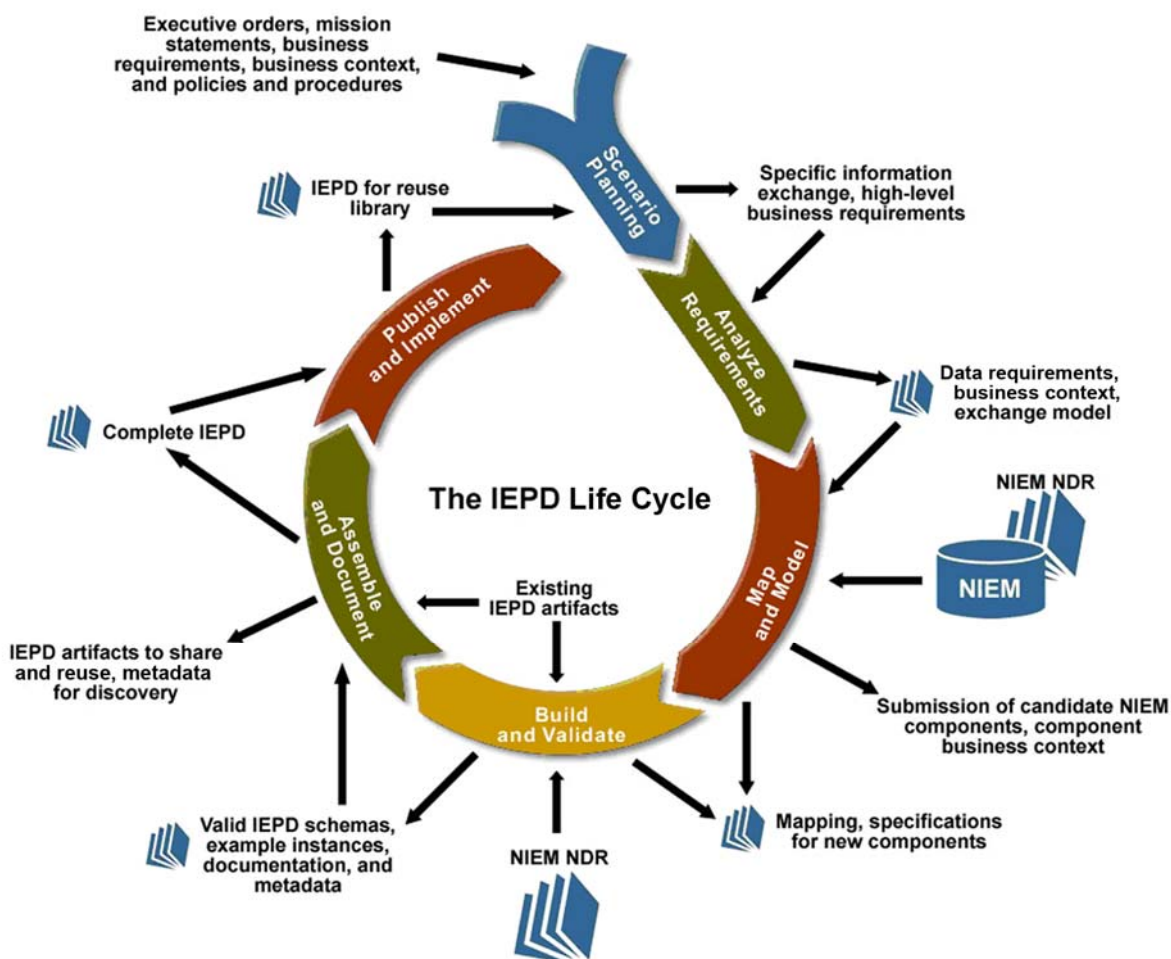


Figure 11: IEPD Life Cycle

5.2.1 Step 1: Scenario Planning and Business Taxonomies

Scenario planning and business taxonomies are two methodologies that can be used for identifying specific information exchanges. Both can be instrumental in identifying high-volume, high-priority, or universal exchanges in specific business contexts in

addition to identifying the specific information exchange points that describe these contexts.

Scenario planning is a bottoms-up approach which depicts either current information exchange practices among involved parties or potential future environments that envision broader and more expansive information sharing. This may also include changes in business practices or processes. In either situation, scenario planning can assist in identifying gaps, impediments, and other flaws in business processes and data exchanges.

Business taxonomies employ a top-down approach which requires documenting the business operations of an organization using a common framework such as the FEA BRM. The FEA BRM taxonomy categorizes an organization's operations by lines of business (LoBs) and subfunctions. Agencies have the flexibility to extend the BRM to support their business requirements. It is at the process level where exchange points describing specific business events will be identified and correlated to IEPDs, which can be developed to affect the exchange of business information (see *Figure 12: BRM Taxonomies*).

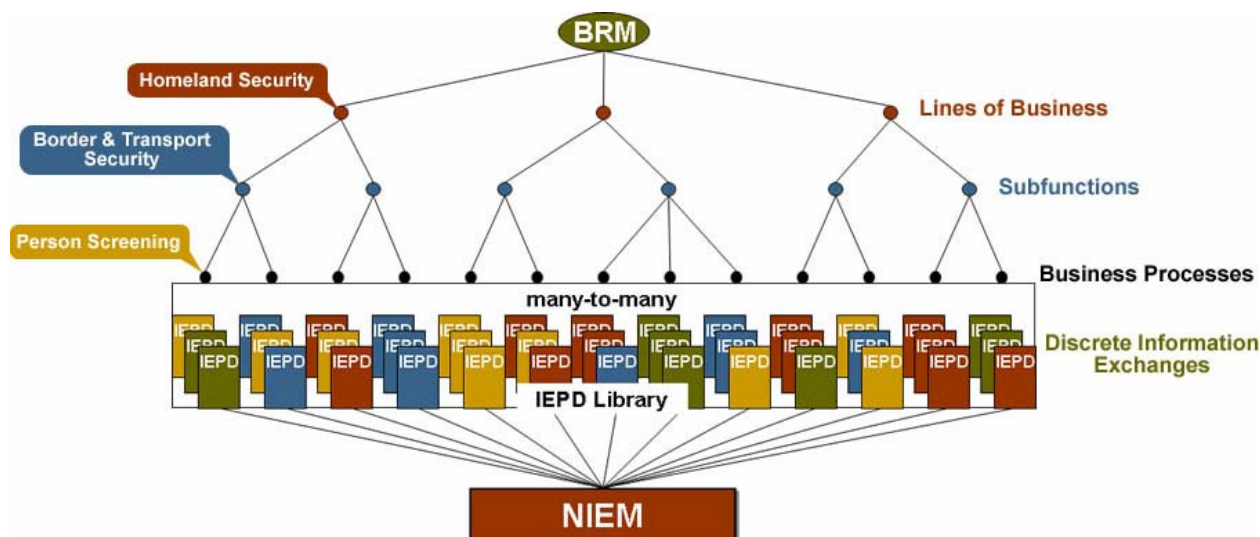


Figure 12: BRM Taxonomies

Regardless of the approach a developer takes—scenario planning or business taxonomy analysis—the result is identification of specific information exchanges which are the objective of IEPD development. This preliminary step is a critical prelude to development of effective IEPDs, in which the business and operational context of information sharing is established and articulated.

5.2.2 Step 2: Analyzing Requirements—Identifying and Documenting Information Exchange Requirements

The IEPD developer selects one or more related exchanges identified in Step 1 to fully elaborate and build an exchange model. The IEPD developer may decide to document multiple information exchanges that are inherent in an operational scenario or business requirement following Steps 2–6. To build an exchange model, the IEPD developer can use information exchange modeling (IEM) tools¹⁰ to map and model the precise nature and content of the exchange, including:

- The event that triggers an information exchange (e.g., an arrest of a person, a border-entry review, a criminal history records check, or an automobile stop);
- The agencies involved in the exchange (e.g., local law enforcement, prosecutor, or U.S. Immigration and Customs Enforcement);
- The business context or conditions surrounding the exchange (e.g., whether the subject is an adult or a juvenile, a citizen or a registered alien); and
- The specific data requirements of the exchange (e.g., the document, data set, or data elements that are actually shared among the agencies).

The outputs of this step include the business context, the data requirements, and an exchange model.

5.2.3 Step 3: Mapping and Modeling Information Exchanges

The mapping and modeling information exchange step ensures consistency in the way information is captured, stored, and exchanged and conformance to a uniform methodology to support generation of the IEPDs. IEPD developers map their data components to the NIEM model using their preferred tools. During this mapping, the developer may find there are matches, partial matches, or no matches to data components within the NIEM model. Matching data components can involve those where the names are the same, or perhaps differ slightly, but where the data components themselves are semantically and structurally equivalent; i.e., there is a one-to-one mapping between the NIEM and the source component. Partial matches can arise when there are similarities, but also some differences, between data components. Differences may include semantic or structural mismatches, element-naming collisions, or mismatches at the value set, data type, or lexical levels. For partial matches, it is

¹⁰ The Justice Information Exchange Model (JIEM) is an example of an IEM tool. Further information on JIEM can be found at <http://www.search.org/programs/info/jiem.asp>

necessary to document the need for extension or refinement of existing data components.

Data components with no matching NIEM data component comprise a set of additional element types that are candidates for insertion into the NIEM model. Depending on the nature of the potential inclusion in the model, recommendations may include adding a new or subordinate type, adding an element, extending a value set, modifying a data type or lexical representation, renaming data components, or revising a definition. For data components that do not match at all, a NIEM-conformant data component must be created using the *NIEM NDR*. When a developer identifies data components to propose for inclusion in NIEM, the submission will be reviewed by the NIEM Business Architecture Committee and the developer should use the Component Mapping Template (CMT). See Section 6 for further detail on the CMT.

As shown in *Figure 13: Where to Get Data Components for IEPDs*, there are basically six ways an IEPD developer can get data components for an IEPD.

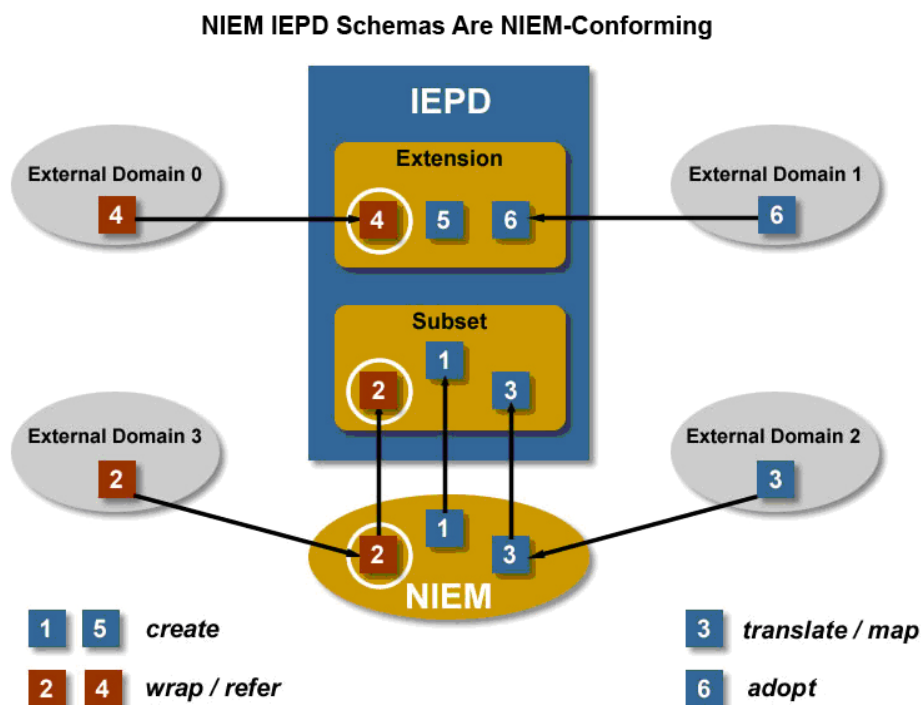


Figure 13: Where to Get Data Components for IEPDs

Case 1: Reuse existing NIEM domain or core data components from the current or previous versions of NIEM.

Case 2: Wrap a data component from an external standard which is not inserted into the NIEM model and place it in the extension schema. These types of data components are candidates for a future NIEM addition and are able to be used immediately in NIEM IEPDs.

Case 3: Reuse a data component that has been translated by an external domain to the *NIEM NDR* and inserted into a NIEM domain or core. In this case, a mapping exists to the original data component. For this scenario a mapping may be maintained between the conforming data component and the original data component from which it was translated, or the external domain may adopt the NIEM-conforming data component within its own model.

Case 4: Reuse a wrapped external domain data component that was inserted into a NIEM domain or core as an external data component.

Case 5: Build a new NIEM-conforming data component based on information exchange requirements and mappings and place it in the extension schema.

Case 6: Reuse a *NIEM NDR*-conforming data component from an external domain. This would occur if the external domain had decided to publish a view of its model that conforms to the *NIEM NDR* and guidelines but remains external from the NIEM model.

The output of this step consists of data-component mapping and newly modeled data components. These newly modeled data components serve to identify new candidate data components for submission to NIEM.

5.2.4 Step 4: Building and Validating IEPDs

Based on the data components identified in Step 3 and the mapping, the IEPD developer builds and generates IEPD schema artifacts including:

Subset schema: Constructed by extracting from the reference schema set those types and elements needed for a specific information exchange. A message instance that validates against the subschema must also validate against the full reference schema set.

Extension schema: Defines an information exchange package (IEP)-specific namespace that contains types, elements, and attributes needed for the IEP but not in NIEM. The purpose is reusability of data components and easier document schema creation. Additionally, they allow for the inclusion of local elements not found in the model and enable the extension of the document schema to include those local elements.

Constraint schema: Adds certain additional constraints or restrictions to the types and elements in the subset. This type of schema is different from the others because it is not bound by the design principles of the reference set. Constraint schemas do not have to be NIEM-conformant. A constraint schema is usually a subset schema that has been modified by applying constraints that could not be applied to the subset without violating conformance.

Exchange schema: Defines the content of the IEP.

Each layer of schemas adds to the ultimate end-to-end interoperability between systems and decreases the cost and time needed for development and implementation. The subset and exchange schemas are mandatory for an IEPD; extension and constraint schemas are optional.

As part of this step, the IEPD developer may also build one or more sample XML instances and eXtensible Stylesheet Language (XSL) stylesheets. These XML instances are examples of the data exchange documents defined by this IEPD and the payload documents that are actually exchanged. Not only do they serve as example artifacts for the IEPD, but they also can be used to validate the schemas for the IEPD. XSL stylesheets are used to consistently format the data within the XML instances to meet display or output requirements.

To validate the schemas, the IEPD developer can use an XML validator tool to ensure that the example XML instances and stylesheets validate the schemas according to the NIEM reference architecture. The validator tool can be used to ensure that both conformance and constraint validation, if applicable, are accomplished. To further define the IEPD, additional documentation including business rules, change log, and metadata is also needed. The outputs of this step are the valid schemas, example instances, documentation artifacts, and metadata.

5.2.5 Step 5: Assembling IEPDs to IEPD Specification

Once all of the schemas, documentation, metadata, and other files have been captured, the IEPD can be generated based on the NIEM IEPD specification format. The NIEM IEPD tool can assist with this process.

The assembly step prepares and packages all required files for this IEPD into a single self-contained, self-documented, portable archive file. Included in this archive are all schemas (subset, extension, exchange, code lists, etc.), sample instances (XML), style-sheets (XSLT), and documentation (business requirements, diagrams, etc.). The archive also contains a metadata file prepared to an XML specification for NIEM IEPD metadata, and an XHTML catalog file that opens in a standard browser and indexes the contents of the archive. By unpacking the archive and opening the catalog file, a user can browse through the entire package. Furthermore, the specification for the catalog is formal enough that the format and purpose of each file in the IEPD can be distinguished. This means that a NIEM IEPD could be machine-processed for various automated purposes.

The output of this step is a complete IEPD, which provides reference for other users. An IEPD is considered to be NIEM-conformant if it:

- Imports and references a NIEM namespace or a correct subset;
- Uses the appropriate NIEM data component (i.e., does not create a duplicate of one that already exists);
- Is semantically consistent (i.e., uses NIEM data components in accordance with their definitions and does not use an element to represent data other than what its definition describes); and
- Applies the NIEM architecture and constructs (i.e., NIEM NDR) correctly and consistently.

NIEM conformance allows stakeholders to share accurate and reliable information that has the same meaning for the receiver as for the sender.

5.2.6 Step 6: Publishing and Implementing Exchanges

The final output of the IEPD life cycle is an IEPD that is published and available for search, discovery, and reuse. IEPD developers have the option of publishing their

IEPDs to their own or an industry repository such as the IEPD Clearinghouse,¹¹ or to register and publish them through the NIEM IEPD Library, though clearly the preference is to publish IEPDs in NIEM for discovery and reuse by NIEM users. Nevertheless, all IEPDs are portable and self-documented and can be registered anywhere.

The NIEM PMO and NC&OC will promote awareness and encourage use of IEPDs through direct outreach with stakeholders, as well as by developing a strategy for interfacing with government IEPD registries. IEPDs being promoted by the PMO will conform to the *NIEM NDR*. IEPDs selected for promotion by the NIEM PMO will align to strategic priorities, including national priority information exchanges identified and designated by the NPEP, and those that are sponsored by an authoritative source (e.g., Global Rap Sheet).

5.3 Data Model Maturity (DMM) Life Cycle

NIEM data model maturity is dependent on the continuous development and refinement of IEPDs, which directly feed into identifying new data components, refining existing data components, and identifying candidates for harmonization. The IEPD Life Cycle and the Data Model Maturity Life Cycle, as shown in *Figure 14: Data Model Maturity Life Cycle*, are therefore tightly integrated. For example, before building a new IEPD, an IEPD developer should search the NIEM IEPD Library to determine whether an IEPD already exists to meet the exchange requirements.

¹¹ The IEPD Clearinghouse can be accessed at <http://it.ojp.gov/iepd/>

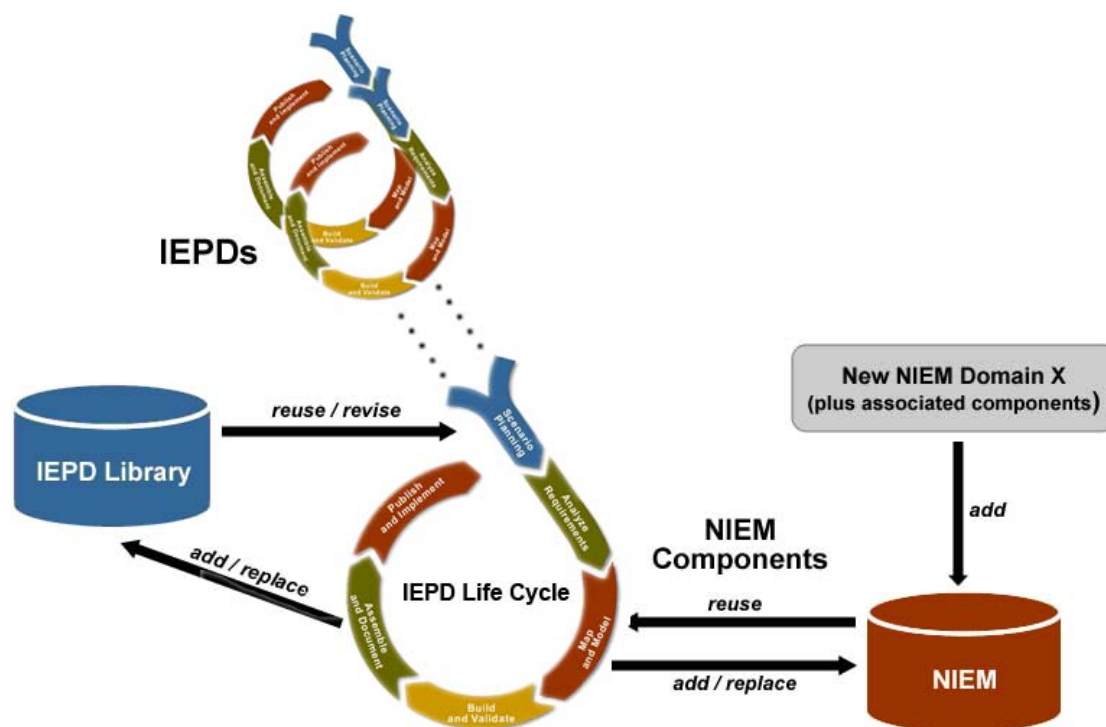


Figure 14: Data Model Maturity Life Cycle

5.3.1 Harmonization

Harmonization is the process of making changes to NIEM in a manner that preserves or improves the model's internal consistency and integrity. Harmonization ensures that:

- NIEM represents each business concept in one and only one place in the model;
- Each component represents a single concept with a clear, unambiguous definition; and
- The NIEM architecture, including use of associations, specialization, roles, and augmentation, is applied consistently and uniformly across components.
- Ongoing harmonization is an iterative process of constant but gradual improvement in the integrity of the model. It seeks to improve the usability of the model for IEPD designers by reducing ambiguity, imprecision, and duplication. It also allows NIEM to scale upwards by providing an orderly and disciplined process for incorporating new content.

As shown in *Figure 15: Model Harmonization*, harmonization within the data model maturity process requires collaborative governance between NIEM participating parties and the NBAC. The NBAC and NIEM participating parties work together to determine

the most suitable option when semantic conflict or ambiguity occurs around a data component.

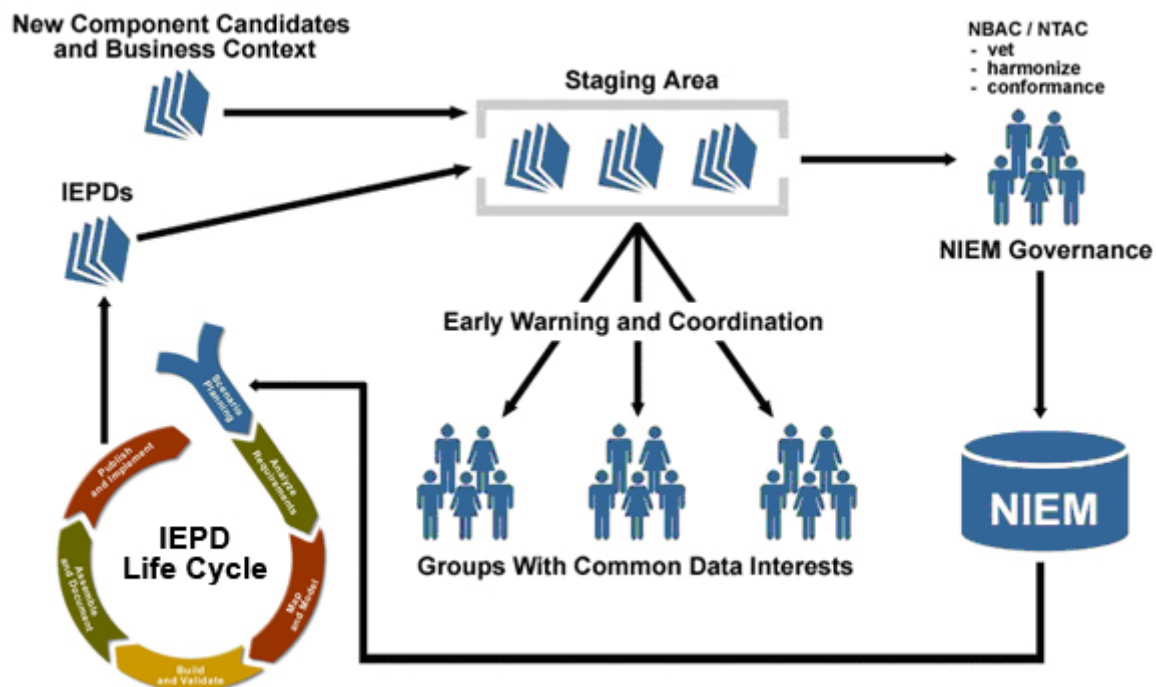


Figure 15: Model Harmonization

During the IEPD development process, an IEPD developer may identify candidate data components for addition to or modification in NIEM. Alternatively, one or more COIs for an existing domain may identify semantic conflict or ambiguity and may want to promote a data component to NIEM core or to identify one COI to remain the authoritative source for the data component.

When reviewing proposed modifications to NIEM, including COI requests for data component promotion, the NBAC will conduct an initial assessment to determine the following:

- Depending on scope, does the package adequately document the business requirements and proposed solution (i.e., complete, accurate, detailed enough, unambiguous, correct format)?
- What is the extent of the impact to NIEM of the proposed modification? For example, which domains are impacted? Does a new domain need to be created? Are universal and common impacted? How many data components are impacted?

- Do proposed new components already exist (in whole or in part) somewhere in the model, perhaps under a different name?
- Have the proposed modifications been coordinated with other groups, tiger teams, or COIs working on related components or business requirements?
- Do the proposed modifications conform to the NIEM NDR and IEPD requirements?

Based on this analysis, the NBAC's decision could be:

- Rejection of proposed modifications;
- Disapproval of new data components;
- Revision of existing data component names or definitions to meet the new requirements;
- Revision of existing data component structure to meet the new requirements;
- Addition of new components to NIEM;
- Replacement of an existing data component by a new proposed component; or
- Some combination of the above.

When data components are approved for addition to NIEM, they may be added to an existing NIEM domain or to NEIM core, or a new NIEM domain may need to be added.

Once the NBAC resolves all gaps and ambiguities, the NIEM development team begins integration of the content into the model. Changes to the underlying data model structure, such as augmentation and substitution groups, may also arise through this process and would also be referred to the NTAC.

The NBAC could also independently take a proactive role as part of its continuing process improvement and daily work and would identify harmonization opportunities based on empirical research and ongoing analysis and refinement of the NIEM model.

As NIEM matures, more IEPDs and data components will become available for reuse, which likely will decrease the amount of time stakeholders spend in extending NIEM data components and IEPDs. Each time the IEPD life cycle repeats, IEPDs will continue to be created or revised and published to the NIEM IEPD Library or other stakeholder registries. Data components will continue to be updated or replaced. In this way, the NIEM processes and model are self-optimizing, and the NBAC will continue to refine this process.

5.3.2 Addition of a New Domain

The need to create a new domain in NIEM may be identified through integration points between the IEPD life cycle and the DMM life cycle. For example, an IEPD developer may identify a set of candidate data components for addition to the model. The developer submits these candidates to the NBAC for review through the harmonization process. One recommendation from the harmonization process may be to add a new domain to NIEM. The NBAC will perform the necessary due diligence to ensure that an appropriate authoritative source for the relevant domain exists before creating the new domain.

In an effort to further the development of information exchange standards across relevant domains, or in response to policy, legislative, or operational priority exchanges identified or designated by NPEP, the PMO may also create a new domain in NIEM or actively recruit a COI in order to build content and IEPDs. The PMO, for example, may approach a candidate COI, such as Transportation, to build or participate in building national exchange standards for cargo screening. The PMO may also decide to present, at workshops or conferences, specific business areas not yet represented in NIEM. Once engaged, the COI will work with the NBAC to create appropriate content for its domain.

5.3.3 Data Model Releases

Once final decisions are made regarding NIEM changes or modifications to the NIEM model, they are implemented and designated to a specific NIEM release.

The NIEM release management process will follow a four-phase approach: Alpha, Beta, Release Candidate (RC), and Production. An Alpha release is expected to have major changes and is only under review by the necessary COI stakeholders, NBAC, NTAC, and the NIEM PMO. The NEIM development team is responsible for making any changes recommended by these teams. If significant changes are identified after approval of the first Alpha release, a second Alpha release is generated. The number of Alpha releases is dependent upon the number of changes identified. Once all Alpha-stage changes are completed and approvals received, the release is moved into the Beta stage.

The Beta stage differs from the Alpha stage in that no major fixes or changes are expected. A release in the Beta stage goes through the same process: an iterative update, a review, and approval by the NIEM development team and the stakeholders. If a major change is identified, the release can be moved back to the Alpha stage and the

process starts over. Once all Beta-stage changes are completed and approvals received, the Beta release becomes a release candidate (RC).

The RC is released for final review by the stakeholders. It is possible for minor problems to be identified, in which case the RC goes back to the Beta stage. All related technical documentation is published on the NIEM.gov Web site. Each RC comes with a set of documentation including:

- The documentation spreadsheet of all types and properties;
- Change log, which provides a summary of all changes since the last release, including reference to the source (e.g., the NCCT issue) and the approval and authorization for each change; and
- NIEM schemas.

Once all RC changes are completed and approvals received, the final release package is prepared and the NIEM RC moved into production.

Other documentation, such as the *NIEM User Guide* and the *NIEM NDR*, will be updated as needed, based on changes to the model. These documents will be posted and distributed based on existing communication processes and procedures.

Each production release is packaged in a hierarchically organized directory structure and archived to a single compressed file. A production release is a set of artifacts, each of which has its own version number included in a release package that has a release version number, e.g., NIEM 1.0. This process ensures that when the release package is downloaded by a user and uncompressed, the set of schemas is categorized within directories such that imports and namespace references remain intact and correctly link local file locations. All NIEM production releases subsequent to version 1.0 will continue to be supported.

All previous versions of NIEM will always be available. Version information is built into the NIEM release namespaces so that the data component in one version is not confused with the same data component in another version. This means that stakeholders are not required to upgrade their IEPDs just because a new version of NIEM is released. Information technology (IT) managers will need to make that business decision along with other decisions required to reconcile their program timelines with other efforts external to them. Users of NIEM will not be required to upgrade to new versions of NIEM. They can continue to use their production versions

and make upgrade decisions based on their own timelines and not the NIEM release timelines.

5.4 NIEM Support Processes

A variety of NIEM support processes are necessary to manage the daily operations of the NIEM program. Many are associated with the engineering lifecycle such as the product-management process, configuration management, and quality-assurance processes. One of the key processes from the end user and stakeholder perspective is the issue-resolution process.

5.4.1 Issue Resolution

The issue-resolution process is initiated by a stakeholder contacting NIEM via the National Information Sharing Standards (NISS) help desk (described in more detail below). As depicted in the following figure, the NISS help desk is responsible for first researching all issues and questions as part of its Level 1 support process.¹² If help-desk staff are unable to address the issue to the complete satisfaction of the user, the issue is escalated to appropriate resource(s) depicted as the Level 2 organizations.

¹² The issue-resolution process was extracted from the National Information Sharing Standards Help Desk Concept of Operations document. A copy of this document can be obtained by contacting the IJIS Institute at staff@ijis.org

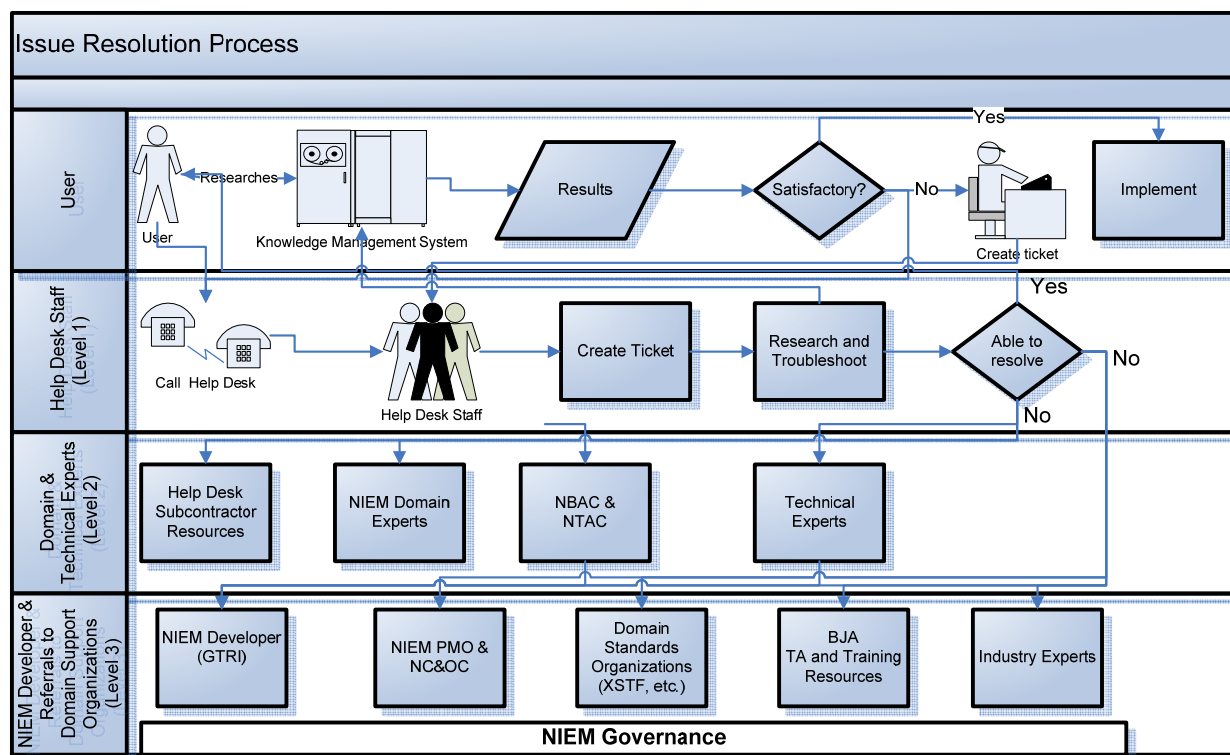


Figure 16: Issue Resolution Process

Level 2 resources will address a variety of inquiries and issues. For example, business issues, such as questions regarding the definition of specific data components or processes for enrolling a new domain in NIEM, will be addressed by the NBAC. Technical or structural issues, such as how to handle external standards or inheritance in the NIEM data model, will be addressed by the NTAC. Requests for communications materials and training are coordinated with the NC&OC. Inquiries and issues that are specific to a given NIEM domain are escalated to the point of contact identified by the NIEM domain participant. For example, some Justice domain issues might be escalated to SEARCH, the National Center for State Courts (NCSC), or Global resources.

If an issue cannot be addressed by Level 2 resources, the issue is escalated to Level 3. Organizations providing support at Level 3 include the NIEM development organization that will be responsible for implementing corrections to defects in the NIEM model or tools as well as implementing suggested enhancements. Other Level 3 organizations provide support using a referral process. For example, some issues may need a response in the form of training or technical assistance that will be provided by a

Bureau of Justice Assistance (BJA) grantee such as the IJIS Institute¹³. Other issues might be forwarded to the NIEM project management professional or the appropriate governance body for resolution. Additionally, each NIEM domain will likely have its own standards organization related to NIEM content. An example of this is the Justice domain's XML Structured Task Force (XSTF). Some issues will be referred to these domain-specific standards organizations.

5.4.2 Product Management and Dissemination

Development of NIEM tools and documentation is based on stakeholders' requirements to ensure they have the capabilities they need to have interoperable information exchanges. Stakeholder questions and issues are collected and evaluated by the NIEM governance committees and may be classified as new requirements. Other requirements may be identified via the NIEM staff members and governance bodies. Requirements are evaluated and, as appropriate, assigned as a specific work package.

The NIEM Communications and Outreach Committee (NC&OC) is responsible for recommending and implementing processes and procedures related to internal communications to ensure the proper checks and balances are in place prior to releasing documentation, training materials, or tools to the public. See the *NIEM Communications and Outreach Plan* for more detail on these processes and procedures. For example, a document such as this *NIEM ConOps* is developed through an iterative review process. The appropriate stakeholders, in conjunction with full-time NIEM staff, are assigned the responsibility for developing the document. They devise an outline and complete the first draft of the document. As part of this process, all tools and documentation go through the NIEM configuration management (CM) and quality-assurance (QA) processes, which ensure that requirements are satisfied within the release to which they were assigned. Tools and documentation are delivered to stakeholders via a variety of communication and collaboration mechanisms.

5.4.3 Configuration Management

NIEM is business-driven. It is essential to trace satisfaction of original requirements for tools, documents, and processes in NIEM through the CM and QA processes. CM provides the guidelines and administrative processes to assure that NIEM work products and documents are appropriately identified, changes are approved at levels commensurate with their impact, versions and revisions are identified, and

¹³ The IJIS Institute training and technical assistance services are described at: www.ijis.org

configuration baselines for all NIEM artifacts are maintained. Integrity of the NIEM products is ensured by institutionalizing defined and managed CM processes.

5.4.3.1 Configuration Management Planning

CM planning will document the context and environment for the various types of NIEM products and documents, such as:

- NIEM program-level artifacts (e.g., directives, policy, plans, and procedures);
- Standards, specifications, requirements, and other documents;
- NIEM model and data dictionary;
- IEPDs; and
- NIEM tools and their related documentation.

CM will define the methods and levels of emphasis to be applied to all NIEM releases. CM will be institutionalized by embedding CM guidelines and procedures as part of the business rules for the tools used in NIEM development and operation.

Each NIEM working entity (NIEM PMO, NBAC, NTAC, NC&OC, NIEM Development Team) will apply CM guidelines to ensure a common, consistent approach and methodology with appropriate oversight, management, and responsibilities. Performance measurements to assess the effectiveness of CM functions will be included in QA checklists at key points in the process.

5.4.3.2 Configuration Identification and Accounting

NIEM is and will continue to be an evolving set of products, including the NIEM data model, NIEM data dictionary, IEPDs, and an array of associated documentation. As the volume of information, tools, and software expands, it will become increasingly important to identify NIEM artifacts with a consistent identification and accounting protocol and to maintain the correct associations between the versions of the artifacts in the NIEM repository and the Web site.

NIEM configuration identification and accounting guidelines address:

- Assigning appropriate unique identifiers and the identification source (which make a specific identification unique);
- Providing date, version, and revision identifiers when the configuration changes;

- Capturing metadata reflecting attributes such as the responsible designer, the current change approval authority, and the custodian;
- Assigning release package (baseline) identification to the artifacts associated with each release, while verifying that requirements and design attributes are accurately reflected in the product definition;
- Systematically maintaining baselines that provide the known configuration from which future changes are to be addressed, while retaining prior configuration baselines related to prior operational implementation; and
- Providing secure controlled access to NIEM metadata and artifacts in NIEM reuse libraries and repositories, ensuring that the correct versions of artifacts for the intended use are made available to authorized end users.

5.4.3.3 Change Management

Baselines provide a stable basis for management of the continuing evolution of the NIEM configuration. As an integral component of NIEM governance, changes to baselines and the release of work products built from approved data components are systematically controlled and monitored using a structured process and a Configuration Control Board (CCB) constituted as a function of the NTAC. The CCB will evaluate and approve proposed changes.

Change management guidelines address:

- Establishing criteria for initiating a request for change and ensuring that changes add value;
- Documenting and uniquely identifying each request for change;
- Classifying requested changes into an appropriate category to aid in determining the appropriate level of review and approval;
- Identifying the appropriate change approval authority that can approve any change and commit resources for implementation;
- Ensuring that the decision maker is aware of the complete impact of the change by:
 - Assessing and evaluating technical, support, schedule, and cost impacts of a requested change before approval, implementation, or incorporation into the product and product information;
 - Coordinating impacts with the impacted stakeholders;

- Determining the effect (incorporation point, such as version, revision, and time frame) of a change so that the total impacts of the change can be quantified and scheduled;
- Implementing each approved change in accordance with the approved change information, and coordinating change implementation with impacted stakeholders before and during change implementation;
- Verifying implementation of a change to ensure consistency among the product, the product-configuration information, and all product-supporting elements; and
- Recording appropriate information in the change log for each release (see Section 5.3.3).

5.4.4 Quality Assurance

Quality assurance (QA) addresses the vision, structure, and process within the NIEM organization that will be used to assure NIEM product quality. Quality is largely determined by the quality of the process used to develop and maintain NIEM products.

5.4.4.1 NIEM Quality-Assurance Vision

The vision of NIEM quality is that all NIEM products and documents satisfy agreements; meet or exceed quality standards; comply with approved requirements, processes, and procedures; and are suitable for their intended use. Quality attributes include accuracy, clarity, consistency, coordination, accessibility, and security.

Quality is everybody's business. All NIEM functional activities and stakeholders share responsibility for the quality and effectiveness of NIEM. Oversight and management of the NIEM QA process falls within the purview of the NTAC and NEIM PMO. *Figure 17: Quality-Assurance Process* illustrates the QA vision and provides an overview of the QA process.

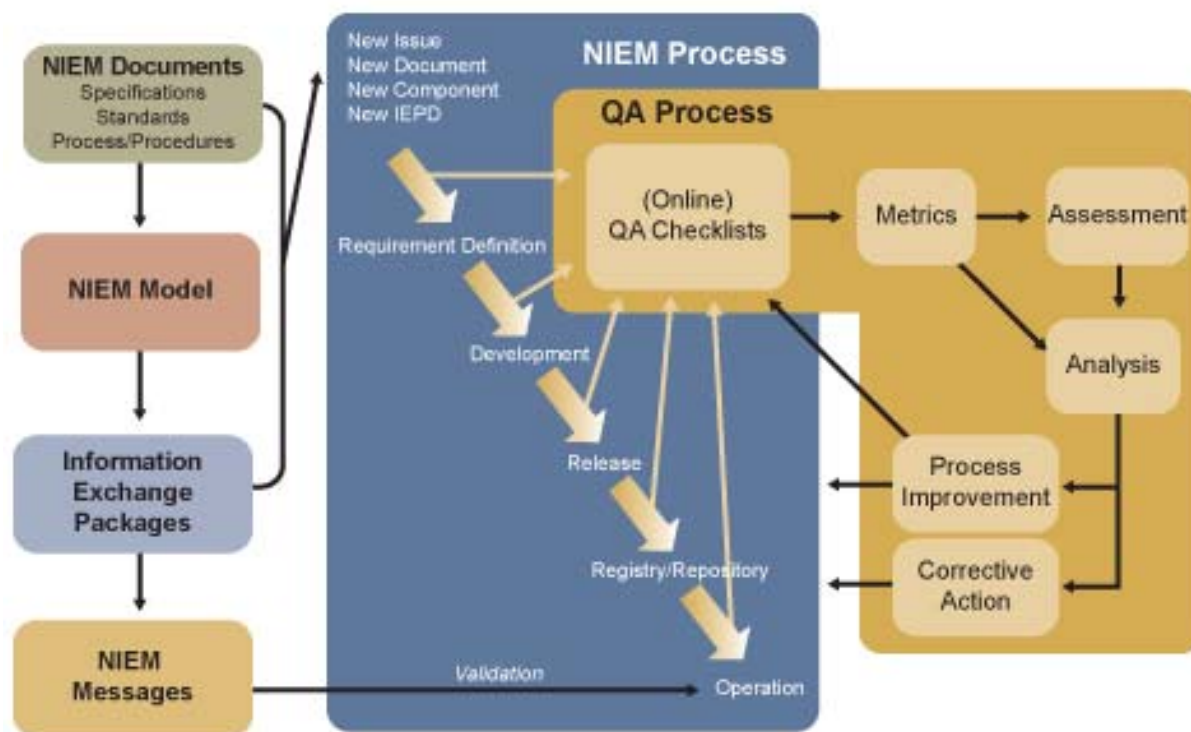


Figure 17: Quality-Assurance Process

As new or modified issues, documents, data components, or IEPDs are initiated, they go through the IEPD life cycle and data model maturity processes as described in this *ConOps*. These processes, as well as the development of NIEM documents (e.g., *IEPD Specification*, *NIEM User Guide*), generally include requirement definition, development, and release for operational use and are entered into libraries, registries, and repositories to facilitate reuse. The specific steps for each of the NIEM processes will be detailed in the *NIEM User Guide* and will include appropriate quality checklists built into the procedures.

Metadata consistent with quality checks collected at applicable points in the process includes metrics that are analyzed to identify necessary corrective actions and improvements to both the NIEM life cycle and quality processes. The metadata, when analyzed and distilled, may also provide records that support periodic quality reviews and audits as well as internal or third-party assessment of NIEM quality, when these become necessary.

5.4.4.2 NIEM Quality Documentation

NIEM QA documentation will include procedures and quality checklists to be included as part of the *NIEM User Guide*. Additionally, QA documentation will include problem reporting, analysis reports, corrective-action reports, and process-improvement recommendations.

5.4.5 Conflict Escalation

The NIEM governance structure provides the support needed in making decisions related to any conflicts that arise. Conflicts are different from issues because they are related to communication, governance, or program-related topics, in contrast to the level of detail tracked through the issue-resolution process. The conflict-escalation process may start at any level. Starting from the beginning of the process, a conflict is identified by program staff or a committee (e.g., NBAC or NTAC). If necessary, the conflict is then escalated to the appropriate committee chairperson, then to the PMO executive director, and ultimately to the ESC for resolution. At the highest level in the escalation process that a conflict attains, that individual or group is responsible for documenting the resolution and informing all involved parties.

6 TOOLS AND TRAINING

NIEM provides a reference set of tools freely available with each NIEM release. The tools implement all of the structural and content features of the release, including the *NIEM NDR*. NIEM's well-defined interfaces and output products also support the development of independent third-party tools.

NIEM provides training materials, such as briefings and process-related documentation, as well as other resources, such as the NISS help desk and knowledge base. Training provides the knowledge and know-how stakeholders need to use the tools and other capabilities provided by NIEM.

The NIEM tools and training opportunities are further described below. More information on the tools strategy will be found in the *NIEM User Guide*, and more information on training can be found in the *NIEM Communications and Outreach Plan*.

6.1 IEPD Development Tools

Figure 18: IEPD Development Tools shows how specific tools available through NIEM support the IEPD development life cycle. Each of the tools is further described below.

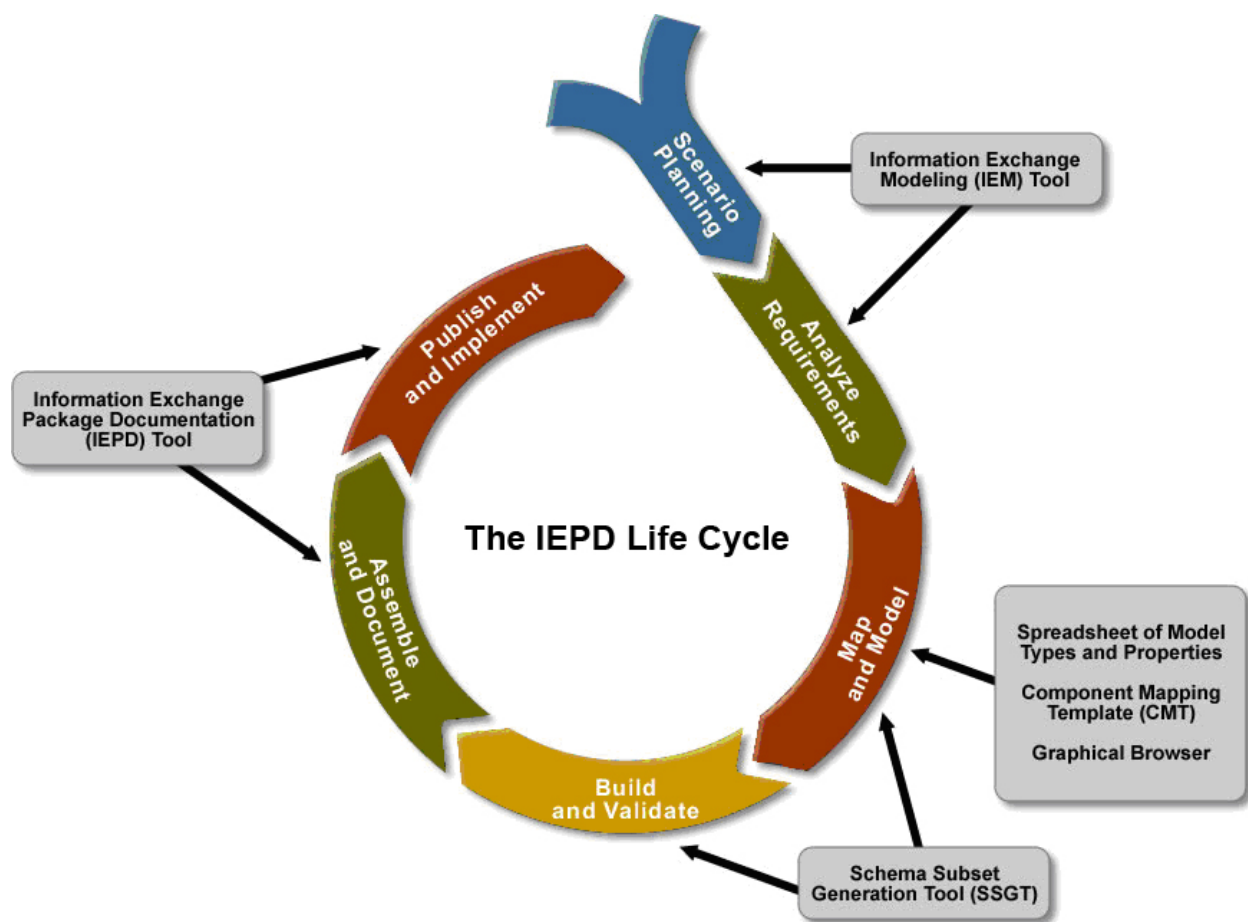


Figure 18: IEPD Development Tools

6.1.1 Information Exchange Modeling Tool

In building an exchange model, the IEPD developer can use an information exchange modeling (IEM) tool to map and model the precise nature and content of the exchange. The Justice Information Exchange Model (JIEM)¹⁴ is an example of a valuable tool that can be used for scenario-based planning and for information exchange mapping and modeling. Although initially developed to map and model information exchange throughout the Justice domain, JIEM is being revised to apply to other domains and for enterprise-wide exchanges. Moreover, JIEM is being extended to support the development of IEPDs more directly, as well as to expand functionality in scenario planning. JIEM documents the flow of information between agencies or domains by identifying key events and other exchange triggers that initiate the need to share information; identifying the agencies involved in the exchange; documenting the nature

¹⁴ JIEM is an application developed by SEARCH, The National Consortium for Justice Information and Statistics, funded by the Bureau of Justice Assistance, Office of Justice Programs, and U.S. Department of Justice. More information regarding this tool can be found at <http://www.search.org/programs/info/jiem.asp>

of business rules governing the exchange; and capturing detailed information regarding the actual information (i.e., the documents, data sets, and data elements) exchanged. JIEM can be used to map “as-is” exchanges as well as to model “to-be” information exchange requirements and the associated business context.

This kind of tool is used in the Scenario Planning and Analyze Requirements phases of the IEPD life cycle.

6.1.2 NIEM XML Data Dictionary Spreadsheet

The NIEM XML data dictionary spreadsheet is a tangible representation of the entire NIEM data dictionary. It includes all of the element names that are organized hierarchically under core data components (person, property, organization, etc.) with hyperlinks to related elements. This spreadsheet also provides information on the type of data being represented (date, integer, string, etc.) and a precise, context-rich definition of each dictionary component.

The XML data dictionary spreadsheet is used to search and identify specific terminology for constructing schemas for IEPDs. This tool is also used during the data harmonization process, when the NBAC and NTAC are reviewing COI proposal packages for integration of data components into NIEM.

The NIEM XML data dictionary spreadsheet is updated with each release of NIEM and is most often used in the Map and Model phase of the IEPD life cycle.

6.1.3 Component Mapping Template (CMT)

The CMT is a Microsoft Excel workbook that COIs currently use to facilitate and document the mapping of their data-component requirements for a particular business exchange or family of exchanges to data components currently resident in NIEM. It identifies and characterizes similarities and differences between NIEM and the COIs’ data-component requirements. Data-component mapping is one artifact required for an IEPD, as defined in the *IEPD Specification*. This tool is used in the Map and Model phase of the IEPD life cycle.

6.1.4 Schema Subset Generation Tool (SSGT)

The SSGT enables a user to select the elements and types required for a data exchange and to save or reload the selection in a “want list” file. The user can then generate a conformant schema subset of the full NIEM reference schema set using the saved want

list. All dependencies are automatically added to ensure that the resulting schema subset is valid. The user requirements can be saved and reloaded in a "want list" file. This tool is used in the Map and Model and Build and Validate phases of the IEPD life cycle.

6.1.5 IEPD Tool

The IEPD tool enables the user to upload or enter the artifacts required for an IEPD (schemas, documentation, and metadata) and assembles into a package according to the IEPD specification. It can also validate that minimum artifacts and metadata are present. The user creates an account and is granted a work space ("My IEPDs"). Inside this work space, the user can upload the artifacts to construct any number of IEPDs (complete or partial); share them with other account holders; or search, discover, and download IEPDs that other account holders have marked for sharing.

In the future, the SSGT and IEPD Library will become fully integrated. A user will also have the capability to generate extension and constraint schemas. Moreover, the tool will provide the ability to search and identify IEPDs based on business context. Users will be able to reuse IEPDs, extend them, and then republish them to the repository.

In addition, this tool will be extended to capture and track business usage context at the data-component level as well as at the IEPD level. IEPDs and data components will relate through their business context. This will enable the NIEM PMO to know how many IEPDs reuse a given data component, what data components are reused most and least often, what data components are extended most and least often, etc. Such metrics will be valuable in determining which data components need revision, which data components are of little use, new requirements, etc. This tool is most often used in the Build and Validate IEPDs phase of the IEPD life cycle.

6.1.6 Graphical Browser

The graphical browser is a Java-based graphical user interface (GUI) for browsing, navigating, and general familiarizing users with the structure of NIEM. Users may start from one of eight different locations in NIEM and three different views including the data model (properties and types), inheritance, and associations. The model is displayed as a set of nodes and edges corresponding to entities and fundamental data-modeling relationships between them such as a "parent of" (is-a), "contains" (has-a) and a "type of."

6.2 Process and Management Tools

These tools provide internal and external communication mechanisms, collaboration work spaces, and issue-tracking mechanisms.

6.2.1 Component Organization and Registration Environment (CORE)

[CORE.gov](http://core.gov) serves as an internal collaboration and knowledge-sharing environment for NIEM governance bodies, such as the NBAC and NTAC, to review and discuss documentation and issues prior to release as a part of the Conduct Data Harmonization and Promotion phase of the IEPD life cycle. Communities exist on CORE.gov for each of the governance bodies that need to share information about NIEM. The communities are permissions-based; only stakeholders with proper permissions are allowed to gain access to a community. Communities can be nested within each other, which allows communities to have subcommunities. Communities are also provided work spaces where they can post work in progress (WIP). This allows communities to work on their deliverables within their work spaces without publishing them for public review. Moreover, communities have the option of having discussion threads, which capture a discussion's history. Discussion threads address such topics as edits to a document or action items assigned to the community.¹⁵

6.2.2 NIEM.gov

The NIEM Web site serves as a primary means by which NIEM can provide the latest documentation and downloads to those interested in NIEM. It also serves as a starting point for those wishing to contact NIEM staff with questions, support, and information requests. As related projects, tools, and support resources develop around NIEM, the Web site will expand as the hub for these supplemental resources.

6.2.3 NIEM Configuration Control Tool (NCCT)

This tool serves as the current technical issue-tracking tool for NIEM in which issues are reviewed and discussed by members of the NTAC and NBAC and assigned to specific work packages to track and monitor them through final resolution. All technical issues and proposed engineering changes are tracked through the entire life cycle and are archived through this tool. Issues are prioritized, marked for criticality, and assigned to be addressed in specific NIEM releases or patches. The approved changes are then verified through the CM and QA processes. Use of the NCCT provides clear

¹⁵ CORE.gov can be accessed at <https://collab.core.gov/CommunityBrowser.aspx>

traceability and accountability for change management of NIEM data components and associated releases through the governance processes.

6.3 Training and Technical Assistance Tools

6.3.1 National Information Sharing Standards (NISS) Help Desk

NIEM has established the National Information Sharing Standards (NISS) help desk¹⁶ to serve as the entry point for stakeholder questions and issues. The help desk assists users in finding answers to their technical questions regarding the content, principles, and best practices for using NIEM. The help desk is the primary source for the practitioner and solution-provider communities for NIEM practice knowledge. The practitioner community includes all COI practitioners who reside in local, state, tribal, and federal government agencies. The solution-provider community includes all firms engaged in the definition, design, development, deployment, and support of systems used by the practitioner community.¹⁷

The National Information Sharing Standards help desk consists of an online knowledge base, which is available 24/7, and live technical support staff who are available from 9:00 a.m. to 8:00 p.m. (EST) Monday–Friday, excluding federal holidays.

The primary service of the help desk will be the management of knowledge that relates to NIEM. Knowledge management will consist of the following three components, which are described in the following sections:

- Knowledge Database and FAQs
- Knowledge Research and Support
- Inquiry Database (Ticketing System)

6.3.1.1 Knowledge Base and Frequently Asked Questions (FAQs)

At the heart of the help desk is a knowledge database (KDB), which is a unique physical repository. The KDB contains a variety of information in a variety of formats. The most commonly received questions are posted on the help-desk knowledge base. This

¹⁶ The help desk can be accessed at <http://www.niem.gov/contact.php>

¹⁷ The help-desk tool information was extracted from the National Information Sharing Standards Help Desk Concept of Operations document. A copy of this document can be obtained by contacting the IJIS Institute at staff@ijis.org

approach provides stakeholders the answers they need quickly. Some of the sources for the KDB are:

- NIEM reference documents and supporting materials;
- NIEM training materials;
- Georgia Technical Research Institute (GTRI) NIEM fact sheets;
- Responses from prior questions submitted to the help desk;
- Solutions to NIEM issues escalated to Levels 2 and 3;
- Published materials from domain-standards organizations, such as the XSTF, NIEM Business Architecture Committee (NBAC), NIEM Technical Architecture Committee, and NIEM tiger teams, as well as IJIS Institute Technology assistance reports¹⁸, related OASIS materials, and other material on the topic of NIEM that will be identified in the future; and
- Designated listservs serving the NIEM community.

6.3.1.2 Knowledge Research and Support

Help-desk staff members will be responsible for providing online support via the Internet and e-mail as well as real-time telephone support. Help-desk staff will conduct initial research on all issues and questions submitted and will return a written response within the parameters of established service-level goals. It is expected that the majority of the help desk's written responses will reference answers or documents already in the KDB that the user could have accessed but did not. When the help-desk staff believes that a full and complete response has been provided, they will contact the individual by e-mail and, as appropriate or needed, by telephone. Answers will be resolved to the satisfaction of the inquirer. If the inquirer is not satisfied, the help desk will follow issue-resolution procedures described in Section 5.4.1.

6.3.1.3 Inquiry Database (Ticketing System)

The inquiry database will be used to support the internal workflow and metrics of help-desk operations. Data fields for open calls, actions taken, escalation to Level 2 or Level 3, closing disposition, and a variety of information such as support-staff identification, date, and time stamps, as well as quality control, have been established. This database will be used as the repository for open calls that have not yet been posted

¹⁸ IJIS Institute Technology assistance reports can be found at: www.ijis.org

to the KDB. It will be the staging area for closed calls that have not been reviewed, scrubbed, and made ready for the KDB. This database will provide quality assurance and performance metric information to support a variety of management reports such as call volume by date and time, and number of open, escalated, and closed calls.

6.3.2 Technical Assistance

The NC&OC will help address specific questions or implementation needs in the field with respect to NIEM exchange development or participation. Technical assistance will help guide organizations through the IEPD process and recommend strategies for partnering with similar efforts.

6.3.3 Training and Conferences

NIEM is a continually evolving program, and new agencies and COIs are joining the effort all the time. As new stakeholders come on board, they need to receive information to gain understanding and knowledge of the core capabilities of NIEM and how to engage in NIEM information exchanges. It is the responsibility of the NC&OC to identify and coordinate the response to this need, including the planning of periodic training workshops and seminars. Some educational materials, such as the *Introduction to NIEM* and *FAQs*, are available on NIEM.gov. Other training materials, such as executive briefings, marketing material, and briefings for conferences and workshops, are tailored depending on the audience.

NIEM staff will participate in relevant industry conferences and workshops such as the annual Users' Conference. The purpose of these events is to share NIEM status, accomplishments, and objectives, as well as to find and encourage new agencies, COIs, and stakeholders to participate in NIEM.

APPENDIX A: NIEM MODELING AND SCHEMA CONCEPTS

The NIEM technical modeling and schema concepts and mechanisms which support building new data components that meet specific requirements and reusing existing NIEM data components are briefly described below. More detail will be found in the *NIEM User Guide* and the *NIEM NDR*.

Data Elements, Classes, Types, and Properties: The NIEM data model uses concepts originating from object-oriented programming (OOP). OOP defines a class as a specific entity in the data model, which may represent a real-world object but may also represent any conceptual object, such as relationships and messages. An object's properties are said to describe the object. When the NIEM XML Schemas are generated from the NIEM data model, data-model classes are represented as XML Schema types, and data-model properties are represented as XML elements and attributes. The XML elements are the fundamental building blocks of XML Schemas and documents. They are composed of a start tag, content, and end tag and can contain other elements or text data. XML attributes are specific characteristics (properties) of an element. They may take the form of content or may describe a relationship between two elements.

Specialization with Inheritance: Specialization is used when a base object class (type) contains or can be subcategorized into a more specific subclass. When this can be done, the subclass derived from the base class inherits the properties of the more general base or parent class. This mechanism is used to share or reuse properties between the general data component and its specialization. For example, a vehicle type (or class) is identified as a data component with properties of vehicle identification number (VIN), make, and model. Truck type (or class) is a specialization of vehicle and thus inherits the vehicle's properties but also has its own characteristic properties, such as truck bed length. Specialization is time independent and is generally used only when the base class and subclass always exist.

Roles: A role is a special type which represents a particular function, purpose, context, or activity for an entity. Roles are generally time-dependent and, therefore, temporary. A new type can be created for a role when the role has specific data associated with it and its own life cycle. A role type has a property, *role-of*, which indicates what object is assuming this role. A single entity may assume multiple roles. For example, many different entities may assume the role of a weapon. Therefore, if a vehicle is used as a weapon (to attempt to injure or kill a person), then an instance of *Weapon Type* would contain the property, *role-of*, which references (links to) the vehicle instance used as the weapon. The *Weapon Type* (the role) might also contain properties that describe the persons and activities involved, dates and times of involvement, and how the entity was used as a weapon.

Associations: An association type is an object that represents a relationship between data components. For example, two person-type instances, Abigail and Bob, could be referenced by a *MarriageAssociationType* to represent the fact they are married. The *MarriageAssociationType* could contain its own properties, such as date of marriage, number of children, date of divorce, death of one spouse, etc.

Augmentation: An augmentation is the addition of domain or model-specific information about a type. One method for adding properties to an object (type) is specialization—deriving a special subclass of a base-class object. However, specialization should be applied only when a real-world subclass of the base class actually exists. Otherwise, it can create new objects and properties that are difficult to reuse (especially across domains). Rather than specialization, properties may be added to types through type augmentation. This maximizes the reuse of both the augmenting properties as well as the augmented type and avoids the limitations caused by inappropriate use of specialization. Furthermore, it simplifies the process of applying data from multiple domains to NIEM data components. In type augmentation, no new entity or subclass is derived. Instead a well-defined container of data properties is simply added to supplement an existing type.

Metadata: Metadata, or data about data, defines information that supports the actual content of XML instances. The metadata feature provides a mechanism for attaching structured properties that describe the pedigree or source (when reported, who reported, how reliable, etc.) of instance data to any data component of the model (type or object, property, association, role, or augmentation) in any namespace. It allows sets of metadata to be extended with additional properties for local requirements and enables metadata properties to be repeated.

Security: NIEM provides two constructs that can be used for identifying data components whose values require special treatment or limited access. The first is a `DocumentType` object, which contains a set of properties borrowed from early Intelligence Community Metadata Working Group (ICMWG) specifications. Information objects can be derived from `DocumentType` and will inherit these properties for use in tagging at the documentation level. For more granular requirements when specific data must be identified, NIEM provides a flexible metadata construct that allows the user to build custom metadata for a single data component of any size. For example, if the last name of a person is classified, it can be tagged as such using the metadata construct.

APPENDIX B: SAMPLE SCENARIO

Below is a sample operational scenario in which specific information exchanges are identified. Information exchanges embedded in this scenario are identified in **bold**.¹⁹ In addition, the process of modeling critical elements of the exchanges is demonstrated using the Justice Information Exchange Modeling tool (JIEM). It is anticipated that developers will fully elaborate operational scenarios requiring information sharing among NIEM domains and related COIs and that subsequently they will conduct detailed modeling of specific information exchanges in order to identify operational requirements and information exchange data components. Once these data components are clearly articulated, developers will thereafter map the components and resulting IEPDs to NIEM to discover and reuse content or propose new content to the NIEM model. For illustrative purposes, only the first two exchanges (below) are specifically called out for demonstration.

Sample Emergency Response Scenario²⁰

The 911 Emergency Operations Center (EOC) of a mid-sized urban jurisdiction begins receiving telephone calls from residents regarding what is variously described as a fire, an explosion, and a partial building collapse of a 25-story building in the city center. The calls, which quickly escalate in number and urgency, are received from residents of the affected office building, local residents of other nearby buildings, and pedestrians and passing motorists using cellular telephones.

The EOC dispatches police, fire units, and emergency medical personnel. The cause of the damage and the fire, as well as the extent of the damage and scope of the emergency, takes time to establish. **First responders arriving on scene begin reporting to the EOC on the nature and scope of the damage,** which is extensive and may well result in a catastrophic collapse of the entire building and potentially extensive damage to surrounding buildings. Initial on-scene units find the aftermath of a significant

¹⁹ Note: Some of the exchanges identified in this sample scenario are complex, multi-agency exchanges and would, for analytic purposes, need to be broken out separately to identify the specific agencies involved, conditions surrounding the exchange, and the precise data shared in these discrete exchanges. Additional exchanges may also be identified throughout this scenario beyond those identified here for illustrative purposes.

²⁰ Note: Portions of this scenario have been adapted from *NIMS Basic Communication and Information Management*, FEMA 501-5, March 29, 2006, Revision D, and *MESA TS 70.001 v. 3.1.2 (2005-01), Project MESA; Service Specification Group—Services and Applications; Statement of Requirement*, Annex C and Annex D, at http://www.projectmesa.org/ftp/Specifications/MESA_70.001_V3.1.2_SoR.doc

explosion with several ongoing fires and many “walking wounded” wandering throughout the incident scene.

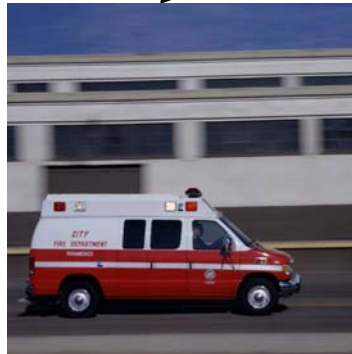
Police and fire units initiate a command post across the street from the incident location. Police units establish a critical perimeter for public safety entry only and begin initiation of a secondary perimeter using geographic information system (GIS) mapping. Emergency Medical Services (EMS) personnel set up an initial triage contiguous to the police and fire command post. **Initially injured persons are assessed, and information is forwarded to area hospitals via devices that track hospital capacities, services available, and patient transports.**

Real-time video feeds are transmitted from the scene to the command post. Personnel location technology is in use providing 2D/3D location and biotelemetry of fire and police personnel to their command staffs, as well as monitoring of immediate air quality in proximity to the explosion site. Upon completion of the first search, the scene is declared unsafe and messages are sent to all on-scene personnel to remain outside the critical perimeter until the scene is cleared by the bomb squad. The media is kept informed of progress, as appropriate.

The scenario above describes in narrative form an operational situation, business context, legislative, judicial or executive mandate, or other circumstance which includes multiple information exchanges. From this scenario the individual and discrete information exchanges are identified for subsequent analysis.



***Exchange 1:
The EOC dispatches police, fire
units, and emergency medical
personnel.***



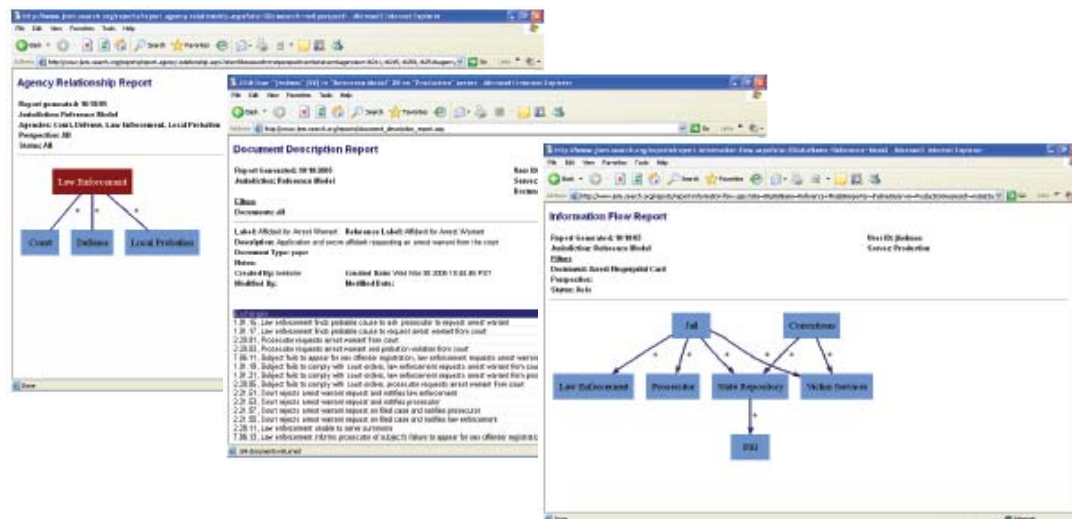
***Exchange 2:
First responders arriving on scene begin reporting to the
EOC on the nature and scope of the damage.***



Once the individual, discrete exchanges are identified, they can be modeled and mapped using an information exchange modeling tool, such as JIEM. JIEM captures detailed information regarding a) the event or situation triggering the exchange of information, b) the agencies or organizations involved in the exchange, c) the conditions (i.e., business rules) surrounding the exchange, and d) the actual information exchanged. This information is captured in the JIEM tool for analysis and review.



This detailed analysis of all dimensions of the information exchange can then be analyzed, graphically displayed, and mapped to NIEM to discover and reuse NIEM *universal* and *common* core data components and IEPDs.



APPENDIX C: TERMS AND DEFINITIONS

The following list is a subset of key terms and their definitions, which are necessary to understand the core concepts discussed in this document. The complete NIEM Terms and Definitions can be found on www.NIEM.gov.

Association: A NIEM construct that represents a relationship among two or more objects. A type, named for the kind of relationship it represents, links multiple objects under specific contexts and may contain properties that are characteristics of the relationship. This allows preservation of the object-oriented design principles of the data model, while allowing more granular specificity of meaning when two or more data objects are related.

Augmentation (or Type Augmentation): A NIEM technique that enables the reuse of type extensions that occur within particular domains for use elsewhere. Type augmentation avoids the need to create new specialized entities and duplicate type extensions that could not have been reused. Instead, the technique simply supplements an existing type with a reusable set of properties required for a given context.

Business Context: A common frame of reference across business areas or domains allowing organizations to share information with specific goals or scenarios in mind.

Business Scenarios: Real-world scenarios that are used to describe or justify a use case for a certain business model.

Code Table (or Code List): A set of related data values and their definitions (or literals) that are valid for a given NIEM property represented as an enumerated type (i.e., coded). In NIEM, a code table is in its own target namespaces and can be internal or external. More formally, a code table or list is an XML Schema type definition that restricts `xsd:string` or `xsd:token` to an `xsd:enumeration` of a fixed, finite set of values; or any type derived from such a type. An XML Schema enumerated element is defined by its code table (i.e., its type definition).

Common Data Component: Data components used in exchanges between two or more domains, but not universally shared.

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.

Component Mapping Template (CMT): The tool of choice for mapping data components used by organizations or domains that are being compared with those that currently exist in NIEM to identify overlap or gaps between the two.

Configuration Management (CM): The guidelines and administrative process to ensure that NIEM work products and documents are appropriately identified, changes are approved at levels commensurate with their impacts, versions and revisions are identified, and configuration baselines for all NIEM artifacts are maintained.

Constraint Schema: An XML Schema that further restricts or constrains instance content specified in the corresponding subset schema.

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.

CORE.gov: Online collaboration tool used by the NIEM governance groups to facilitate internal communications.

Data: Facts represented in a readable language (such as numbers, characters, images, or other methods of recording) on a durable medium. Data on their own carry no meaning. Empirical data are facts originating in or based on observations or experiences. A database is a store of data concerning a particular domain. Data in a database may be less structured or have weaker semantics (built-in meaning) than knowledge in a knowledge base. Compare data with *Information*.

Data Component: Basic business data items that represent real-world objects and concepts. Information that is exchanged between agencies can be broken down into individual data components—for example, information about people, places, material things, and events.

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 Exchange: Fixed, recurring transactions between parties, such as the regular exchange of environment testing data among federal, state, local, and tribal entities.

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 Promotion: The identification of data components that are semantically agreed upon between NIEM domains, or among all NIEM domains, and are reclassified in a higher-level namespace such as *common* or *universal*.

Data Standard: 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.

Discovery: The act of locating a machine-processable description of a Web service-related resource that may have been previously unknown and that meets certain functional criteria. It involves matching a set of functional and other criteria with a set of resource descriptions. For NIEM, discovery normally refers to the search for IEPDs and data components within a repository that can be reused in IEPD development.

Document Schema: A schema within an IEPD that has been established for the purpose of defining the actual content model of an information exchange. The document schema works in conjunction with the subset, extension, and constraint schemas to form a complete package that represents the exchange. This is a more specific term for *exchange schema*.

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.

Domain-Specific Components: A data component that meets technical standards, complies with NIEM requirements, and is specific to only one domain, which is managed and harmonized by a COI.

Element: The fundamental building block of an XML document. XML elements can contain other elements or content. XML elements are composed of a start tag, content, and end tag and may include attributes.

Enterprise: A business association consisting of a recognized set of interacting business functions, able to operate as an independent entity.

Exchange Mapping: The process of comparing desired exchange content with the exchange specifications in order to ensure semantic compatibility prior to information exchange.

Exchange Model: A reference to the National Information Exchange Model as a provider of exchange modeling standards and best practices.

Extensible Markup Language (XML): XML is a structured language for describing information being sent electronically from one entity to another. XML Schema defines the rules and constraints for the characteristics of the data, such as structure, relationships, allowable values, and data types.

Exchange Schema: The XML Schema that describes the document or set of data to be exchanged. This is a more general term for a document schema.

Exchange Specification: Any details describing the exchange, including schemas, business rules, and more. This term often describes the contents of an information exchange package documentation (IEPD).

Extension Schema: An XML Schema that defines data elements that are to be used in an exchange but do not exist in the NIEM model, which therefore must be extended.

External Standard: A standard with a governing body outside the scope of NIEM whose products must be used in conjunction with NIEM in exchanges.

Framework: In software development, a framework is a defined support structure in which another software project can be organized and developed. A framework may include support programs, code libraries, a scripting language, or other software to help develop and glue together the different components of a software project.

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.

Governance: The system and manner of providing authority and control.

Information: Contextual meaning associated with, or derived from, data.

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.

Information Sharing: The broad concept of sharing information between agencies or organizations that do not inherently have access to such information. The need for robust nationwide information sharing is the guiding principle of the NIEM program.

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.

Justice Information Exchange Model (JIEM): An online tool to enable scenario planning and to collect both “as-is” and “to-be” requirements from users for information sharing. It documents the triggering event, the agencies involved, the business context, and the actual content of information exchanges.

Message: The basic unit of communication between a requester and a provider. It should encompass an XML message instance defined by an IEPD relevant to the message exchange.

Metadata: Structured data about data. Metadata includes data associated with either an information system or an information object for purposes of description, administration, legal requirements, technical functionality, use and usage, and preservation.

Namespace: A collection of names, used in XML documents as element types²¹ and attribute names,²² that is identified by a prefix linked to a URI reference. Using XML namespaces alleviates naming conflicts in XML that arise when XML elements and attributes from different sources use identical names.

Naming and Design Rules (NDR): The NIEM NDR includes rules and principles that are intended to establish and, more importantly, enforce a degree of standardization at the national level.

NIEM Configuration and Control Tool (NCCT): The primary tool used for inserting and tracking technical and business issues with the NIEM data model and to help the Program Management Office in prioritizing input from the stakeholder community.

NIEM Participating Parties: Organizations that have signed the Memorandum of Understanding for the National Information Exchange Model (NIEM). Participating parties include ODNI, DHS, DOJ, and Global. Other organizations will become participating parties as described in the MOU.

Quality Assurance(QA): A process by which the quality of design and performance of a system or data is tested and verified prior to implementation.

Repository: An information system used to store and access information, schemas, stylesheets, controlled vocabularies, dictionaries, and other work products. It would normally be discovered via a registry.

Role: An independently valid context-specific specialization that enhances the desired contextual meaning of a data component in a data exchange. For example, a person data component could take on the role of a law enforcement official, a witness, or a plaintiff. By utilizing a role methodology, the object-oriented nature of the model can be preserved, while allowing explicit customization that does not depend on object inheritance.

²¹ <http://www.w3.org/TR/REC-xml#dt-stag>

²² <http://www.w3.org/TR/REC-xml#dt-attname>

Scenario-Based Planning: A process of planning and identifying data exchanges by analyzing a business process and describing information exchanges using business use-case scenarios to justify the need for those exchanges.

Schema Subset Generation Tool (SSGT): The preferred tool used to generate schema subsets from the NIEM data model without needing to edit the model schema itself. Subsets are saved and shared via the want-list mechanism.

Stakeholder: A person or organization that has a legitimate interest in a project or entity; anyone with an interest (or stake) in what the entity does.

Subset Schema: A subset of the primary NIEM reference schema, whose data components are taken entirely from the parent schema while excluding those data components that are unnecessary for a given exchange.

Type: A description of a class of objects that share the same operations, abstract attributes and relationships, and semantics. The operations aspect of a type is a programming concept related to methods and is, therefore, not applicable in NIEM, which uses only the data aspects.

Type Extension: A description of a class of objects that share the same operations, abstract attributes and relationships, and semantics. The operations aspect of a type extension is a programming concept related to methods and is, therefore, not applicable in NIEM, which uses only the data aspects.

Universal Component: A data component that meets technical standards, complies with NIEM requirements, is defined in universally acceptable terms across all participating domains, and is reusable.

Use Case: A business process example used as a basis for exchange modeling, whose description includes an information flow. See also Scenario Based Planning.

Want List: A portable construct used in the SSGT to save and reuse schema subsets of the overall NIEM data model. A want list can be saved or loaded directly from the SSGT tool. A want list is an XML instance that specifies the NIEM data components required (and therefore selected) by the user for the subset schema he/she is building. It does not include NIEM data components the user-selected set depends on.

XML Instance: An XML document that contains actual data and whose format and inclusion is specified and validated by an associated XML Schema.

XML Schema: Defines the vocabulary (elements and attributes), the content model (structure, element nesting, and text content), and data types (value constraints) of a class of XML documents. Note: When written with a capital S, the term refers specifically to the XML Schema Definition (XSD or WXS) language developed by the W3C. However, when written with a lowercase s, the meaning is more generic, referring to any of several schema languages for use with XML, such as DTDs, RELAX NG, Schematron, etc. In both cases, an XML Schema is used to validate XML instances, to verify that the instances conform to the model that the schema describes.

APPENDIX D: ACRONYMS

AIC: Architecture and Infrastructure Committee
BRM: Business Reference Model
CCB: Configuration Control Board
CIO: Chief Information Officer
CIS: Central Index System
CM: Configuration Management
CMT: Component Mapping Template
COI: Community of Interest
ConOps: Concept of Operations
CORE.gov: Component Organization and Registration Environment
DAS: Data Architecture Subcommittee
DHS: U.S. Department of Homeland Security
DMM: Data Model Maturity
DOJ: U.S. Department of Justice
DON: Department of the Navy
DRM: Data Reference Model
ebXML: Electronic Business XML
EMS: Emergency Medical Services
EOC: Emergency Operations Center
ESC: Executive Steering Committee
FAQs: Frequently Asked Questions
FEA: Federal Enterprise Architecture
GIS: Geographical Information System
Global JXDM: Global Justice XML Data Model
GUI: Graphical User Interface
ICE: Immigration and Customs Enforcement
ICMWG: Intelligence Community Metadata Working Group
IEM: Information Exchange Modeling
IEP: Information Exchange Package
IEPD: Information Exchange Package Documentation
IRS: Internal Revenue Service
ISO: International Standards Organization
IT: Information Technology
JIEM: Justice Information Exchange Model
JMIE: Joint Maritime Information Element
JTTF: Joint Terrorism Task Force
LoB: Line of Business

MOU: Memorandum of Understanding
NBAC: NIEM Business Architecture Committee
NCCT: NIEM Configuration Control Tool
NC&OC: NIEM Communications and Outreach Committee
N-DEx: National Data Exchange
NDR: Naming and Design Rules
NIEM: National Information Exchange Model
NIST: National Institute of Science and Technology
NTAC: NIEM Technical Architecture Committee
OOP: Object-Oriented Programming
OWL: Web Ontology Language
PMO: Program Management Office
QA: Quality Assurance
QOD: Quality of Design
RC: Release Candidate
RDF: Resource Definition Framework
ROI: Return on Investment
SitReps: Situation Reports
SME: Subject-Matter Expert
SSAN: Social Security Account Number
SSGT: Schema Subset Generation Tool
TECS: Treasury Enforcement Communications System
U.S.: United States
VIN: Vehicle Identification Number
W3C: World Wide Web Consortium
WIP: Work in Progress
XML: Extensible Markup Language
XSTF: XML Standards Taskforce
XSL: XML Stylesheet Language
XSIWG: XML Schema Interoperability Working Group

The background is a solid teal color. On the left side, there are faint, white, hand-drawn geometric patterns. These include a series of parallel lines forming a grid-like structure, and several overlapping circles and arcs, some of which are dashed. The patterns appear to be technical or architectural sketches.

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