



NATIONAL INFORMATION EXCHANGE MODEL

Annual Report

2020





2020 Annual Report

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Executive Summary

NIEM celebrated its fifteenth anniversary in 2020. Despite the COVID-19 crisis, NIEM was able to extend its reach – enabling secure, scalable, enterprise-level data interoperability across diverse, complex systems and organizations. Extensive, multi-year efforts were successfully completed, notably, the major NIEM 5.0 Release. This was accomplished with the significant amount of direct NIEM user-community involvement throughout development. A 2020 milestone was the creation and launch of the Defense Acquisition University's *Introduction to NIEM* courseware.

The NIEM Business Architecture Committee (NBAC) had a most productive 2020. This included the substantive work of the Registry and Repositories Tiger Team, supporting NIEM's exploration of becoming a formal standard, work in attracting organizations to implement NIEM, and encouraging the standup of new domains and communities of interest. The Emerging Technology Tiger Team is working to identify a NIEM pilot opportunity in 2021. The State, Local, Tribal and Territorial Tiger Team was established to increase user participation and representation. NBAC's 2020 Annual Meeting was held virtually over four days, many with featured speakers. In 2021, NBAC objectives include continuing the work of the Tiger Teams, initiating a mentorship program, evaluating NIEM tools under development, and advancing NIEM adoption.

The NIEM Technical Architecture Committee's (NTAC) 2020 highlights focused on satisfying important operational needs. It is committed to supporting all phases of the NIEM lifecycle with free and open-source software. NTAC successfully developed the NIEM JSON specification establishing conformance targets for JSON data. A proof-of-concept prototype converting a NIEM-conforming XML document into the equivalent NIEM JSON or NIEM RDF data was completed. NTAC established guidelines for NIEM's internationalization with goals to impact both tools and specifications. NTAC continues development of a technology-neutral representation for NIEM models using the Common Model Format (CMF) and metamodel development.

The Best of NIEM awards were launched in 2009. In 2020, we recognized NIEM implementation projects with noteworthy contributions to the use, growth, and adoption of NIEM. These projects illustrate NIEM's enabling solutions to real-world problems at the local, statewide, national, and international levels – representing NIEM's diversity – across domains, agencies, and all levels of government and the private sector.

Key NIEM initiatives begun late in 2019 and 2020 are expected to be completed in 2021, including NIEM.gov website enhancements and migration to the Drupal 8 Content Management System, the IEPD Registry and Repositories, and implementation of the Jira Service Desk™ issue management software. The IEPD Lifecycle Development Process is being automated by re-engineering the NIEM tool landscape. The process of assessing whether NIEM seek to become an accredited standard is going forward, with a self-assessment of governance documents and procedures completed.

Despite 2020's unparalleled disruptions, NIEM expanded and strengthened its reach and support of enterprise-level information exchanges with significant accomplishments and progress towards long-term goals. NIEM is committed to supporting an ambitious Work Plan for 2021 and beyond.



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Introduction

The exercise of preparing an annual report provides the opportunity to reflect on the past year's challenges and accomplishments and allows a focus on the future and NIEM's way ahead.

COVID-19 was a major disruptor across all of society in 2020. It consumed resources, dramatically altering business practices, operations, and priorities. Novel work environments, interruption of travel, and a shifting reliance on virtual meetings and communications to maintain routine operations was the norm. While anecdotal, our Department of Homeland Security (DHS) partners – representing stewardship of seven of the fifteen NIEM Domains and leading the Emerging Technology Tiger Team – reported that COVID-19 consumed essentially all focus and resources from March through the balance of 2020.

Despite this unparalleled disruption, NIEM was able to expand and strengthen its reach and support of enterprise-level information exchanges. All NIEM's Executive Steering Council (ESC) meetings, Annual Meetings, and all outreach and engagement activities were conducted virtually in 2020. NIEM leadership remained focused on the NIEM mission, purpose, and enterprise. The NIEM Management Office (NMO) is resourced to support an ambitious Work Plan for 2021 and beyond.

The Executive Steering Council (ESC) is NIEM's decision-making body regarding membership, funding requirements, program, and technical direction, and other organization decisions. The U.S. Department of Defense (DoD) is currently the ESC's steward. NIEM's primary sponsors and ESC members include the DoD, US Department of Homeland Security (DHS), U.S. Department of Justice (DOJ), and the U.S. Health and Human Services (HHS). In September, NIEM's executive sponsorship transitioned from the ESC Chair, Mr. Peter Ranks (DoD Chief Information Officer) to Mr. David Spirk (DoD Chief Data Officer).

NIEM identified over ten organizations with the potential to become Domains, Communities of Interest (COIs), and/or NIEM adopters during 2020. NIEM internationalization has seen a renaissance in planned activities and products.

A strong, positive indicator of NIEM's health and potential is the high level of participation and enthusiasm associated with 2020's "Best of NIEM" award submissions. The NIEM Technical Architecture Committee (NTAC) and NIEM Business Architecture Committee (NBAC) pursued work plans with only minor interruption. Most recently, the NMO implemented Jira Service Desk™ issue management software internally to make the tracking and resolution of user issues more efficient and effective.

Two major NIEM initiatives were completed in 2020:

- Major NIEM's 5.0 Release
- NIEM courseware for the Defense Acquisition University.

Three major initiatives started in 2020 which are anticipated to be complete in 2021:

- NIEM IEPD Registry and Repositories
- NIEM Tools Development
- NIEM.gov migration to the Drupal 8 Content Management System (CMS).

This report provides a comprehensive review of NIEM, addressing NIEM's 2021 work plan and goals, as well as providing details of 2020 activities. In year's past, the annual report focused on NBAC's equities.

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NIEM's Way Ahead

The NMO executes the ESC's vision for NIEM, managing day-to-day operations, encouraging the adoption and use of NIEM, and overseeing all working group and committee activities. The NMO coordinates with NIEM domains, Communities of Interest (COIs), principal stakeholders, and other information-sharing initiatives to promote collaboration and interest in NIEM priorities.

NMO Executive Director's Perspective



Stuart Whitehead, SES

Mr. Stuart Whitehead, SES (Deputy Director, Cyber & Command, Control, Communications & Computers Integration, Joint Staff J6 and NMO's Executive Director) provided his executive perspective on NIEM's future path at September's ESC meeting and at the NBAC Annual Meeting.

While the ESC and NBAC are distinct audiences, they share a vested interest in NIEM's ongoing growth. With respect to the many challenges we face, Mr. Whitehead provided each audience with a similar executive viewpoint on NIEM's accomplishments, status, and future objectives. The comments that follow are excerpts from his presentation, *NIEM's Path to the Future*, given at the NBAC Annual Meeting on 18 September.

Mr. Whitehead emphasized that NIEM is thriving. He said, "The idea of bringing in, improving, expanding, reforming, and modernizing our various domains, the relationship to the core, all of it – is still a very powerful good news story. ... In addition to all of the work, all of the content, all of the normalization that goes on through all of this – what really is of value to me is that NIEM continues to respond to change ... NIEM's built-in ability to think ahead, is very useful. It continues to be relevant. ... That's why NIEM is an activity more than just the technical aspects."

Mr. Whitehead reiterated the value of NIEM stating, "We need to keep asking ourselves, how do we relate to the broader community. ... That we keep thinking about the larger purpose of what we are to achieve here. ... The challenge is, if we don't do that, then suddenly we find ourselves forced to do things that people do poorly... (but) that machines do very well ... repeatable processes."

Looking to our immediate future, Mr. Whitehead said "... Where I think we really want to be – we need to have this competitive intelligence. We really must have a data centric way forward and that means as a (NIEM) community there are very useful things that we should put into practice.

Our 2021 focus should prioritize:

- Metamodel development which allows us to craft a way forward that is agile and not bound to a given technology
- Internationalization is also very important; translating NIEM into French is an important first step
- Take those final steps to get NIEM clearly understood as a standard so it has the provenance for implementation
- Mentorship is crucial for not only maintaining the NIEM community but also for how we work with others
- Continue content maturation and NIEM adoption."

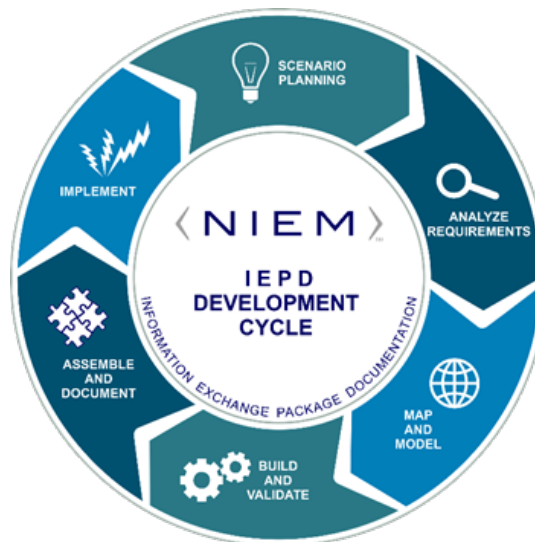


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NMO Managing Director's Perspective

NIEM's Managing Director is Mrs. Katherine Escobar (Deputy Division Chief, Data and Services Division, Cyber and Command, Control, Communications and Computers Integration (DD C5I), Joint Staff J6 and NMO's Managing Director). In her presentation, *NIEM 2021 Priority Planning*, to the NBAC Annual Meeting on 18 September, Mrs. Escobar provided her perspective for 2021. Selected portions of her presentation appear below.

Mrs. Escobar stated, "NMO's priority is to promote NIEM's adoption and growth. Supportive of this goal are our ongoing initiatives to develop a Registry and Repositories to assist in schema re-use, aligning appropriately, and by refreshing existing tools congruent with the NIEM lifecycle and forward-looking development, and a review and improvement of processes with a focus on becoming a standard and preparing for the future."



"A 2020 priority was the standup of the State, Local, Tribal and Territorial (SLTT) Tiger Team. The team was chartered in the third quarter. It focuses on ways to bring some of our underserved communities back into the NIEM fold. One proposal gaining community support is a series of virtual roadshows as part of an engagement and onboarding campaign. The team has collaborated with the National Association of State Chief Information Officers (NACSIO). It is now on the cusp of bringing state and local interests into the Cyber Domain, which is currently heavy with federal partners. Other inclusion efforts are in the offing for 2021."

Mrs. Escobar noted, "Emerging technology continue to be a focus area in 2020-2021, but the project plan required adjusting the ambitious 2020 objectives due to encroachment by COVID-19. The Emerging Technology Tiger Team looks forward to a prototype demonstration involving NIEM and Artificial Intelligence in the 2021 timeframe." She concluded, "As we continue to move toward NIEM model maturity and improving overall business practices, the goal of instantiating NIEM as a formal standard is within our grasp as a community. Along with NIEM as a standard, we continue to make progress on our path toward internationalization. NIEM is poised for an ambitious, exciting, and successful 2021, regardless of the imposition of COVID-19 in 2020."



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NIEM Business Architecture Committee

Highlights

While the NIEM Business Architecture Committee (NBAC) felt all the constraints associated with COVID-19, 2020 was a very productive year. As a 2019 carryover, the Registry and Repositories Tiger Team completed a System Specifications document in May 2020. This specification outlined the Use Cases, Requirements, constraints, limitations, and assumptions surrounding the need for a NIEM Registry/Repository.

NBAC has been a strong proponent of efforts to investigate and evaluate various standards organizations as NIEM considers the tradeoffs of becoming a formal standard. NBAC, and notably the NBAC Co-Chairs, Kamran Atri and Thomas Krul, were champions along with NMO in attracting new NIEM adopters and encouraging the standup of new domains. These ongoing efforts are likely to produce at least 2-3 new domains in 2021, including Statistics, Treasury, and Education.

During the 2019 Annual Meeting, NBAC identified its Program-of-Work for 2020. NBAC introduced the use of the Action Tracker in 2020. This was subsequently translated into a spreadsheet in which tasks are reviewed and managed by Co-Chairs bi-monthly. This tool provides transparency to the community and a more precise method of evaluating accomplishments and challenges, along with the opportunity to influence outcomes on an ongoing basis.

A recognized shortfall over the last several years is associated with domain assessments. Annually, the NBAC provides each domain a template for self-assessment of overall domain health and performance. The objective is to compare a domain's self-assessment to the Domain's Service Agreement (DSA) and Charter with the assessment of the Co-Chairs and the NMO. If remediation is needed, assistance and support would be offered to bring the domain into compliance with the DSA and Charter. Each year, around one-quarter of the assessments are completed and returned.

NBAC 2020 Annual Meeting

With travel restrictions in place, the NMO in conjunction with NTAC, NBAC and ESC conducted the Annual Meetings as a series of virtual meetings. NBAC's 2020 Annual Meeting was held virtually 14-18 September. It was preceded by the NTAC Annual Meeting held in August, followed by the ESC's quarterly meeting later in September.

NBAC's Annual Meeting featured two, two-hour long sessions each day with featured speakers. This format accommodated 2020 priorities focusing on NIEM adoption and growth, the 5.0 Major Release, Tiger Teams, and recommendations to the ESC for the upcoming year. A significant deliverable was the NBAC 2021 Work Plan, which was subsequently briefed to the ESC.

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Tiger Teams

The NBAC community uses tiger teams to address areas of particular importance to the NBAC and NIEM overall. NBAC has three active tiger teams: Emerging Technology, Internationalization, and the State, Local, Tribal and Territorial Teams.

Emerging Technology Tiger Team

NBAC's Emerging Technology Team's first meeting was conducted at the end of March. The focus was on member introductions and related experience, and an effort to identify NIEM piloting opportunities.

The team co-chairs reported during the Annual Meeting that the team had lost much of their initial momentum as DHS's focus shifted to responding to the COVID-19 pandemic much of 2020. The team's methodology and objectives are intact, however, the timeline for deliverables has been pushed forward.

During December's ESC meeting, Kamran Atri reported the Tiger Team is engaging DARPA to become actively involved. It is felt their representation will give the team access to research and development capabilities.

The co-chairs are fully engaged and expect to clarify specifics as DHS adjusts Science and Technology (S&T) priorities in 2021. The team has made progress in building on the work of Syed Mohammed, Chief— Modeling and Simulation, DHS. The team's practice of aligning NIEM with DHS's Science and Technology Directorate's ongoing efforts continues, particularly within the Artificial Intelligence arena. Planning for 2021 focuses in the following areas: Outreach & Engagement; Technology / Information Sharing Champions; Foundational Alignment; Standards Development Organizations.

NBAC Emerging Technology Tiger Team

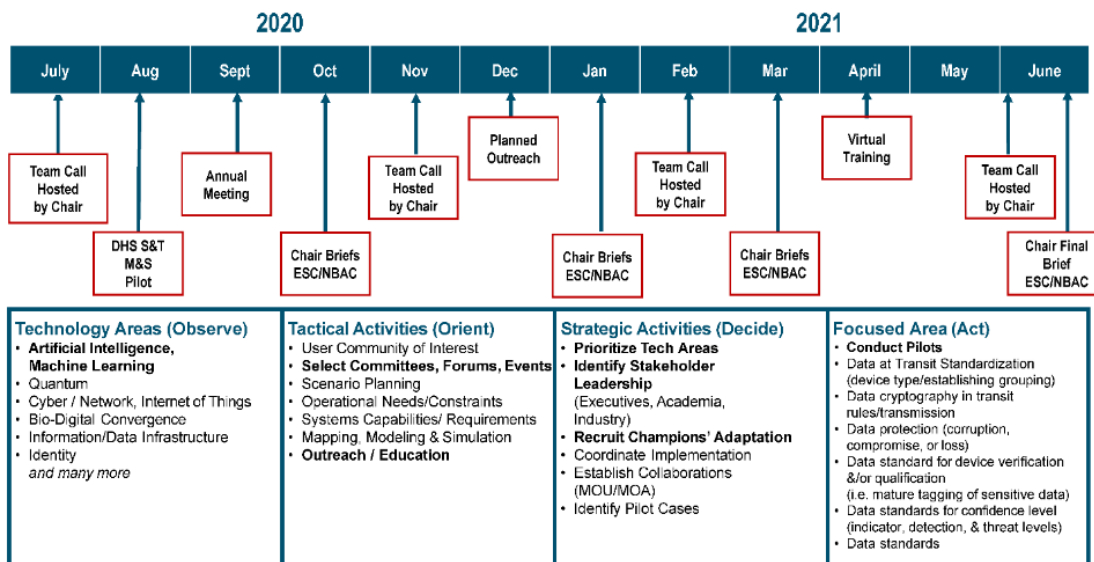
2020-2021 Roadmap

Mission: Promote NIEM as a Framework for Information Exchange for Emerging Technology

Approach: Observe, Orient, Decide, Act (OODA)

Near Term (6-9 months): Revise Roadmap, expand collaborations, engage, expand pilot opportunities

Long Term (12-24 Months): Partnerships, collaborations/coordination, pilots, success/impact/metrics



NIEM Meeting (every other Monday) NBAC Monthly (every 3rd Thursday)
 NIEM Releases – 5.1 incremental NIEM 5.1 Considerations: Domain-level models; tools and training

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Internationalization Tiger Team

The NIEM Internationalization Tiger Team was reinvigorated as NIEM leadership recognized the importance of defining both NIEM as a standard and adapting the model to be easily accessible to international partners.

The Government of Canada continues adoption of NIEM approach, coordinating the recommendation through the Enterprise Architecture Review Board (EARB). This effort is benefited by having Mr. Thomas Krul, an employee of the Government of Canada, as the team Co-Lead. A first step towards a more international web presence is to mirror NIEM.gov in French. To accomplish this, Thomas Krul is providing translation services to French.

During the Internationalization Tiger Team session at the 2020 Annual Meeting, Webb Roberts, NIEM lead developer, discussed internationalization from the NTAC perspective. Of particular importance was establishing the distinction between internationalization and localization:

- Internationalization is the process of designing a software application so that it can be adapted to various languages and regions without engineering changes
- Localization is the process of adapting internationalized software for a specific region or language by translating text and adding locale-specific components.

NTAC released its perspective on options for NIEM internationalization, clarifying the NTAC's preferred goals and recommended routes. Three candidate goals were proposed for the near term. These are discussed in detail in NTAC's *2020 Highlights* in this report.

State, Local, Tribal and Territorial Tiger Team

In early 2020, NBAC solicited volunteers interested in reviving a State, Local, Tribal and Territorial Tiger Team. Co-Chairs were appointed, the charter socialized in early summer and approved. The kickoff meeting was held in June.

The initial objectives of producing a charter, organizing, and holding meetings, and establishing a GitHub page for collaboration were accomplished in early June allowing the team to focus on developing marketing materials, an outreach tracker, grant assistance and planning a SLT User conference.

In broad terms, the team focuses on growing state, local, tribal, and territorial participation in NIEM and increasing interoperability across this community. The team reached out to NASCIO and agreed to a cooperative approach leveraging the long-standing relationship NASCIO enjoys with the SLT community.

The team established a set of metrics to benchmark performance and measure success, which included:

- Increasing participation
 - Joining COI Discussions
 - Engaging individuals inquiring about and/or joining a Domain
- Number of speaking engagements
- Representation across all 50 states, territories, and tribes.

The State, Local, Tribal and Territorial Tiger Team and NASCIO participated jointly in a presentation session during NBAC's Annual Meeting. The session outlined progress, discussed the value of data to the community, and the ability/wherewithal of states to embrace NIEM post-COVID-19. As 2020 ended, both co-chairs made transitions in employment and were no longer able to lead the team. New co-chairs were recruited and are in place.



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NIEM Technical Architecture Committee

The NIEM Technical Architecture Committee (NTAC) defines and supports NIEM's governing technical architecture. NTAC maintains NIEM's technical specifications, ensuring robust and efficient development of NIEM's core structure and processes for the use and reuse of data definitions and exchanges.

NTAC maintains NIEM's tool strategy in support of information exchanges across organizations and communities of interest. NTAC is led by co-chairs Mike Hulme and Scott Renner.

Highlights

- **Updated IEPD specification**

Several unused conformance targets from the existing Model Package Documentation (MPD) specification were removed to create a specification that is only about Information Exchange Package Documentation (IEPD) artifacts. This focuses the specification on its most common use case and makes the specification easier to understand.

- **Simplified NIEM distribution structure**

The directory structure for the NIEM 5.0 release removes nested directories that proved to be unnecessary in practice.

- **Detailed metadata semantics**

Considerable effort went into the interpretation of metadata and relationship metadata attributes to ensure this would satisfy important operational needs, such as privacy metadata in health care information.

The results are part of the NIEM 5.0 Naming and Design Rules (NDR), which included supporting:

- Alternate names and definitions
- New components in alternate languages
- Any language or region in Message Specifications
- Multiple languages in code lists
- Alternate language names and definitions NIEM models.

- **Guidelines for NIEM internationalization**

NTAC made the following distinctions between localization and internationalization:

- Internationalization is the process of designing a software application so that it can be adapted to various languages and regions without engineering changes
- Localization is the process of adapting internationalized software for a specific region or language by translating text and adding locale-specific components.

These guidelines were provided to the Internationalization Tiger Team during the Tiger Team's session at the Annual Meeting.

– continued –



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NTAC Guidelines for NIEM internationalization (continued)

NTAC released its perspective on options for NIEM internationalization, clarifying the NTAC's preferred goals and recommended routes. Three near-term candidate goals were proposed:

- Development of international NIEM components
 - General components, used everywhere
- Support localization
- Specific components for a region or language
 - Formats for alternate-language definitions and names of existing components
 - Enable users to create components in any language
 - Entire schemas in any language
 - Use xml:lang in schemas and data

These goals imply impact on both tools and specifications. Tool features should include language-specific search and browsing, components tailored for specific locales, and artifacts localized for a specific language or region.

▪ **Specification for NIEM JSON**

This specification establishes conformance targets for NIEM JSON data. Strict conformance is for JSON data completely corresponding to an XML message defined in an IEPD. Lax conformance is for JSON data that follows the rules but does not have a defined XML equivalent.

▪ **Metamodel for NIEM models**

At present, NIEM models are defined in XML Schema format. This is inconvenient/inefficient for developers who wish to work with other data formats (JSON, Google Protocol buffers, etc.). NTAC is Developing a technology-neutral representation for NIEM models, the Common Model Format (CMF). The CMF is the keystone of planned tool interoperability among tools supporting any data format for which there is sufficient interest.

▪ **NIEM XML to JSON translator**

This proof-of-concept prototype converts any NIEM-conforming XML document into the equivalent NIEM JSON or NIEM RDF data.

▪ **Tool gap spreadsheet**

The NTAC is committed to supporting all phases of the NIEM IEPD lifecycle with free and open-source software. This spreadsheet identifies existing gap in that commitment.

▪ **Specification refresh**

All of the technical specifications have been edited in preparation for NIEM 5.0.



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NIEM 2020 Highlights

Best of NIEM 2020

2020 marked NIEM's fifteenth anniversary – and the ninth time the Best of NIEM awards have been presented since they were launched in 2009. In that first year, we recognized NIEM implementation projects that demonstrated how intergovernmental collaboration and innovative technology delivered results that improved performance, increased efficiency, and supported transparency.

In 2020, we solicited and recognized NIEM implementation projects which demonstrated significant accomplishments, with noteworthy contributions to the use, growth, and adoption of NIEM. We strongly encouraged our larger NIEM community to recognize these NIEM projects and actively promoted the awards nomination process. Six nominees were awarded Best of NIEM 2020 awards at the NIEM ESC's September meeting.

NIEM is enabling solutions to real-world problems at the local, regional, statewide, national, and international levels

These winners are representative of NIEM's diversity and use – across domains, communities of interest, agencies and organizations



BEST OF NIEM 2020 WINNERS

Government of Canada
Employment and Social Development
Interoperability Solution Division
Innovation, Information and Technology Branch

City of Charlotte, North Carolina
Innovation and Technology Team

U.S. Department of Defense
Defense Counterintelligence and
Security Agency
Enterprise Analytics and Information

**U.S. Centers for Disease Control
and Prevention**
Center for Preparedness and Response
Division of Emergency Operations
Situational Awareness Branch

State of Florida
Department of Law Enforcement
Criminal Justice Information Services Division

**U.S. Department of
Homeland Security**
Citizen and Immigration Services
Office of Information Technology
Identity, Records, and National Security Division



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NIEM Major 5.0 Release

“NIEM 5.0 represents three years of extensive NIEM user-community input, development, and harmonization efforts to deliver information exchange solutions addressing our users’ needs. With NIEM’s community-powered, open source approach, users directly contribute both content and technical expertise, propelling NIEM’s growth forward with timely solutions to challenging interoperability problems,” said Katherine Escobar, NMO Managing Director, on 5.0’s release.

NIEM announced the public availability of NIEM version 5.0 in December. This major release underscores NIEM’s value and relevance as a force multiplier in enabling secure, scalable enterprise-level data interoperability across diverse, complex systems and organizations.

NIEM’s Active Community Involvement

A powerful example of the NIEM community’s active involvement is in the development of 5.0 is NIEM’s Harmonization Workgroup, which oversaw the entire harmonization process.

The workgroup included several dozen NIEM user/volunteers involved throughout the review process for Core, cross-domain, and domain-specific content.

The group remodeled and refactored content to improve consistency and provide easier reuse.

In all, the group reviewed over a thousand components, and resolved over eighty harmonization and technical issues.

NIEM 5.0 Highlights

- Establishes the NIEM metamodel framework which decouples XML from NIEM
- Controlled Unclassified Information (CUI) metadata
- Refined Geography Markup Language (GML) profile
- Major updates to the Federal Bureau of Investigation’s National Crime Information Center National Data Exchange (NDEx), and Uniform Crime Reporting code table
- Public Health Emergency Operations Center (PH-EOC) Minimum Data Set
- Generic Statistical Information Model (GSIM) content
- NIEM JavaScript Object Notation (JSON) Schema output, providing the basis for the development of JSON Schema for specific exchanges.

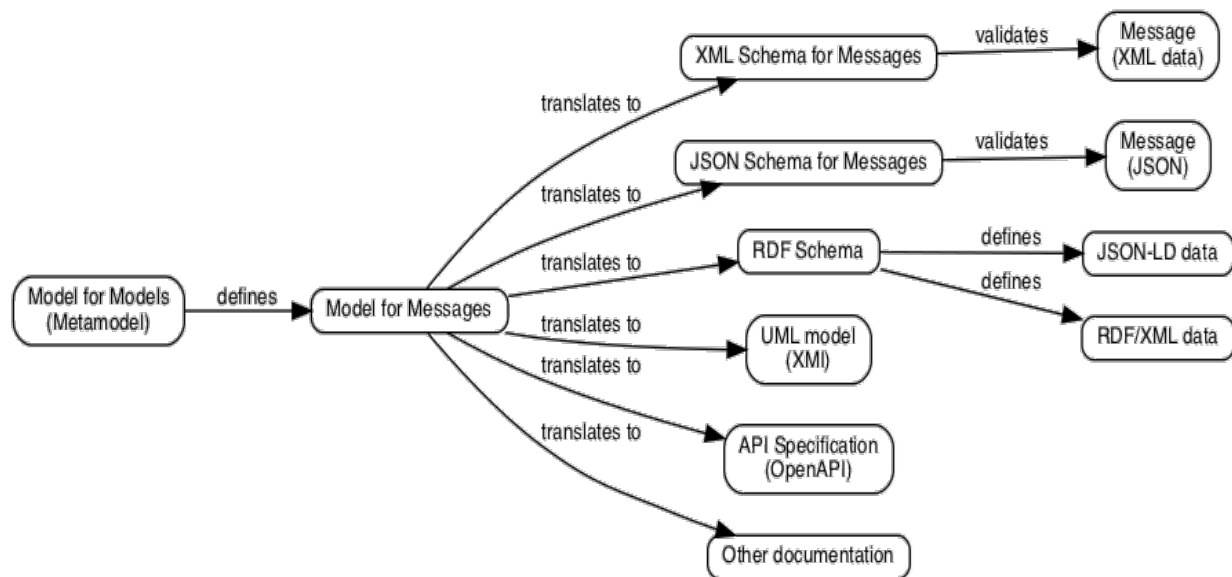
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NIEM facilitates secure information exchange by providing the definitions, relationships, and structure by which data are shared among domains and communities of interest. NIEM’s Core contains the data components within information exchange elements universally available to all NIEM users. Overall, the NIEM model is extensive, with more than 12,000 existing elements, or properties, that define the semantic content of the model.

NIEM 5.0’s new and updated specifications better describe what data looks like and means. NIEM’s strength of extensibility allows individual domains to further define data elements specific to their unique needs and requirements. NIEM currently supports exchange efforts among fifteen chartered domains and communities of interest who are working towards becoming a domain. These are formed when organizations recognize the need for secure, rapid data exchange. Membership includes representatives from federal, state, local, tribal, territorial, international, and private organizations.

This version establishes the NIEM metamodel framework currently in development. The NIEM metamodel is a data model describing NIEM data models. It carries the critical aspects of NIEM models as a “model description” data object that can be handled as XML, JSON, or other formats. NIEM data descriptions can be converted in conformant XML Schema. The following diagram illustrates how NIEM transforms a model into required representations.

NIEM’s Metamodel Framework





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NIEM Tool Development

NIEM is automating the IEPD Lifecycle Development Process. It is well along in the analysis of the existing NIEM tool landscape and are leading construction on a toolset which streamlines the IEPD development lifecycle.

Technical Requirements Analysis

The NMO provided a comprehensive operational requirements document to the tool development team. The team conducted an analysis of the current IEPD lifecycle and associated capabilities, including:

- Gap analysis and capture of capability gaps and prioritization of for requirement analysis
- Identification of high-level requirement groups and next-tier requirements for each group
- Documentation of requirements into a Requirements Traceability Matrix (RTM)
- Prioritization of the requirement groups to develop three Courses of Action (COAs)
- Development of the Requirements Document, including:
 - Inclusion of requirements from the RTM
 - Identified capability gaps
 - Identified COAs and produced high level mock-ups of the proposed user interface
 - Team recommendations.

The COA selected provided a balanced requirements solution that enhances each area of the IEPD lifecycle and of the NIEM resources. It will increase the value and efficiency of NIEM for new and existing users and their organizations, including:

- Streamlined, enhanced processes to provide an additional level of accuracy in search, conformance, and validation properties
- Ability to customize and tailor their experience
- Centralized location to store and synchronize all artifacts
- Community content leveraged through access of the future NIEM Registry and Restricted
- Registry and Restricted Repositories as a new NIEM resource
- This way ahead is not restricted by the availability of the Registry and Repository as it will be worked in a separate, but coordinated, effort
- Select enhancements will be developed and later tailored to the availability of the Registry and Repository.

Hosting Environment Analysis

A hosting environment assessment identified a suitable environment for meeting NMO requirements and realizing operational efficiencies. The analysis considered technical, cost, and risk factors assessing seven environments based on five identified dimensions: Data; Tools; Tool Infrastructure; Business Outcomes; Technical Requirements.

The team solicited user and community input for the hosting environment which included: Emergent business requirements and business expectations; aspirational business capabilities; Input on the desired business outcomes and technical requirements for evaluating the environment.



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To provide the recommendation that best meets NIEM objectives, business and IT stakeholder priorities, and the systematic assessment for each alternative, the team comprehensively measured computing resourcing, storage, etc. Hosting environments assessed included: NIEM.gov; DI2E; Platform One; Azure Government; MAX.gov; WMAAFIP; AWS Gov Cloud.

Qualified recommendations made for a hosting environment determined the following:

- Amazon Web Services or Azure are highly suitable choices if NIEM prefers to have complete control over the environment
- Platform One is a suitable choice if NIEM does not require complete control and prefers to use an environment that is already authorized. Stakeholders should establish service level agreements.

IEPD Lifecycle Tools Development

The Tool Development Team is developing the IEPD Lifecycle Tools. The goal is a consolidated toolset capable of supporting new development of an all-inclusive IEPD. This toolset will include the capabilities of ConTesA, SSGT, and Movement by providing a thorough understanding of all NIEM Business Rules and detailed requirements gathered through several technical user focus groups. The team is using an Agile development three-phase process with integrated testing and user experience feedback.

NIEM IEPD Registry and Repositories

During 2020, considerable progress was made with the IEPD Registry and Repositories initiative. A Tiger Team established requirements in late 2019, with the work completed in May 2020. The initiative was subsequently approved by the ESC. The requirements identified three Registry and Repository capabilities:

- Public Registry – provides metadata about IEPDs
- Restricted Repository – contains IEPDs available to users meeting permission-based requirements
- Public Repository – contains IEPDs accessible to all users, except for IEPDs in the Restricted Repository.

The objective is to complete the first increments of the Restricted Repository capabilities in 2021, with the Restricted Repository prioritized first. Work began in October using technical requirements derived from the team's operational requirements document. The Restricted Repository will be hosted on the DoD Warfighting Mission Area – Architecture Federation and Integration Portal (WMA-AFIP). The WMA-AFIP development team sprint necessary to complete increment one is expected to be completed in Q1 2021. The hosting platform for the Public Registry has yet to be finalized.

Beta testing is planned prior to each going live with a selected group of active NIEM users, with user feedback incorporated. The developers will work closely with NIEM's tool developers to ensure the Registry and Repository data can be pulled in by the new NIEM tools.

Appropriate business and technical processes to manage and maintain the Registry and Repositories, including process/s to validate individual IEPDs before they are published for potential reuse. The strategic communications plan will increase awareness, information, and encourage involvement within the NIEM community and prospective users as the capabilities are available for use.



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NIEM Standard Designation

NIEM recognizes that there is a need across government agencies and organizations to adopt open source standards. The National Technology Transfer and Advancement Act of 1995 (NTTAA) and the *Revised OMB Circular A-119* direct federal agencies to adopt voluntary consensus standards (the exception being where doing so would be inconsistent with law or otherwise impractical). NIEM determined that we should clearly distinguish our identification within the voluntary consensus space, avoiding any impression of a mixed message/s about whether NIEM is a framework and/or a standard.

Government and industry prefer formal standards. There is an inherent perceived interoperability and credibility due to the rigor in accrediting to a recognized standard. By aligning with a standards body, NIEM would be visible and accessible to larger technical audiences. With this increased visibility, there is a possibility for wider contribution to the standard's development, adoption of the standard, and an increased potential of attracting open source tool developers.

A self-assessment was completed in 2020 based on the American National Standards Institute (ANSI) Essential Requirements and the OMB Circular A-11 and meetings with several standards bodies. The evaluation confirmed the earlier determination that NIEM embodies the features to which voluntary consensus standards must adhere (i.e., openness, balance of interest, due process, and an appeals process, etc.).

NIEM identified several options varying in cost, time, and resource commitments. These are being evaluated and include NIEM becoming an ANSI Accredited Standards Developer (ASD), a NIEM stakeholder becoming the ASD, or the Organization for the Advancement of Structured Information Standards (OASIS) potentially filling the ASD role. As noted, careful attention is being given all aspects of the evaluation to ensure the best and most appropriate fit for NIEM and our user community.

Defense Acquisition University

In early 2020, NIEM began working with the Defense Acquisition University (DAU) to prepare a NIEM course which launched in October 2020. The DAU is a corporate university of the DoD offering "acquisition, technology, and logistics" training to military and Federal civilian staff and Federal contractors.

This *Introduction to NIEM* course has as the primary audience Government Project Managers, System Engineers, and Software Engineers. The course's purpose and objectives are to introduce "what is NIEM" with a focus on Government implementations to align with the DoDI 8320.07 NIEM-first policy. The course is included in the DAU's Acquisition Community Courseware and is part of a larger course on IT Standards required for those in acquisition-specific billets. The course is self-paced and accessed on-line.

Katherine Escobar led the curriculum development process with DAU. Over an eight-week period, she worked with a DAU-provided online curriculum/CBT developer to design the course.

NIEM's staff and lead developer, as well as members of the NBAC and NTAC contributed to the course's development. Materials were derived from NIEM's courseware and supplemented with templates and tools developed by NIEM through NMO, NBAC, NTAC, and the NIEM user community.



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Strategic Communications

The Strategic Communications function resides within the NMO. It is responsible for the development and oversight of all NIEM internal, community, and external communications and maintaining the NIEM brand standard.

NIEM has an active presence on a wide range of social media, including NIEM.gov (informational website), GitHub (technical website), YouTube (informational and technical site), LinkedIn, and Twitter. Strategic Communications activities maximize coverage across many of NIEM's social media sites and take full advantage of NIEM's comprehensive community and user or subject-specific email lists.

NIEM.gov

GitHub
<http://niem.github.io/>

 **YouTube**
www.YouTube.com/NIEMConnects

LinkedIn
<http://www.linkedin.com/groups/1903175>


www.twitter.com/NIEMConnects

NIEM's 2020 Work Plan included numerous major events and initiatives in which Strategic Communications played an active role in ensuring successful national and international communications before, during, and following the event. These included: MilOps and Cyber User Training, Cyber Domain Stakeholder meeting, NATO's CWIX 2020, NIEM 5.0 Major Release, NMO/NBAC/NTAC 2020 Annual Meeting, and the Best of NIEM Awards. NIEM.gov's redesign and Drupal 8 migration is discussed in greater detail in this section. Examples of content associated with these appear throughout this report.

The NMO manages NIEM initiatives, events, symposiums, meetings and/or activities to include comprehensive communications plan for the event – identifying audience/s, key messages, a project list of activities and materials to be developed and released. Events have traditionally been an important NIEM activity. Essentially any effort that brings a group together – whether termed as a meeting, symposium, or workshop, require Strategic Communications full attention. The team works closely with the NMO team to ensure the right audiences are targeted, informed, and encouraged to participate in the event. The team works closely with the leaders and Subject Matter Experts (SME) to ensure the presentation materials are accurate and professional in appearance.

Beginning in late 2019, NIEM's Strategic Communications introduced an on-line event management website to promote and manage on-line registration and event information. This allowed NIEM to use a widely accepted method of managing events both more efficiently and professionally. Following a successful MilOps and Cyber NIEM 1.0 meeting, all 2020 NIEM events were virtual. Using event management software and virtual meeting software supported successful event/s management.

NIEM's 2021 Work Plan identifies Strategic Communications and Outreach activities. Among them are the development of the new NIEM.gov website and Drupal 8 migration, and supporting key initiatives, including the Registry and Repositories, 2021 Best of NIEM awards and Success Stories, updating NIEM training materials, and the NIEM 5.1 minor release, and offering NIEM.gov in French.



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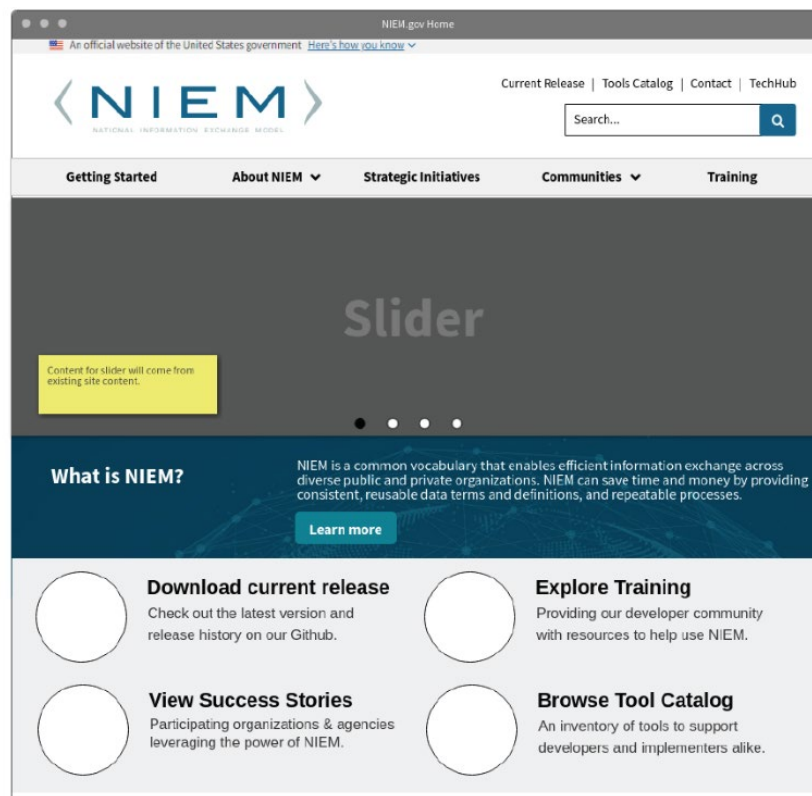
NIEM.GOV

NMO oversees the development of the new NIEM.gov website which is expected to launch by April 2021. The website incorporates open source user interface (UI) components and adheres to U.S. federal government websites visual style guidance and community best practices (i.e., Worldwide Web Accessibility Standards (W3C), U.S. Web Design System (USWDS), ADA-Section 508 compliance, etc.),

The DHS's Web Content Management as a Service (WCMAaaS) Team provides NIEM.gov website development and support to the NMO. The team provides:

- Subject matter expertise with United States Web Design System (USWDS) requirements for agency websites
- Network access for content management capabilities
- Assists with the analysis of the NIEM IEPD registry requirements analysis, including developing an initial IEPD Registry proof of concept
- Dedicated guidance and support for the NIEM.gov website Drupal 8.0 migration.

A mock-up of part of the new home page follows.



In parallel with this effort, the Content Management System (CMS) Drupal 7 was migrated to Drupal 8, providing improved website performance, security, ease of development, and improved user experience for front-end and administrative users. Additional organization of the new website's page content is planned for 2021, to include input from the ESC, NBAC, NTAC and NIEM user community.

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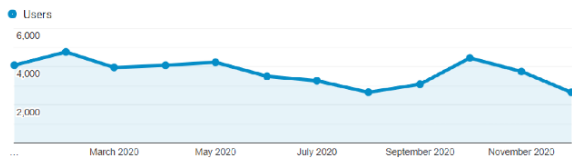
The NMO monitors key metrics, including user traffic, user acquisition, and perceived popularity of content. NMO reviews and engages with the community on YouTube, Twitter, and LinkedIn. An overview of 2020 website analytics for NIEM.gov and NIEM.github.io follows.

NIEM WEB ANALYTICS 2020 OVERVIEW

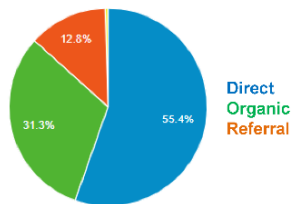
NIEM.gov

(Informational)

Traffic Over Time



How Users Find NIEM



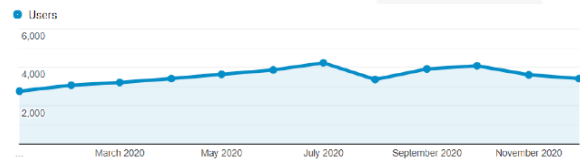
Top Five Pages Users View

Top 5 Pages
/ (home page)
/about-niem
/tools-catalog
/getting-started
/about-niem/niem-model

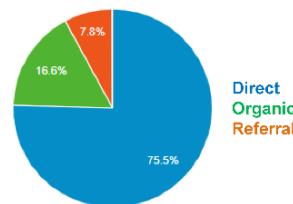
NIEM.GitHub.io

(Technical)

Traffic Over Time



How Users Find NIEM



Top Five Pages Users View

Top 5 Pages
/niem-releases
/reference/[...]/attribute/json
/ (home page)
/json/sample-schema
/training

Social Media



Email Marketing



Benefits

- Users sign up & give permission to receive news
- Personal & private; target users based on agency, role, etc.
- Measurable analytics; email open rate, click through, etc.



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NIEM 2021 Work Plans

NIEM Management Office 2021 Work Plan

Traditionally, the Work Plan is approved by the ESC as part of the Annual NBAC-NTAC/ESC meetings. The development of the 2021 Work Plan reflected the unique constraints imposed by COVID-19 restrictions. The NTAC and NBAC each met in August and September respectively, with joint sessions in September designed to focus on NBAC, NTAC, and NIEM overall Work Plans. The NMO's 2021 Work Plan was briefed to the ESC on 23 September and subsequently approved.

The NMO's Work Plan is a dynamic document which matures within the current year and forecasts future work over the next calendar year. The process begins by identifying those events and tasks which extend into the next year's work and beyond. The NMO synthesizes the Work Plan and solicits ESC approval as elements are identified throughout the year.

As an example of the Work Plan's development process, the initial effort to identify requirements for a NIEM IEPD registry and repositories was approved by the ESC during the 2019 Annual Meeting. A team was established in November 2019 to develop requirements. This process continued through the spring of 2020 with a design review conducted over the summer. Course of Actions (COA) were developed and approved, and resources identified and allocated. Registry and Repositories development is expected to span 2021. The plan is predicated on work identified by the NTAC, NBAC, Strategic Communications, NMO, and the NIEM community at large. It reflects the both major unique and recurring events, initiatives, anticipated for delivery in the calendar year.

NMO 2021 Work Plan	
NMO Products <ul style="list-style-type: none">▪ NBAC/NTAC liaison support (ongoing)▪ Public Registry/Secure Repositories (Q1-Q2)▪ Tiger Teams support (ongoing)▪ NIEM as a Standard (Q1-Q4)▪ Best of NIEM Awards ((ESC Annual Meeting)▪ CY2022 Work Plan (Q3-Q4)	Strategic Communications and Outreach <ul style="list-style-type: none">▪ Refresh NIEM.gov▪ Update NIEM Process and Procedures Documentation (Q1-Q4)▪ NIEM.gov bi-lingual (English/French)▪ Quarterly Success Story highlights▪ New product advertising
Meetings and Workshops <ul style="list-style-type: none">▪ NBAC (monthly)▪ NTAC (monthly)▪ ESC (quarterly)▪ NMO/NBAC/NTAC Annual (Q3 or Q4)	Community Deliverables <ul style="list-style-type: none">▪ "Baseline" IEPD Tools Implementation (ongoing)▪ IEPD Registry implementation (Q1-Q4)▪ Modernize NIEM Training Materials (Q3-Q4)▪ Establish NMO-endorsed Training Pool (Q3-Q4)▪ NIEM.gov updates (monthly)▪ NIEM 5.1 Minor Release (Q3)



2020 Annual Report

NBAC 2021 Work Plan

In preparation for the 2020 Annual Meeting and the ESC's September meeting, the NBAC Co-Chairs and NMO drafted the NBAC 2021 Work Plan. This listing of events, tasks, and objectives informs the overall NIEM Work Plan, and serves as the predicate for the NBAC's Action Tracker.

The tracker categorizes and prioritizes the NBAC Work Plan and assigns responsibilities and due dates. The tracker is published at the beginning of each calendar year and serves as the metrics from which to track NBAC performance.

NBAC 2021 Work Plan		
Events and tasks Included on Action Tracker and those relating to the NMO Work Plan		
NBAC Events and Tasks with Objectives	Action Tracker	Informs NIEM Work Plan
NBAC 2021 Monthly Meetings	✓	✓
NBAC 2021 Annual Report	✓	
NBAC 2021 Annual Meeting	✓	✓
Continue Tiger Team Initiatives	✓	✓
Revisit NIEM cost model, supporting development of materials demonstrating NIEM's cost/benefit	✓	
Assist NMO <ul style="list-style-type: none"> Modernize NIEM Training Material Evaluating newly structured NIEM Tools Onboard new NIEM Domain Assess and support NIEM Registry development 	✓ ✓ ✓ ✓	✓ ✓
Advance NIEM Adoption <ul style="list-style-type: none"> Engage GAO and showcase NIEM Use GAO Report to setup outlier 	✓ ✓	
Improve NIEM Implementation (including Release plans) <ul style="list-style-type: none"> Revisit tools, such as Domain Self - Assessment 	✓	
Take Active Role in New/Prospective Domain Onboarding <ul style="list-style-type: none"> Statistics Health National Oceanic and Atmospheric Administration Veteran Affairs Treasury Public Works/Safety Grants 	✓	
Strengthen NBAC and NTAC Collaboration	✓	



2020 Annual Report

NTAC 2021 Work Plan

Continue specification simplification

The NTAC will apply the “conventions over configuration” design paradigm to the IEPD specification, greatly reducing the complexity of the documenting manifest file for simple exchanges that follow the expected pattern. Revised terminology that avoids NIEM-specific names is an important part of this simplification. The NTAC expects that over time, descriptive terms like “message specification” will be easily adopted by an enlarged NIEM community and will eventually replace legacy synonyms such as “IEPD”.

Metamodel development and Common Model Format tooling

The NTAC will create prototype software to convert the CMF to and from other formalisms, including XML Schema and UML models. This work will validate the CMF and metamodel and identify any needed modifications.

Metadata vocabulary development

The semantics of the metadata and relationship metadata attributes is part of the NIEM 5.0 NDR. The common metadata properties to be expressed through those attributes, especially those needed for technical requirements, such as enforcing privacy constraints, remain to be developed.

XML/JSON translator

The internal representation of this tool needs to be replaced with the CMF. The XML to JSON translation must be updated according to the more detailed RDF semantics in the NIEM 5.0 NDR. The reverse JSON-to-XML translation will be explored and implemented if feasible.

Strengthen NTAC / NBAC collaboration

The NTAC desires to strengthen collaboration with NBAC to facilitate the process of receiving the NBAC’s business requirements, and to help the NBAC better understand the rationale behind changes to the NIEM technical framework.

NTAC 2021 Work Plan and Meetings

NTAC Monthly Meetings

NIEM/NTAC Annual Report

NTAC Annual Meeting

NTAC Biweekly with NBAC/NMO/ESC

NTAC Technical Specification Working Group (Weekly)

Assist NMO

- Modernizing the NIEM training material
- Introduce newly structured NIEM tools
- Advance NIEM adoption

Improve NIEM

- Implementation
- Simplification
- Internationalization
- Security



2020 Annual Report

Conclusion

2020 marked NIEM's fifteenth anniversary. NIEM continues to extend its reach, enabling secure, scalable, enterprise-level data interoperability across diverse, complex systems and organizations. With NIEM's community-powered, open source approach, users directly contribute both content and technical expertise, propelling NIEM's growth forward with timely solutions to challenging interoperability problems.

Major accomplishments included the NIEM 5.0 Release, developed with a substantial amount of NIEM user-community input, and which established the framework for the NIEM metamodel. NBAC made substantive contributions to key initiatives, including the Registry and Repositories, NIEM's exploration of becoming a formal standard, attracting organizations and agencies wishing to implement NIEM, and encouraging the standup of new domains and communities of interest. The State, Local, Tribal and Territorial Tiger Team was formed to increase user participation and representation. The Internationalization Tiger Team is working to increase NIEM's accessibility. The Emerging Technology Tiger Team is identifying a NIEM pilot opportunity in 2021. NBAC's 2020 Annual Meeting focused on NIEM adoption and growth, the 5.0 Major Release, Tiger Teams, and the NBAC 2021 Work Plan.

NTAC is supporting all phases of the NIEM lifecycle with free and open-source software. NTAC's 2020 highlights included updating the IEPD specification and directory distribution structure for ease of use, and detailed metadata semantics work. NTAC developed the NIEM JSON specification, establishing conformance targets for JSON data. A proof-of-concept prototype converting NIEM-conforming XML document into the equivalent NIEM JSON or NIEM RDF data was completed. The group established guidelines for NIEM's internationalization with goals to impact both tools and specifications. NTAC continues development of a technology-neutral representation for NIEM models using the Common Model Format (CMF) and metamodel development.

Since 2009, the Best of NIEM awards have been presented nine times. In 2020, we recognized NIEM implementation projects with noteworthy contributions to the use, growth, and adoption of NIEM. The winners are representative of NIEM enabling solutions to real-world problems at the local, statewide, national, and international levels. These six represent NIEM's diversity – across domains, communities of interest, all levels of government and the private sector.

A 2020 milestone was the successful launch of the DAU's *Introduction to NIEM* course. Longer term, major initiatives begun in 2020 are planned for completion in 2021. This includes the new NIEM.gov website and migration, the IEPD Registry and Repositories, and implementation of the Jira Service Desk™ issue management software. NIEM is automating the IEPD Lifecycle Development Process by re-engineering the NIEM tool landscape. With the self-assessment of governance documents and procedures, NIEM assessing the path forward to become an accredited standard.

We conclude by echoing the positive statement of NIEM's Managing Director, Katherine Escobar, when she declared that "NIEM is poised for an ambitious, exciting, and successful 2021."



NATIONAL INFORMATION EXCHANGE MODEL

2020 Annual Report

NIEM.gov

GitHub
<http://niem.github.io/>

 **YouTube**
www.YouTube.com/NIEMConnects

LinkedIn
<http://www.linkedin.com/groups/1903175>


www.twitter.com/NIEMConnects