NIEM
NATIONAL INFORMATION EXCHANGE MODEL

Business Architecture Committee (NBAC)

2019 Annual Report

Kamran Atri **Co-Chair, NBAC**	**Thomas Krul** **Co-Chair, NBAC**

EXECUTIVE SUMMARY

The NIEM Business Architecture Committee (NBAC) advanced enterprise information sharing with the release of NIEM 4.2 that includes 11,510 data properties harmonized across 14 domains and NIEM core. Additional NBAC 2019 highlights include:

- Supporting the successful NIEM sponsorship transition from the Department of Homeland Security (DHS) to the Department of Defense (DoD)
- Onboarding the NIEM Cyber Domain with DHS Cybersecurity and Infrastructure Security Agency (CISA) as the steward
- Promoting the internationalization of NIEM by installing a new NBAC Co-Chair from Canada and advancing language translation of the NIEM attributes and code lists
- NBAC stakeholder nominations receiving NIEM 2019 Awards:
    - Program Manager for DoD Biometrics - Best of NIEM 2019 Award
    - Joint Technical Coordinating Group for Munitions Effectiveness - Best of NIEM 2019 Award
    - DHS Office of Biometric Identity Management (OBIM) - NIEM UML Achievement Award
- Identifying NBAC community recommendations to advance NIEM tools, architecture, adoption, and training
- Advancing the NIEM Emerging Technologies Tiger Team (NET[3]) to promote NIEM as an information exchange framework for emerging technologies and enabling the President's Executive Order for Artificial Intelligence (AI)
- Leveraging the International Tiger Team to initiate an English-French Canada translation effort, identifying common data attributes supporting more than 300 global operations
- Recommend updating NIEM's Vision statement to:
    - Elevate data as a strategic asset by advancing the NIEM community-based standards framework to improve global data interoperability and support existing and emerging technologies
- Identifying NIEM 2020 priorities:
    - NIEM 5.0 major release
    - Advance NIEM adoption
    - Support and reinvigorate domain growth
    - Improve the ability to implement NIEM
- Emphasizing the NIEM Value Proposition in a system of systems interoperability environment that "When using NIEM, you only need to "speak" two languages – your own and NIEM"
- Initiated the NIEM State, Local, and Tribal Tiger Team (SLT3) to improve outreach and increase NIEM awareness, participation, and adoption within State, Local and Tribal governments
- Formalizing the requirements for a NIEM IEPD Registry to promote discovery and reuse

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NIEM Governance

The NBAC supported the successful transition of NIEM sponsorship from the Department of Homeland Security (DHS) to the Department of Defense (DoD) on January 1, 2019. During the transition, the NIEM Program Management Office (PMO) was renamed to NIEM Management Office (NMO). Figure One illustrates the NIEM governance structure that is comprised of the:

- Executive Steering Council (ESC), chaired by the DoD's Deputy CIO for Information Enterprise, Mr. Peter Ranks (SES)
- NIEM Management Office (NMO), led by the NIEM Executive Director Joint Staff J6 Deputy Director for Cyber and Command, Control, Communications and Computers (C4) Integration (DD C5I) Mr. Stuart Whitehead (SES) and the NIEM Managing Director Mr. Ryan Schultz
- NIEM Business Architecture Committee (NBAC), Co-Chaired by Mr. Kamran Atri and Mr. Thomas Krul
- NIEM Technical Architecture Committee (NTAC), Co-Chaired by Dr. Scott Renner and Mr. Mike Hulme
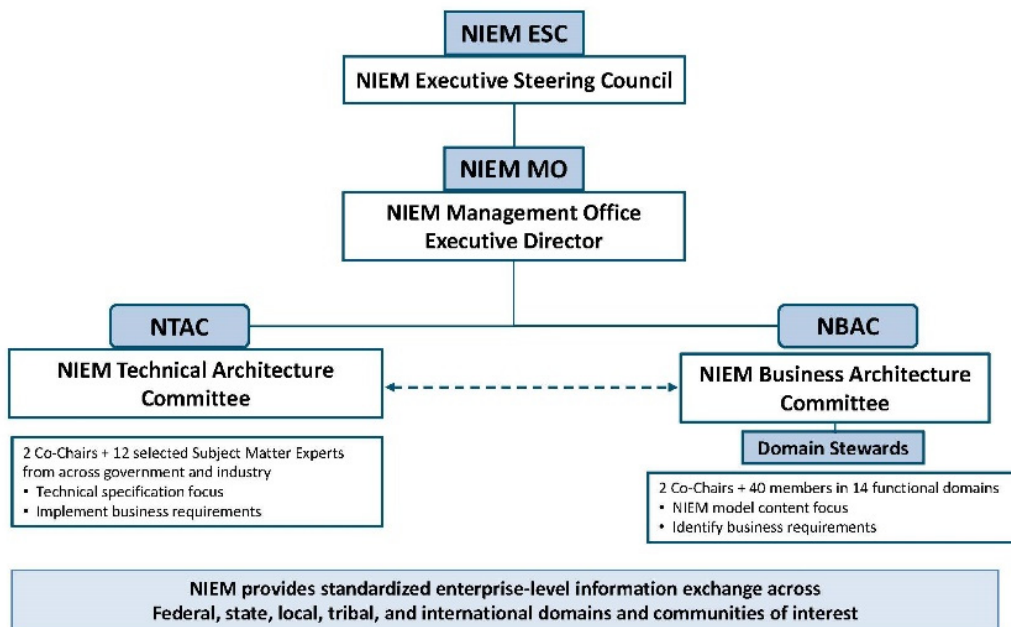
Figure 1 NIEM Governance Structure

NIEM 2019 Awards

The following NBAC community nominations received NIEM 2019 awards:

Project Management Office (PM) DoD Biometrics – Best of NIEM

PM DoD Biometrics worked closely with the Defense Forensics and Biometrics Agency (DFBA) to harmonize and implement a NIEM 4.0 conformant DoD the Electronic Biometric Transmissions Specifications (EBTS) to enable biometrics communication and interoperability across the DoD. Automated Biometrics Identification System (DoD ABIS) enterprise.

Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) – Best of NIEM

The DoD JTCG/ME, Cyber Operations and Lethality Effects Integrated Product Team, developed the NIEM conformant Joint Non-Kinetic Effectiveness Information Exchange Package Documentation (IEPD) as a cyberspace operations information sharing standard for U.S. Service Components and other federal agencies.

Office of Biometric Identity Management (OBIM) - NIEM UML Achievement

DHS OBIM developed a Rapid DNA Prototype to quickly identify biological kinship relationships to avert human trafficking of children. Utilizing model-based systems engineering (MBSE) processes and tools to define integrated project, capability, activity, system, data, and standards architecture models promoted baseline understanding of business processes, system design patterns to identify optimization opportunities, mitigate risk, and inform design decisions.

NIEM Domain Highlights

The below table provides an overview of the NIEM domains with organizational sponsor, domain focus, and points of contact. Specific domain and Community of Interest highlights and engagement activities are described in alphabetical order.

NIEM Domain Overview			
NIEM Domain	Organizational Sponsor	Content Focus	Points of Contact
Core	DOD	Common data types, properties, code sets across multiple Domains	Ms. Christina Medlin Mr. Ralph O'Connell
Agriculture	U.S. Department of Agriculture (USDA)	Farm Service Agency (FSA) and Risk Management Agency (RMA) reporting data about crops, acreage, and revenue	Mr. Mr. Garon Reeves
Biometrics	DHS Office of Biometric Identity Management (OBIM)	Coordinated global identity management effort to support intelligence, law enforcement, international trade, travel and immigration	Mr. Thomas Freed Ms. Diane Stephens (NIST) Mr. Will Graves (DoD) Ms. Jennifer Stathakis (FBI)
Chemical, Biological, Radiological, and Nuclear	DHS S&T Domestic Nuclear Detection Office (DNDO)	Detect and interdict radiological and nuclear threats across DOJ, DOE, DOS, DOD, Nuclear Regulatory Commission (NRC), state, local	Mr. Thomas Tullia Mr. Melson Martis
Cyber	DHS Office of Immigration Statistics (OIS)	Enable Federal Government and critical infrastructure owners and operators information exchanges	Mr. Preston Werntz Mr. Juan Gonzalez
Emergency Management	DHS Science and Technology (S&T) First Responders Group (FRG)	Supports first responder information sharing with homeland security and resource management stakeholders	Mr. Kamran Atri Mr. Lain McNeill
Human Services	Department of Health and Human Services (HHS)	Improve human service client outcomes, lower costs, and enhance operational efficiencies through standardized information sharing	Mr. Robert Tagalicod Mr. Tom Carlson
Immigration	DHS Office of Immigration Statistics (OIS)	Standardized information sharing to improve federal immigration, customs, and air security law enforcement and operations	Mr. Curtis Ross Ms. Jennifer Kish
Infrastructure Protection	DHS Office of Infrastructure Protection (IP)	Coordinated national program to reduce risks to the nation's critical infrastructure and key resources (CIKR)	Mr. Ash Chaterjee
Intelligence	ODNI Criminal Intelligence Coordinating Council	Supports intelligence information sharing with justice and homeland security	Ms. Sue Dohr
International Trade	DHS Customs and Border Protection (CBP)	Share information to facilitate trade and eliminate security threats before they arrive at ports and borders.	Ms. Renee Messalle Mr. Shailesh Sardesai
Justice	Federal Bureau of Investigation (FBI)	Enable national, state, local, tribal justice and public safety community information sharing	Ms. Cherie Cochran Ms. Kate Silhol
Maritime	Office of Naval Intelligence (ONI) OCIO	Global maritime information sharing (vessels, people, cargo, locations, activities) to support US security, safety, economy, or environment	Dr. Benjamin Apple
Military Operations	DoD Joint Staff J6	Improve military operations and decision making within the DoD and with multinational mission partners	Mr. Ralph O'Connell Mr. Rodney McCoy
Screening	DHS	Supports a wide range of screening and credentialing activity information across homeland security mission areas	Mr. Steve Yonkers
Surface Transportation	Department of Transportation (DOT) Chief Data Officer	Support DOT Traffic Records Coordinating Committee and the State Traffic Records Coordinating Committees	Mr. Daniel Morgan (SES)

FIGURE 2 NIEM DOMAIN OVERVIEW

Agriculture Domain

The NBAC and NMO engaged the U.S. Department of Agriculture (USDA) and learned that their priority is to implement their Orbus iserver enterprise architecture to advance common business processes and methods across the 28 USDA agencies. The NBAC is eager to meet USDA's selection of a new Chief Data Officer (CDO) and collectively engage their CIO Mr. Ted Kaouk to gain leadership support for NIEM.

Biometrics Domain

DHS OBIM is working to expand DNA information functionality that advances both NIEM Biometrics domain content and their Futures Identity strategic objectives. OBIM is utilizing model-based systems engineering (MBSE) to establish a baseline understanding of OBIM business processes, system design patterns, and architectures to exploit performance analysis. Biometrics Domain representatives regularly participate in NIEM, NBAC, NET[3] and cross-domain and Core harmonization meetings. DNA development stakeholders include the National Institute of Standards and Technology (NIST) and the Federal Bureau of Investigation. The Quarterly Newsletter for the Biometrics Domain is an informative publication that is a NIEM domain best practice that informs federal and state agencies on the latest development efforts and promote the NBAC/NTAC/NMO activities.

CBRN Domain

The NBAC and NMO engaged the DHS Countering Weapons of Mass Destruction Office (CWMD) and learned they were authorized and formally established in December 2018. One CWMD objective is to advance the Global Nuclear Detection Architecture (GNDA) framework for detecting, analyzing, and reporting on nuclear and other radioactive materials that are out of regulatory control. CWMD works closely with federal, state, local, tribal, territorial, and international partners to counter these threats.

Cyber Domain

The NBAC voted to endorse DHS Cybersecurity and Infrastructure Security Agency (CISA) as the NIEM Cyber Domain Steward. The Cyber Domain Stewardship Agreement (DSA) and Cyber Domain Charter documents are in final review for executive leadership signature. The NBAC and MilOps Domain are supporting CISA in achieving their detailed plan to:

- Establish domain governance structures and procedures
- Establish domain operations
- Stand up the Cyber Domain with outreach to internal and external community stakeholders, and develop Cyber Domain model content.

Emergency Management (EM) Domain

The EM Domain has close working relationships with other domains, particularly those with global response capabilities and focus, including MilOps, Justice, Surface Transportation, and Biometrics.

Going forward, EM will likely have heavy involvement in both international and emerging

technologies and may either have attributes within its own model, or shared attributes across domains (or new in core). This alignment has worked well to this point and we see no reason for re-architecture.

Prior to recent support transitions, the EM domain held regular community outreach and training sessions. The domain intends to commence both again in earnest with outreach in late 2019 and training sessions and cross-domain workshops in 2020. Initial outreach includes new facilitator contact information, NIEM 5.0 call for attributes and issues, Emerging Tech and International issue review/call for participation)

Human Services (HS) Domain

The HSD regularly participates in NIEM NBAC, NMO, Harmonization Working Group, and ESC meetings. Due to HHS organizational changes, engagement with external stakeholders is currently more successful than internal domain operations. HSD did not perform a domain update this year, is starting to plan:

- An improved tools strategy to support exchange development and model discovery which may include investing in an updated Wayfarer for NIEM 4.2 and beyond.
- Restarting the business of domain management on a recurring schedule with a more proactive posture with respect to identifying and developing data exchange opportunities within the domain and with other domains/partners outside of NIEM.

Immigration Domain

DHS Office of Immigration Statistics (OIS) is leading the adoption of NIEM-First policy by the Immigration Data Integration Initiative (IDII) Authorities. The goal of the IDII is to develop a more fully integrated immigration data environment and to strengthen the Department's systems for analyzing and reporting on immigration data. OIS requests NMO and NBAC support to advance the NIEM-JSON implementation strategy to share with the Immigration Domain community. Coordination with our IDII Capability and Implementation Working Group led by Data Services Division (DSD). Key activities include:

- Governance development, and application of the Enterprise Immigration Domain Standards (DGWG)
- Policy oversight and development supporting the governance activities (POWG)
- Capability and Implementation Working Group (CIWG) – IDII Data Sharing Framework and Data Model development
- Authoritative Source Data Toolset Development

Justice Domain

NIEM evolved from the Global Justice XML Data Model (GJXDM) in 2006 and the Justice Domain includes 4,206 data property elements. Justice is the most mature domain and representatives regularly participate in NIEM NBAC, Harmonization Working Group, and ESC meetings.

Military Operations (MilOps) Domain

MilOps domain representatives participate in all NBAC, NET[3] and International Tiger Team

meetings. MilOps conducts quarterly configuration control boards (CCBs), and actively engages organizations that are working with and/or considering adopting NIEM. The MilOps team provides technical support and quickly responds to stakeholder inquiries. Due to the limited distribution of some MilOps stakeholder data terms, MilOps maintains MilOps Mission Specific (MOMS) domain content for DoD and DoD contractors. Some specific MilOps highlights:

- Supporting the Joint Non-Kinetic Effects (JNKE) IEPD change request (CR) technical design review (TDR) for harmonization and inclusion into the NIEM MOMS release.
- Completing four United States Message Text Format (USMTF) MilOps CRs and TDRs for simple type content.
- Evaluated Integrated Air Missile Defense (IAMD) CIXS-CIDS schema for MilOps adoption.
- Incorporated Defense Security Services (DSS) content into MOMS 4.2 release.
- Engaging the US Transportation Command to establish a Logistics Domain.
- Incorporating NIEM into the Special Operations Forces, Intelligence Community, DoD Trident Spectre data ecosystem to enable artificial intelligence algorithmic processing.

Screening Domain

The NBAC and NMO engaged the DHS HQ Office of Strategy, Policy, and Plans for Threat Prevention and Security Policy and learned that they are coordinating with their CIO to provide a technical subject matter expert (SME) to support their Screening and Vetting Office policy analysts to effectively perform domain steward responsibilities. The NBAC will follow up to support the re-establishment of their domain governance and outreach activities.

Surface Transportation Domain

The NBAC and NMO engaged the U.S Department of Transportation's Chief Data Officer, Mr. Daniel Morgan (SES) to plan the Surface Transportation Domain engagement strategy. Mr. Morgan will facilitate NBAC and NMO introductions to DoT program office managers to advance NIEM adoption. He also suggested the NBAC introduce NIEM into the American Association of State Highway and Transportation Officials (AASHTO), Association of Transportation Safety Information Professionals (ATSIP), American Association of Motor Vehicle Administrators (AAMVA), International Association of Chiefs of Police (IACP), and National Emergency Management Association (NEMA) collaboration forums.

NIEM Community of Interest (CoI) Highlights

Specific domain and Community of Interest highlights and engagement activities are described in alphabetical order.

Health COI

Under the leadership of the Department of Health and Human Service (HHS), the NIEM Health COI was very active in conducting six COI meetings and participating in NIEM, NBAC, and NTAC meetings. However, the sponsoring Administration for Children and Families (ACF) was dissolved in September 2019. The NBAC and NMO engaged the HHS Chief Information Officer (CIO) to reinstate the Health CoI and advance the establishment of the NIEM Health Domain.

The NMO supported the successful NIEM Health Symposium to foster NIEM adoption across the federal, state, and local health information stakeholders.

Humanitarian Aid

The NBAC engaged the US Agency for International Development (USAID) to support their objective of improving information sharing with international non-governmental organizations (NGOs). USAID participated in the NBAC F2F and is interested in adopting NIEM.

International Partners

The NBAC International Tiger Team is focusing Initiate translation effort (Canada)

Continued attribute identification (300+ global operations)

Design concepts, governance, and impacts on model architecture and engineering

The NBAC Co-Chair Mr. Thomas Krul is aggressively engaging his country's departments and agencies to achieve Government of Canada adoption of NIEM.

MilOps Domain stakeholders are supporting North Atlantic Treaty Organization (NATO) adoption of NIEM as the NATO Core Data Framework.

DOD Joint Artificial Intelligence Center (JAIC)

Because many Domain Stewards are pursuing artificial intelligence (AI) data solutions for their community, the NBAC is coordinating the MilOps defined requirements for NIEM to support the JAIC objectives in a standardized approach that will benefit the NIEM community.

Meteorology and Oceanography (METOC) COI

The NBAC engaged the National Oceanic and Atmospheric Administration (NOAA) Office of Marine and Aviation Operations (OMAO) to assess the value proposition for adopting NIEM into their Scientific Computing System (SCS) Data architecture.

National Association of State CIOs (NASCIO)

The NBAC is focusing attention on State and Local partners and is standing up the State & Local Tiger Team.

US Office of Management and Budget (OMB)

Since OMB is leading the fulfillment of the Open Data and Evidence-Based Policymaking Act, the NBAC is engaging OMB to adopt the NIEM value proposition across federal agencies.

Statistics Domain

The U.S. Census Bureau won the 2018 Best of NIEM Award for implementing NIEM into their 2020 Census data collection architecture. The NBAC and NMO are supporting the Census Bureau to host the NIEM Statistical Domain Symposium in 2020 and onboard the NIEM Statistics Domain to advance a standardized approach across the Federal Statistical Agencies.

NBAC Highlights and Activities

NIEM 4.2 Minor Release

The NIEM 4.2 minor release was published in October 2019 and included the following model content changes.

NIEM 4.2 Model Content Changes

Biometrics	Added and updated DNA and pedigree components
Emergency Management	Added new components to support the Public Health Emergency Operations Center (PH EOC) Minimum Data Set
Justice	Harmonized and updated key FBI code tables
GENC	Updated GENC CSV code lists and provided an alternate XML Schema enumeration representation for easier community support
Core Supplement 4.0.2	Updated Core-dependent code tables in additive schemas that can be used alongside or in place of the original schemas
QA and Harmonization	Harmonized some domain elements that overlapped elements in Core and resolved some QA issues

NIEM 4.2 Core and Domain data property, type, and code counts are shown in the below figure. NIEM Types are either simple or complex. Complex types are described by properties and often described as attributes.

NIEM releases include standardized codes that are governed by standards development organizations (SDOs); the code sets shown on the right side of the diagram are the specific code sets that NIEM incorporates in each release. For example, the genc code set is the Geopolitical Entities, Names, and Codes (GENC) that specifies the country code representation of names of countries and their subdivisions. GENC is managed by the National Center for Geospatial Intelligence Standards (NCGIS). There are four types of genc codes with a total of 5,623 codes that are the individual code values.

NIEM 4.2	Properties	Types	Codes
Core	1,586	271	185
Domains	9,919	2,552	9,436
Agriculture	64	8	
Biometrics	1,012	591	1,327
CBRN	608	147	
Emergency Management	822	333	1,234
Human Services	812	276	1,048
Immigration	457	95	1,388
Infrastructure Protection	31	8	3
Intelligence	66	17	
International Trade	534	91	
Justice	4,206	502	217
Maritime	339	47	180
Military Operations	306	132	130
Screening	599	255	3,731
Surface Transportation	63	50	178
Code Sets	5	1,098	73,009
Total	11,510	3,921	82,630

	Types	Codes
Code Sets	1,098	73,009
aamva_d20	84	732
ag_codes	62	79
apco	8	206
atf	8	98
can	2	13
cbrncl	131	2,435
census	2	3,235
commodity	8	131
dea	6	482
dod_jcs-pub2.0	2	11
dol	2	840
edxl_rm	4	24
fips_5-2	2	69
genc	4	5,623
have-codes	24	43
hazmat	2	2,441
hl7	7	83
iso_3166	8	5,698
iso_4217	2	182
iso_639-3	2	8,393
itcodes	44	2,219
jc3iedm	4	364
jp3-52	5	117
mmucc	146	700
ncic	184	31,982
ndex	250	4,560
nga	4	50
nlets	6	20
occs	6	1,006
sar	8	76
ucr	56	528
unece	17	151
usda_fsa	4	347
usps	2	62
xCard	2	9

FIGURE 3 NIEM 4.2 RELEASE STATISTICS

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NIEM Emerging Technologies Tiger Team (NET³)

The NET³ mission is to promote NIEM as an information exchange framework for emerging technologies and enable the President's Executive Order for Artificial Intelligence (AI) to enhance access to Federal data/models/computing resources to increase their value for AI R&D. The observe, orient, decide, and act (OODA) approach will be used to perform the tactical and strategic activities shown in the NET³ Roadmap below.
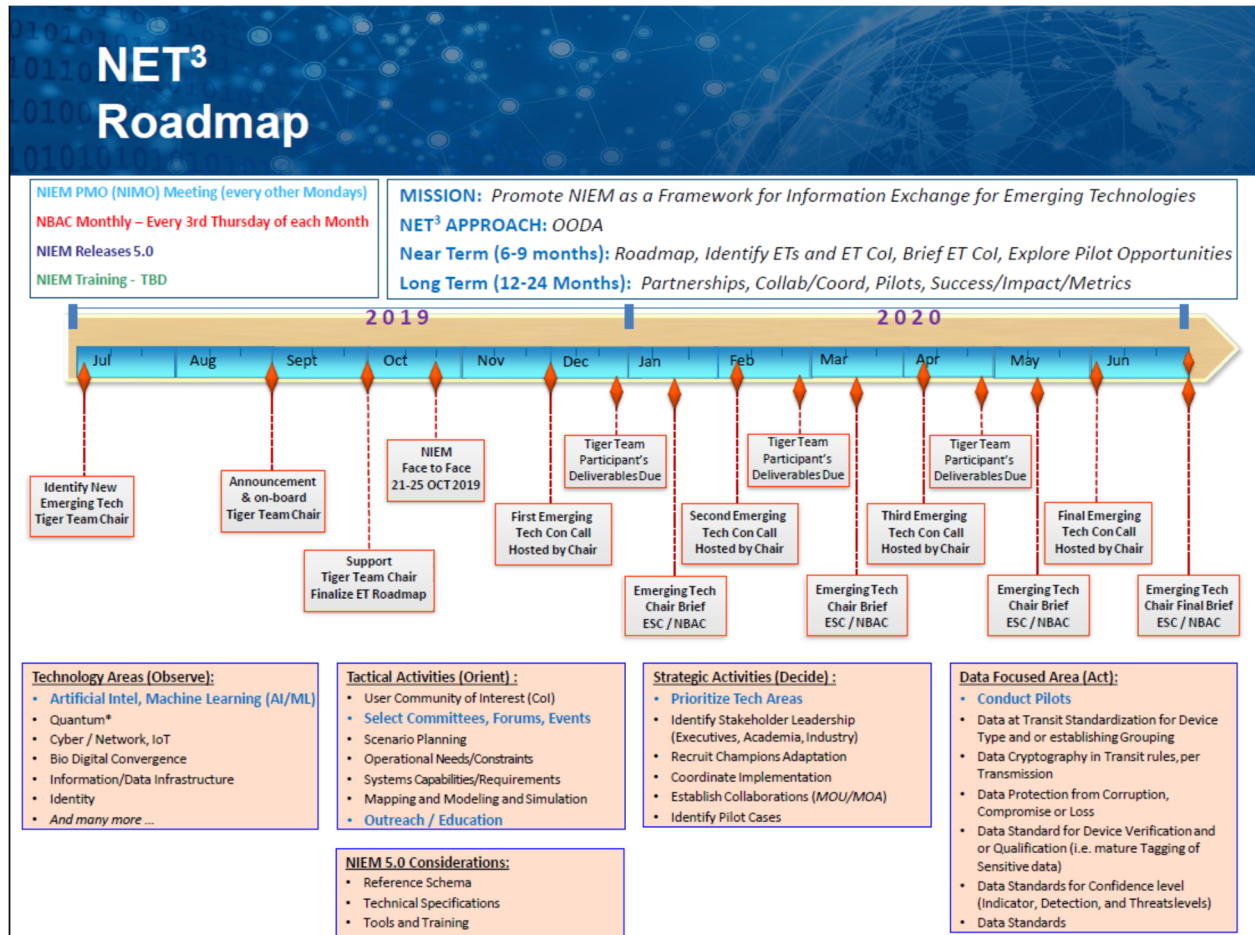
NET³ Roadmap

NIEM PMO (NIMO) Meeting (every other Mondays)
NBAC Monthly – Every 3rd Thursday of each Month
NIEM Releases 5.0
NIEM Training - TBD

MISSION: Promote NIEM as a Framework for Information Exchange for Emerging Technologies
NET³ APPROACH: OODA
Near Term (6-9 months): Roadmap, Identify ETs and ET CoI, Brief ET CoI, Explore Pilot Opportunities
Long Term (12-24 Months): Partnerships, Collab/Coord, Pilots, Success/Impact/Metrics

2019 — Jul | Aug | Sept | Oct | Nov | Dec | **2020** — Jan | Feb | Mar | Apr | May | Jun

- Identify New Emerging Tech Tiger Team Chair
- Announcement & on-board Tiger Team Chair
- Support Tiger Team Chair Finalize ET Roadmap
- NIEM Face to Face 21-25 OCT 2019
- First Emerging Tech Con Call Hosted by Chair
- Tiger Team Participant's Deliverables Due
- Emerging Tech Chair Brief ESC / NBAC
- Second Emerging Tech Con Call Hosted by Chair
- Tiger Team Participant's Deliverables Due
- Third Emerging Tech Con Call Hosted by Chair
- Emerging Tech Chair Brief ESC / NBAC
- Tiger Team Participant's Deliverables Due
- Emerging Tech Chair Brief ESC / NBAC
- Final Emerging Tech Con Call Hosted by Chair
- Emerging Tech Chair Final Brief ESC / NBAC

Technology Areas (Observe):
- Artificial Intel, Machine Learning (AI/ML)
- Quantum*
- Cyber / Network, IoT
- Bio Digital Convergence
- Information/Data Infrastructure
- Identity
- And many more …

Tactical Activities (Orient) :
- User Community of Interest (CoI)
- Select Committees, Forums, Events
- Scenario Planning
- Operational Needs/Constraints
- Systems Capabilities/Requirements
- Mapping and Modeling and Simulation
- Outreach / Education

NIEM 5.0 Considerations:
- Reference Schema
- Technical Specifications
- Tools and Training

Strategic Activities (Decide) :
- Prioritize Tech Areas
- Identify Stakeholder Leadership (Executives, Academia, Industry)
- Recruit Champions Adaptation
- Coordinate Implementation
- Establish Collaborations (MOU/MOA)
- Identify Pilot Cases

Data Focused Area (Act):
- Conduct Pilots
- Data at Transit Standardization for Device Type and or establishing Grouping
- Data Cryptography in Transit rules, per Transmission
- Data Protection from Corruption, Compromise or Loss
- Data Standard for Device Verification and or Qualification (i.e. mature Tagging of Sensitive data)
- Data Standards for Confidence level (Indicator, Detection, and Threatslevels)
- Data Standards

FIGURE 4 NIEM EMERGING TECHNOLOGIES TIGER TEAM ROADMAP

NBAC International Tiger Team

The International Tiger Team has made progress in expanding the utility of NIEM to a larger global audience by initiating an English-French Canada translation effort, identifying common data attributes to support more than 300 global operations, and researching design concepts, governance, and impacts on model. Going forward, Tiger Team activities will be focused on NIEM 5.0, new information exchange pilots, and community of interest (COI) outreach and engagement as shown below.
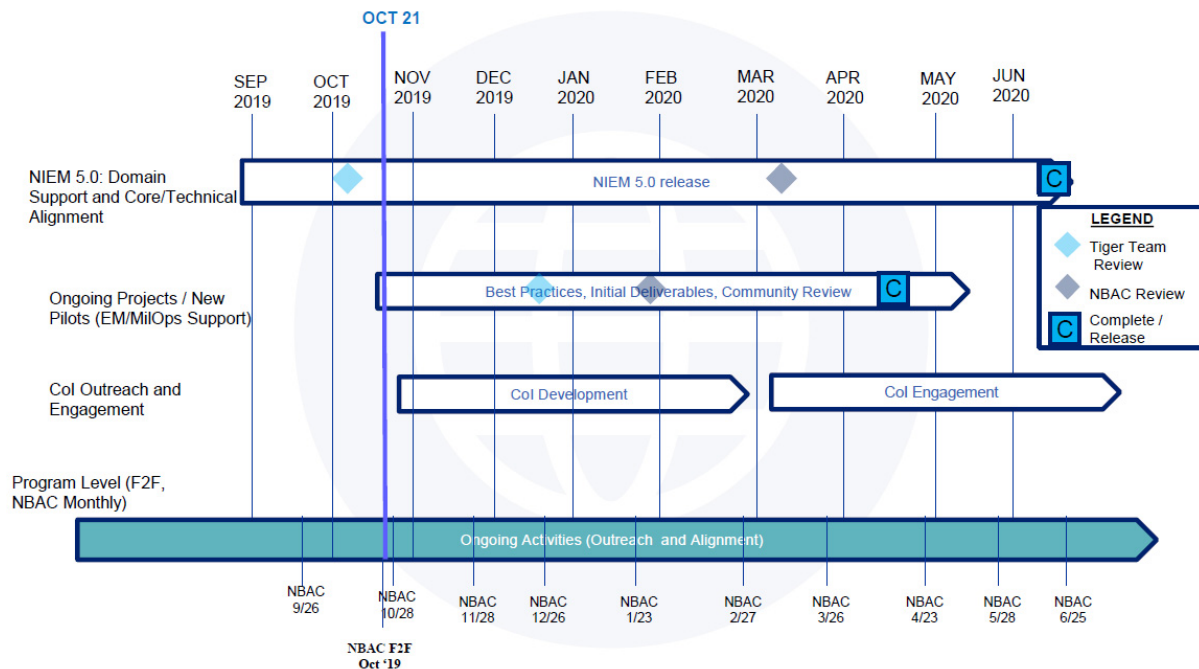
Figure 5 NBAC International Tiger Team 2019-2020 Timeline

NBAC Community Recommendations for NIEM

To improve NIEM adoption, implementation, and reuse, NBAC community stakeholders offer the following NIEM tool, architecture, outreach, and training recommendations for NMO consideration.

NIEM Tool Recommendations

- Provide an end-to-end tool capability to facilitate and automate all phases of the NIEM IEPD Lifecycle, including tools to trace information exchange requirements from architecture scenario planning artifacts to mapping extract, transform, load (ETL) operations, IEPD implementation, and IEPD posting for discovery and reuse.
- Provide the Community with an Enterprise Architecture Tool to document "as is" and "to-be" architectures and exchange models.
- Integrate existing Movement and SSGT tools.
- NIEM should position itself as an information exchange 'translator' between standards

to alleviate it being dismissed as a competing or standard.

- Consider alternate representations of NIEM xml (e.g. JSON, UML, etc.) to make it easier for tool developers to work within the NIEM framework.
- Provide comprehensive NIEM JSON tool support.
- Allow SSGT to restrict data type facets in subset schema generation. For example, string minimum Length or integer minimum Inclusive values.
- Provide an easy browsing tool for NIEM core and Domain content.

NIEM Architecture Recommendations

- Create IEPD registry or repository.
- Develop Privacy Sensitivity Marking and additional guidance on authorization for access to NIEM-exchanged data
- Provide a NIEM enterprise development and implementation environment that supports xml, json, mobile device exchanges and application program interface (API), micro and web service reuse.

NIEM Outreach Recommendations

- Market NIEM to state, local, and tribal government and non-governmental organizations.
- Provide a NIEM Customer Relations Management (CRM) tool to improve Domain collaboration and awareness within and across federal, state, local, and international stakeholders.
- Provide access to a library of topic based information (e.g., AI, IoT, Open Data, etc.) handouts to facilitate cross-community collaboration.
- Develop and maintain an updated list of organizations using NIEM.

NIEM Training Recommendations

- Provide NIEM tool training to improve understanding and proficiency in building extension schemas, augmentations, and implementation.
- Recommend specific training objectives be identified with associated curricula for adopters, modelers, developers, and users to achieve and demonstrate (test) level of NIEM proficiency.

NIEM Vision, Priorities and Goals

The NBAC responds to NIEM ESC guidance and Domain recommendations by annually reviewing and recommending updates to the NIEM vision, priorities, and goals.

NIEM Vision:

The NBAC recommend updating the current NIEM Vision to read: Elevate data as a strategic asset by advancing the NIEM community-based standards framework to improve data interoperability and support existing and emerging technologies among federal, state, local, tribal, industry and international partners.

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NIEM Priorities and Goals

The NBAC recommends the following NIEM Priorities and Goals:

NIEM Priorities and Goals	
Priority	**Goals**
NIEM 5.0 Major Release	Domain content harmonization
	Technical specification updates
	Tool updates
	Training updates
	NIEM architecture and tool enhancements
Advance NIEM Adoption	NIEM Strategic Communications Plan
	National Association of State CIOs (NASCIO)
	US Office of Management and Budget (OMB)
	DOD Joint Artificial Intelligence Center (JAIC)
	International Partners
	Meteorology and Oceanography (METOC)
	Humanitarian Aid – US Agency for International Development (USAID)
Support and Reinvigorate Domain Growth	Statistics Domain (US Census Bureau)
	Health Domain Stand Up and Outreach - HHS
	Screening Domain
	CWMD Domain
	Agriculture Domain
	Surface Transportation Domain
Improve NIEM Implementation	Java Script Object Notation (JSON)
	NIEM IEPD Registry
	Support Artificial Intelligence (AI)
	Metadata tagging to control access to sensitive information
	International Data Sharing
	NIEM Maturity Model
	API and Web Services

NIEM 5.0 Major Release

NIEM 5.0 major release development is in progress with the Harmonization Workgroup resolving model content issues and harmonizing components across the NIEM Core and domains. The NBAC is collaborating with the NTAC to identify NIEM architecture and technical specification change recommendations. These activities include defining NIEM requirements to support International information sharing, enabling emerging technologies, and simplifying NIEM usage. The planned NIEM 5.0 release schedule follows:

Phase   Estimated Date

Alpha 1   March 2020

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Beta 1   June 2020
Release Candidate (RC) 1 August 2020
Technical   September 2020

Advance NIEM Adoption

To encourage organizations to adopt NIEM, the NBAC developed the NIEM Value Proposition that highlights how NIEM significantly reduces the mapping level of effort to improve interoperability in a system of systems information ecosystem.
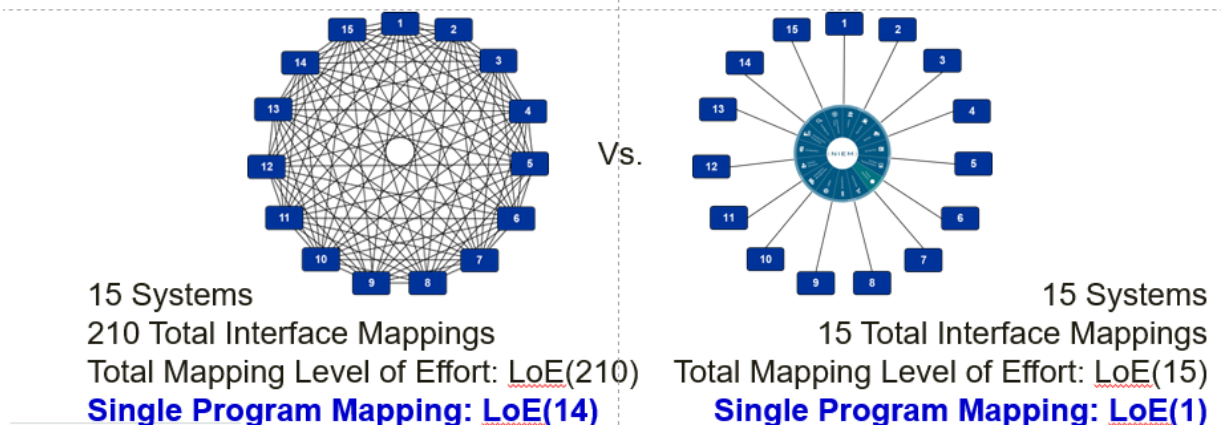

FIGURE 6 NIEM VALUE PROPOSITION

Improve NIEM Implementation

The NBAC recognizes several opportunities to improve NIEM implementation by extending the framework beyond Extensible Markup Language (XML), promoting Information Exchange Package Documentation (IEPD) discovery and reuse, enabling new technologies, and evolving a service-based architecture. Specifically, the NBAC and NTAC have agreed to schedule quarterly collaboration sessions to define NIEM requirements for the following areas.

- Java Script Object Notation (JSON)
- NIEM IEPD Registry
- Support Artificial Intelligence (AI)
- Metadata tagging to control access to sensitive information

- International Data Sharing
- API and Web Services

NIEM Maturity Model

To help inform the way forward for evolving NIEM, the NBAC and NTAC will be supporting the development of a NIEM Maturity Model to identify the as-is and to-be mature state of NIEM to guide the application of available NIEM community resources.

NTAC Contribution

Tool Strategy

In response to the NBAC identification NIEM community tool needs and issues, the NTAC is developing the NIEM tool strategy to address the following requirements:

- Open source and user-installable
- Standards-based
- Modular, to support incremental improvements
- Support a self-service model
- Easy to use
- Compatible across domains.

The NMO must balance the application of constrained resources to support current and future NIEM tools. What changes to the current toolset are needed for current operations of NIEM as a service provider? What is the appropriate tool strategy to market NIEM and to position NIEM for a healthy future? A 2019 priority has been conceptualizing a NIEM tool strategy and steering that discussion and evaluation of alternative tool visons within NBAC and NTAC.

NIEM Metamodel and the Common Model Format

The NTAC is developing the NIEM Metamodel to support multiple data representations including JSON and UML. The intent is to enable NIEM to be used with existing and emerging information exchange technologies by establishing a common model format. The first phase will focus on tools and techniques to transform between XML Schema, JSON Schema (to specify JSON messages), and UML versions of NIEM data definitions. The NIEM Metamodel will facilitate the transformation between these formats.

JSON Schema for NIEM

The NTAC is developing the NIEM JSON Specification to enable a JSON representation of NIEM XML data (see https://github.com/NIEM/NIEM-JSON-Spec/releases/tag/v4.0alpha1). JSON data that conforms to NIEM is expressed as JSON-LD data, which conforms to the data model defined by NIEM XML Schema data definitions.

The NIEM JSON specification will enable the use of JSON's in a repeatable, consistent way. NTAC cautions that the JSON specification alone will not sufficiently enable the broad use of JSON, nor does it provide a method for specifying or verifying specific JSON syntaxes for use in exchanges. An improvement would be for NIEM to provide a means of developing and

maintaining JSON Schemas that define JSON messages for NIEM.

There are complications in using JSON Schema in a manner consistent with how NIEM uses XML Schema. The JSON Schema language does not supply a type system that can accomplish what the XML Schema type system does. NIEM needs a manner of defining and reusing common data definitions, providing for class/type inheritance, derived/specialized properties, and datatype definitions, which are not described by JSON Schema. However, software could produce JSON Schema that is consistent with NIEM data definitions, and which would verify a useful proportion of the constraints and semantics expressed in NIEM data definitions.

To provide a sufficient JSON Schema representation for NIEM data models, software would require the complete data definitions for an entire exchange, whereas an XML Schema can be produced for a single namespace in isolation. For JSON Schema, class/type inheritance would be *flattened*, removing copying properties of base types into the derived types. Derived/specialized properties, which are represented as element substitution in NIEM XML Schema, would also be flattened, copying optional properties into schemas where they may occur. This will limit the precision of cardinality specifications in the schema, but will provide clear grammars of what elements may occur in which locations within a message, and will enable machine validation of many aspects of a JSON message.

UML for NIEM

The NTAC is considering two use cases for the use of NIEM data definitions with UML software:

1. Rendering NIEM data definitions as UML models for incorporation into existing UML class diagram usage patterns
2. Enabling the construction of new conformant NIEM data definitions by people using UML tools.

The NIEM Metamodel will facilitate both use cases.

In the first case, a NIEM subset, or other data model, will be rendered as a UML XMI (XML Metadata Interchange), which is an XML format that describes UML models. This XMI data may be imported into a variety of UML tools, proving the NIEM data definitions as UML class diagrams.

In the second use case, a UML data model that follows certain conditions will be transformed into the common model format. This model may then be handled as other models are handled: rendered as XML Schema, or as JSON Schema, or incorporated into IEPDS or future versions of NIEM.

A set of software modules that convert between the common model format and UML's XMI format will enable common tools (such as the existing SSGT, the Schema Subset Generation Tool), to add UML capability to their production of NIEM Schemas and other inputs to the IEPD generation process. Any such modules produced by the NIEM program will be developed as open source, user-installable software.

NIEM Management Office (NMO) Contribution

NIEM's NMO is responsible for day-to-day operational leadership. The NMO is led by the Mr. Stuart Whitehead, Deputy Director, Cyber and Command and Control, Communications and Computers Integration (DDC5I), Joint Staff J6.

The NMO organization identifying key points of contact is shown in the following Figure

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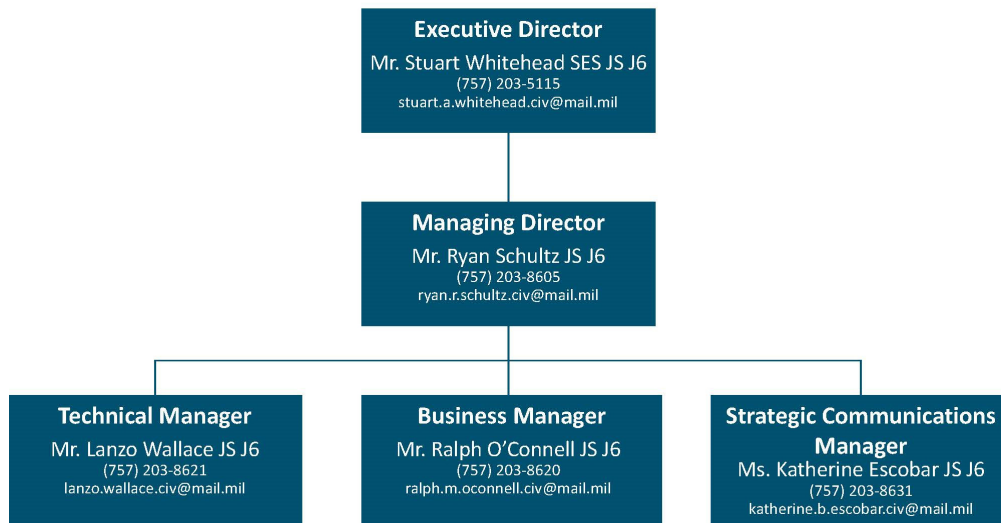(757) 203-8631
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Figure 7 NIEM Management Office

The two work horses of the NIEM organization are the Business Architecture Committee (NBAC) and the NIEM Technical Architecture Committee (NTAC).

NBAC membership draws from the NIEM domains as well as the broader NIEM community. The NBAC committee is led by co-chairs and includes voting members, NMO liaison, representatives from the 14 NIEM domains, as well participants from the NIEM community. The NBAC is primarily responsible for vetting new potential domains to the ESC for inclusion in the data model, determining the requirements underpinning new data model releases, and maintaining the NIEM Core and requisite harmonization activities.

NTAC is responsible for defining the technical architecture that governs NIEM. The committee is led by two co-chairs. Committee members are recommended by the NMO, key stakeholders and representatives of engaged Communities of Interests (COIs), and approved by NTAC co-chairs. A NMO Liaison is also assigned to the NTAC.

Key 2019 NMO, NBAC and NTAC activities described throughout this report included: the Work Plan, Release 4.2 and Release 5.0, Domain Activities, Tiger Teams, onboarding new domains and tool and model strategy.

APPENDIX

Appendix A: Glossary of Abbreviations and Acronyms

AI	Artificial Intelligence
APAN	All Partners Access Network
COTS	Commercial Off the Shelf software
CTOC	Combating Transnational Organized Crime
DHS	US Department of Homeland Security
ESC	Executive Steering Council (NIEM)
FEMA	US Federal Emergency Management Agency
HIPAA	Health Insurance Portability and Accountability Act
HUD	US Housing and Urban Development
ICAM	Identity Credential and Access Management
IDAM	Identity and Access Management
IEPD	Information Exchange Package Documentation
IoT	Internet of Things
JAIC	Joint Artificial Intelligence Center
MPD	Message Package Document
METROC	Meteorology and Oceanography
NATO	North Atlantic Treaty Organization
NIEM	National Information Exchange Model
NBAC	NIEM Business Architecture Committee
NMO	NIEM Management Office
NTAC	NIEM Technical Architecture Committee
OMB	US Office of Management and Budget
PHI	Protected Health Information
SSGT	Schema Subset Generation Tool
UML	Unified Markup Language
USAID	United States Agency for International Development