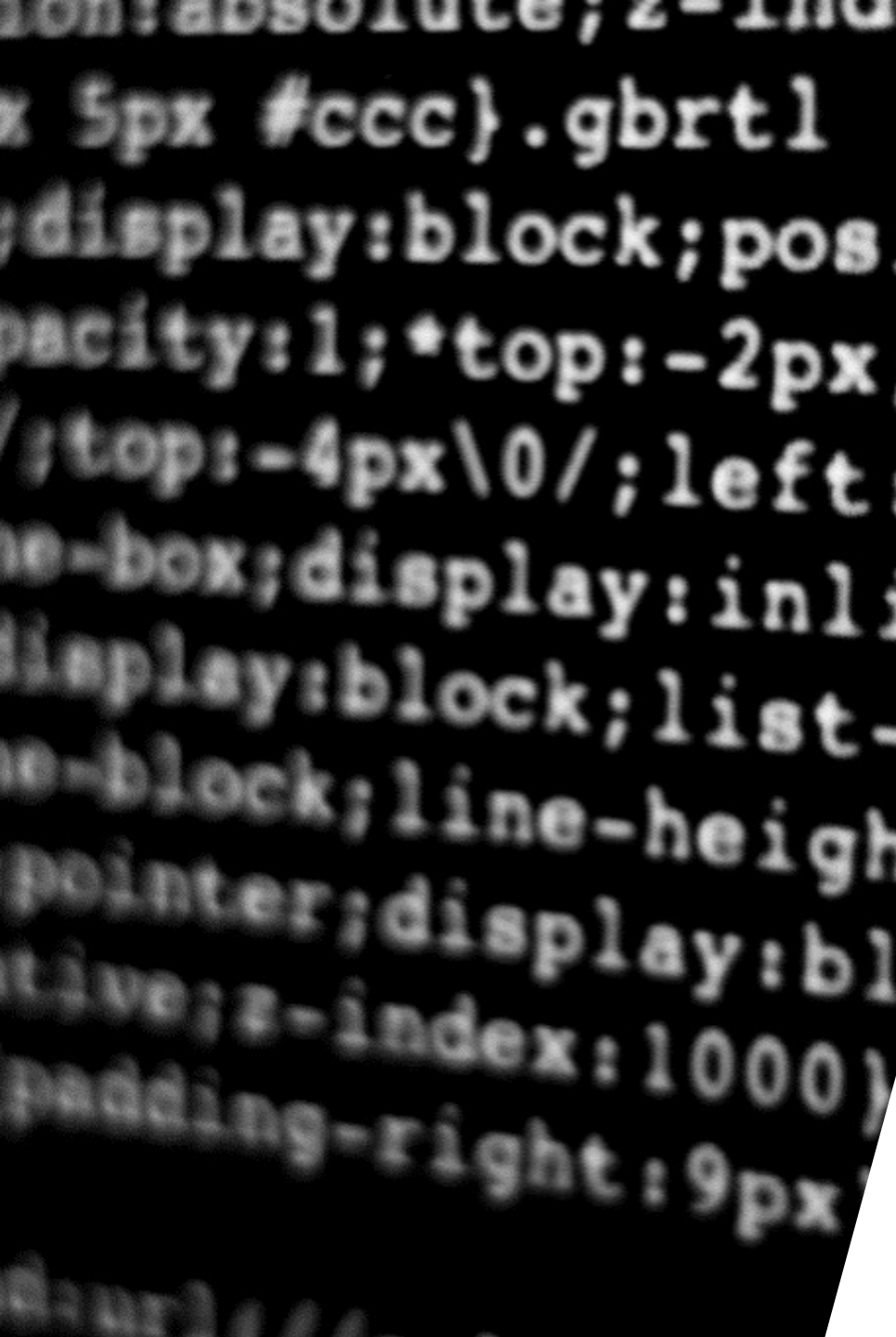


INTRODUCTION TO THE NATIONAL INFORMATION EXCHANGE MODEL (NIEM)

Presenter: Katherine Escobar

Organization Name: NIEM Management Office

Summary: Interoperability between information systems starts at the Data level with semantic interoperability, the ability of computer systems to exchange data with unambiguous, shared meaning. Introduction to the National Information Exchange Model (NIEM) will provide an overview of the NIEM Framework, benefits, resources, and how to begin creating semantic interoperability for your system data sharing needs.

2:00 PM TO 3:00 PM

OVERVIEW

February 23, 2021

Ms. Katherine Escobar
Joint Staff J6, DDC5I, Data & Standards
NIEM Managing Director

AGENDA

- Interoperability Challenges
- National Information Exchange Model (NIEM)
- How to Get Started
- Next Steps

WHY NIEM?

- Your mission depends on sharing of data
  - Within and across Immigration stakeholders
  - With Federal, State, Local, Tribal partners
  - With International partners
  - With Industry partners
- For Immigration, this includes
  - Multiple, complex data sharing permutations (ex: Cyber, Immigration, Customs and Border Control, etc…)
  - Data must be shared across multiple networks, multiple security boundaries, multiple IT capabilities and still be understandable
  - Component programs are not equipped to handle all domains in this Enterprise-level data sharing challenge

Many Immigration Stakeholders are using NIEM, to include but not limited to:
ICE, CBP, USCIS, CWMD, S&T, FEMA, TSA, USCG, and CISA.
NIEM is also a key element of many of the Federal Government strategic imperatives

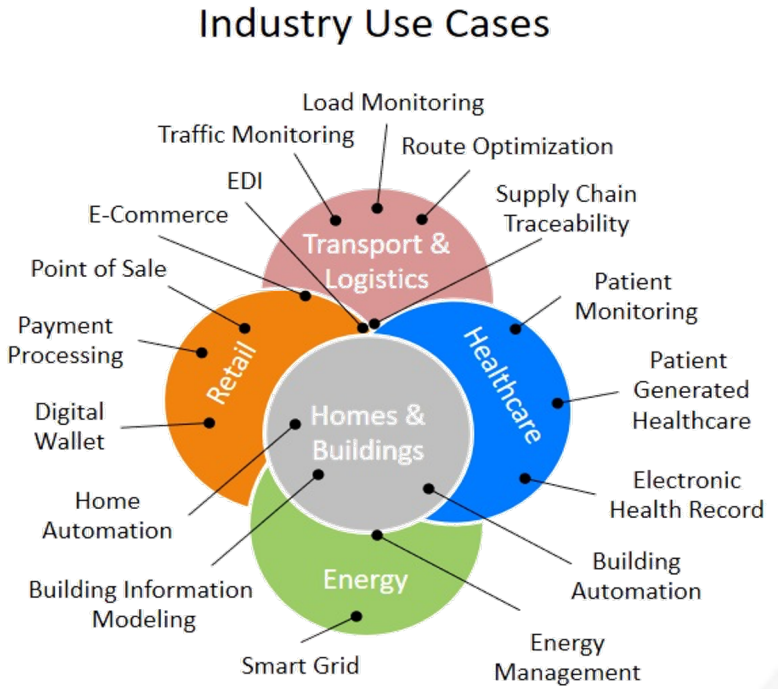
NSA LED DOMAINS

Domain	NSA Office
Cyber	Cybersecurity and Infrastructure Security Agency (CISA)
Biometrics	Office of Biometric Identity Management (OBIM)
Emergency Management	NSA Science and Technology (S&T)
Immigration	NSA Citizenship and Immigration Services (CIS) and Immigration and Customs Enforcement (ICE)
Chemical, Biological, Radiological, and Nuclear (CBRN)	Countering Weapons of Mass Destruction (CWMD) with Cooperation of Customs and Border Patrol (CBP)
International Trade	NSA Customs and Border Protection (CBP)
Infrastructure Protection (IP)	Cybersecurity and Infrastructure Security Agency (CISA)
Screening	NSA HQ Office of Strategy, Policy, and Plans

INTEROPERABILITY

Across all levels of government, industries, and technical solution providers, **interoperability** is an essential tool for:

- Better decision making
- Reduction of manual processing
- Increased productivity
- Reduction of errors
- Management of costs



Everyone agrees it takes interoperability of systems to achieve these benefits.

INTEROPERABILITY CHALLENGES

If everyone agrees, why is there a lack of interoperability problem?

- Lack of unified agreement on standards selection and implementation
- Siloed (domain-specific) development efforts driven by need, isolated by incompatibility
- Proprietary and vendor-driven solutions vs. Interoperable driven solutions
- Information Blocking - business, technical, and organizational practices that prevent or materially discourage access, exchange or use

Effective information sharing is critical to the missions

INTEROPERABILITY SOLUTION

The key factor to achieve interoperability is **data**

- Information exchange is critical to ensuring timely information is available when and where it is needed
- To exchange data, systems must have agreement on:
  - **Syntactic**: Data encodings and representation
  - **Semantic**: Consistent terminology and meanings

NIEM Solves the Interoperability Challenges at the Data Level

IMMIGRATION DOMAIN SCOPE

- The NIEM Immigration domain manages those unique immigration-related services and benefits missions data components in NIEM
- Components support mission critical information sharing requirements within Federal, State, Local, Tribal, Territorial and International Partners.
- Immigration Domain is a catalogue of data components, and is used to support information exchange requirements from the following functional categories:
  - Naturalization
  - Work Authorization
  - Border Control
  - Customs
  - Trade
  - Protection
  - Employment

NATIONAL INFORMATION EXCHANGE MODEL

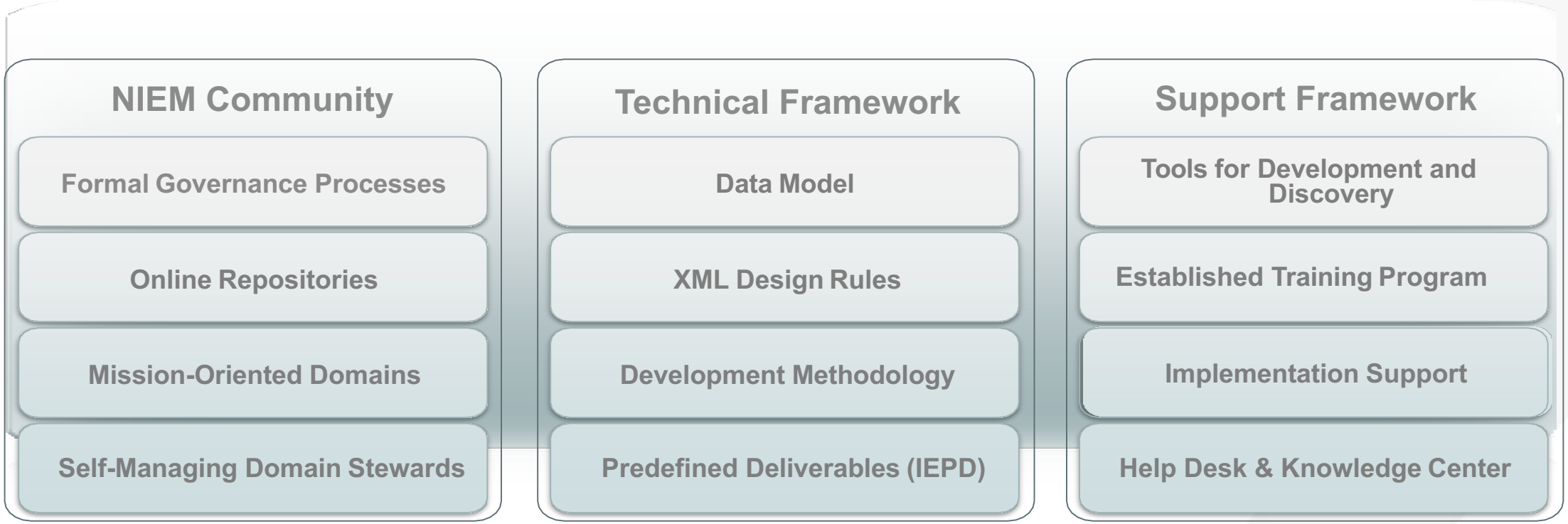
NIEM FRAMEWORK

NIEM is a community-driven, government and jurisdiction-wide, standards-based approach to exchanging information

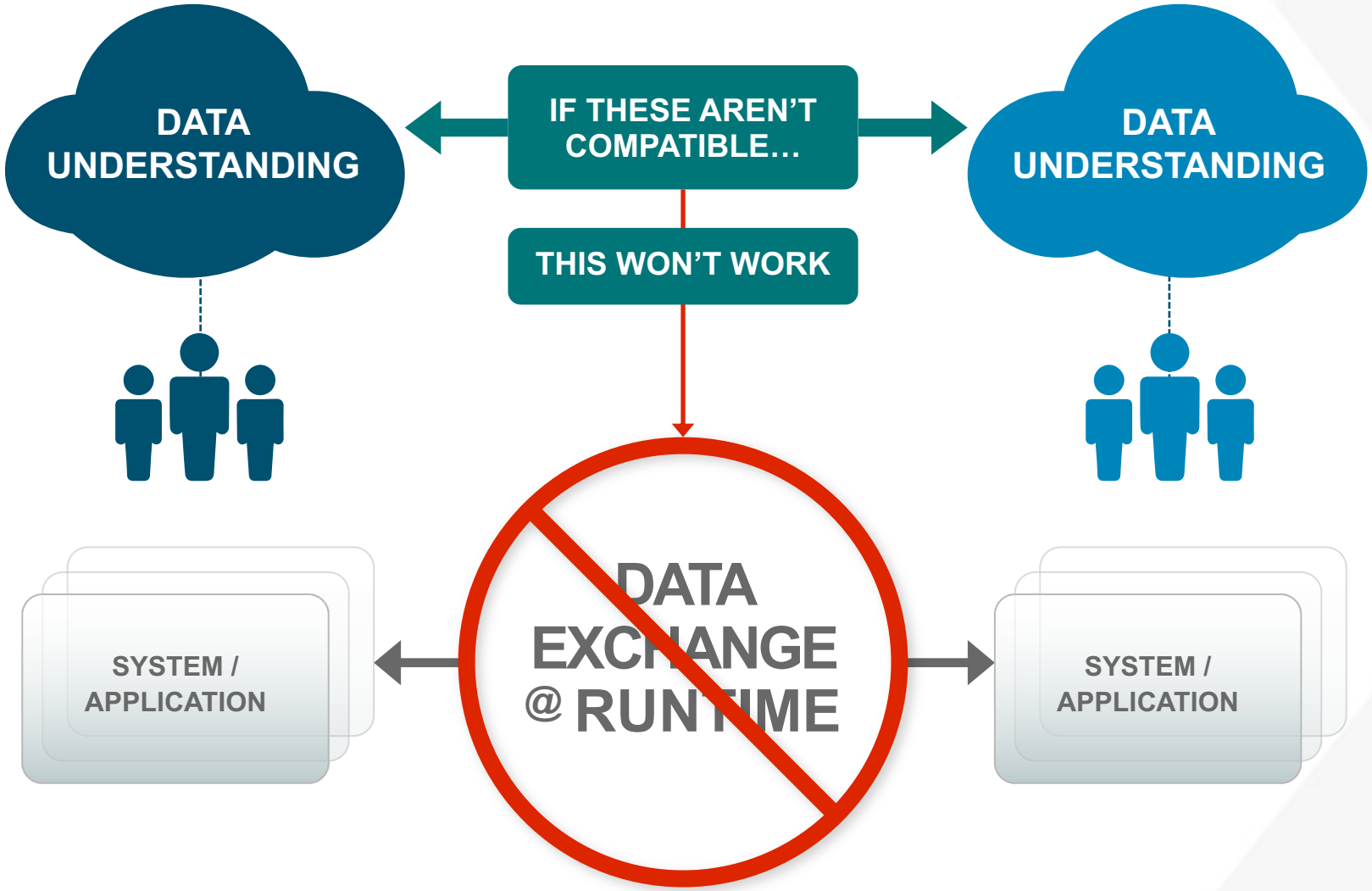
Diverse communities can collectively leverage **NIEM to increase efficiencies** and improve decision-making

NIEM is available to everyone, including public and private organizations

NIEM includes a data model, governance, training, tools, technical support services, and an active community to assist users in adopting a standards-based approach to exchanging data



DATA INTEROPERABILITY PROBLEM



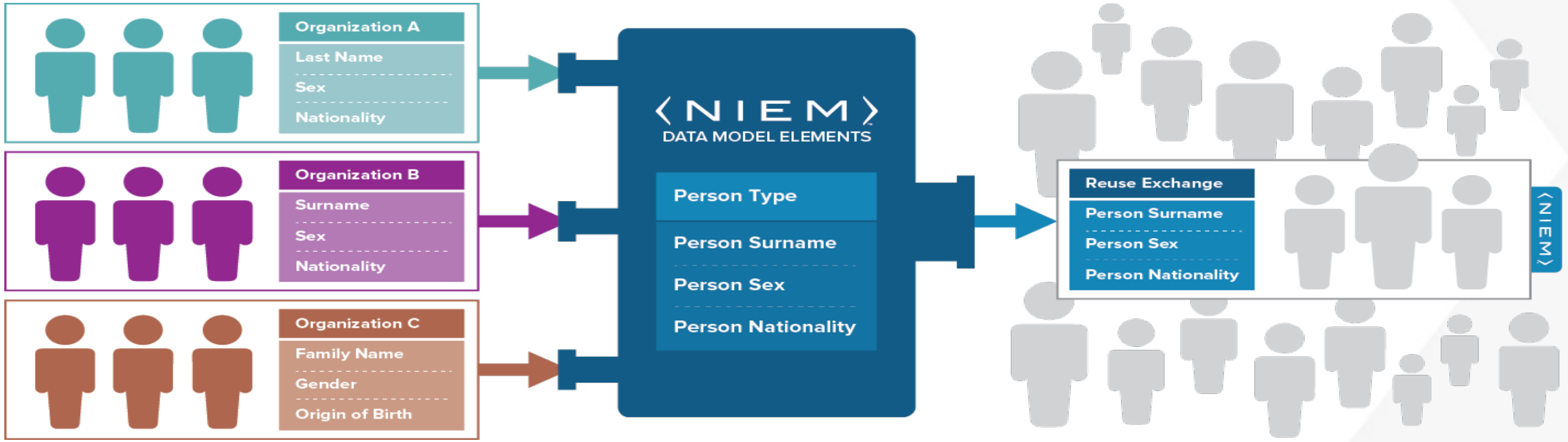
NIEM IN ACTION: HOW NIEM EXCHANGES DATA COMPONENTS AND DATA ELEMENTS

NIEM is

a common vocabulary –
enabling efficient information exchange across diverse public and private organizations

NIEM is not

a system or database –
NIEM does not specify how to transmit or store data



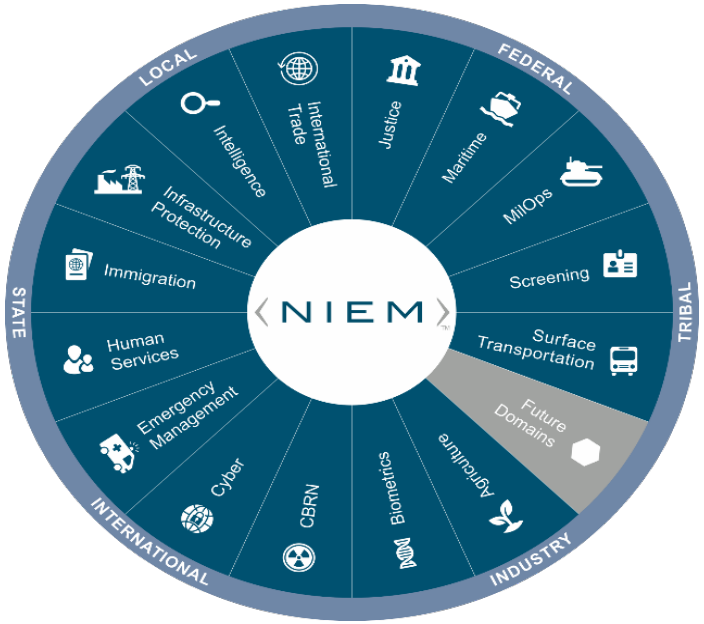
Using NIEM, organizations come together to agree on a common vocabulary
When additional organizations are added to the information exchange, the initial NIEM exchange can be reused, saving time and money

NIEM – THE BIG PICTURE

NIEM enables organizations to move information across organizational boundaries in order to interoperate – and act as one – while each maintains authority for their own existing systems

Common Language

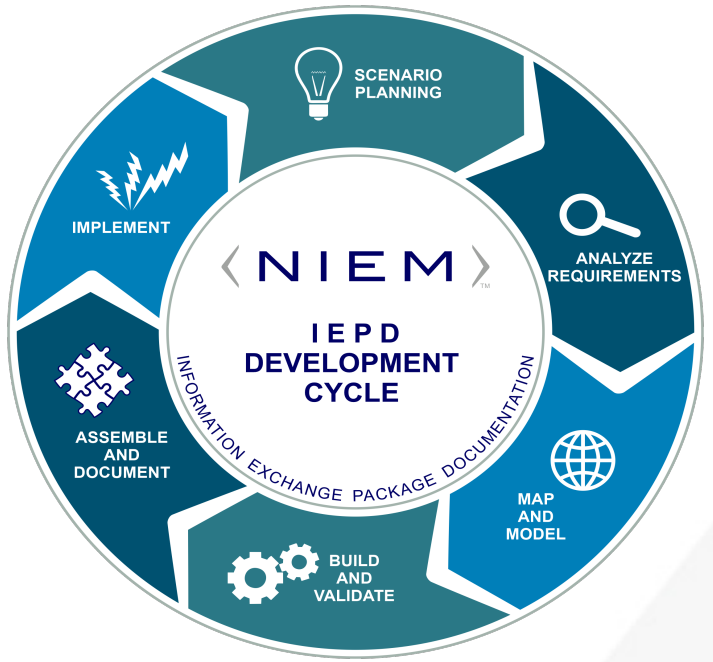
(Data Model Lifecycle)



Built and governed by users within the Federal, State, Local, Tribal, and Private Sectors

Repeatable, Reusable Process

(Exchange Specification Lifecycle)



MODEL OVERVIEW

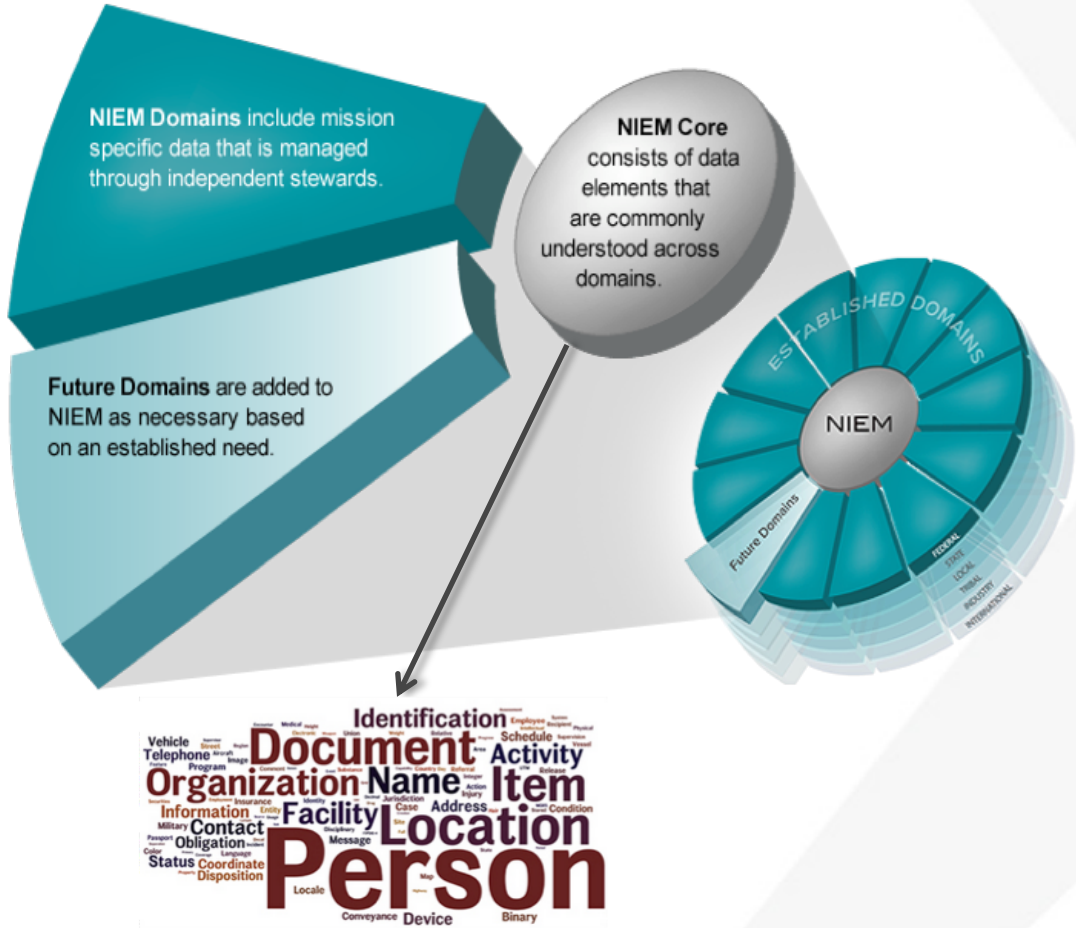
Think of the NIEM data model as a mature and stable data dictionary of agreed-upon terms, definitions, relationships and formats independent of how information is stored in individual agency systems

The data model consists of two sets of closely related vocabularies:

- **NIEM core**
- **Individual NIEM domains**

NIEM core includes data elements commonly agreed upon across all NIEM domains (i.e., person, activity, location, and item, etc.)

Individual NIEM domains contain mission-specific data components that build upon NIEM core concepts

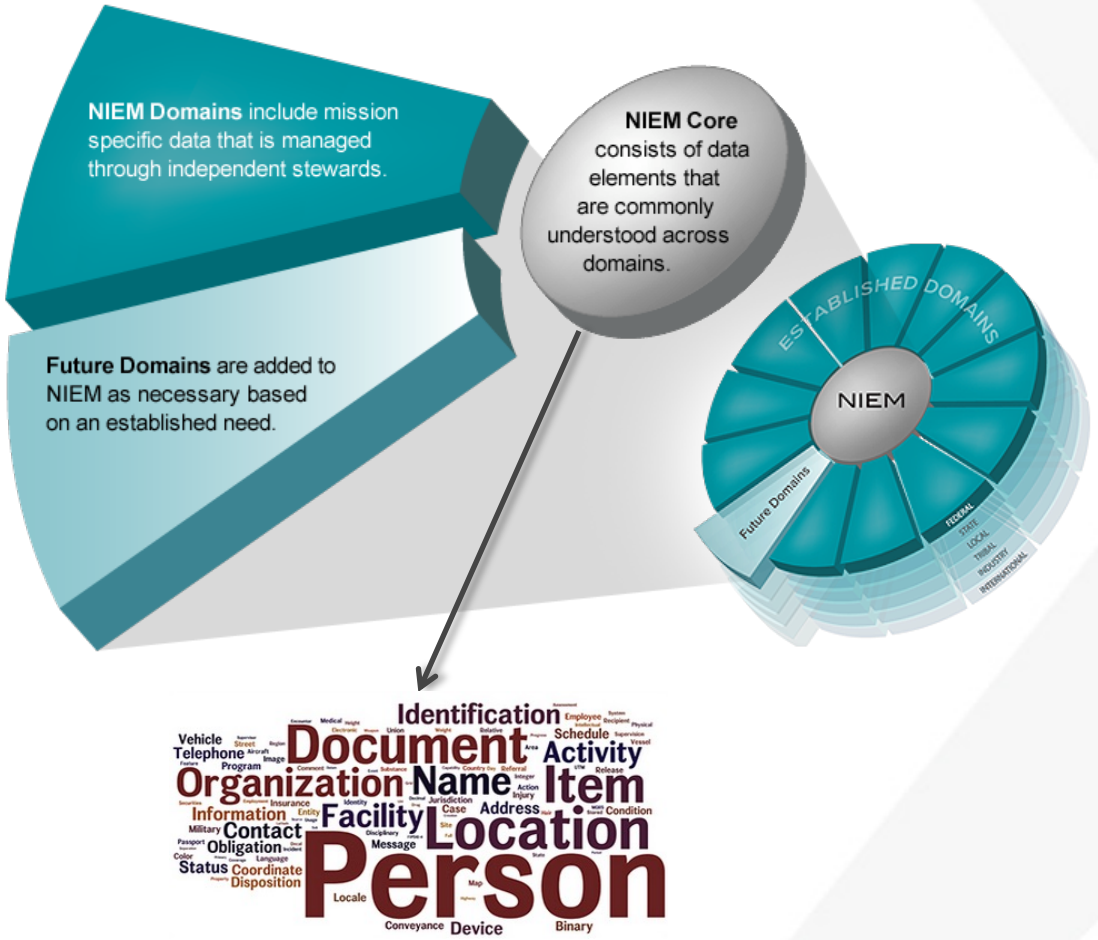


NIEM MODEL CONTENT

Think of the NIEM data model as a mature and stable data dictionary of agreed-upon terms, definitions, and formats independent of how information is stored inside individual IT systems.

NIEM Domains

- Agriculture
- Biometrics
- Chemical, Biological, Radiological, & Nuclear
- Cyber
- Emergency Management
- Human Services
- Immigration
- Infrastructure Protection
- Intelligence
- International Trade
- Justice
- Maritime
- Military Operations
- Screening
- Surface Transportation



NIEM ADVANTAGE

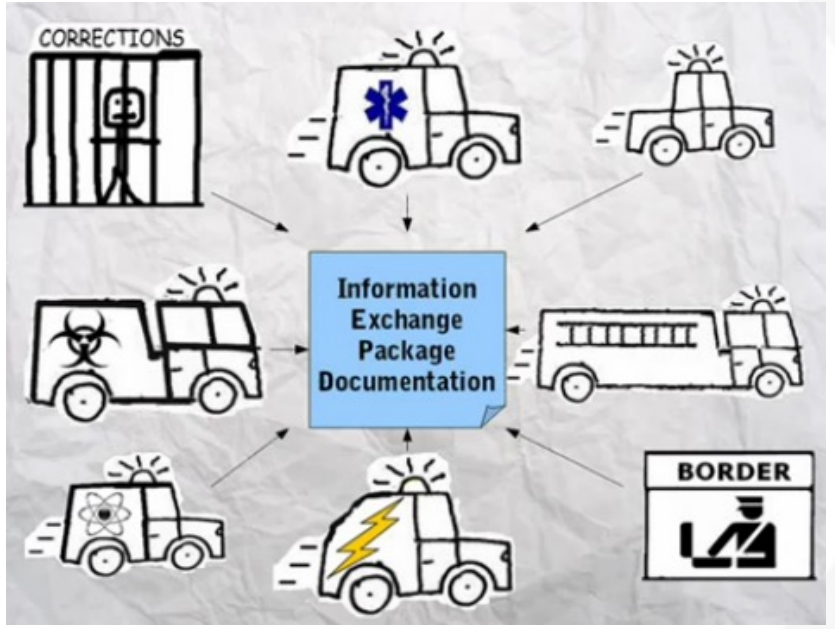
When using NIEM, you only need to "speak" two languages — your own and NIEM

EXAMPLE Communicating With 15 Different Systems

WITHOUT NIEM

LOE Single Program Mapping = 14
LOE Total Mapping = 210
210 Total Interface Mappings

USING NIEM



LOE Single Program Mapping = 1
LOE Total Mapping = 15
15 Total Interface Mappings

Level of Effort (LoE)

NIEM COMMUNITY STAKEHOLDERS

The NIEM community continuously communicates with six different stakeholder types

Each stakeholder is interested in NIEM and how it can help their organization or project for different reasons

Executives

NIEM minimizes the time-to-market while allowing maximum flexibility.

Program Managers

NIEM can make a job easier by helping teams build exchanges in less time, for less money time.

Architects

NIEM offers a better way to exchange data and is adaptable; it can be modified or new capabilities added to an existing exchange.

Developers

Tools and support are available to make exchange development easier and faster.

Implementers

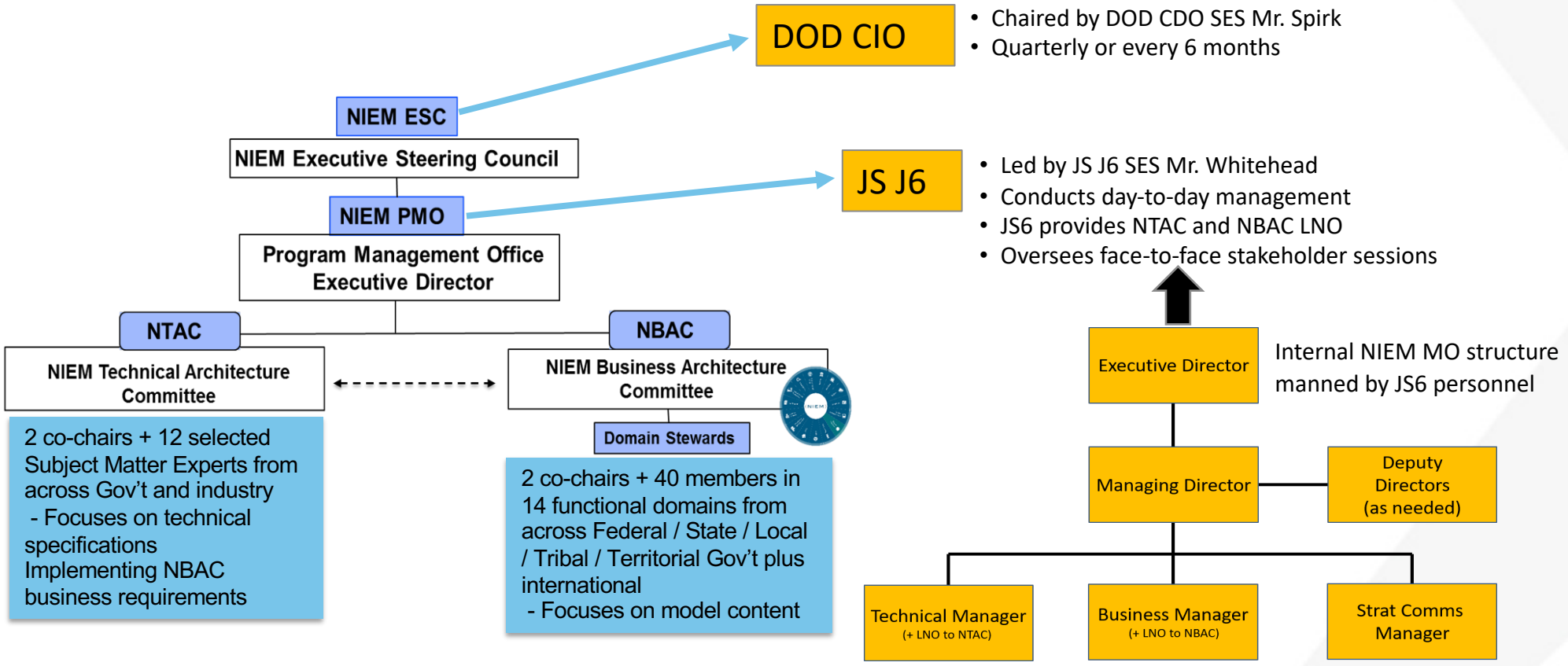
NIEM can lower the cost of maintenance in comparison to legacy formats.

Tool Providers

NIEM can be an avenue to connect with customers who have an interest in information sharing capabilities.

NIEM ORGANIZATION GOVERNANCE

NIEM provides standardized enterprise-level information exchange across Joint, Coalition and Interagency domains



NIEM IS AN OPEN STANDARD

The National Technology Transfer and Advancement Act
(NTTAA) directs Federal agencies to adopt voluntary consensus standards wherever possible (avoiding development of unique government standards) and establishes reporting requirements.

OMB A-119 Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities
All federal agencies must use voluntary consensus standards in lieu of government-unique standards in their procurement and regulatory activities, except where inconsistent with law or otherwise impractical.

NIEM Alignment to Open Standard Criteria

- ✓ Openness
- ✓ Balance of interest
- ✓ Due process
- ✓ Appeals process
- ✓ Consensus

STANDARDS THAT INCLUDE NIEM

- ANSI 42.42 Radiological Nuclear detectors – CBRN Domain
- ANSI APCO Alarm Monitoring Company to Public Safety Answering Point (PSAP)
- OASIS EXDL, Emergency Data Exchange Language FEMA (Emergency Management Domain)
- NIST Big Data Framework Vol 7
- Nation Fire Protection NFPA 950 calls for compliance with NIEM. Emergency Incident Data Document (EIDD) IEPD – NISTIR 8255
- Biometrics ANSI/NIST ITL Standard – Biometrics Domain
- Biometric Conformance Test Software (BioCTS)
- BioCTS for AN-ITL v2 is a desktop application which tests electronic biometric data files, known as transactions, for conformance to NIST Special Publication (SP) 500-290
- Conformance Test Architecture (CTA) and Test Suite (CTS) called "BioCTS for AN-2011 NIEM XML" designed to test implementations of AN-2011 NIEM XML encoded transactions.
- NIEM cited in patent – Integrated Environment for Developing Information Exchanges patent No: US 8,769,480 B1 Dated July 1, 2014
- Model Minimum Uniform Crash Criteria Guideline (MMUCC) – Department of Transportation

NIEM DOMAIN OVERVIEW

NIEM Domain	Organizational Sponsor	Content Focus	Points of Contact
Agriculture	Department of Agriculture	Farm Service Agency (FSA) and Risk Management Agency (RMA) reporting data about crops, acreage, and revenue as part of the federal crop insurance program	Garon Reeves
Biometrics	NSA National Protection and Programs Directorate Office of Biometric Identity Management	Part of a coordinated global effort to maintain and refine operations focused on security, intelligence, law enforcement, international trade, travel and immigration by means of identity management and assurance	John Boyd (SES) Thomas Freed
Chemical, Biological, Radiological, and Nuclear	NSA Domestic Nuclear Detection Office (DNDO) with cooperation of Customs and Border Patrol	National effort to detect and interdict radiological and nuclear threats. The GNDA (Global Nuclear Detection Architecture) involves NSA, DOJ, DOE, DOS, DOD, the Governmental Nuclear Regulatory Commission (NRC), state, local, and tribal agencies	Lon Gowen Dr. Brendon Plapp
Core	NSA/DOD	Common data types, properties, code sets across multiple Domains	Christina Medlin Ralph O'Connell
Cyber	NSA Cybersecurity and Infrastructure Security Agency	Enable Federal Government and critical infrastructure owner and operator's information exchanges	Preston Werntz Juan Gonzales
Emergency Management	NSA Science and Technology First Responders Group	Supports emergency-related services (first responders, responding to disasters), information sharing, and activities such as homeland security and resource communications management	Dan Cotter (SES) Kamran Atri
Human Services	Department of Health and Human Services (HHS) Administration for Children and Families	Create and encourage greater collaboration and service integration among human service programs and agencies to improve client outcomes, lower costs, and enhance operational efficiencies	Dorothy Wan
Immigration	NSA Citizenship and Immigration Services (CIS) and Immigration and Customs Enforcement (ICE)	Standardized information sharing to improve investigative and enforcement responsibilities for federal immigration laws, customs laws, and air security laws to foster better collaboration with their external partners	Jennifer Kish Curtis Ross

NIEM DOMAIN OVERVIEW (cont'd)

NIEM Domain	Organizational Sponsor	Content Focus	Points of Contact
Infrastructure Protection	NSA Office of Infrastructure Protection	Coordinated national program to reduce risks to the nation's critical infrastructure and key resources (CIKR)	Preston Werntz
Intelligence	ODNI Criminal Intelligence Coordinating Council and the federal Intelligence Community	Identify the operational needs to exchange intelligence, as well as the opportunities to share information with other domains and functions in justice and homeland security	Sue Dohr
International Trade	NSA Customs and Border Protection	Enable resulting in greater facilitation of trade and more effective identification and elimination of security threats before they arrive at ports and borders. Aligns with the World Customs Organization (WCO) Data Model and the Customs Business Process models.	Tomas Mills
Justice	FBI steward the U.S. Attorney General's Advisory Council on Global Justice Information Sharing	Global Justice XML Data Model (GJXDM) became the first NIEM domain in 2005 to enable the entire justice and public safety communities to effectively share information at all levels – laying the foundation for local, state, tribal, and national justice interoperability.	April Mitchell Cherie Cochran
Maritime	Office of Naval Intelligence OCIO stewards in coordination with NSA	Support full Maritime Domain Awareness: "the effective understanding of anything associated with the global maritime domain that could impact the United States' security, safety, economy, or environment" including vessels, people, cargo, maritime locations and activities	Ms. Sandra Brown Ms. Kelly McCool Harry Petrey
Military Operations	Joint Staff J6 stewards on behalf of the DOD CIO	Data components necessary to support improved data interoperability between DOD and mission partners for operations	Ralph O'Connell Adrian Francis
Screening	NSA	Supports, coordinates, and harmonizes a wide range of screening and credentialing activity information across homeland security mission areas	Steve Yonkers
Surface Transportation	Department of Transportation CDO	Exchange transportation information between organizations to support DOT Traffic Records Coordinating Committee and the State Traffic Records Coordinating Committees	Daniel Morgan (SES)

VALUE PROPOSITION – INTEROPERABILITY

The interoperable nature of NIEM establishes:

Common Language and Vocabulary	Agnostic Implementation
NIEM eliminates confusion by providing consistency of data definitions between agencies	NIEM is open-nonproprietary, scalable, tailorable. Platform, language, system, and network agnostic

NIEM enables systems to work together at the data level
Implementers decide how agencies' systems are implemented

VALUE PROPOSITION – REUSABILITY

The reuse of IEPDs, in part and whole, within NIEM will:

Decrease Development Time	Increase Consistency
Decreases the development time for information exchanges that use similar sets of data	Allows practitioners to increase the syntactic and semantic consistency in data definitions across their information exchanges

VALUE PROPOSITION – STANDARDIZATION

The formalization of NIEM as a standard enables

Large Support Community	Structured Approach
NIEM Practitioners can leverage NIEM's large support community to decrease development time for exchanges and increase conformance	Repeatable approach that decreases the inconsistencies and duration of development

WHY NIEM?

Collaboration

NIEM brings stakeholders together through reuse and community engagement

Consistency

NIEM provides consistency through reusable schema, which allows for many implementation options

Development

Flexible and extendable, NIEM saves development time through agreed-upon elements, relationships, and formats independent of how information is stored in individual systems

Support

New users can leverage what already exists and engage directly with other NIEM members for assistance.

WHICH LEADS TO

- Lower Development Costs
- Enhanced Mission Capabilities
- Common Vocabulary
- Reduced Maintenance Costs
- Faster Mediation
- Rapid Implementation
- Increased Interoperability
- Reuse

NIEM DOMAIN RESOURCES

These resources provide additional guidance on managing a domain

GOVERNANCE

Guidance on Establishing Domain Governance – Detailed guidance for the domain governance model. Domains are advised to read this document before drafting a domain charter, and domain operations and maintenance (O&M) plans

Domain Charter Template – Standard format and guidance for the charter

Domain O&M Plan Template – Standard format and guidance the domain O&M plan

STAKEHOLDER ENGAGEMENT

Domain Community of Interest Guidance – Planned for development by the NMO

Domain Stakeholder Communications Guidebook – Planned for development by the NMO

DATA MODEL

NIEM Naming and Design Rules (NDR) – Detailed design rules for domain data model structure

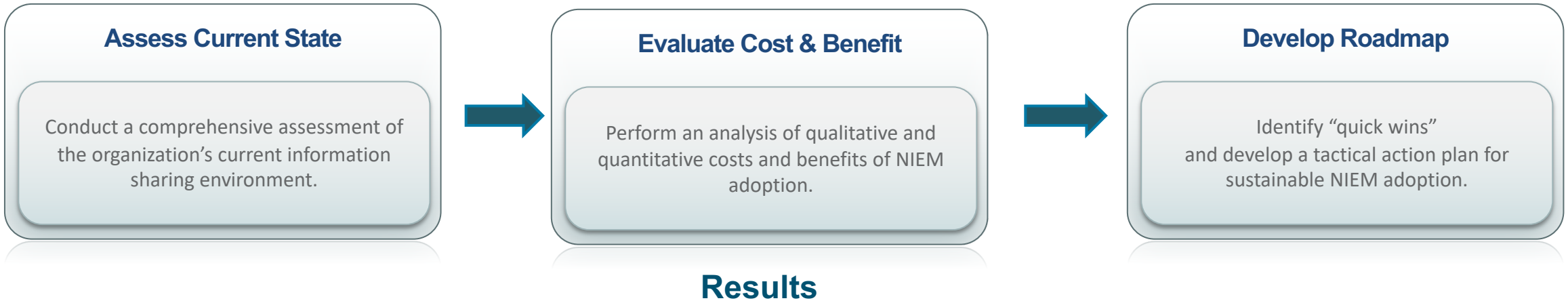
Model Package Description (MPD) Specification – Defines terminology, identifies required/optional artifacts and metadata, specifies normative rules, schemes and syntax, and provides non-normative guidance

HOW TO GET STARTED

ROADMAP TO ADOPTION

NIEM Engagement Process

The engagement process is a self-service model that includes tools and methods for organizations to:



Results

- Identify information exchanges where NIEM can provide the most value to the organization
- Develop a tailored action plan outlining how the organization can adopt and sustainably use NIEM for information exchange

For more information on the NIEM Engagement Process, please visit **NIEM.gov/roadmaptoadoption**

CONSIDERATIONS FOR ADOPTION

ARCHITECTURE

- Systems on either side of the exchange can use different implementation architectures (i.e., different programming languages, operating systems)

CONSISTENCY

- All participants in an information exchange must agree on the definition and structure for the data in the exchange—NIEM provides this standardization

DEVELOPMENT

- IEPD Lifecycle should be used to guide development of NIEM conformant information exchanges to make sure all the necessary artifacts are created

REUSE

- Elements already defined within NIEM should be used whenever possible; exchange elements outside of or created to fill requirements not covered in NIEM should also be reused whenever possible

SKILL LEVEL TO IMPLEMENT NIEM

- Developers with the skills to design and implement a data exchange can learn the NIEM approach in a matter of hours
- Developer training is available
  - No-cost online courses are on the NIEM website
- Plenty of example IEPDs to follow
- Don’t start from scratch, leverage shared IEPDs
- The NIEM technical specifications are complex, however
  - Most developers do not need to read them
  - Free tools can perform most of the conformance checking

NEXT STEPS

Start your action plan and schedule your resources for NIEM training!

	NIEM 100	NIEM 101	NIEM 200	NIEM 300	NIEM 301	NIEM 302	NIEM 303
Executive Managers	●	○					
Program and Project Managers	●	●	●				○
Architects	●	●	○	●			●
Developers	●	●		●	●	●	●

● = Required ○ = Optional depending on role

FINAL THOUGHTS

- Leverage the NIEM Management Office as a resource for your Immigration Data Integration Initiative (IDII)use
  - Technical implementation support
  - Development Tools
  - Training resources online and instructor led
- Continue Collibra integration of NIEM for compliance
- Implement NIEM to share information across multiple data systems of NSA Office of Immigration Statistics (OIS), Immigration and Customs Enforcement (ICE), U.S. Citizenship and Immigration Services (USCIS), Customs and Border Protection (CBP), US Coast Guard (USCG), and US Department of Justice (DOJ)

CONTACT US

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NMO Steve Sullivan (stephen.m.sullivan14.ctr@mail.mil), 757-203-8619

NBAC Kamran Atri (katri@a4safe.com), 703-930-6057

NBAC Thomas Krul (Thomas.krul@Canada.ca), 613-949-6513

NIEM.gov

GitHub
http://niem.github.io/

YouTube
www.YouTube.com/NIEMConnects

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

www.twitter.com/NIEMConnects

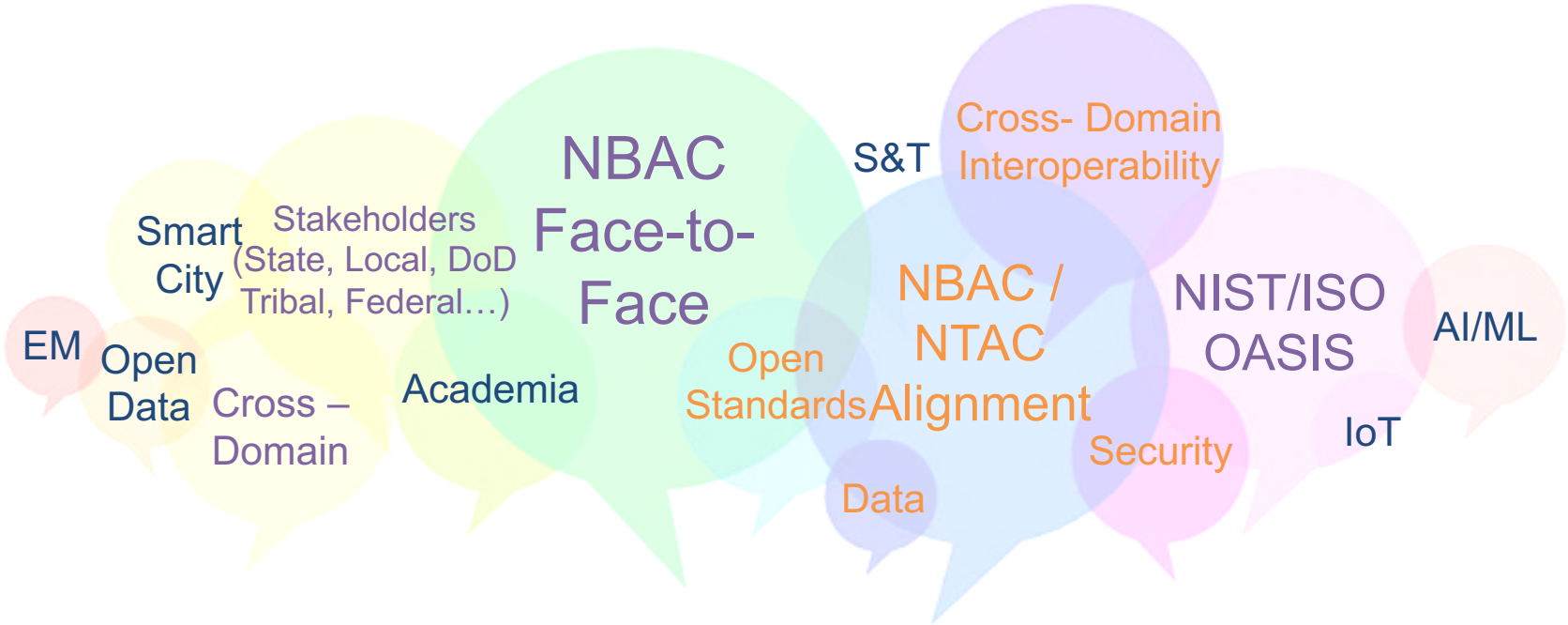
REFERENCE MATERIAL

- **Starting Point**: https://www.niem.gov/
- **Training**: https://niem.github.io/training/
- **Technical Resources**: https://www.niem.gov/techhub
- **Current Release**: https://www.niem.gov/techhub/niem-model/current-release
- **IEPD Developer Resources**: https://www.niem.gov/techhub/iepd-resources
- **Implementation Support**: https://niem.github.io/
- **Tools:** https://www.niem.gov/tools-catalog


NIEM
TM

BACKUP SLIDES

WHERE DOES IT FIT? HOW DOES IT WORK? WHAT SHOULD I KNOW?



NSA USES OF NIEM

- Interstate Justice and Public Safety Network (NLETS) - exchange mission-critical law enforcement information.
- Amber Alert - child abduction emergency alert.
- Prescription Drug Monitoring Exchange (PMIX) - Mitigate pharmaceutical drug abuse across state lines.
- FBI Incident Reporting National Data Exchange System (N-Dex) standardized and secure criminal justice information sharing to relevant criminal justice agencies.
- FBI National Crime Information Center (NCIC) - United States' central database for tracking crime-related information.
- Centers for Disease Control and Prevention (CDC) Emergency Preparedness and Response Exchange Requirements - exchange and sharing of critical emergency management (EM) data.
- National Electronic Interstate Compact Enterprise (NEICE) - placement of children in foster care across state lines.
- Indian Child Welfare Act (ICWA) e-Notice.

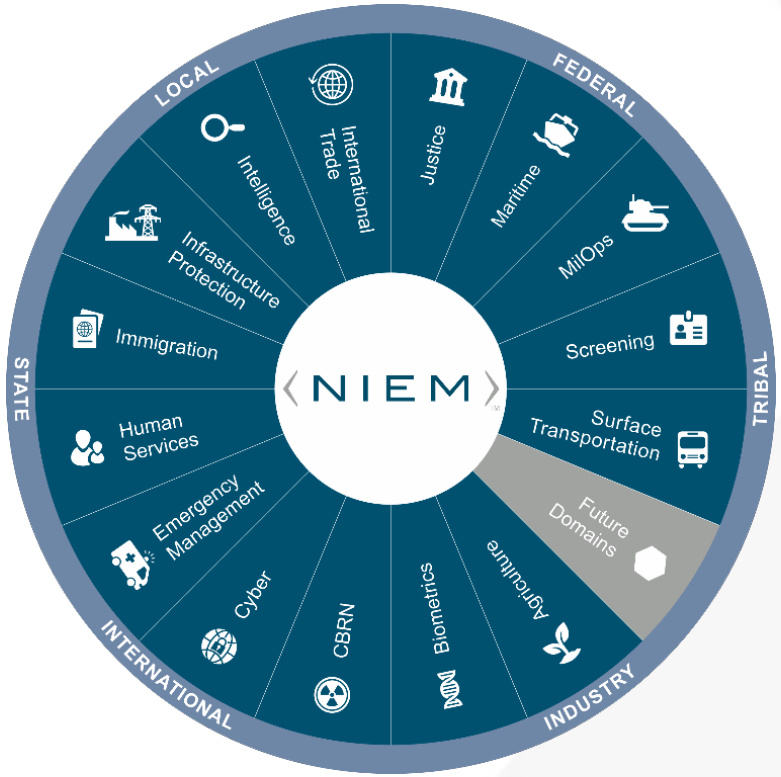
https://www.niem.gov/about-niem/success-stories

WAYS TO USE NIEM

- Write producer or consumer software for a data exchange specified by others who used NIEM
  - ANSI/NIST-ITL 1-2011 (Biometrics)
  - N.25 Protocol (Radiological and nuclear detection)
  - Developers may not even know about NIEM
- Reuse NIEM data definitions without the exchange framework
  - Treating NIEM like Dublin Core or schema.org
- Design a NIEM-based exchange specification for known partner
- Form a community that creates its own NIEM model extension and/or set of exchange specifications
- Participate in an existing NIEM domain (or join the NTAC)
- Stand up a new NIEM domain and serve as domain steward

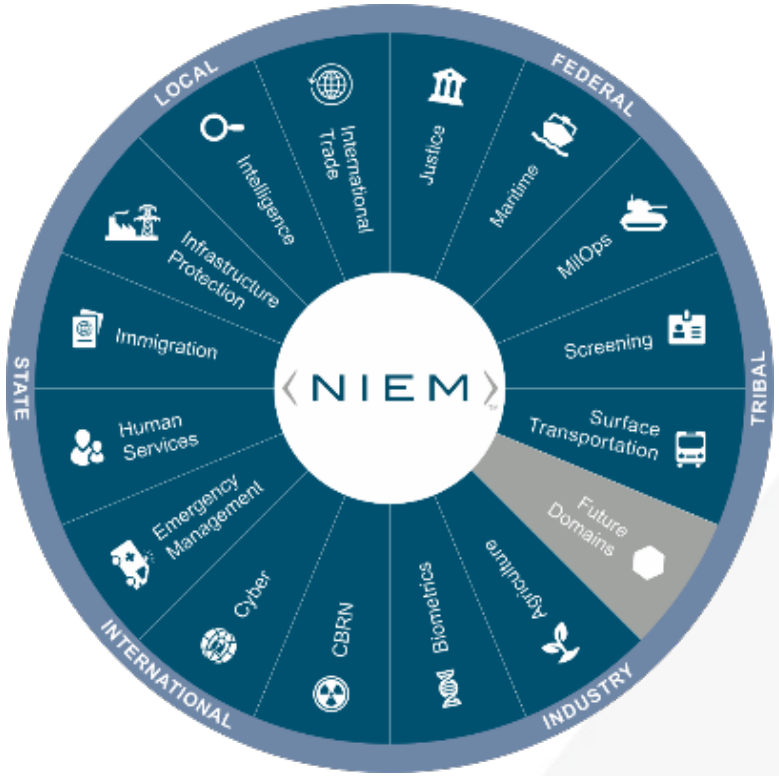
“THE DATA EXCHANGE DESIGNER IS KING”

- Nothing in NIEM or any NIEM domain can ever dictate the information content of any data exchange
- NIEM rules for extension and reuse guarantee that every exchange designer will always be able to specify the exact information needed by his exchange participants
- If you want more control over your enterprise or community, you must layer that governance on top of NIEM
- NIEM will work with
  - The agreement you can achieve
  - The flexibility you need
  - The control you choose to impose (within scale limits on data model size)



NIEM IS ABOUT COOPERATION, NOT CONTROL

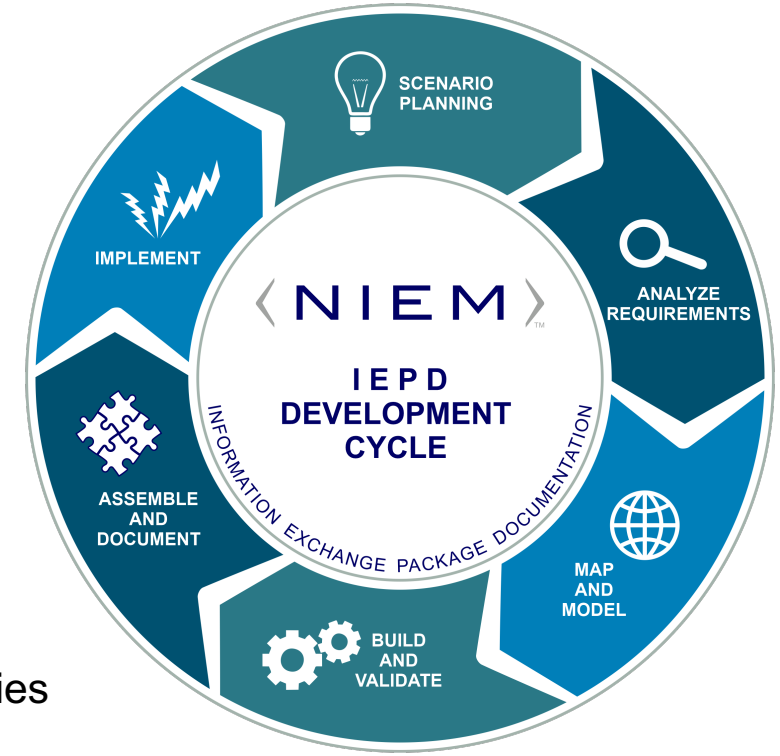
- NIEM Core and NIEM domains create data components by consensus among data exchange designers
- Components are established when participants believe that a common definition will make their exchanges easier to create and implement
- Each domain changes on its own schedule, under its own control
- Changes in the core or in a domain do not force changes in other domains or in any data exchange
- No one is ever required to use a component that does not satisfy the data exchange needs, so there is no leverage for controlling the participants



WHAT IS A NIEM INFORMATION EXCHANGE?

In NIEM, an information exchange is also known as an **Information Exchange Package (IEP),** a description of specific information exchanged between a sender and a receiver.

The IEP is usually coupled with additional documentation, sample message instances, business rules, and more to compose an **Information Exchange Package Documentation (IEPD)**

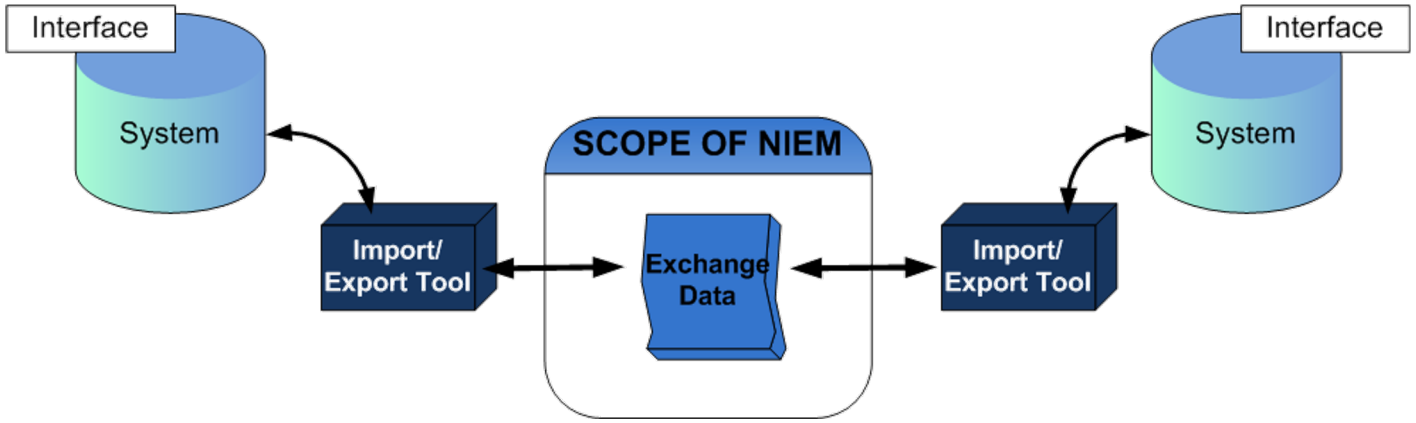


Core Functions of an IEPD

- Developed to provide the business, functional, and technical details of the information exchange through predefined artifacts
- Created with a core set of artifacts in a prescribed format and organizational structure to allow for consistency
- Designed to be shared and reused in the development of new information exchanges through the publication in IEPD repositories

SCOPE OF NIEM

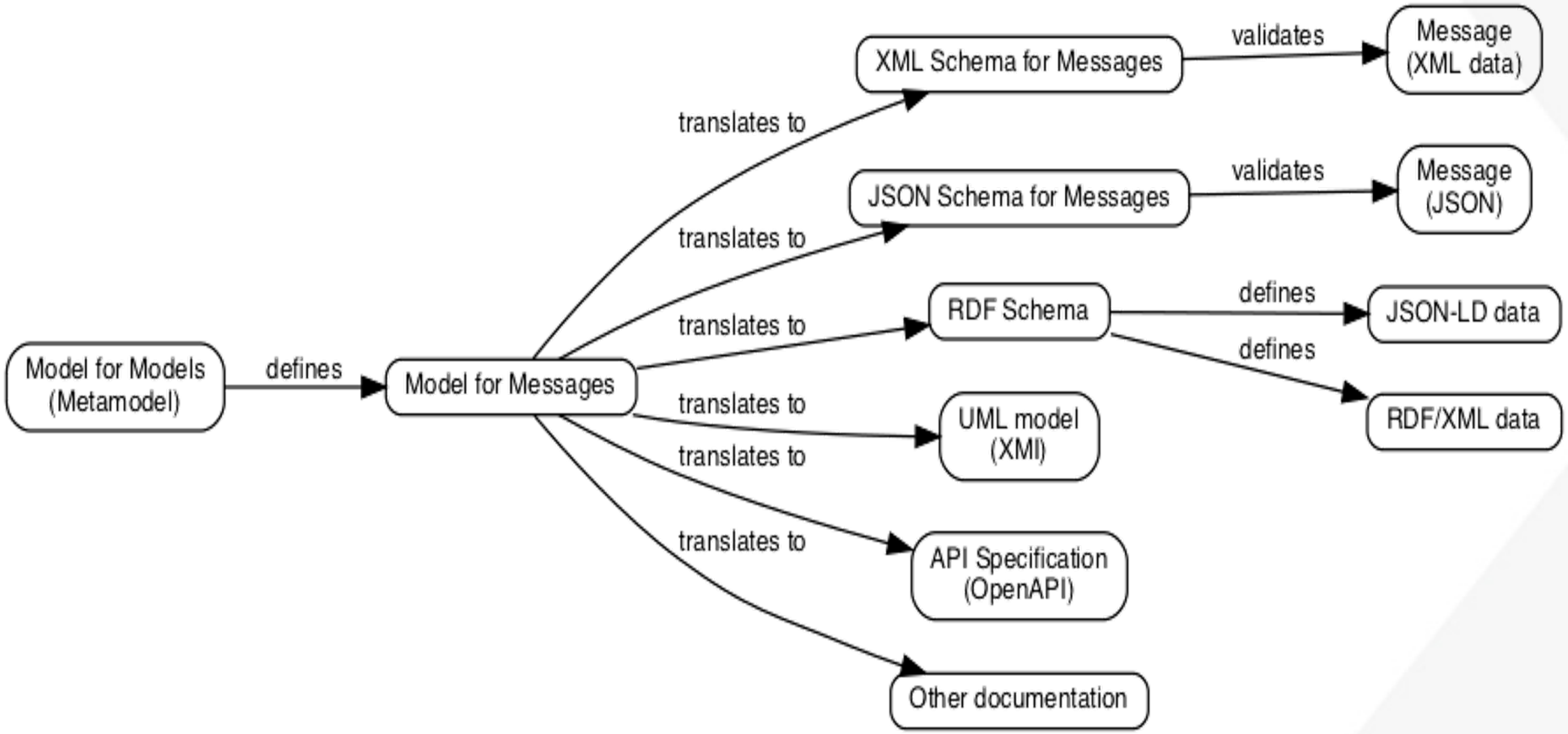
NIEM is a data layer standard and intentionally does not address all the necessary technologies needed for information sharing



Exchange partners decide how to store and process the NIEM-conformant data being exchanged

NIEM…MORE THAN XML

TRANSFORM A MODEL INTO REQUIRED REPRESENTATIONS



STEP 1: NIEM 5.0 RELEASE

The NTAC has created a draft metamodel

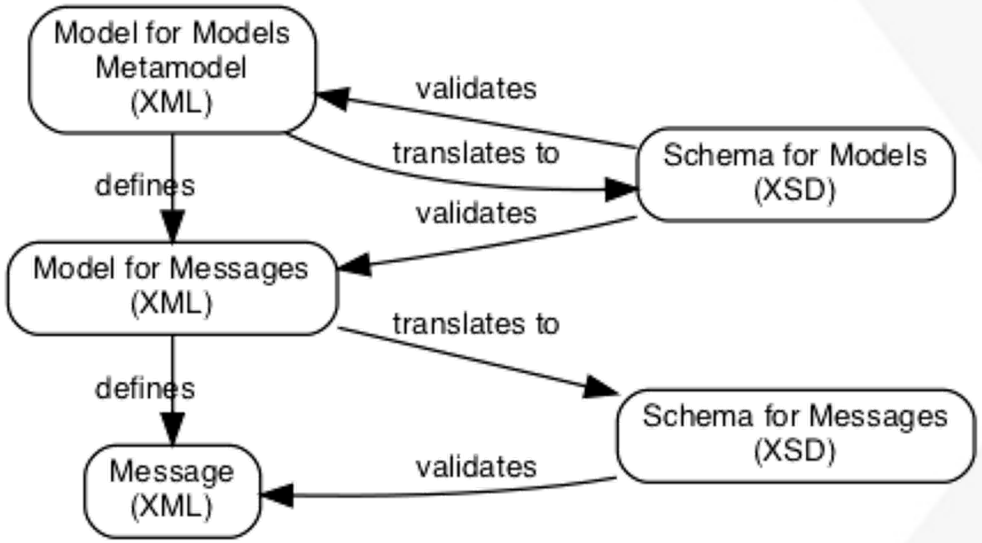
- Represents a NIEM model (NIEM data definitions) as a data object
- Work in progress

We can represent NIEM reference schemas as a "model description"
data object

- Most features are supported, but not necessarily all; it's a draft
- This could be handled as XML, JSON, or other formats

We can convert NIEM data descriptions into conformant XML Schema

The metamodel is represented as XML data



NIEM METAMODEL

The NIEM metamodel is a data model that describes NIEM data models

It carries the aspects of NIEM models that we care about, without a focus on XML Schema-specific features

A data component has a **name**, **namespace**, and a human-readable **definition:**

- A **Class** defines a category of object. e.g., a vehicle
- A **Datatype** defines a category of simple data: e.g., a string, date, or enumeration
- An **Object Property** represents a relationship to an object
- A **Data Property** represents a characteristic with a simple data values