DHS US-VISIT Standards for Multi-Modal Biometrics

William Graves
US-VISIT/Information Sharing and Technical Assistance
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Why Use Multiple Modalities?

- Improve identification accuracy
- Allow capture of an alternative biometric if primary biometric is poor quality or missing
- Mitigate the risk of fraud or spoofing with a single biometric
- Provide options for capture if there are environmental or time constraints
- Enhance compatibility with other biometric identification systems

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US-VISIT Multi-Modal Limited Production Pilot (LPP)

- Build back-end capabilities to support multi-modal services for US-VISIT customers
  - 1:1 Verification with face and iris images
  - 1:N Identification with iris images
  - Store and retrieve for DNA, palmprint, and SMT
- Build a transmission specification to support multi-modal services and data sharing with multiple stakeholders
- Front-end technology agnostic – accepts standards-conformant face and iris images output by any device
- Evaluate matcher performance on biometric data submitted by customers

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Modalities for US-VISIT/IDENT

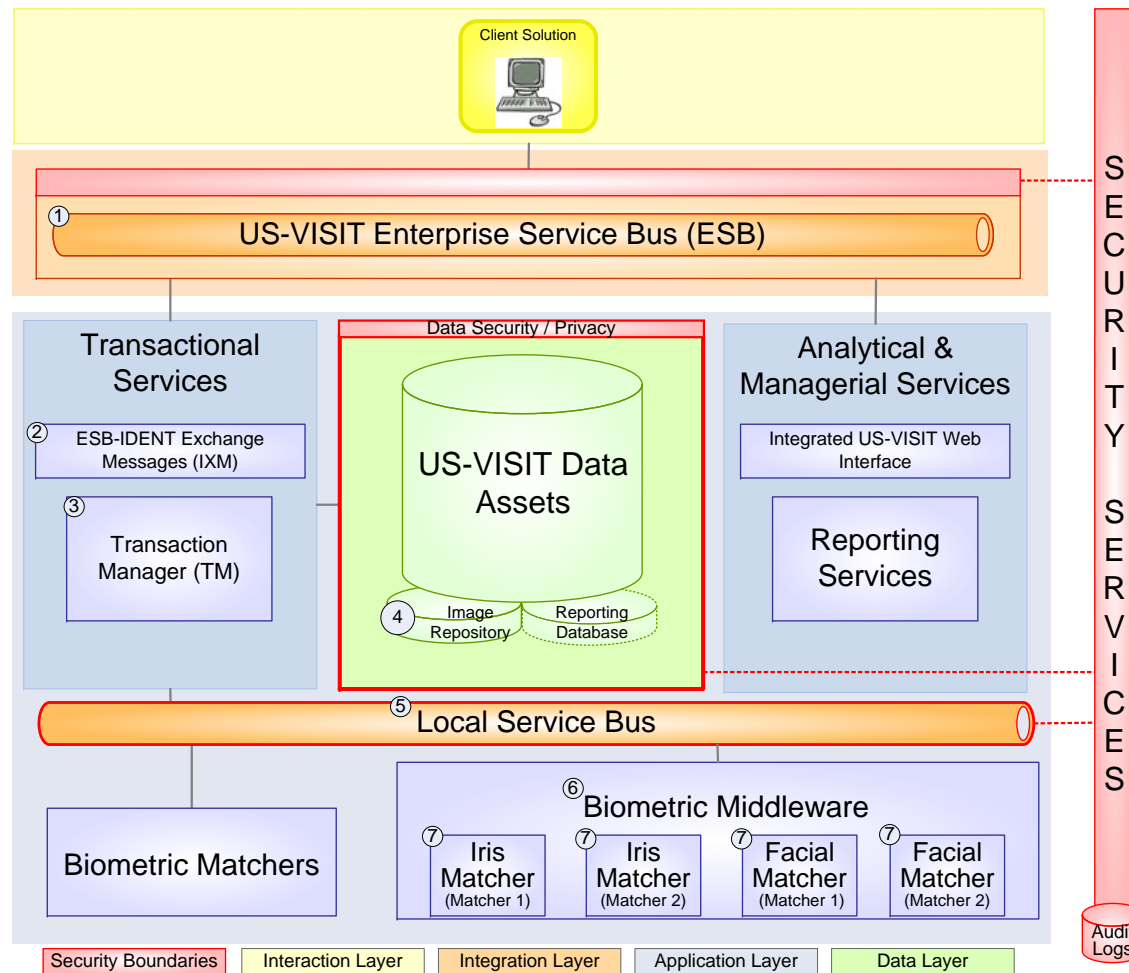- Iris, Facial, Palm print, DNA profile, and Scars, Marks and Tattoos (SMT)

	Identify (1:N)	Verify (1:1)	Retrieve	Store
Facial	Future	New	Existing	Existing
Iris	New	New	New	New
Palm Print	Future	Future	New	New
SMT	Future	Future	New	New
DNA	Future	Future	New	New

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LPP: Initial Stakeholders

- CBP Office of Border Patrol (OBP)
  - Improved face image capture and dual iris capture in OBP operations at southwest border
  - 1:1 verification for face and iris
  - 1:N iris identification
  - Capture devices:
    - Iris ID TD100
    - SEEK devices from DoD
- CBP Office of Field Operations Global Entry (GE)
  - Incorporates iris capture at two GE enrolment centers
    - Iris ID TD100
  - Adds iris matching capability to GE kiosks at two POEs (Dulles and JFK)
    - AOptix VM for kiosk

LPP: Architecture

Client Solution

① US-VISIT Enterprise Service Bus (ESB)

Transactional Services

② ESB-IDENT Exchange Messages (IXM)

③ Transaction Manager (TM)

Data Security / Privacy

US-VISIT Data Assets

④ Image Repository | Reporting Database

Analytical & Managerial Services

Integrated US-VISIT Web Interface

Reporting Services

⑤ Local Service Bus

⑥ Biometric Middleware

⑦ Iris Matcher (Matcher 1)
⑦ Iris Matcher (Matcher 2)
⑦ Facial Matcher (Matcher 1)
⑦ Facial Matcher (Matcher 2)

Biometric Matchers

SECURITY SERVICES

Audit Logs

Security Boundaries | Interaction Layer | Integration Layer | Application Layer | Data Layer

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LPP: Iris and Face Matchers

- Iris Matchers
  - Iris ID matcher SDK and DaonEngine Snap-ins (1:1 and 1:N matching snap-ins and transform snap-in for template generation)
  - Iritech matcher SDK and DaonEngine Snapins (1:1 and 1:N matching snap-ins and transform snap-in for template generation)
  - Each supports gallery up to 30,000 iris pairs and 1:N and 1:1 matching
- Facial Matchers
  - NEC facial matcher and DaonEngine Snapins (1:1 matching snap-in and transform snap-in for template generation)
  - Cognitec FaceVACS SDK with DaonEngine Snapin (1:1 matching snap-in and transform snap-in for template generation)
  - 1:1 verify service only

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Limited Production Pilot Schedule

- Design
  - Completed March 2010
- Development
  - Completed October 2010
- Testing
  - Product Application Testing (PAT) – Completed July 2011
  - IV&V – Completed November 2011
  - Product Integration Testing (PIT) – March 2012
  - Performance Testing – Completed October 2011
- Deployment
  - Production Deployment – February 2012
  - Operational Evaluations – March 2012

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Standards for Sharing Multimodal Biometrics

IDENT eXchange Message (IXM)

- IXM is the IDENT XML biometric standard messaging format for interacting with US-VISIT IDENT Biometric Services

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Automated Biometric Identification System (IDENT) Exchange Messages (IXM) Specification—v6.0.4

January 30, 2012

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United States
Visitor and Immigrant Status Indicator Technology Program

IXM Goals & Principles

- Establish common interfaces
  - Develop common interface specifications and mechanisms for US-VISIT users

- Support DHS/US-VISIT SOA Initiative
  - Develop IXM using XML/SOAP technology
  - Use existing Web services specifications (SOAP, WSDL, WS-Addressing)
  - Support SOA Messaging Protocols and NIEM Conformance

- Support DHS XML biometric standard messaging format

- Leverage data exchange models
  - NIEM, ANSI/NIST-ITL

- Promote interoperability between US-VISIT and others
  - Allow for XML file format, EFTS or EBTS

- Leverage existing technology for binary data transmission
  - XML-binary Optimized Packaging (XOP)

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IDENT IXM Development

GJXDM/NIEM

- GJXDM (Global Justice) based
- Some NIEM elements
- Fully backward compatible

5.0

- Incorporates new modalities (palm print, SMT, iris, and DNA)

5.5

NIEM Conformant

- Adds new services
- Fully NIEM 3.0 conformant

| NIEM Subset | IDENT Extensions | ANSI/NIST ITL 1-2011 |

6.0

IDENT IXM 5.5 Multimodal Messaging

- Based on a legacy data model GJXDM (Global Justice)

- Updates select service messages and data elements to introduce additional modalities for LPP

- Services: Identify, IdentifySync, Verify, VerifySyncand Retrieve Identity messages

- Minimizes impact of existing IXM subsystem while introducing new elements

- Uses ANSI/NIST ITL 2-2008 elements to satisfy requirements for the exchange of new modalities for LPP

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Moving forward to IXM 6.0

- Maintains the data elements needed to meet technical and business requirements
- Replaces all GJXDM elements with NIEM
- Fully NIEM 3.x conformant Domain model and subset schema
- Uses existing elements within NIEM core and domains
- Extends NIEM where needed for IDENT
- Provides services through IEPD Exchange schemas
- Simplifies and extends IXM 5.X syntax
  - Increase flexibility and scalability
- IXM 6.0 is NOT backward compatible with IXM 5.x
- Provides improved messaging:
  - Easier client side development
  - Improve internal message transport
  - Enhance data sharing and interoperability

National Information Exchange Model (NIEM)

- Supports information sharing with enterprise-wide information exchange standards and processes
- Built on demonstrated success of GJXDM (Global Justice Exchange Data Model)
- Common lexicon
- Repository of information exchange packages
- Increases and leverages "re-use" of
  - Existing Standards
  - Data Related Technology
  - Existing Infrastructure
  - Knowledge/Experience
  - Multi-organizational Interactions and Relations
  - Sponsored by US Dept of Justice, DHS and several other agencies

NIEM Benefits

- Results achieved with full NIEM adoption:
  - Measurable cost savings (both initially and ongoing) by utilizing standardized methodologies and reusable data exchange components and specifications.
  - Reduced development and deployment times by reusing existing structures of information.
  - More efficient structure for information sharing with DHS Components and semantic integrity across information systems.
  - Better decision-making from more timely, accurate, and complete information, ultimately resulting in enhanced public safety and homeland security.

  - Will, the first bullet above originally said, "For US-VISIT, the following results will be achieved"

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NIEM Domains

NIEM is currently comprised of several key Domains such as the justice, public safety, emergency and disaster management, intelligence and homeland security enterprise. A Domain can be defined as a sphere of activity, concern, or function. For purposes of NIEM, a Domain refers to a business enterprise broadly reflecting the agencies, units of government, operational functions, services, and information systems which are more or less organized or affiliated to meet common objectives.
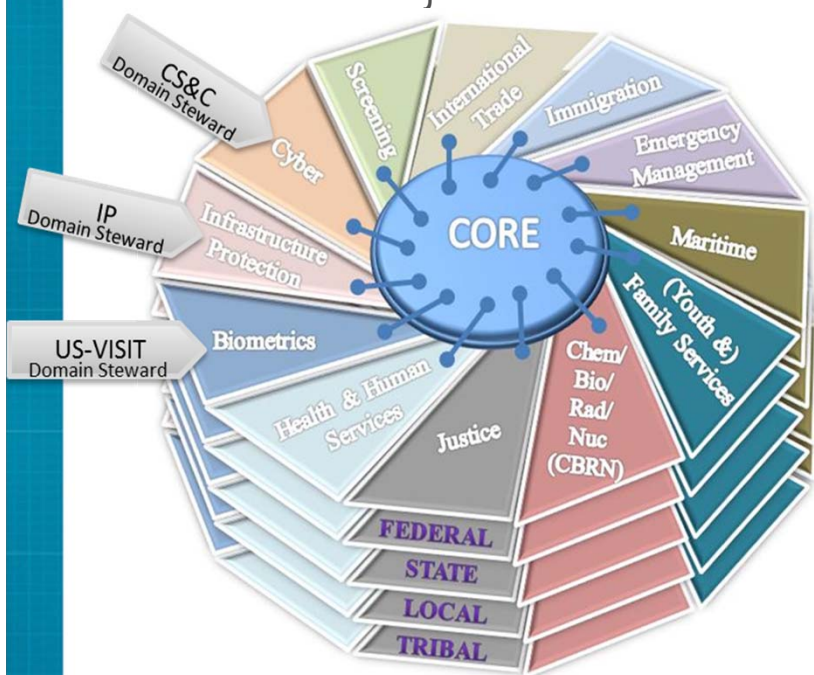
	Properties	Types	Codes Lists
NIEM 2.0	4,291	1,601	42,609
NIEM 2.1	5,692	2,157	46,430
	+33%	+35%	+9%

NIEM 2.1 was published on 9/28/2009.

Release of new domains, update of current domains, focus on cross domain info exchanges.

Biometrics introduces a new domain for NIEM 3.x

US-VISIT is the Biometrics Domain Steward

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NIEM IEPD

- An IEPD is a specification for an Information Exchange Documentation Package and defines a particular data exchange. It is generally composed of files that describe the structure of the information being exchanged and documents that explain the business context and usage

- Artifacts make up an IEPD:

    - **Exchange files** – the files that describe the possible arrangement of information in a valid exchange document using a common vocabulary of terms

    - **Documentation** – artifacts pertaining to and supporting the business side of the exchange (definitions, processes, rules, etc.

    - **Catalog Files** – specification artifacts that are needed to meet the requirements which state that an IEPD should be portable, self-contained, self-documenting and able to be registered anywhere
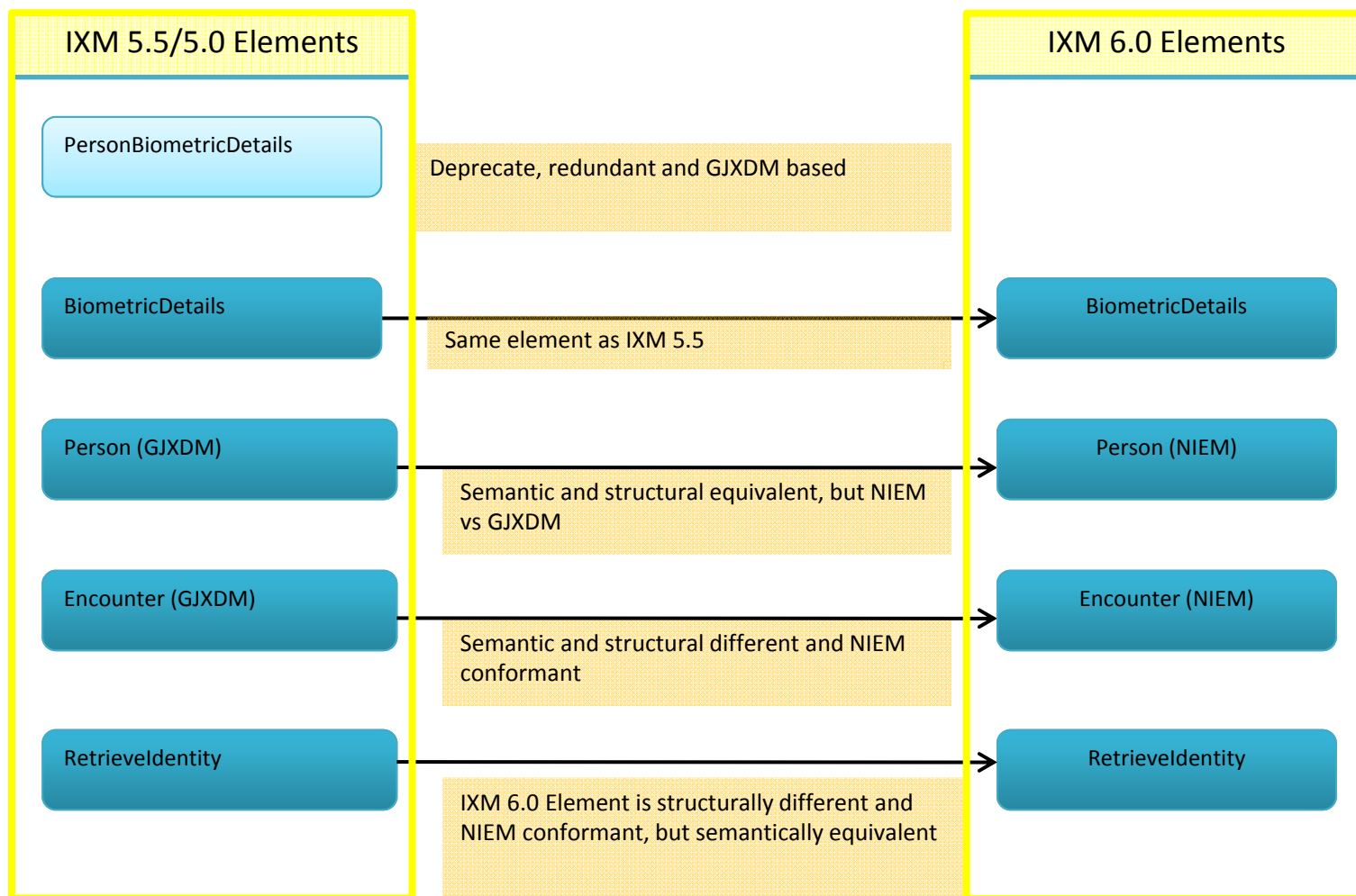
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NIEM IEPD Development Process
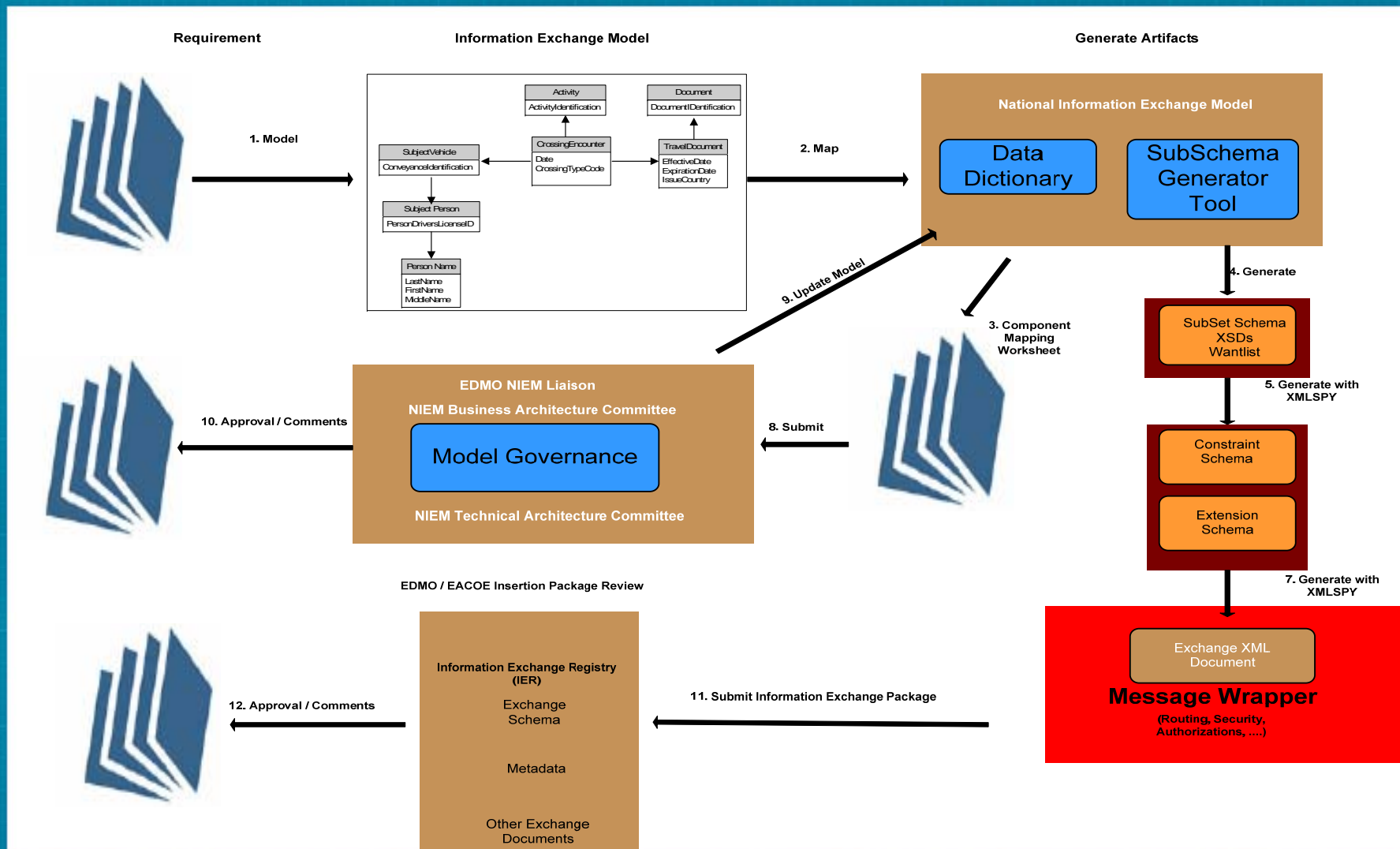
IEPD Benefits

- Common message exchange

- Availability of NIEM support tools and training

- Accessibility to nationally known vetted data requirements to implementers

- Semantic Integrity: Coherent & consistent information exchange standards

- Enhances organization and scalability through known NIEM processes

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NIEM/IXM Mapping

IXM 5.5/5.0 Elements

- PersonBiometricDetails

  Deprecate, redundant and GJXDM based

- BiometricDetails

  Same element as IXM 5.5

- Person (GJXDM)

  Semantic and structural equivalent, but NIEM vs GJXDM

- Encounter (GJXDM)

  Semantic and structural different and NIEM conformant

- RetrieveIdentity

  IXM 6.0 Element is structurally different and NIEM conformant, but semantically equivalent

IXM 6.0 Elements

- BiometricDetails
- Person (NIEM)
- Encounter (NIEM)
- RetrieveIdentity

IDENT IXM Supported Biometric Standards

- Iris
  - ANSI/NIST-ITL 2-2008 and 1-2011, Type 17
- Face
  - ANSI/NIST-ITL 2-2008 and 1-2011, Type 10
  - ISO/IEC 19794-5
  - ICAO 9303
- Future
- Scars, Marks, and Tattoos (SMT)
  - ANSI/NIST-ITL 1-2011, Type 10
- Palm Print Standard
  - ANSI/NIST-ITL 1-2011, Type 15
- DNA
  - ANSI/NIST-ITL (Annex to be published for ANSI/NIST-ITL 1-2011)

Biometric Standards Requirements for US-VISIT

Version 1.0

March 15, 2010

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United States Visitor and Immigrant Status Indicator Technology (US-VISIT) Program

Contact Information

- **William Graves**
- **Chief Biometric Engineer**
- **US-VISIT Program**
- **Information Sharing and Technical Assistance Branch**
- **William.graves@dgs.gov**
- **Tel: 202-298-5230**