



XML-in-Practice 2009

A Conference of IDEAlliance

SEPTEMBER 30 - OCTOBER 1
ARLINGTON HILTON
WASHINGTON DC METRO
ARLINGTON, VIRGINIA USA



PRODUCED BY

IDEAlliance
International Digital Enterprise Alliance ®

The logo for XML-in-Practice 2009 features a 2x2 grid of colored squares (orange, blue, green, red) to the left of the text. The text 'XML-in-Practice' is in a large, bold, black sans-serif font, and '2009' is written vertically to its right. Below the main title, the text 'A Conference of IDEAlliance' is written in a smaller, black sans-serif font.

XML-in-Practice 2009

A Conference of IDEAlliance

The slide background is a light blue gradient with a central white starburst pattern. A thin blue horizontal line is at the top, and a thin blue horizontal line is at the bottom. In the top right corner, there is a small logo consisting of four colored squares (orange, blue, green, red).

About NIEM

PRODUCED BY

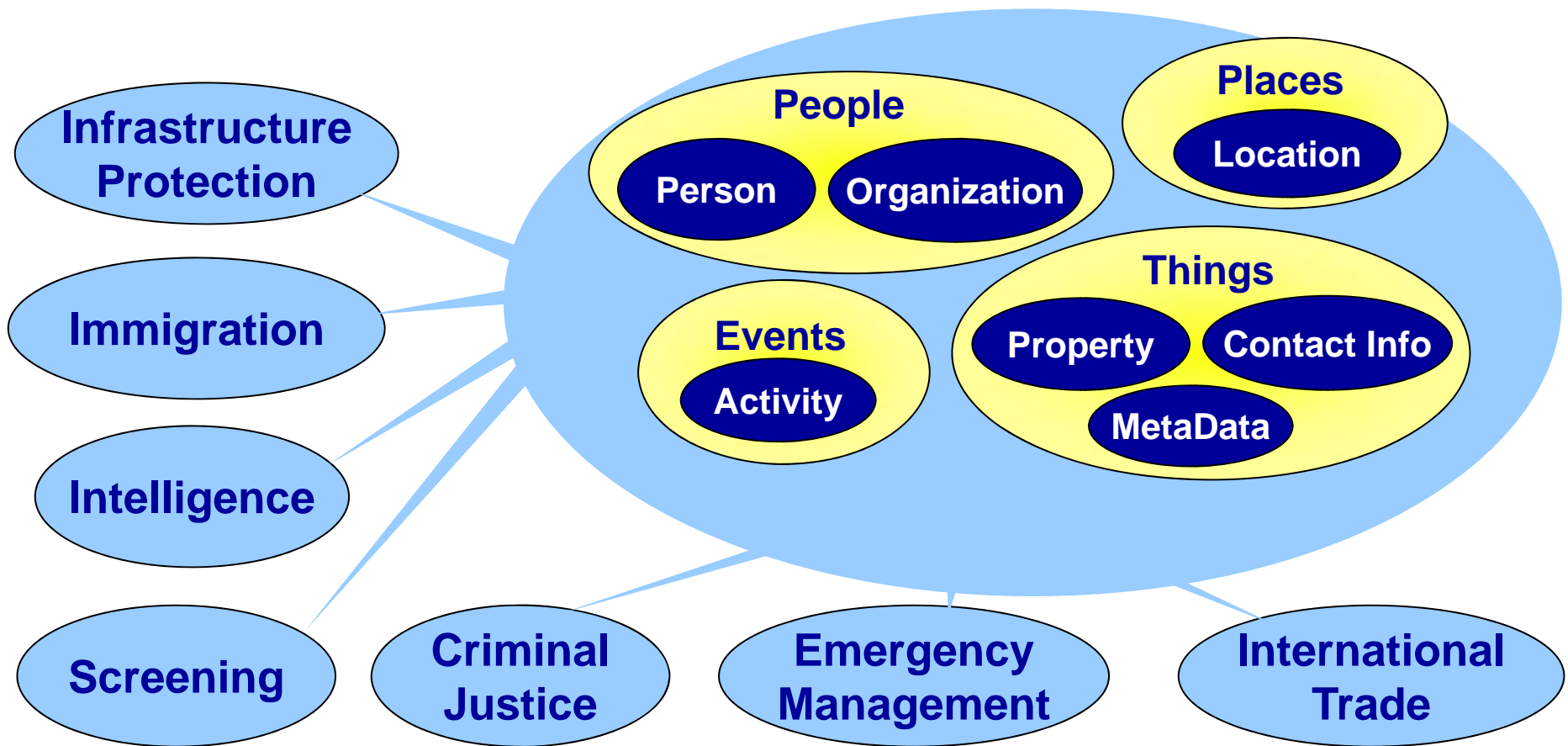
IDEAAlliance
International Digital Enterprise Alliance ®

What NIEM Is

- A **National Standard** that facilitates information sharing:
 - ◆ Across organizational and jurisdictional boundaries
 - ◆ At all levels of government
- A **Data Model** providing:
 - ◆ Agreed-upon terms, definitions, and formats for various business concepts
 - ◆ Agreed-upon rules for how those concepts fit together
 - ◆ Independence from how information is stored in individual agency systems
- A **Structured Approach** for:
 - ◆ Development tools, processes, and methodologies

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

NIEM at 50,000 Feet



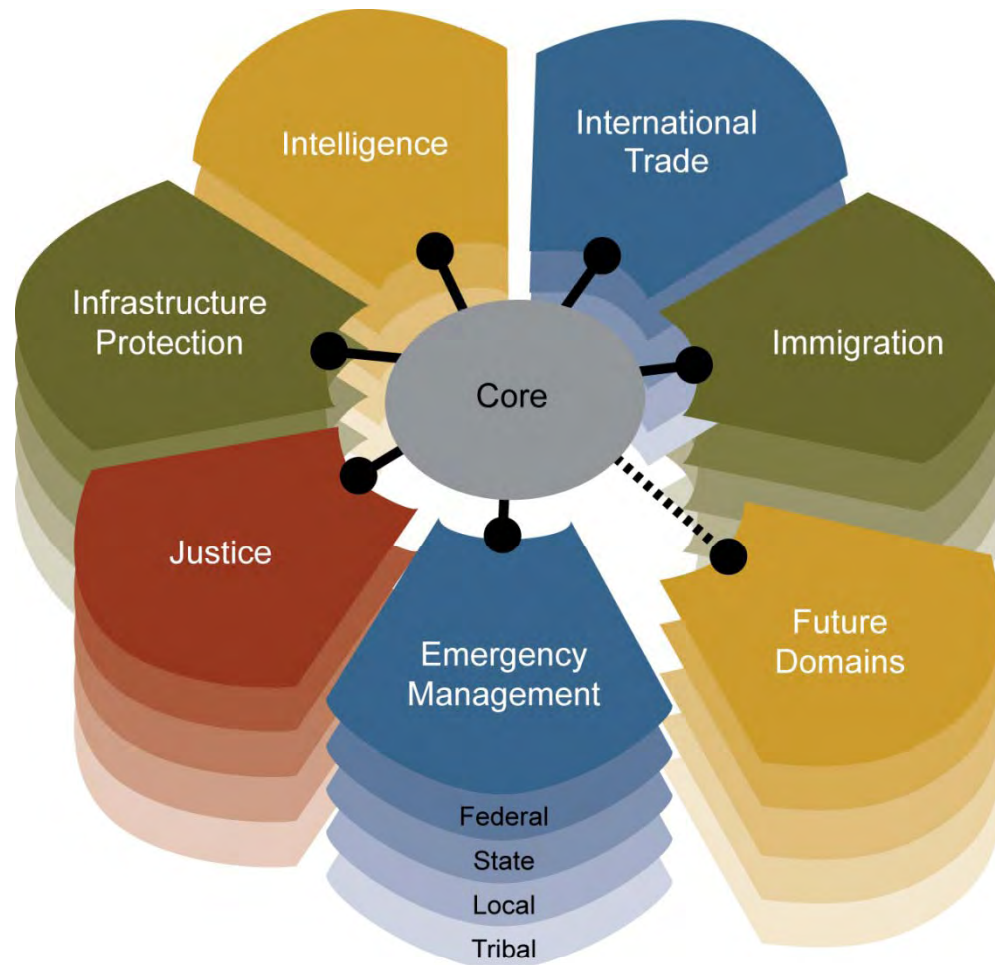
Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

What NIEM is Not

- A database schema
- Just a data dictionary
- Only applicable to the Federal government
 - ◆ Includes many other communities at all levels of government
- A programming language
- A replacement for interagency agreements
 - ◆ NIEM is the technical solution; the policy and business issues must also be worked out

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

Participating Communities



Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>



XML-in-Practice 2009

A Conference of IDEAlliance



Overview of NIEM IEPDs

PRODUCED BY

IDEAlliance
International Digital Enterprise Alliance ®

IEP Defined (1 of 2)

- An Information Exchange Package (IEP) is a set of data that is transmitted for a specific business purpose.
 - In this case it is a NIEM-conformant XML document instance sent from one computer to another.
- May be from one agency to other agencies, between systems within an agency, between a user client and a server.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

IEPD Defined (2 of 2)

- Information Exchange Package Documentation (IEPD) is a set of artifacts that define the content and structure of a IEP.
- The IEPD does NOT specify:
 - How the IEP gets from one organization to another.
 - How the sending system generates the IEP or under what circumstances.
 - How the receiving system processes the IEP.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

How NIEM Supports IEPDs

- XML defines a machine readable format for exchanging information – it is the grammar/syntax.
- NIEM is the source of most of the components used in the information exchange – a vocabulary with some structure.
- Extensions to NIEM make up the rest of the components used in the information exchange.
- An IEPD pulls together NIEM components and extension components.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

Some IEPD Development Cases

- Reference IEPDs
 - Disposition information that could be reused wherever disposition information is exchanged.
- Small, single IEPD for a specific purpose
 - Disposition information from a statewide courts system to a criminal case history (CCH) in a particular state.
- Set of IEPDs for service interaction with a particular application
 - All information exchanges with a CCH.
- Enterprise-wide set of IEPDs
 - All information exchanges with a county, or a set of local-to-state.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

IEPD Artifacts – Exchange Files (1 of 3)

- Subset Schema
 - A set of XML Schemas that defines the NIEM components used in your IEPD.
 - A subset of the entire NIEM data model.
 - Can be produced using the SSGT or other means.
 - Can add constraints to the Subset Schema.
- Wantlist
 - An XML document that specifies what components you want from the NIEM data model.
 - Can be consumed by and produced by the SSGT or other means.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

IEPD Artifacts – Exchange Files (2 of 3)



- Extension Schema
 - A set of XML Schemas that define extended components.
 - A separate local namespace of components not contained in NIEM.
- Exchange Schema
 - The base document XML Schema that defines the XML root element and is generally named after the IEPD itself.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

IEPD Artifacts – Exchange Files

(3 of 3)



- Sample XML Instances
 - One or more sample IEPs that conform to the IEPD.
 - Can be used for additional understanding and testing.
- Sample Stylesheets
 - One or more sample XSLT stylesheets to show how an IEP might be transformed for display or other uses.
 - Can include sample output based on a Sample XML Instance.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

IEPD Artifacts – Documentation

- Business requirements
- Memoranda of Understanding
- Endorsement letters
- Methodology and tools
- Testing and conformance
- Exchange content model
- Use case model
- Business rules

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>



XML-in-Practice 2009

A Conference of IDEAlliance



The NIEM Model

PRODUCED BY

IDEAlliance
International Digital Enterprise Alliance ®

The NIEM Model

- NIEM defines a "meta model" on top of XML
 - defines things like objects, properties, associations, roles
- This meta model is used by both the NIEM model itself, and must be used by any extension or exchange schemas
- There is no standard notation to represent a NIEM model logically (e.g. UML); the XML schemas *are* the model

NIEM Objects and Properties

- The NIEM model consists most fundamentally of objects and properties
 - Example: "Person" is an object, "PersonBirthDate" is a property.
- Objects are represented in XML as complex elements (elements with children)
- Properties are generally represented as children of the objects.

```
<nc:Person s:id="Per1">  
  <nc:PersonBirthDate>  
    <nc:Date>1950-05-12</nc:Date>  
  </nc:PersonBirthDate>  
</nc:Person>
```

Object Inheritance

- NIEM objects can extend other objects
- The base object has the type `s:ComplexObjectType`, from which all other objects are (directly or indirectly) specialized
- XML Schema complex type extension is used for this
- For example,
 - `CommercialVehicleType`
 - extends `VehicleType`
 - extends `ConveyanceType`
 - extends `TangibleItemType`
 - extends `ItemType`

Associations and References

- Two objects can be related using an association element
- An association contains references to the related objects, and possibly other information

```
<nc:ResidenceAssociation>  
  <nc:AssociationBeginDate>  
    <nc:Date>2000-01-01</nc:Date>  
  </nc:AssociationBeginDate>  
  <nc:AssociationEndDate>  
    <nc:Date>2007-01-01</nc:Date>  
  </nc:AssociationEndDate>  
  <nc:PersonReference s:ref="Per1"/>  
  <nc:LocationReference s:ref="Loc1"/>  
  <nc:ResidenceDescriptionText>duplex</nc:ResidenceDescriptionText>  
</nc:ResidenceAssociation>
```

Roles

- Roles can be used to indicate the role an object plays in another type or in an exchange
- Avoids creating conflicting specializations of the same object
 - for example, having a VictimType and a WitnessType, when a single person could play both roles

```
<nc:Person s:id="Per1">  
  <nc:PersonName>....</nc:PersonName>  
</nc:Person>
```

...elsewhere...

```
<j:Subject>  
  <nc:RoleOfPersonReference s:ref="Per1"/>  
  <j:SubjectCautionInformationCode>00</j:SubjectCautionInformationCode>  
</j:Subject>
```

Augmentations

- Reusable bundles of properties in particular contexts
- For example, the Justice domain has a set of person-related properties that it bundles together for exchanges to reuse
- The exchange might define its own augmentations

```
<lexsdigest:Person>  
  <nc:PersonBirthDate>...</nc:PersonBirthDate>  
  <nc:PersonName>...</nc:PersonName>  
  <j:PersonAugmentation>  
    <j:PersonFBIIdentification>...</j:PersonFBIIdentification>  
    <j:PersonStateFingerprintIdentification>...</j:PersonStateFingerprintIdentification>  
  </j:PersonAugmentation>  
  <lexsdigest:PersonAugmentation>  
    <lexsdigest:PersonRegisterNumber>...</lexsdigest:PersonRegisterNumber>  
  </lexsdigest:PersonAugmentation>  
</lexsdigest:Person>
```

Metadata

- Information about the data
 - Source, quality, language, reliability, etc.
- Can be shared by multiple objects

```
<lexsdigest:Metadata s:id="M1">  
  <nc:CommentText>Reported by suspect</nc:CommentText>  
  <nc:DistributionText>SBU</nc:DistributionText>  
  <nc>LastVerifiedDate>  
    <nc>Date>2004-01-01</nc>Date>  
  </nc>LastVerifiedDate>  
</lexsdigest:Metadata>
```

...elsewhere...

```
<nc:Person>  
  <nc:PersonBirthDate s:metadata="M1">...</nc:PersonBirthDate>  
</nc:Person>
```



XML-in-Practice 2009

A Conference of IDEAlliance

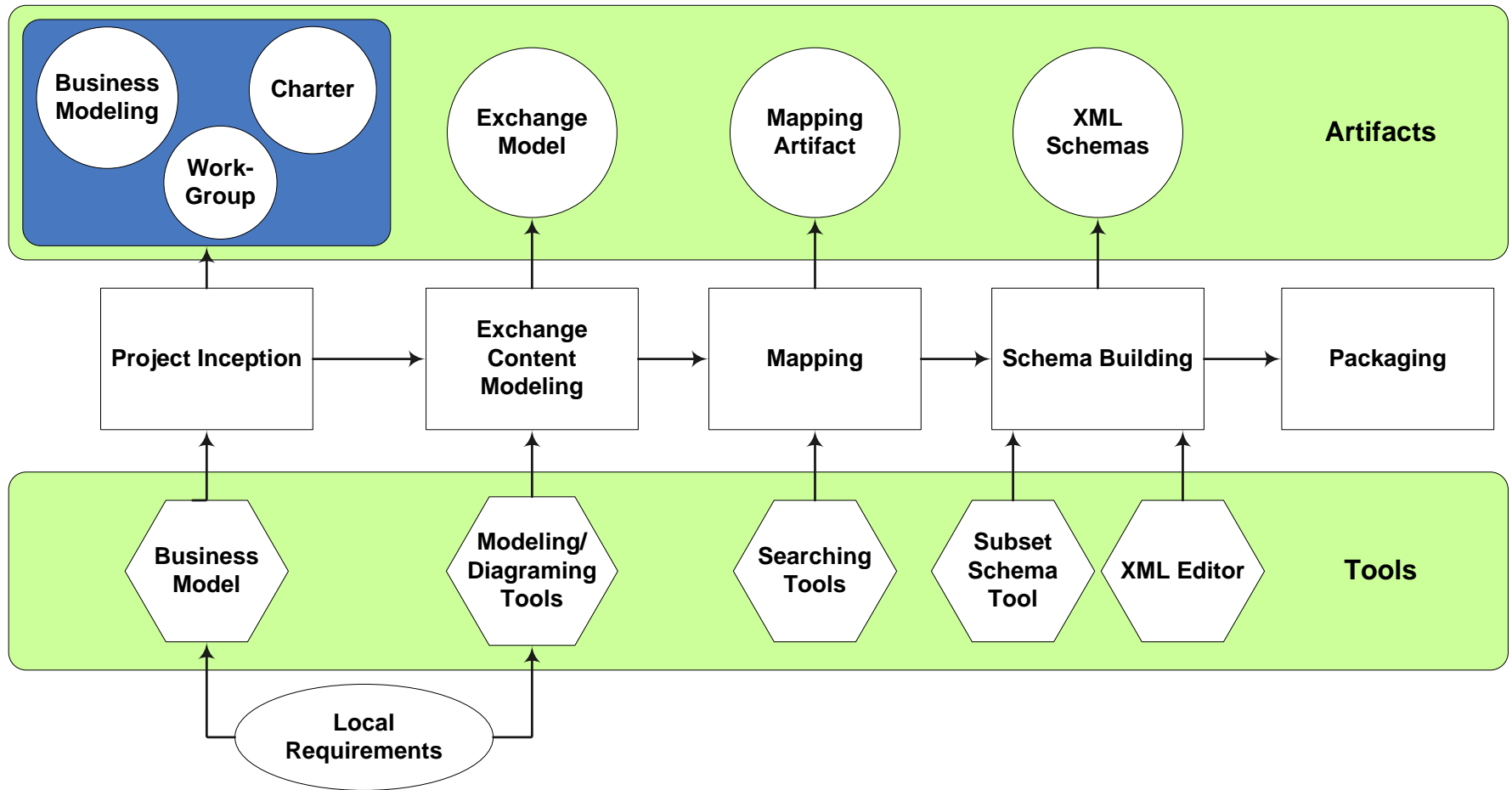


Steps for Building a NIEM IEPD

PRODUCED BY

IDEAlliance
International Digital Enterprise Alliance ®

Sample IEPD Development Overview



Source: NIEM Practical Implementer's Course
 Available under the Creative Commons License at
<http://www.niem.gov/training.php>

Sample IEPD Development Steps

(1 of 4)



- Project Inception
 - Gather information on the business context and usage of the exchange.
 - Gather existing documentation such as forms, data models, and interface specifications.
- Exchange Content Modeling
 - Develop an exchange content model diagram, depicting data element hierarchies and relationships.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

How to Model Your Exchange

- Use the tool/paradigm of your choice
 - UML
 - Entity-relationship diagrams
 - Spreadsheets, text documents, etc.
- Consider the relationships between data elements
- Consider cardinalities of data elements (optional, required, repeating)
- Decide what you consider to be the "root" - e.g. an incident report, an inmate record, a court case
- Keep the NIEM meta model in mind, but do not try to fit your model directly into NIEM model yet (that's the next step)

Sample IEPD Development Steps

(2 of 4)



- Mapping
 - Map the business data to NIEM components.
 - Identify and define extension components.
 - Map the remaining business data to extension components.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

How to Map Your Exchange to NIEM

- Use a tool that lets you browse and search the NIEM model
 - NIEM Wayfarer (<http://www.ncsconline.org/niemwayfarer/>)
 - Schema Central (<http://schemacentral.com/sc/niem20/ss.html>)
- Browse the NIEM model for components that appear in your exchange - consider synonyms when searching
- When a component is not part of base NIEM, create a new element name in your own namespace
 - Consider the NIEM Naming and Design Rules (NDR)
- Use a spreadsheet to keep track of the mappings
 - Use full XPathS in the spreadsheet to unambiguously point to the appropriate element

Sample IEPD Development Steps

(3 of 4)



- Schema Building
 - Develop the NIEM Subset XML Schema file.
 - Develop the Extension XML Schema file.
 - Develop the Exchange XML Schema file.
 - Develop a sample XML instance (IEP) file.
 - Develop a sample Style Sheet file.
 - Verify all developed XML instance and XML Schema files are well-formed.
 - Perform XML validation of the XML instance.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

How to Create a Subset



- To generate a subset, use the NIEM Schema Subset Generation Tool (SSGT)
 - <http://niem.gtri.gatech.edu/niemtools/ssgt/index.iepd>
 - Based on your mapping spreadsheet, find all of the needed components in SSGT and generate a subset and wantlist automatically
- Don't forget to edit the cardinalities of the elements
 - By default, zero to many of any element are allowed
- Save the wantlist in a safe place
 - If you need to modify your subset later you will re-upload the want list and start from that

How to Build Your Extension/Exchange Schemas

- Use the XML editor of your choice
- Use the NIEM meta model
 - e.g. consider whether a component is an object, property, association, role, augmentation, or metadata
- Be sure to consider the NIEM Naming and Design Rules (NDR) for rules about:
 - Naming
 - Definitions of elements
 - Use of particular XML Schema constructs
- Check your schemas for conformance using the conformance tool at niem.gov

Sample IEPD Development Steps (4 of 4)

- Packaging
 - Analyze and/or review the artifacts to verify that the developed XML instance and XML Schema files are NIEM-conformant.
 - Assemble the artifacts into an IEPD.

Source: NIEM Practical Implementer's Course
Available under the Creative Commons License at
<http://www.niem.gov/training.php>

How to Package an IEPD



- Use the "Work with IEPDs" Tool
 - <http://niem.gtri.gatech.edu/niemtools/iepd/index.iepd>
- Upload the extension and exchange schemas
- Pull in the NIEM subset from the SSGT
- Add all the associated metadata using the IEPDs tool
 - required for NIEM conformance
- Save the IEPD
 - optionally allow other users to see it
- Generate an IEPD (as a zip file) for distribution

The logo for XML-in-Practice 2009 features a 2x2 grid of colored squares (orange, blue, green, red) to the left of the text. The text 'XML-in-Practice' is in a large, bold, black sans-serif font, and '2009' is written vertically to its right. Below the main title, the text 'A Conference of IDEAlliance' is written in a smaller, black sans-serif font.

XML-in-Practice 2009

A Conference of IDEAlliance

The title 'IEPD Reuse' is displayed in a bold, blue, sans-serif font. It is centered on a light blue background with a complex, abstract pattern of overlapping lines and shapes that create a sense of depth and movement.

IEPD Reuse

PRODUCED BY

The IDEAlliance logo consists of the word 'IDEAlliance' in a black sans-serif font, with a stylized arc above the 'Alliance' part. Below it, the full name 'International Digital Enterprise Alliance' is written in a smaller font, followed by a registered trademark symbol.

IDEAlliance
International Digital Enterprise Alliance ®

Consider Reusing an Existing IEPD



- Drastically improves interoperability among agencies
- Saves an enormous amount of work
 - Modeling, mapping, subset generation, schema development
- Can often result in a better design
- Allows you to take advantage of existing tools

How to Find Existing IEPDs

- Justice IEPD Clearinghouse
 - <http://it.ojp.gov/framesets/iepd-clearinghouse-noClose.htm>
- NIEM.gov Clearinghouse
 - <http://niem.gtri.gatech.edu/niemtools/iepdt/search/index.iepd>
- LEXS
 - Logical Entity Exchange Specification
 - <http://www.lexs.gov>
 - Should be your first choice for law enforcement, public safety and many other domains

Problem #1: The “IEPD Consistency” Problem

Definition:

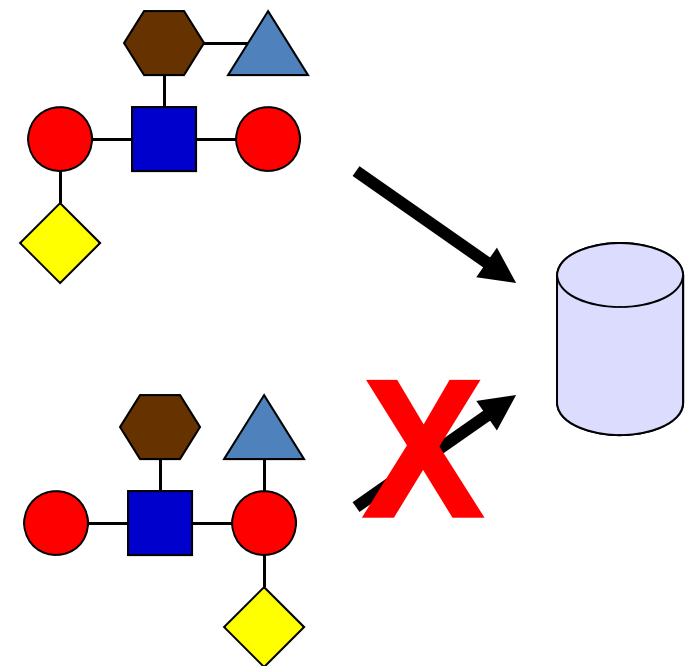
Two groups *independently* developing IEPDs for the *same purpose* may (nay, *will*) create *incompatible* IEPDs.

Result:

Small-scale interoperability between *coordinating* partners, but not large-scale interoperability between independent community members (i.e., the *ultimate promise of standards*)

Mitigations:

- Top-down standards: requires “center of mass”
- Formal standards: long, arduous process
- Consensual standards: hard to gather and govern enough participants to “tip”



Problem #2: The “Polyglot” Problem

Definition:

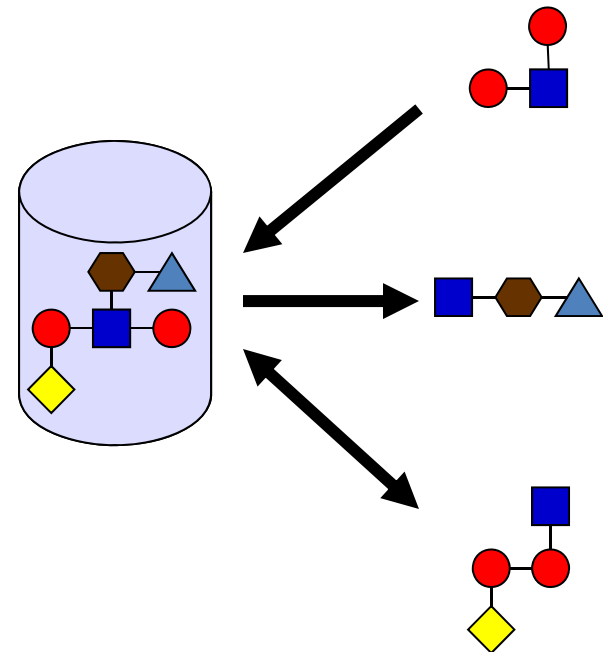
An organization that exchanges data with **multiple partners** must simultaneously support multiple **distinct IEPDs**.

Result:

Cost and expertise are **limiting factors** in the attempt to create **robust, rich networks** of information exchange – instead, sharing is **disjoint** and/or **shallow**

Examples:

- OCDETF Fusion Center: 18 separate interfaces, limited structured data
- State fusion centers will need to:
 - Combine data from local systems
 - Share data horizontally with other state systems
 - Pass data up to national systems

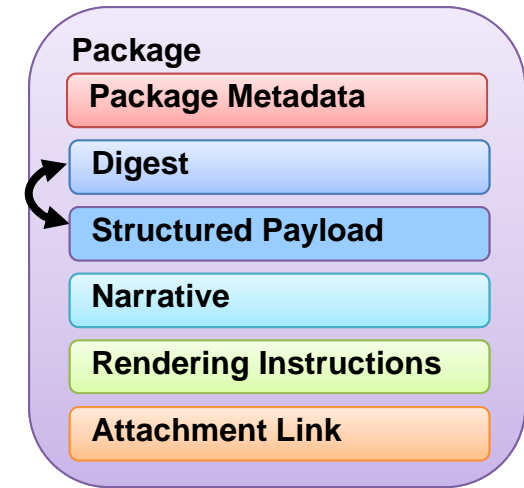


What is LEXS?

- DOJ created *IEPDs* for our complex systems
 - Publication & Discovery (LEXS PD)
 - For publishing and updating data from a source to a consumer
 - Search & Retrieval (LEXS SR)
 - For system-to-system federated searches and result drill-downs
 - Subscription & Notification (LEXS SN) - new in LEXS 4.0
 - Allow users to subscribe to new information of interest based on search criteria
- An *extensible framework* for creating other interoperable IEPDs
 - Examples
 - N-DEx Incident and Arrest IEPD
 - N-DEx Incarceration and Booking IEPD
 - SAR (Suspicious Activity Reporting)
 - ICEPIC

LEXS Data Item Structure

- Package
 - Package Metadata
 - Identification, contact information, etc.
 - Digest
 - Standardized structured entities, roles, and associations
 - Foundation of run-time interoperability
 - Structured Payload
 - Based on independently created schemas
 - Can be ignored if not recognized/understood/implemented by consumers
 - Provides framework for extensibility
 - Narrative
 - Unstructured (text) data
 - Rendering Instructions
 - XSLT or pre-rendered (e.g., PDF) attachments
 - Can reference content in un-recognized structured payloads
 - Foundation of interoperable display (human understanding)
 - Attachment Link
 - links to binary attachments, e.g. facial image, SMT image



Further Resources




- NIEM
 - <http://www.niem.gov>
 - Online training course: <http://www.niem.gov/training.php>
 - Tools: <http://niem.gtri.gatech.edu/niemtools/home.iepd>
 - Documents: <http://www.niem.gov/library.php>

- LEXS
 - <http://www.lexs.gov>

The logo for XML-in-Practice 2009. It features a 2x2 grid of colored squares (orange, blue, green, red) to the left of the text "XML-in-Practice" in a large, bold, black sans-serif font. To the right of the text, the year "2009" is written vertically in a smaller, black sans-serif font. Below the main text, the phrase "A Conference of IDEAlliance" is written in a smaller, black sans-serif font.

XML-in-Practice 2009

A Conference of IDEAlliance

The background of the slide is a light blue gradient with a central white starburst or lens flare effect. In the top right corner, there is a small horizontal row of four colored squares: orange, blue, green, and red.

Thank you for your interest

Feel free to contact me at:

Email: pwalmsley@datypic.com

Website: <http://www.datypic.com>

PRODUCED BY

IDEAAlliance
International Digital Enterprise Alliance®
43

Creative Commons



Attribution-ShareAlike 2.0

You are free to

- Copy, distribute, display, and perform the work
- Make derivative works
- Make commercial use of the work

Under the following conditions

- For any reuse or distribution, you must make clear to others the license terms of this work
- Any of these conditions can be waived, if you get permission from the copyright holder

Your fair use and other rights are in no way affected by the above

This is a human-readable summary of the [Legal Code \(the full license\)](#) and [Disclaimer](#)

This page is available in the following languages

[Català](#), [Deutsch](#), [English](#), [Castellano](#), [Suomeksi](#), [français](#), [hrvatski](#), [Italiano](#), [日本語](#), [Nederlands](#), [Português](#), and [中文\(繁\)](#)

[Learn how to distribute your work using this license](#)



Attribution—You must give the original author credit



ShareAlike—If you alter, transform, or build upon this work, you may distribute the resulting work only under a license identical to this one