Understanding the Landscape and Opportunities

David Webber, Information Architect, Oracle Public Sector
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Agenda

• Open Data
  – Open Data Introduction, Solution Architecture and Tools

• Information Alignment
  – Dictionaries - Key Technology and Foundation Pillar

• NIEM Development Life Cycle
  – NIEM Concepts, Tools and Adoption

• Summary
  – Opportunities for Government

*NIEM – National Information Exchange Model
"Open Data is the new default… anywhere, anytime on any device, and everything should be APIs"

Steven VanRoekel
Federal CIO – Whitehouse Digital Strategy Architect
Decoding the Digital Strategy

- What exactly are Open Data APIs?
- How can Oracle solutions support them?
- What does a solution architecture look like?
- How does this align with NIEM*?
- What technology pillars and tools are there?

*NIEM – National Information Exchange Model
Open Data APIs explained

- A way, via the internet, to securely deliver information between entities and systems
- API – Application Programming Interface
- Security is supported along with roles and permissions for requestors, e.g.
  - **Public information** – such as road works, health services, voting
  - **Private information** – patient data, student data, company data
Oracle Solutions for Open Data

- Introducing Open-XDX
- How Oracle Solutions work with Open-XDX
- Open Data APIs – unleashed data
- Cross-platform and device delivery
Oracle Open Data Solution – Open-XDX

• Open-XDX is an all new component designed to deliver **rapid Open Data APIs**
• Integrates into Oracle Fusion Middleware foundation and Database products
• Uses XML configuration templates and code-less methods and open source NIEM tools
• Allows plug-and-play delivery for Oracle customers and applications
Integration Conceptual View

**Open XDX deployment**

### Design
- Visual Editor
- SQL Browser
- Dictionaries
- Drag and Drop

### Test
- Generate Data
- Validate Data
- Send Data

### Deploy
- Open XDX
- Web Services
- FMW / BPM

### Data Delivery
- Device
- Browser
- Server

*ORACLE*
Open XDX - Conceptual Overview

Control template contains information of the exchange structure design and DB mapping rules of data tables and columns.

Template
- Structure
- Rules
- DB Mappings
- Parameters

Open-XDX

Rapid Deploy

Configuration

Open Data XML

Send

Data Exchange

Existing Information Databases

SQL

JDBC connection
Option #1 – Visual Mapping Mode

NIEM target XML

- Individual column assignments made as DB mapping rules to existing XML structure layout;
- Original XML layout imported from industry schema (such as NIEM PMIX shown here)

Control template contains information of the exchange structure design and DB mapping rules of data tables and columns

Template
  - Structure
  - Rules
  - DB Mappings
  - Parameters

Data store connection wizard

Dragging and Dropping Mappings

Database schema viewer

XML structure viewer

Existing application SQL tables; e.g. Oracle Healthcare, E-Business Suite, custom system, etc.
Option #2 – Visual Designer Mode

- Start with new empty XML structure;
- Toggle database viewer to designer mode.
Visual Designer Mode

Data Exchange Design

Control template contains information of the exchange structure design and DB mapping rules of data tables and columns

Template
- Structure
- Rules
- DB Mappings
- Parameters

Store Configuration

- Drag and Drop of Table
- Drag and Drop Designer
- Database schema viewer
- XML structure viewer

- Drag and Drop table into XML structure
- Complete XML structure components automatically inserted (with Database Mappings);
- All component names / definitions conform to NIEM Naming and Design Rules (smart rename wizard converts SQL to XML)
Demonstration – Open-XDX Data Generation

Data Exchange

Oracle Tools

1. MySQL Workbench
2. XML Designer
3. Generate

Existing Information

Open-XDX

Open Data

XML

Send

Application Data Tables

Live Data Demo

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Applicability to Government Challenges

• Cost of building information exchanges
  – Reduction of development sunk costs through minimizing coding tasks
  – Allowing rapid prototyping and proof of concepts (agile development)
  – Flexibility - dynamic adaptable templates instead of rigid fixed code
  – Reuse – templates for common systems / solutions easily shared and adapted

• Government transparency and public information sharing
  – Structured content from data stores – e.g. election results reporting, monthly cost reports, scheduled road maintenance; obvious metadata and semantics
  – Simple search requests on data – e.g. part numbers, codes, licenses lookup
  – *Not intended* for unstructured and textual content document delivery

• Practical real world data sharing anywhere
  – Direct simple tool with short learning curve and plug and play deployment
Dictionaries - Key Technology and Foundation Pillar
NIEM Past and NIEM Future
Lessons Learned

INFORMATION ALIGNMENT
NIEM Past and Present Challenges

- Vertical domain vocabulary for DHS and DOJ
- One dozen domain dictionaries
- Technology limited - built using XSD schema
- Core components highly contextual to DHS/DOJ
- Surprisingly – no actual logical models of information!
- Gap with semantic technologies integration
- Limited data content rules and code lists
- Mapping automation support missing
- Multi-year development life cycles
Dictionaries Semantics Approach

• Abstract dictionary representations with strong semantics, rules and code lists support
• Schema, models, documentation are generated from dictionary definitions automatically
• Contextual mechanisms allow linear number of true core components – not exponential growth
• Easier for practitioners to leverage with more predictable and repeatable results
• Enable domain use horizontally across government
• ETL mapping automation support
• Continuous collaboration environment
Dictionaries: Key Pillar of Information Sharing

1. Canonical XML Components Dictionary
2. Component Associations and Couplings
3. Exchange Templates and Rules
4. W3C Schema and Model Representations
5. Delivery Control, Messaging, Security
6. Implementation Artifacts and Examples
Available Dictionary Tools

• CAM toolkit provides a rich set of tools to create and manage dictionaries
  – Bottom up harvesting of existing information assets
  – Top down modelling and engineering
  – Reuse scoring and comparison reporting

• Dictionary aligned with UN/CEFACT CCTS work
  – Supports concepts and model
  – Component *renamer* supports NIEM Naming and Design Rules

• Practical solution - supports desktop tools
  – Support for Excel spreadsheet importing and exporting
  – Can generate UML models
  – Works with simple Mindmap rendering

• Dictionary Collections
  – Create collaborative shared sets of dictionaries
Value Proposition

- Allow business data analysts to focus on information needs and build data exchanges
- Aligns information with industry standards and enterprise information stores
- Ensures consistent usage and definitions using profile of syntax-neutral terms and constructs
- Components can be derived from existing domain schema and data structures
- Supports providing sharing and collaboration services
- Allows development of supporting analytics tools
The Vision

UML Technologies

XML Technologies

Rules Technologies

HTML 5 rendering tools

W3C Schema Tools

Semantic Representations

Security solutions

Middleware solutions

NIEM Components in Neutral Dictionary Representation
NIEM Concepts, Tools and Adoption
Information Exchange Life Cycle (IEPD)

NIEM DEVELOPMENT
NIEM is still improving...

- Collections of complex XML Schema
- Verbose components
- Embedded context in names
- Currently facing significant scaling challenges
  - Inconsistencies; too much manual management; slow lifecycles
- Dictionary technology incubating
- Enhanced code lists mechanism incubating
- UML profile is evolving initiative with OMG
  - Attempt to marry modelling techniques and XSD Schema syntax
- Policy and Security mechanisms incubating
- Rules technologies incubating
National Information Exchange Model (NIEM) Tools for enabling interoperability

Provides the tools for enabling interoperability at the data layer within and across systems supporting information sharing, while preserving investments in current technology and optimizing new technology development.

COMPLEXITY
multiple disconnected components + closed coded
Swim Lane Comparison

This is what NIEM exchanges are delivered with on-the-wire!

**UML Technologies**
- UML
- XMI
- Patterns
- Associations
- Stereotypes
- Inheritance

**XML Technologies**
- XML
- XQuery
- XPath
- Elements
- Attributes
- Content

**W3C Schema**
- XSD
- Namespace
- Enumerations
- Cardinality
- Facets
- Complex Types

**Audience:**
- Data Modellers / Designers
- Software Developers and Middleware Engineers
- General content delivery and applications; content engineers; rules representation systems; multimedia delivery; geospatial systems
National Information Exchange Model (NIEM)

Repeatable, Reusable Methodology
(Exchange Specification Lifecycle)

- Design
- Develop
- Deploy
- Document
- Dictionaries
- Discovery
- Differentiate
- Diagnose

IEPD - Information Exchange Package Documentation
NIEM IEPD / Exchange Delivery Lifecycle

- **Diagnose**
  - Requirements
  - Updates

- **Design**
  - Discovery
  - Drag and Drop Visual Designer
  - Exchange Templates

- **Develop**
  - XSD Schema
  - NIEM IEPD Reports

- **Document**
  - XMI / UML Models
  - Required IEPD artifacts

- **Deploy**
  - Production
  - Results

- **Differentiate**
  - Validated Templates / Schema

- ** NIEM IEPD / Exchange Delivery Lifecycle **

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• Minimal learning curve for practitioners
• Provide technology neutral methods, tools and techniques
• Leverage visual metaphors – WYSIWYG
• Business Rule Validation
• Conformance Test Suites
• SQL data mapping / XML generation (code-free methods)

CAM Toolkit

SIMPLICITY
integrated components + visual metaphors + open source

• Creates technical artifacts needed for a NIEM IEPD
• Deliver the NIEM domain and core component sets in format that can be quickly adapted and reused
### IEPD Delivery Tasks / Tools Matrix

<table>
<thead>
<tr>
<th>Activity</th>
<th>CAM</th>
<th>CAMV</th>
<th>Open-XDX (OPX)</th>
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<tbody>
<tr>
<td>Exchange Schema Development</td>
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<tr>
<td>Canonical Model Development / Generation</td>
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<tr>
<td>Exchange Schema Generation</td>
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<tr>
<td>NIEM Compliance Checking / Reporting</td>
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<tr>
<td>WSDL / JAXB Binding Generation</td>
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<td>Operation Message Test Case Generation</td>
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<tr>
<td>Production Services Message Generation</td>
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<tr>
<td>SQL Schema Mapping</td>
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<tr>
<td>NIEM IEPD Artifact Generation</td>
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<tr>
<td>- Cross-reference spreadsheet</td>
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<tr>
<td>- UML model</td>
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<tr>
<td>- Business Rules Report</td>
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<td>- XSD schema package</td>
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<tr>
<td>Conformance Test Suite</td>
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<tr>
<td>Run time XML instance validation</td>
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</tbody>
</table>

In order to be NIEM-conformant, the IEPD must adhere to:

1. **NIEM Conformance Document**
2. **NIEM Naming and Design Rules (NDR) v1.3**
3. **NIEM Model Package Description (MPD) Specification v1.0**
Key Technology Capabilities

- Delivering on the Open Data Digital Strategy Vision for government
- Open Standards and Open Source based
- Plug and play with code-free templates and rapid development
- Supports NIEM and Open XML exchanges
- Leverages deployed technology today
- Workflow integration
- Dictionary component management
- Secure messaging delivery and partner management
- Delivered across-platform and device
- End-to-end security & governance
CAMeditor.ORG Project Statistics

SNAPSHOT OF PROJECT ACTIVITIES

100,000+ CAMeditor.org page visits to site

165+ countries have downloaded tools;

30% of visitors are from U.S.;

700+ downloads weekly

1000+ student views of online video training resources

6 languages now available

www.cameditor.org
www.niemtrainingvideos.org