

# EDXL Distribution

The Theory of Publish/Subscribe

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# Presentation Goal

The Goal of this presentation is to explain how Information Exchange requirements documented in DoD Architecture Framework can be described in EDXL Distribution Element metadata and distributed via robust Publish Subscribe messaging systems like Nuparadigm Foundation.

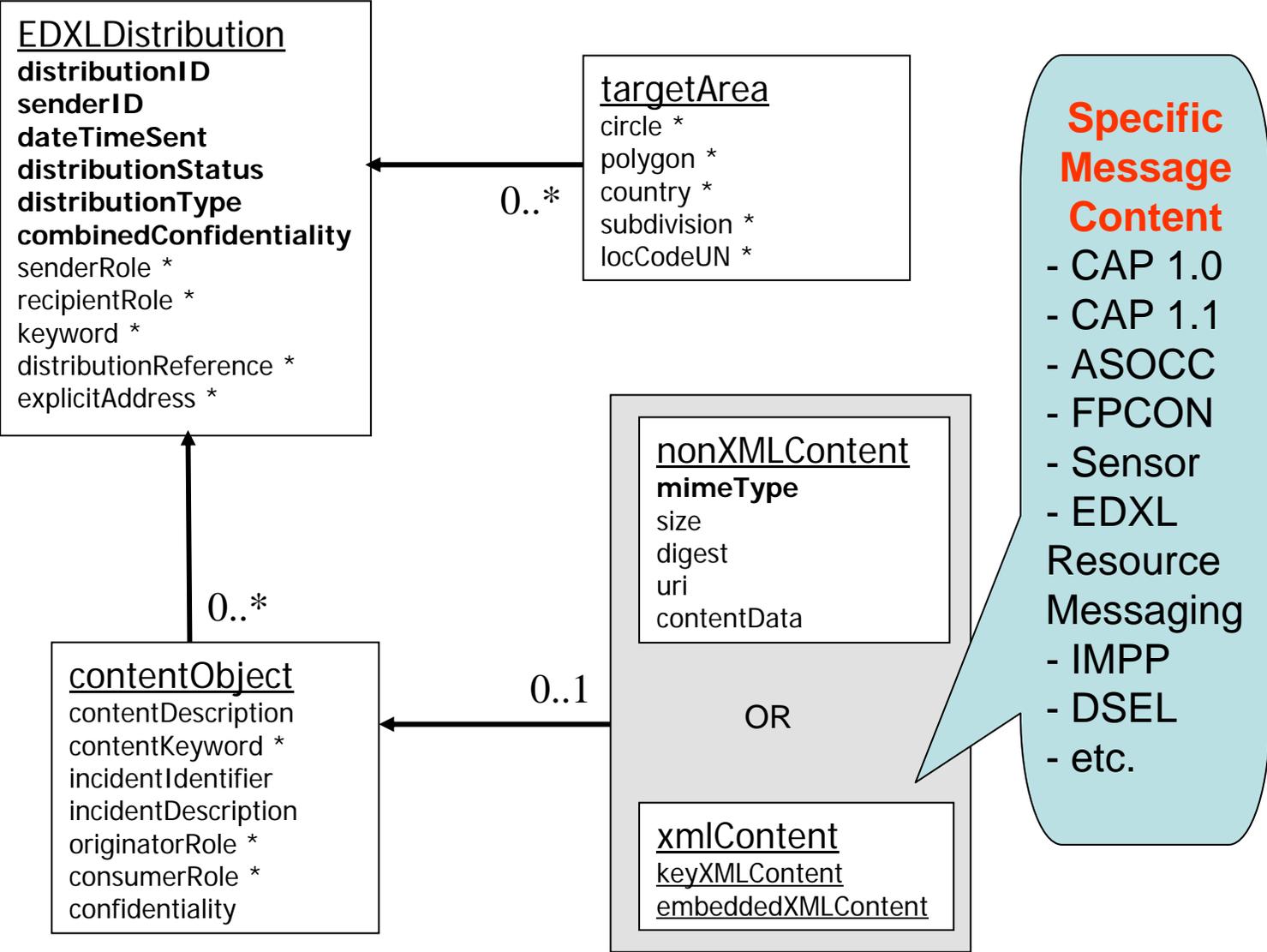
The DoD Architecture Framework provides the guidance, rules, and product description for developing and presenting architecture descriptions that ensure a common denominator for understanding, comparing, and integrating Families of Systems (FOSs), Systems of Systems (SoSs) and interoperating and interacting architectures.

The primary purpose of the EDXL Distribution Element is to facilitate the routing of any properly formatted emergency messages to recipients. The Distribution Element may be thought of as a "container". It provides the information to route "payload" message sets (such as XML Alerts or Resource Messages), by including key routing information such as distribution type, geography, incident, and sender/recipient IDs

# DoD AF & EDXL Terms

- Emergency Data Exchange Language (EDXL) is a family of XML documents
- EDXL Distribution Element (EDXL-DE) is meta data qualifying distribution of arbitrary data
- EDXL Payload is the name of content data being exchanged between entities using EDXL-DE
- Collection of Interests (COI) group Payload characteristics into collections of interests/topics
- Endpoints define the input or output methods used by the instantiating messaging system

# EDXL Distribution Element (DE)



# DoD AF Operational Views

- These views describe the tasks and activities, operational elements, and information exchange requirements required to conduct business processes or specific missions.
- There are the seven Operational Views in DoD AF
  - High-Level Operational Concept Graphic (OV-1)
  - Operational Node Connectivity Description (OV-2)
  - Operational Information Exchange Matrix (OV-3)
  - Organizational Relationship Chart (OV-4)
  - Operational Activity Model (OV-5)
  - Operational Activity Sequence and Timing Descriptions (OV-6a, 6b, 6c)
  - Logical Data Model (OV-7)
- These seven views provide a Framework for creating taxonomies of any real world system
- They allow flexible decomposition of processes or missions to any arbitrary level of detail
- EDXL Distribution Element Metadata captures the concepts of decomposition for the OV-2/OV-5 and OV-3 Operational Views

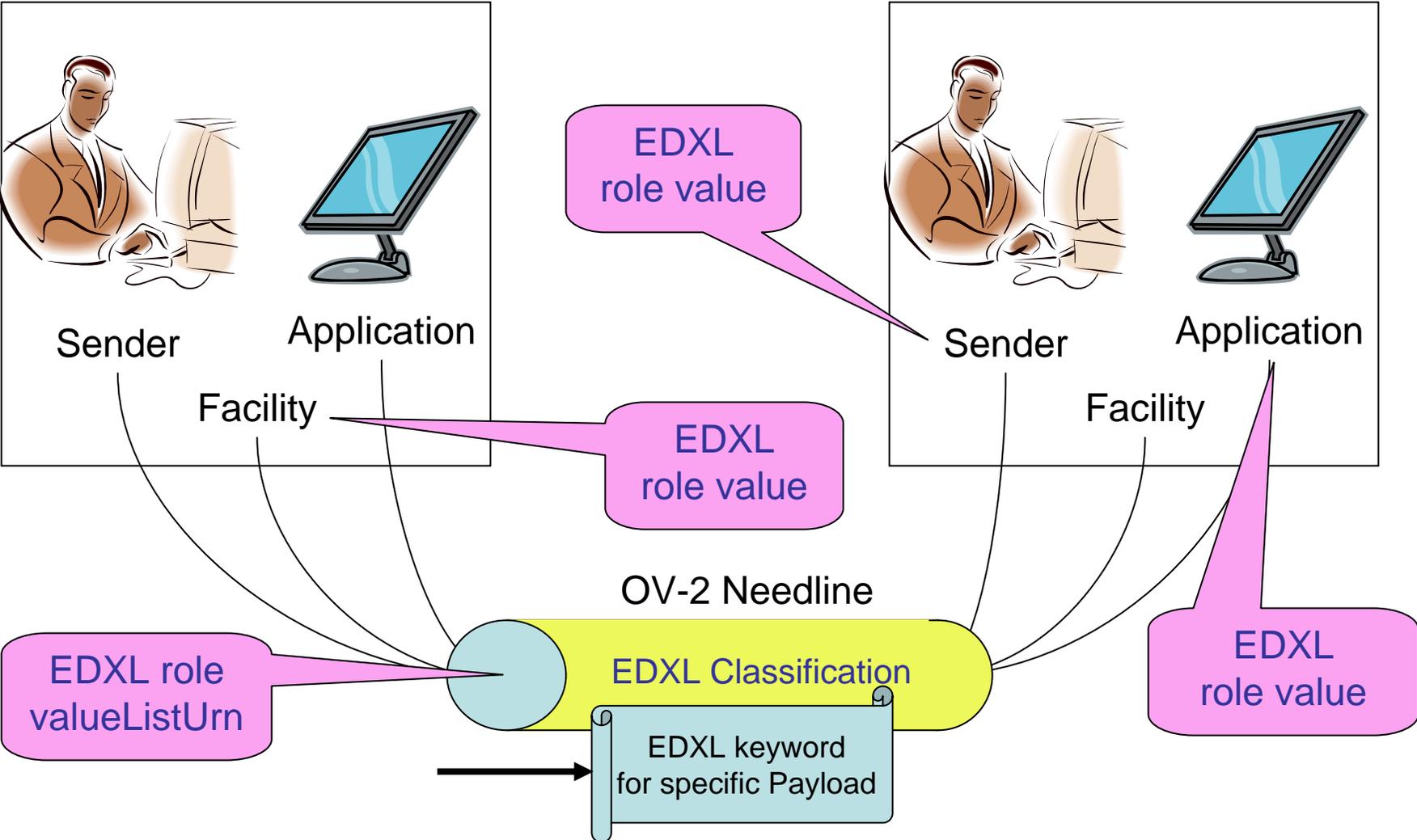
# OV-2 to EDXL Terminology

- The Operational Node Connectivity Description graphically depicts the operational nodes (or organizations) with needlines between those nodes that indicate a need to exchange information.
- An Operational Node is an element of the operational architecture that produces, consumes, or processes information.
- OV-2 levels of operational abstraction vary but include:
  - Operational / Human Roles (e.g. NC JOC duty officer)
  - An Organization (e.g. Defense Threat Reduction Agency DTRA)
  - Organization Types
    - Logical groupings (e.g. National Capital Region NCR)
    - Functional groupings (e.g. NGB-CST, CBRN Sensor Node)
  - Activity Type (e.g. assess CBRN Sensor activation for validity)
- EDXL header metadata uses the following elements to capture:
  - Information Producer < senderRole >
  - Information Consumer/Processor < recipientRole >
  - Needlines < keyword > which denote information exchange (IERS)
- Each specific valueListUrn table should contain all < senderRole >, < recipientRole >, and < keyword > in a single OV-2 diagram.

# OV-2 Levels of Abstraction vs EDXL Value Pairing

## Producer / EDXL SenderRole

## Consumer / EDXL RecipientRole



# OV-3 to EDXL Terminology

- The Operational Informational Exchange Matrix details information exchanges and identifies “*who* exchanges *what* information with whom, *why* the information is necessary, and how the information must occur.
- An Information Element is a formalized representation of information subject to a business or operational mission. EDXL uses the Payload for this concept
- An Information Exchange is an act of exchanging information between two distinct operational nodes. Exchanges are labeled by an Information Exchange Identifier (IEI) and can be all or part of an EDXL Payload.
- OV-3s map operational abstraction from OV-2, OV-5, and OV-6 to actual message content. These can be individual XML elements of EDXL Payload
  - OV-3 IEIs label specific information content and associated transaction, performance, IA and security attributes of a specific exchange class.
  - <xmlContent> contains Payloads XML elements that could represent an IEI.
- EDXL <contentObject> metadata uses the following elements to capture:
  - Information Producer <originatorRole>
  - Information Consumer <consumerRole>
  - Needlines <contentKeyword> which can denote information exchange (IEs)
  - Security <confidentiality> which is a specific IEI attribute use to restrict delivery
- Each specific valueListUrn table should contain all <originatorRole>, <consumerRole>, and <contentKeyword> in a single OV-3 diagram.

# OV-3 Levels of Abstraction vs EDXL Value Pairing

## Identifier / EDXL ContentObject

## Identifier / EDXL ContentObject



**Producer**

```

<alert xmlns="urn:oasis:names:tc:emergency:cap:1.1">
  <identifier>Aug08_000001</cap1.1:identifier>
  <sender>dellis@sandia.gov</cap1.1:sender>
  <msgType>Alert</cap1.1:msgType>
  <scope>Public</cap1.1:scope>
  <info>
    <category>CBRNE</cap1.1:category>
    <event>Possible Terrorism</cap1.1:event>
    <urgency>Immediate</cap1.1:urgency>
    <audience>sensor Management</cap1.1:audience>
    <:senderName>Rad1</cap1.1:senderName>
    <headline>Radiation Detection</cap1.1:headline>
  </info>
</alert>
    
```



**Consumer**

```

<alert xmlns="urn:oasis:names:tc:emergency:cap:1.1">
  <identifier>Aug08_000001</cap1.1:identifier>
  <sender>dellis@sandia.gov</cap1.1:sender>
  <msgType>Alert</cap1.1:msgType>
  <scope>Public</cap1.1:scope>
  <info>
    <category>CBRNE</cap1.1:category>
    <event>Possible Terrorism</cap1.1:event>
    <urgency>Immediate</cap1.1:urgency>
    <audience>sensor Management</cap1.1:audience>
    <:senderName>Rad1</cap1.1:senderName>
    <headline>Radiation Detection</cap1.1:headline>
  </info>
</alert>
    
```

EDXL keyword  
or Roles  
(e.g. OPREP3)

Information  
Exchange  
Identifier  
or  
EDXL  
contentKeyword or  
keyXMLContent

### OV-3 Needline Identifier

EDXL role  
valueListUrn

EDXL Classification

EDXL contentObject  
signature and/or  
encryption

# EDXL Distribution Methods

- Explicit delivery <explicitAddress>
  - Messages sent to external distribution system <valueListUrn>.
  - Messages sent to external application and/or sensor node
- Direct delivery is a subset of Explicit delivery where
  - The distribution system is the routing framework itself and values are the actual output endpoints associated with a specific subscribers.
  - Messages sent to specific framework recipient endpoint.
- Explicit Publish/Subscribe (Pub/Sub) delivery
  - Messages sent to specific producer/consumer framework endpoint.
  - Direct assertion for explicit sender by a specific subscriber.
  - Direct identification of specific subscriber in EDXL Distribution header information.
- Implicit Publish/Subscribe (Pub/Sub) delivery
  - Messages sent to implied Collection of Interest (COI) group endpoint.
  - COI endpoint determined via Needlines or IELs distribution evaluation
- Targeted delivery
  - Direct and Explicit/Implicit (Pub/Sub) message delivery with scope of delivery restricted by targetArea or other distribution element value (e.g. confidentiality.)

# Implicit Publish/Subscribe

		Consumer	Consumer
	Data	Know who has data	Does not know who has data
<b>S</b> <b>e</b> <b>n</b>	Know who needs data	Either same as column to right or below	Publish for <recipientRole> or <consumerRole> or <keyword> or <contentKeyword>
<b>d</b> <b>e</b> <b>r</b>	Does not know who needs data	Subscribe for <senderRole> or <originatorRole> or <keyword> or <contentKeyword>	This is Implicit Publish/Subscribe Evaluation of Needlines or IERs to determine collection of interest. Use inference to determine COI potential framework endpoints.

# EDXL Header Usage

Element	Element Purpose	Core Message Routing Usage	Delivery Selection
distributionID	Message Identification	None	None
senderID	Message Identification	None	None
dateTimeSent	Message Identification	None	None
distributionStatus	Action Level	None - TBD	Application Filtering
distributionType	Functional Type	None - TBD	Application Filtering
combinedConfidentiality	Informational	None	Security Filtering
language	Informational	None	Nationality Filtering
senderRole	Functional Role	Exp/Imp Pub/Sub	COI Filtering
recipientRole	Functional Role	Exp/Imp Pub/Sub	COI Filtering
keyword	Content Identification	Exp/Imp Pub/Sub	COI Filtering
distributionReference	Message Identification	Experimenting	Fixed
explicitAddress	External delivery	Explicit	Fixed

# ContentObject Elements Usage

ContentObject Element	Element Purpose	Core Message Routing Usage	Delivery Selection
contentDescription	Informational	None	Special *
contentKeyword	Content Identification	Exp/Imp Pub/Sub	COI Filtering
incidentID	Informational	None	None
incidentDescription	Informational	None	None
originatorRole	Functional Role	Exp/Imp Pub/Sub	COI Filtering
consumerRole	Functional Role	Exp/Imp Pub/Sub	COI Filtering
confidentiality	Informational	None	Security Filtering
any*	Message Security	None	Certificate Holders

# Payload Element Usage

<b>nonXMLContent Element</b>	<b>Element Purpose</b>	<b>Core Message Routing Usage</b>	<b>Delivery Selection</b>
contentType	Content Identification	None	Application Filtering
size	Informational	None	Distribution Filtering
digest	Message Security	None	None
uri	Informational	None	None
contentData	Payload	None	None
<b>xmlContent Element</b>	<b>Element Purpose</b>	<b>Message Routing Usage</b>	<b>Delivery Selection</b>
keyXMLContent	Expose specific Payload elements	None	COI Filtering
embeddedXMLContent	Payload	None	None

# Value List URN Tables

- Value names should focus on class of OV-2 diagram
- Naming of Value should reference OV-2 Roles/Activities
  - S- for Producer (e.g. S-Sensor Node)
  - R- for Consumer (e.g. R-Sensor Management)
  - N- for Needline (e.g. N-Sensor Node:Sensor Management)
  - M- for Specific Document (e.g. M-ANSI N42.42)
  - K- for Specific Document Content (e.g. K-Radiation Spectrum)
- For every Producer there should be one or more pairs of Consumer Values in table and associated Needlines
- Specific Document and Content should be referenced in EDXL registries like the NIEM or DoD XML registries
- Mappings between existing organizational taxonomies should be harmonized by using Ontology's specifically derived for the specific distribution method (e.g. National Alerting Framework)

# Publish Subscribe Registration

<b>Publish</b> <ul style="list-style-type: none"><li>• Type of contentObject being sent<ul style="list-style-type: none"><li>◦ Specific schemas</li><li>◦ Specific mime types</li></ul></li><li>• Restrict usage of content keyword tables</li><li>• Register keyword tables for originator roles</li><li>• Ability to add new schemas, keyword tables, originator roles, and mime types</li></ul>	<b>Subscribe</b> <ul style="list-style-type: none"><li>• Type of contentObject to receive<ul style="list-style-type: none"><li>◦ Specific schemas</li><li>◦ Specific mime types</li></ul></li><li>• Restrict the consumer role tables and the values within the consumer role table</li><li>• Restrict the keyword tables and the values within the keyword table</li><li>• Evaluate all explicit addresses from all explicit address schemas<ul style="list-style-type: none"><li>◦ DMIS Cog/#215</li><li>◦ <a href="mailto:jon@me.org">Email/jon@me.org</a></li></ul></li></ul>
<ul style="list-style-type: none"><li>• Type of distribution element<ul style="list-style-type: none"><li>◦ Specific keyword table and values</li><li>◦ Specific sender role tables and values</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Type of distribution element<ul style="list-style-type: none"><li>◦ Specific keyword tables and values</li><li>◦ Specific consumer role tables and values</li></ul></li></ul>

Certificates will be issued to any system which registers with the distribution system. Certificates will be used to create encrypted Tunnels and to Encrypt and Sign contentObjects.