AIA e-Business Activities Overview
GEIA Meeting
January 30, 2002

Presented by:
Ron Schuldt, Lockheed Martin

AIA Creates e-Business Steering Group

At its 14 March, 2001, meeting the AIA Executive Committee

agreed to establish a corporate-level steering group to coordinate the various e-business activities currently underway at AIA and to establish clear policy defining what common e-Business practices are and how they are to be implemented.

*- AIA Executive Action Report 6-2001
DTD 23 March 2001*

e-Business Steering Group Members

Northrop Grumman	**Tom Shelman (chair), VP, Internal Information Services, and CIO**
	Keith Glennan, Director, e-Business, Northrop Grumman
AAI	**David Powell (vice chair), Director, Information Technology**
BAE Systems*	**Gary Mucha, VP, Operations**
	Bharat Amin, Director, Corporate Information Technology
Boeing*	**Scott Griffin, VP and CIO**
	Paul L. Pasquier, Director, e-Buy
Exostar	**Jim Mandracchia, Chief Strategist**
General Dynamics*	**Not yet represented**
Goodrich*	**Stephen Huggins, Senior VP, Strategic Resources and Information Technology**
	Brian P. Cawley, Director, Aerospace IT Consulting
Honeywell*	**In Transition**
Lockheed Martin*	**Joseph Cleveland, CIO and President, Enterprise Information Systems**
	Marillyn A. Hewson, VP, Shared Services, Lockheed Martin
Matrix One	**Stephen J. Daimler, Director, Strategic eSourcing Solutions Federal Group**
MOOG	**Jim Van Oss, Director, Information Technology**
Raytheon*	**Jim Newman, Director, e-Supply Chain Management**
	Rebecca Rhoads, VP and CIO
	Tim Wholey, Corporate Director, B2B Integration
Textron	**Sandi Walker, VP, Information Technology**
TRW	**Priscilla Guthrie, VP, e-Business**
	Diane Murray, VP, Information Systems and Processes
United Technologies*	**John Doucette, VP and CIO**
	Peter Longo, VP and CIO, Pratt and Whitney
Vought Aircraft	**Bryan Tutor, CIO**
	Judith Northup, VP, Material

*Company a Member of AIA 2001 Executive Committee

The members of the Aerospace Industries Association are committed to the following vision for e-Business across our industry:

All participants in the aerospace value chain will be able to exchange information relative to product design, business relationships, transactions, and product support across an information backbone which is open and accessible to all.

The Information Backbone Contents

Business Applications
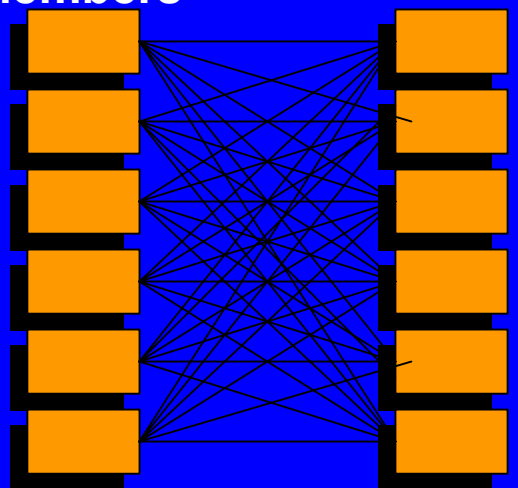**(AIA Member Unique – Out of Scope for e-BSG)**

"Information Backbone"

Outreach & Policy

Business Process

Component Elements

Registry & Repository

Trading Partner Profile

Transport & Package

Security

Technical Environment
(AIA Member Unique – Out of Scope for e-BSG)

The Reason for the Standards

The Cost of a Single Interface is Anywhere from $10K to $1M, Depending on Complexity

AIA Members

Business Partners

OR

Business Applications
(AIA Member Unique – Out of Scope for eBSG)

"Information Backbone"
Business Process
Outreach & Policy | Component Elements | Security
Registry & Repository
Trading Partner Profile
Transport & Package

Technical Environment
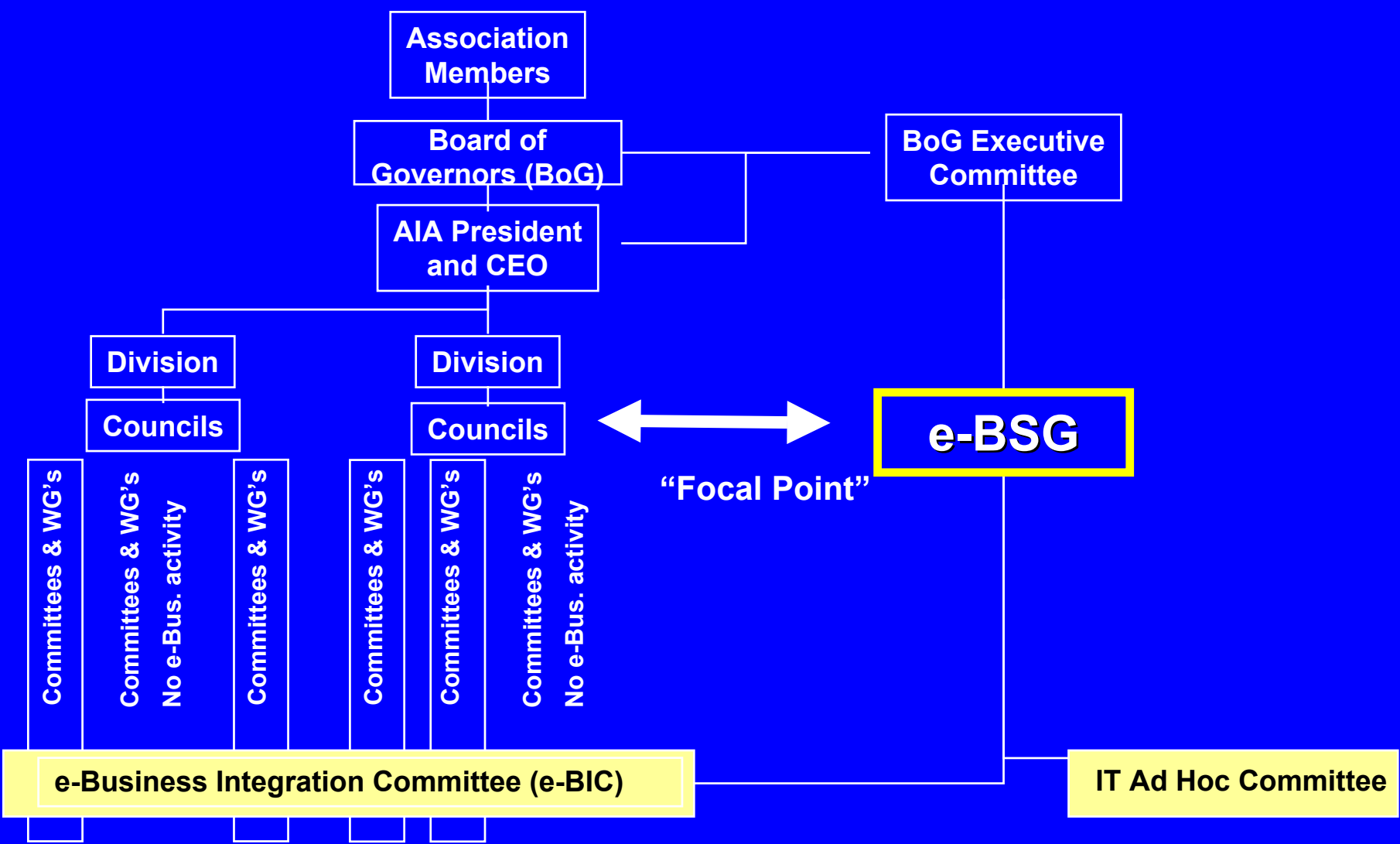(AIA Member Unique – Out of Scope for eBSG)
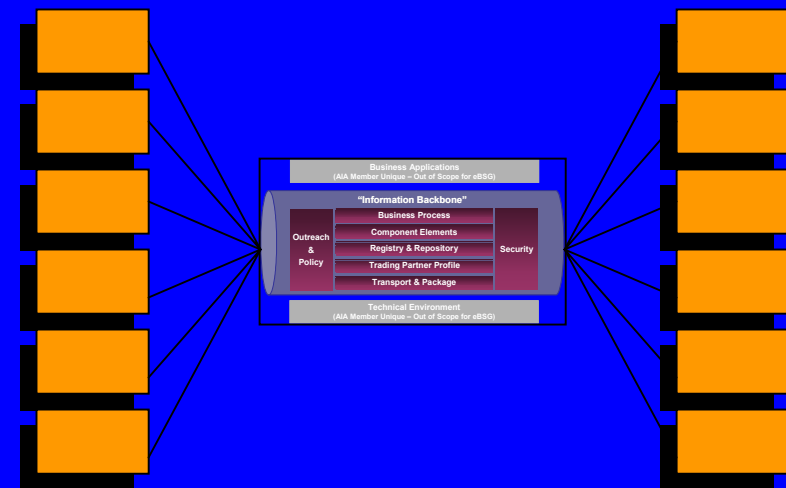
Cost and Complexity
$\sim n^2$

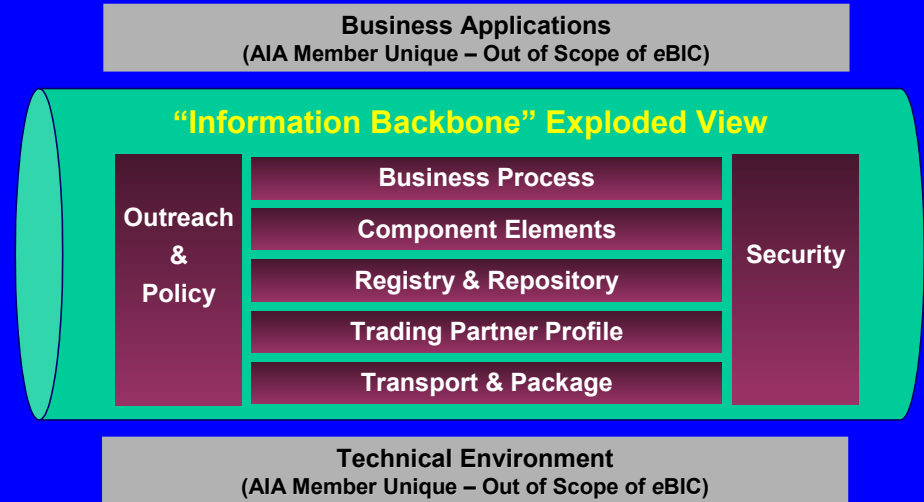**Cost and Complexity**
$\sim n+n$

Our companies will build e-Business communications capabilities with or without the AIA's involvement

The Reporting Relationships

The e-BIC Leaders

EB Interoperability Framework	eBIC Leader(s)
Outreach & Policy	Lockheed Martin Boeing
Business Process	Vought Goodrich Raytheon
Components Elements	Boeing
Registry & Repository	Northrop Grumman Raytheon
Trading Partner Profile	Lockheed Martin Boeing
Transport & Package	MOOG Textron AAI
Security	MOOG Textron

Business Applications
(AIA Member Unique – Out of Scope of eBIC)

"Information Backbone" Exploded View

Outreach & Policy

- Business Process
- Component Elements
- Registry & Repository
- Trading Partner Profile
- Transport & Package

Security

Technical Environment
(AIA Member Unique – Out of Scope of eBIC)

*e*BIC working groups aligned to EB Interoperability Framework*

*Framework based on ebXML Specification

e-BSG Decision/Direction to EEWG

- Assign XML Data Map responsible to EEWG (Marillyn Hewson to discuss with Ron Schuldt and Brian Cawley will discuss with Bob Moore)
  - Identify common elements
  - Identify 'which groups' are working remaining specific data elements.
  - ECWG remains a report to SMC except for this task reporting to e-BSG
  - Consult with AIA Council lawyers on standardization to keep us legal
  - David Johnson to advise team now the draft direction on where they're headed.
  - Face-to-face, two-day meeting (Lockheed Martin (Hewson) to host) between new IDE and e-BSG (Oct. 8 and 9)
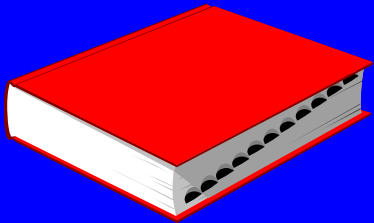
Project Mission Statement

The Aerospace Metadata Harmonization Project
    shall produce AIA harmonized XML metadata mapping matrices where overlaps and conflicts exist between existing metadata standards that are relevant to the aerospace industry.

What is Metadata?
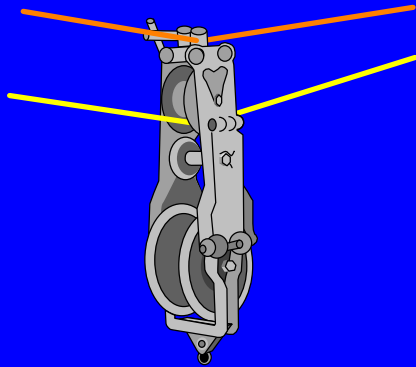
Data	Metadata
199-81-026	Part Number

Data	Metadata
19981026	Document Revision Date

Metadata is commonly defined as --- data about data

XML is Metadata

<BookTitle>For Whom the Bell Tolls</BookTitle>

metadata   **data**

- "For Whom the Bell Tolls" is data
- "BookTitle" is metadata
- *An XML tag name is metadata*

Though semantically equal, the following are 4 different XML tag names

<PARTNUMBER>111-222-333</PARTNUMBER>

<partNumber>111-222-333</partNumber>

<PartNumber>111-222-333</PartNumber>

<partnumber>111-222-333</partnumber>

As result, many industries are defining their metadata (tag name) standards
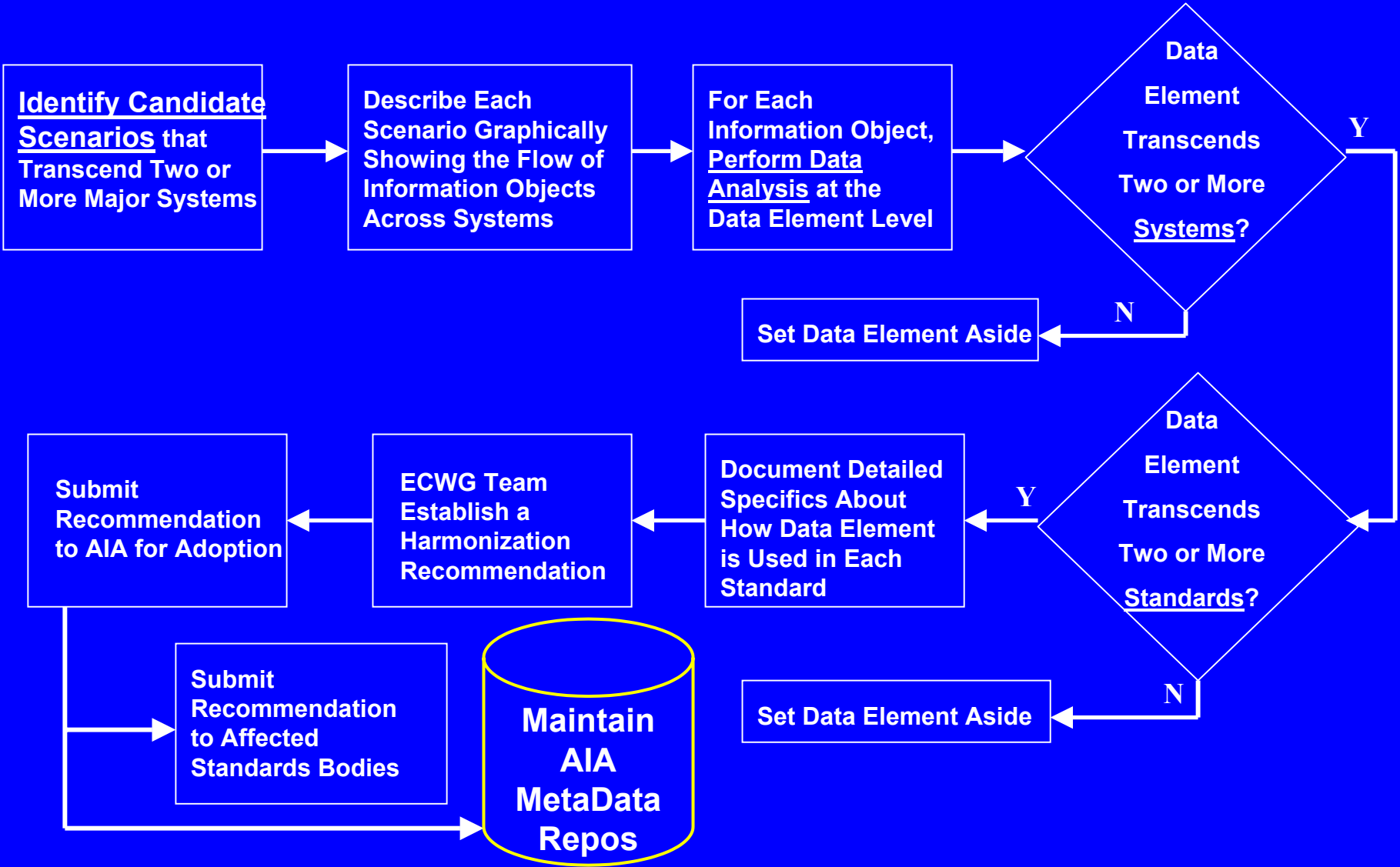
Project Scope

- **The Aerospace Metadata Harmonization Project scope shall initially include key metadata that on a global scale uniquely identify, locate, and timestamp the following metadata objects:**
  - **Person (e.g., person identifier) - identify**
  - **Place (e.g., physical address, file URL, 2-D and 3-D spatial coordinates) - locate**
  - **Product (e.g., product identifier, part identifier, material identifier, etc.) - identify**
  - **Asset (e.g., aircraft identifier, ship identifier, building identifier, etc.) - identify**
  - **Process (e.g., drilling process identifier, testing process identifier, etc.) – identify**
  - **File (e.g., engineering drawing identifier, specification identifier, etc.) – identify**
  - **Enterprise (e.g., supplier identifier, company identifier, government agency identifier, etc.) – identify**
  - **Time (e.g., GMT, local time and date) – timestamp**
- **Upon successful completion of the deliverables defined within the boundaries of the initial scope, a decision by the e-BSG will determine whether the need exists to expand beyond the initial scope and to continue the project.**
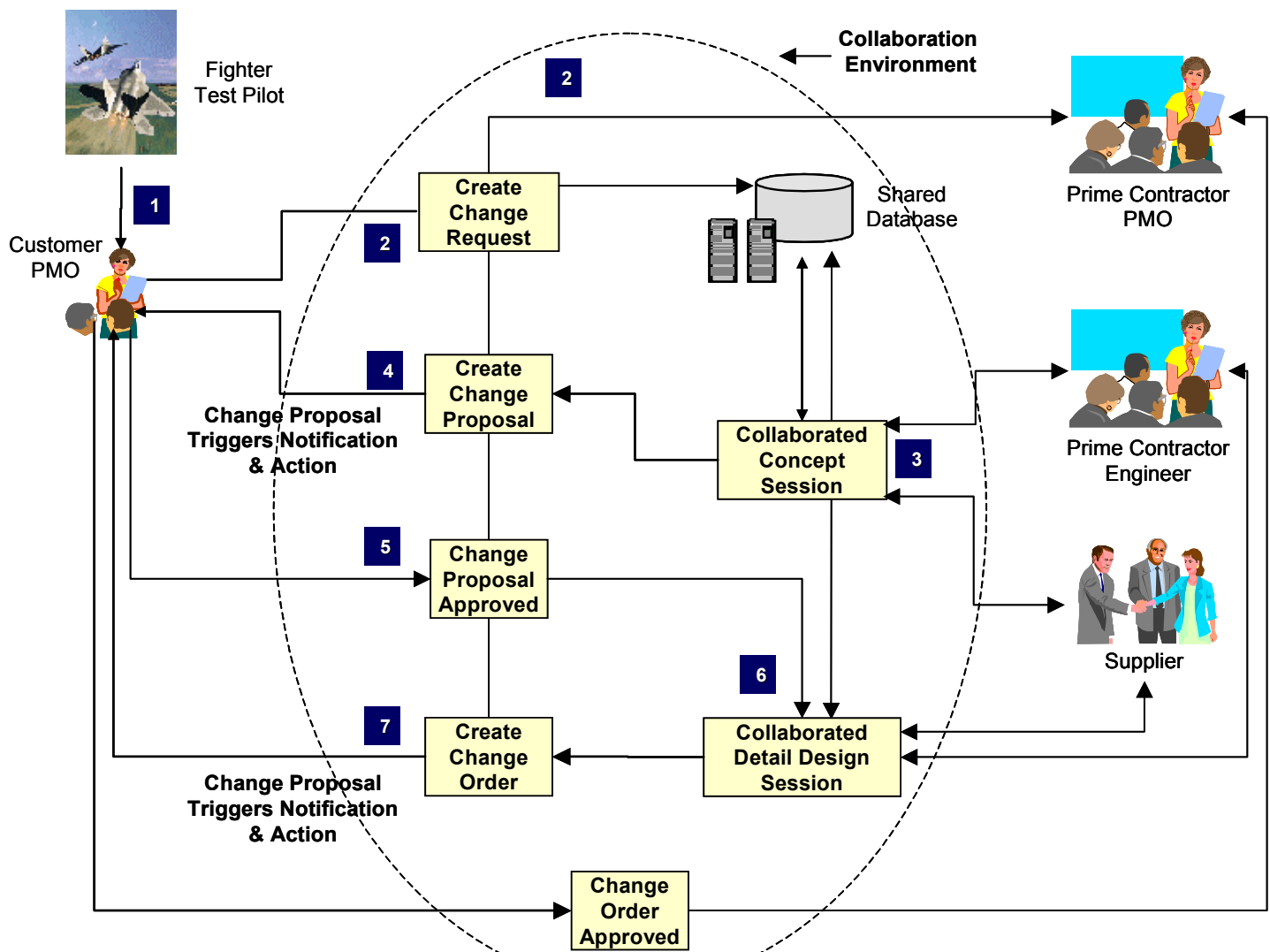
Project Deliverables

The Aerospace Metadata Harmonization Project deliverables are

1. A documented **business process and data analysis** of overlaps of key metadata between metadata standards used within the aerospace industry. As a minimum, the analysis will identify at least one scenario in which the metadata item in question is used across two or more standards that are used within the aerospace industry

2. A **single mapping matrix** containing the AIA recommended XML representation (tag name) of each key metadata standard, its harmonized definition, and corresponding (semantically equal) overlaps with other metadata standards used within the aerospace industry

3. Once approved by the e-BSG, the trial-use phase deliverables identified above in items 1 and 2 shall be **published** on the AIA Web site or other medium **as determined suitable** by AIA legal counsel

Project Process/Methodology

Identify Candidate Scenarios that Transcend Two or More Major Systems

→

Describe Each Scenario Graphically Showing the Flow of Information Objects Across Systems

→

For Each Information Object, Perform Data Analysis at the Data Element Level

→

Data Element Transcends Two or More Systems?

Y →

N → **Set Data Element Aside**

Data Element Transcends Two or More Standards?

Y →

N → **Set Data Element Aside**

Document Detailed Specifics About How Data Element is Used in Each Standard

→

ECWG Team Establish a Harmonization Recommendation

→

Submit Recommendation to AIA for Adoption

→ **Submit Recommendation to Affected Standards Bodies**

Maintain AIA MetaData Repos

EIA-836 Engineering Change Scenario

EIA-836 Engineering Change Scenario

Scenario: During aircraft acceptance testing, a problem is detected that leads to a Change Order.

(1) Test pilot identifies and reports a problem reaching an Electronic Counter Measures (ECM) control switch during maneuvers. The pilot requests that the ECM control switch be re-located to a more accessible position.

(2) The customer Program Office completes an online Change Request and authorizes the prime contractor to expend effort to develop a proposed change.

(3) After considering several options, the prime contractor decides to further investigate swapping locations with a panel of pre-flight system status lights (a panel provided by a supplier). During collaborative whiteboard sessions between the prime and the supplier to visualize, manipulate, and annotate a multi-dimensional model of the ECM and its panel location, the decision is reached that the swap is feasible.

(4) An online Change Proposal is completed by the Prime Contractor PMO and submitted to the Customer PMO. The submission triggers a series of internal reviews and.

(5) The Customer PMO approves the Change Proposal that, in turn, triggers the initiation of detailed design development.

(6) Using the mark-ups created in the collaborative whiteboard sessions during the conceptualization phase, the prime contractor and supplier further manipulate the ECM and control panel configuration to finalize the design.

(7) Once the design is complete, the prime submits the Change Order for approval.
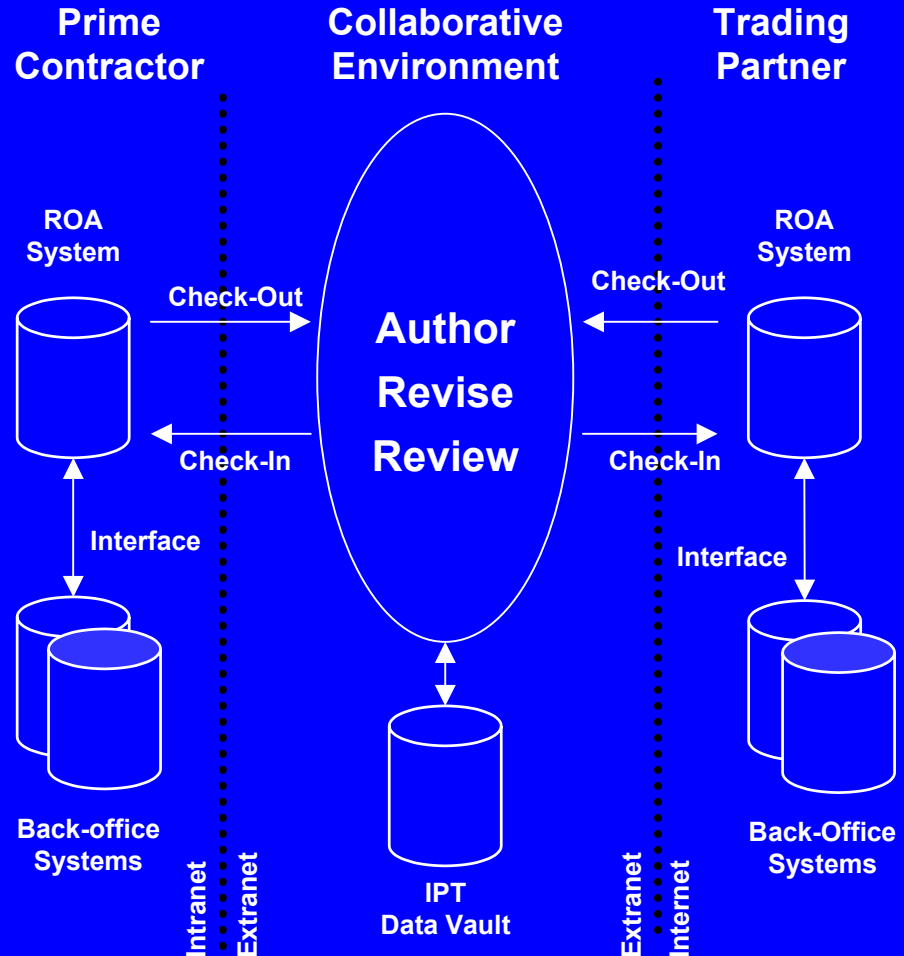
(8) The customer approves the Change Order.

Example Collaboration Scenario

Description

- **Author, revise, review in extranet-hosted collaboration environment**

- **Management of data performed in Record of Authority (ROA, e.g. PDM, ERP) systems**

- **Subset of product metadata and data temporarily checked-out of ROA systems and replicated into collaborative environment, reviewed/revised, then checked-in to ROA systems**

Examples
- **ICD Development**
- **ECP Development**

Prime Contractor

Collaborative Environment

Trading Partner

ROA System

ROA System

Check-Out

Check-Out

Author Revise Review

Check-In

Check-In

Interface

Interface

Back-office Systems

Back-Office Systems

IPT Data Vault

Intranet

Extranet

Extranet

Internet

Record of Authority -Temporarily Transferred

Other Collaboration Scenarios

Processes

- **Requirements Development**
- **Project Management**
- **Response to GIDEP Alert**
- **Proposal Preparation**
- **Action Item Management**
- **Design Analysis**
- **Cabling Design**
- **Update Technical Orders**
- **E-BOM to M-BOM Conversion**
- **Others**

Types of Structured Data

- **Requirements Data**
- **Configuration Mgmt Data**
- **Cost Estimating Data**
- **Schedule Data**
- **Dynamic Analysis Data**
- **Thermal Analysis Data**
- **Technical Manual Source Data**
- **Manufacturing Process Data**
- **Others**

All Require Structured Data Interaction with Other Structured Data

Example Data Analysis Results

UDDI

- **Universal Unique ID (UUID)**
- Globally unique
- Supports many ID codes
- 128 bit hexadecimal (8 char AN)

EIA-836

- **Organization ID**
- Supports many ID codes
    - CAGE, DUNS, FSCM, etc.
- ID length not specified

AIA EDI

- **Originating Company ID Number**
- Supports many ID codes
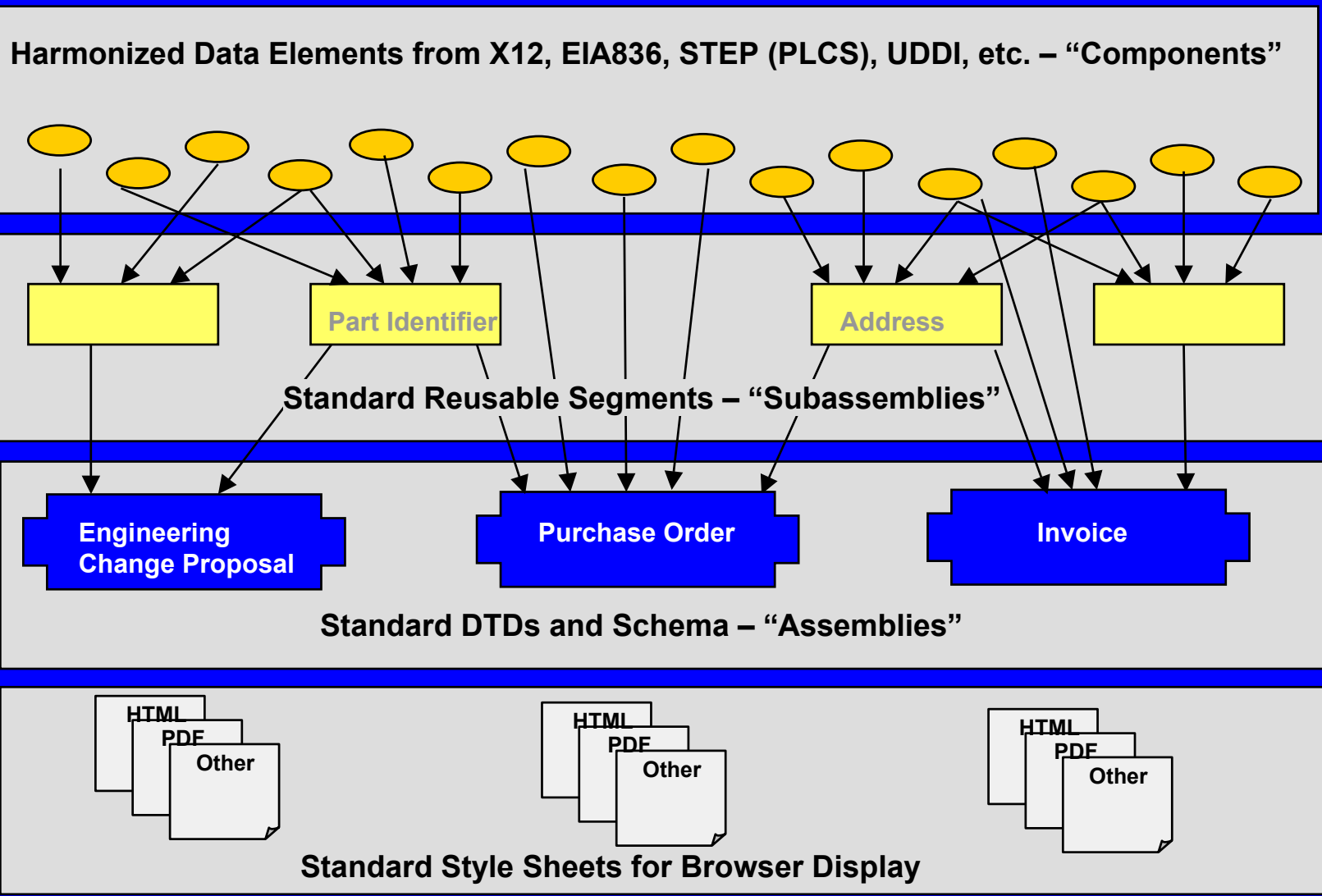   - CAGE, DUNS, FSCM, etc.
- ID length (10 char AN)

AIA Transactions

UDDI

EIA836 Collaboration

STEP Collaboration
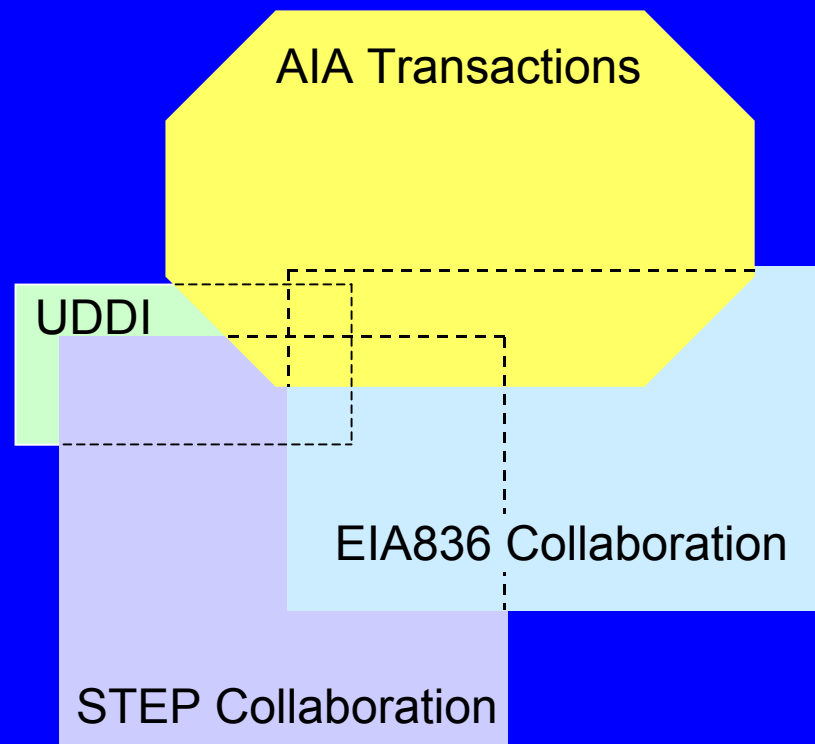
Example Overlaps

- Supplier ID
- Address
- Part Number

XML Mapping Matrix – Draft Mockup

AIA XML Tag Name and Definition *Conforms to ebXML Naming Convention*	X12 Name, Definition, Syntax Rules, Business Process Usage Rules, Value Constraints	ISO 10303 (STEP) Name, Definition, Syntax Rules, Business Process Usage Rules, Value Constraints	EIA-836 Na Syntax Rul Business P Rules, Valu
<TradingPartnerIdentifier>	Originating Company ID Number (DFI) Identification Number	Organization ID (see STEPML)	Organization ID
Semantically equivalent metadata standards			
Semantically equivalent metadata standards			
Semantically equivalent metadata standards			
Semantically equivalent metadata standards			

AIA On-line Repository - Content

Harmonized Data Elements from X12, EIA836, STEP (PLCS), UDDI, etc. – "Components"

Part Identifier

Address

Standard Reusable Segments – "Subassemblies"

Engineering Change Proposal

Purchase Order

Invoice

Standard DTDs and Schema – "Assemblies"

HTML
PDF
Other

HTML
PDF
Other

HTML
PDF
Other

Standard Style Sheets for Browser Display

UDEF Background

CALS ISG - Developed UDEF

Industry

Ron Schuldt (Chair) - Lockheed Martin
Barbara Barman (Vice Chair) - Raytheon
Rob Bryant - DynCorp
Ruey Chen - David Taylor Research Center
Bob Hodges - Texas Instruments
Neal McNamara - Analysis & Technology Inc.
Bud Orlando - TRW
Madelyn van der Bokke - ASEC
George Walther - Lockheed Martin

Government

Norma Kornwebel - PM JCALS
Dinah Beres - NAWC
Steve Waterbury - NASA

EIA - Applied UDEF

Industry

Ron Schuldt (Chair) - Lockheed Martin
Rick Lang - Texas Instruments
Pam Stanfield - Lockheed Martin
Gary O'Hara - Hughes Space and Comm
Tony DiPerna - Ericsson Communications
Ken McTee - Texas Instruments
Cindy Hauer - Mevatec Corp
Fred Bahrs - CMstat Corporation
Doug Drury - ITT Federal Services
Lee LeClair - Texas Instruments
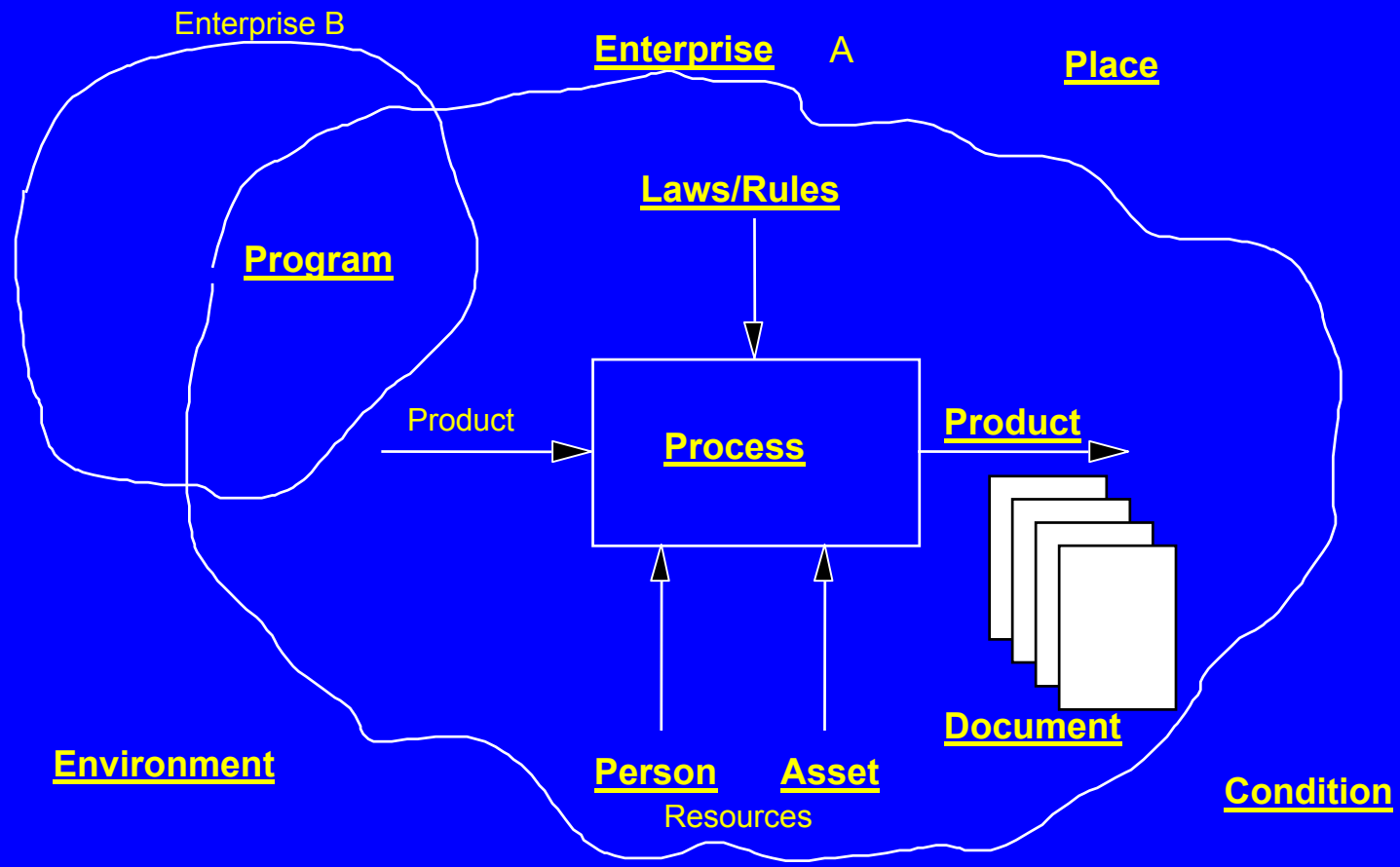
Government

Deborah Cornelius - US Army Missile Cmd
C. H. VanLandingham - NOAA Nat'l Wea Svc

AFEI (formerly CALS ISG) Wants to Manage UDEF
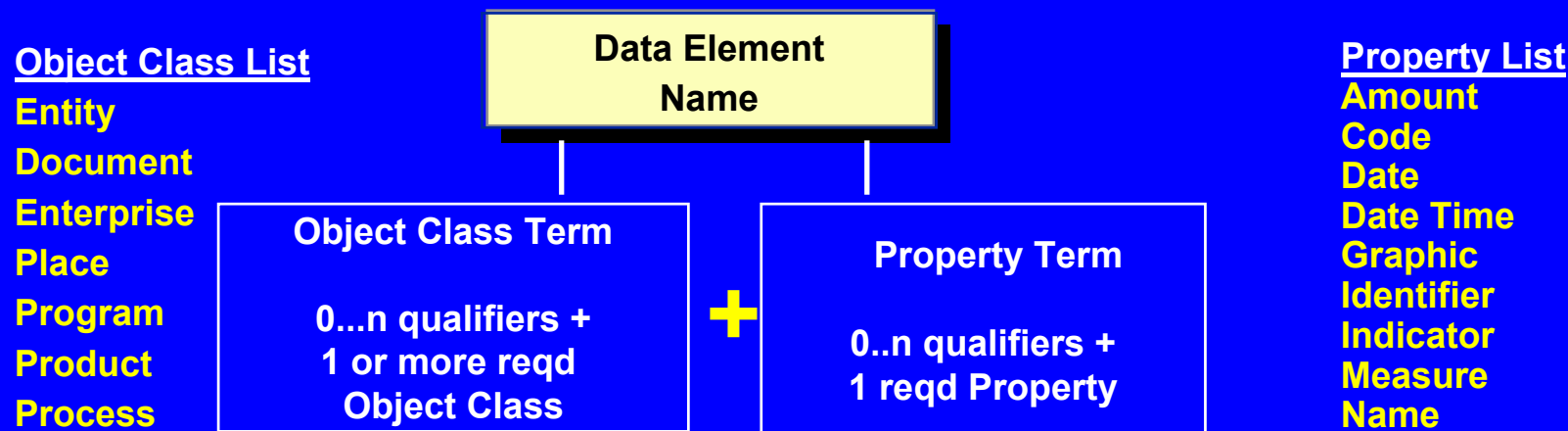
UDEF Objects = Context Categories

Entity

Enterprise B

Enterprise A

Place

Laws/Rules

Program

Product

Process

Product

Document

Environment

Person **Asset**

Resources

Condition

UDEF Naming Convention

Complies with ISO 11179 Naming Convention and Supports ebXML

Object Class List
Entity
Document
Enterprise
Place
Program
Product
Process
Person
Asset
Law/Rule
Environment
Condition

Data Element Name

Object Class Term

**0...n qualifiers +
1 or more reqd
Object Class**

+

Property Term

**0..n qualifiers +
1 reqd Property**

Property List
Amount
Code
Date
Date Time
Graphic
Identifier
Indicator
Measure
Name
Percent
Picture
Quantity
Rate
Text
Time
Value

Example Data Element Names

Document Abstract Text

Enterprise Name

Product Price Amount

Product Scheduled Delivery Date

Engineering Design Process Cost Amount

Object Word Definitions

Entity - Any concrete or abstract thing of interest, including associations among things

Asset - Any data or information about any resource, other than human, which is used, consumed, or available for use/consumption by any process of an enterprise

Document - Any data or information about any collection of data or information, regardless of format, which has definable boundaries and is so designated for one or more purposes

Enterprise - Any data or information about any definable boundary collection of human and asset resources used to perform a collection of processes to create one or more products which are intended for use or consumption by outside entities

Environment - Any data or information about any natural or man-made surrounding that is relevant to the enterprise

Person - Any data or information about any person that is relevant to the enterprise

Law-Rule - Any data or information about laws (natural or man-made) or policies that govern any process of the enterprise

Place - Any data or information about any location that is relevant to the enterprise

Process - Any data or information about a definable course of events distinguishable by its purpose or by its effect, whether natural, manual, automated or machine supported and which is relevant to the enterprise

Product - Any data or information regarding something that is the result of a set of processes and which is intended to be used or consumed by activities outside of the enterprise

Program - Any data or information about any definable collection of enterprises bound by a common set of objectives

Condition - Any data or information that describes the state of something of interest to the enterprise

Property Word Definitions

Amount - always monetary

Code - a character string used to replace a definitive value

Date - a day within a particular calendar year (a type of date time)

Date Time - a particular point in the progression of time

Graphic - a diagram, graph, mathematical curve or similar representation

Identifier - a character string used to identify and distinguish uniquely

Indicator - a list of two and only possible values (synonym for Boolean)

Measure - a description of the attributes associated with a numeric value that is determined by measuring an object (Unit of Measure)

Name - a word or phrase that distinctively designates a person, place, etc. (a type of text)

Percent - a rate expressed in hundredths between two values with same UoM (a type of numeric)

Picture - a visual representation of a person, object, or scene

Quantity - a number of non-monetary units - associated with objects (a type of numeric)
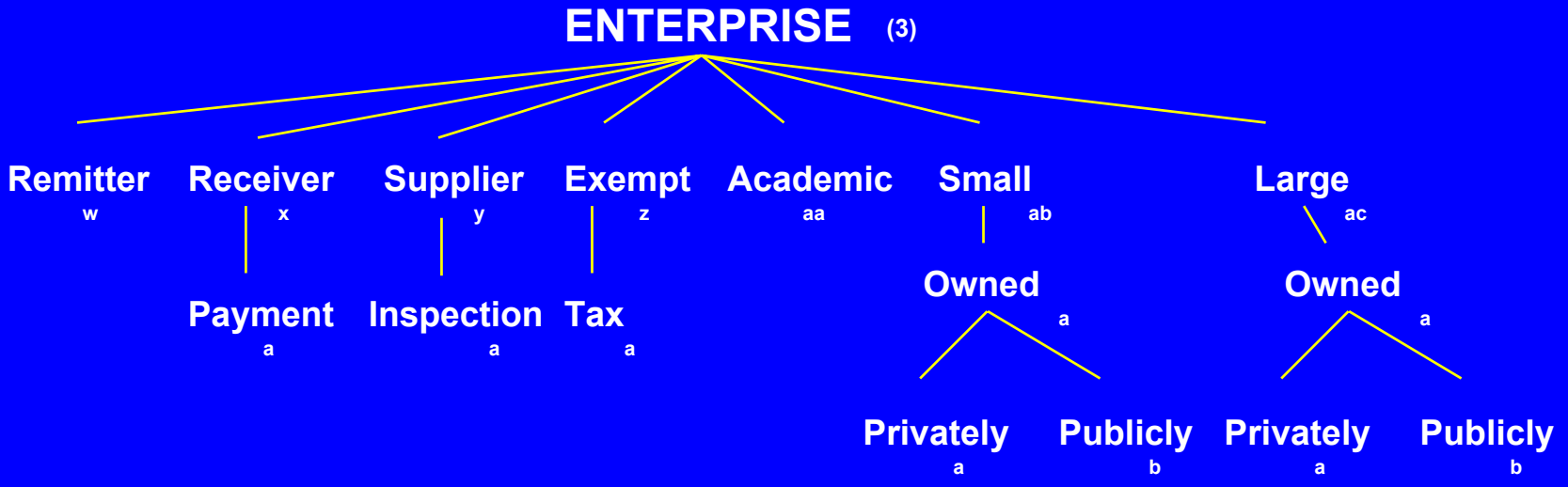
Rate - a quantity or amount measured with respect to another quantity or amount (a type of numeric)

Text - a character string generally in the form of words of a language

Time – the time within a (not specified) day (a type of date time)

Value – numeric information that is assigned or determined by calculation, counting, or sequencing (a type of numeric)

Example "Enterprise" Object Tree

ENTERPRISE (3)

- **Remitter** w
- **Receiver** x
  - **Payment** a
- **Supplier** y
  - **Inspection** a
- **Exempt** z
  - **Tax** a
- **Academic** aa
- **Small** ab
  - **Owned** a
    - **Privately** a
    - **Publicly** b
- **Large** ac
  - **Owned** a
    - **Privately** a
    - **Publicly** b

Example "Name" Property Tree

NAME (10)

- **Stage** 9
- **City** 10
- **Family** 11
- **Given** 12
- **File** 13
  - **Electronic** 1
- **Division** 14
- **System** 15
- **Subsystem** 16
- **Department** 17
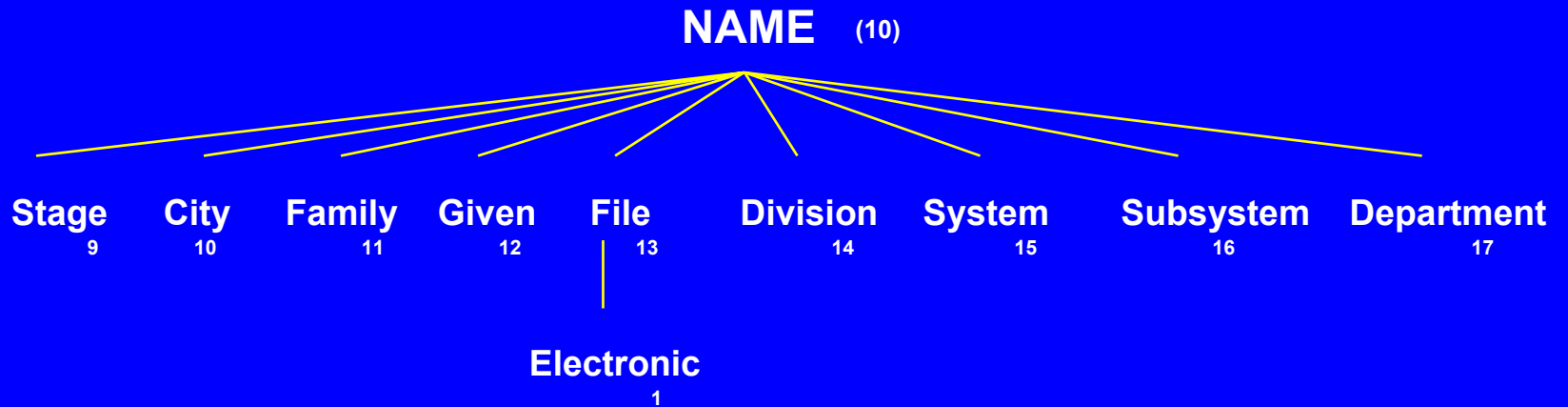
How to Map to the UDEF

1. **Identify the applicable UDEF property word that characterizes the dominant attribute (property) of the data element concept.** For example, Name, Identifier, Date, etc.

2. **Identify the dominant UDEF object word that the dominant property (selected in step 1) is describing.** For example, Person_Name, Product_Identifier, Document_Date, etc.

3. **By reviewing the UDEF tree for the selected property identified in step 1, identify applicable qualifiers that are necessary to unambiguously describe the property word term.** For example, Last Name

4. **By reviewing the UDEF tree for the selected object identified in step 2, identify applicable qualifiers that are necessary to unambiguously describe the object word term.** For example, Customer Person

5. **Concatenate the object term and the property term to create a UDEF naming convention compliant name where it is recognized that the name may seem artificially long.** For example, Customer Person Last Name

6. **Derive an intelligent UID based on the UDEF taxonomy that carries the UDEF inherited indexing scheme.** For example <CustomerPersonLastName UID="as.5_5.10">

Example Mappings

CM Data Elements

document-publication-**date**
document-data-rights-expiration-**date**
document-sheet-total-**quantity**
document-sheet-size-**code**
software-**product**-version-**identifier**
part-**product**-**identifier**
reference-**document**-revision-**identifier**
enterprise-division-address-**text**
program-**name**
product-**quantity**
enterprise-address-**text**

Universal ID

2_5.6
2_1.2.6.6
2_1.8.11
2_1.6.4
p.9_8.8
g.9_8
aj.2_9.8
3_2.12.14
10_10
9_11
3_12.14

Additional Example Mappings

X12 & EDIFACT Data Elements

X12 & EDIFACT Data Elements	Universal ID
country code	e.7_4
invoice number- assigned by issuer	bd.2_1.35.8
purchase order type code	d.t.2_33.4
postal code	7_1.10.4
location qualifier	7_20.33.4
location identifier	7_8.4
contract effective date	e.2_13.6
expiry date of import license	a.be.2_6.6
item number - product	9_8
item number - service	f.9_8
price	9_2.1

Goal – UDEF IDs Become ebXML UIDs

UDEF ID = ebXML UID	EIA-836	X12 (EDI)	Vendor A
g.9_8	Part Product Identifier	Product/Service ID	Part No
g.9_9	Part Product Name	Product/Service Name	
y.3_9		Entity (Supplier) Name	Supplier
e.2_8	Contract Document Identifier	Buyer's Contract Number	Contract No
f.g.9_11	Component Product Quantity		
2_33.4	Document Type Code	Report Type Code	Doc Type

<PartProductIdentifier UID="g.9_8">123-456-789</PartProductIdentifier>
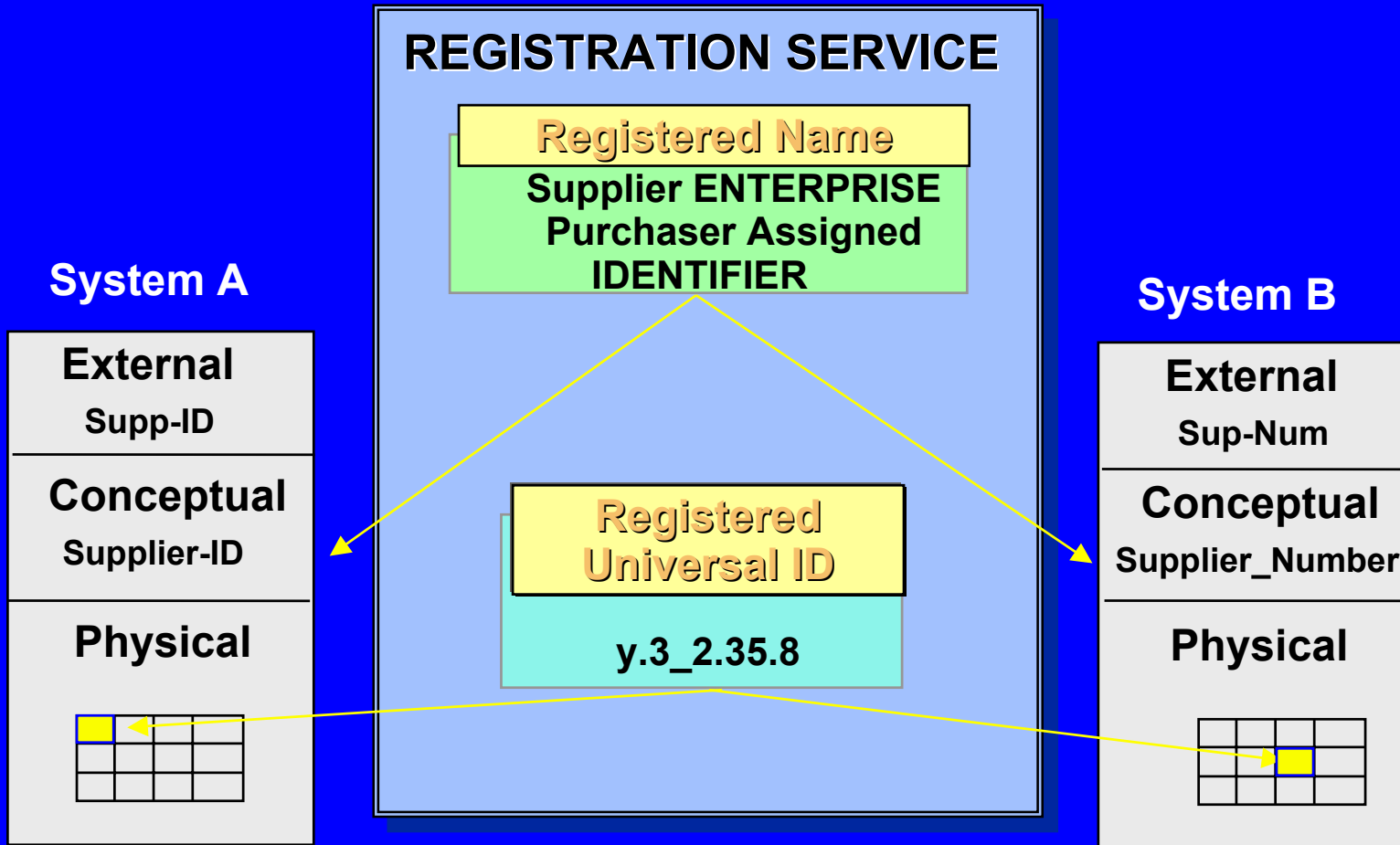
<ProductServiceID UID="g.9_8">123-456-789</ProductServiceID>

<PartNo UID="g.9_8">123-456-789</PartNo>

Benefit – UIDs eliminate the baggage associated with changing names

UDEF Requires a Registration Service

REGISTRATION SERVICE

Registered Name

Supplier ENTERPRISE
Purchaser Assigned
IDENTIFIER

Registered Universal ID

y.3_2.35.8

System A

External
Supp-ID

Conceptual
Supplier-ID

Physical

System B

External
Sup-Num

Conceptual
Supplier_Number

Physical

AFEI provides this service about Jan 2003

Core Components Schedule (Draft)

Core Components Schedule (Draft) presentation slide showing a timeline diagram across 2001, 2002, and 2003, organized by Transaction, Integration, and Collaboration categories.

	2001	2002	2003

Transaction
- ebXML Core Components
- Harmonized ebXML Core Components
- AIA EDI IC -> AIA XML DTD
- AIA IC
- Harmonized EDI 4010 Trans Set
- Aerospace ML XML DTD for Harmonized EDI Trans Set (procurement)
- Aerospace ML XML Schema
- Industry Convergence To UBL??

Integration
- UDEF Development
- UDEF V 1.0
- UDEF Updates (AIA-managed)
- UDEF Transferred to AFEI
- Meta-Data Harmonization
- Harmonized Meta-Data Index 1.0
- Harmonized Meta-Data Index 2.0

Collaboration
- 836 Development
- 836 Vote
- 836 Standard
- 836 XML Schema
- STEP Standard
- STEP XML

Legend:
- ◇ National/International Standard
- ◆ AIA Standard

Universal Data Element Framework (UDEF)

Description

The UDEF is a rules based metadata naming convention that follows the principles of ISO 11179 and supports the ebXML core components naming convention. Once a data element concept has been mapped to the UDEF, the data element can then be assigned a UDEF derived intelligent unique ID.

Business Problem

- Point-to-Point Interfaces are the Norm
- Mappings are Time Consuming Process
- Lack Consistent Naming Convention
- Lack Standard Data Names
- System Experts Often Retained to Support Interface Development

Major Milestones

- Initial Map Draft 0.4 EIA-836 – Jan 2002
- Publish UDEF V1.0 – Mar 2002
- Initial Map STEP (non-Geometry) – July 2002
- Initial Map AIA ICs – Sept 2002
- Update UDEF As Required During 2002
- Transfer UDEF to AFEI – 1st Qtr 2003

How Implemented by AIA Company

- Obtain Mapping Matrix from AIA Web site
- Map Company System Metadata to Matrix
- Assign UDEF ID to Each Map

Dependencies

- Support by EDI Experts
- Support by STEP Experts
- Support by EIA-836 Experts
- AFEI Assumes UDEF Management