DoDAF Work Products Adapted for the Federal Enterprise Architecture Framework

Context

During the past decade the Federal government has identified effective management practices that have been incorporated into law and guidance regarding the development and oversight of information technology (IT) resources. Further, the foundation of the approach to developing IT resources is the emerging practice of enterprise architecture, which seeks to integrated strategic, business, and technology planning. Several enterprise architecture frameworks are authorized for use in the federal government, including the Federal Enterprise Architecture Framework (FEAF), the Treasury Enterprise Architecture Framework (TEAF), the Department of Defense Architecture Framework (DODAF), and the Federal Enterprise Architecture (FEA) Reference Models.

This Guide is intended to provide examples of how enterprise architecture work products (documentation artifacts) that were developed using the DODAF approach can also be used with the FEAF approach. This can be valuable to agencies are integrating architecture segments and IT systems that may have been developed using either approach. For example, the Department of Homeland Security (DHS) has been given oversight responsibility for the U.S. Coast Guard which has used the DODAF approach, the Customs Bureau which has used the TEAF approach, and the Transportation Safety Administration which has used the FEAF approach. DHS has chosen the FEAF approach as its overall framework, as well as the underlying work products identified by John Zachman who influenced the development of all of the aforementioned approaches enterprise architecture in the federal government.

Purpose of the Work Products

The set of work products presented here is intended to provide additional guidance to Federal architects in following the Federal Enterprise Architecture Framework (FEAF).

An architecture framework, such as the FEAF, is a logical structure for organizing complex information about an enterprise. This information includes the enterprise's information, business processes, participants, the hardware and software systems that support those processes and participants, and the plans, policies, rules and constraints under which the enterprise operates.

Typically, an architecture framework consists of

1) an overall structure to partition the enterprise information into manageable, understandable portions.

   The FEAF structure consists of a Zachman-like structure of cells, each of which calls for a particular type of *primitive* (i.e., normalized or orthogonal, non-duplicative) information. Thus, the FEAF provides a conceptual outline for all of the types of information that needs to be captured in an architecture.

2) a description of work products, consisting of groupings of specified information into a graphical/textual format.

   The work products are an alternative way of organizing the data. The products are usually *composites*: the bundling of data from one or more Zachman cells into a set of related data and portraying it graphically. These work products assist in the human communication of architecture information and in the development of consistent primitive information.

To implement the Clinger-Cohen Act, the Office of Management and Budget (OMB) Circular A-130 requires that each agency develop an enterprise architecture. This architecture must be developed in accordance with an architecture framework and must contain a specified set of information. The following figure lists the requirements from the Circular and shows how the work products in this document help satisfy each requirement.

FEAF Version 1.1 focuses on the concepts and general types of information captured for each cell of the Zachman framework. The Zachman framework organizes enterprise architecture information into normalized categories and gives only examples of types of architecture work products or models that can be used to capture the required types of information. The purpose of this product guidance is to provide more concrete guidance on the content and format of architecture work products.

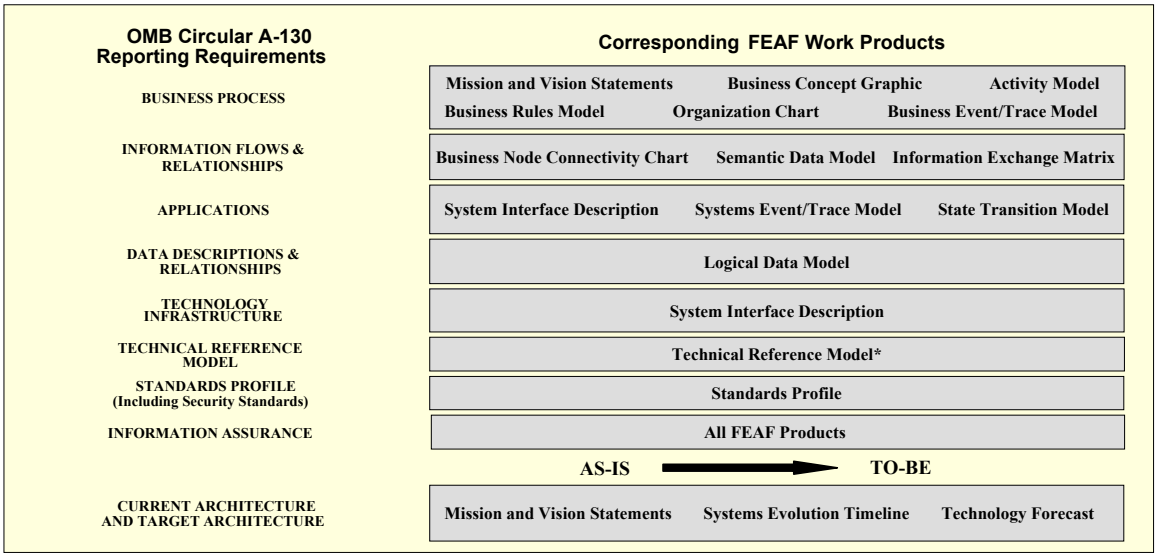


Figure 1-1. Work Products Help Satisfy OMB Circular A-130 Requirements

*The TRM is not considered as an architecture work product but is required by A-130. It is addressed in separate FEAF guidance.

The architecture work products selected for the FEAF concentrate primarily on the information in the top two rows of the Zachman framework, since the overall focus of the FEAF is the top two rows of the Zachman framework. Some work products in the Designer row are also included in order to provide the connection between the business needs and the overall system design and because some of the A-130 required information, such as the Standards Profile, is contained in the Designer row. In addition, an architecture planning document, the Enterprise Architecture Roadmap, is recommended.

The Technical Reference Model (TRM), which is required by A-130, is a guidance or motivation document that provides uniformity across the Federal government rather than an agency or segment specific work product. Guidance with respect to the TRM is provided in a separate appendix to the FEAF.

The following table provides the rationale for including each product. If “Security” is listed as a rationale, then information in this product is needed to document the security aspects of the architecture. This security information is discussed in the work product description.

Table 1-1. Rationale for Recommended FEAF Products

Product Name	Reason for Inclusion
Enterprise Architecture Roadmap	EA Overview and planning document
Business Concept Graphic	Zachman (Planner/Scope) A-130 – Business Process
Mission and Vision Statements	Zachman (Planner/Scope and Owner/ Enterprise Model – Motivation) A-130 – Business Process and Target Architecture Security
Organization Chart	Zachman (Planner/Scope and Owner/ Enterprise Model – People) Security
Semantic (Conceptual) Data Model	Zachman (Planner/Scope and Owner/ Enterprise Model – Data) A-130 – Information Flows and Relationships Security
Activity Model	Zachman (Planner/Scope, Owner/ Enterprise Model, and Designer/Information Systems Model – Application and People) A-130 – Business Process Security
Business Node Connectivity Chart	Zachman (Planner/Scope and Owner/ Enterprise Model – Technology) A-130 – Information Flows and Relationships Security
Business Event/Trace Model	Zachman (Planner/Scope and Owner/ Enterprise Model – Time) Security
Information Exchange Matrix	Zachman (Planner/Scope – Motivation; Owner/ Enterprise Model – all columns except Motivation; Designer/Information Systems Model – People) A-130 – Information Flows and Relationships Security
Logical Data Model	Zachman (Designer/Information Systems Model – Data) A-130 – Data Descriptions and Relationships Security
Business Rules Model	Zachman (Designer/Information Systems Model – Motivation) A-130 – Business Process
System Interface Description	Zachman (Designer/Information Systems Model – Technology) A-130 – Applications and Technology Infrastructure Security
Systems Event/Trace Model	Zachman (Designer/Information Systems Model – Time) Security
State Transition Model	Zachman (Designer/Information Systems Model – Time) Security

Product Name	Reason for Inclusion
Standards Profile	Zachman (Designer/Information Systems Model – Motivation) A-130 – Standards Profile Security
Systems Evolution Timeline	Zachman (Designer/Information Systems Model – Motivation) A-130 – Transition Strategy
Technology Forecast	Zachman (Designer/Information Systems Model – Motivation) A-130 – Transition Strategy Security

How to Use This Product Guidance

The following sections provide descriptions of recommended architecture work products. Each work product description includes a discussion of the product and an outline (for textual products) or a graphical template or generic example. Each graphical architecture work product has an associated set of textual information, called information elements, that are required to make the graphic fully understandable. These information elements are documented in Appendix A (Product Information Elements). The product is not complete without the supporting information elements.

Not every architecture will need to include all of the architecture work products described in this document. The enterprise should select products based on the purpose of the architecture, including the information requirements from outside organizations (e.g., OMB budgeting). For example, the State Transition Model will not be required unless the enterprise systems exhibit complex state based behavior. An enterprise may wish to include additional architecture work products to address special needs. Not every enterprise will want to develop all these architecture work products starting with the first version of their enterprise architecture. Additional products will be developed as the architecture evolves. The plans for this evolution should be documented in the Enterprise Architecture Roadmap.

The templates provided for the architecture work products may be tailored. For example, color coding can be added or the shape of graphical icons can be changed. The amount of information on a graphic can be limited or expanded. The information elements included in the product (see Appendix A: Product Information Elements) may be expanded or the definitions further refined. However, since one of the goals of standardized architecture work products is communication, the general shape and information content of the products should be retained. Product tailoring should be documented in the Enterprise Architecture Roadmap.

In the following sections, the recommended FEAF architecture work products are presented first, followed by a mapping of the Zachman primitives to the products. The detailed information elements that should be captured in each work product are described in a separate Appendix A: Product Information Elements. Finally, a section discussing the relationships among the architecture work products is included at the end of the document.

Architecture Work Products

1 Enterprise Architecture Roadmap

The Enterprise Architecture Roadmap is a textual description of an organization's multiyear plans for preparing, using, and managing its enterprise architecture (EA). It provides an overview of the EA in terms of its contents, evolution, and use.
Each EA Roadmap should contain the following elements:

- The organization's goals for its EA
- Key drivers or intended uses for the EA
- The scope of the organization's EA
- Stakeholders and their roles in the use and management of the EA
- The organization's high-level governance approach toward its EA
- A listing of the work products that will be prepared with any special tailoring approaches described
- A high-level description of the organization's EA development approach or formal methodology to be used
- A high-level description of the planned activities and schedule related to EA development, use, and management

Standard Outline for Enterprise Architecture Roadmap

0. Executive Summary

1. Purpose of Roadmap

2. Enterprise Architecture Key Drivers and Goals
   - Enterprise Architecture Key Drivers
   - Enterprise Architecture Goals

3. Enterprise Architecture Scope and Stakeholders
   - Enterprise Architecture Scope
   - Enterprise Architecture Stakeholders

4. Enterprise Architecture Governance
   - Responsibilities
   - Validation Approach
   - Evolution Issues
   - Interactions with Investment Management and other management processes
   - Protection of EA information

5. Enterprise Architecture Work Products
   - List of Work Products with scope and boundaries
   - Tailoring details and assumptions, as necessary, including security protection label sets for both national security and SBU information

- Mapping of products to EA Goals and Drivers, as appropriate

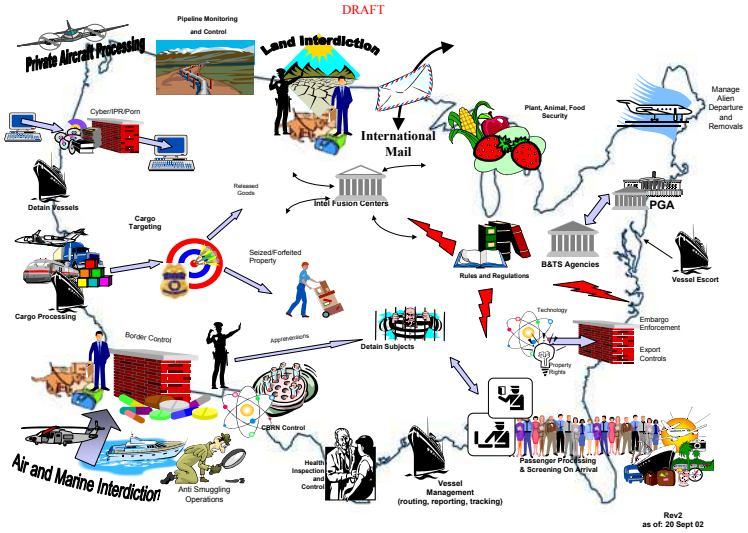
6. Enterprise Architecture Development Approach
   - Development methods and techniques
   - Tools, product formats, repository, and tool security

7. Plans and Schedule for Enterprise Architecture Related Activities
   - Schedule for current version of EA
   - Future plans and schedules

Appendices: Glossary, List of Acronyms, References

2 Business Concept Graphic

The Business Concept Graphic facilitates human communication, and is intended for presentation to high-level decision makers. It should convey, in simple terms, what the enterprise is about and give an idea of the players and actions involved. It can also be used to orient and focus detailed architecture discussions. The description should consist of one or more graphics, as needed, with explanatory text. The graphical appearance depends on the scope and intent of the architecture, but in general a Business Concept Graphic will describe such things as the key business processes or missions, high-level operations, organizations, geographical distribution, and critical business assets. Since the format is free form and variable, no generic template is shown. However, the following graphic provides an example Business Concept Graphic for Border and Transportation Security.



Business Concept Graphic for Border and Transportation Security

3 Mission and Vision Statements

The Mission Statement describes the charter of the enterprise and the scope of work the enterprise needs to perform together with its goals and objectives. The Vision Statement describes critical success factors for achieving the enterprise's mission, including the resolution of key issues involving current performance of the mission. The goals, objectives, and critical business and success factors that have security implications should be identified. For example, goals and objectives might involve critical business assets and changes in business processes involving these assets.

Vision Statements cover both business process aspects of the enterprise and IT aspects and provide guidance for the Target Architecture.

This document should reference the FEA-PMO Business Reference Model (BRM) in identifying the Lines of Business that the enterprise is involved in and the FEA-PMO Performance Reference Model (PRM) for standard outcomes (i.e., goals) and corresponding performance measures for those Lines of Business.

Standard Outline for Mission and Vision Statements

Enterprise Mission Statement

- Customer Needs
- Lines of Business
- Business Goals and Objectives
- Business Performance Measures

Business Vision

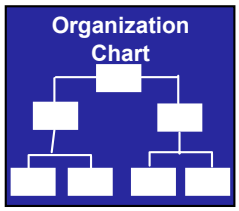
- Critical Business Issues
- Critical Success Factors
- Vision for the Future

4 Organization Chart

The Organization Chart illustrates relationships among organizations or resources. Relationships can include direction or coordination (which influence the type of connectivity that is needed), and many others, depending on the architecture's purpose. An Organization Chart might include the standard business organization structure, but might also need to include additional relationships and working groups needed to document roles and relationships key to understanding the business process.

An Organization Chart is needed for security analysis in order to identify the organizations responsible for the stewardship of business assets and to identify the

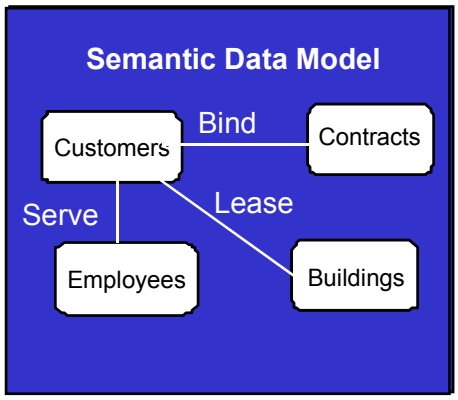
organization units responsible for performing business processes or activities. A generalized representation is illustrated in the following template:



Organization Chart

5 Semantic Data Model

The Semantic Data Model, sometimes also called a Conceptual Data Model, is an Entity Relationship Model that presents business asset types as entities and graphically represents the business relationships among them. This model may incorporate common business entities and relationships from the FEA-PMO Data Reference Model (DRM) based on the Lines of Business from the Mission and Vision Statements. The business assets must have their security attributes identified. There are a variety of similar modeling notations used for Semantic Data Models. In the example format illustrated below, the entities are boxes and the relationships are lines between the boxes.



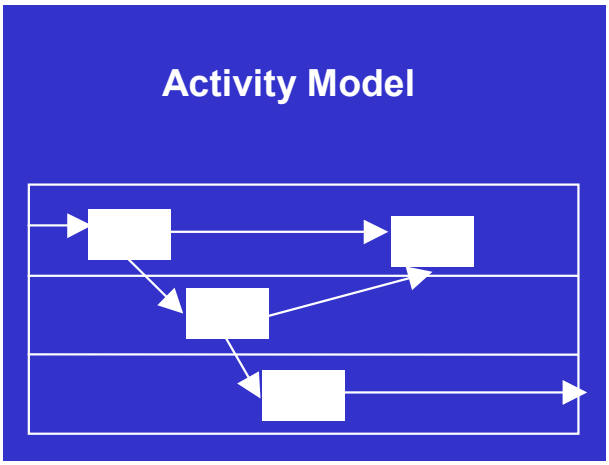
Semantic Data Model

6 Activity Model

The Activity Model describes the business processes and their constituent activities associated with the enterprise, the inputs and outputs of the business processes, and the flow of information among the activities within the processes. Activity Models are hierarchical in nature; that is, they begin with a single box that represents the overall business process and proceed successively to decompose the process into its constituent activities to the level required by the purpose of the architecture. Each

activity box on each diagram should show the inputs and outputs associated with the activity. Annotations to the model identify the organizations and systems that perform the activities. In addition, the business rules that control the performance of the activities are keyed to each activity. Processes and activities that access protected business assets should be identified as well as the generic security approaches (e.g., prevention, detection, and response) that the activities need to support with respect to those business assets.

An Activity Model can be illustrated both as an Activity Hierarchy, showing only the decomposition of the process and activities, and as an Activity Flow Model, showing the flow of information among the activities at the various levels of decomposition. There are a variety of notations used for Activity Models, including IDEF0. The amount of information shown on graphics may vary; additional information required for security analysis (e.g., performing organizations and systems) should be included in the accompanying text. The following template illustrates an example format for this product:



Activity Model

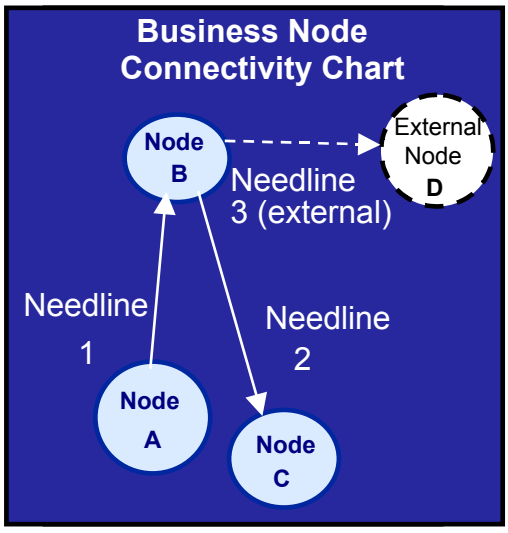
7 Business Node Connectivity Chart

The main features of this product are the business nodes and the needlines between them that indicate the business need to exchange information. A business node is an entity that performs activities and produces, consumes, or processes information. Business nodes may be business facilities, organizations or roles. Usually, a single style of nodes, i.e., business facilities, business facility types, organizations, or roles, will be used within a given architecture. If the business nodes are best described as organizations or roles, then the organizations in the Organization Chart should have an associated set of business locations. The activities performed by each node (from the Activity Model) should be included in accompanying text or on the diagram itself. Business nodes where protected business assets are stored or where activities that access protected assets are performed should be identified.

A needline documents the requirement to exchange information between nodes and is represented by an arrow (indicating the direction of information flow). Needlines are annotated with a diagram-unique identifier and/or a phrase that is descriptive of the principal types of information exchanged. The specific characteristics of the information exchanged are documented in the Information Exchange Matrix (described below). There is a one-to-many relationship between needlines and information exchanges; that is, a single needline arrow on the Business Node Connectivity Chart represents a collection of multiple individual information exchanges.

The needline arrows do *not* indicate how the information transfer is implemented. The implementation (what systems are used to effect the transfer) is shown in the Systems Interface Description work product (described below). Since a needline represents a collection of information exchanges, the actual implementation of these information exchanges may take more than one form. Therefore, a single needline may translate into multiple system interfaces and communications paths.

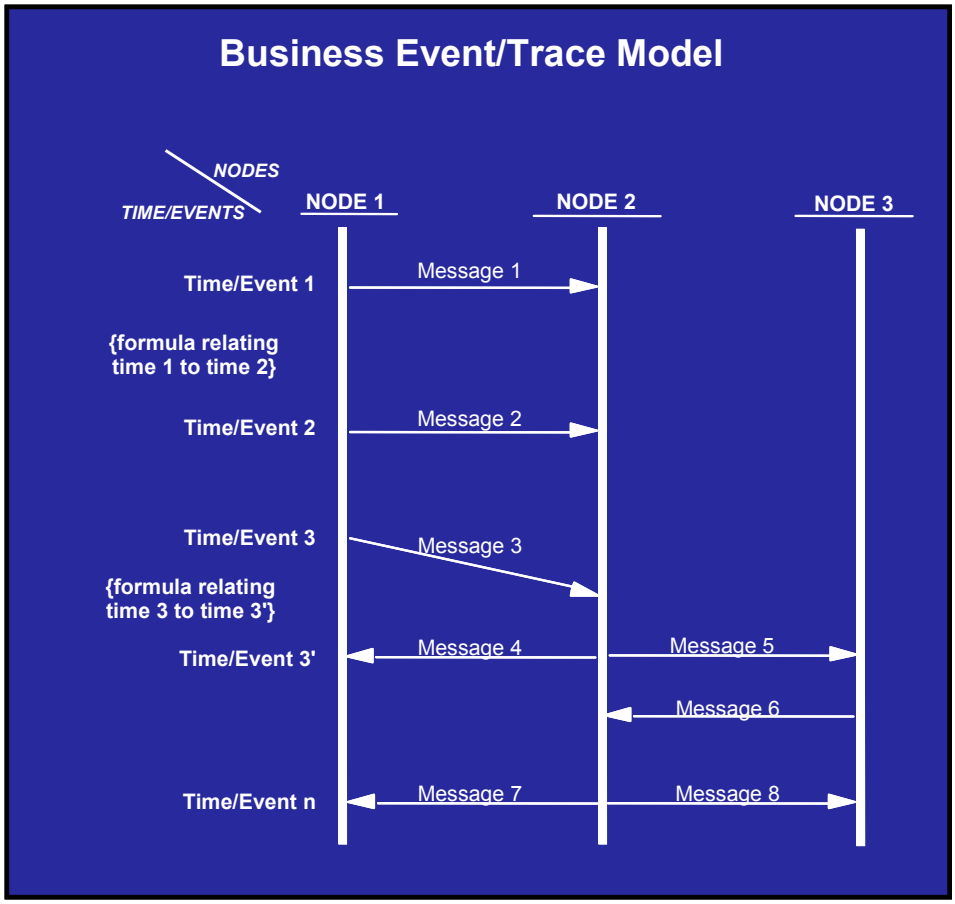
The Business Node Connectivity Chart should also illustrate information exchanges with external nodes when these external exchanges are important for showing the interfaces among Federal Agencies or Federal Segments. External nodes are nodes that are not strictly within the scope of the subject architecture but that act as important sources of information required by nodes within the architecture or important destinations for information produced by nodes within the architecture. External needlines should be labeled to show the external source or destination as well as the information exchanged if the external node itself is not shown. External needlines and nodes should be indicated with a different style of line from the other needlines (e.g., dashed versus solid). The following template illustrates an example format:



Business Node Connectivity Chart

8 Business Event/Trace Model

The Business Event/Trace Model allows the tracing of information exchanges or messages in a set of scenarios or operational threads. Each model should focus on a critical sequence of events and a description of this scenario should accompany the model. With time proceeding from the top of the diagram to the bottom, a specific diagram lays out the sequence of information exchanges that occur between business nodes for a given scenario. These information exchanges are associated with events and actions (see Information Exchange Matrix below). The time periods between information exchanges can be indicated. The direction of the event arrows shows flow of control, in terms of the business process, from node to node. Security relevant events (e.g., creation/acquisition of a new business asset that needs protection) should be identified. Each scenario should be depicted by a separate model. The following template illustrates an example format:



Business Event/Trace Model

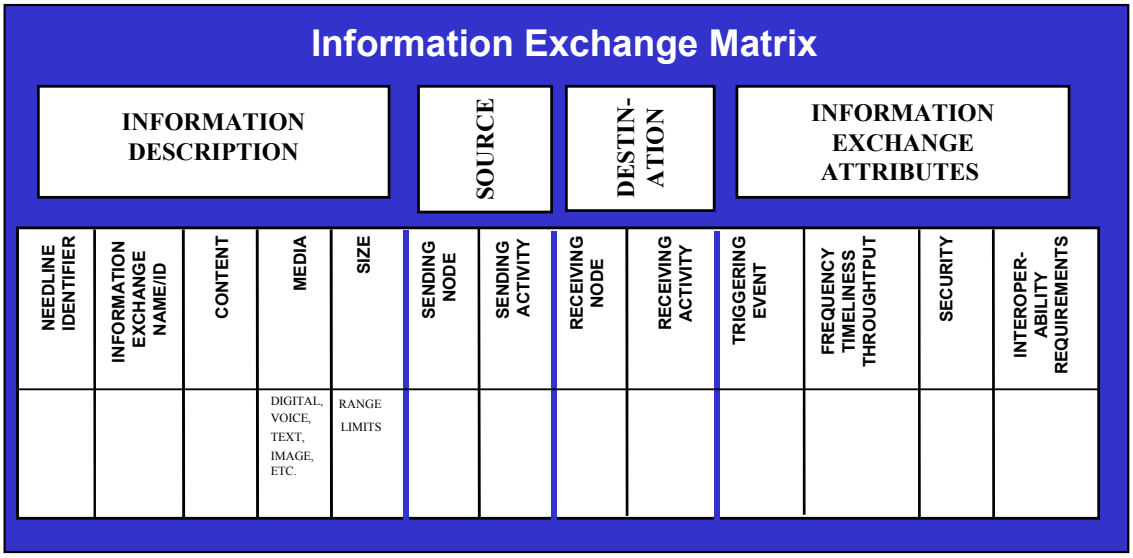
9 Information Exchange Matrix

Information exchanges express the relationships across four important aspects of the architecture (information, activities, locations, and times) with a focus on the specific

aspects of the information flow. Information exchanges identify which business nodes exchange what information during the performance of what activities and in response to which events. Additional information on who is performing the activity can be added, if needed for security analysis.

The matrix describes relevant attributes of the exchange such as size, logical specification of the information – i.e., media, timeliness required, and the security classification and properties of the information. The matrix also identifies the event that triggers the information exchange (e.g., set schedule or citizen request). The matrix keys the exchange to the producing and using activities and nodes and to the needline (from the Business Node Connectivity Chart) the exchange satisfies. The Information Exchange Matrix partitions each high-level needline into its component parts, i.e., into distinct information exchanges between business nodes.

The template below illustrates an example format for this product. Additional characteristics of the information exchange may be added to the matrix based on the purpose or goals of the architecture activity (documented in the EA Roadmap).

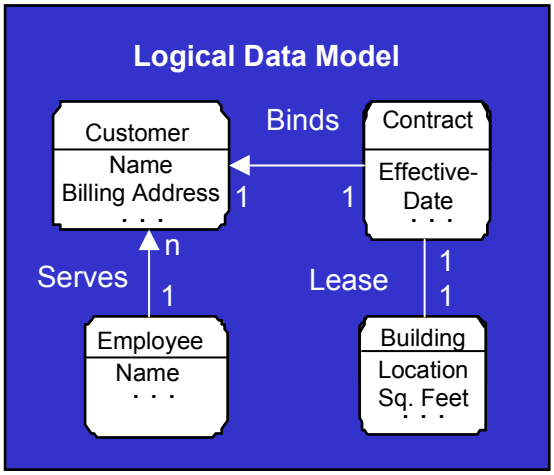


Information Exchange Matrix

10 Logical Data Model

The Logical Data Model is a representation of the objects of the enterprise about which it records information, in either automated or non-automated form. The Logical Data Model should be a fully attributed, keyed, normalized entity relationship model that reflects the intent of the Semantic Data Model. This model may incorporate common business entities and relationships from the Data Reference Model based on the Lines of Business from the Mission and Vision Statements. As with the Semantic Data Model, the security aspects of the entities and their relationships should be included in the model.

The following template illustrates an example format for the basic version of this product:



Logical Data Model

11 Business Rules Model

Business rules are statements that define or constrain some aspect of the enterprise's mission or business. These rules can include such guidance as the conditions under which work flow control passes from one organizational unit to another, or the conditions under which a role is authorized to proceed with a specific activity. Business rules may be associated with business assets or data entities and their relationships in the Semantic or Logical Data Model. For example, a person may only have one legal spouse at any given point in time. Business rules can also be associated with activities in the Activity Model. For example, your bank account must contain sufficient funds to cover the amount of money in your withdrawal request before the ATM machine will dispense the money.

Business rules can be grouped into the following categories:

Structural Assertions: These rules concern mission or business domain terms (i.e., entity definitions) and facts (i.e., associations among entities – relationships) that are usually captured by the entities and relationships of entity-relationship models; these reflect static aspects of business rules already captured in the data models.

Action Assertions: These rules concern some dynamic aspects of the business and specify constraints on the results that actions produce. There are three types of action assertions:

- Condition: A guard or "if" portion of an "if-then" statement. If the condition is true, it may signal the need to enforce or test additional action assertions

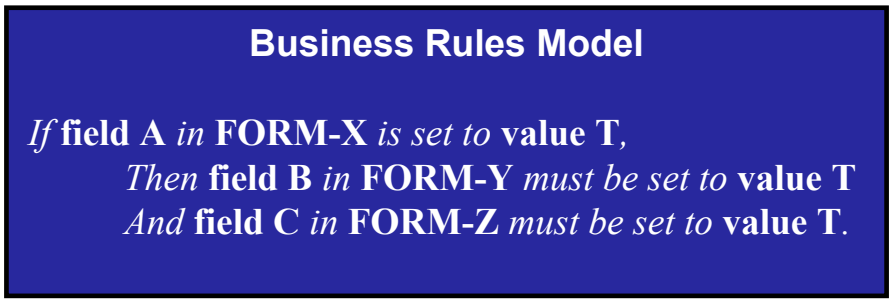
- Integrity Constraint: These must always be true (e.g., a declarative statement)

- Authorization: Restricts certain actions to certain roles or users

Derivations: These rules concern algorithms used to compute a derivable fact from other terms, facts, derivations, or action assertions.

Since the Structural Assertion rules are usually captured in a Logical Data Model, the Business Rule Model can be used to concentrate on the more dynamic Action Assertions and Derivations rules.

Business rules should be independent of the modeling paradigm used, declarative (i.e., non-procedural), and atomic (i.e., indivisible yet inclusive). The rules should be distinct, independent constructs and should only involve business terms. There is no commonly accepted notation for business rules, but they can be documented in a formal language such as decision trees and tables, structured English, or mathematical logic. The following template provides an example business rule in structured English.



Business Rules Model

The notation used to record rules should be documented in the EA Roadmap. The notation selected should be referenced and well-documented (i.e., there should be textbooks or articles that describe it and provide examples of its use).

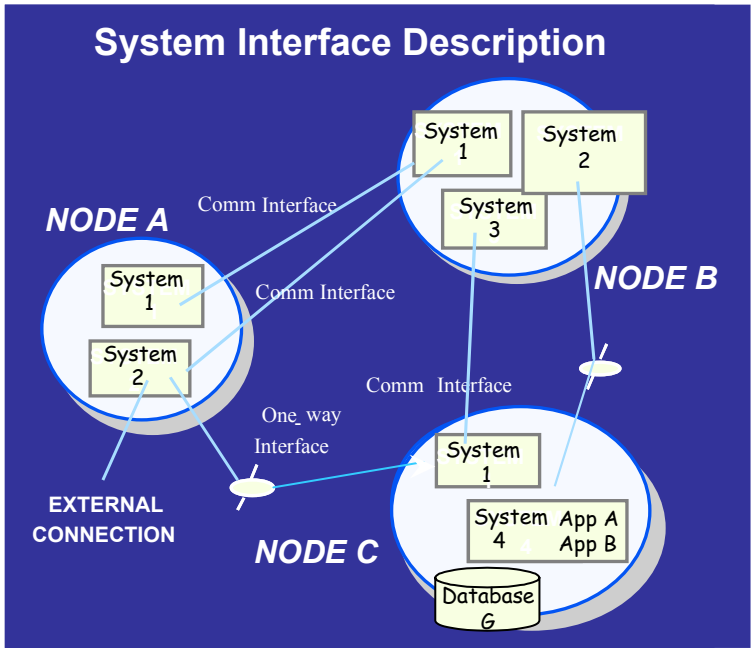
12 System Interface Description

The System Interface Description depicts the location of systems in terms of systems nodes and the structure of systems resident at those and their interfaces at several levels of abstraction (i.e., between system nodes, between systems, or between system components). The accompanying textual information records systems nodes and systems that support each business node from the Business Node Connectivity Chart and how the needlines are supported by the interfaces. A systems node and a business node may be one and the same if the business node represents a business facility where systems are resident.

A system interface is a simplified or generalized representation of a communications pathway or network or a component interface, usually depicted graphically as a straight line (possibly with amplifying information). Often, pairs of connected systems or system components have multiple interfaces between them. The System Interface Description

depicts all interfaces between systems and/or system components that are of interest to the architect.

The following template illustrates a suggested format for this product when the focus of attention is on the location of the systems at the nodes and the interfaces among the nodes. The systems may be annotated with the names of major applications or system functions and shared data stores may be indicated. The accompanying textual information contains the system functions and selected infrastructure information. Security relevant system functions and infrastructure information should be identified. Shared data stores that contain protected information should be identified. When system components are identified, the components that implement security functions should be identified and mapped back to the security approaches identified in the Activity Model for the business processes supported by the system.



System Interface Description

13 System Event/Trace Model

The System Event/Trace Model is similar in form to the Business Event/Trace Model. However, the purpose of the System Event/Trace Model is to document the trace or integration of system functions required in a scenario or critical sequence of events. A description of the scenario should accompany the model. System Event/Trace Models can be used by themselves or in conjunction with State Transition Models (described below) to describe dynamic behavior or interactions of the enterprise systems or systems nodes.

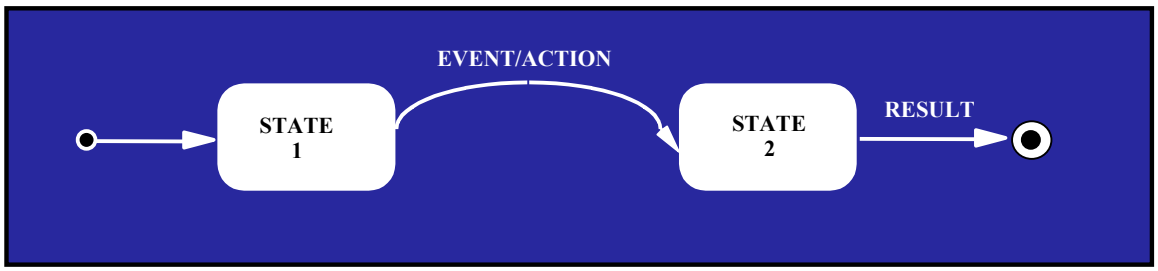
With time proceeding from the top of the diagram to the bottom, a specific model lays out the sequence of system data exchanges that occur between systems nodes or

systems for a given scenario. These data exchanges are associated with system events and functions. The time periods between information exchanges can be indicated. The direction of the event arrows shows flow of control from node to node or system to system. Security relevant system events (e.g., read access to protected data) should be identified. Each scenario should be depicted by a separate model. The example format for the System Event/Trace Model is the same as that for the Business Event/Trace Model.

14 State Transition Model

A State Transition Model provides a complete behavioral description of a system of systems, systems node, or system in terms of system events and system states, the transitions between system states, and the system functions (including applications) associated with the states or transitions. When an event occurs, the next state depends only on the current state and the event. A change of state is called a transition.

The figure below provides a template for a simple form of State Transition Model. Initial states (usually one per model) are pointed to by a black dot and incoming arrow while terminal states are identified by an outgoing arrow pointing to a black dot with a circle around it. States are indicated by rounded corner box icons and labeled by name or number and, optionally, any system functions associated with that state. Transitions between states are indicated by directed lines (i.e., one way arrows) labeled with the event that causes the transition and the system function associated with the transition. For complex situations, a hierarchical version of the State Transition Model, called Harel State Charts, can be used.



Harel State Charts

15 Standards Profile

This product is the set of rules that governs system implementation and operations for the enterprise. In most cases, building a Standards Profile will consist of identifying the applicable portions of existing technical standards guidance from the FEA-PMO Technical Reference Model, tailoring those portions as needed (e.g., selecting from options), and filling in any gaps with agency, Line of Business, or program specific standards. Care must be taken to select standards in such a way as to be compatible

with relevant standards from other enterprises, Lines of Business, or segments with which the enterprise must interoperate. Security standards should be identified.

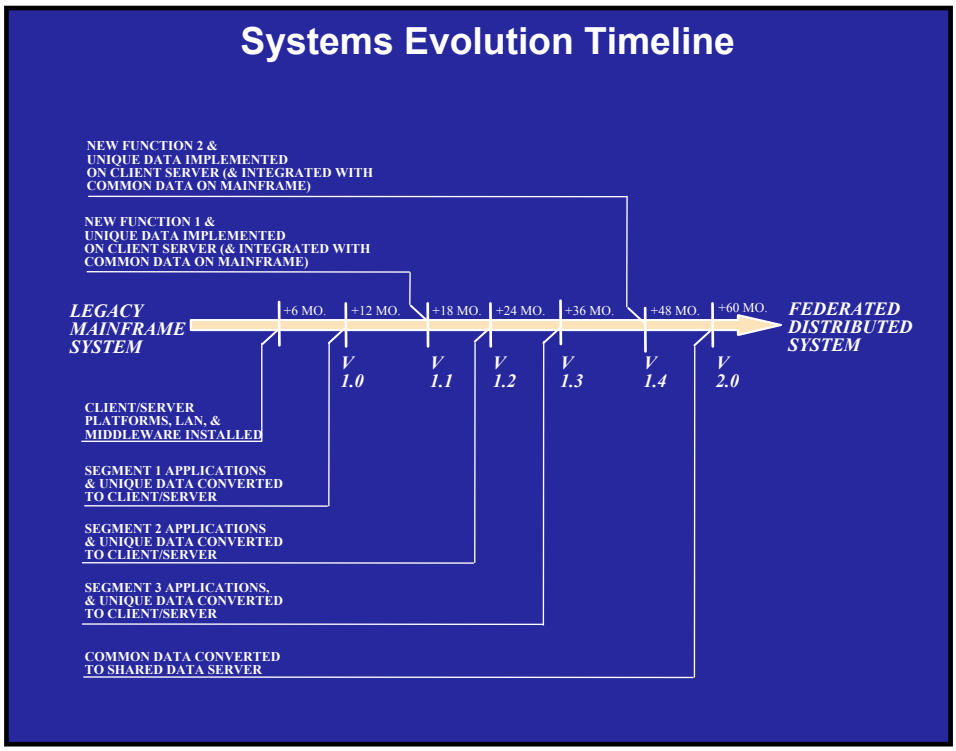
Typically, the Standards Profile is organized based on the enterprise's Technical Reference Model (TRM). Relevant service areas and services are identified from the TRM and these areas are populated with the selected standards. Sometimes the Standards Profile and TRM are combined into one document, as is the case with the FEA-PMO TRM. The following template illustrates an example format for a Standards Profile (based on an IEEE 1003.0 compliant TRM).

Standards Profile

SERVICE AREA	SERVICE	STANDARD
Support Applications	Web Applications	Internet Explorer Version 4.X or better
		Netscape Version 3.X or better
Data Management	Business Data Standards	Data Universal Numbering System (DUNS)
		ZIP Code Directory
		Congressional District Identifier
		ISO 3166: ISO 3166 -1 (1Ocober 1997) and ISO 3166 -2 (15 December 1998) (Codes for the Representation of Names of Countries and Their Subdivisi ons)
		U.S. State Codes and Territory Codes
		Catalogue for Federal Domestic Assistance Program
		Electronic Grants Data Elements
Data Interchange	Document Interchange	XML 1.0, W3C Recommendation, 10 February 1998, Rec-xml-19980210 (Extensible Markup Language) HTML 4.0 Specification, W3C Recommendation revised 24 -apr-1998, Rec- html40-19980424 (Hypertext Markup Language)
		ANSI ASC X12 (Electronic Data Interchange)
Communications	World Wide Web Services	IETF RFC-2616 Hypertext Transfer Protocol – HTTP/1.1, June 1999
	Electronic Mail	IETF Standard 10/RFC -821/RFC-1869/RFC-1870 Simple Mail Transfer Protocol (SMTP) Service Extensions, November 1995
		IETF Standard 11/RFC -822/RFC-1049 Standard for the Format of ARPA Internet Text Messages, 13 August 1982
		IETF RFCs 2045-2049 Multipurpose Internet Mail Extensions (MIME), November 1996

16 Systems Evolution Timeline

The Systems Evolution Timeline provides an overview of the enterprise's transition plan. The timeline is a high level schedule of the plans for evolving or modernizing a enterprise's systems over time. This timeline shows when new or upgraded system capabilities or constituent systems will come on-line and when new technologies or standards will be applied. The end goal of the timeline is the achievement of system support for some phase of the enterprise's vision (as outlined in the Mission and Vision Statements). The dates for introduction of new technology should be coordinated with the Technology Forecast. The following template provides a generic example of a Systems Evolution Timeline.



Systems Evolution Timeline

17 Technology Forecast

A Technology Forecast is a detailed description of emerging technologies and specific hardware and software products. It contains predictions about the availability of emerging capabilities and about industry trends in terms of specific timeframes (e.g., 6 month or one year intervals) selected by the enterprise. The specific timeframes selected and the technologies being tracked should be coordinated with architecture transition plans. That is, insertion of new capabilities and upgrading of existing systems may depend on or be driven by the availability of new technology. The forecast includes potential technology impacts on current architectures and thus influences the development of transition and objective (i.e., To-Be) architectures. The forecast should be tailored to focus on technology areas that are related to the purpose for which a given architecture description is being built and should identify issues that will affect the architecture. Technologies that provide security functionality should be identified. The Technology Forecast is usually organized based on the enterprise's TRM and is sometimes combined with the TRM or Standards Profile. The following template illustrates an example format for a Technology Forecast (based on an IEEE 1003.0 compliant TRM).

Technology Forecast

Mapping of Work Products to Zachman Framework

The following matrix provides a mapping of the Zachman primitives in the first three rows of the Zachman Framework (Planner, Owner, and Designer) to the FEAF architecture work products. Work products that appear in more that one Zachman cell are composites that capture relationships among Zachman primitives. Items listed in parentheses (i..e, the FEA-PMO Reference Models) in the Motivation column are not FEAF architecture work products, but are other management documents and Government standards that influence the architecture work products.

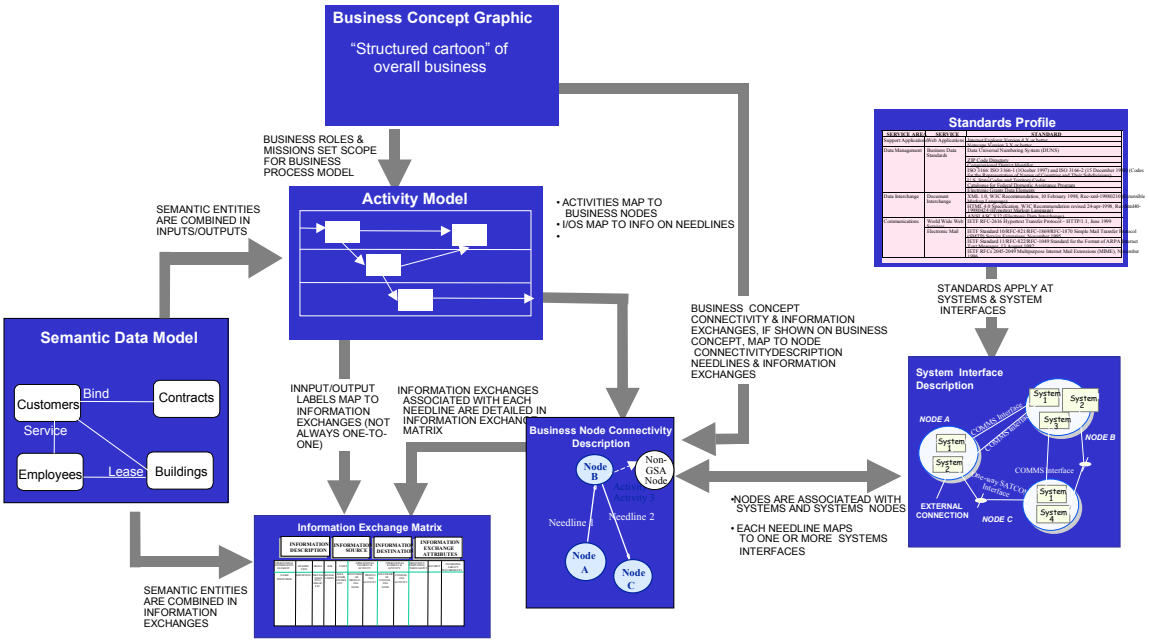
Zachman Primitives/FEAF Product Mapping

Perspective	Data Architecture (What)	Application Architecture (How)	Technology Architecture (Where)
Planner/Scope	Dictionary entries for business assets from Semantic Data Model	Dictionary entries for activities from Activity Model	Dictionary entries for business nodes from Business Node Connectivity Chart
Owner/Enterprise Model	Semantic Data Model Information Exchange Matrix	Activity Flow Model with inputs and outputs Information Exchange Matrix	Business Node Connectivity Description Information Exchange Matrix*
Designer/ Information Systems Model	Logical Data Model	Activity Flow Model with controls and mechanisms (both systems/system functions and organizations)	System Interface Description (perspectives as appropriate)

Perspective	People (Who)	Time (When)	Motivation (Why)
Planner/Scope	Dictionary entries for organizations from the Organization Chart	Dictionary entries for business events from the Business Event/Trace Model and triggering events from the Information Exchange Matrix	Business goals, performance measures, and critical success factors from the Mission and Vision Statement Business Concept Graphic (BRM, PRM, DRM)
Owner/Enterprise Model	Organization Chart Activity Flow Model with performing organizations identified Information Exchange Matrix*	Business Event/Trace Models with time periods designated Information Exchange Matrix*	Business objectives from Mission and Vision Statement (Business Unit Risk Assessment) (DRM)
Designer/ Information Systems Model	Organization Chart with roles identified; logical specification of work products from Information Exchange Matrix*	System Event/Trace Models State Transition Model	Business Rules Model Standards Profile Systems Evolution Timeline Technology Forecast (TRM, SRM, DRM)

Product Relationships

In order to be useful for analysis purposes, an architecture must consist of a set of interrelated, not isolated, products. Understanding the relationships among the products will allow the architect to make logical grouping of products for particular analytical purposes and will also facilitate the selection of a sequence of product-builds. Without this information, linkage to business and mission may be difficult. There are many built-in relationships among the products in the FEAF. Some of these relationships exist between products in adjacent cells of the product matrix; however, other relationships exist between products in non-adjacent cells, both up-and-down and left-to-right. The following figure illustrates some important product relationships. The figure is intended only to demonstrate some of the more critical relationships among some of the products. Additional relationships exist and can be identified in the shared information elements required in the architecture work products (see Appendix A).



Some Relationships Among the Work Products

Glossary

BRM	Business Reference Model
DRM	Data Reference Model
EA	Enterprise Architecture
FEAF	Federal Enterprise Architecture Framework
OMB	Office of Management and Budget
PRM	Performance Reference Model
SRM	Service Component Reference Model
TRM	Technical Reference Model

Appendix A

Product Information Elements

The following tables describe the information elements, sometimes called the dictionary or data dictionary entries associated with the graphical or tabular FEAF architecture work products. The graphical and tabular architecture work products consist of the graphic or table plus the associated information elements. The information elements make these architecture work products understandable for the reader and provide the raw input to architecture analysis processes. The products are incomplete without the associated information elements.

There are no information element tables for the EA Roadmap or the Mission and Vision Statements since these are textual products. (An outline is provided for each of these textual products in the main document to provide guidance on their information content.)

Business Concept Graphic Information Elements

Since the Business Concept Graphic has few constraints, there is no detailed set of information elements for it. However, each graphical icon and connecting line on the graphic should have an associated description that includes a spelling out of all acronyms that appear in the labels of the icons or connecting lines. In addition, if business assets, business locations, business activities, business relationships, or systems are named on the Business Concept Graphic, then the names used should correspond to the names that appear in other architecture work products.

Organization Chart Information Elements

Information Elements	Attributes	Example Values/Explanation
Graphical Box Types		
Organization		
	Name	**Name of an organization that appears on the graphic. This may be an "official" organization or something more mission oriented such as a standing committee or a working group required by procedure.**
	Description	**Text description of the organization's purpose, including the spelling out of all acronyms**
	Role/ Responsibility	**Text description of the role played by the described organization**

Information Elements	Attributes	Example Values/Explanation
Graphical Arrow Types		
Organizational Relationship		
	Name/Label	**Relationship label used on graphic**
	Description	**Textual description of relationship**
	Relationship Type	**The type of the relationship documented (e.g., Direct/Command, Indirect, Situation Dependent; Coordination; Backup, Member of Working Group)**
	Organization Name 1	**Name of source organization for relationship**
	Organization Name 2	**Name of destination organization for relationship**
Non-graphical Types		
Human Role		
	Name	**Name of a human role (personnel position) in an organization**
	Description	**Text description of the human role**
	Role/ Responsibility	**Text description of the responsibility the human role performs**
Organization Type		
	Name	**Name of organization type**
	Description	**Text description of the organization type**
Referenced Types		
Asset Type		**See Semantic Data Model Information Elements**
Business Node		**See Business Node Connectivity Chart Information Elements**
Activity		**See Activity Model Information Elements**
Relationships		
Organization Is Responsible for Business Asset		

Information Elements	Attributes	Example Values/Explanation
	Organization Name	Name of an organization or organization type
	Asset Type Name	Name of a business asset type that the organization is responsible for protecting
Organization Owns Business Node		
	Organization Name	Name of an organization or organization type
	Business Node Name	Name of a business node owned/operated by the organization
Organization Performs Business Activity		
	Organization Name	Name of an organization or organization type
	Activity Name	Name of an activity that is performed (in whole or in part) by personnel or resources from the organization
Organization has Human Role		
	Organization Name	Name of an organization or organization type
	Human Role Name	Name of a human role
Organization Has Business Location		(needed when the business nodes represent organizations)
	Organization Name	Name of an organization or organization type
	Business Location	The address of the business location or a location type (e.g., regional site, field office) when there are multiple locations of the same type and with the same characteristics.

Semantic Data Model Information Elements

Information Elements	Attributes	Example Values/Explanation
Graphical Box Types		
Asset Type		
	Name	**Name of the business asset or object**
	Description	**Textual description of the asset**
	Reference	**Reference to accepted definition of the asset, if one exists (e.g., FEA-PMO DRM reference)**
	Security Class	**For information assets this should identify the type of classified or Sensitive But Unclassified (SBU) information involved. N/A should be used for information assets that don't require protection.**
	Criticality	**A qualitative measure of how critical this asset is to the enterprise (e.g., High, Medium, Low). This may be N/A for assets that don't require protection.**
Graphical Arrow Types		
Relationship Type		
	Name	**Name/identifier of the relationship type**
	Description	**Textual description of the relationship represented**
	Reference	**Reference to accepted definition of the relationship, if one exists (e.g., FEA-PMO DRM reference)**
	Source Asset Type Name	**Name of the asset type at the source of the relationship**
	Target Asset Type Name	**Name of the asset type at the target of the relationship**
Category		

Information Elements	Attributes	Example Values/Explanation
Relationship Type		
	Name	**Name of the subtyping relationship**
	Description	**Textual description of the subtype relationship represented**
	Reference	**Reference to accepted definition of the category relationship, if one exists (e.g., FEA-PMO DRM reference)**
	Source Discriminated Asset Type Name	**Name of the supertype that is the source of the relationship**
	Discriminant Attribute Type Name	**Name of the attribute type that provides the discriminant for the asset type (should be an attribute associated with the asset)**
	Number of Discriminant Values	**Number of different subtypes (if known)**
Non-graphical Types		
Attribute Type		
	Name	**Name of attribute type**
	Definition	**Definition of attribute**
	Reference	**Reference to accepted definition of the attribute, if one exists (e.g., FEA-PMO DRM reference)**
Referenced Types		
Information Exchange		**See Information Exchange Matrix Information Elements**
Activity I/O Information		**See Activity Model Information Elements**
Business Rule		**See Business Rules Model Information Elements**
Relationships		
Asset Type Requires Security		**(for asset types that require protection)**

Information Elements	Attributes	Example Values/Explanation
Property		
	Asset Type Name	**Name of a business asset type**
	Security Property	**Type of security protections that the asset type requires (e.g., Confidentiality, Integrity, Availability)**
Asset Type Security Property Priority		**(for asset types that require protection)**
	Asset Type Name	**Name of a business asset type**
	Asset Security Property	**A security protection type associated with the business asset**
	Security Property Priority	**A qualitative measure of the priority the enterprise gives to protecting assets of this type with respect to the security property. This priority is in terms of allocating resources to ensure the protection of this security property for assets of this type.**
Asset Type Security Property Approach		**(for asset types that require protection)**
	Asset Type Name	**Name of a business asset type**
	Asset Security Property	**A security protection type associated with the business asset**
	Security Property Approach	**A list of the generic security approaches to be used in protecting assets of this type (e.g., prevention, detection, response) and their relative priority.**
Asset Type Is Described By Attribute Type		
	Asset Type Name	**Name of asset type**
	Attribute Type Name	**Name of an associated attribute type**
Relationship Type Has Rule		

Information Elements	Attributes	Example Values/Explanation
	Relationship Type Name	Name of a relationship type
	Business Rule Name	Name/identifier of a business rule associated with that relationship type
Asset Type Has Rule		
	Asset Type Name	Name of an asset type
	Business Rule Name	Name/identifier of a business rule associated with that asset type
Attribute Type has Rule		
	Attribute Type Name	Name of an attribute type
	Business Rule Name	Name/identifier of a business rule associated with an attribute
Category Relationship Type Has Destination Asset Type		
	Category Relationship Type Name	Name of subtyping relationship
	Destination Asset Type Name	Name of asset type that is a subtype
	Discriminant Value	Value of the discriminant attribute that is associated with the asset subtype
Asset Is Related To Information Exchange		
	Asset Type Name	Name of an asset type
	Information Exchange Identifier	Identifier of an Information Exchange
	Description of Relationship	Text description of the relationship between the asset type and the information exchange (e.g., same, is

Information Elements	Attributes	Example Values/Explanation
		subset of, contains)
Asset Is Related To Activity I/O Information		
	Asset Type Name	Name of an asset type
	Activity I/O Information Name	An of the information associated with an activity input or output flow
	Description of Relationship	Text description of the relationship between the asset and activity I/O (e.g., same, is subset of, contains)

Activity Model Information Elements

Information Elements	Attributes	Example Values/Explanation
Graphical Box Types		
Activity		
	Name	Name of activity
	Level identifier	If using hierarchical decomposition of activities: Identifier that corresponds to the activity's place in the activity hierarchy – should be unique
	Description	Description of the activity, including any security relevant aspects of the activity
	BRM Reference	The FEA-PMO BRM Line of Business or sub-function containing this activity. May be applicable for high level activities only.
	Activity Cost	Cost for activity derived from or used in activity based costing analysis (optional)
Graphical Arrow Types		
Hierarchy Chart Connector		
	Parent Activity	Name or level identifier of an activity that

Information Elements	Attributes	Example Values/Explanation
		has a decomposition
	Child Activity	Name or level identifier of child (i.e., subordinate) activity
Flow Connector		(For process oriented models)
	Name	Label of connector on graphic
	Type	If using IDEF0: One of Input, Output, Control, Mechanism
For subtype Input/Output		
	Source	Name of source activity or "External"
	Destination	Name of destination activity or "External"
	Activity I/O Information Name	Name of the information associated with the flow
For subtype Control		(required for security analysis even if it doesn't appear on the graphic)
	Source	Name of source activity or "External"
	Destination	Name of destination activity
	Control Description	Description of the control information or name of the activity I/O Information if the control is an output from an activity
For subtype Mechanism		(required for security analysis even if it doesn't appear on the graphic)
	Destination	Name of destination activity
	Resource type	Type of resource represented: organization/ role or system
	Resource Name	Organization or system name
Non-graphical Types		
Model		
	Name	Name /identifier of activity model
	Type	activity hierarchy, IDEF0-style model, object-oriented, or other type of model
	Purpose	Purpose of model
	Viewpoint	Viewpoint of model

Information Elements	Attributes	Example Values/Explanation
Diagram		
	Title	**Title of diagram/graphic**
	Diagram Number	**Level number of diagram (for leveled families of diagrams)**
Facing Page Text		
	Identifier	**Identifier/title of a page of text**
	Text	**Text description of the content of a graphic/diagram and its constituent parts**
Activity I/O Information		
	Name	**Name of input or output information (or product) for an activity**
	Description	**Description of the information or product**
Referenced Types		
Organization		**See Organization Chart Information Elements**
Asset Type		**See Semantic Data Model Information Elements**
System		**See System Interface Description Information Elements**
Business Node		**See Business Node Connectivity Chart Information Elements**
Information Exchange		**See Information Exchange Matrix Information Elements**
Relationships		
Diagram Belongs To Model		
	Diagram Title	**Title of a diagram**
	Model Name	**Name of the model to which the diagram belongs**
Facing Page Text References Diagram		
	Facing Page	**Identifier/title for a page of text**

Information Elements	Attributes	Example Values/Explanation
	Text Identifier	
	Diagram Title	Title of the diagram which the text describes
Activity Is Contained in Diagram		
	Activity Name	Name/identifier of an activity
	Diagram Title	Title of the diagram on which the activity occurs.
Flow Connector Is Contained in Diagram		
	Flow Connector Name	Label of connector
	Diagram Title	Title of diagram on which the connector appears
Activity Has Input		
	Activity	Name or level identifier of an activity
	Activity I/O Information Name	Name or label of information or product that is an input to the activity
Activity Is Decomposed Into Sub Activity		
	Activity	Name or identifier of a decomposed activity
	Sub Activity	Name or identifier of a sub activity
Activity Has Output		
	Activity	Name or level identifier of an activity
	Activity I/O Information Name	Name or label of information or product that is an output from the activity
Activity I/O Information Is Associated With An Information Exchange		(Information produced or consumed by an activity may be associated with multiple information exchanges.)

Information Elements	Attributes	Example Values/Explanation
	Activity I/O Information Name	Name or label of information that is an input or output of an activity
	Information Exchange Identifier	Identifier for an associated information exchange (from the Information Exchange Matrix)
Activity I/O Information Contains Protected Asset		
	Activity I/O Information Name	Name of input or output information (or product) for an activity
	Asset Type	Name of business asset type that has security properties.
Activity Is Performed At Business Node		(Should be the inverse of the relationship Business Node Has Associated Activity)
	Activity Name	Name/identifier of an activity
	Business Node Name	Name/identifier of the business node where that activity is performed.
Activity Accesses Protected Business Asset		
	Activity Name	Name/identifier of an activity
	Asset Type	Name of a business asset type that has security properties
	Type of Access	A description of the way in which the activity accesses the protected business asset (e.g., create, delete, modify)
	Activity Security Approach	The types of security approaches that the activity requires in its access to the protected business asset (e.g., prevention, detection, response). The approach may depend on the type of access.
Flow Connector Corresponds To Flow Connector		

Information Elements	Attributes	Example Values/Explanation
	Flow Connector Name	Name of flow connector on boundary of child diagram
	Flow Connector Name	Name of the corresponding flow connector on parent diagram

Business Node Connectivity Chart Information Elements

Information Elements	Attributes	Example Values/Explanation
Graphical Box Types		
Business Node		
	Name	Name or label of node icon on diagram
	Description	Text description of mission or role being performed by the node
	Level identifier	If using hierarchical decomposition of nodes: Identifier that corresponds to the node's place in the node hierarchy – should be unique
Graphical Arrow Types		
Needline		
	Identifier	Unique identifier of the needline (may be a number)
	Descriptive Name	Descriptive name for the needline, usually associated with the type(s) of information associated with the needline
	Description	Text description of needline
	"From" Business Node	Name of node icon that is the source of the node connector on the diagram
	"To" Business Node	Name of the node icon that is the destination of the node connector on the diagram
External		(if any). A needline which has one end not

Information Elements	Attributes	Example Values/Explanation
Needline		shown or a node outside the scope of the architecture
	Identifier	Unique identifier of the needline (may be a number)
	Descriptive Name	Descriptive name for the needline, usually associated with the type(s) of information associated with the needline
	Description	Text description of needline
	"From" Node	Name of node (business node icon or external node annotation) that is the source of the node connector on the diagram
	"To" Node	Name of the node (business node icon or external node annotation) that is the destination of the node connector on the diagram
Hierarchy Chart Connector		
	Parent Business Node	Name or level identifier of a node that has a decomposition
	Child Business Node	Name or level identifier of child (i.e., subordinate) node
Non-graphical Types		
External Node		(if any) A business node which is outside the scope of the architecture
	Name	Name of external node (i.e., label on diagram)
	Description	Textual description of the role performed by the external node
	Type	Logical (organizational) or Physical Node
Referenced Types		
Activity		See Activity Model Information Elements
Organization		See Organization Chart Information Elements
Organization		See Organization Chart Information

Information Elements	Attributes	Example Values/Explanation
Type		Elements
Relationships		
Business Node Is Decomposed Into Sub Nodes		
	Business Node	Name or identifier of a decomposed business node
	Sub Node	Name or identifier of a sub node
Business Node Represents Organization		(may not be applicable to all architectures)
	Business Node Name	Name/identifier of business node representing the organization
	Organization Name	Name/identifier of organization represented by business node
Business Node Represents Organization Type		(may not be applicable to all architectures)
	External Node Name	Name/identifier of business node representing the organization type
	Organization Type Name	Name/identifier of organization type represented by business node
Business Node Has Associated Activity		
	Business Node Name	Name/identifier of business node where the activity is performed
	Activity Name	Name/identifier of an activity associated with business node
Business Node Has Associated Business Location		(for business nodes that do not represent organizations)
	Business Node	Name/identifier of business node where

Information Elements	Attributes	Example Values/Explanation
	Name	the activity is performed
	Business Location	The address of the business location or a location type (e.g., regional site, field office) when there are multiple locations of the same type and with the same characteristics.
Business Node Stores Asset Type		
	Business Node Name	Name/identifier of business node where the activity is performed
	Asset Type Name	Name of a business asset that is resident at the business node
	Business Node Security Approach	The types of security approaches that the business node requires in its storage of a protected business asset (e.g., prevention, detection, response).

Business Event/Trace Model

Information Elements	Attributes	Example Values/Explanation
Graphical Box Types		
Business Node Lifeline		
	Business Node Lifeline Name	Name of the Business Node lifeline
	Description	Text description of any assumptions or scope constraints on the lifeline
Graphical Arrow Types		
Message		
	Name	Message label or name of message
	Description	Textual description of message

Information Elements	Attributes	Example Values/Explanation
	Originating Business Node Lifeline Name	Name of business node lifeline where Message begins
	Terminating Business Node Lifeline Name	Name of business node lifeline where Message ends
Non-graphical Types		
Business Event		
	Name	Name of a business event
	Description	Textual description of the business event
Message Time		
	Identifier	Identifier for the time when an message stops or starts
	Position On Lifeline	Relative position of message on lifeline (e.g., top-most or first, second, etc.)
	Formula	Algebraic formula for calculating the time of message occurrence (i.e., starting or stopping of the message) relative to beginning of business node lifeline
Referenced Types		
Business Node		See Business Node Connectivity Chart Information Elements
Information Exchange		See Information Exchange Matrix Information Elements
Relationships		
Business Node Lifeline Represents A business Node		
	Business Node Lifeline Name	Name of the business node lifeline
	Business Node Name	Name of the business node represented by the business node lifeline
Message Starts		

Information Elements	Attributes	Example Values/Explanation
At Time		
	Message Name	**Label of the message on the graphic**
	Starting Message Time Identifier	**Identifier of the time at which the message occurs or starts; gives the relative position of the message on its starting lifeline; may be identical to the ending time**
Message Ends At Time		
	Message Name	**Label of the Message**
	Ending Message Time Identifier	**Identifier of the time at which the message ends; gives the relative position of the message on its ending lifeline; value of time should be greater than or equal to the value of the starting time, in terms of lifeline position**
Message Is Associated with Information Exchange		
	Message Name	**Label of the message**
	Information Exchange Identifier	**Identifier of an information exchange associated with the message**
Message Is Associated With Business Event		
	Message Name	**Name/identifier of a message**
	Business Event Name	**Name of a business event**
Business Event Is Triggering Event for an Information Exchange		**(for business events associated with a message/information exchange)**

Information Elements	Attributes	Example Values/Explanation
	Business Event Name	Name of a business event
	Information Exchange Identifier	Identifier of the information exchange that is the message associated with/triggered by the business event

Information Exchange Matrix

Information Elements	Attributes	Example Values/Explanations
Non-graphical Types		
Information Exchange Identifier		Identifier for the information exchange – usually based on the relevant Needline identifier; should be unique for the architecture
Information Exchange Description		
	Name	Name for the information element – indicative of the information content
	Content Description	Description of the content of the information element
	Media	Voice, digital, image, hardcopy text, etc.
	Size	Size range in terms of number of characters, digits, pages, as appropriate
	Triggering Event	Brief textual description of the event(s) that triggers the information exchange
	Frequency	How often the information exchange occurs; may be an average or a worst case estimate and may include conditions, e.g., wartime or peacetime
	Timeliness	Required maximum allowable time of exchange from node to node (in seconds)
	Security Class	The type of classified or Sensitive But Unclassified (SBU) information involved in the Information Exchange. This security class should be consistent with the security class of any business asset related to the information exchange.

Information Elements	Attributes	Example Values/Explanations
	Criticality/ Priority	Identification of the criticality of the exchange and the priority of the exchange within its criticality category
	Interoperability Requirements	Required level of interoperability for the information exchange
Referenced Types		
Needline		See Business Node Connectivity Chart Information Elements
Activity		See Activity Model Information Elements
Event		See Business Event/Trace Model Information Elements
Relationships		
Needline Supports Information Exchange		
	Needline Identifier	Identifier of a needline
	Information Exchange Identifier	Identifier of an information exchange supported by the needline
Information Exchange Has Producing Activity		
	Information Exchange Identifier	Identifier of the information exchange produced
	Activity Name	Name of the activity (at the originating business node of the needline) that produces the information exchange
Information Exchange Has Consuming Activity		
	Information Exchange Identifier	Identifier of the information exchange consumed
	Activity Name	Name of the activity (at the receiving business node of the needline) that consumes the information exchange

Logical Data Model

Information Elements	Attributes	Example Values/Explanation
Graphical Box Types		
Entity Type		
	Name	**Name of the type of person, place, thing, or message of interest**
	Description	**Textual description of the entity**
	Reference	**Reference to accepted definition of the entity, if one exists (e.g., FEA-PMO DRM reference)**
	Security Class	**The type of classified or Sensitive But Unclassified (SBU) information involved. N/A should be used for entities that don't require protection.**
Graphical Arrow Types		
Relationship Type		
	Name	**Name/identifier of the relationship type**
	Description	**Textual description of the relationship represented**
	Reference	**Reference to accepted definition of the relationship, if one exists (e.g., FEA-PMO DRM reference)**
	Source Entity Type Name	**Name of the entity type at the source of the relationship**
	Target Entity Type Name	**Name of the entity type at the target of the relationship**
Category Relationship Type		
	Name	**Name of the subtyping relationship**
	Description	**Textual description of the subtype relationship represented**

Information Elements	Attributes	Example Values/Explanation
	Reference	Reference to accepted definition of the category relationship, if one exists (e.g., FEA-PMO DRM reference)
	Source Discriminated Entity Type Name	Name of the supertype that is the source of the relationship
	Discriminant Attribute Type Name	Name of the attribute type that provides the discriminant for the entity type (should be an attribute associated with the entity)
	Number of Discriminant Values	Number of different subtypes (if known)
Non-graphical Types		
Attribute Type		
	Name	Name of attribute type
	Definition	Definition of attribute
	Reference	Reference to accepted definition of the attribute, if one exists (e.g., FEA-PMO DRM reference)
Data Model Rule		
	Name	Name/identifier of the rule
	Type	Type of data model rule: one of null rule; child delete rule; child update rule
	Text	Text of the rule
Data Domain		
	Name	Name of the data domain
	Description	Textual description of the domain
	Range Constraint	Value range allowable for attributes with this data domain
	Size Constraint	Maximum number of characters in the display representation of attributes with this data domain

Information Elements	Attributes	Example Values/Explanation
Referenced Types		
Asset Type		**See Semantic Data Model Information Elements**
Relationships		
Entity Type is Related to Asset Type		
	Entity Type Name	**Name of an entity type**
	Asset Type Name	**Name of a business asset type**
Entity Type Requires Security Property		**(for entity types that require protection; should be consistent with the Asset Type security properties for any related Asset Type)**
	Entity Type Name	**Name of an entity type**
	Security Property	**Type of security protections that the entity type requires (e.g., Confidentiality, Integrity, Availability)**
Entity Type Security Property Priority		**(for entity types that require protection; should be consistent with the Asset Type security property priorities for any related Asset Type)**
	Entity Type Name	**Name of an entity type**
	Entity Security Property	**A security protection type associated with the entity**
	Security Property Priority	**A qualitative measure of the priority the enterprise gives to protecting entities of this type with respect to the security property. This priority is in terms of allocating resources to ensure the protection of this security property for entities of this type.**
Entity Type Security Property Approach		**(for entity types that require protection; should be consistent with the Asset Type security property approach for any related Asset Type)**
	Entity Type Name	**Name of an entity type**

Information Elements	Attributes	Example Values/Explanation
	Entity Security Property	A security protection type associated with the entity
	Security Property Approach	A list of the generic security approaches to be used in protecting entities of this type (e.g., prevention, detection, response) and their relative priority.
Entity Type Is Described By Attribute Type		
	Entity Type Name	Name of entity type
	Attribute Type Name	Name of an associated attribute type
	Attribute Role	The role of the attribute: Key, Foreign Key, Non-Key
Relationship Type Is Described By Attribute Type		
	Relationship Type Name	Name of relationship type
	Attribute Type Name	Name of an associated attribute type
Data Domain Constrains Values of Attribute Type		
	Data Domain Name	Name of a data domain
	Attribute Type Name	Name of an attribute type whose values must be within the data domain
Category Relationship Type Has Destination Entity Type		
	Category Relationship Type Name	Name of subtyping relationship

Information Elements	Attributes	Example Values/Explanation
	Destination Entity Type Name	Name of entity type that is a subtype
	Discriminant Value	Value of the discriminant attribute that is associated with the entity subtype

Business Rules Model

Information Elements	Attributes	Example Values/Explanation
Non-graphical Types		
Rule		
	Name	Rule name/identifier
	Type	One of: Structural Assertion, Action Assertion, Derivation
	Description	Textual discussion of assertion or derivation
	Text	Text of assertion or derivation in selected formal language
Formal Language		
	Name	Name of the formal language selected to record the rules
	Source	Reference to the textbook or article where the selected formal language is described.
Referenced Types		
Activity		See Activity Model Information Elements
Asset Type		See Semantic Data Model Information Elements
Relationships		
Rule Applies to Activity		(if any rules are related to activities)
	Rule Name	Name of action assertion or derivation rule

Information Elements	Attributes	Example Values/Explanation
	Activity Name	Name of activity to which the rule applies
Rule Applies to Asset Type		(if any rules are related to entities)
	Rule Name	Name of structural assertion rule
	Asset Type Name	Name of asset type to which the rule applies

System Interface Description

Information Elements	Attributes	Example Values/Explanation
Graphical Box Types		
Systems Node		(Appears in internodal and intranodal perspectives)
	Name	Name of a systems node, usually denoting a facility where an operational node is located. If the corresponding operational node is designated as a physical one, then the systems node name and the physical operational node name may refer to the same entity (definition).
	Description	Text summary description of systems node's corresponding role or mission and associated resources (e.g., people, platforms, facilities, systems) that perform these roles or missions
	Location	The location of the systems node (i.e., the location where its constituent systems are resident)
	Certification and Accreditation Requirements	Reference to any certification and accreditation requirements for the systems node as a whole, if any
System		(Appears in all versions)
	Name	Name/identifier of system or subsystem
	Description	Text summary of function or set of functions performed and constituent parts contained,

Information Elements	Attributes	Example Values/Explanation
		e.g., shared DB
	Certification and Accreditation Requirements	Reference to any certification and accreditation requirements for the systems, if any
System Component		(Appears in intrasystem version and appears optionally on other versions)
	Name	Name/identifier of system component, including model/version number
	Type	Type of component, for example: hardware component; platform component (i.e., combined hardware and system software); system software; application (i.e., mission unique) software; or persistent data
	Description	Text description of function(s) supported by system component
	Reference	Reference to this component in a source of reusable or common components, if any, such as the FEA-PMO SRM or TRM
	Vendor/ Source	Source of system component
Graphical Arrow Types		
Interface		(Required in internodal and intranodal perspectives)
	Name	Name/identifier of interface
	Description	Text description of interface; may include a discussion of communications systems or communications systems elements involved as well as indications as to whether interface is two-way or one-way only
	Endpoint 1: System Name	Name of entity (systems node, system) that is at one end of the interface. In case of one-way connections, this endpoint is the source endpoint
	Endpoint 2: System Name	Name of entity (systems node, system) that is at the other end of the interface. In case of one-way connections, this endpoint is the target endpoint

Information Elements	Attributes	Example Values/Explanation
Non-graphical Types		
System Function		
	Name	Name/identifier of system function
	Description	Text summary description of system function
Referenced Types		
Organization		See Organization Chart Information Elements
Business Node		See Business Node Connectivity Chart Information Elements
Activity		See Activity Model Information Elements
Activity Security Approach		See Activity Model Information Elements
Needline		See Business Node Connectivity Chart Information Elements
Relationships		
Systems Node Contains System		
	Systems Node Name	Name/identifier of a systems node
	System Name	Name/identifier of a system resident at that node
Systems Node/System Has Accreditation Authority		(for those systems nodes and systems that have certification and accreditation requirements)
	Systems Node/System Name	Name/identifier of a systems node or system
	Organization Name	Name of the organization that is the accreditation authority for the systems node or system

Information Elements	Attributes	Example Values/Explanation
System Contains (Sub)-System		
	Systems Name	Name/identifier of a system
	(Sub)-System Name	Name/identifier of a subsystem contained within system
System Contains System Component		
	System Name	Name/identifier of a system
	System Component Name	Name/identifier of a component of the system
System Performs System Function		
	System Name	Name/identifier of a system
	System Function Name	Name/identifier of a system function performed by system
Systems Node Supports Business Node		
	Systems Node Name	Name/identifier of systems node
	Business Node Name	Name/identifier of business node supported by automation resident at the systems node
System/ Subsystem Supports Business Node		
	System Name	Name/identifier of system
	Business	Name/identifier of a business node with

Information Elements	Attributes	Example Values/Explanation
	Node Name	activities supported by the system
System/ Subsystem Supports Activity		
	System Name	Name/identifier of a system
	Activity Name	Name of an activity supported by the system
System Component Supports Activity		
	System Component Name	Name/identifier of a system component
	Activity Name	Name of an activity supported by the system component
System Component Implements Security Service		
	System Component Name	Name of a system component
	Security Service Name	Name of a security service (e.g., Identification & Authentication, encryption, accounting).
Security Service Supports Activity Security Approach		(the security service and the activity should be related to the same system component)
	Security Service Name	Name of a security service
	Activity Name	Name of an activity that accesses a protected business asset
	Activity Security Approach	Any security approaches that the activity requires in its access to the protected business asset (e.g., prevention, detection, response).

Information Elements	Attributes	Example Values/Explanation
	Degree of Confidence	A qualitative measure (e.g., high, medium, low) of the degree of confidence provided by the security service in supporting the security approach
Interface Implements Automated Portion of Needline		
	Interface Name	Name/identifier of interface
	Needline Name	Name/identifier of needline partially or fully implemented by the Interface

System Event/Trace Description

Information Elements	Attributes	Example Values/Explanation
Graphical Box Types		
Systems Node Lifeline		
	Systems Node Lifeline Name	Name of the Systems Node lifeline
	Description	Text description of any assumptions or scope constraints on the lifeline
Graphical Arrow Types		
Message		
	Name	Message label or name of message
	Description	Textual description of message
	Originating Systems Node Lifeline Name	Name of systems node lifeline where Message begins
	Terminating Systems Node	Name of systems node lifeline where Message ends

Information Elements	Attributes	Example Values/Explanation
	Lifeline Name	
Non-graphical Types		
System Event		
	Name	Name of system event
	Description	Textual description of the system event
Message Time		
	Identifier	Identifier for the time when a message stops or starts
	Position On Lifeline	Relative position of message on lifeline (e.g., top-most or first, second, etc.)
	Formula	Algebraic formula for calculating the time of message occurrence (i.e., starting or stopping of the message) relative to beginning of systems node lifeline
Referenced Types		
Systems Node		See System Interface Description Information Elements
Information Exchange		See Information Exchange Matrix Information Elements
Relationships		
Systems Node Lifeline Represents An Systems Node		
	Systems Node Lifeline Name	Name of the systems node lifeline
	Systems Node Name	Name of the systems node represented by the systems node lifeline
Message Starts At Time		
	Message Name	Label of the message on the graphic
	Starting Message Time Identifier	Identifier of the time at which the message occurs or starts; gives the relative position of the message on its starting lifeline; may be identical to the ending time

Information Elements	Attributes	Example Values/Explanation
Message Ends At Time		
	Message Name	**Label of the Message**
	Ending Message Time Identifier	**Identifier of the time at which the message ends; gives the relative position of the message on its ending lifeline; value of time should be greater than or equal to the value of the starting time, in terms of lifeline position**
Message Implements Information Exchange		
	Message Name	**Label of the message**
	Information Exchange Identifier	**Identifier of an information exchange that the message implements**
Message Is Associated With System Event		
	Message Name	**Name/identifier of a message**
	System Event Name	**Name of a system event**

State Transition Model

Information Elements	Attributes	Example Values/Explanation
Graphical Box Types		
State		
	Name	**State name**

Information Elements	Attributes	Example Values/Explanation
	Description	Textual description as necessary
Graphical Arrow Types		
Transition		
	Label	Transition identifier or name of the event that triggers the transition
	Description	Textual description of transition
	Source State Name	Name of state where transition begins
	Target State Name	Name of state where transition ends
Non-graphical Types		
State Chart		
	Name	Name/identifier of state chart
	Description	Textual description of what the state chart represents
	Start State Name	Name of start state for state chart
Action		
	Name	Name/identifier of an action that takes place while the system is in a given state or during a state transition
	Description	Pseudo-English or code for activity function
Referenced Types		
System Function		See System Interface Description Information Elements
System Event		See Systems Event/Trace Model Information Elements
Relationships		
State Chart Has Terminal State		
	State Chart Name	Name/identifier of a state chart
	State Name	Name of a terminal state for that state chart
System Event Triggers		

Information Elements	Attributes	Example Values/Explanation
Transition		
	Transition Name	Name/identifier of a transition
	System Event Name	Name of the system event that triggers the transition
State Has Associated Action		
	State Name	Name of a state
	Action Name	Name of the action performed while the activity is in a given state
Transition Has Associated Action		
	State Name	Name of a state
	Action Name	Name of the action performed during a transition
Action Is Related To System Function		
	Action Name	Name/identifier of an action
	System Function Name	Name/identifier of a system function
	Relationship Description	Text description of the relationship (e.g., action is same as the system function, action is a sub-set of the system function, action contains the system function)

Standards Profile

Information Elements	Attributes	Example Values/Explanation
Non-graphical Types		
Standards		

Information Elements	Attributes	Example Values/Explanation
Profile		
	Name	**Name/identifier of profile**
	Description	**Text summary description covering the content of the profile, including reference to any parent profile**
	Applicable Date	**Start date for use of the profile**
Reference Model		
	Name	**Name/identifier of reference model used to select services and organize standards**
	Description	**Text summary description of technical domain addressed by the reference model**
	Source	**Reference to the source documentation and organization supporting the reference model**
Service Area		
	Name	**Name/identifier for service area included in profile or forecast**
	Description	**Textual description of service area and included services, including issues for and impacts on system architecture**
	Version/Date	**Date or version number for the service area forecast (for use in forecast products)**
Service		
	Name	**Name/identifier for service**
	Description	**Text summary description of the service**
	Status	**Applicability of some standard for this service: for example, "now" or "future," meaning there are current standards for this service or interface to the service; or there are expected to be some in the future**
Standard		
	Standard Name	**Name and ID number for standard, including maintaining organization and**

Information Elements	Attributes	Example Values/Explanation
		relevant revision dates
	Type	Description of the type of standard, e.g., de jure, industry or de facto, organizational or project specific
	Security Relevant	Yes or No
	Description	Text summary description of content of standard. If the standard is security relevant, then this relevance should be outlined.
	Reference	Reference in a containing Standards Profile (e.g., FEA-PMO TRM) that makes the standard required
	Options	Selected standard options
	Parameters	Selected standard parameters
	Start Date	Initial date on which the standard is applicable
	End Date	Date after which the standard is no longer applicable
Referenced Types		
System		See System Interface Description Information Elements
System Component		See System Interface Description Information Elements
System Function		See System Interface Description Information Elements
System Interface		See System Interface Description Information Elements
Relationships		
Standards Profile Is Refinement Of Standards Profile		
	Standards Profile Name	Name/identifier of a standards profile
	Standards Profile Name	Name/identifier of a standards profile which is a refinement of the other profile

Information Elements	Attributes	Example Values/Explanation
		(e.g., has more of the parameters and options selected, has selected fewer service areas, or has selected specific standards for a service out of a set of potential standards for that service offered in the more general profile)
Standards Profile Is Based On Reference Model		
	Standards Profile Name	Name/identifier of standards profile
	Reference Model Name	Name of a reference model used to organize the profile's standards
Reference Model Includes Service Area		
	Reference Model Name	Name of a reference model
	Service Area Name	Name of a service described in the reference model
Service Area Includes Service		
	Service Area Name	Name/identifier of a service area
	Service Name	Name/identifier of a service included in that service area
Standards Profile Includes Service Area		
	Standards Profile Name	Name/identifier of a standards profile
	Service Area Name	Name/identifier of a service area contained in the standards profile
Standard Addresses Service		
	Standard Name	Name/identifier of a standard
	Service Name	Name of the service to which the

Information Elements	Attributes	Example Values/Explanation
		standard is applicable
Standards Profile Contains Standard		
	Standards Profile Name	Name/identifier of a standards profile
	Standard Name	Name/identifier of a standard contained in the standards profile
Standard Applies to System		
	Standard Name	Name/ID number of a standard
	System Name	Name/identifier of a system
Standard Applies to System Component		
	Standard Name	Name/ID number of a standard
	System Component Name	Name/identifier of a system component
	Standard Name	Name/ID number of a standard
Standard Applies to System Function		
	Standard Name	Name/ID number of a standard
	System Function Name	Name/identifier of a System Function
Standard Applies to System Interface		
	Standard Name	Name/ID number of a standard
	System Interface Name	Name/identifier of a system interface

Systems Evolution Timeline

Information Elements	Attributes	Example Values/Explanation
Non-graphical Types		
Timeline		
	Name	**Name of timeline**
	Description	**Textual description of purpose of timeline, including goals of the migration or evolution process being documented**
	Beginning Time	**Date of beginning of timeline**
	Ending Time	**Date of ending of timeline**
Milestone		
	Name	**Name/identifier for milestone**
	Date	**Date for achieving milestone in terms of month and year or number of months from baseline date**
	Description	**Goals to be achieved at milestone**
Graphical Arrow Types		
System Grouping Link		
	Milestone Name	**Name/identifier of the milestone when this grouping should complete integration**
	System Group Name	**Name/identifier for a set of systems, subsystems, or system components**
	Number of Constituent systems, subsystems or System Components	**Number of systems, subsystems, or system components grouped together**
Non-graphical Types		
System Group		
	Name	**Name/identifier for a set of systems,**

Information Elements	Attributes	Example Values/Explanation
		subsystems, or system components
	Description	Textual description of system group
Referenced Types		
System		See System Interface Description Information Elements
System Component		See System Interface Description Information Elements
Timed Technology Forecast		See Technology Forecast Information Elements
Standard		See Standards Profile Information Elements
Relationships		
System Group Contains Constituent System, Subsystem, or System Component		
	System Group Name	Name/identifier for a set of systems, subsystems, or system components
	System, subsystem, or System Component Name	Name of systems, subsystems, or system components contained in the system group
Milestone Is Completed With System Group		
	Milestone Name	Name/identifier of milestone
	System Group Name	Name/identifier for a set of upgraded systems, subsystems, or system components required to complete a milestone
	System Version	Version name/number for system configuration at the completion of milestone
Timeline Has		

Information Elements	Attributes	Example Values/Explanation
Beginning System Configuration		
	Timeline Name	**Name/identifier of timeline**
	System Name	**Name of a system (for system evolution timelines)**
	System Version	**Version name/number for system configuration at the beginning of timeline (for system evolution)**
Timeline Has Ending New System		
	Timeline Name	**Name/identifier of timeline**
	System Name	**Name of new system (or subsystems) available at end of timeline**
Timeline Contains Milestone		
	Timeline Name	**Name/identifier of timeline**
	Milestone Name	**Name/identifier of milestone**
	Relative Position of Milestone	**Position of milestone on timeline relative to beginning of timeline (e.g., first, fifteenth)**
Milestone Requires Timed Technology Forecast		
	Milestone Name	**Name/identifier of milestone**
	Timed Technology Forecast Name	**Name/identifier of a timed technology forecast for a specific technology required for supporting the system associated with the milestone. That is, milestone cannot be met if technology forecasted is not available**
Milestone Includes Existing Standard		
	Milestone Name	**Name/identifier of milestone**

Information Elements	Attributes	Example Values/Explanation
	Standard Name	Name/identifier of a standard from the Standards Profile that will be used in system, subsystem, or system components integrated for the milestone

Technology Forecast

Information Elements	Attributes	Example Values/Explanation
Non-graphical Types		
Technologies Forecast Profile		
	Name	Name/identifier of Technologies Forecast Profile
	Description	Textual description of purpose of forecast
Timed Technology Forecast		
	Name	Name/identifier of a forecast regarding a specific technology
	Technology	Textual description of a specific technology being forecasted
	Security Relevant	Yes or No
	Time frame	Time frame for which forecast is valid; usually expressed in terms of a (future) date or months from baseline
	Discussion	Textual notes regarding technology status, likely commercial market acceptance, and risk assessment of adopting the technology forecasted, including its impact on system security
Referenced Types		
Reference		See Standards Profile Information

Information Elements	Attributes	Example Values/Explanation
Model		Elements
Service Area		See Standards Profile Information Elements
Service		See Standards Profile Information Elements
System		See System Interface Description Information Elements
System Component		See System Interface Description Information Elements
System Interface		See System Interface Description Information Elements
Relationships		
Technologies Forecast Profile Is Based On Reference Model		
	Technologies Forecast Profile Name	Name/identifier of the Technologies Forecast Profile
	Reference Model Name	Name/identifier of the Technical Reference Model used to organize the forecast
Technologies Forecast Profile Covers Service Area/Service		
	Technologies Forecast Profile Name	Name/identifier of technologies forecast profile
	Service Area/Service Name	Name/identifier of a Reference Model service area or service covered by the technologies forecast profile
Service Area/Service Has Timed Technology Forecast		
	Service Area/Service	Name/identifier of a service area or service

Information Elements	Attributes	Example Values/Explanation
	Name	
	Timed Technology Forecast Name	Name/identifier of a specific, time sensitive forecast for technology relevant to the service area or service
Timed Technology Forecast Impacts System		
	Timed Technology Forecast Name	Name/identifier of a timed technology forecast
	System	Name/identifier of a system that could be impacted by the technology forecast
Timed Technology Forecast Impacts System Component		
	Timed Technology Forecast Name	Name/identifier of a timed technology forecast
	System Component	Name/identifier of a system component that could be impacted by the technology forecast
Timed Technology Forecast Impacts System Interface		
	Timed Technology Forecast Name	Name/identifier of a timed technology forecast
	System Interface Name	Name/identifier of a system interface (e.g., communications interface or API) that could be impacted by the technology forecast