DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

The DoDAF Architecture Framework Version 2.02

Welcome to DoDAF Version 2.02! This is the official and current version for the Department of Defense Architecture Framework.

Version 2.02

This is the current release of DoDAF as of August 2010.

A PDF version of this website is produced periodically and can be downloaded here: DoDAF 2.02.pdf

For a description of changes made to DoDAF/DM2 2.01 to create DoDAF/DM2 2.02, download the Version Description Document here.

DoDAF Conformance

DoD Components are expected to conform to DoDAF to the maximum extent possible in development of architectures within the Department. Conformance ensures that reuse of information, architecture artifacts, models, and viewpoints can be shared with common understanding. Conformance is expected in both the classified and unclassified communities, and further guidance will be forthcoming on specific processes and procedures for the classified architecture development efforts in the Department.

DoDAF conformance is achieved when:

- The data in a described architecture is defined according to the DM2 concepts, associations, and attributes.
- The architectural data is capable of transfer in accordance with the PES.

DoDAF Journal

The DoDAF Journal is a community of interest based discussion board. The Journal includes descriptions of best practices, lessons learned, example views and DM2 datasets, DoDAF model templates, DoDAF meeting presentations, and tutorial materials, and reference documents. It can be used by reference, component, capability, segment, and solution architects and core process stakeholders. Any member of the DoDAF community may submit material for publication and an editorial board will work with the authors to determine appropriateness, ensure public releasability, and make any needed changes to content.

Contact Information

For any general enquiries, please contact us via the general enquiry mailboxes listed on our contact page.

Go to top of page ↑

DoDAF

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

- [Six Core Processes DoDAF Supports]
- [DM2 Support for the Six Core Processes DoDAF Supports]
- [What is New in DoDAF V2.0]

Architecture Development

Meta Model

Viewpoints & Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoD EA Conference 2011

Hampton, VA April 11-15, 2011
Registration will be available at:
WWW.DODENTERPRISEARCHITECTURE.ORG
Targeted Date TBD
Co-hosted by DoD CIO Architecture, Standards & Interoperability Directorate and Joint Staff

Introduction

The Department of Defense Architecture Framework (DoDAF), Version 2.0 is the overarching, comprehensive framework and conceptual model enabling the development of architectures to facilitate the ability of Department of Defense (DoD) managers at all levels to make key decisions more effectively through organized information sharing across the Department, Joint Capability Areas (JCAs), Mission, Component, and Program boundaries. The DoDAF serves as one of the principal pillars supporting the DoD Chief Information Officer (CIO) in his responsibilities for development and maintenance of architectures required under the Clinger-Cohen Act. DoDAF is prescribed for the use and development of Architectural Descriptions in the Department. It also provides extensive guidance on the development of architectures supporting the adoption and execution of Net-centric services within the Department.

DoD managers, as process owners, specify the requirements and control the development of architectures within their areas of authority and responsibility. They select an architect and an architecture development team to create the architecture in accordance with the requirements they define.

DoD Components are expected to conform to the DoDAF developing architectures within the Department. **DoDAF Conformance** ensures reuse of information and that architecture artifacts, models, and viewpoints can be shared with common understanding.

DoDAF V2.0 focuses on architectural "data", rather than on developing individual "products" as described in previous versions. In general, data can be collected, organized, and stored by a wide range of architecture tools developed by commercial sources. It is anticipated that these tools will adopt the DM2 PES for the exchange of architectural data.

DoDAF V2.0 provides a Data Capture Method for each data group of the DM2 to guide architects in collecting and organizing the necessary architectural data.

The DoDAF enables architectural content that is "Fit-for-Purpose" as an architectural description consistent with specific project or mission objectives. Because the techniques of architectural description can be applied at myriad levels of an enterprise, the purpose or use of an architectural description at each level will be different in content, structure, and level of detail. Tailoring the architectural description development to address specific, well-articulated, and understood purposes, will help ensure the necessary data is collected at the appropriate level of detail to support specific decisions or objectives.

Visualizing architectural data is accomplished through **models** (e.g., the products described in previous versions of DoDAF). Models can be documents, spreadsheets, dashboards, or other graphical representations and serve as a template for organizing and displaying data in a more easily understood format. When data is collected and presented as a "filled-in" model, the result is called a **view**. Organized collections of views (often representing processes, systems, services, standards, etc.) are referred to as **viewpoints**, and with appropriate definitions are collectively called the **Architectural Description**.

DoDAF V2.0 discusses DoDAF-described Models and Fit-for-Purpose Views:

- **DoDAF-described Models (also referred to as Models)** are created from the subset of data for a particular purpose. Once the DoDAF-described Models are populated with data, these "views" are useful as examples for presentation purposes, and can be used as described, modified, or tailored as needed.

Fit-for-Purpose Views are user-defined views of a subset of architectural data created for some specific purpose (i.e., "Fit-for-Purpose"). While these views are not described or defined in DoDAF, they can be created, as needed, to ensure that presentation of architectural data is easily understood. This enables organizations to use their own established presentation preferences in their deliberations.

The models described in DoDAF, including those that are legacies from previous versions of the Framework, are provided as pre-defined examples that can be used when developing presentations of architectural data.

Specific DoDAF-described Models for a particular purpose are prescribed by process-owners. All the DoDAF-described Models do not have to be created. If an activity model is created, a necessary set of data for the activity model is required. Key process owners will decide what architectural data is required, generally through DoDAF-described Models or Fit-for-Purpose Views. However, other regulations and instructions from the DoD and the Chairman, Joint Chiefs of Staff (CJCS) have particular presentation view requirements.

The architect and stakeholders select views to ensure that the Architectural Descriptions will support current and future states of the process or activity under review. Selecting Architecture Viewpoints carefully ensures that the views adequately frame concerns, e.g., by explaining the requirements and proposed solutions, in ways that enhance audience understanding.

DoDAF also serves as the principal guide for development of *integrated architectures* as defined in DoD Instruction 4630.8, which defines an integrated architecture as "An architecture consisting of multiples views or perspectives facilitating integration and promoting interoperability across capabilities and among integrated architectures". The term integrated means that data required in more than one instance in architectural views is commonly understood across those views.

The DM2 provides information needed to collect, organize, and store data in a way easily understood.

The DM2 replaces the Core Architecture Data Model (CADM) which supported previous versions of the DoDAF. DM2 is a data construct that facilitates reader understanding of the use of data within an architecture document. CADM can continue to be used in support of architectures created in previous versions of DoDAF. **NOTE: DoDAF V2.0 does NOT prescribe a Physical Data Model (PDM), leaving that task to software developers who will implement the principles and practices of DoDAF in their own software offerings.**

DoDAF V2.0 is a marked change from earlier versions of Command, Control, Communications, Computers, and Intelligence Surveillance Reconnaissance Architecture Framework (C4ISR AF) or DoDAF, in that architects now have the freedom to create enterprise architectures to meet the demands of their customers. The core of DoDAF V2.0 is a data-centric approach where the creation of architectures to support decision-making is secondary to the collection, storage, and maintenance of data needed to make efficient and effective decisions. The architect and stakeholders select views to ensure that architectures will explain current and future states of the process or activity under review. Selecting architectural views carefully ensures that they adequately explain the requirement and proposed solution in ways that will enhance audience understanding.

DoDAF V2.0 also provides, but does not require, a particular methodology in architecture development. It provides guidance and suggestions on how to ensure that other proposed methods can be adapted as needed to meet the DoD requirements for data collection and storage. Similarly, the views presented in DoDAF are examples, intended to serve as a possible visualization of a particular view. DoDAF V2.0 also continues providing support for views (i.e., 'products' developed in previous versions of the Framework). These views do not require any particular graphical design by toolset vendors.

Authority: Law and Policy DoDAF Supports

Federal law and policies have expressed the need for architectures in support of business decisions.

Policy / Guidance	Description
Clinger-Cohen Act of 1996	Recognizes the need for Federal Agencies to improve the way they select and manage IT resources and states, “information technology architecture, with respect to an executive agency, means an integrated framework for evolving or maintaining IT and acquiring new IT to achieve the agency’s strategic goals and information resources management goals.” Chief Information Officers are assigned the responsibility for “developing, maintaining, and facilitating the implementation of a sound and integrated IT architecture for the executive agency”.
E-Government Act of 2002	Calls for the development of Enterprise Architecture to aid in enhancing the management and promotion of electronic government services and processes.
Office of Management and Budget Circular A-130	“Establishes policy for the management of Federal information resources” and calls for the use of Enterprise Architectures to support capital planning and investment control processes. Includes implementation principles and guidelines for creating and maintaining Enterprise Architectures.
OMB Federal Enterprise Architecture Reference Models (FEA RM)	Facilitates cross-agency analysis and the identification of duplicative investments, gaps, and opportunities for collaboration within and across Federal Agencies. Alignment with the reference models ensures that important elements of the FEA are described in a common and consistent way. The DoD Enterprise Architecture Reference Models are aligned with the FEA RM.
OMB Enterprise Architecture Assessment Framework (EAAF)	Serves as the basis for enterprise architecture maturity assessments. Compliance with the EAAF ensures that enterprise architectures are advanced and appropriately developed to improve the performance of information resource management and IT investment decision making.
General Accounting Office Enterprise Architecture Management Maturity Framework (EAMMF)	“Outlines the steps toward achieving a stable and mature process for managing the development, maintenance, and implementation of enterprise architecture.” Using the EAMMF allows managers to determine what steps are needed for improving architecture management.

Go to top of page ↑

Six Core Processes DoDAF Supports

Organizations within the DoD may define local change management processes, supportable by Architectural Descriptions, while adhering to defined decision support processes mandated by the Department, including JCIDS, the DAS, SE, PPBE, Net-centric Integration, and PfM. These key support processes are designed to provide uniform, mandated, processes in critical decision-making areas, supplemented by individual agency operations, defined by Architectural Descriptions tailored to support those decisions-making requirements.

Joint Capability Integration and Development System

The primary objective of the JCIDS process is to ensure warfighters receive the capabilities required to execute their assigned missions successfully. JCIDS defines a collaborative process that utilizes joint concepts and integrated Architectural Descriptions to identify prioritized capability gaps and integrated joint Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF) and policy approaches (materiel and non-materiel) to resolve those gaps. JCIDS implements an integrated, collaborative process to guide development of new capabilities through changes in joint DOTMLPF and policy.

JCIDS process owners have written policy to support architecture requirements (i.e., specific product sets required in specific documents, such as the Information Support Plan, Capability Development Document, and Capability Production Document) that permits components and lower echelon commands to invoke the JCIDS process for requirements at all levels.

Defense Acquisition System

The DAS exists to manage the nation's investments in technologies, programs, and product support necessary to achieve the National Security Strategy and support employment and maintenance of the United States Armed Forces. The DAS uses Joint Concepts, integrated architectures, and DOTMLPF analysis in an integrated, collaborative process to ensure that desired capabilities are supported by affordable systems and other resources.

DoD Directive 5000.1 provides the policies and principles that govern the DAS. In turn, DoD Instruction 5000.2, Operation of the DAS establishes the management framework for translating mission needs and technology opportunities, based on approved mission needs and requirements, into stable, affordable, and well-managed acquisition programs that include weapon systems and automated information systems (AISs). The Defense Acquisition Management Framework provides an event-based process where acquisition programs advance through a series of milestones associated with significant program phases.

The USD (AT&L) leads the development of integrated plans or roadmaps using integrated architectures as its base. DoD organizations use these roadmaps to conduct capability assessments, guide systems development, and define the associated investment plans as the basis for aligning resources and as an input to the Defense Planning Guidance (DPG), Program Objective Memorandum (POM) development, and Program and Budget Reviews.

Systems Engineering

DoD Acquisition policy directs all programs responding to a capabilities or requirements document, regardless of acquisition category, to apply a robust SE approach that balances total system performance and total cost with the family-of-systems, and system-of-systems context. Programs develop a Systems Engineering Plan (SEP) for Milestone Decision Authority (MDA) that describes the program's overall technical approach, including activities, resources, measures (metrics), and applicable performance incentives.

SE processes are applied to allow an orderly progression from one level of development to the next detailed level using controlled baselines. These processes are used for the system, subsystems, and system components as well as for the supporting or enabling systems used for the production, operation, training, support, and disposal of that system. Execution of technical management processes and activities, such as trade studies or risk management activities may point to specific requirements, interfaces, or design solutions as non-optimal and suggest change to increase system-wide performance, achieve cost savings, or meet scheduling deadlines.

Architecture supports SE by providing a structured approach to document design and development decisions based on established requirements.

Planning, Programming, Budgeting, and Execution

The PPBE process allocates resources within the DoD and establishes a framework and process for decision-making on future programs. PPBE is a systematic process that guides DoD's strategy development, identification of needs for military capabilities, program planning, resource estimation, and allocation, acquisition, and other decision processes.

JCIDS is a key supporting process for PPBE, providing prioritization and affordability advice.

DoDAF V2.0 supports the PPBE process by identifying the touch points between architecture and the PPBE process, identifying the data to be captured within an Architectural Description, facilitating informed decision-making, and identifying ways of presenting data to various stakeholders/roles in the PPBE decision process.

Portfolio Management

DoD policy requires that IT investments be managed as portfolios to ensure IT investments support the Department's vision, mission, and goals; ensure efficient and effective delivery of capabilities to the Warfighter; and maximize return on investment within the enterprise. Each portfolio may be managed using the architectural plans, risk management techniques, capability goals and objectives, and performance measures. Capability architecting is done primarily to support the definition of capability requirements. PfM uses the Architectural Description to analyze decisions on fielding or analysis of a needed capability.

Architectural support to PfM tends to focus on the investment decision itself (although not exclusively), and assists in justifying investments, evaluating the risk, and providing a capability gap analysis.

Operations

In most cases, an enterprise will capture its routine or repeatable business and mission operations as architectural content. However, when the basic structure of an activity is very stable and the activity repeated often, such as military operations planning or project definition and management, the enterprise may choose to include that structure as part of the Architectural Description itself. In this case, the architecture repository may be enhanced to include templates, checklists, and other artifacts commonly used to support the activity.

The JCIDS, PPBE, and DAS processes establish a knowledge-based approach, which requires program managers to attain the right knowledge at critical junctures to make informed program decisions throughout the acquisition process. The DoD IT PfM process continues to evolve that approach with emphasis on individual systems and/or services designed to improve overall mission capability. Consistent with OMB Capital Planning and Investment Control (CPIC) guidance, the DoD uses four continuous integrated activities to manage its portfolios – analysis, selection, control, and evaluation. The overall process is iterative, with results being fed back into the system to guide future decisions.

Go to top of page ↑

DM2 Support for the Six Core Processes DoDAF Supports

The DoDAF V2.0 Meta-model Groups support the viewpoints and DoD Key Processes of JCIDS, DAS, PPBE, System Engineering, Operations, and Portfolio Management (IT and Capability). The table below indicates a non-inclusive mapping of DoDAF Meta-model Groups to the DoDAF Viewpoints and DoD Key Processes. The support for the Key Processes is for the information requirements that were presented at the workshops for the key processes and, as such, do not reflect all of the information requirements that a key process could need.

DoDAF Meta-model Groups Mapping to Viewpoints and DoD Key Processes

	View Points	**DoD Key Processes**
Metamodel Data Groups	AV, CV, DIV,OV,PV,StdV, SvcV, SV	JCIDS, DAS, PPBE, System Engineering, Operations, Portfolio Management (IT and Capability)
Performer	CV, OV, PV,StdV, SvcV,	J, D, P, S, O, C

	SV	
Activity	OV	J, O, C
Resource Flow	AV, CV, DIV,OV,PV,StdV	J, S, O
Data and Information	AV, DIV	J, D, P, S, O, C
Capability	CV, PV, SV, SvcV	J, D, P, S, O, C
Services	CV, StdV, SV	P, S, C
Project	AV, CV, PV, SvcV, SV	D, P, S, C
Training/Skill/Education	OV, SV, SvcV, StdV	J, S, O
Goals	CV, PV	J, D, P, O, C
Rules	OV, StdV, SvcV, SV	J, D, S, O
Measures	SvcV, SV	J, D, S, O, C
Location	SvcV, SV	P, S, O

Go to top of page ↑

What is New in DoDAF V2.0

The major changes for DoDAF V2.0 are:

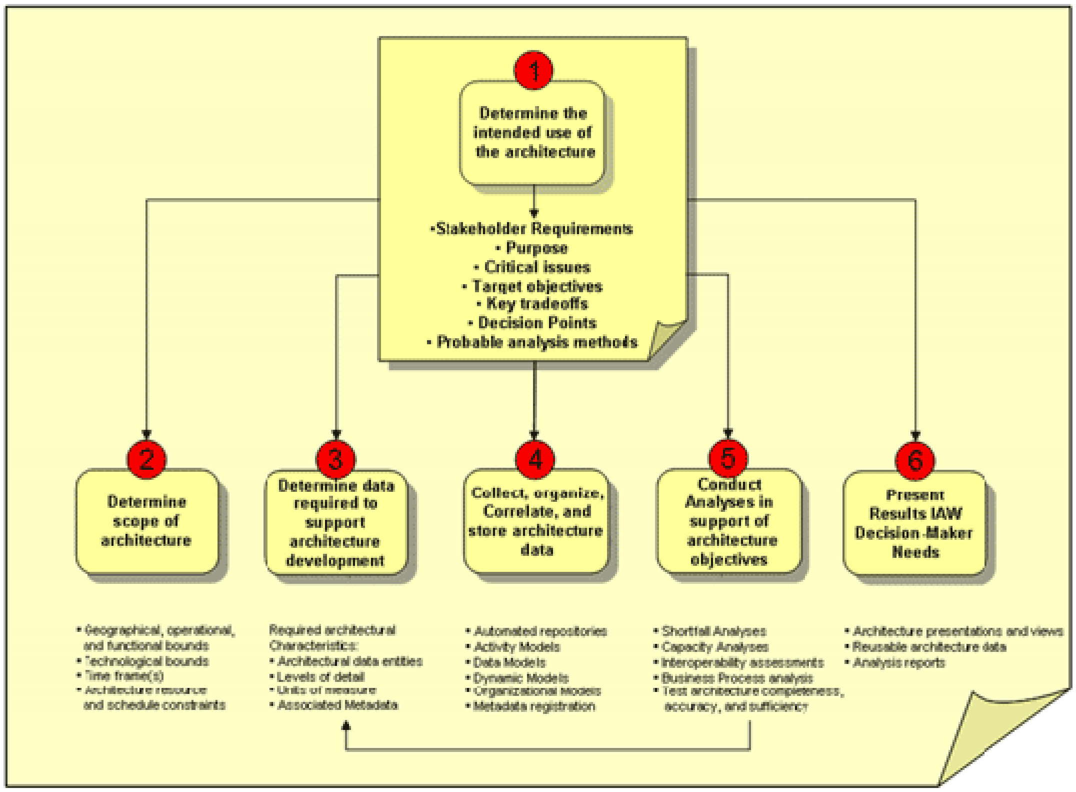
- The major emphasis on architecture development has changed from a product-centric process to a data-centric process designed to provide decision-making data organized as information for the manager.
- Products have been replaced by views that represent specific types of presentation for architectural data and derived information. With the focus on data, DoDAF V2.0 does not have products but has DoDAF-described Models. Rather than the Operational Viewpoint-5 (OV-5) Operational Activity Model Product, there is the Activity Model with the same supporting data. This is shifting the focus of the architecture effort onto the data early in the Architecture Development Process.
- Architecture views are, in turn, organized into viewpoints, which provide a broad understanding of the purpose, objectives, component parts, and capabilities represented by the individual architectural views.
- The three major viewpoints of architecture described in previous version (e.g., Operational, Technical, and System) have been changed to more specific viewpoints that relate to the collection of architecture-related data which can be organized as useful information for the manager in decision-making. To support customer requirement and re-organization needs:
    - All the models of data—conceptual, logical, or physical—have been placed into the Data and Information Viewpoint.
    - The Technical Standards Viewpoint has been updated to the Standards Viewpoint and can describe business, commercial, and doctrinal standards, in addition to technical standards.
    - The Operational Viewpoint now can describe rules and constraints for any function (business, intelligence, warfighting, etc.) rather that just those derived from data relationships.
    - Due to the emphasis within the Department on Capability PfM and feedback from the Acquisition community, the Capability Viewpoint and Project Viewpoint have been added.

- System has changed from DoDAF V1.5. System is not just computer hardware and computer software. System is now defined in the general sense of an assemblage of components - machine, human - that perform activities (since they are subtypes of Performer) and are interacting or interdependent. This could be anything, i.e., anything from small pieces of equipment that have interacting or interdependent elements, to Family of Systems (FoS) and System of Systems (SoS). Note that Systems are made up of Materiel (e.g., equipment, aircraft, and vessels) and Personnel Types.
- The Department initiatives for Architecture Federation and Tiered Responsibility have been incorporated into Version 2.0.
- Requirements for sharing of data and derived information in a Federated environment are described.
- Specific types of architecture within the Department have been identified and described (e.g., Department-level [which includes Department, Capability & Component architectures] and Solution Architectures).
- The DoD Enterprise Architecture is described.
- Linkages to the Federal Enterprise Architecture are defined and described.
- Architecture constructs originally described in the UK Ministry of Defence Architecture Framework (MODAF), the NATO Architecture Framework (NAF), and the Open Group Architecture Framework (TOGAF) are adopted for use within DoDAF.
- A DoDAF Meta-model (DM2), containing a Conceptual Data Model (CDM), a Logical Data Model (LDM), and a Physical Exchange Specification (PES) has been created.
- Approaches to SOA development are described and discussed.
- For the architect, DoDAF V2.0 changes the focus of the Architecture Development Process are described in "What Does the Architect Need to Do"? The basis of the Architecture Development Process is now the Data Meta-model Groups, described in the LDM.
- To align with ISO Standards, where appropriate, the terminology has changed from Views to Viewpoint (e.g., the Operational View is now the Operational Viewpoint).
- DoDAF can capture the security markings and is described in the PES. In addition, a discussion of the security characteristics mapped to the DoDAF Concepts has been added.
- In DoDAF V1.5 and previous versions, Nodes are logical concepts that caused issues in the exchange and discussion of architectures. In one architecture that was reviewed, Operational Nodes mapped to System, Organization, Person Type, Facility, Materiel, and Installation. Within the same architecture, System Node maps to System, Materiel, Organization, and Location. The overlap Organizational and System nodes (System, Organization, Material) illustrates the complexity of trying to define Nodes. The concrete concepts of Node (including Activities, System, Organization, Person Type, Facility, Location, Materiel, and Installation) were incorporated into the DoDAF Meta-model. Since Nodes are logical concepts that could be used to represent the more concrete concepts of activities, systems, organizations, personnel types, facilities, locations, materiels, and installations or combinations of those things, DoDAF V2.0 focuses on those concrete concepts. There will not be a mapping of Node to the DoDAF V2.0 Meta-model Groups, concepts, classes, or associations. For the architect, there are some changes in architecture development:
    - When appropriate, DoDAF V1.0 and V1.5 architectures that use the Node concept will need to update the architecture to express the concrete concepts in place of the abstract concept that Node represents. When pre-DoDAF V2.0 architecture is compared with DoDAF V2.0 architecture, the concrete concepts that Node represents must be defined for the newer architecture.
    - DoDAF V2.0 architectures will need to express the concrete concepts (activities, systems, organizations, personnel types, facilities, locations, materiels, and installations, etc.).

Go to top of page ↑

Architecture Development

6-Step Architecture Development Process



Architecture Development 6-Step Process

Step 1: Determine Intended Use of Architecture
Step 2: Determine Scope of Architecture
Step 3: Determine Data Required to Support Architecture Development
Step 4: Collect, Organize, Correlate, and Store Architectural Data
Step 5: Conduct Analyses in Support of Architecture Objectives
Step 6: Document Results in Accordance with Decision-Maker Needs

The high-level, 6-step architecture development process provides guidance to the architect and Architectural Description development team and emphasizes the guiding principles. The process is data-centric rather than product-centric (e.g., it emphasizes focus on data, and relationships among and between data, rather than DoDAF V1.0 or V1.5 products). This data-centric approach ensures concordance between views in the Architectural Description while ensuring that all essential data relationships are captured to support a wide variety of analysis tasks. The views created as a result of the architecture development process provide visual renderings of the underlying architectural data and convey information of interest from the Architectural Description needed by specific user communities or decision makers. The figure above depicts this 6-step process.

NOTE: It is important to note that the development of Architectural Description is an iterative process and a unique one, in that every Architectural Description is:

- Different in that architecture creation serves a specific purpose, and is created from a particular viewpoint.
- Serving differing requirements, necessitating different types of views to represent the collected data.
- Representative of a 'snapshot in time' (e.g., the Architectural Description may represent the current view or baseline, or it may represent a desired view in some future time).
- Changeable over time as requirements become more focused or additional knowledge about a process or requirement becomes known.

The methodology described below is designed to cover the broadest possible set of circumstances, and also to focus on the most commonly used steps by the architecture community.

Step 1: Determine Intended Use of Architecture. Defines the purpose and intended use of the architecture ("Fit-for-Purpose"); how the Architectural Description effort will be conducted; the methods to be used in architecture development; the data categories needed; the potential impact on others; and the process by which success of the effort will be measured in terms of performance and customer satisfaction. This information is generally provided by the process owner to support architecture development describing some aspect of their area of responsibility (process, activity, etc.).

A template for collection of high-level information relating to the purpose and scope of the Architectural Description, its glossary, and other information, has been developed for registration of that data in DARS.

Step 2: Determine Scope of Architecture. The scope defines the boundaries that establish the depth and breadth of the Architectural Description and establish the architecture's problem set, helps define its context and defines the level of detail required for the architectural content. While many architecture development efforts are similar in their approach, each effort is also unique in that the desired results or effect may be quite different. As an example, system development efforts generally focus first on process change, and then concentrate on those automated functions supporting work processes or activities. In addition to understanding the process, discovery of these 'system functions' is important in deciding how to proceed with development or purchase of automation support.

Information collected for Architectural Descriptions describing services is similar to information collected for Architectural Descriptions describing systems. For describing services, Architectural Description will collect additional information concerning subscriptions, directory services, distribution channels within the organization, and supporting systems/communications web requirements.

Similar situations occur with Architectural Description development for joint operations. Joint capabilities are defined processes with expected results, and expected execution capability dates. The Architectural Descriptions supporting the development of these types of capabilities usually require the reuse of data already established by the military services and agencies, analyzed, and configured into a new or updated process that provides the desired capability. Included are the processes needed for military service and/or agency response, needed automation support, and a clear definition of both desired result and supporting performance measures (metrics). These types of data are presented in models.

The important concept for this step is the clarity of scope of effort defined for the project that enables an expected result. Broad scoping or unclear definition of the problem can delay or prevent success. The process owner has the primary responsibility for ensuring that the scoping is correct, and that the project can be successfully completed.

Clarity of scope can better be determined by defining and describing the data to be used in the proposed Architectural Description in advance of the creation of views that present desired data in a format useful to managers. Early identification of needed data, particularly data about the Architectural Description itself, the subject-matter of the proposed Architectural Description, and a review of existing data from COIs, can provide a rich source for ensuring that Architectural Descriptions, when developed, are consistent with other existing Architectural Descriptions. It also ensures conformance with any data-sharing requirements within the Department or individual COIs, and conformant with the DM2.

An important consideration beginning with this and each subsequent step of the architecture development process is the continual collection and recording of a consistent, harmonized, and common vocabulary. The collection of terms should continue throughout the architecture development process. As architectural data is identified to help clarify the appropriate scope of the architecture effort, vocabulary terms and definitions should be disambiguated, harmonized, and recorded in a consistent AV-2 process documented in the "DoDAF V2.0 Architecture Development Process for the DoDAF-described Models" Microsoft Project Plan.

Analysis of vocabularies across different Architectural Descriptions with similar scope may help to clarify and determine appropriate Architectural Description scope. Specific examples of data identification utilizing the AV-2 Data Dictionary construct are found in the DoDAF Journal.

Step 3: Determine Data Required to Support Architecture Development. The required level of detail to be captured for each of the data entities and attributes is determined through the analysis of the process undergoing review conducted during the scoping in Step 2. This includes the data identified as needed for execution of the process, and other data required to effect change in the current process, (e.g., administrative data required by the organization to document the Architectural Description effort). These considerations establish the type of data collected in Step 4, which relate to the architectural structure, and the depth of detail required.

The initial type of architectural data content to be collected is determined by the established scope of the Architectural Description, and recorded as attributes, associations, and concepts as described in the DM2. A mapping from DM2 concepts, associations, and attributes to architecture models suggests relevant architectural views the architect may develop (using associated architecture techniques) during the more comprehensive and coherent data collection of Step 4. This step is normally completed in conjunction with Step 4, a bottom-up approach to organized data collection, and Architectural Description development typically iterates over these two steps. As initial data content is scoped, additional data scope may be suggested by the more comprehensive content of Architectural Views desired for presentation or decision-making purposes.

This step can often be simplified through reuse of data previously collected by others, but relevant to the current effort. Access to appropriate COI data and other architecture information, discoverable via DARS and the DMR, can provide information on data and other architectural views that may provide useful in a current effort.

Work is presently underway within the Department to ensure uniform representation for the same semantic content within architecture modeling, called Architecture Modeling Primitives. The Architecture Modeling Primitives, hereafter referred to as Primitives, will be a standard set of modeling elements, and associated symbols mapped to DM2 concepts and applied to modeling techniques. Using the Primitives to support the collection of architecture content and, in concert with the PES, will aid in generating common understanding and communication among architects in regard to architectural views. As the Primitives concepts are applied to more modeling techniques, they will be updated in the DoDAF Journal and details provided in subsequent releases of DoDAF. When creating an OV-6c in Business Process Modeling Notation (BPMN), the Primitives notation may be used. DoD has created the notation and it is in the DoDAF Journal. The full range of Primitives for views, as with the current BPMN Primitives, will be coordinated for adoption by architecture tool vendors.

Step 4: Collect, Organize, Correlate, and Store Architectural Data. Architects typically collect and organize data through the use of architecture techniques designed to use views (e.g., activity, process, organization, and data models as views) for presentation and decision-making purposes. The architectural data should be stored in a recognized commercial or government architecture tool. Terms and definitions recorded are related to elements of the (DM2).

Designation of a data structure for the Architectural Description effort involves creation of a taxonomy to organize the collected data. This effort can be made considerably simpler by leveraging existing, registered artifacts registered in DARS, to include data taxonomies and data sets. Each COI maintains its registered data on DARS, either directly or through a federated approach. In addition, some organizations, such as U.S. Joint Forces Command (JFCOM), have developed templates, which provide the basis of a customizable solution to common problems, or requirements, which includes datasets already described and registered in the DMR. Examples of this template-based approach are in the DoDAF Journal.

DARS provides more information that is specific, and guidance on retrieving needed data through a discovery process. Once registered data is discovered, the data can be cataloged and organized within a focused taxonomy, facilitating a means to determine what new data is required. New data is defined, registered in DARS, and incorporated into the taxonomy structure to create a complete defined list of required data. The data is arranged for upload to an automated repository to permit subsequent analysis and reuse. Discovery metadata (i.e., the metadata that identifies a specific Architectural Description, its data, views, and usage) should be registered in DARS as soon as it is available to support discovery and enable federation. Architects and data managers should use the DoD EA Business Reference Model (DoD EA BRM) taxonomy elements as the starting point for their registration efforts. Additional discovery metadata, such as processes and services may be required later, and should follow the same registration process.

Step 5: Conduct Analyses in Support of Architecture Objectives. Architectural data analysis determines the level of adherence to process owner requirements. This step may also identify additional process steps and data collection requirements needed to complete the Architectural Description and better facilitate its intended use. Validation applies the guiding principles, goals, and objectives to the process requirement, as defined by the process owner, along with the published performance measures (metrics), to determine the achieved level of success in the Architectural Description effort. Completion of this step prepares the Architectural Description for approval by the process owner. Changes required from the validation process, result in iteration of the architecture process (repeat steps 3 through 5 as necessary).

Step 6: Document Results in Accordance with Decision-Maker Needs. The final step in the architecture development process involves creation of architectural views based on queries of the underlying data. Presenting the architectural data to varied audiences requires transforming the architectural data into meaningful presentations for decision-makers. This is facilitated by the data requirements determined in Step 3, and the data collection methods employed during Step 4.

DoDAF V2.0 provides for models and views. DoDAF-described Models are those models that enable an architect and development team whose data has already been defined and described consistent with the DM2. The models become views when they are populated with architectural data. These models include those previously described in earlier versions of DoDAF, along with new models incorporated from the MODAF, the NATO NAF, and TOGAF that have relevance to DoD architecture development efforts.

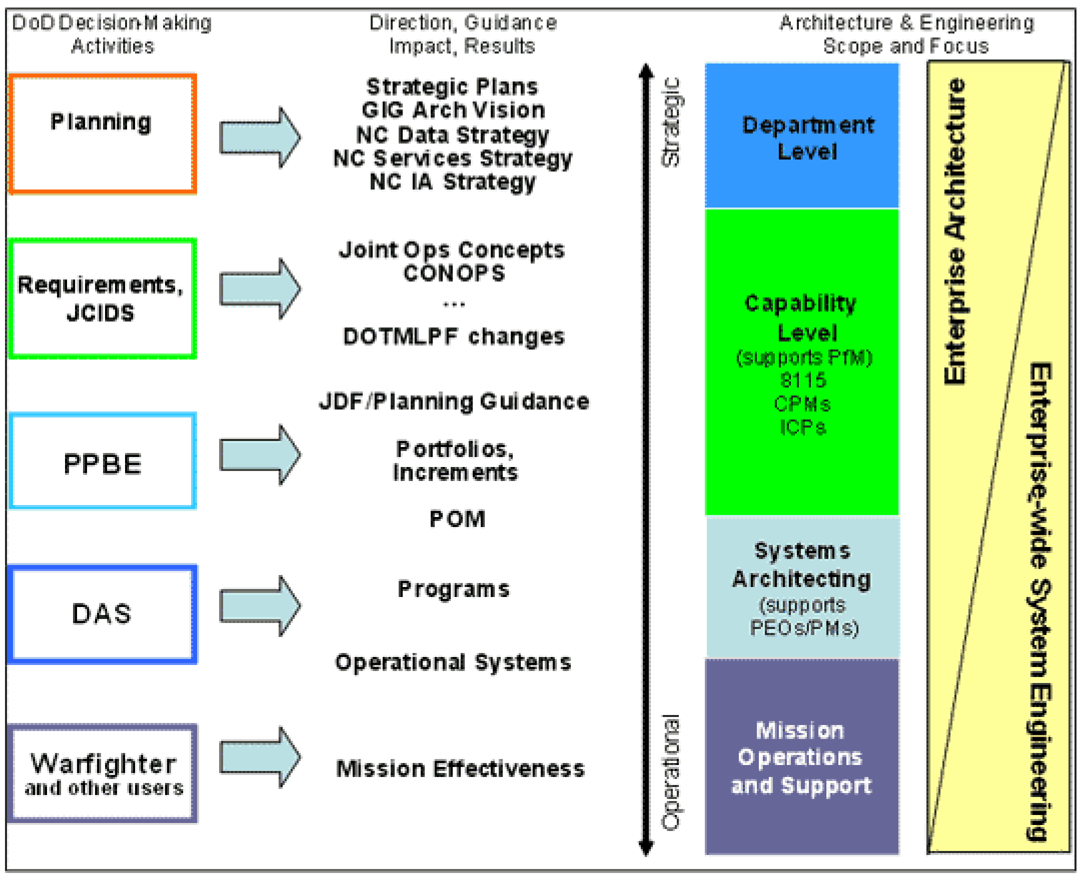
Fit-for-Purpose Views are user-defined views that an architect and development team can create to provide information necessary for decision-making in a format customarily used in an agency. These views should be developed consistent with the DM2, but can be in formats (e.g., dashboards, charts, graphical representations) that are normally used in an agency for briefing and decision purposes. An Architectural Description development effort can result in an Architectural Description that is a combination of DoDAF-described Models and Fit-for-Purpose Views.

DoDAF does not require specific models or views, but suggests that local organizational presentation types that can utilize DoDAF-created data are preferred for management presentation. A number of available architecture tools support the creation of views described in this step. The PES provides the format for data sharing.

NOTE: DoDAF V2.0 does NOT prescribe a Physical Data Model, leaving that task to the software developers who will implement the principles and practices of DoDAF in their own software offerings.

Scoping Architectures to be "Fit-for-Purpose"

Establishing the scope of an architecture is critical to ensuring that its purpose and use are consistent with specific project goals and objectives. The term “Fit-for-Purpose” is used in DoDAF to describe an architecture (and its views) that is appropriately focused (i.e., responds to the stated goals and objectives of process owner, is useful in the decision-making process, and responds to internal and external stakeholder concerns. Meeting intended objectives means those actions that either directly support customer needs or improve the overall process undergoing change. The architect is the technical expert who translates the decision-maker’s requirements into a set of data that can be used by engineers to design possible solutions. At each tier of the DoD, goals and objectives, along with corresponding issues that may exist should be addressed according to the established scope and purpose, (e.g., Departmental, Capability, SE, and Operational), as shown in the notional diagram in the figure below.



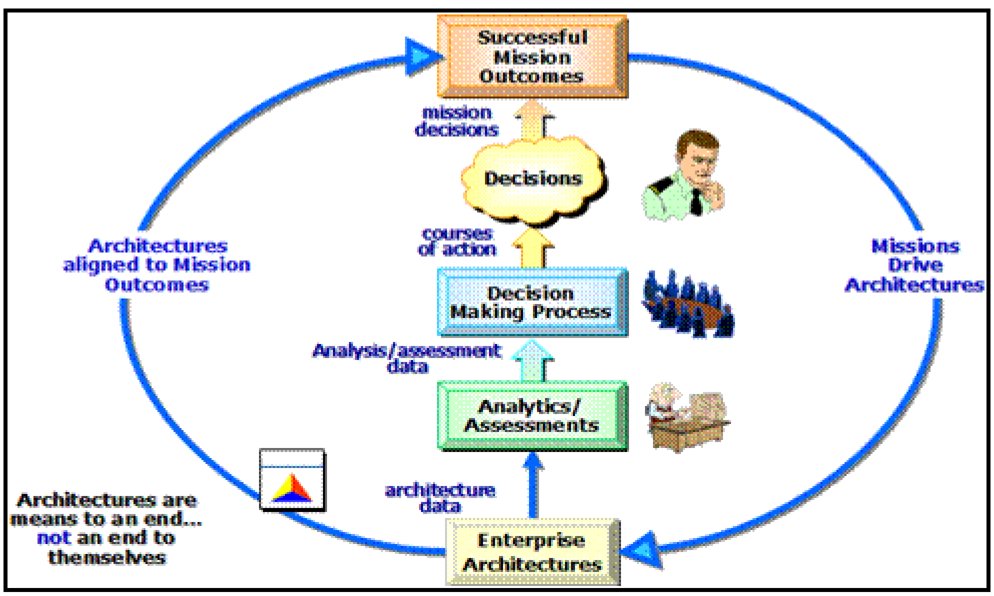
Establishing the Scope for Architecture Development

Establishing a scope for an architecture effort at any tier is similarly critical in determining the architecture boundaries (Purpose and Use expected), along with establishing the data categories needed for analysis and management decision-making. Scope also defines the key players whose input, advice, and consensus is needed to successfully architect and implement change (i.e., Stakeholders, both internal and external). Importantly, scope also determines the goals and objectives of the effort, consistent with both boundaries and stakeholders; since goals and objectives define both the purpose for architecture creation and the level of the architecture. Establishing the scope of an effort also determines the level of complexity for data collection and information presentation.

Architecture development also requires an understanding of external requirements that may influence architecture creation. An architecture developed for an internal agency purpose still needs to be mappable, and consistent with, higher level architectures, and mappable to the DoD EA. For some architecture developments, consideration must be given in data collection and graphical presentation to satisfaction of other external requirements, such as upward reporting and submission of architectural data and models for program review, funding approval, or budget review due to the sensitivity or dollar value of the proposed solution. This site contains guidance on data collection for specific views required by instruction, regulation, or other regulatory guidance (i.e., Exhibit 53, or Exhibit 300 submissions; OMB Segment architecture reviews, or interoperability requirements).

Architecture scoping must facilitate alignment with, and support the decision-making process and ultimately mission outcomes and objectives as shown in the figure below. Architectural data and supporting views, created from organizing raw data into useful information, and collected into a useful viewpoint, should enable domain experts, program managers, and decision makers to utilize the architecture to locate, identify, and resolve definitions, properties, facts, constraints, inferences, and issues, both within and across architectural boundaries that are redundant, conflicting, missing, and/or obsolete. DoDAF V2.0 provides the flexibility to develop both Fit-for-Purpose Views (User-developed Views) and views from DoDAF-described Models to maximize the capability for decision-making at all levels. The figure below shows how the development of architectures supports the management decision process. In this case, the example shows how an architecture and the use of it in analysis can facilitate the ability to determine and/or validate mission outcome.

Analysis also uncovers the effect and impact of change (“what if”) when something is redefined, redeployed, deleted, moved, delayed, accelerated, or no longer funded. Having a disciplined process for architecture development in support of analytics will produce quality results, not be prone to misinterpretations, and therefore, be of high value to decision makers and mission outcomes.



Mission Outcomes Supported by Architectures

Enterprise Architecture

“Today, the encouraging coalescence among leaders is that many enterprise systems have the same architectural approach—although not all express it in the same way. A similar convergence addresses the kinds of techniques, pattern, and

designs that are independent of specific application domains, and that enable effective production of responsive, scalable, flexible, and unifiable enterprise applications."

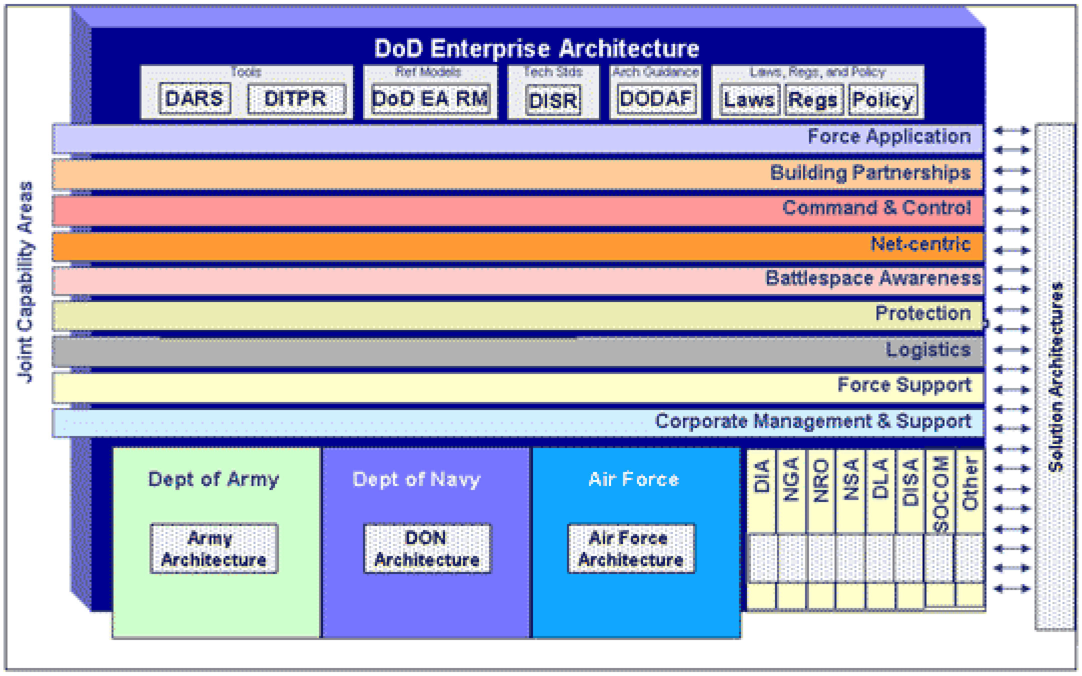
Within DoD, Enterprise Architecture (EA) has been seen for many years as providing product-oriented insight into a wide range of data, programs, and activities, organized through Communities of Interest (COI). The data-centric approach to DoDAF V2.0 is designed to facilitate the reuse and sharing of COI data. Since DoDAF provides the conceptual, logical, and PES but does not otherwise prescribe the configuration of the product composition, architects and stakeholders are free to create their views of data that best serve their needs.

Introduction and Overview

An Architectural Description is a strategic information asset that describes the current and/or desired relationships between an organization's business, mission and management processes, and the supporting infrastructure. Architectural Descriptions define a strategy for managing change, along with transitional processes needed to evolve the state of a business or mission to one that is more efficient, effective, current, and capable of providing those actions needed to fulfill its goals and objectives. Architectural Descriptions may illustrate an organization, or a part of it, as it presently exists; any changes desired (whether operational or technology-driven); and the strategies and projects employed to achieve the desired transformation. An Architectural Description also defines principles and goals and sets direction on issues, such as the promotion of interoperability, intra-, and interagency information sharing, and improved processes, that facilitate key DoD program decisions.

Such support extends beyond details or summaries of operational and systems solutions, and includes program plans, programmatic status reporting, financial and budget relationships, and risk management. In addition to detailed views of individual solutions, the framework supports the communication of enterprise-wide views and goals that illustrate the context for those solutions, and the interdependencies among the components. Beyond the solution space, standard mechanisms for communicating program plans, financial information, and project status are established so that executives and managers can evaluate and direct their programs.

The DoD EA is an Architectural Description that is an enterprise asset used to assess alignment with the missions of the DoD enterprise, to strengthen customer support, to support capability portfolio management (PfM), and to ensure that operational goals and strategies are met. The DoD EA is shown below. It is comprised of DoD architecture policy, tools, and standards, DoD-level Architectural Descriptions like the DoD Information Enterprise Architecture (DoD IEA), DoD-level Capability Architectural Descriptions, and Component Architectural Descriptions. Its purposes are to guide investment portfolio strategies and decisions, define capability and interoperability requirements, provide access to Segment architecture information, to establish and enforce standards, guide security and information assurance requirements across the Department of Defense, and provide a sound basis for transition from the existing DoD environment to the future. The DoD EA is a federation of Architectural Descriptions with which Solution Architectural Descriptions must conform. Its content includes but is not limited to rules, standards, services and systems lifecycle information needed to optimize and maintain a process, or part of a process that a self-sufficient organization wants to create and maintain by managing its IT portfolio. The DoD EA provides a strategy that enables the organization to support its current operations while serving as the roadmap for transitioning to its target environment. Transition processes include an organization's PfM, PPBE, and EA planning processes, along with services and systems lifecycle methodologies.



Components of the DoD EA

The JCA portfolios describe future, required operational, warfighting, business, and Defense intelligence capabilities, together with the systems and services required. They provide the organizing construct for aligning and federating DoD EA content to support the Department portfolio management structure. The description of the future DoD operating environment and associated capability requirements represent the target architecture of the DoD EA. These are time-phased as determined by functional owners and JCA developers.

Migration in a net-centric operating environment from the “As-Is” to the “To-Be” requires that the DoD Information Environment Architecture (DoD IEA) and the Net-Centric strategies act as uniform references for, and guide the transition sequence to ensure that both operational/business capabilities and IT capabilities, as required, are properly described. Policy is being developed by the DoD CIO to describe how federation will be used to mature the DoD EA as well as its relationship to federated, solution Architectural Descriptions.

Transition Planning

As discussed above, one major impetus for creating and using Architectural Descriptions is to guide acquisition and development of new enterprises, capabilities and systems or improvements to existing ones. Earlier versions of DoDAF addressed this need exclusively using “As-Is” and “To-Be” Architectural Descriptions, along with a Systems and/or Services Technology Forecast. The “As-Is” and “To-Be” concepts are time-specific snapshots of DoDAF views that initially served as the endpoints of a transition process. However, this transition strategy has several potential pitfalls, to include the difficulty in accurately representing the “As-Is” starting point where legacy systems are sometimes poorly documented, and processes are largely undefined. There is also the consideration that long-term goals are often very flexible, resulting in flux in the “To-Be” version.

Since the “As-Is” and “To-Be” Architectural Descriptions are time-specific versions of similar sets of data with similar viewpoints, transition planning is able to chart an evolutionary path from the “As-Is” to its corresponding “To-Be” architectural vision given a clear understanding of the expected outcomes or objectives through some future (perhaps undefined) future point. It is expected that the To-Be Architectural Descriptions will change over time as Departmental priorities shift and realign.

Federated Approach to DoD Architecture Management

The Department has adopted a federated approach to distributed architectural data collection, organization, and management among the Services, Agencies and COIs as its means of developing the DoD Enterprise Architecture, with a virtual rather than physical data set described through supporting documentation and architectural views. This approach provides increased flexibility while retaining significant oversight and quality management services at the Departmental level. Detailed guidance on the DoD federation approach will be contained in DoDD 8210, “Architecting the DoD Enterprise.”

Tiered Accountability

Tiered Accountability (TA) is the distribution of authority and responsibility to a DoD organization for an element of the DoD EA. Under TA, DoD is defining and building enterprise-wide capabilities that include data standards, business rules, enabling systems, and an associated layer of interfaces for Department, specified segments of the enterprise (e.g., JCA, DoD Components), and Programmatic solutions. Each tier has specific goals, as well as responsibilities to the tiers above or below them.

Architectural Descriptions are categorized when developed to facilitate alignment (mapping and linking), cataloging, navigating, and searching disparate architecture information in a DoD registry of holdings. All Architectural Descriptions developed by the tiers should be federated, as described in the DoD Federation Strategy.

Alignment in the tiers is required for the DoD EA to be discoverable, shareable, and interoperable. Architectural Descriptions can also support many goals within the tiers, each of which may imply specific requirements for structure, content, or level of detail. Alignment decisions should balance the interdependence of Architectural Descriptions with the need for local flexibility to address local issues. Alignment describes the minimum constraints needed to ensure consistency across architecture levels. Architectural Descriptions often relate at some ‘touch point’ to other Architectural Descriptions on the same level, level(s) above, or level(s) below, and should be discovered and utilized in the development of Architectural Descriptions to ensure that appropriate linkages are created and maintained. The need to plan for them implies that each Architectural Description sharing a touch-point should be available to architects on both sides. The DMR for data and the DARS for architecture registration facilitate the ability to discover and utilize architectural data, with the caveat that any touch-points within the purview of an established COI adhere to COI guidance.

DoD Architecture Enterprise Services

The next generation of DoD Enterprise Architectures will be constructed by employing a set of DoD Architecture Enterprise Services (DAES) for registering, discovering, aligning, translating, and utilizing architectural data, and derived information to support key DoD decision processes through implementing the concepts of the DoD Net-Centric Strategies. DAES will be implemented using Web Services, in which specific content and/or functionality is provided by one user for others, many of whom may be unknown to the provider. An Operational Resource Flow Description (A redesigned Operational Viewpoint 2 (OV-2) DoDAF-described Model) has been retained in DoDAF V2.0 to describe those services that can be discovered and subscribed from one or more specific sources and delivered to one or more known or unknown subscribers.

Registration of architectures, one of the goals of the NCDS , is the first step toward enabling discovery of architecture metadata. DAES includes a registration service to register the metadata (through the DMR), and a method to describe the purpose and scope of an Architectural Description (through DARS). The registration service will enable cataloging of Architectural Descriptions in federated repositories, and, once complete, Architectural Descriptions are ‘available’ for discovery. When an Architectural Description is discoverable, it can be aligned to, linked to, or re-used by other Architectural Descriptions. The discovery service enables users to execute a federated search for architecture holdings meeting specified search parameters.

Alignment to the Federal Enterprise Architecture

The OMB established the Federal Enterprise Architecture (FEA) program in 2003 to build a comprehensive business-driven blueprint of the entire Federal Government. OMB’s Circular

A-11 requires that Cabinet-level agencies, including the DoD, link their budget submissions to the FEA, and annually evaluates those submissions through the Enterprise Architecture Assessment Program, which establishes an evaluation score for overall agency progress.

The core principles of the FEA program are:

- Business-driven approach.
- Promote collaboration of effort and reuse.
- Improve efficiency and effectiveness of business operations through the use of enterprise architecture for the capital investment process.
- Demonstrate cost savings and cost avoidance through improved core processes, and cross-agency sharing and mutual investment.

DoD leverages the FEA construct and core principles to provide the Department with the enterprise management information it needs to achieve its own strategic transformation goals and respond to upward reporting requirements of OMB. The primary objective is to improve DoD performance, using EA, by providing a framework for cross-mission analysis and identification of gaps and redundancies; and by developing transition plans and target architectures that will help move DoD to the net-centric environment.

Several Federal and DoD-specific EA artifacts exist that describe enterprise-level management information. These include:

- The President's Management Agenda.
- OMB A-11 Exhibit 300 submissions.
- OMB FEA Practice Guidance.
- OMB EA Assessment Guide.
- OMB FEA Reference Models.
- DoD EA Reference Model (RM) Taxonomy.
- DoD EA Consolidated RM.
- DoD EA Transition Strategy.
- DoD Segment Architectures.
- DoD EA Self-Assessment.
- DoD Architecture Federation Strategy.

These artifacts facilitate the alignment with the FEA, contribute to a broader understanding of architecture alignment, provide a basis for federated Architectural Descriptions, promote a more efficient and effective use of assets, and ultimately lead to better decision-making.

When developing architectures, particularly at the Departmental and Component levels, alignment with the FEA is accomplished by utilizing the Federal Enterprise Architecture-Consolidated Reference Model (FEA-CRM) documents together with DoD documents and references as a basis for defining processes, data, services, and technical standards. As an example, when a process owner determines that an Architectural Description is needed for some specific purpose, the first references to use are as shown below, as well as other Architectural Descriptions above and below the level of the Architectural Description under development. The DoD-level information is contained in the DoD EA Reference Models, along with the implementing guidance, standards, and descriptions of Department-wide information that is mapped to the FEA-CRM in accordance with the FEA construct.

References to Architectural Description Development

Resource	Description	Architecture Use
Determine Processes Involved	DoDAF FEA Business Reference Model (BRM)	(DoDAF) Determine techniques and notation to be used (FEA BRM) Determine FEA business processes to align to; use taxonomies in BRM to name processes
Identify and Define data	DM2 (DM2) FEA Data Reference	(DM2) Data Group and metadata structures (DRM) Existing Government-wide metadata for

	Model (DRM)	linkage to architecture
Document Architectural Description and Ensure Compliance	DoDAF DoD Metadata Registry (DMR) DoD Architecture Registry System (DARS) Toolset OMB EA Guidance Federated Enterprise Architecture-Consolidated Reference Model (FEA-CRM) OMB EA Assessment Guide	(DoDAF) provides described models, and guidance on creating Fit-for-Purpose Views for presentation purposes (DMR) Provides existing metadata to use in conjunction with DMR to create data required (DARS) provides registration services for architecture discovery (Toolset) provides automated notation method for creating views (OMB EA Guidance) provides information on required format and content of EA for OMB 53/300 process (OMB EA Assess. Guide) provides guidance on evaluation of architectures submitted to OMB for review
Publish Architecture	DoD Architecture Federation Strategy Agency Repository DARS	(DoD Fed. Strategy) provides guidance on architectural data discovery (Agency Repository) stores EA Data (DARS) Providers EA contact information

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

Architecture Development

Meta-Model

- Conceptual
- Logical
- PES
- IDEAS Foundation Ontology

Viewpoints & Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoD EA Conference 2011

Hampton, VA April 11-15, 2011
Registration will be available at:
WWW.DODENTERPRISEARCHITECTURE.ORG
Targeted Date TBD
Co-hosted by DoD CIO Architecture, Standards & Interoperability Directorate and Joint Staff

DoDAF Meta-Model (DM2)

The Purpose of the DoDAF Meta Model (DM2)

The purpose of DoDAF is to define concepts and models usable in DoD's six core processes:

1. Capabilities Integration and Development (JCIDS)
2. Planning, Programming, Budgeting, and Execution (PPBE)
3. Acquisition System (DAS)
4. Systems Engineering (SE)
5. Operations Planning
6. Capabilities Portfolio Management (CPM)

In addition, DoDAF 2.0's specific goals were to:

1. Establish guidance for architecture content as a function of purpose – "fit for purpose"
2. Increase utility and effectiveness of architectures via a rigorous data model – the DoDAF Meta Model (DM2) -- so the architectures can be integrated, analyzed, and evaluated to mathematical precision.

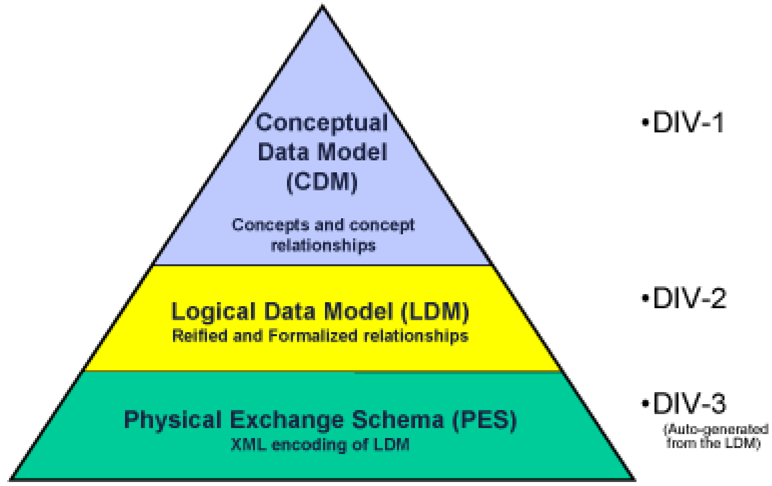
The purposes of the DM2 are:

1. Establish and define the ***constrained vocabulary*** for description and discourse about DoDAF models (formerly "products") and their usage in the 6 core processes
2. Specify the s***emantics and format*** for federated EA data exchange between:architecture development and analysis tools and architecture databases across the DoD Enterprise Architecture (EA) Community of Interest (COI) and with other authoritative data sources
3. Support ***discovery and understandability*** of EA data:
   - Discovery of EA data using DM2 categories of information
   - Understandability of EA data using DM2's precise semantics augmented with linguistic traceability (aliases)
4. Provide a basis for semantic precision in architectural descriptions to support heterogeneous architectural description ***integration and analysis*** in support of core process decision making.

The DM2 defines architectural data elements and enables the integration and federation of Architectural Descriptions. It establishes a basis for semantic (i.e., understanding) consistency within and across Architectural Descriptions. In this manner, the DM2 supports the exchange and reuse of architectural information among JCAs, Components, and Federal and Coalition partners, thus facilitating the understanding and implementation of interoperability of processes and systems. As the DM2 matures to meet the ongoing data requirements of process owners, decision makers, architects, and new technologies, it will to a resource that more completely supports the requirements for architectural data, published in a consistently understandable way, and will enable greater ease for discovering, sharing, and reusing architectural data across organizational boundaries.
To facilitate the use of information at the data layer, the DoDAF describes a set of models for visualizing data through graphic, tabular, or textual means. These views relate to stakeholder requirements for producing an Architectural Description.

What and Where is the DM2

In accordance with standard data modeling conventions, the DM2 has several levels, as shown in the figure below.



DM2's Three Levels

Each of these is important to a particular viewer of Departmental processes.

1. The conceptual level or Conceptual Data Model ***(CDM)*** defines the high-level data constructs from which Architectural Descriptions are created in non-technical terms, so that executives and managers at all levels can understand the data basis of Architectural Description.
2. The Logical Data Model ***(LDM)*** adds technical information, such as attributes to the CDM and, when necessary, clarifies relationships into an unambiguous usage definition.
3. The Physical Exchange Specification ***(PES)*** consists of the LDM with general data types specified and implementation attributes (e.g., source, date) added, and then generated as an XSD.

The DM2 consists of the following data items:

	Schema files	Definitions and Aliases	Description Documents
CDM	N/A		Conceptual Data Model (CDM) Description, Manager and Core Process Stakeholder's Guide to DM2
LDM	UML and XMI files employing IDEAS Profile	MS Excel file	Logical Data Model (LDM) Description, Architect's Guide
PES	XML Schema Description (XSD)		Physical Exchange Specification (PES), Integrator, Data Analyst, and Developer's Guide

The LDM and PES can be obtained from the DoD Meta Data Registry (MDR) ARCH namespace. The ARCH namespace serves the DoD EA Community of Interest (COI). The DoD MDR is the authoritative source for all DoD metadata. This DoDAF site contains CDM as well as LDM, PES, and ontology documentation.

Go to top of page ↑

Background
Architecture Development
Meta-Model
Conceptual
Logical
PES
IDEAS Foundation Ontology
Viewpoints & Models
Presentation Techniques
Configuration Management Overview
Acronyms List and Glossary of Terms

Site Map
Archives

DM2 - DoDAF Meta-Model

The DM2 Conceptual Data Model

Relationship to Universal Core and the Zachman Framework interrogatives

Relationship of DM2 Principal Elements to DoD's Six Core Processes

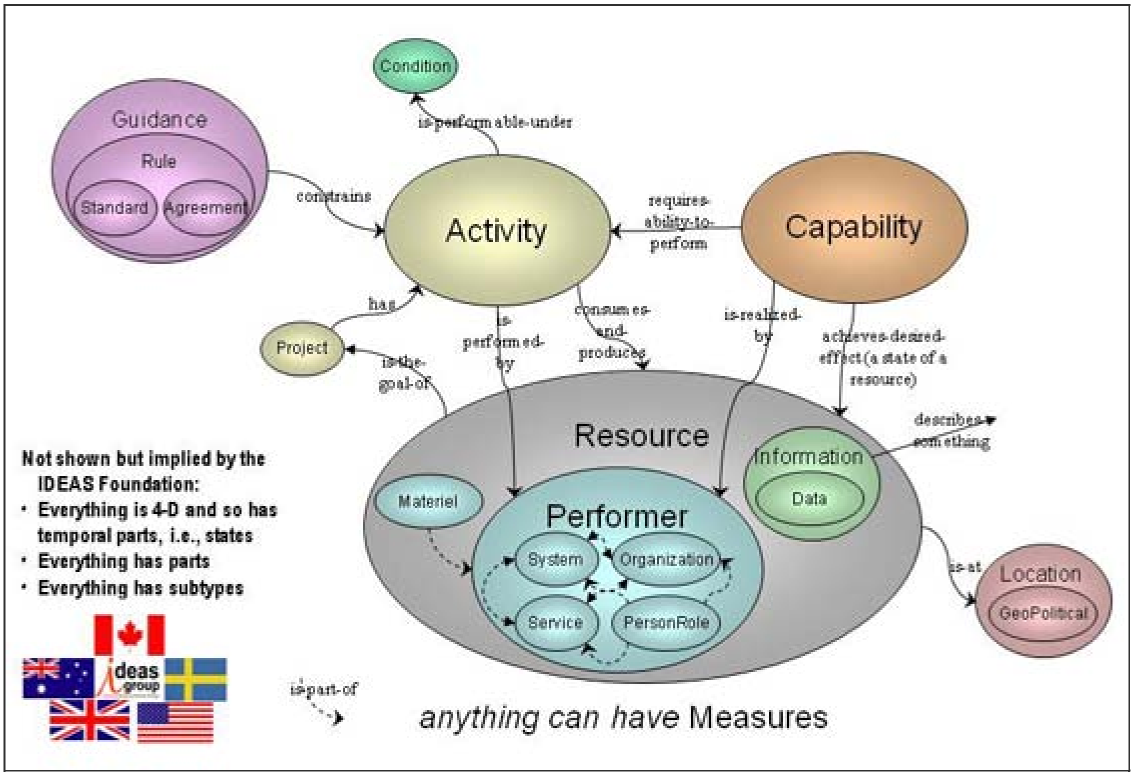
Overview of The DM2 Foundation

The CDM defines concepts involving high-level data constructs from which Architectural Descriptions are created, enabling executives and managers at all levels to understand the data basis of Architectural Description. The key concepts are as follows:

1. **Activity**: Work, not specific to a single organization, weapon system or individual that transforms inputs (Resources) into outputs (Resources) or changes their state.
2. **Resource:** Data, Information, Performers, Materiel, or Personnel Types that are produced or consumed.
    - **Materiel:** Equipment, apparatus or supplies that are of interest, without distinction as to its application for administrative or combat purposes.
    - **Information:** The state of a something of interest that is materialized -- in any medium or form -- and communicated or received.
        - **Data**: Representation of information in a formalized manner suitable for communication, interpretation, or processing by humans or by automatic means. Examples could be whole models, packages, entities, attributes, classes, domain values, enumeration values, records, tables, rows, columns, and fields.
        - **Architectural Description**: Information describing an architecture such as an OV-5b Operational Activity Model.
    - **Performer**: Any entity - human, automated, or any aggregation of human and/or automated - that performs an activity and provides a capability.
        - **Organization**: A specific real-world assemblage of people and other resources organized for an on-going purpose.
        - **System:** A functionally, physically, and/or behaviorally related group of regularly interacting or interdependent elements.
        - **Person Type:** A category of persons defined by the role or roles they share that are relevant to an architecture.
        - **Service:** A mechanism to enable access to a set of one or more capabilities, where the access is provided using a prescribed interface and is exercised consistent with constraints and policies as specified by the service description. The mechanism is a Performer. The capabilities accessed are Resources -- Information, Data, Materiel, Performers, and Geo-political Extents.
3. **Capability**: The ability to achieve a Desired Effect under specified (performance) standards and conditions through combinations of ways and means (activities and resources) to perform a set of activities.
4. **Condition**: The state of an environment or situation in which a Performer performs.
5. **Desired Effect:** A desired state of a Resource.
6. **Measure:** The magnitude of some attribute of an individual.
7. **Measure Type**: A category of Measures.

8. **Location**: A point or extent in space that may be referred to physically or logically.
9. **Guidance:** An authoritative statement intended to lead or steer the execution of actions.
    - **Rule:** A principle or condition that governs behavior; a prescribed guide for conduct or action.
        - **Agreement**: A consent among parties regarding the terms and conditions of activities that said parties participate in.
        - **Standard**: A formal agreement documenting generally accepted specifications or criteria for products, processes, procedures, policies, systems, and/or personnel.
10. **Project**: A temporary endeavor undertaken to create Resources or Desired Effects.
11. **Vision**: An end that describes the future state of the enterprise, without regard to how it is to be achieved; a mental image of what the future will or could be like.
12. **Skill**: The ability, coming from one's knowledge, practice, aptitude, etc., to do something well.

Additional CDM concepts are identified and defined in [DoDAF-DM2 Data Dictionary](#).
The CDM also describes the relationships among data constructs in relatively non-technically and easily understood terms. The figure below is a graphical representation of the CDM.



DM2 Conceptual Data Model (DIV-1) Diagram

[Go to top of page ↑](#)

DM2 - DoDAF Meta-Model

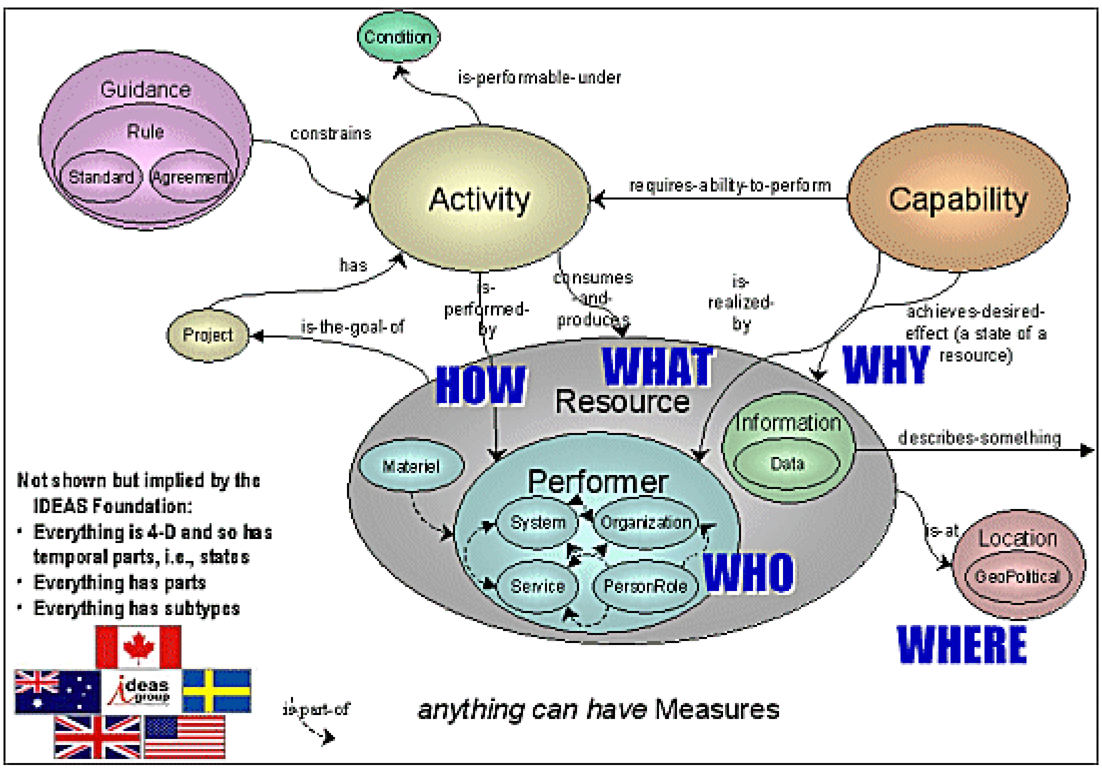
DM2 CDM Relationship to Universal Core and Zachman Framework Interrogatives

Relationship of DM2 Principal Elements to DoD's Six Core Processes

Overview of the DM2 Ontologic Foundation

The DM2 CDM relates to Universal Core and the Zachman Framework interrogatives as shown in the figure below. Specifically:

1. The Data Description — What (we generalize to other Resources besides just Data)
2. The Function Description — How (and also the Performer that performs the Function, Measures, Rules, and Conditions associated with)
3. The Network Description — Where (generalized)
4. The People Description — Who (we include Organizations)
5. The Time Description — When
6. The Motivation Description — Why (broadened to include Capability requirements)



Overlay of UCORE and Zachman Framework Interrogatives with DM2 CDM
(click to enlarge)

Go to top of page ↑

Background
Architecture Development
Meta-Model
Conceptual
Logical
PES
IDEAS Foundation Ontology
Viewpoints & Models
Presentation Techniques
Configuration Management Overview
Acronyms List and Glossary of Terms

Site Map
Archives

DM2 - DoDAF Meta-Model

Relationship of DM2 Principal Elements to DoD's Six Core Processes

Relationship to Universal Core and the Zachman Framework interrogatives

Overview of the DM2 Ontologic Foundation

DM2 and Core Process Relationships Overview

An overview of the role of the concepts modeled in the DM2 is shown in the table below. The key to the symbols in this table are at the bottom:

Mapping of DM2 CDM Core Concepts to DoD Core Processes DoDAF Supports

DM2 CDM Core Concepts	Core Process Utilization						
	JCIDS Capability Mgmt	JCIDS Interop & Supp	DAS	PPBE	CPM	SE / SOSE	Ops Planning
Activity	●	⊙	◉	◉	⭘	◉	⭘
Agreement	⊙	◉	◉	⊠	⊠	◉	◉
Capability	●	◉	⭘	◉	●	◉	◉
Condition	⭘	⊙	○	⊙	⊙	⊙	⭘
Data	◉	⭘	⊙	○	◉	◉	⊙
DesiredEffect	●	○	◉	⊠	⭘	⊙	●
Guidance	○	◉	◉	⊙	⊙	◉	⭘
Information	⭘	⭘	⊙	○	◉	◉	⭘
Location	⊙	⊙	○	⊙	⊙	○	◍
Materiel	◉	○	◉	⊙	⊙	⭘	⭘
Measure	●	⭘	⭘	⊙	⭘	◉	⊙
MeasureType	●	⭘	⭘	⊙	⭘	◉	⊙
Organization	⊙	○	○	⊙	⊙	○	◍
Performer	⭘	⭘	⭘	⭘	⭘	◍	⭘
PersonType	◉	⊙	⊙	○	⊙	⊙	⭘
Project	⊠	⊠	⭘	⊙	◉	⊙	◉
Resource	◉	◉	⊙	○	◉	◉	⭘
Rule	⊙	⭘	◉	○	⊙	⭘	⊙
Service	⊙	◉	◉	⊙	◉	◍	⊠
Skill	◉	⊙	⊙	○	⊙	⊙	⭘
Standard	⊙	●	◉	○	⊙	⭘	⊙
System	⊙	◍	◍	◍	◍	●	◉
Vision	⊙	⊠	⊙	○	◉	⊠	○
ArchitecturalDescription	⭘	◍	◉	⊙	⭘	◍	◉

Legend:

●	Critical role
◍	Substantial role
⭘	Significant role
◉	Moderate role
⊙	Supporting role
○	Minor / optional role
blank	Insignificant / no role

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

- Background
- Architecture Development
- Meta-Model
  - Conceptual
  - Logical
  - PES
  - IDEAS Foundation Ontology
- Viewpoints & Models
- Presentation Techniques
- Configuration Management Overview
- Acronyms List and Glossary of Terms
- Site Map
- Archives

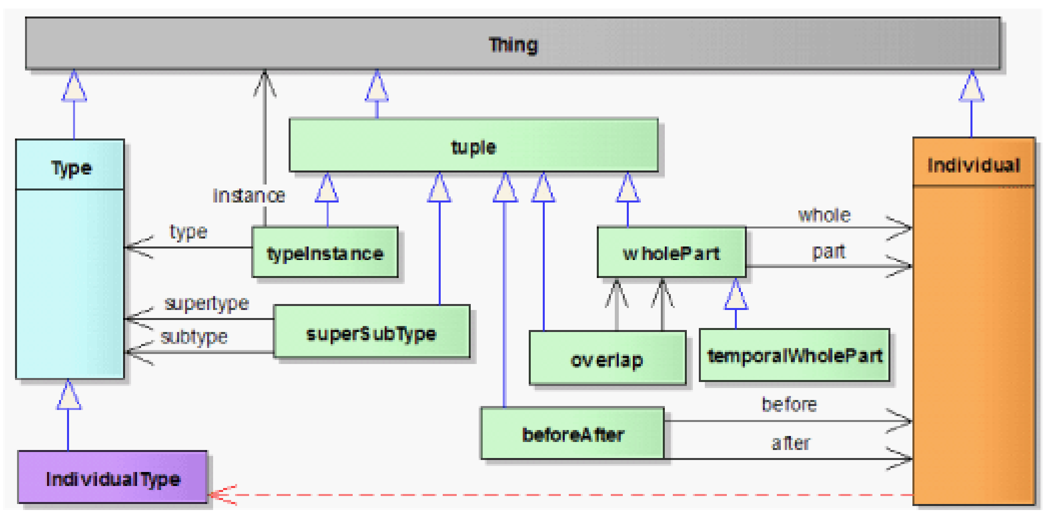
DM2 - DoDAF Meta-Model

Overview of the DM2 Ontologic Foundation

Relationship to Universal Core and the Zachman Framework interrogatives

Relationship of DM2 Principal Elements to DoD's Six Core Processes

Underlying the DM2 is a foundation of common ontologic constructs that facilitate the reuse of common data patterns, an overview of which is shown in the figure below.



Overview of DM2 Foundation

The top-level foundation elements are:

1. ***Thing***, similar to other model's *object*.
2. ***Individual***, a *thing* that exists as an indivisible whole, or as a single member of a category.
3. ***Type***, a set of individuals or classes of other sets or classes.
4. ***Tuple***, ordered places of *things* (e.g., a block in a spreadsheet or a table).

These foundation elements are similar to many other foundation high-level data constructs that exist in the industry. The common patterns that are reused are:

1. ***Composition*** (or whole-part).
2. ***Super/Sub Type*** (or generalization/specialization, e.g., tank or main battle tank).
3. ***Before /After***, for *things* that have time-related relationships in their Type.
4. ***Overlap***, e.g., for *things* that can exchange other things that are parts of themselves, things that occur at overlapping times and overlapping places.

Composition and Super/Sub Type apply to almost all architecture concepts. Before/After is frequently used to model before/after situations, while Interface applies to few concepts, limited at this time to the pattern describing Activity.

The benefits of adopting the IDEAS formal foundation and common patterns are:

1. Re-use of common patterns saved a lot of work
2. Model compactness through inheritance of superclass properties and common patterns
3. Reconciliation and analysis tool. The agreed-upon analysis principles provide a principled basis for issue analysis
4. Information pedigree model
5. Design reification and requirements traceability
6. Services description
7. Semantic precision. Improved ability to integrate and analyze multiple heterogeneous EA datasets to fulfill EA purposes.
8. Mathematical precision

These benefits are described in detail in the DM2 Physical Exchange Specification description documents.

Go to top of page ↑

How to Use the DODAF Meta Model (DM2)

DM2 Data Dictionary and Model Files

- Download the DM2 EA 2.02 file
- Interactive version of the DM2
- Download the DM2 Data Dictionary

LDM Diagramming and Use of UML as an Ontology Diagramming Tool
Presentation Types for DM2 Data

DM2 Data Groups

For ease of understanding; the DM2 LDM is presented in groups of semantically related concepts into clusters. These clusters are categorized as Principle Architectural Constructs and Supporting Architectural Constructs. The Principle Architectural Constructs are the fundamental building blocks necessary to describe an enterprise's internal and external behavior and structure. These are as follows:

Performers: Any entity - human, automated, or any aggregation of human and/or automated - that performs an activity and provides a capability.

Resource Flows: The behavioral and structural representation of the interactions between Activities (which are performed by Performers) that is both temporal and results in the flow or exchange of objects such as information, data, materiel, and performers.

Information and Data: Representations (descriptions) of things of interest and necessary for the conduct of activities. Information is the state of a something of interest that is materialized -- in any medium or form -- and communicated or received.

Rules: How rules, standards, agreements, constraints, and regulations and are relevant to architectures. A principle or condition that governs behavior; a prescribed guide for conduct or action

Goals: How goals, visions, objectives, and effects relate and bear on architectures. A desired state of a Resource

Capability: The ability to achieve a Desired Effect under specified [performance] standards and conditions through combinations of ways and means [activities and resources] to perform a set of activities.

Services: A mechanism to enable access to a set of one or more capabilities , where the access is provided using a prescribed interface and is exercised consistent with constraints and policies as specified by the service description. The mechanism is a Performer. The "capabilities" accessed are Resources -- Information, Data, Materiel, Performers, and Geo-political Extents.

Project: All forms of planned activities that are responsive to visions, goals, and objectives that aim to change the state of some situation. A temporary endeavor undertaken to create Resources or Desired Effects.

Reification: The process of reifying or to regard (something abstract) as a material or concrete thing. Reification, in DoDAF 2, is used to introduce the concept of the varying levels of architectural descriptions or refinement and traceability between the levels.

Organizational Structure: Representations of the organization types, organizations and individuals that is present in the architecture.

The Supporting Architectural Constructs providing architectural properties and attributes are as follows:

Measures: All form of measures (metrics) applicable to architectures including needs satisfaction measures, performance measures, interoperability measures, organizational measures, and resource physical measures (e.g., mass.). The magnitude of some attribute of an individual.

Locations: A point or extent in space that may be referred to physically or logically.

Pedigree: The origin and the history of something; broadly: background, history.

Go to top of page ↑

How to Use the DODAF Meta Model (DM2)

DM2 Data Dictionary and Model Files

The DM2 LDM description provides the essential aspects of the standard terminology used as the basis of DoDAF 2.0. The DM2 provides the standard data lexicon definitions and the logical relationships between elements of the lexicon. The DM2 defines the common architectural description lexicon across the 6 major processes of the DoD. That terminology and its mapping to other widely-used terms is contained in the DM2 Data Dictionary. The DM2 Data Dictionary is maintained in Microsoft Excel and has the following structure.

Columns in DM2 Data Dictionary

B	C	D	E	F	G	H	I	J	K	L-AB	AC-CB
Name	Definition	Aliases	Status	Source Definitions	Definition Rationale, Further work, other	Examples	Association?	CDM?	Who	DM2 Data Group Applicability	DoDAF Legacy Model Applicability ("Monster Matrix")
Name of concept or relationship	Agreed-upon definition	Aliases are kept in the data dictionary	In model, alias, external, new	Multiple sources maintained	Comments		Is this a relationship?	Is this in the Conceptual Data Model	Primary investigator	Which of the 12 DM2 submodels does this apply?	Which of the 52 AV-1 through DIV-3 does this apply?

It is best used using:

a. Microsoft Excel data filters to see only the items of interest. This is particularly useful when examining the "monster matrix", by filtering to the DM2 elements that are necessary or optional in a view.
b. Microsoft Excel "freeze panes" to view columns far to the right.
c. Row and/or column grouping (some are already included) or hiding to see the information of interest. For instance, you may interested in the "monster matrix" but not the definitions, sources, etc.

To download the DM2 Data Dictionary, click here.

The detailed model description including the detailed definitions, relationships and the lexicon mapping to the DoDAF 2.0 views (models) are available as an Enterprise Architect (SPARX) file that can be viewed using a licensed copy of Enterprise Architect or a free viewer only. Since the DM2 is based on IDEAS, not UML, to see the diagrams correctly, an IDEAS profile should be installed.

a. To download the DM2 EA file, click here.
b. To navigate to the SPARX EA-lite site, click here.
c. To navigate to the IDEAS Group site to download the IDEAS profile, click here.

Go to top of page ↑

How to Use the DODAF Meta Model (DM2)

LDM Diagramming and Use of UML as an Ontology Diagramming Tool

The IDEAS Model is represented in UML. The UML language is not ideally suited to ontology specification in its native form. The UML language can be extended through the use of profiles. The IDEAS Model has been developed using a UML Profile - any UML elements that are not stereotyped by one of the IDEAS foundation elements will not be considered part of an IDEAS ontology. The IDEAS Foundation specifies the fundamental types that define the profile stereotypes. The super-subtype structure in IDEAS is quite comprehensive, and showing the super-type relationships on some diagrams can result in a number of crossed lines. In these cases, supertypes of a given type will be listed in italic text in the top-right-hand corner of the UML element box.

The stereotype of an element in an IDEAS UML model is shorthand for the element being an instance of the type referred to by the Stereotype, though the type must be one that has been defined in the root package of the foundation. Hence, if the stereotype is < > then the element is an instance of an Individual. The following stereotyped classes, with their color-coding are used in the model:

a. <<Individual>> An instance of an Individual - something with spatio-temporal extent [Color Name: Grey(80%), Color Codes: R40 G40 B40]

b. <<Type>> The specification of a Type [Color Name: Pale Blue, Color Code: R153 G204 B255]

c. <<IndividualType>> The specification of a Type whose members are Individuals [Color Name: Light Orange, Color Codes: R255 G173 B91]

d. <<TupleType>> The specification of a Type whose members are tuples [Color Name: Light Green, Color Codes: R204 G255 B204]

e. <<Powertype>> The specification of a Type that is the set of all subsets of a given Type [Color Name: Lavender, Color Codes: R204 G153 B255]

f. <<Name>> The specification of a name, with the exemplar text provided as a tagged value [Color Name: Tan, Color Codes: R255 G254 B153]

g. <<NamingScheme>> The specification of a Type whose members are names [Color Name: Yellow, Color Codes: R255 G255 B0]

The following stereotyped relationships are used in the model:

a. <<typeInstance>> a relationship between a type and one of its instances (UML:Dependency) [Color Name: Red, Color Codes: R255 G0 B0]

b. <<powertypeInstance>> a relationship between a type and its powerset (UML:Dependency) [Color Name: Red, Color Codes: R255 G0 B0]

c. <<nameTypeInstance>> a relationship between a name and its NameType (UML:Dependency) [Color Name: Red, Color Codes: R255 G0 B0]

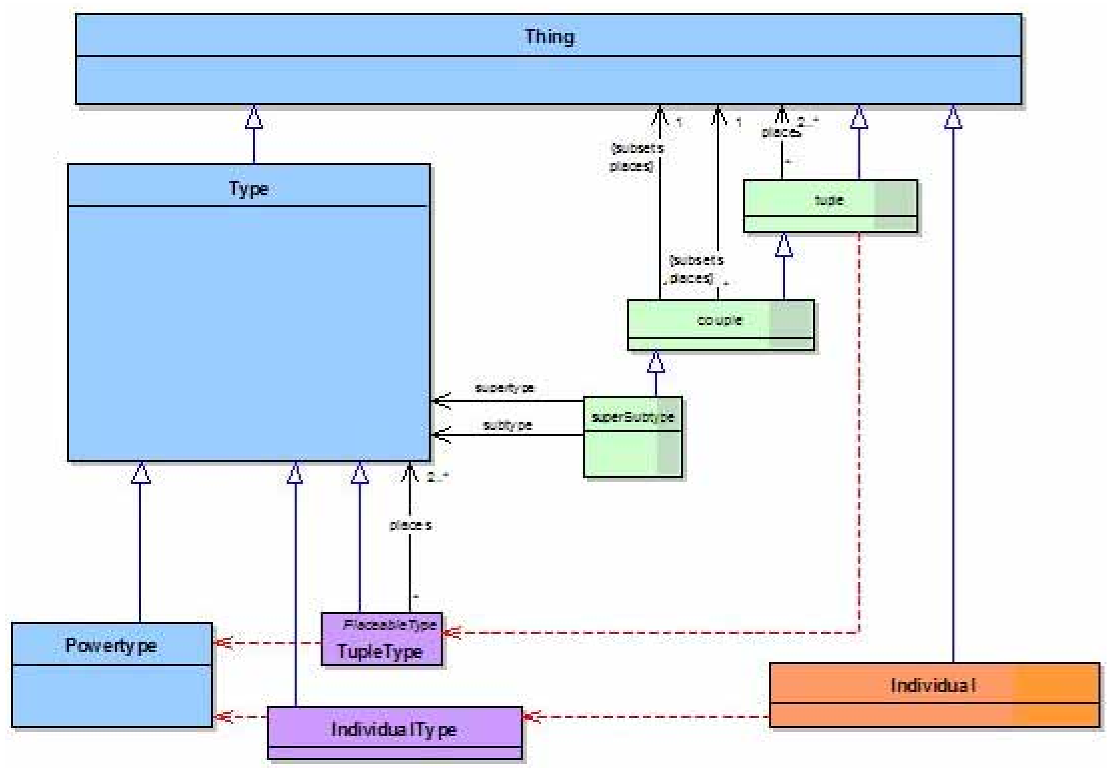
d. <<super-subtype>> a relationship between a type and one of its subtypes (UML:Generalisation) [Color Name: Blue, Color Codes: R0 G0 B255]

e. <<wholePart>> a relationship between an individual and one of its parts (UML:Aggregation) [Color Name: Green, Color Codes: R0 G147 B0]

f. <<namedBy>> a relationship between a name and the thing it names [Color Name: Black, Color Codes: R0 G0 B0]

g. <<tuple>>/<<couple> a relationship between a things (UML:n-ary relationship diamond) [Color Name: Grey(80%), Color Codes: R40 G40 B40]

Some examples are depicted in the figure below:



(click to enlarge)

The naming convention for classes, attributes, and association names is camel case as follows:

a. Class names start with uppercase.

b. Attributes and association names start with lowercase.

c. Acronyms are all uppercase. Acronyms in the middle of a name are avoided because of the concatenation of the acronym uppercase and the succeeding string leading uppercase.

Note that the size of the icons is not indicative of their importance; the sizes are adjusted to reduce line crossings and bends to make the diagrams easier to understand.

Note: In some instances the data model figures may be hard to read in a hardcopy printout but a version at full-resolution which can be zoomed in is published in the online DoDAF v2.0 Meta-Model Data Dictionary. Definitions for the model terms are contained in the DoDAF v2.0 meta-model data dictionary (download links cited in section 1). This includes a summary of aliases, composite term definitions, authoritative source definitions, and rationale. Note that foundational classes are generally not shown on data group diagrams; this foundational material is found in the ideas foundation ontology tab. This includes super-subtype, whole-part, temporal-whole-part, overlap, type-instance (member-of), and before-after patterns. Also not shown are the data structures for classification marking of architecture information at the whole and element (portion) levels using the Intelligence Community - Intelligence Standard Markings (IC-ISM). The schema for the IC-ISM is in physical exchange specification (PES) tab. Lastly, note that the size of the icons is not indicative of their importance; sizes are adjusted to reduce line crossings and bends to make the diagrams easier to understand.

Go to top of page ↑

How to Use the DODAF Meta Model (DM2)

Presentation Types for DM2 Data

Within the DoDAF Meta-model, the elements in the DoDAF Models (Views) are represented with time periods (temporal extents). Temporal extent can connote the future, thus allowing the models to represent “To-Be” capabilities and processes or the “before-after” aspects of the activities. Generally, DoDAF views, models and supporting data are represented in the following general forms:

- Structural Models comprised of diagrams describing the structural or static aspects of architecture.
- Behavioral Models comprised of diagrams describing the behavioral or dynamic aspects of architecture.
- Tree Models-A type of structural model which can represent DoDAF elements in a taxonomic form.. These can represent “whole-part”, “super-subtype relationships or other relationships. These models are particularly important in maintaining traceability thru the various level of detail in representing the design or architecture. A Work Breakdown Structure (WBS) is an example of a model including both activities and/or performers in a decomposition tree.
- Mapping: Views that provide matrix (or similar) mappings between two different types of information. This used to represent such things as functional and data allocations and traceability.
- Tabular: Views which present data arranged in rows and columns, which generally amplify or have a direct relationship to the behavioral, structural (including ontological) models.
- Pictorial: Views such as free-form pictures.
- Timeline: Model comprised of diagrams usually describing the programmatic aspects of architecture ((E.g. Gant Chart). This is generally related directly to the WBS taxonomic model. These can also represent time in efficiency analysis of the activities in a process (e.g. LSS analysis).

Go to top of page ↑

DM2 Data Groups

Performers

Performer is a class of entities that are central to the description of architecture. It is the Who in the Architectural Development Process. The How, tasks, activities, and processes (composite of activities), are assigned to Performers to accomplish the desired outcome. Performers are further subdivided and allocated to organizations, personnel and mechanization. Rules, locations and measures are then applied to organizations, personnel and mechanization. Within this assignment and allocation process there are many major tradeoff opportunities. Automation (mechanization versus people) tradeoffs, analysis for items such as performance and cost/benefit are involved in the process. When these tradeoffs and associated decisions are sufficiently mature, an allocated baseline can be declared and initial work breakdown structures refined.

Data Group Descriptions

The DoDAF Meta Model for the data comprising Performers, is shown in the figure below.

a. The first thing to note about Performer is that it can represent:
   1. A Person Type such as described by the Amy's Military Occupational Specialties (MOS). MOS describe Skills and their measurement (not shown in this diagram). Includes Materiel assigned and necessary for the performance of activities, e.g., as per Army CTA-50. Note that Person Types have temporal whole-parts (states) such as in-garrison or deployed that may have different Materiel compositions and other associations such as applicable Rules.
   2. An Organization (type or actual Individual Organization) meaning a mission chartered organization, not limited to just collections of people or locations, e.g., the Federal Bureau of Investigation (FBI) has a chartered mission and it chooses the locations, people, etc., to accomplish such.
   3. A System in the general sense of an assemblage of components – machine, human – that accomplish a function, i.e., anything from small pieces of equipment to FoS and SoS. Note that Systems are made up of Materiel (e.g., equipment, aircraft, and vessels) and Personnel Types, and organizational elements.
   4. A Service, from a software service to a business service such as Search and Rescue.
   5. Any combination of the above.

b. The performance of an Activity by a Performer occurs in physical space and time. That is, at some place and time, the Activity is conducted. This is referred to as a spatial-temporal overlap, simply meaning that the Activity and Performer overlap in space and time. There are two ways in which a Performer spatial-temporally overlaps an Activity:
   1. In the act of performing the Activity. This relationship is sometimes called assigned to for the purposes of traceability.
   2. The other way is as part of a larger process (aggregated Activity). This is sometimes called allocated to and forms the initial stages of system or process decomposition. Allocated Performer elements (parts of Performers) are assigned Activities (or processes, tasks) in the initial stages of Performer definition.

c. A standard (Rule) constrains an Activity in general. Some of those constraints might also apply to the performance of the Activity by a Performer.

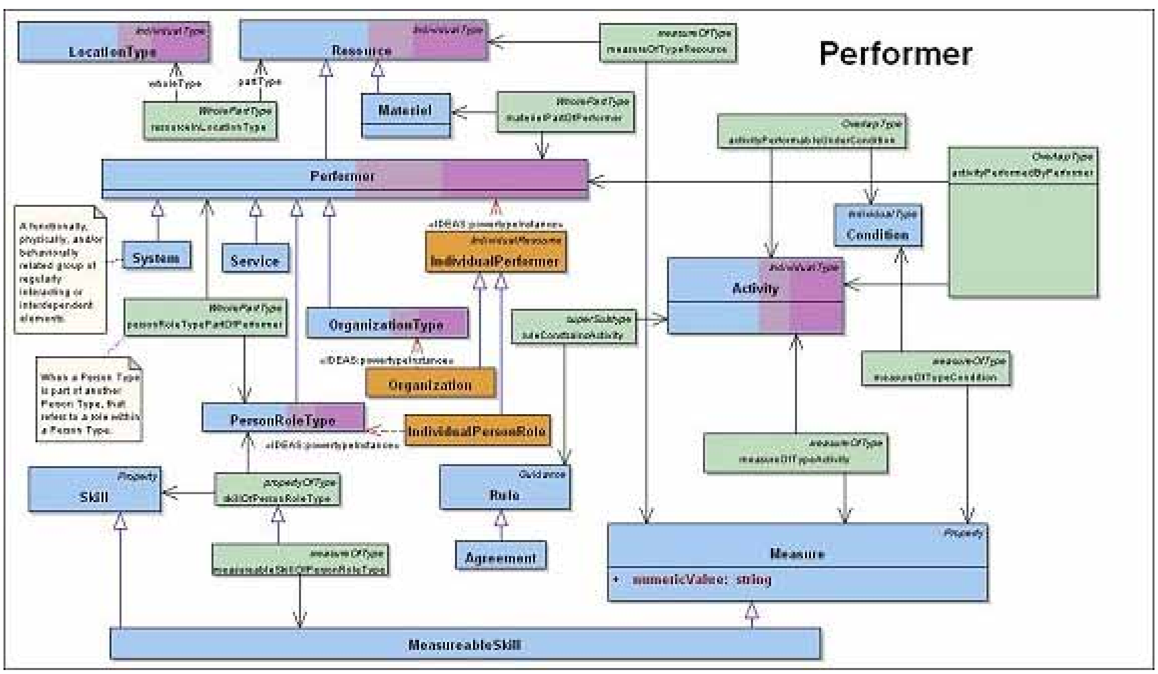
d. A Performer may have Measures associated with the performance of an Activity (e.g., target tracking accuracy.) It may also have Measures associated with the Performer overall (e.g., operational condition.)

e. Performers perform at Locations that can be specific positions or areas, regions, or installations, sites, or facilities. Location type requirements/capabilities of a Performer are captured/expressed via the Activities that are performed under certain Conditions (e.g., must be able to perform Maneuver under Desert Conditions.)

f. Activities performed by a System can be called system or service functions (i.e., activities and/or processes performed by a system). System or service functions (activities) are allocated to hardware, software, firmware or personnel (when the person is considered integral to the system).

g. In typical uses, the Activities are represented by verbs and Performers are represented by nouns. This distinguishes the how from the who. In a typical specification process allocation to performers can take place at varying levels of detail depending on the design maturity or the intended degree of design constraint.

h. Performers are represented in many places and stages in the detailed architecture. It should be noted that a pure Requirements Architectural Description may not show allocations or performer. This may be left to later stages of the design process. Further, not all architecture modeling standards explicitly provide for allocation. For example, the Systems Modeling Language (SysML) extensions to the UML modeling standard have added this feature.



DoDAF Meta Model for Performers
(Click to enlarge)

Usage in Core Processes

Data for Performer are used in the following ways:

JCIDS:

1. Person Type processes are typically termed Tactics, Techniques and Procedures (TTP) in DoD. Procedures are allocated sets of activities and/or processes, where Tactics and Techniques, typically, are made up of the procedures as influenced by rules, doctrine, paradigms, etc. acquired through skill development during the education and training process.
2. A pure Requirements Architectural Description may not show allocations or performer. This may be left to later stages of the design process.

PPBE:

1. Programs of Record (PoR) are Projects that can contain both material and non-material Performers (See FYDP Program Structure Handbook (DoD 7045.7-H).
2. Program of Record are linked to the PPBE through the Work Breakdown Structure (WBS) (see DAS) depicting Performers related to cost.
3. The Planning and Programming*[1] process typically conducts analysis through the evaluation of Capabilities, Performers and the attributes associated with Performers (e.g. Measures). (e.g. "Gap and Overlap analysis", Capability evolution, etc.).

DAS:

1. MIL-HDBK-881A*[2] and DoD 5000.1, in providing fundamental guidance for specifications, WBS, Statement of Works (SOWs) of the DAS, all require the identification of the Performers and their component parts and types as fundamental elements.
2. The acquisition process generally involves Performers either through the material acquisition of systems or the acquisition of processes associated with performers.
3. The acquisition process can also involve the Acquisition of Services.

SE:

1. Activities are assigned to Performers (organizational, human, materiel, or some combination thereof). Capabilities or lower-level derived capabilities, measures,conditions, constraints and other expressions of requirements are assigned to the various levels of Performer reification. Allocation occurs from level-to-level as part of structural design decomposition or design refinement.
2. Allocation is the term used by architects and engineers to denote the organized cross-association (mapping) of elements within the various structures or hierarchies of a user view regardless of modeling convention or standard. The concept of allocation requires flexibility suitable for abstract system specification, rather than a particular constrained method of system or software design. System modelers often associate various elements in abstract, preliminary, and sometimes tentative ways. Allocations can be used early in the design as a precursor to more detailed rigorous specifications and implementations. As the requirements definition stage gives way to the design stage and actual components become visible, it becomes important to distinguish between allocated to and assigned to.
3. Some types of performers under configuration control called system Configuration Items (CIs). Software Configuration items are termed Computer Software Configuration Items (CSCIs) or Software Configuration items (SCIs) in MIL-HDBK-881A. Hardware Configuration items may follow the Mil-STD-196E taxonomy (Central, Center, System, Subsystem, Set, Group, Unit.) MIL-HDBK-881A , which guides DoD

Work Breakdown Structures (WBS), defines software only by levels (e.g., 1, 2, 3, etc.)

Ops Planning:

1. Determines who is going to accomplish the required tasks (activities), where, under what conditions, and to what measures

CPM:

1. Performers are the major items in the portfolio to be managed and optimized

Go to top of page ↑

DM2 - DoDAF Meta-Model

Resource Flows

Resource Flows are used to model the flow of Resources - Materiel, Information (and Data), Geo-Spatial Extents, Performers, or any combination thereof. Resource Flows are key modeling techniques used in the definition of Interfaces and assurance of Interoperability between Activities and their associated Performers (e.g., Systems and Personnel.) Resource Flow models and associated analysis techniques reveal behavior such as:

- The connectivity between resources.
- Resource Flow modeling provides an explicit means to describe the behavior of activities, systems, organizations and their composite effects on the overall enterprise.
- The content of the information flowing between resources (e.g., interface definition).
- The order or sequential behavior (parallel or serial) of the resources in relation to one another (e.g., project task execution and critical path).
- The behavior of Resource Flow between or within organizations (e.g., work flow, information flow, etc.).
- The changes in state during the spatial and/or temporal existence of the resource.
- The rules that modify the behavior of the Resource Flow (e.g., business rules, controls, decisions, etc.).
- The measures that define the quality, constraints, timing, etc. of the Resource Flow (e.g., Quality of Service (QoS), measures of performance, measures of effectiveness, etc.).
- The flow of control orchestrating the behavior of the Resource Flow.

Data Group Description

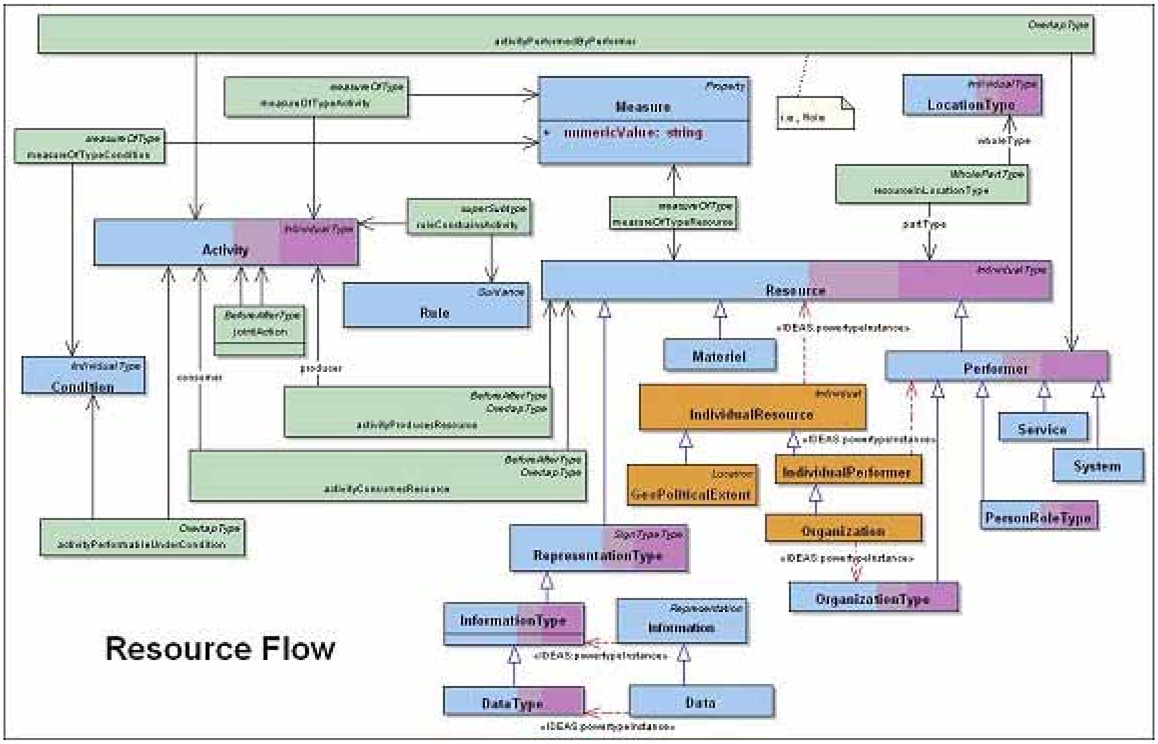
The DoDAF Meta Model for the data comprising Resource Flows is shown in the figure below. The following should be noted:

a. Whereas prior versions of DoDAF modeled only information and data exchanges and flows, this version also allows modeling of other flows, such as:
   1. Materiel flows such as ammunition, fuel, etc. important for modeling the fire rate, logistics, etc., aspects of a Capability solution so it can be compared with other alternative solutions.
   2. Personnel Types such as Military Occupational Specialty (MOS) that allow representation of the Training and Education pipeline aspects of Doctrine, Organization, Training, Material, Leadership and Education, Personnel, and Facilities (DOTMLPF).
   3. Performers such as Services, Systems, or Organizations that might be the output or result of a Project’s design and production process (activities). This allows modeling of, for instance, an acquisition project.

b. Another difference from prior versions of DoDAF is that all exchanges and flows are by virtue of a producing or consuming Activity. Resource Flows are Activity-based, not Performer based since a Performer cannot produce or consume a resource other than by conduct of a production or consumption activity. That is, a Performer can only provide or consume by conducting an activity of production or consumption. For instance, publication and subscription are modeled as an interaction between the publishing Activity, the subscribing Activity, and the information or data Resource.

Note that publication is typically not at the same time as subscription but the subscriber does have to go to the publication place to retrieve the Resource. For example, data might be published at 2:00 GMT on a server located at some URL and the subscriber may not overlap until 10:00 GMT. Also note in the diagram the overlap is a triple - the producing Activity, the Consuming Activity, and the Resource.

c. The exchange or flow triple may have standards (Rules) associated with it such as Information Assurance (IA)/Security rules or, for data publication or subscription, data COI and web services standards.
d. Rules and Measures are applied to specific Activities and their Performers. Activities, Systems and Personnel can be assigned to Locations and further can be assigned Conditions and Constraints.
e. The term flow implies that something (e.g., materiel, information) is moving from point A to point B, hence the use of the foundation concept of "overlap".
f. The exchange or flow triple may have Measures associated with it such as timeliness, throughput, reliability, or QoS.
g. Resource Flow modeling can be performed at varying levels of detail and fidelity depending on the areas of concern being analyzed and the solutions being sought. The upper-level aggregations have been termed need lines in previous versions DoDAF. Other terminology expressing levels of aggregation are used depending on the community of interest (e.g., The SysML modeling standard uses lifeline).
h. It should be noted that information inputs and outputs between resources for some levels of decomposition may be at a higher-level of abstraction than the information characteristics represented in the matrix. This is commonly done to simplify graphical representations of information flow or in the initial definition stages where the characteristics are still unknown. In this case, multiple information exchanges will map to a single resource input or output. Similarly, the information inputs and outputs between resources at a low-level of decomposition may be at a higher-level of detail than the information exchanges in the matrix, and multiple information inputs and outputs may map to a single information exchange. In these cases, to provide the necessary clarity and precision, an ontological or taxonomic structure of information aggregation should be developed for use in each level of decomposition of the Resource Flow models (e.g., The Navy Common Information Exchange List [CIEL] represents initiatives showing taxonomic structure or levels of aggregation).



DoDAF Meta Model for Resource Flow

(Click to enlarge)

Usage in Core Processes

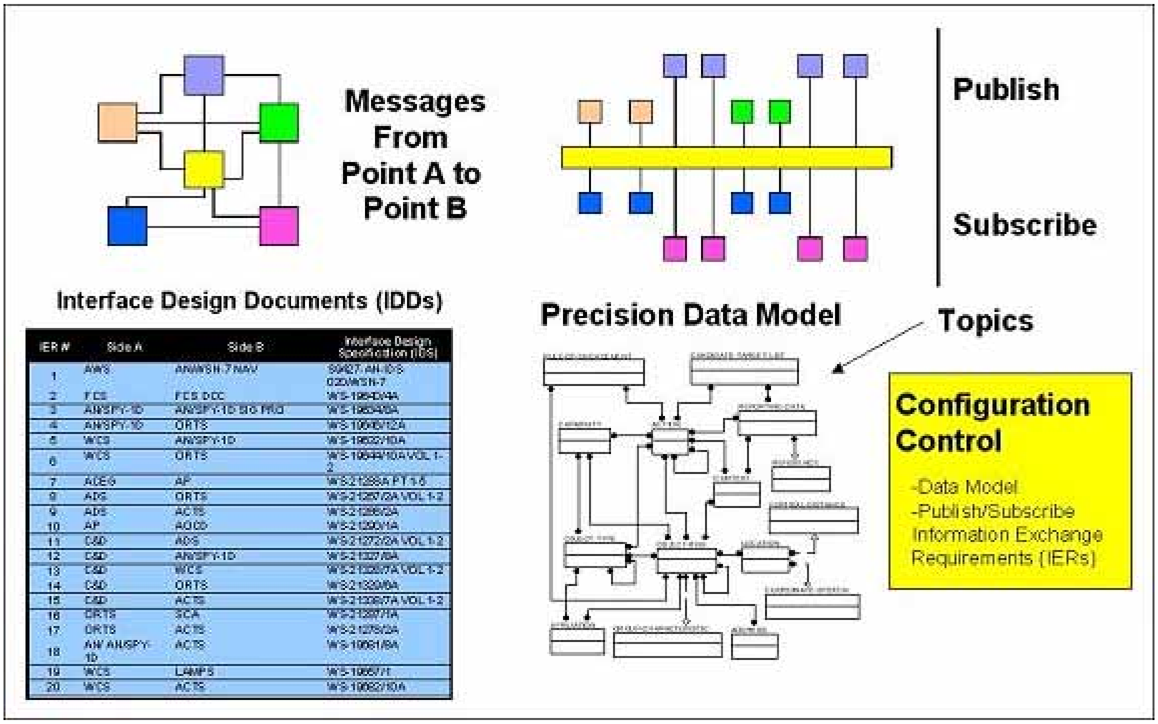
Resource Flow modeling is a fundamental engineering based technique used in Information Technology (IT) Architecture, System Engineering, Process Re-engineering, Resource Planning and many other disciplines.

a. JCIDS
    1. Where are the process bottlenecks?
    2. Are the activities and procedures interoperable?
    3. Identify new and emerging systems interoperability requirements.
    4. Uncover unnecessary or inefficient operational activities and information flows.
    5. Evaluate alternative architectures with different connectivity and Resource Flow to maximize capability and minimize automation complexity.
    6. Identify critical connectivity needs and interfaces (or Key Interface Profiles (KIPs) between activities and their performers (organizations and personnel types).
    7. Critical Interfaces are generally documented in formal interface documentation signed by the responsible authorities (both information supplier and information consumer) in charge of each end of the interface. This type of interface may be annotated as a Key Interface (KI). A KI is defined as an interface where one or more of the following criteria are met:
    8. Support Analysis of Alternatives (AoA) and other Systems Engineering Analysis.

b. DAS
    1. The interface spans organizational boundaries (may be across instances of the same system, but utilized by different organizations).
    2. Support the development of test sequences and procedures.
    3. The Details of Resource Flow (materiel, personnel, or data) are generally documented in Interface Control Documents (ICDs), Interface Requirements Specifications (IRSs) and Interface Description Documents (IDDs). This data is typically provided to DoD Investment Review Board (IRB) registry systems for

the purpose of milestone reviews and support of acquisition decisions points.

c. PPBE
    1. Ensure FYDP provides flows needed for operations and missions
    2. Ensure consumption requirements are met by producers
d. SE
    1. Identify new system or service, functions (activities), components and modifications required.
    2. Identify new Resource Flow and system integration requirements.
    3. Identification of the need for Application of new standards.
    4. Clearly identify the relationship and information flow between systems and system/services in an SoS or between services in a Service Oriented Architecture (SOA) including definition of publish or subscribe requirements
    5. Interface Identification and Definition including interoperability analysis and standardization.
    6. Support configuration management of interfaces. Interfaces are generally documented in interface documentation representing the agreements of the responsible parties in charge of each end of the interface (both information supplier and information consumer). This, in no way implies a point-to-point interface. Interfaces implemented with an enterprise service bus, for example, are defined with appropriate publish/subscribe documentation formalized, if necessary, with contractual agreements between information supplier and consumer.
    7. Critical interfaces are generally documented in formal interface documentation signed by the responsible authorities (both information supplier and information consumer) in charge of each end of the interface. For legacy point-to-point interfaces this may be in the form of Interface Control Drawings (ICDs), Interface Requirement Documents (IRSs), Interface Design Documents (IDDs), etc. In multiple access or common connectivity (radio communications or bus type connectivity) implementations may be in the form of formal agreements (defined herein as a consent among parties regarding the terms and conditions of activities that said parties participate in) detailing the specific set of implementations (e.g., Tactical Digital Information Links [TADILs]) data elements implementation tables or in the case of a SOA, a publish/subscribe implementation document. These agreements are, in general, managed and controlled by the SoS or System Project manager. In new systems, and where possible the interface should be managed and configuration controlled using a common precision data model. Figure 4 illustrates the evolution from configuration control of legacy point-to-point interfaces to a net-centric, distributed processing means of connectivity using carefully managed publish and subscribe agreements and documentation based on formally documented logical and physical data models.



Migrating from Legacy to Data Focused Configuration Management

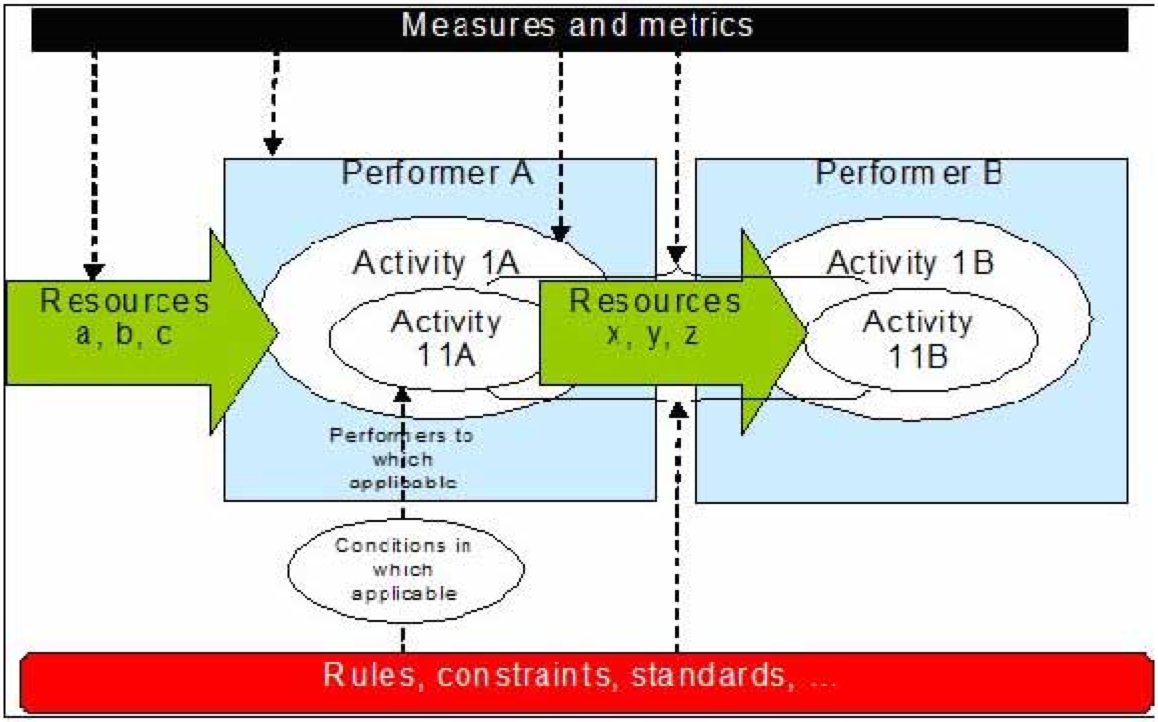
(Click to enlarge)

e. Ops Planning
   1. Operations utilizing information flows should be technology independent. However, operations and their relationships may be influenced by new technologies. There may be some cases in which it is necessary to document the way activities are performed to examine ways in which new systems could facilitate streamlining the activities
   2. Mission Planning including simulation and training.
   3. Logistics planning.
   4. Provide a necessary foundation for depicting information needs and task sequencing to assist in producing procedures, operational plans and facilitate associated personnel training.
   5. Identify critical mission threads and operational Resource Flow exchanges by annotating which activities are critical (i.e., identify the activities in the DoDAF-described Model that are critical e.g., Critical Path).

f. CPM
   1. Resource flows can be used to represent the structural and behavioral relationships between the Activities and Performers within the portfolio including interfaces and interdependencies.

Presentation

Resource Flows are generally depicted as Structural, Behavioral and Tree models with amplifying tabular information. A generic Resource Flow presentation is shown in the figure below.



Migrating from Legacy to Data Focused Configuration Management

Go to top of page ↑

DM2 Data Groups

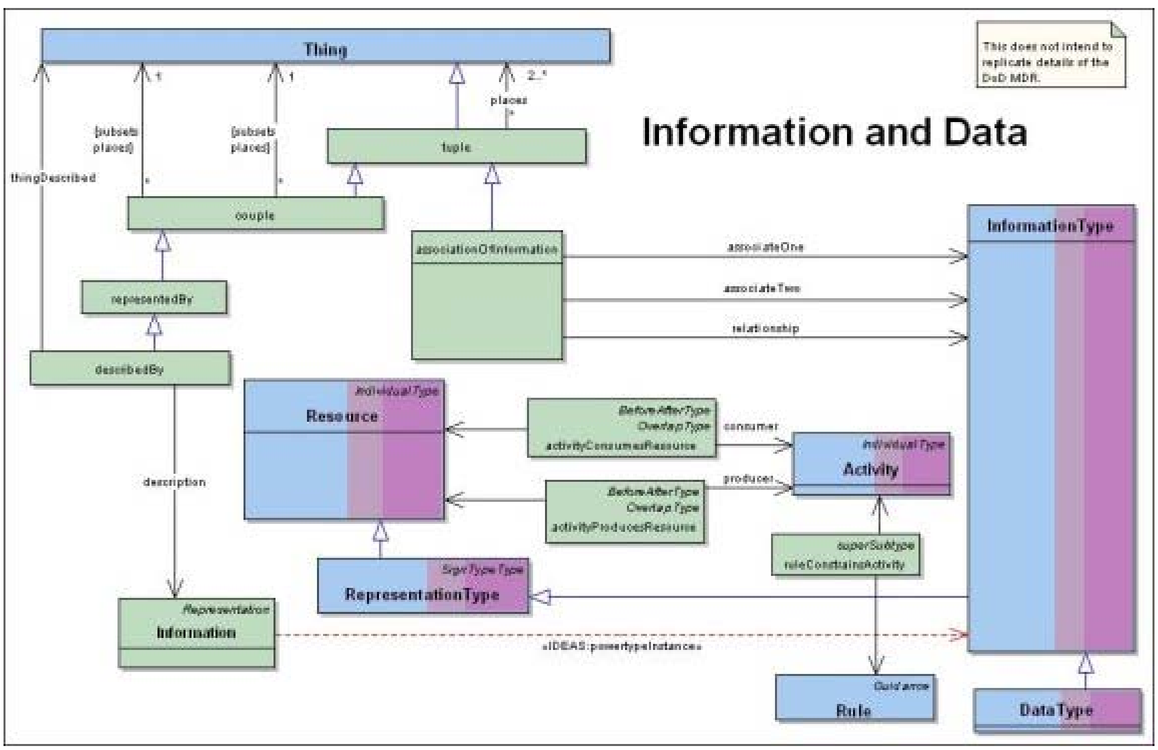
Information and Data

Information is the state of a something-of-interest that is materialized, in any medium or form, and communicated or received. In DoDAF V1.0, this took the form of what was called a logical data model which even in DoDAF V1.0 permitted a less structured and formalized description than the computer science definition of a logical data model. In DoDAF V2.0, the emphasis is on the identification and description of the information in a semantic form (what it means) and why it is of interest (who uses it). Although this may entail some formality such as describing relationships between concepts, its purpose is to convey the interests in the operator, executive, or business person's frame of reference.

Data is the representation of information in a formalized manner suitable for communication, interpretation, or processing by humans or by automatic means, and is concerned with the encoding of information for repeatability, meaning, and proceduralized use. While information descriptions are useful in understanding requirements, e.g., inter-federate information sharing requirements or intra-federate representation strategies, data descriptions are important in responsive implementations of those requirements and assurances of interoperable data sharing within and between federates.

Data Group Description

The DoDAF Meta Model, for the data comprising Information and Data, is shown in the figure below.



Information and Data Model Diagram
(Click image to enlarge)

Items of note are as follows:

a. The key concept in this model is that Information describes some Thing - material, temporal, or even abstract, such as a relationship (Tuple) or set (Type).
b. Since Information is a Thing, Information can describe other Information, e.g., metadata.
c. A Name is a type of Information in that it describes a Thing. A Name may be short or long - there is no restriction. So a textual description can be thought of a just a long Name. Information is more general than text strings and could be structured, formalized, or include other manners of description such as diagrams or images.
d. Information, as a Resource Type, inherits whole-part, super-subtype, and before-after relationships.
e. If Information is processable by humans or machines in a repeatable way, it is called proceduralized. Not all proceduralized information is necessarily computerized; forms are examples of data proceduralized for human repeatable processing.
f. Data to be proceduralized has associations such as parts and types as well as other application specific associations. So for an Entity-Relationship model, Attributes are has associations with Entities and Entities are related according to verb phrases and cardinalities. In the physical schema, the fields are associated to data types.
g. The representation for Data is not intended to cover all the details of, for instance, a relational data base management system (DBMS) underlying Meta-model, but just those aspects necessary to support the decision-making of the core processes.
h. Architectural Descriptions describes architectures. An Activity Model is an example of an Architectural Description. Two subtypes of Architectural Description are called out - the AV-1 and the Manifest - because of their importance in discovery and exchange, respectively. Note that the AV-1 information can also be provided in a structured manner, using the Project data group to describe the architecture project's goals, timeline, activities, resources, productions, rules, measures, etc. In a typical development project, the architecture descriptions will be at increasing levels of detail, what John Zachman calls "levels of reification".

It should be noted that all methods, even the most philosophical and methodical, involve the ingestion of some record of the enterprise's processes, legacy information-keeping systems, and descriptions of what types of things it thinks it deals with. Upon collection of this raw data, terms within it are then:

a. Identified. This is done by noting recurring or key terms.
b. Understood. Definitions of terms are sought and researched. In most cases, there are multiple authoritative definitions. Definitions selected should be appropriate for the context of use of the term within the enterprise activities.
c. Collated and correlated. This is done by grouping seemingly similar or related terms.
d. Harmonized. In this step, aliases, near-aliases, and composite terms are identified. A consensus definition is formulated from the authoritative source definitions. Often super-subtype and whole-part relationships begin to emerge.

The next step is to relate the harmonized terms. Some of the relationships are implicit in the definitions and these definitions may contribute to the relationship description. At this point, the formality can vary. A formal ontological approach will type all relationships to foundational concepts such as whole-part and super-subtype. However, there are many metaphysical challenges with such an approach and it is not necessary for many applications. This constitutes the conceptual-level of modeling, defined and related terms, now considered concepts because the definitions and relationships lend a meaning to the terms. The conceptual model should be understandable by anyone knowledgeable about the enterprise. Super-subtype and whole-part relationships can provide cognitive economy. Conceptual models can be done in Entity-Relationship or UML Class model style although any format that documents definitions and relationships is functionally equivalent. Note that the subtype concept in UML generally results in the subclass inheriting properties from the supertype while in Entity-Relationship (E-R) modeling only the identifying keys are inherited directly; the other supertype properties are available after a join operation.

At the logical-level, relationships may have cardinalities or other rules added that indicate how many of one instance of something relates to an instance of something else, the necessity of such relations, and so on. The concepts may also be attributed, meaning they will be said to have some other concept, e.g., the concept of eye has the concept of color. Often at the logical-level, the relationships are reified or made concrete or explicit. At the logical-level, this is done in case there is something additional that needs to be stated about the relationship, e.g., the quantity of some part of something or the classification of the related information, which may be different from the classification of the individual elements. There may also be considerations of normalization, meaning that the database structure is modified for general-purpose querying and is free of certain undesirable characteristics during insertion, update, and deletion operations that could lead to a loss of data integrity. The benefits of normalization are to uncover additional business rules that might have been overlooked without the analytical rigor of normalization and ensure the precise capture of business logic. The logical model, though having more parts than the conceptual model, should still be understandable by enterprise experts. At the logical-level, some sort of modeling style is normally used such as Entity-Relationship or UML Class modeling.

At the physical-level, the exact means by which the information is to be exchanged, stored, and processed is determined. At this level, we are talking about data. The efficiency, reliability, and assured repeatability of the data use are considered. The datatypes, the exact format in which the data is stored are determined. The datatype needs to accommodate all the data that is permissible to store or exchange yet be efficient and disallow formats that are not permissible. The entities may be de-normalized for efficiency so that join operations don't have to be performed. Logical associations may be replaced with identifiers (e.g., as associative entities or foreign or migrated keys in Entity Relationship Diagrams [ERDs] or explicit identifier attributes or association classes in class models). Keys, identifiers, and other means of lookup are setup. Indexes, hashes, and other mechanisms may be setup to allow data access in accordance with requirements. The physical target may be any of the following:

a. Database – relational, object, or flat file.
b. Message exchange format – document (e.g., XML), binary (e.g., Interface Definition Language (IDL)).
c. Cybernetic (human – machine), e.g., print or screen formats, such as forms.

Usage in Core Processes

Information and Data models are used in the following ways:

a. Commonality and Interoperability between Core processes
   1. Information models materialize for enterprise participants what things are important to the enterprise and how they are related.
   2. Information models can serve as a basis for standardization of terminology and concept inter-relationships for human, machine, and human-machine communications.
   3. Information models can provide cognitive compactness for an enterprise's personnel through the use of taxonomies and other relationship structures. This can improve clarity, efficiency, accuracy, and interoperability of action within the enterprise.
   4. Information models document the scope of things the enterprise is concerned with in a form that allows comparison with other communities of interest to reveal common interests.
   5. COI coordination and harmonization.
   6. Authoritative sources identification and management.
b. JCIDS and PPBE

1) Data and information models can be used to determine if a proposed capability will interoperate, be redundant with, or fill gaps in conjunction with other capabilities.

c. SE and DAS

1) Data models can be used to generate persistent storage of information such as in databases.
2) Data models can be used to generate formats for exchanging data between machines, humans, and machine-to-human. For example, an XSD is a physical data model that is generally an exchange format. Web services can be used with relational DBMS' to generate XML for exchange in the format of the data model implemented in the DBMS. The underlying data models (the physical data model and the exchange data format) do not have to be the same; a translator or mediator may be invoked to translate during the exchange.
3) Data models can be used to compare whether Performers are compatible for data exchange.
4) Interdependent data or information needs.
5) Data and information models can be used during milestone reviews to verify interoperability, non-redundancy, and sufficiency of the solution.
6) Information models are useful in initial discovery of a service, to know what sorts of information it may provide access to or its accessed capabilities need. An information model is part of a service description.
7) Data models are useful in knowing how to interact with a service and the capabilities it provides and for establishing the service contract. A data model is part of a service description and service contract.
8) Database/sources consolidation and migration.
9) Standards definition and establishment.
10) Mediation and cross-COI sharing.

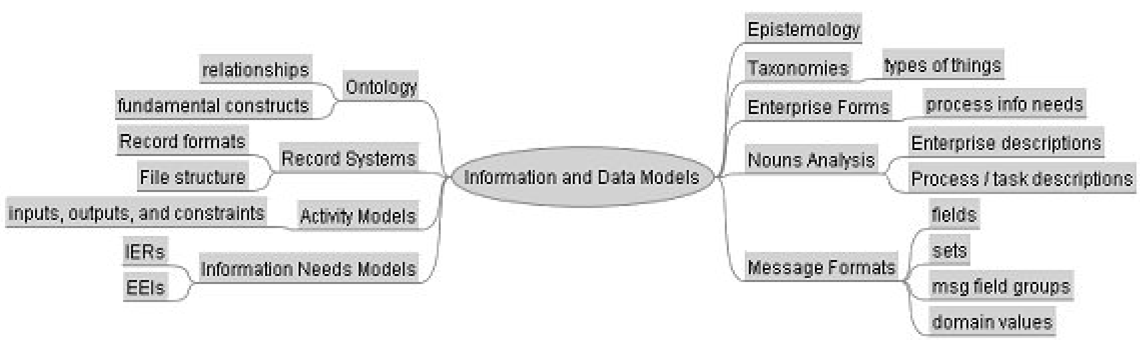
d. OPS Planning

e. CPM

1) Data and information models can be used to determine if components of a portfolio have:
2) Overlapping data or information production (an indication of potential unwanted redundancy).
3) Data assets management.

Presentation

Presentation of Information and Data are depicted using all the forms shown in 1.3 and manifest themselves in the presentation of many of the other Data Groups. Modeling information and data have well established techniques and styles. Techniques for constructing and presenting models of Information and Data vary. They are taught in academic and vocational curricula. There is considerable literature, such as books, professional journals, conference proceedings, and professional magazines, on best practices, experiences, and theory. The figure below illustrates some of the basic methods for model creation.



Examples of the Ways Information and Data Models are Constructed

Go to top of page ↑

DM2 - DoDAF Meta-Model

Rules

Rules are prescriptive sets of procedures regarding the execution of activities within an enterprise. Rules exist within the enterprise whether or not they are ever written down, talked about, or even part of an organization's consciousness. However, it is fairly common practice for organizations to gather rules in a formal manner for specific purposes.

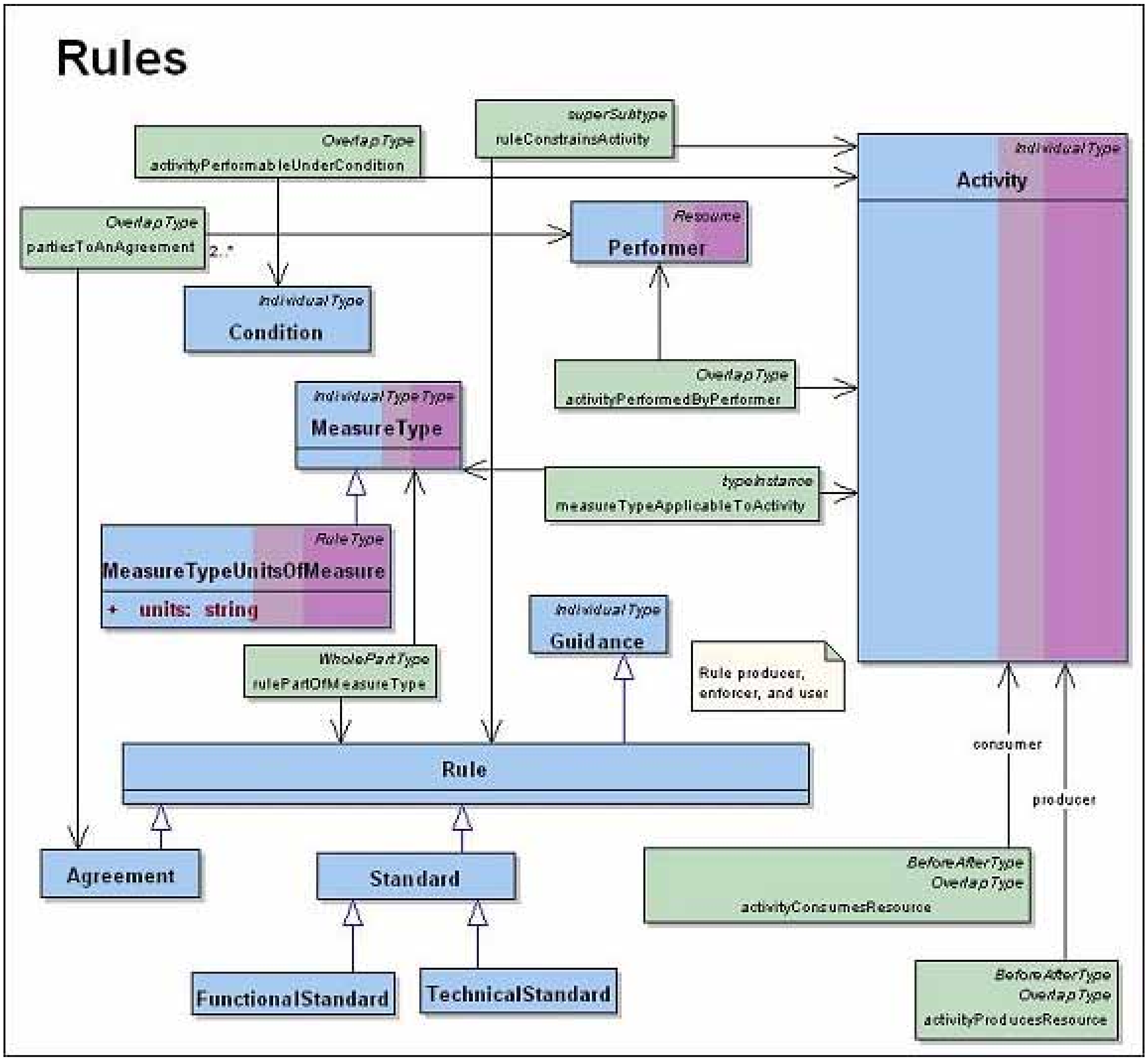
Business rules are a type of Rule that govern actions and are initially discovered as part of a formal requirement-gathering process during the initial stages of a Project or during activity analysis, or event analysis. In this case, the collecting of the business rules is coincidental to the larger discovery process of determining the workflow of a process. Projects such as the launching of a new system or service that supports a new or changed business operation might lead to a new body of business rules for an organization that would require employees to conceptualize the purpose of the organization in a new way. This practice of coincidental business rule gathering is vulnerable to the creation of inconsistent or even conflicting business rules within different organizational units, or within the same organizational unit over time.

The DoDAF Meta Model provides a set of clear, concise data about rules that facilitates the creation of rules and enables the sharing of those rules with others requiring similar information.

A rule is not a process - the two, while related, are very different. A process is a transformation that produces new things (outputs) from existing things (inputs), while a rule prescribes the exact procedures to be used to ensure that the output is as to be expected in each instance that the process is executed.

Data Group Description

The DoDAF Meta Model for the data comprising Rules is shown in the figure below.



DoDAF Meta Model for Rules

(Click image to enlarge)

The following should be noted about the Rules Data Group:

a. A Rule constrains Activities. For example, a speed limit rule constrains driving activity. Some seemingly static rules have the effect of limiting possible activities. For example, a rule that security fences must be 10 feet high constrains the activity of building security fences. This constraint may apply or vary under certain conditions. For example, speed limits can be lower in poor weather conditions.
b. Security classification, security marking, releasability, etc. are types of Guidance. Similarly; a Rule is a stronger form of Guidance.
c. An important Constraint type is a Service Policy that constrains access to capability Performers.
d. Doctrine, by definition, constrains military action.

Usage in Core Processes

Rules data are used to create, document, and share rules of all types that support operational activities and/or the execution of capabilities in operational processes (composite activities). These data can include:

a. Processes that define transactions where data must be exchanged or passed to execute a specified activity, such as PPBE, CPM, JCIDS, or DAS.
b. Rules that define methods of accessing information or services within the net-centric

environment, such as Ops, PPBE, CPM, or JCIDS.

c. The order of steps that occur in a series of actions that must be performed in a specific order, such as DAS, SE, PPBE, or CPM.
d. Rules defining analysis of options or future actions, such as Ops Planning, JCIDS, PPBE or CPM.

Data for Rules are used in the six core processes in the following ways:

a. JCIDS:
   1) For Materiel Facility, Installation, and Site trade-offs as part of DOTMLPF analyses
   2) For detailing Interoperability requirements.
   3) In constraining requirements dealing with material and non-material solutions.
   4) In relating Doctrine and TT&P to material and non-material solutions.
b. PPBE:
   1) In the Planning and Programming process many rules are applied to cost-benefit tradeoffs, cost estimation, program structure, and program constraints.
c. DAS:
   1) In both technical and programmatic aspects of the DAS.
   2) In specification, standards, directives and guidelines.
d. SE:
   1) In the architectural descriptions of systems describing both structure and behavior.

   2) In standards applied throughout the design and development process.
e. Ops Planning:
   1) Rules are the basic elements contained in Doctrine, TT&P and training publications. Rules are used throughout the development and architectural descriptions of Operational processes.
f. CPM:
   1) In describing and governing both the programmatic and technical aspects of the portfolio.
   2) In describing the standards and constraints applicable to the portfolio.

Presentation

Rules can be represented in many ways. Typically behavioral and tree structures as well as various logic mapping techniques can be used to depict rules, their relationships and interactions. Conflicting rules can be identified using many well know logic analysis instruments and techniques.

Go to top of page ↑

DM2 Data Group

Goals

Goals data are defined to represent the desired effect, ends, visions, outcomes, objectives, etc. for which operational processes, projects, or special programs are conducted. Goals are used to help guide the Organizations to ensure that everyday operations are aligned to a strategic direction. A goal is an end toward which long-term, ongoing effort is directed. In general, goals are established to provide a description of the intended future state. They are established to provide a target to aim toward, whereby activity is focused on attaining the desired effect (goal). Goals provide participants in activities a sense of direction, and a view of what to expect as activity progresses toward some end point. A Goal (and its aliases) describe a desired state of a Resource (Materiel, Information, Performer, or Geopolitical Extent.) Goals data can be expressed as enterprise goals-high-level strategic goals that apply to the entire organization-or as more specific operational goals that define desired outcomes of the work process.

Data Group Description

The following should be noted about the Goals Data Group:

a. Although the language sounds different, the meaning of a desired effect (a change in state of some object) is the same as the meaning of goal.
b. A desired change in the state of some object leads to activities constrained by Rules that are performed by Performers. Some Activities are considered Events because they are of near-zero duration with respect to the frame of discernment of the Vision, Performers, etc.
c. Within DoDAF, goals are identified and described to provide direction to Activities and to orient those Activities toward a desired effect. When a Performer executes an Activity, the Performer does so within the limitations prescribed for the Activity (Rules) and aims toward a desired effect. That effect should either meet, or contribute to meeting, established Goals that reflect the vision of the organization.

Usage in Core Processes

Goals are established at all levels of the organization and each of the core DoD processes. Goals can be applied to the Enterprise or Solution architecture effort. Goals are particularly useful to teams undertaking an architecture development effort to evaluate the success of the effort and how the effort contributes to achieving higher level goals, mission requirements, capability developments, or development of Services and Systems to support Department or organizational business operations.

Data for Goals are useful for:

a. Scoping an activity to ensure that resources utilized in executing an activity contribute to the overall goals and vision of the organization.
b. Establishing rules under which activities are executed to create boundaries for efficiency and effectiveness (Constraints) and establishing those circumstances under which an activity is executed (Event).
c. Establishing measures to determine the success of an activity, consistent with an established goal.

Data for Projects can be used in the six core processes in the following ways:

a. JCIDS: In establishing desired and threshold capabilities. Traceability should always be maintained between Goals and capabilities. This should include measures, rules and pedigree.
b. PPBE, DAS, SE: Goals are established at all level of the design, development and acquisition process. Traceability throughout the various levels is essential to the proper management an control of cost, systems engineering and acquisition.
c. Ops Planning: In establishing Operational Plans Goals and objectives are established related to Missions. Goals can be described as both strategic and tactical.
d. CPM: In establishing both the technical and programmatic aspects of the portfolio.

Presentation

Goals are typically depicted in tabular or textual form. It is desirable that Goals be presented in a structured manner showing primary and derived goals. This enhances project traceability.

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

DM2 Data Groups

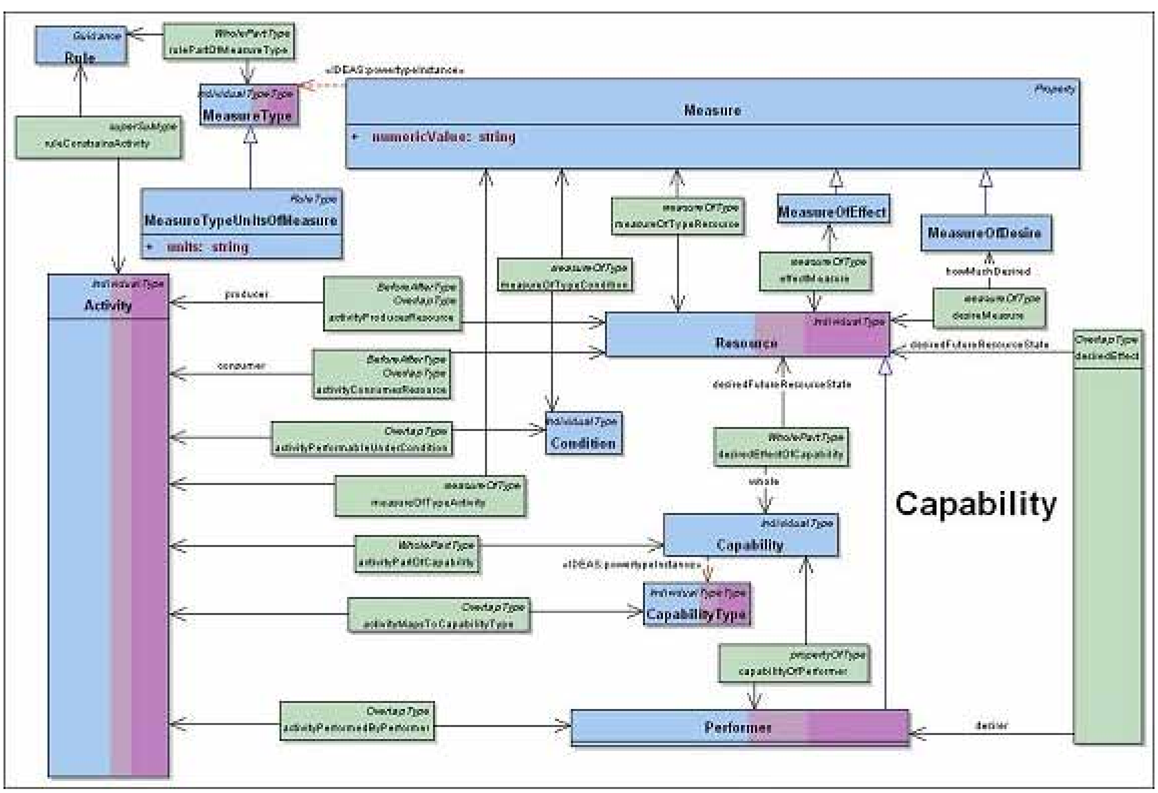
Capability

The Capability Data Group provides information on the collection and integration of activities that combine to respond to a specific requirement. A capability, as defined here is "the ability to achieve a desired effect under specified standards and conditions through combinations of means and ways to perform a set of tasks." This definition is consistent with that contained in the JCIDS Instruction published by the Joint Staff.

Data Group Description

The DoDAF Meta Model for the data comprising Capability is shown in the figure below. Items of note:

a. Ways and means are interpreted in DM2 language to be Resources and Activities
b. Because a Desired Effect is a desired state of a Resource (see Goals data group), a Capability is about states (persistence of current ones, or changes to future ones) of Resources.
c. Capabilities link to Measures (Metrics) through the Activities they entail and the Desired Effects sought.
d. Capabilities relate to Services via the realization of the Capability by a Performer that is a Service. In general, a Service would not provide the Desired Effect(s) but, rather, access to ways and means (Activities and Resources) that would.



DoDAF Meta Model for Capability

(Click image to enlarge)

Usage in Core Processes

Data for Capabilities are used to describe the capability; define acquisition and development requirements necessary to provide the required capability; facilitate understanding of capability execution; develop/update/improve doctrine and educational materials in support of capability execution; and to facilitate sharing and reuse of data.

The Capabilities Data Group (CDG) has a representation at varying levels, from enterprise level to solutions and applies to all DoD core processes. This includes enterprise goals associated with the overall vision, that provide a strategic context for the capabilities described by an architecture, and an accompanying high-level scope, more general than the scenario-based scope defined in an operational concept diagram. At this level, the CDG enables a high-level description of capabilities in decision-makers contexts that can be used for communicating a strategic vision regarding capability evolution. Factors considered in a Capability Based Analysis are:

a. Doctrine
b. Organizations
c. Training
d. Materiel
e. Leadership and Education
f. Personnel
g. Facilities

The following sections document how the Capability Data Group and DM2 support analysis of each of these factors.

In Joint Pub 1-02, Dictionary of Military and Associated Terms, doctrine is defined as "Fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgment in application."

The concept of judgment required in application deals with decision making and cannot be precisely modeled except perhaps as rules affecting the applicability of other rules. The parts of doctrine that can be modeled are included in the capability data group as follows:

a. Principles are modeled as Rules.

b. Military forces and elements thereof are modeled as types and assemblies of Performers.

c. Actions are modeled as Activities.

Thus, doctrine is contained in the specification of certain fundamental Rules, Activities, and Performers and the relationships among them. These relationships are:

a. Each Performer must be of one or more Activities.

b. Each Activity must be by one or more Performers.

c. Each Rule may be a constraint on one or more Activities.

d. Each Activity may be constrained by one or more Rules.

e. Each Rule may be a constraint on one or more Performers.

f. Each Performer may be constrained by one or more Rules.

Thus, since the DM2 contains the entities and relationships listed above it contains the necessary and sufficient set of entities and relationships to permit the modeling of doctrine and a separate data group for Doctrine is not required.

Organization. An organization is a specific real-world assemblage of people and other resources organized for an ongoing purpose. DM2 models Organizations as a type of Performer.

Defining an Organization as an assemblage means that each Organization exhibits a whole/part relationship whereby each Organization may be an assembly of other Organizations and each Organization may also be a component of one or more other Organizations. The following DM2 relationships are involved in the capability based analysis of Organization where each Organization is a type of Performer:

a. Each Capability must be the result of one or more Activities.

b. Each Activity must be by one or more Performers, where each Performer must be a type of Organization, therefore, each Capability must be provided by one or more Organizations.

c. Each Organization must be the Performer of one or more Activities.

d. Each Rule may be a constraint on one or more Organizations.

e. Each Organization may be constrained by one or more Rules.

f. Each Rule may be a constraint on one or more Activities.

g. Each Activity may be constrained by one or more Rules.

Training is defined as an activity or set of Activities to increase the capacity of one or more performers to perform one or more tasks under specified conditions to specific standards:

a. Each Performer may be either an Organization or a Person.

b. Each Performer must be of one or more Activities.

c. Each Activity must be performed under one or more Conditions.

d. Each Activity must be completed to meet one or more Standards.

e. Each Standard must be specified by one or more Measures.

Materiel is a type of Resource. Like Organization above, each Materiel exhibits a whole/part relationship whereby each Materiel may be an assembly of other Materiels and each Materiel may also be a component of one or more other Materiels.

The following DM2 relationships are involved in the capability based analysis of materiel where each Materiel is a part of a Performer:

a. Each Performer must be assigned to one or more Organizations.

b. Each Performer must be used by one or more Persons, where each Person must be the member of only one Organization at any one time.

c. Each Capability must be the result of one or more Activities.

d. Each Activity must be by one or more Performers, where each Performer must be either an Organization or a Person using a Performer.

e. Each Performer must be the Performer of one or more Activities.

f. Each Rule may be a constraint on one or more Performers.

g. Each Performer may be constrained by one or more Rules.

h. Each Rule may be a constraint on one or more Activities.

i. Each Activity may be constrained by one or more Rules

Leadership and Education. Joint Pub 1-02 does not define leadership. In the context of the DM2, leadership is defined as the ability to lead. Joint Pub 1-02 defines Military Education as the systematic instruction of individuals in subjects that will enhance their knowledge of the science and art of war. Thus, to a certain extent, leadership is a set of skills that can be taught as part of the science and art of war and a smaller set of skills that can be trained as Activities that must be performed under specified conditions to meet specified standards.

Leadership is about the judgment required in application of doctrine; it deals with decision making and cannot be precisely modeled except perhaps as rules affecting the applicability of other rules.

Personnel. Personnel refer to Persons. Each Person is a type of Performer.

The following DM2 relationships are involved in the capability based analysis of materiel where each Person is a type of Performer:

a. Each Person must be assigned to only one Organization at any one time.

b. Each Person may the user of one or more Materiels.

c. Each Materiel must be used by one or more Persons.

d. Each Capability must be the result of one or more Activities.

e. Each Activity must be by one or more Performers, where each Performer must be either an Organization or a Person using a Materiel.

f. Each Person must be the Performer of one or more Activities.

g. Each Rule may be a constraint on one or more Persons.

h. Each Person may be constrained by one or more Rules.

i. Each Rule may be a constraint on one or more Persons.

j. Each Activity may be constrained by one or more Rules.

Facilities. A Facility is defined as a real property entity consisting of underlying land and one or more of the following: a building, a structure (including linear structures), a utility system, or pavement. Please note that this definition requires that facilities be firmly sited on or beneath the surface of the earth. Things like tents, aircraft, and satellites that are not affixed to a single location on or beneath the surface of the earth are a type of Materiel. Materiel are germane to capability-based analysis through the following relationships:

a. Each Facility may be the site of one or more Performers and any Materiel that is part-of the Performer(s).

b. Each Performer may be at only one Facility or within a Materiel enclosure at any one time.

c. Because a Facility is an Individual, it has a spatial and temporal extent.

An Individual instance of Materiel has a spatial and temporal extent in contrast to a Type which does not. Generally Architectural Descriptions deal with Types of Materiel, not specific Individuals, e.g., not specific serial-numbered items of equipment. However, the DM2 does represent a Performer at a Location and, consequently, any Materiel that is part of the Performer would also be at the Location.

Presentation

Capabilities are typically depicted in tabular or textual form. In some cases a pictorial is used to help clarify the Capability. It is desirable that Capabilities be presented in a structured manner showing primary and derived capabilities. Capabilities should be presented in a manner depicting traceability to both Activities and Goals.

Go to top of page ↑

DM2 Data Groups

Services

A Service, in its broadest sense, is a well-defined way to provide a unit of work, through which a provider provides a useful result to a consumer. Services do not necessarily equate to web-based technology or functions, although their use in the net-centric environment generally involves the use of web-based, or network-based, resources.

Functionally, a Service is a set of strictly delineated functionalities, restricted to answering the what-question, independent of construction or implementation issues*. Services form a layer, decoupling operational activities from organizational arrangements of resources, such as people and information systems. Finally, Services form a pool that can be orchestrated in support of operational activities, and the operational activities define the level of quality at which the Services are offered.

The Services Data Group provides those data that support the definition and use of Services within the net-centric environment. Section 2.7.1 identifies and describes the data within the group; Section 2.7.2 provides an example method for collecting data on services; Section 2.7.3 provides illustrative uses of the data, and Section 2.7.4 provides presentation examples for using the Services-related data for presentation to/for management in decision-making.

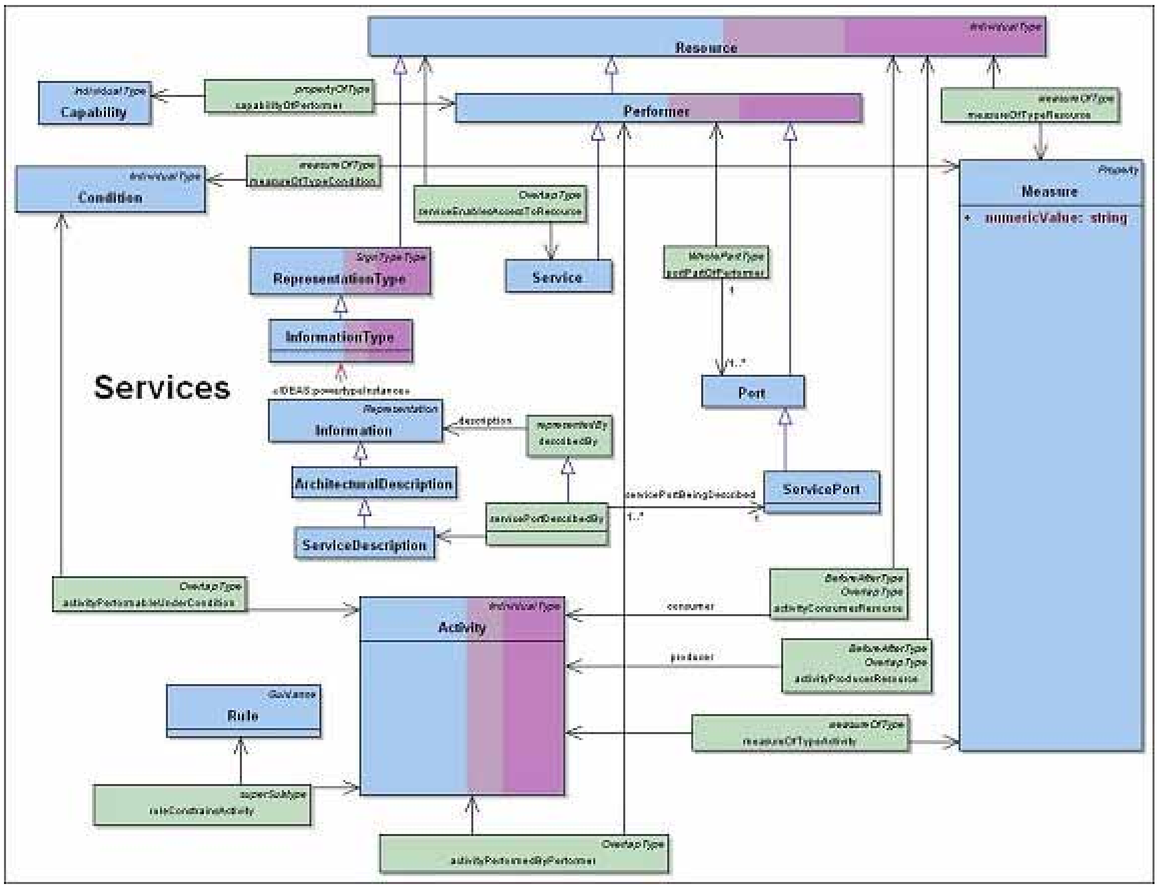
Data Group Description

The DoDAF Meta Model for the data comprising services is shown in the figure below. Note the following guidance:

a. Services are activities done by a Service provider (Performer) to achieve desired results for a Service consumer (other Performer). A Service is a type of Performer which means that it executes an activity and provides a capability.
b. Capabilities and Services are related in two ways. One, the realization or implementation of a Capability by a Performer (usually a configuration of Performers, including Locations) may include within the configuration Services (or Service compositions) to access other Performers within the overall Performer configuration. Conversely, the realization or implementation of a Capability by a Performer (configuration, including Location) may provide the Performers that are accessed by a Service (or Service composition).
c. Unlike DoDAF V1.5, Services in DoDAF V2.0 include business services, such as Search and Rescue. This is important to keep in mind because much of the SOA literature is IT-oriented.
d. Although, in principle, anything has a description, the importance of self-description for discovery and use of Services merits its call-out as a class. Further, because only a public-facing side is described, the Service description needs to represent that it describes the Service Port, not the entire Service. A Service Port is a special type of Port that is self-describing and visible. The Service Description of the Service Port is of all aspects necessary to utilize the Service and no more. As such, it may include visible functionality, QoS, interface descriptions, data descriptions, references to Standards or other Rules (Service Policy), etc. The inner workings of the Service are not described in a Service Description.
e. Since Service inherits whole-part, temporal whole-part (and with it before-after), Service may refer to an orchestrated or choreographed Service, as well as individual

Service components.

f. Since Service Ports are types of Ports and Ports are types of Performers, they inherit all of Performer's properties, including Measures associated with the Performer, performance of Activities (Service Functions) with associated Measures, and provision of objects (Materiel, Data, Information, Performers, Geopolitical Extents).
g. Any Performer that consumes a Service may have a Service Port that is described in the service request. This description indicates how the Service provider should provide or respond back to the Service consumer. That is, Service Ports are parts of Performers that may or may not be Services themselves.



DoDAF Meta Model for Services
(Click image to enlarge)

Usage in Core Processes

The Services Data Group captures service requirements for capabilities, performers and operational activities supporting all the core processes. The DM2 data elements describing Services are linkable to architecture artifacts in the Operational, Capability, System and Project Viewpoints.

Data for Service are used in the six core processes in the following ways:

a. JCIDS, PPBE, DAS and SE:
   1) Services, such as those reified into web or computer based software services (Software as a Service (SaaS), are considered Performers and are used in the same fashion (See Performer Usage in Core Processes 2.1.2).
b. Ops Planning:
   1) Service functions (activities and processes) and resources support operational Planning and other processes that facilitate the exchange of information among

Performers, aid in decision making and support training. TT&P documents together with training materials generally contain the Service used in Operations.
2) Business processes (e.g. Administrative, Logistics, etc) also can be reified as Services both manual and automated.

c. CPM:
1) Services such as SaaS can be part of a portofolio.

Presentation

Services are generally rendered using all the presentation techniques shown in Section 1.3. Typically Structural, behavioral and tree models are used to depict Services with amplifying tabular information.

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

DM2 Data Groups

Project

A Project is a temporary endeavor undertaken to create Resources of Desired Effects. Projects are relevant to all six core processes. Projects form the major elements of the DAS and are the primary focus of the DoD PPBE system.

The Primary Construct of the PPBE system is the Program Element (PE). The PE is defined as:

> ***Program Element****: The program element is the basic building block of the Future Years Defense Program. The PE describes the program mission and identifies the organization responsible to perform the mission. A PE may consist of forces, manpower, materiel (both real and personal property), services, and associated costs, as applicable.*

The key architectural construct within the Program Element is the Work Breakdown Structure (WBS) subject to DoD Instruction 5000.2. The WBS is the primary instrument connecting an Architectural Description to the Defense Acquisitions System and the PPBE processes. The Work Breakdown Structure (WBS) is defined as:

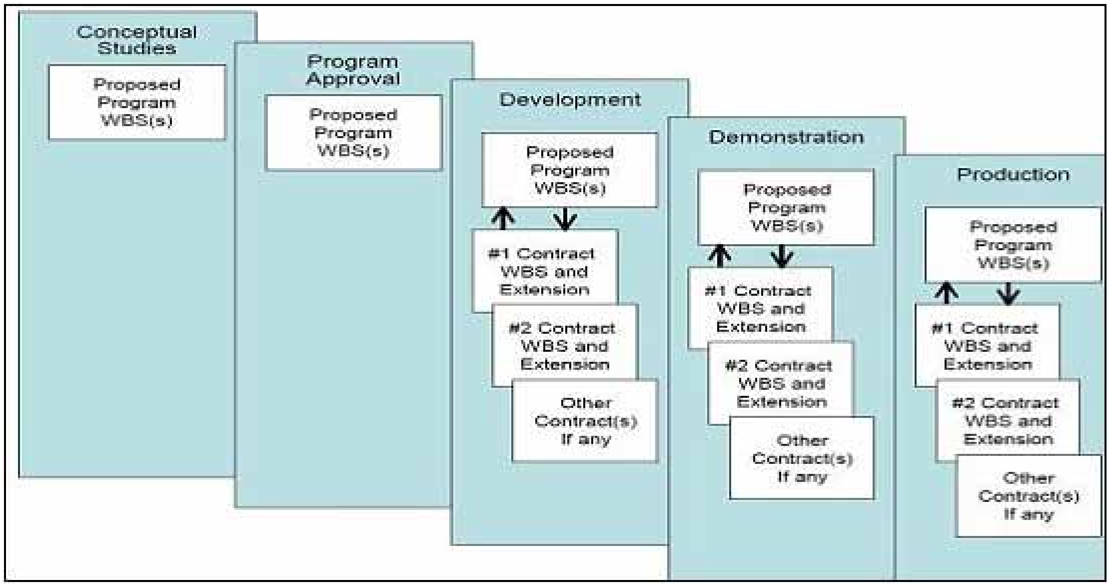
> ***Work Breakdown Structure****: "A product-oriented family tree composed of hardware, software, services, data, and facilities. The family tree results from systems engineering efforts during the acquisition of a defense materiel item".*

MIL-HDBK-881A provides guidance for constructing the WBS applicable to programs subject to DoD Instruction 5000.2. The WBS is the process necessary for subdividing the major product deliverables and project work into smaller more manageable components and it serves as a valuable framework for the technical objectives, and therefore it is product-oriented. Its elements should represent identifiable work products, whether they are equipment, data, or related service products. A WBS is a product structure, not an organizational structure, providing the complete definition of the work to be performed by all participants and the required interfaces between them.

Hardware, software, services, data, and facilities are Resources in the DM2. The information captured in the project administrative tool/techniques (e.g., Project Management Body of Knowledge [PMBOK] 2004) provides the basis for resource information in the DM2. The WBS forms the basis of reporting structures used for contracts requiring compliance with ANSI/EIA 748 Earned Value Management System (EVMS) Guidelines and reports placed on contract such as Contractor Cost Data Reporting (CCDR), Software Resource Data Report (SRDR), Contract Performance Reports (CPR), and Contract Funds Status Reports (CFSR).

MIL-HDBK-881A states: ".the Program WBS and Contract WBS help document architectural products in a system life cycle. The DoD Architecture Framework (DoDAF) V1.0 defines a common approach for DoD Architecture Description development, presentation, and integration for warfighting operations and business operations and processes."

Just as the system is defined and developed throughout its lifecycle, so is the WBS. In the early Project phases of concept refinement, system architecture, and technology development, the program WBS is usually in an early stage of development. The results of the Analysis of Material Approaches and the Analysis of Alternatives (AoA) provide the basis for the evolution of the WBS at all stages of Project evolution. As the architectural design of the project's product or service matures, so should the WBS. The WBS is a primary tool in maintaining efficient and cost effective developments of products and services. The figure below illustrates the evolution of the WBS during the lifecycle of Project.



Evolution of the Project WBS

A Project Plan contains the project WBS (including Tasks and responsible Organizations). The Project Data Group (PDG) contains the essential data required for defining a Project Plan, e.g., those required by DoD 5000.2:

a. Acquisition Strategy

b. Technology Development Strategy

c. System Engineering Plan.

The Tasks and Performers form the essential elements of the project's WBS. The use of both Tasks and Performers focusing on products to be delivered (e.g., System, Service, etc.) in the WBS is the essential premise of the product-oriented WBS defined in MIL-HDBK-881A.

The Project Plan also shows plans and initiatives to coordinate transition planning in a documented program baseline, shows critical success factors, milestones, measures, deliverables, and periodic program reviews.

Data Group Description

The DoDAF Meta Model for the data comprising Project is shown in Figure 13. There are several items to note regarding this model:

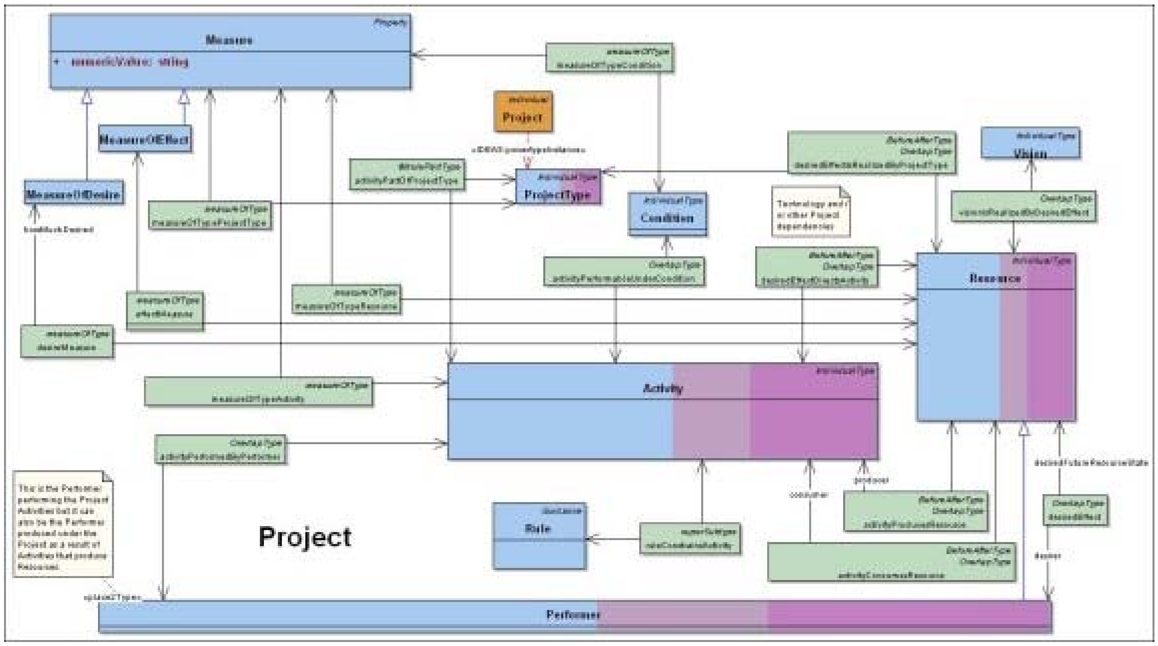
a. Like all concepts in the DM2, Project has whole-part, temporal whole-part, and super-subtype relationships so that major Projects can have minor Projects within them, Projects can have time phases, and Projects can be categorized.

b. Because a Project involves execution of a plan composed of Activities (Tasks), there is a flow of resources into the project's activities and a flow of products out of them, as described by the Resource Flow data group. So this model can describe a Project that results in a System, a Service, Personnel Types (i.e., Training), Organizations (i.e., organizational development), Materiel, or Locations (e.g., Facilities, Installations).

c. Because technology is part of the Project, this group models the analog of the DoDAF V 1.0 and V1.5 SV-9 (System and Services Technology Forecast) and SV-8 (System and Services Evolution Description).

d. Many kinds of measures may be associated with a Project - needs, satisfaction, performance, interoperability, organizational, and cost.

e. Measures and Rules can be assigned at all levels of the Project decomposition. Top-level Measures and Rules (Conditions and Constraints) could be assigned to the Vision, Goals, and Objectives (VGO). Lower-level Measures and Rules can then be derived and assigned to compliance and test criteria. When part of a legal contract, policy, or directive, formal agreement, or contract instrument, the Rules constitute a principle portion of the requirements for the Project.



DoDAF Meta Model for Project

Usage in Core Processes

Data for Projects are used in the following ways:

a. JCIDS
1)Project is the typical outcome of the JCIDS process when material solutions are identified. 2)Non-material solutions may also result in projects

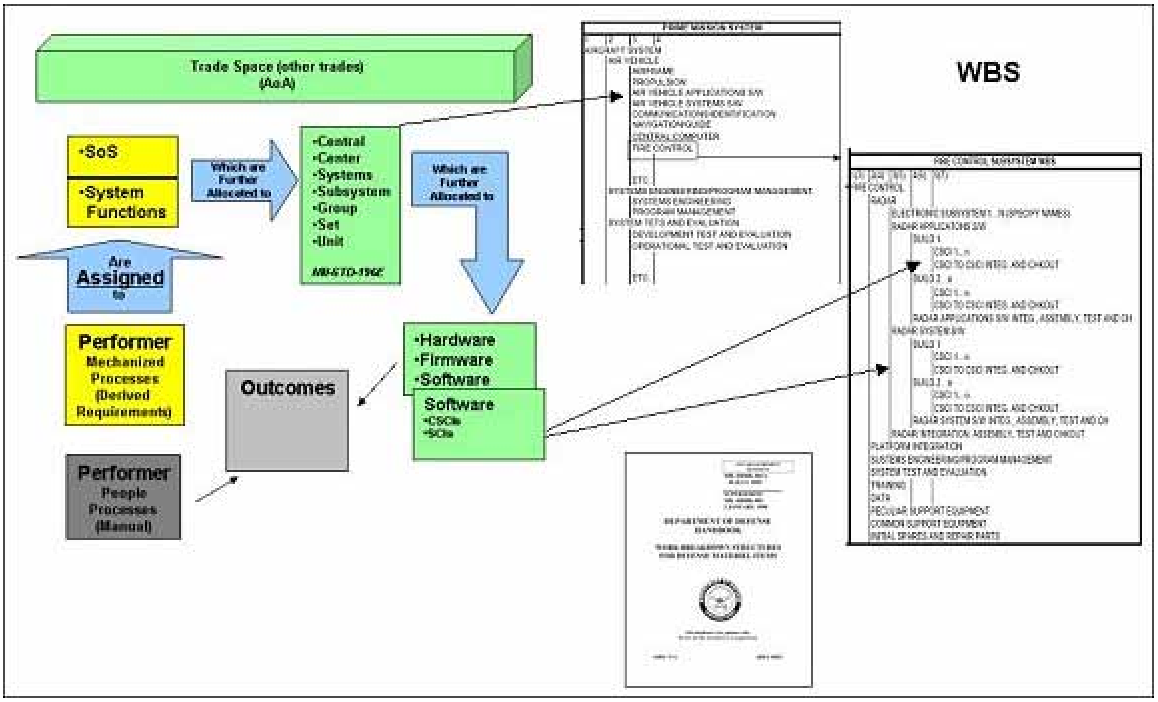
b. PPBE, DAS , and CPM
1)Project is the core element of the PPBE, DAS and CPM processes. The primary construct of Project is the Work Breakdown Structure (WBS). The WBS is the primary reification within Project that relates Performers and Activities to Cost and Milestones. As stated in MIL-HDBK-881A, the WBS is a continually evolving instrument from Project conception to lifecycle management. This tracks closely with the evolution of the architecture. As key Activities are refined into primary Activities and assigned to or allocated to Performers, the WBS should mature and the project definition can gain additional focus (reification).

2)Early Project WBSs may contain high-level Activities (Tasks, Processes, System Functions, or Service Functions). As the Project matures, the WBS identifies the system components, such as subsystems and software configuration items (SCIs). The SCIs can be software services or individually testable and deliverable packages of software. Depending on the acquisition strategy, all or part of the Project WBS and, depending on acquisition strategy, may become the Contract WBS and form the basic outline of the requirements in a statement of work and the project Statement of Objectives (SOO) or Specification. The figure below illustrates this method.

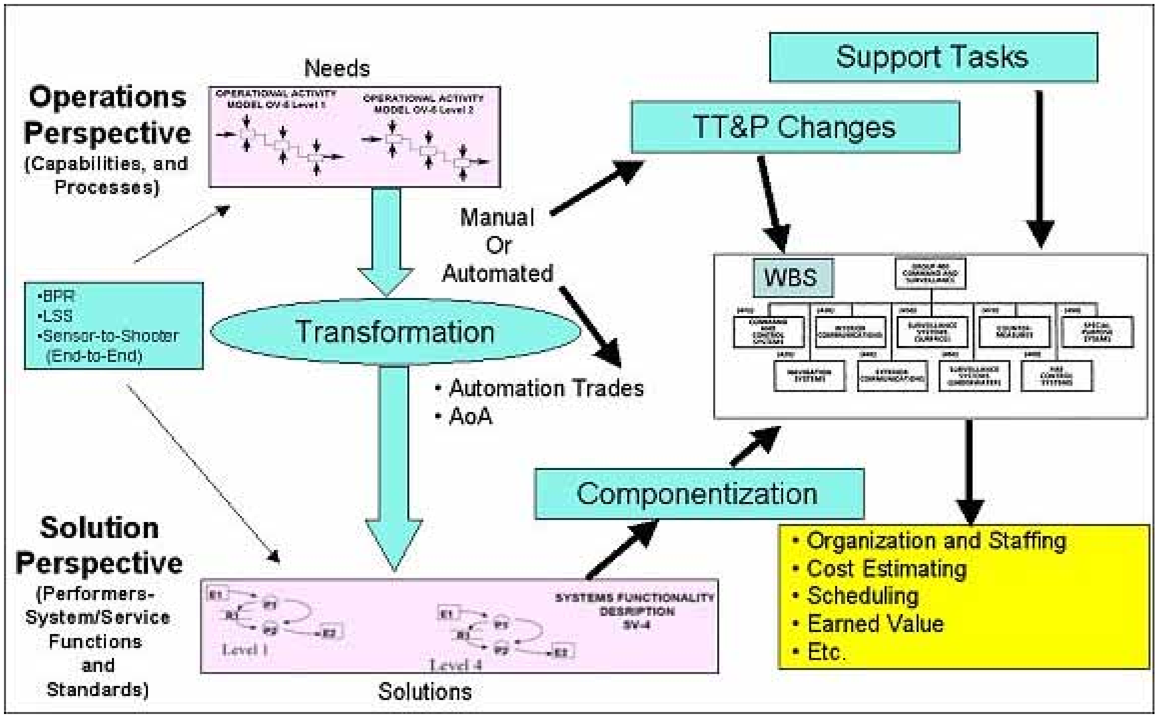
3)The other, non-materiel portions of the WBS (Work Packages, Task and Activities) are derived in a similar fashion, i.e., Activities assigned to or allocated to Performers that are, in turn, assigned to Organizations, Personnel and Facilities.

c. SE
The data derived from Architectural Descriptions, derived through the systems engineering process, directly support the definition and structuring of Projects. The DoDAF architectural data elements are used in the WBS, Architecture based and Classical Specifications and the SOW essential to the systems engineering process. The DoDAF augments classical System Engineering techniques by standardizing the lexicon and relationships. The figure below illustrates the typical systems engineering process and its relationship to DODAF constructs. The process shows how operational needs, as described in description documents such as the Capabilities Description Document (CDD), are translated into structured, engineerable requirements and associated Project constructs. Further, this shows how capabilities and processes are transformed into Solutions through automation tradeoffs and Analysis of Alternatives (AoA). Various alternatives are iterated through the architectural descriptions to meet the required performance, cost, and schedule constraints. From here, Functional and Allocated baselines can be established. As increased detail is added to the architecture, classical systems engineering and design techniques are increasingly applied.

d. Ops Planning:
1)Project also is used in Operational Planning in such areas as developing specific Mission Plans and procedures. Any effort in the Operational community requiring identifiable funding and management can be defined as a Project.



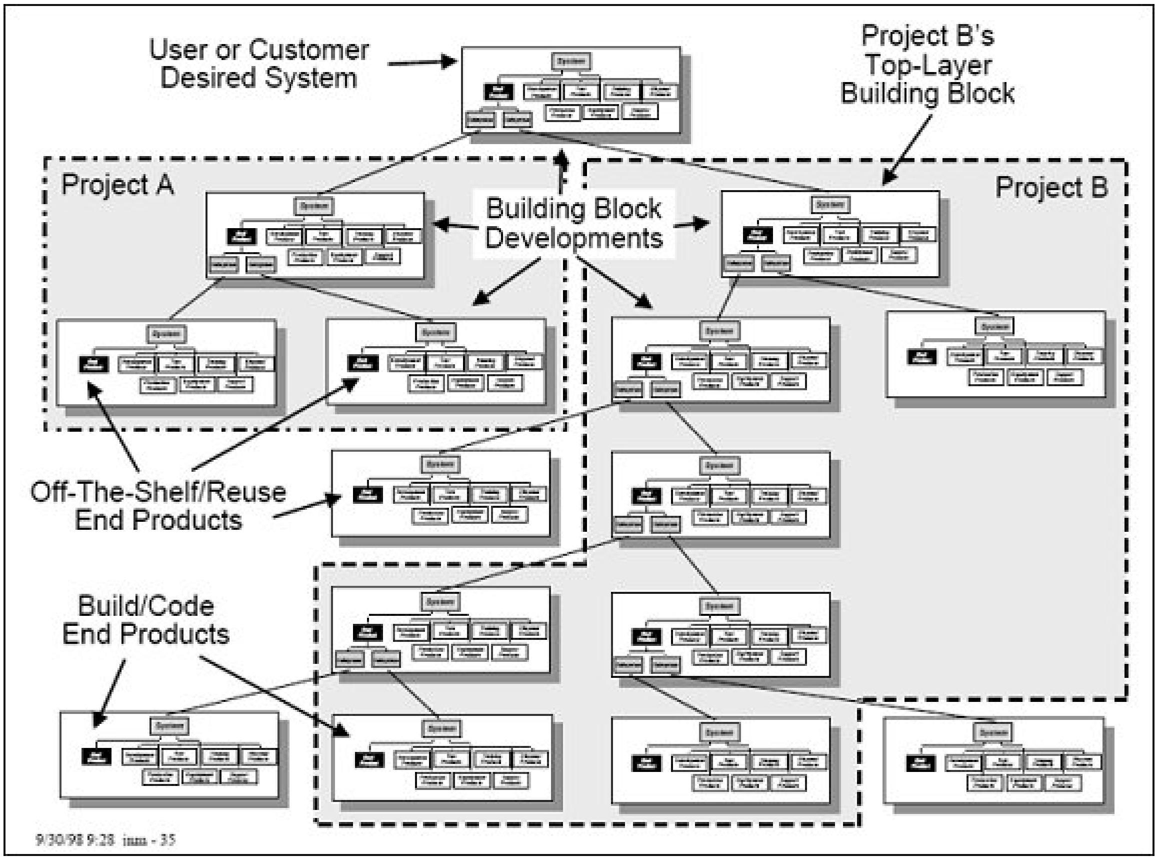
Derivation of the Materiel Portion of the WBS
(click to enlarge)



Architectural Description Usage in Forming Project Structure Reified in the WBS

Presentation

Project presentation techniques are typically use Tree models (WBS), Timeline Models and Tabular information (e.g. spread sheets). Tree models containing products and organizations are represented in the PDG as whole-part breakdowns of the overall end-product and participating organizations of the project. The figure below illustrates how a whole-part structure can be used to partition the Project into manageable subprojects, identify where common off-the-shelf-building blocks (Reuse) can be utilized, and identify all components of the system. In the acquisition stages, the level of breakdown of this decomposition is dependent on perspective (e.g., SoS, Enterprise, System, etc.) and acquisition strategy.



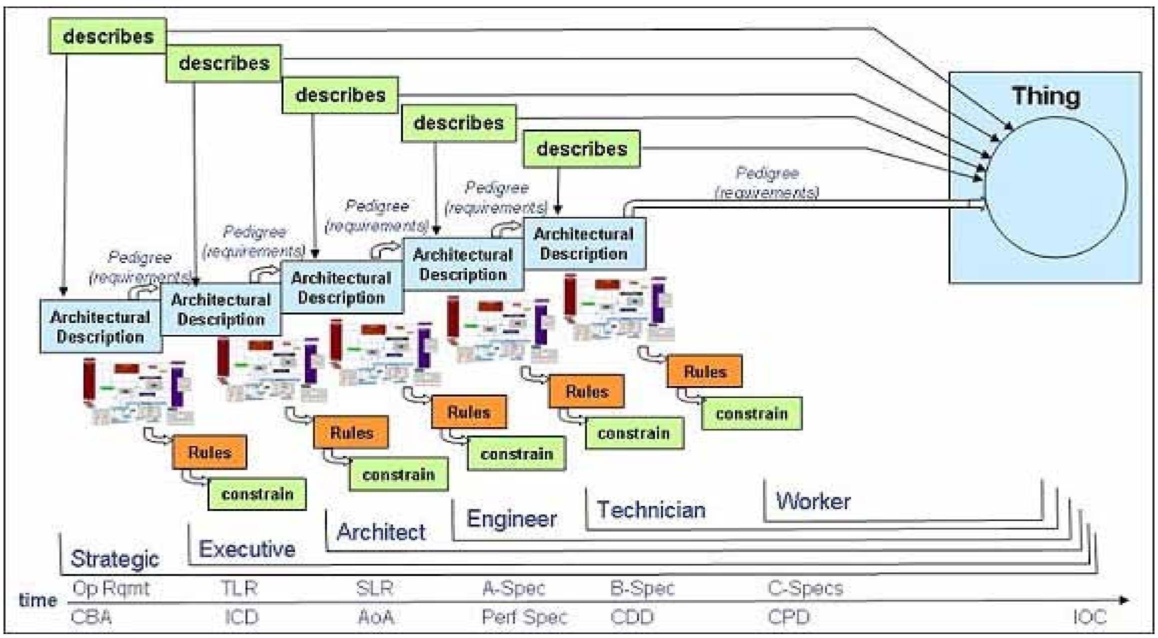
Non-prescriptive, Illustrative Example of System Project Decomposition Used to Develop the Product Portion of the WBS

Go to top of page ↑

DM2 Data Groups

Reification

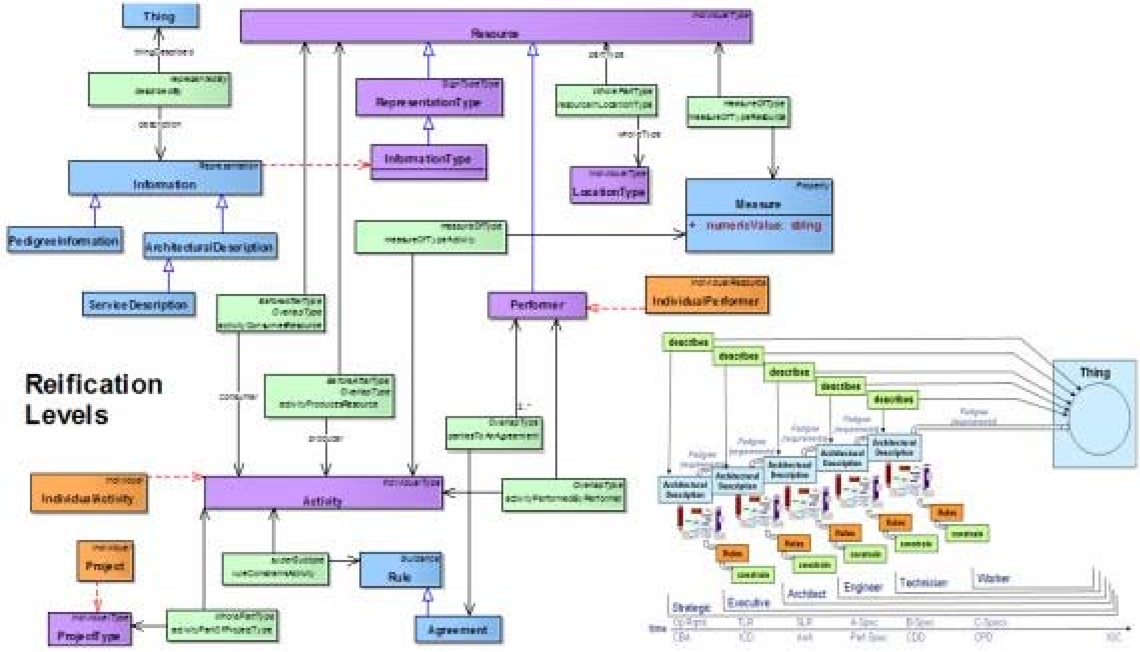
Architectural descriptions such as activity models are example of architectural descriptions that reified at many level of detail. In a typical development project, the architecture descriptions (contained in plans, specifications and/or "model based" Computer Aided Design Tools (CAD)) provide increasing levels of detail as the project progresses through the normal DoD Milestone process. This is what John Zachman calls "levels of reification", as shown in the figure below.



Reification of Architectural Descriptions at Varying Levels
(Click image to enlarge)

Data Group Description

The DoDAF Meta Model for the data comprising reification is shown in the figure below.



DoDAF Meta Model for Reification

(Click image to enlarge)

Usage in Core Processes

Reification is used in the six core processes in the following ways:

a. JCIDS: Refinement and increased levels of detail of capability and solution constraint descriptions from ICD to CPD.

b. PPBE: Refinement in Project or Program Work Breakdown Structures (WBSs) and Cost to complete estimates.

c. DAS: Refinement and Increase detail of design and architectural descriptions through the milestone review process.

d. SE:
1) Refinement and Increase detail of design and architectural descriptions through the various design and development stages.
2) Clearly described functional allocations and traceability throughout the various levels of architectural descriptions (e.g. specifications, architectural view and models).

e. Ops Planning: Refinement and increasing levels of detail in Tactics, Techniques and Procedures throughout the stages of operational plan development.

f. CPM: Refinement and increased detail in the descriptions of the capability, performance, functionality and cost effectiveness of the portfolio.

Presentation

Reification is depicted throughout all the elements of the architectural descriptions. It is evident in all levels of design detail or refinement. From one level to another level different people become involved in the architecture and design process. The reification process illustrates that at different levels, "one person's design becomes the next person's requirement". Reification can take all forms of descriptive techniques. Typically the structural, behavior, tree models and views will be present throughout all the normal programs documentation (e.g. specifications, system engineering plans, procedural documents, training manuals, doctrine publications, etc.)

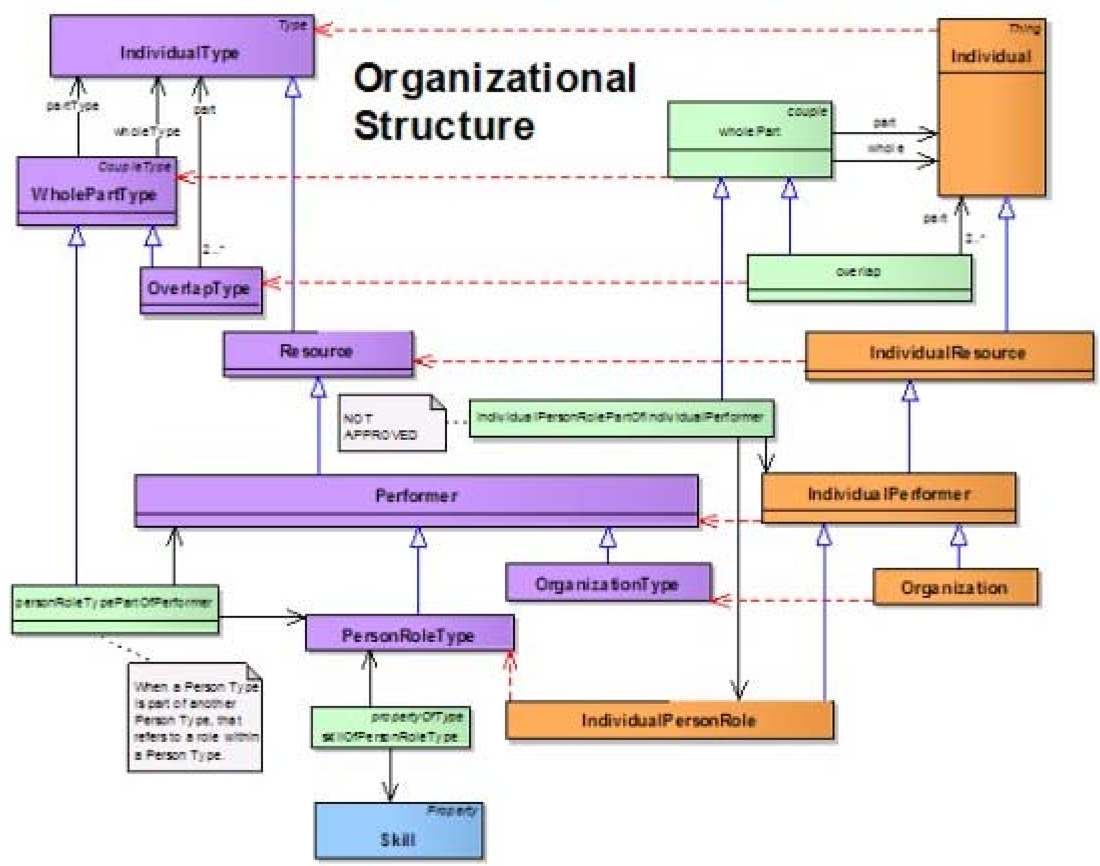
Go to top of page ↑

DM2 Data Groups

Organizational Structure

Data Group Description

The DoDAF Meta Model for the data comprising organizational structure is shown in the figure below.



DoDAF Meta Model for Organizational Structure
(Click image to enlarge)

Usage in Core Process

Presentation

Go to top of page ↑

Hampton, VA April 11-15, 2011
Registration will be available at:
WWW.DODENTERPRISEARCHITECTURE.ORG
Targeted Date TBD
Co-hosted by DoD CIO Architecture, Standards & Interoperability Directorate and Joint Staff

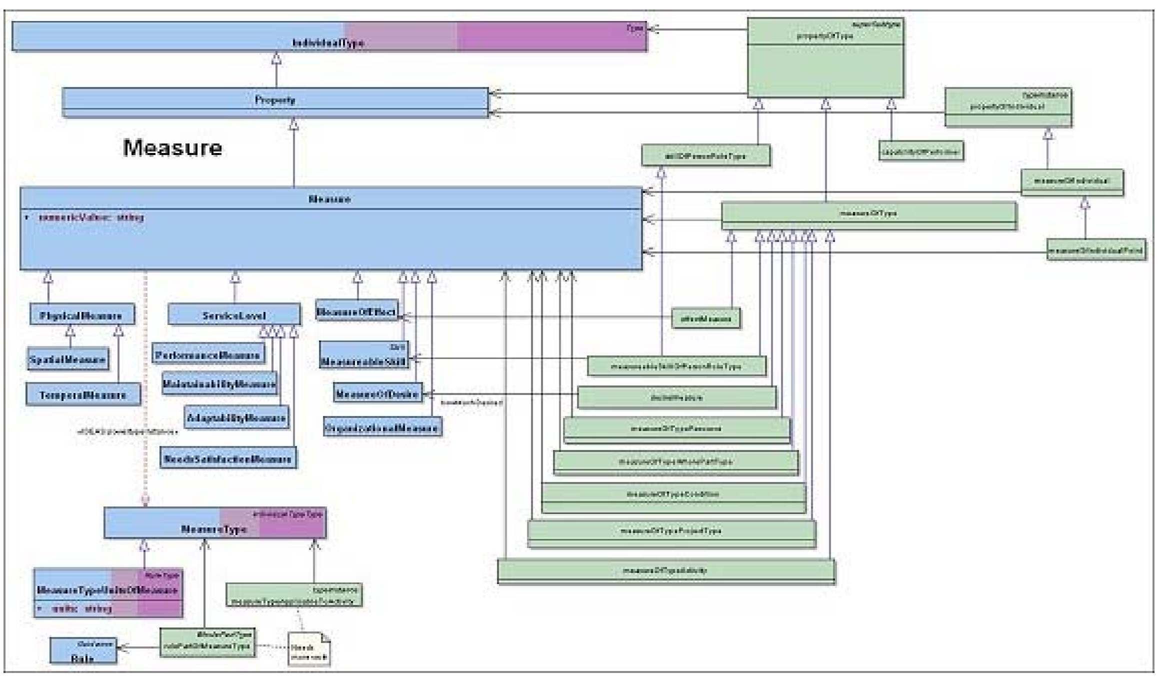
DM2 Data Groups

Measures

A measure is the magnitude of some attribute of an object. Measures provide a way to compare objects, whether Projects, Services, Systems, Activities, or Capabilities. The comparisons can be between like objects at a point in time, or the same object over time. For example, a Capability may have different measures when looking at the current baseline and over increments toward some desired end-state. Measures play a much greater, central role in DoDAF V2.0, compared to earlier versions of DoDAF. This change has multiple drivers, including: Core Process use of architectural data. Those management and engineering processes depend on quantification as a means of improving objectivity, accountability, and efficiency of the processes. Federal Enterprise Architecture (FEA) Performance Reference Model. There are many kinds of Measures that are applicable to many architecture elements. These are described in the following paragraph.

Data Group Description

The DoDAF Meta Model for the data comprising Measures, is depicted in the figure below.



DoDAF Meta Model for Measures
(Click image to enlarge)

The following should be noted about the Measures Data Group:

a. The key elements of the Measure Data group are Measure and Measure Type. Measure refers to the actual measure value and units. It relates to a Measure Type that describes what is being measured. Examples of each are shown below in the table

below.

Measure	Measure Type
1 year	Timeliness
Mach 3	Rate
99 percent	Reliability
56K	BAUD
3 meters	Target Location Error (TLE) Accuracy
1,000 liters	Capacity
$1M	Cost
Level 3	Capability Maturity Model® Integration (CMMI) Organizational Level

Non-prescriptive, Illustrative Examples of Measures and Measure Types

b. Formally, a Measure defines membership criteria for a set or class; e.g., the set of all things that has 2 kg mass. The relationship between Measure and Measure Type is that any particular Measure is an instance of all the possible sets that could be taken for a Measure Type.

c. The lower part of Figure 20 depicts the upper tiers of a Measure Type taxonomy or classification scheme. It is expected that architects would add more detailed types (make the taxonomy more specialized), as needed, within their federate. Note that Service Level has multiple inheritances because a Service QoS or Service Level Agreement (SLA) could address User Needs, User Satisfaction, Interoperability, or Performance.

d. All Measure Types have a Rule that prescribes how the Measure is accomplished; e.g., units, calibration, or procedure. Spatial measures' Rules include coordinate system rules. For example, latitude and longitude are understandable only by reference to a Geodetic coordinate system around the Earth.

e. As a Measure Type, cost can be captured in the architecture at different levels, based on the Process-owners requirements

f. The upper part of the figure above depicts how Measures apply to architecture elements. Note that they apply to relationships between objects; e.g., the Measure applies to a Performer performing an Activity. The Activity has a relationship to Measure Type that says what Measure Types apply to an Activity. This represents Universal Joint Task List (UJTL) tasks and their applicable Measure Types, including Conditions, that is, Condition is quantified by a Measure Type. (The whole-part relationship feature of Condition allows it to be singular.) This is accomplished by Condition's typeInstance association, saying an elementary Condition is a member (instance) of a Measure Type class.

Usage in Core Processes

Data for Measures are used in the six core processes in the following ways:

PPBE and JCIDS:

1. Planning – adequacy analysis: From an adequacy point of view, Measures that are

associated with a Capability (including Capability increment, since Capabilities have whole-part inheritance). Capabilities can be compared with the Measures associated with the Performers to see if the Performer solution(s) are adequate. A set of alternative Performers as part of an Analysis of Alternatives could also be evaluated. Goals or Desired Effects could compare with Measures associated with Performers.

2. Programming – overlap analysis: The purpose of an overlap analysis is to determine if there are overlaps, or undesired duplicative capability, in the spending plan, portfolio, capabilities development, or acquisition plan. Similar functionality is often only an indicator of overlapping or duplicative capability. Often Performers with similar functionality operate under different Measures which are not duplicative or overlapping capability. For example, operational-level situation awareness systems may not be as fast or precise as a tactical-level, but they may handle a larger number of objects over a larger area.
3. Goal Setting: Measures are often part of Goals; e.g., production or efficiency Goals.
4. Requirements: Requirements often have Measure elements.
5. Capability Evolution: Measures are part of capability evolution, showing increments of measurable improvement as the capability evolves and allowing monitoring about when the capability is projected to be achieved or has already been achieved.

SE and DAS:

1. System Engineering/Design: Measures set the design envelope goals, sometimes called performance characteristics or attributes. They can also set the constraints; e.g., cost constraints.
2. Performance–Cost Tradeoffs: Measures of performance (e.g., effectiveness) can be compared to different costs to evaluate and make decisions about alternative solutions.
3. Benchmarking: Measures can be used to establish benchmarks of performance, such as for a personnel skill or a radar tracking accuracy test.
4. Organizational and Personnel Development: Organizational and personnel goals are often established and then monitored using Measures.
5. Capacity Planning: Measures can be used to plan for needed capacity; e.g., for networks, training programs.
6. Quality of Service (QoS) Description: In SOA, QoS is often expressed as a Measure; e.g., bit loss rate or jitter. These Measures show up in the service description and are part of service discovery, so users can discover access to capabilities that meet their quality requirements.
7. Project Constraints: Measures such as cost and risk can be constraints on Projects.

CPM:

1. Portfolio Balancing. Measures can be used to balance a portfolio so that it achieves the right mix of goals and constraints.

Ops Planning:

1. Organizational and Personnel Development. Organizational and personnel goals are often established and then monitored using Measures.

Presentation

Presentation Measures are typically displayed in tabular form and are usually tied to Structural, Behavioral or Tree models and their constituent elements. Measures can also be represented in a tree structure illustrating the traceability of derived metric requirements.

Go to top of page ↑

DM2 Data Groups

Locations

A location is a point or extent in space. The need to specify or describe Locations occurs in some Architectural Descriptions when it is necessary to support decision-making of a core process. Examples of core process analyzes in which locations might have a bearing on the decisions to be made include the following:

1. Base Realignment and Closure (BRAC) (SE process).
2. Capability for a new regional command (JCIDS).
3. Communications or logistics planning in a mission area (Ops process).
4. System and equipment installation and Personnel Type assignments to Facilities (Operations and SE processes).

Examples where Locations play little, if any, role in the process are:

1. Prioritization of precision engagement programs (PPBE and portfolio management processes).
2. Streamlining of a business process (SE process).
3. Doctrine development (JCIDS and Operations processes).

The role of Locations in the decision process was implicit in earlier versions of DoDAF. In this version, they are treated explicitly and precisely to allow more rigorous analysis of requirements (e.g., communications or logistics planning) and clearer differentiation among solutions alternatives).

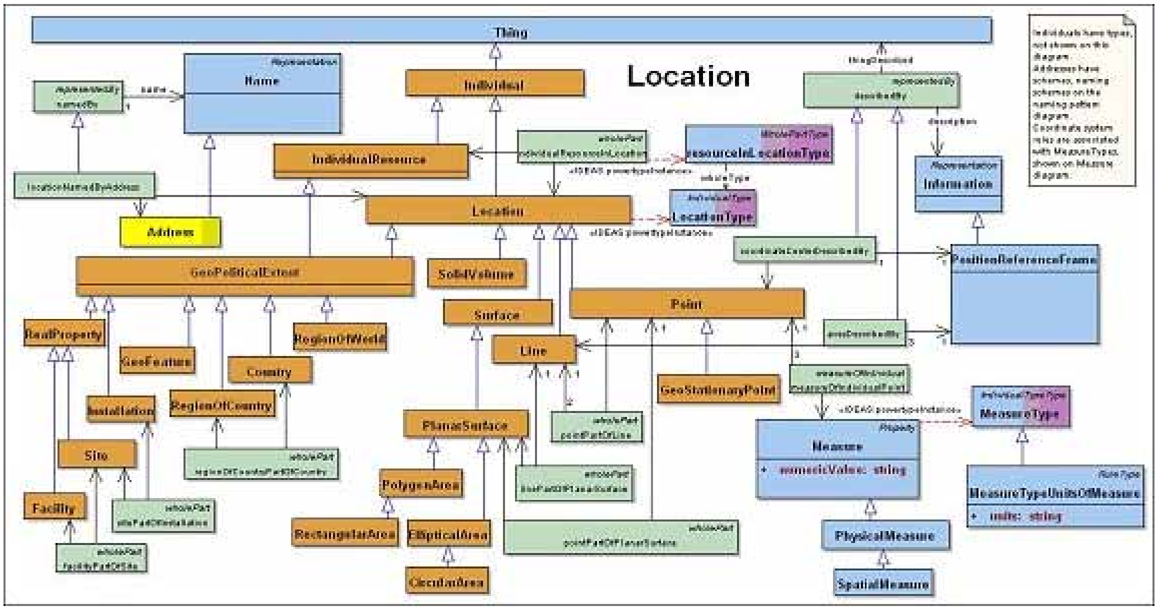
Data Group Description

The DoDAF Meta-model for the data comprising Locations is shown in the figure below. There are several items to note:

a. Addresses such as URLs, Universal Resource Names (URNs), postal addresses, data link addresses, etc. are considered Names for Locations. For example, a postal address is a naming system for the Location of a building. A Universal Resource Locator is a name for a server that is located somewhere on the Web.
b. The naming pattern works by identifying the following:
   1) the name string,
   2) the object being named, and
   3) the type of name (e.g., postal address). Name here is used in the broadest sense, such that a description is considered a long name.
c. The lower left of the diagram is a model of types of Location objects. These can be alternatively named using the naming pattern in the upper left and delineated using the Extent pattern in the lower right.
d. Minimal parts of the Spatial Extent (Point, Line, Surface, and Solid Volume) are detailed because of the varying requirements within a federate. That is, member of the federate may need to specialize the Spatial Extents. Some common and simple classes are modeled, such as a Line described by two Points and a Planar Surface defined by a Line and Point.
e. Facilities are types of Locations. In prior versions of DoDAF it was not clear if a Facility

could be thought of as a system or just a Location. This is now clarified. To describe the functionality of a Facility, the Activities performed by the Performers located at the Facility are described.

f. Installation, Site, and Facility follow Army guidance from the Real Property Inventory Requirements (RIPR). Similarly, a Facility can be a linear structure, such as a road or pipeline.
g. Geofeatures (called FEATURE in Joint Consultation, Command and Control Information Exchange Data Model (JC3IEDM)) cover man-made control features, as well as geophysical features (including meteorological and oceanographic phenomena).



DoDAF Meta Model for Locations
(Click image to enlarge)

Additional considerations in modeling Location data are as follows:

a. For many architecture applications, a locating scheme is some kind of geometric system because many uses (see next paragraph) require geometric calculations.
b. Named locations (e.g., facility, base, installation, region names) can be applicable since their use may be merely to describe where performance occurs. In addition, the naming pattern basically can use the name as a surrogate for the geometric location, such as postal addresses are rarely applicable to architectures.
c. If a geometric system is needed, the coordinate system, reference frame, and units are chosen. The Geospatial Markup Language (GML) defines 26 different kinds of coordinate systems, including one called user defined. In many cases, a federate may choose reference to GML so issues like handed-ness and orientation don't have to be defined again.
d. The accuracy should be determined. For many uses, Locations may not need to be as accurate as some Geospatial system can be, since the use calculation may have many approximations, assumptions, and minor influencing variables that are chosen to be ignored.
e. In some cases, there may be need for speed and acceleration ranges. Since these are unusual, they are not part of the core DM2 but would be added as extensions for these kinds of models. The speed could be extended as an attribute or as a trajectory consisting of a set of spatial-temporal points, where the trajectory is a whole and the points are parts.

Usage in Core Processes

Data for Locations are used to describe where Performers perform. The Location concept supported the system node in DoDAF V1.0 and V1.5. In DoDAF V2.0, it is generalized and more precisely defined. Examples of the uses of the various types of Locations in all the core processes are:

a. Facility Locations allow description that certain systems or organizations are located at a specific facility. Note that the function of the Facility is determined by the Activities performed by the Performers located at the Facility; that is, the Facility itself is not a Performer.
b. Installation Locations allow descriptions of certain organizations that operate or use an installation.
c. Region Locations are used to describe what Performers and Activities are performed in certain regions.
d. A Point Location can be used to state when a Performer is located at a specific Point; e.g., latitude and longitude. When the location is not that specific, Regions, Countries, and other geometric shapes can be used.
e. Line (set of lines) allows description of Performers located on, beside, or within some enclosing lines. The line could be described mathematically so that it could specify an orbit, e.g., that certain satellites are in some orbit.
f. Volume, e.g., that some systems cover a certain volume; e.g., an air defense system.
g. Addresses (names for locations) allow descriptions of where something is located using the address scheme; e.g., the URL address scheme allows for looking up the internet protocol (IP) and then the files on the server.

Presentation

Location is typically represented in architecture in pictorial diagrams, however tabular and other representations may be used depending on the "Fit-for-Purpose" application. In many instances, locations are depicted in conjunction with typical models and view used in architectural descriptions.

Go to top of page ↑

DM2 Data Groups

Pedigree

The pedigree data group represents the workflow for a Resource. It describes the Activities used to produce a Resource, e.g., a piece of Information. Of particularly high importance for architectural descriptions, is the production of architecture description information. (Architecture descriptions are types of Information since Information describes some Thing and architecture descriptions describe the architecture.) All aspects of the production workflow are describable with the Pedigree data group including:

a. What Resources were consumed in the production of the Resource

b. What Performers performed the production

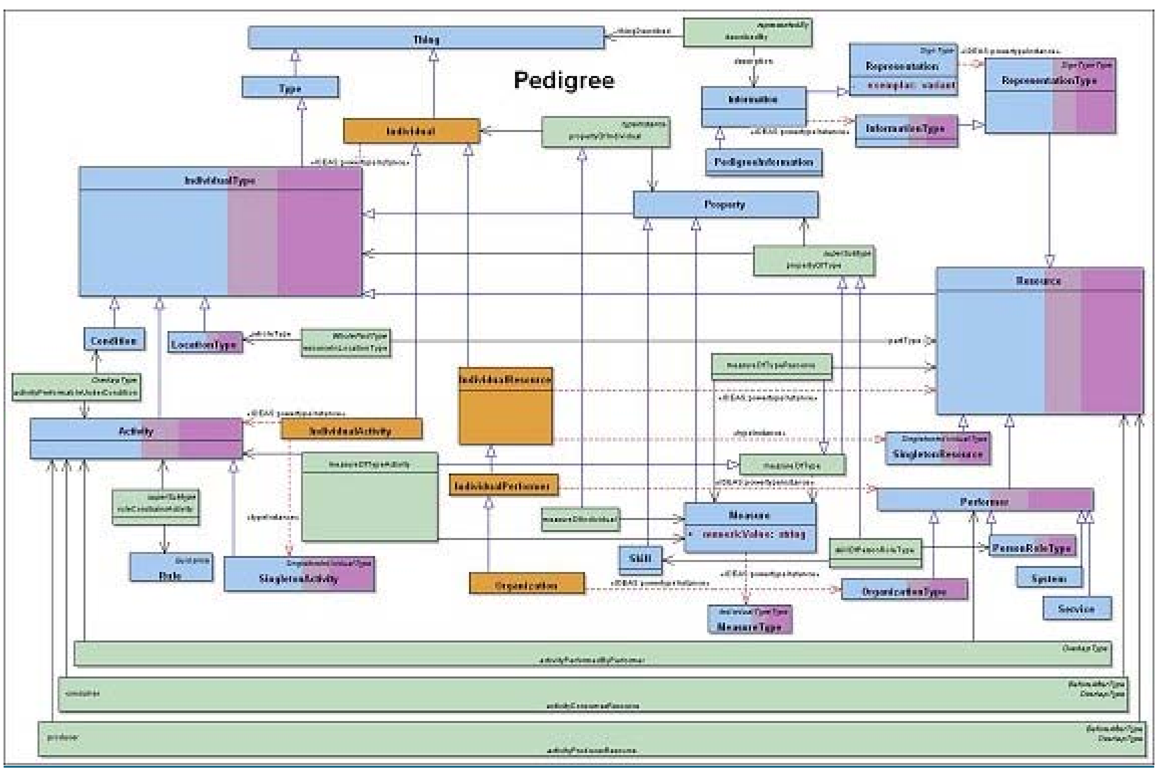
c. What Rules constrained the production activity

d. What metrics (Measures) applied to the production and the Resources consumed

e. Where did the production occur

Data Group Description

The DoDAF Meta Model for the data comprising Pedigree is shown in the figure below.



DoDAF Meta Model for Pedigree
(Click image to enlarge)

Usage in Core Processes

Pedigree is used to demonstrate the rationale for architecture description choices. In many systems engineering and requirements analysis processes, it is the means by which traceability information is maintained.

Presentation

Pedigree information is usually presented in traceability matrices, tables, or indented text. Sometime reverse-traceability information is presented, wherein the source (e.g., requirement) is listed and then the architectural artifacts that satisfy it are shown next.

Go to top of page ↑

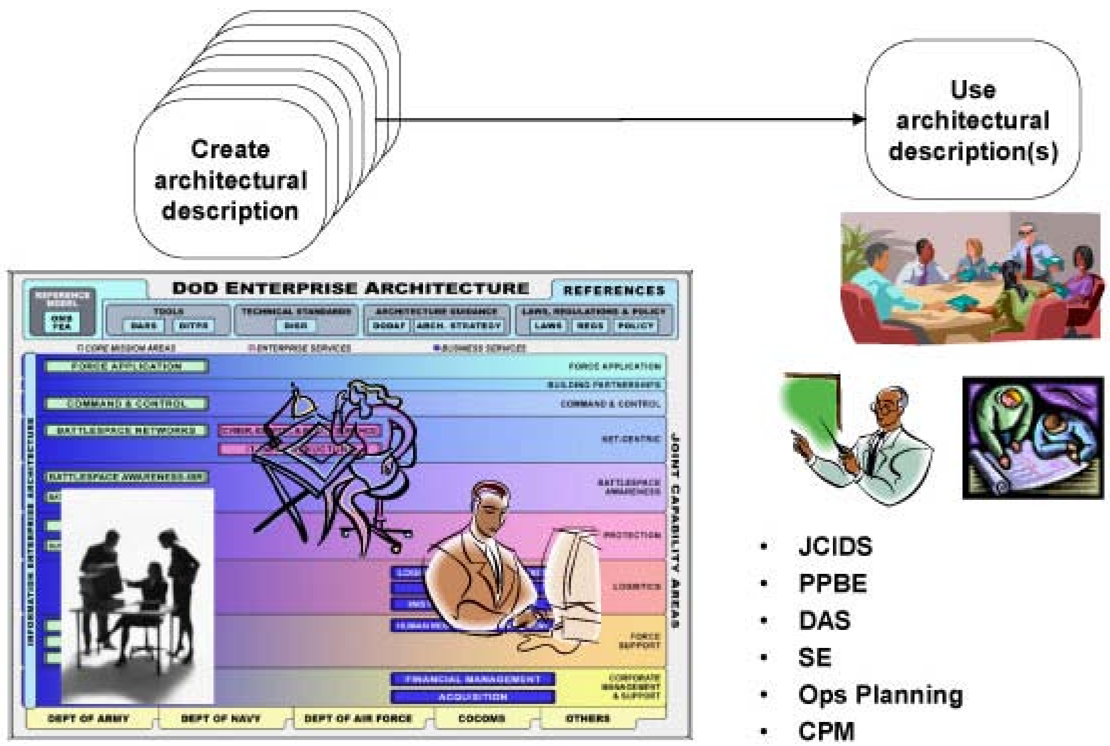
DM2

DoDAF Physical Exchange Specification (PES)

PES XSD downloads:

- IDEAS Foundation
- DM2 Foundation
- DM2 Domain
- IC-ISM

In the support of these, EA data must be exchanged and shared. The general pattern for this exchange is shown in the figure below.



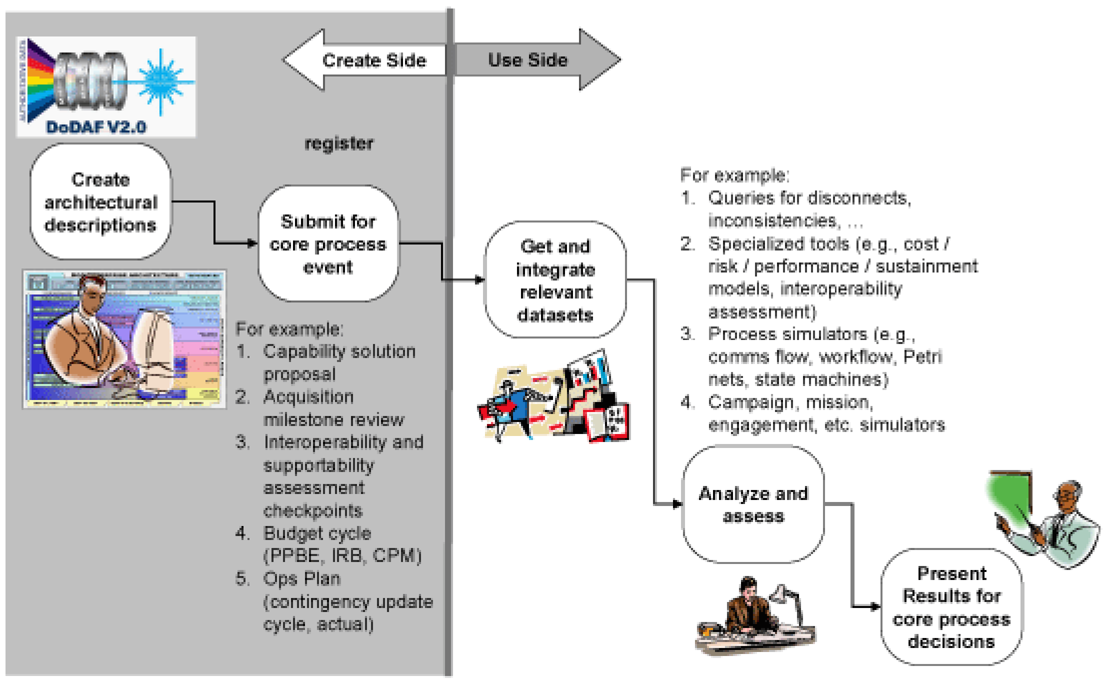
General Pattern for EA Information Sharing and Data Exchange

The information to be shared varies across the core processes and is determined by the information needs of specific use cases within those core processes. Notional examples of such use cases are shown in the figure below.

Core Process	Use Case	General Pattern
JCIDS		
	JCD / ICD / CPD / CDD Review	Assessment
	JCD / ICDFNA / FSA / FNA / AoA	Optimization
	ISP / TISP Evalutation	Assessment
	Preparer	Creation
DAS		
	Milestone Reviews	Assessment
	Functional Control Boards	Assessment
PPBE		
	IRB – OMB 300	Assessment
	POM	Optimization
Capabilities Portfolio Management		
	Analyze / access portfolio	Optimization
Systems Engineering		
	Spec development	Development
Ops Planning		
	Plans development	Development

Notional EA Information Sharing Use Cases

Core process use case stakeholders work with EA data developers to determine what information needs to be shared when in order to support the core process. A notional example of the resultant information exchange in shown in the figure below. Note that in this case, the data presented for decisions may <u>not be EA data, but, rather, the analysis results</u> from analyzing EA data.



Notional Pattern of EA Information Sharing for Assessment Processes

When exchanging architectural data, the PES is the specification for the exchange. The PES provides an efficient and standard means to ensure that data sharing can occur in a toolset-agnostic, methodology-agnostic environment. Use of the by architects to document architectural data and information in tools, through spreadsheets, or other means, and deposit that data and organized information into federated repositories is facilitated by the common understanding underlying the use of the PES.

The DM2 PES XML schema (XSD) provides a neutral format for data exchange between EA data and data sources including:

1. EA databases.
2. DoD Authoritative Source Databases (e.g., DoD Information Technology Portfolio Repository [DITPR]).
3. Unified Profile for DoDAF and Ministry of Defence Architecture Framework (MODAF) (UPDM) and SysML-based Unified Markup Language (UML) Tools.
4. Other Information Technology (IT) and enterprise architecture Tools.
5. Modeling and Simulation Tools that are used in EA assessments, e.g., AoA's.
6. Reporting Tools, e.g., for Chairman of the Joint Chief of Staff Instruction (CJCSI) or Department of Defense Instruction (DoDI) submission.
7. Systems Engineering Tools.
8. Other Federal agencies (e.g., Department of Homeland Security (DHS), Department of Justice (DoJ).
9. Coalition partners and North Atlantic Treaty Organization (NATO).
10. Other organizations with which DoD exchanges Enterprise Architecture (EA) data (e.g., industry, States, National Government Organizations [NGO's]).

This role is illustrated in the figure below.

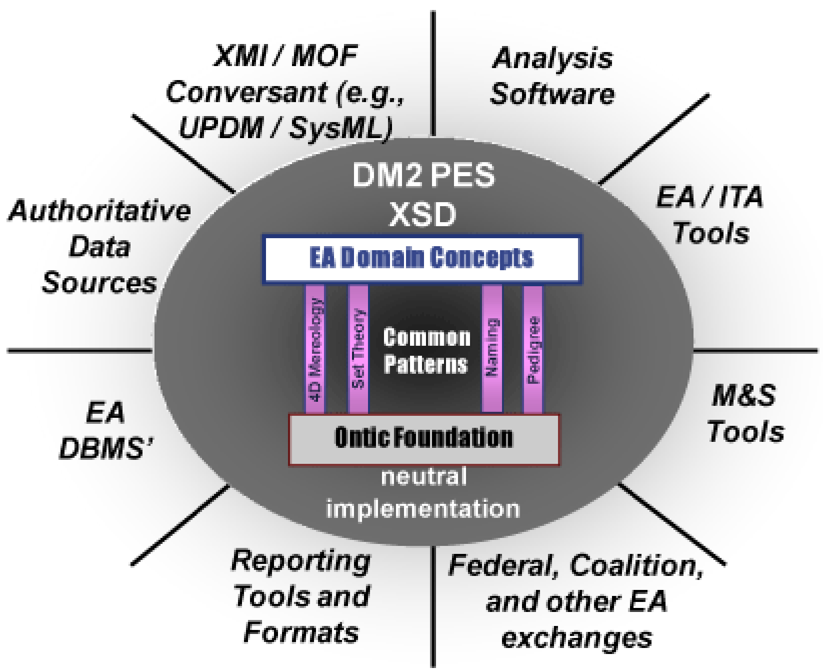


Illustration of DM2 Role in Providing a Neutral Model for Data Exchange

Note that within any particular community above, there may be a data exchange format particular to that community. A particularly important case is the UPDM-SysML XML Metadata Interchange (XMI) format for data exchange of UML models. XMI provides a neutral way to exchange model data, including diagram data, between UML tools. A universal DM2 PES to XMI translation will allow UPDM-SysML tools to interoperate with the other tools and data sources used in DoD EA.

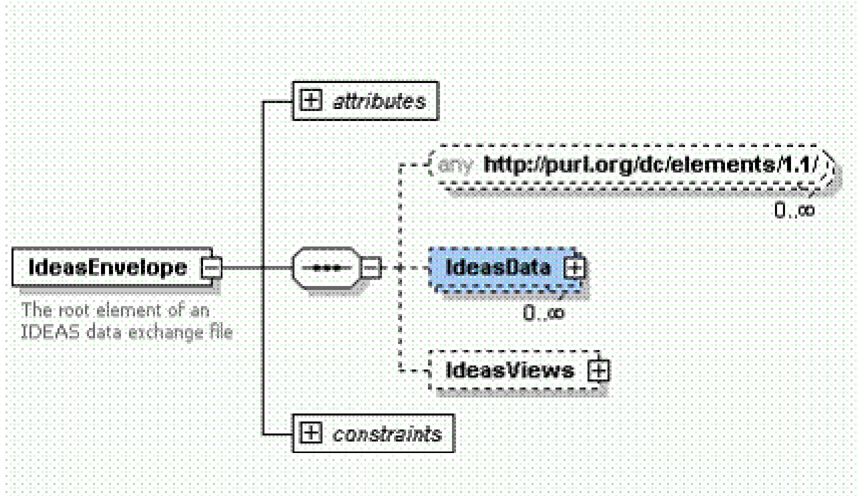
XSD

The DM2 PES eXtensible Markup Language (XML) Schema Definitions (XSDs) is auto-generated from the DM2 Logical Data Model. No additional semantics are added or changed.

There are four DM2 PES XSD's:

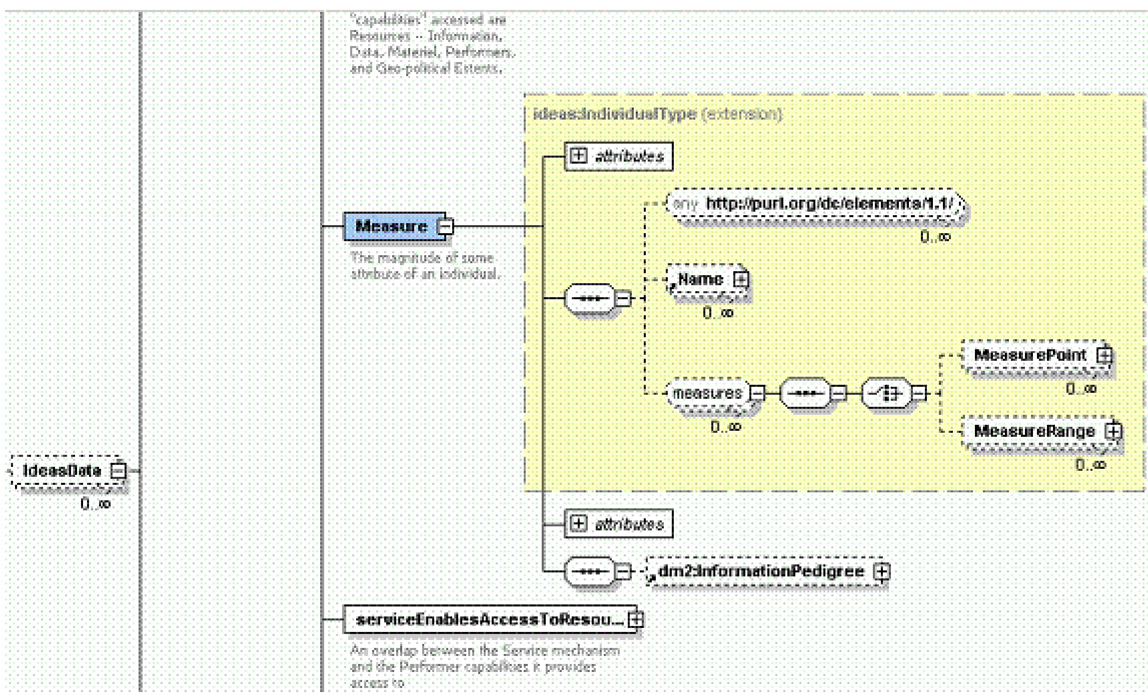
1. IDEAS Foundation, version 1.0
2. DM2 additional foundation
3. Classification marking (externally controlled)
4. DM2 exchange data

The DM2 PES XSD used for data exchange has a very simple structure as shown in the figure below.



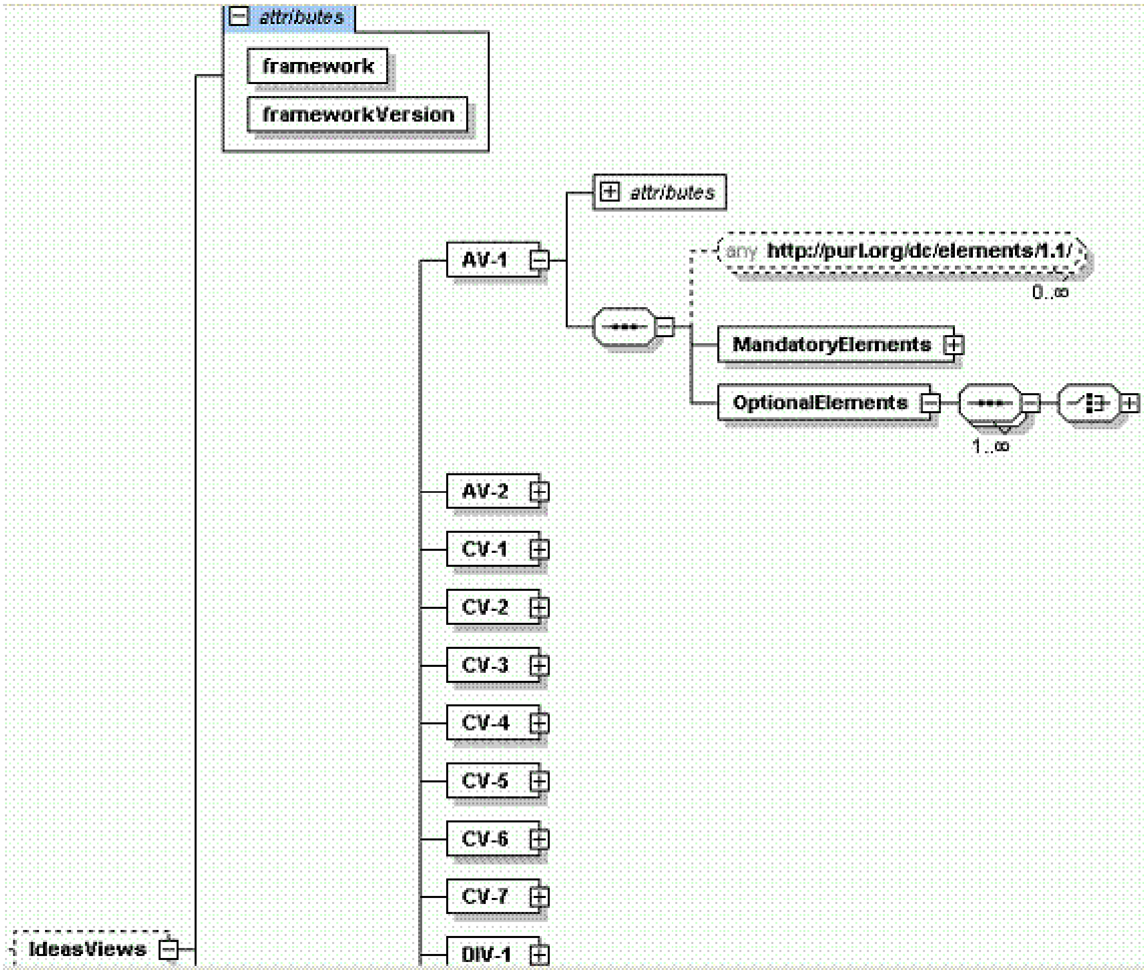
Top-Level Structure of a the DM2 PES XSD for Exchange

The IdeasData section contains all the DM2 domain data in a flat structure with elements linked together using standard XML document IDref's. A piece of this flat structure is shown in the figure below. All of the DM2 data that is to be exchanged is contained in this section.



Sample of the IdeasData Section of the DM2 PES XSD for Data Exchange

The IdeasViews section then specifies what DoDAF views this data pertains to. A sample of this section is shown in the figure below. If a DM2 PES XML document is received and these views are indicated as being represented in the dataset, this XSD can be used to validate the document, to see that the mandatory data is present and that data that is not optional is not contained.



Sample of the IdeasViews Section of the DM2 PES XSD for Data Exchange

The PES XSD's can be downloaded here:

- IDEAS Foundation
- DM2 Foundation
- DM2 Domain
- IC-ISM

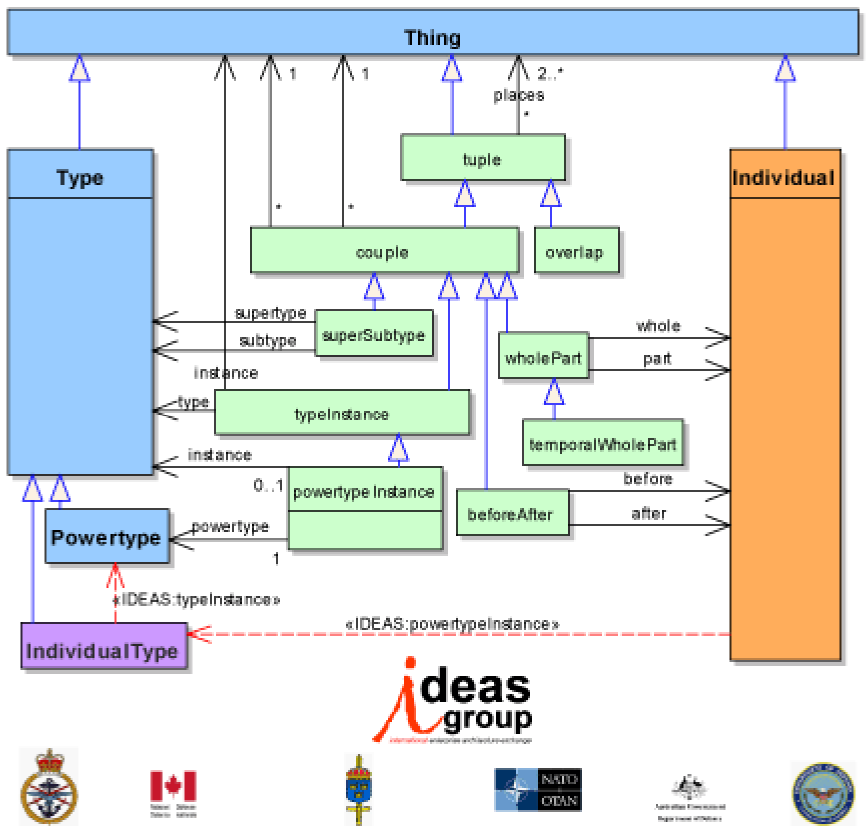
In-progress examples of DM2 PES XML documents are available to DM2 Working Group members on the DM2 Collaboration Site www.silverbulletinc.com/dm2, and will be made available to the entire EA community on the DoDAF Journal.

Go to top of page ↑

DM2

DoDAF Formal Ontology

The DM2 is founded upon the International Defence Enterprise Architecture Specification (IDEAS) (http://www.ideasgroup.org or http://en.wikipedia.org/wiki/IDEAS_Group) a formal ontology foundation developed by the defense departments and ministries of the United States, United Kingdom, Canada, Australia, and Sweden in coordination the North Atlantic Treaty Organization (NATO). All DoDAF concepts and concept relationships inherit several rigorously defined mathematical properties from the IDEAS Founda tion. A view of the upper levels of the IDEAS Foundation is shown in the figure below.



IDEAS Foundation Top-Level

The IDEAS Foundation is higher-order. It is extensional (see Extension [metaphysics]), using physical existence as its criterion for identity. In practical terms, this means the ontology is well suited to managing change-over time and identifying elements with a degree of precision that is not possible using names alone. The methodology for defining the ontology is very precise about criteria for identity by grounding reasoning about whether two things are the same using something that can be accurately identified. So, comparing two individuals, if they occupy precisely the same space at the same time, they are the same. Clearly this only works for individuals, but the principle can be used to compare types too. For two types to be the same, they must have the same members. If those members are individuals, their physical extents can be compared. If the members are types, then the analysis continues until individuals are reached, then they can be compared. The advantage of this methodology is that names are separated from things and so there is no possibility of confusion about what is being discussed. It is also four dimensionalist so that temporal parts (or states) can be represented, along with before-after behaviors. A partial bibliography of research and reference material used in deriving the IDEAS Foundation is included in the appendix to this document.

None of these foundation properties are unusual; they are all used in reasoning everyday. The basic concepts are:

1. Three basic types of Things:
   - Individuals are Things that exist in 3D space and time, i.e., have 4D spatial-temporal extent.
   - Types, sets or collections of things. Two important Types are distinguished – ones whose members are Individuals and those whose members are other than Individuals. This is an important distinction between naïve set theory and type theory.
   - Tuples, ordered relations between things, e.g., ordered pairs in 2D analytic geometry, rows in relational database tables, and subject-verb-object triples in Resource Description Framework.
2. Basic relationships:
   - Set theoretic:
     - Super-subtype; e.g., a type of system or service, capability, materiel, organization, or condition.
     - Type-instance, similar to “element of” in set theory
   - Mereologic:
     - Whole-part; e.g., components of a service or system, parts of the data, materiel parts, subdivisions of an activity, and elements of a measure.
     - Temporal whole-part; e.g., the states or phases of a performer, the increments of a capability or projects, the sequence of a process (activity).
   - 4D Topologic:
     - Overlap
     - Before-after

Items of note:

1. Types include sets of Tuples and sets of sets.
2. Tuples can have other Tuples in their tuple places.
3. The participants in a super-subtype relationship can be from the same class, e.g., the supertype can be an instance of Measure Type as well as the subtype. This allows for representation of as much of a super-subtype taxonomy as is needed.
4. Power Type members are generated from some Type by taking all the possible subsets of the members of the Type. For example consider the Type whose members are a, b, c. The powerset would be:

   $$\{a,b,c\},\{a,b\},\{a,c\},\{b,c\},\{a\},\{b\},\{c\},\{\varnothing\}$$

5. For example, take the Individual Type AIRCRAFT, whose members include all the aircraft of the world. The powerset generated from this set would have:

   $$\{a_1,a_2,...,a_n\},\{\varnothing\}$$
   $$\{\text{F-15}_1,\text{F-15}_2,...,\text{F-15}_{\text{lastF}-15\text{built}}\}$$
   $$\{\text{F-15}_1,747_1,...,\text{Cessna}_1\}$$

6. Some of these subsets are not used by anyone, e.g., the full set, the null set, or just

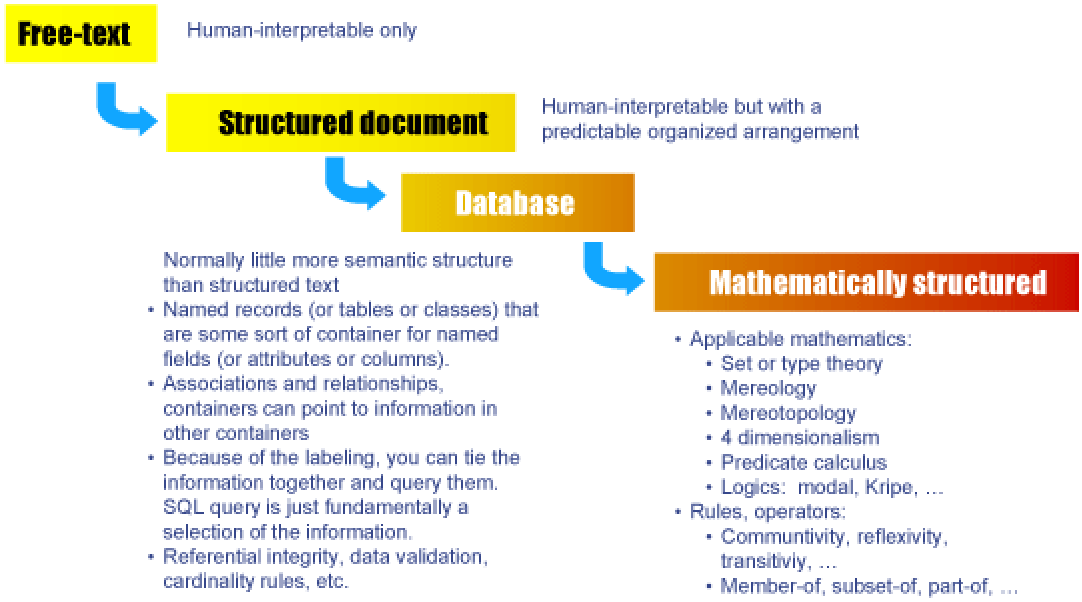
some random subset. However, the second one, which might be name F-15 Type, is quite useful. The last example is not useful to most unless you are interested in the first (assuming the subscript 1 means first) of any particular aircraft type, e.g., if you were doing a study of first-off-the-line aircraft production lessons-learned. This is the usefulness of Power Types and why they are employed in DM2: they allow for multiple categorization schemes, according to someone else's use, yet traceability back to the common elements so that the relationships between multiple categorization schemes can be understood. This was a DM2 requirement – multiple categorization schemes or taxonomies – because across a large enterprise it is not possible to employ a single categorization scheme; rather schemes vary depending on function. For example, a weaponeer's classifies ordnance is naturally different from a logistician's, the former concerned with delivery means, lethality, etc. and the latter with weight, size, and other transportation issues.

7. Note also that a powerset can then be taken of the powerset. This allows for build up of what is often called a taxonomic hierarchy. These are quite useful in enterprise Architectural Descriptions.

The DM2 utilizes the formal ontology of IDEAS because it provides:

1. Mathematical rigor needed for precision Architectural Descriptions that can be analyzed and used in detailed processes such as Systems Engineering and Operations Planning.
   - type (~set) theory
   - 4D mereotopology
2. Deals with issues of states, powertypes, measures, space -- what is truly knowable vs. what is assumed
3. Separates signs and representations from referents
4. DM2 domain concepts are extensions to the formal foundation
   - Rigorously worked-out common patterns are reused: Super-subtype, whole-part, temporal whole-part, type-instance, before-after, overlap
   - Saved a lot of repetitive work – "ontologic free lunch"
   - Model compactness through inheritance of superclass properties and common patterns.
   - Economizes implementations
   - Higher quality and consistency throughout due reuse of the rigorously worked-out common patterns
5. Improved interoperation with Unified Profile for DoDAF and MODAF (UPDM)-SysML tools which are following IDEAS concepts.
6. Improved opportunities for Coalition and NATO data exchange since MODAF is following IDEAS and NAF is interested in following IDEAS.
7. Agreed-upon analysis principles that provide a principled basis for issue analysis
8. Better ability to integrate and analyze EA data for EA purposes.

The advantage over free-text, structured documents, and databases in using this type of mathematically structured information is somewhat explained by the figure below that shows a spectrum of information structuring.

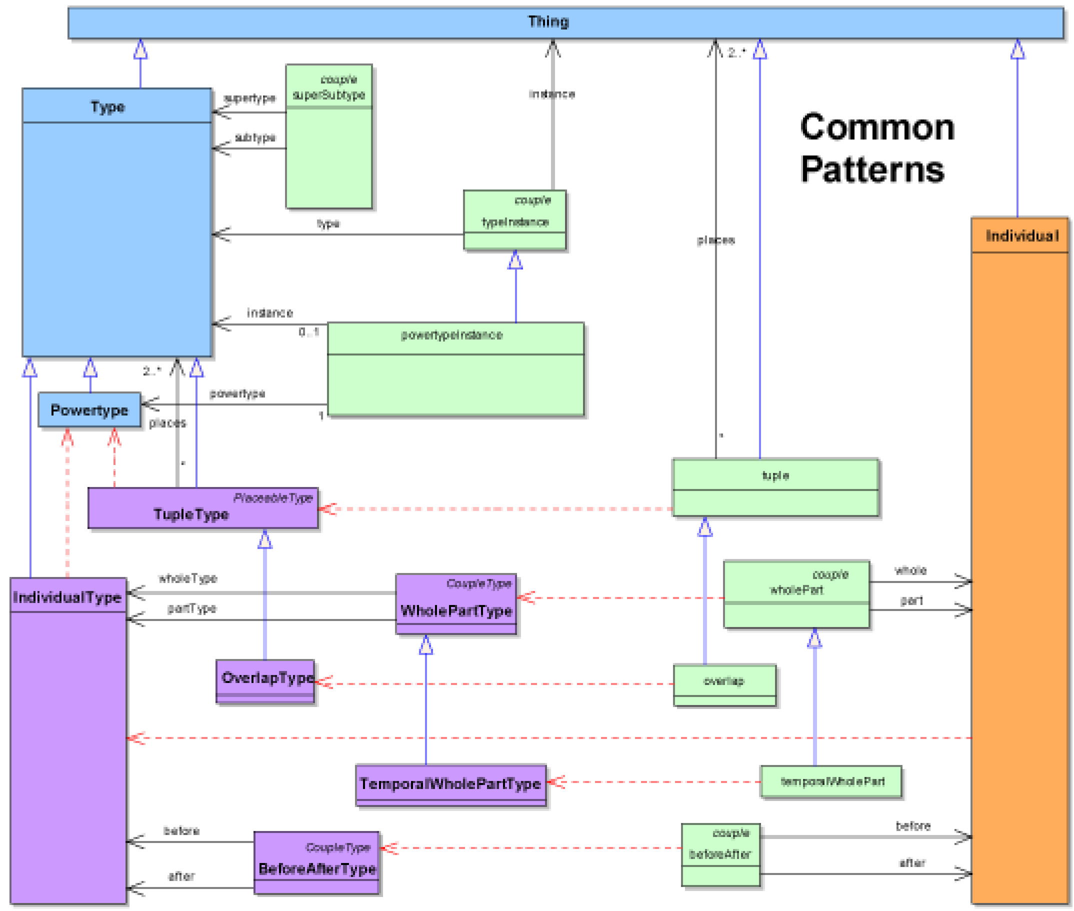


A Spectrum of Information Structuring

This shows that databases are really just storage and retrieval with connections only for exactly matching pieces of information (e.g., "keys" or exactly matching strings). The nature and purposes of EA require more than just storage, retrieval, and exchange, e.g., integration, analysis, and assessment across datasets. Founding DM2 on IDEAS provides the ontologic foundation supports entailment and other sorts of mathematical understanding of the data with membership (~ set theory) and 4D mereotopology (parts and boundaries). Some of these structures are so fundamental in human reasoning that it's hard to see that computers don't have it at all. But they are needed if we want to use them for something more than just storage and retrieval. They have to be encoded it into them with formal methods.

Common Patterns

The re-use patterns useful to Architectural Descriptions are shown in the figure below.



DM2 Common Patterns

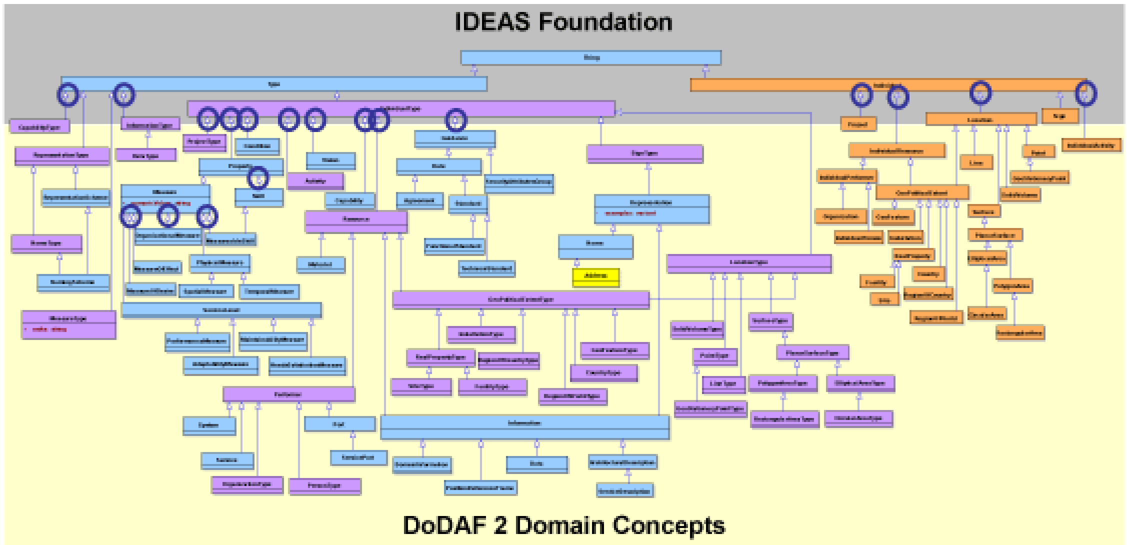
The IDEAS foundation concepts, common to all data groups are shown in the table below. It is important to remember that even though these are not repeated in the descriptions of the data groups, they are nevertheless present in the model and apply to the data group concepts according to the Doman Class Hierarchy shown in the figures below.

IDEAS Foundation Concepts Applicable to all DoDAF Data Groups

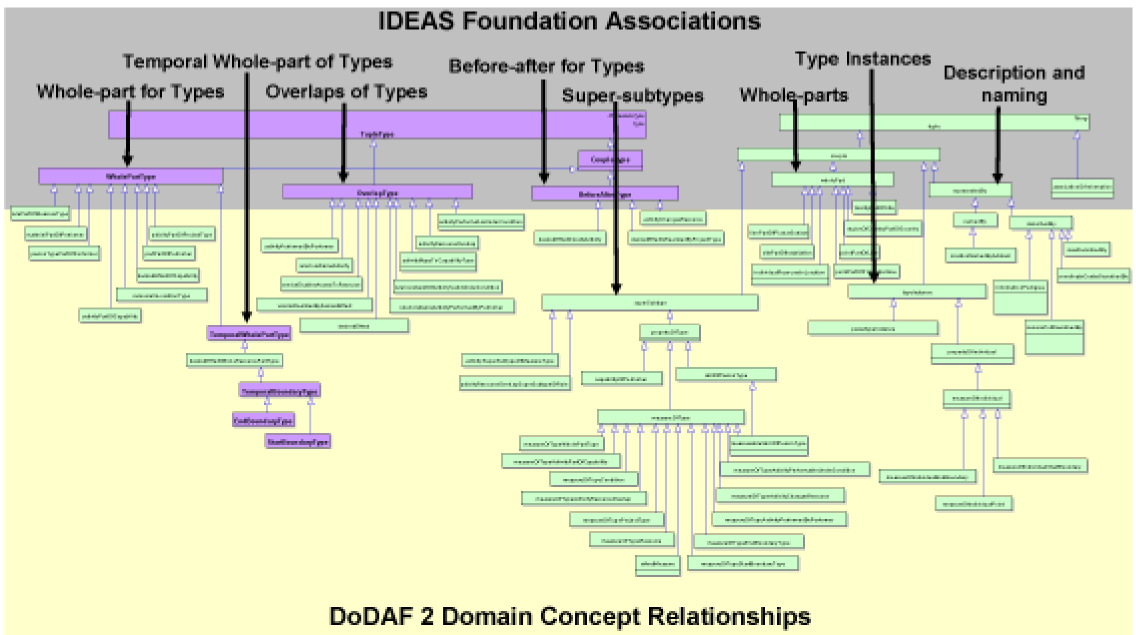
IDEAS Concept	Definition
Classes	
DescriptionScheme	A RepresentationScheme and DescriptionType whose members are intentionally descriptions
IndividualPerformer	A specific thing that can perform an action
Information	Information is the state of a something of interest that is materialized -- in any medium or form -- and communicated or received.
InformationType	Category or type of information
Location	A point or extent in space that may be referred to physically or logically.
LocationType	The powertype of Location
Measure	The magnitude of some attribute of an individual.

MeasureType	A category of Measures
Performer	Any entity - human, automated, or any aggregation of human and/or automated - that performs an activity and provides a capability.
Representation	A SignType where all the individual Signs are intended to signify the same Thing.
RepresentationScheme	A RepresentationType that is a collection of Representations that are intended to be the preferred Representations in certain contexts.
Resource	Data, Information, Performers, Materiel, or Personnel Types that are produced or consumed.
Rule	A principle or condition that governs behavior; a prescribed guide for conduct or action
ServiceLevel	A measurement of the performance of a system or service.
Thing	The union of Individual, Type, and tuple.
Associations	
beforeAfter	A couple that represents that the temporal extent end time for the individual in place 1 is less than temporal extent start time for the individual in place 2.
BeforeAfterType	An association between two Individual Types signifying that the temporal end of all the Individuals of one Individual Type is before the temporal start of all the Individuals of the other Individual Type.
describedBy	A tuple that asserts that Information describes a Thing.
descriptionSchemeInstance	A representationSchemeInstance that asserts a Description is a member of a DescriptionScheme.
endBoundary	A temporal whole part couple that relates the temporal boundary to the whole.
EndBoundaryType	A temporal whole part couple that relates the temporal boundary to the whole taken over a Type.
measureOfIndividualEndBoundary	endBoundary is a member of Measure
measureOfIndividualStartBoundary	startBoundary is a member of Measure
measureOfTypeEndBoundaryType	endBoundaryType is a member of Measure
measureOfTypeStartBoundaryType	startBoundaryType is a member of Measure
namedBy	A couple that asserts that a Name describes a Thing.
	A representationSchemeInstance that asserts a

namingSchemeInstance	Name is a member of a NamingScheme.
overlap	A couple of wholePart couples where the part in each couple is the same.
OverlapType	An overlap in which the places are taken by Types only.
representationSchemeInstance	A typeInstance that asserts a Representation is a member of a RepresentationScheme.
representedBy	A couple that asserts that a Representation represents a Thing.
startBoundary	The beginning of a temporalBoundary.
StartBoundaryType	The beginning of a temporalBoundaryType.
superSubType	An association in which one Type (the subtype) is a subset of the other Type (supertype).
temporalBoundary	The start and end times for the spatio-temporal extent of an Individual
TemporalBoundaryType	The start and end times for the Individual members of a Type.
temporalWholePart	A wholePart that asserts the spatial extent of the (whole) individual is co-extensive with the spatial extent of the (part) individual for a particular period of time.
TemporalWholePartType	A couple between two Individual Types where for each member of the whole set, there is a corresponding member of the part set for which a wholePart relationship exists, and conversely
typeInstance	A Thing can be an instance of a Type - i.e. set membership. Note that IDEAS is a higher-order model, hence Types may be instances of Types.
wholePart	A couple that asserts one (part) Individual is part of another (whole) Individual.
WholePartType	A coupleType that asserts one Type (the part) has members that have a whole-part relation with a member of the other Type (whole).



DM2 Domain Concepts are Subtypes (Extensions) of IDEAS Foundation Concepts



DM2 Associations are Subtyped to IDEAS Mathematical Associations

IDEAS Foundation Mathematics

When creating or analyzing DM2 data, the following mathematical properties should be followed. (Note, this material is incomplete and will be provided in later versions of either DM2 or IDEAS documentation. Additional sources for ontologic mathematics include: 1) National Center for Ontologic Research (NCOR), http://ontology.buffalo.edu/smith/; 2) Direct Model-Theoretic Semantics for OWL 2, http://www.w3.org/TR/2009/REC-owl2-direct-semantics-20091027/)

Type Theory Math

Commutative and anti-commutative, e.g., $A \cap B = B \cap A$

Reflexive and irreflexive, e.g., $A \subset A$, A Ø A

Associative, e.g., $A \cup (B \cup C) = (A \cup B) \cup C; \quad A \cap (B \cap C) = (A \cap B) \cap C;$

Transitive, e.g., $A \subset B \wedge B \subset C \Rightarrow A \subset C$

others:

$a \in A \wedge A \subset B \Rightarrow a \in B$

if $\{A_i\}$ forms a partition of A then $a \in A_j \Rightarrow a \notin A_k \forall j \neq k$

Mereotopologic Math

Parthood $xPy \equiv x \text{ is a part of } y$

Proper part x is a proper part of y $x\langle P \rangle y \equiv xPy \wedge \neg yPx$

P and $\langle P \rangle$ are transitive : $xPy \wedge yPz \Rightarrow xPz$

$aPb \wedge a \neq b \Rightarrow \neg bPa;$

P is antisymmetric : $xPy \wedge yPx \Leftrightarrow x = y$

Overlap proposition $xOy \Leftrightarrow \exists z \ni zPx \wedge zPy$

Overlap operator : $x \bigcap y = z_o \ni z_oPx \wedge z_oPy \wedge \forall z_i \neq z_o, z_iPx \wedge z_iPy \Rightarrow z_iPPz_o$

Underlap $xUy \equiv \exists z \ni xPz \wedge yPz$

xOy and xUy are reflexive, symmetric, and intransitive

Overlap Associative $aO(bOc) = (aOb)Oc$

Before xBy is transitive : $xBy \wedge yBz \Rightarrow xBz$

Proper before is irreflexive $\neg u\langle B \rangle u$

Properbeforeisanti-commutative $a\langle B \rangle b \Rightarrow \neg b\langle B \rangle a$

IDEAS Foundation Partial Bibliography

1. Berger, Peter L, and Thomas Luckmann; The Social Construction of Reality; Doubleday & Company, Garden City, New York; 1966.
2. Casati, Roberto, and Achille C Varzi; Holes and other Superficialities; The MIT Press, Cambridge, Massachusetts; 1995.
3. Casati, Roberto, and Achille C Varzi; Parts and Places: The Structure of Spatial Representation; The MIT Press, Cambridge, Massachusetts; 1999.
4. Clark, Bowman L; "Individuals and Points"; Notre Dame Journal of Formal Logic, Vol. 26; 1985.
5. Coquand, Thierry; "Type Theory"; Stanford Encyclopedia of Philosophy; 2006.
6. Davenport, Thomas H, and Laurence Prusak; Working Knowlege: How Organizations Manage What They Know; Harvard Business School Press, Boston, Massachusetts; 1998.
7. Gilbert, Margaret; On Social Facts; Princeton University Press, Princeton, New Jersey; 1992.
8. Grenon, Pierre, and Barry Smith; "The Cornucopia of Formal-Ontological Relations"; Dialectica. Vol. 58; 2004
9. Grenon, Pierre, and Barry Smith; "Snap and Span: Toward Dynamic Spatial Ontology"; Spatial Cognition and Computation; Lawrence Erlbaum Assosiates, Inc, Leipzig, Germany.
10. Hacking, Ian; Historical Ontology; Harvard University Press, Cambridge, Massachusetts; 2002.
11. Hawley, Katherine; How Things Persist; Oxford University Press, Oxford; 2001
12. Janssen, Terry, et al; A Multi- INT Sematic Reasoning Framework for Intelligence Analysis Support

13. Kay, Paul; “Taxonomy and Semantic Contrast”; Language; Vols. 47, number4; University of California, Berkeley, CA, 1971.
14. Kempson, Ruth M; Semantic Theory; Cambridge University Press, Cambridge; 1977.
15. Levinson, Stephen C; Pragmatics; Cambridge University Press, Cambridge; 1984.
16. Lyons, John; Language, Meaning, & Context; Fontana Paperbacks, Great Britain; 1981.
17. Nerlich, Graham; The Shape of Space; Second ed; Cambridge University Press,New York, NY; 1994.
18. Partee, Barbara H, Alice Ter Meulen, and Robert E Wall; Mathematical Methods in Linguistics, Vol. 30; Kluwer Academic Publishers, Dordrecht; 1990.
19. Partridge, Chris; Business Objects: Re-Engineering for Re-Use; The Boro Centre; 2005.
20. Potter, Michael; Set Theory and its Philosophy; Oxford University Press, Oxford; 2004.
21. Pulman, S G; Word Meaning and Belief; Ed. James R Hurford and John A Hawkins; Croom Helm Linguistics Series; Billing & Sons Limited, Great Britain; 1983.
22. Rea, M. C., “Four Dimensionalism” in The Oxford Handbook for Metaphysics. Oxford Univ. Press
23. Sider, Theodore; Four Dimensionalism: An Ontology of Persistence and Time; Oxford University Press, Oxford; 2001.
24. Simons, Peter; Parts: A Study in Ontology; Oxford University Press, Oxford; 1987.
25. Smith, Barry; “Against Fantology”; Experience and Analysis; By M E Reicher and J C Marek; 2005.
26. Smith, Barry; “The Basic Tools of Formal Ontology”; Formal Ontology in Information Systems; IOS Press, Amsterdam; Frontiers in Artifitial Intellegence and Applications; 1998
27. Smith, Barry; “Mereotopology: A Theory of Parts and Boundaries”; Data and Knowledge Engineering; Department of Philosophy, Buffalo, New York; 1996.
28. Smith, Barry, and David M Mark; “Do Mountains Exist? Toward an Ontology of Landforms.” Enviorment & Planning B (Planning and Design); National Center for Geographic Information and Analysis, Buffalo, New York; 2009.
29. Stein, Lynn Andrea; “Imagination and Situated Cognition”; Thinking about Android Epistemology; Ed. Kenneth M Ford, Clark Glymour, and Partick J Hayes; AAAI Press, Menlo Park; 2006. Sider, Theodore. “Four Dimensionalism”. Philosophical Review. pp. 197-231

Go to top of page ↑

DoDAF Viewpoints and Models

DoDAF has been designed to meet the specific business and operational needs of the DoD. It defines a way of representing an enterprise architecture that enables stakeholders to focus on specific areas of interests in the enterprise, while retaining sight of the big picture. To assist decision-makers, DoDAF provides the means of abstracting essential information from the underlying complexity and presenting it in a way that maintains coherence and consistency. One of the principal objectives is to present this information in a way that is understandable to the many stakeholder communities involved in developing, delivering, and sustaining capabilities in support of the stakeholder's mission. It does so by dividing the problem space into manageable pieces, according to the stakeholder's viewpoint, further defined as DoDAF-described Models.

Each viewpoint has a particular purpose, and usually presents one or combinations of the following:

- Broad summary information about the whole enterprise (e.g., high-level operational concepts).
- Narrowly focused information for a specialist purpose (e.g., system interface definitions).
- Information about how aspects of the enterprise are connected (e.g., how business or operational activities are supported by a system, or how program management brings together the different aspects of network enabled capability).

However, it should be emphasized that DoDAF is fundamentally about creating a coherent model of the enterprise to enable effective decision-making. The presentational aspects should not overemphasize the pictorial presentation at the expense of the underlying data.

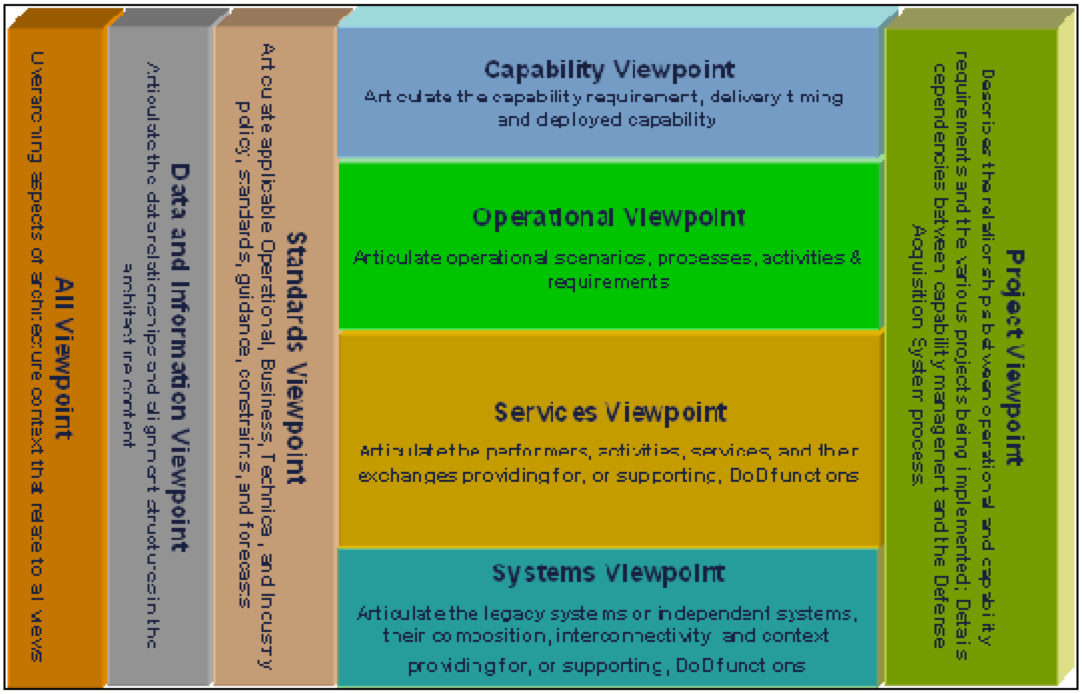
DoDAF organizes the DoDAF-described Models into the following viewpoints:

- The All Viewpoint describes the overarching aspects of architecture context that relate to all viewpoints.
- The Capability Viewpoint articulates the capability requirements, the delivery timing, and the deployed capability.
- The Data and Information Viewpoint articulates the data relationships and alignment structures in the architecture content for the capability and operational requirements, system engineering processes, and systems and services.
- The Operational Viewpoint includes the operational scenarios, activities, and requirements that support capabilities.
- The Project Viewpoint describes the relationships between operational and capability requirements and the various projects being implemented. The Project Viewpoint also details dependencies among capability and operational requirements, system engineering processes, systems design, and services design within the Defense Acquisition System process. An example is the Vcharts in Chapter 4 of the Defense Acquisition Guide.
- The Services Viewpoint is the design for solutions articulating the Performers, Activities, Services, and their Exchanges, providing for or supporting operational and capability functions.
- The Standards Viewpoint articulates the applicable operational, business, technical, and industry policies, standards, guidance, constraints, and forecasts that apply to capability and operational requirements, system engineering processes, and systems

and services.

- The [Systems Viewpoint](), for Legacy support, is the design for solutions articulating the systems, their composition, interconnectivity, and context providing for or supporting operational and capability functions.

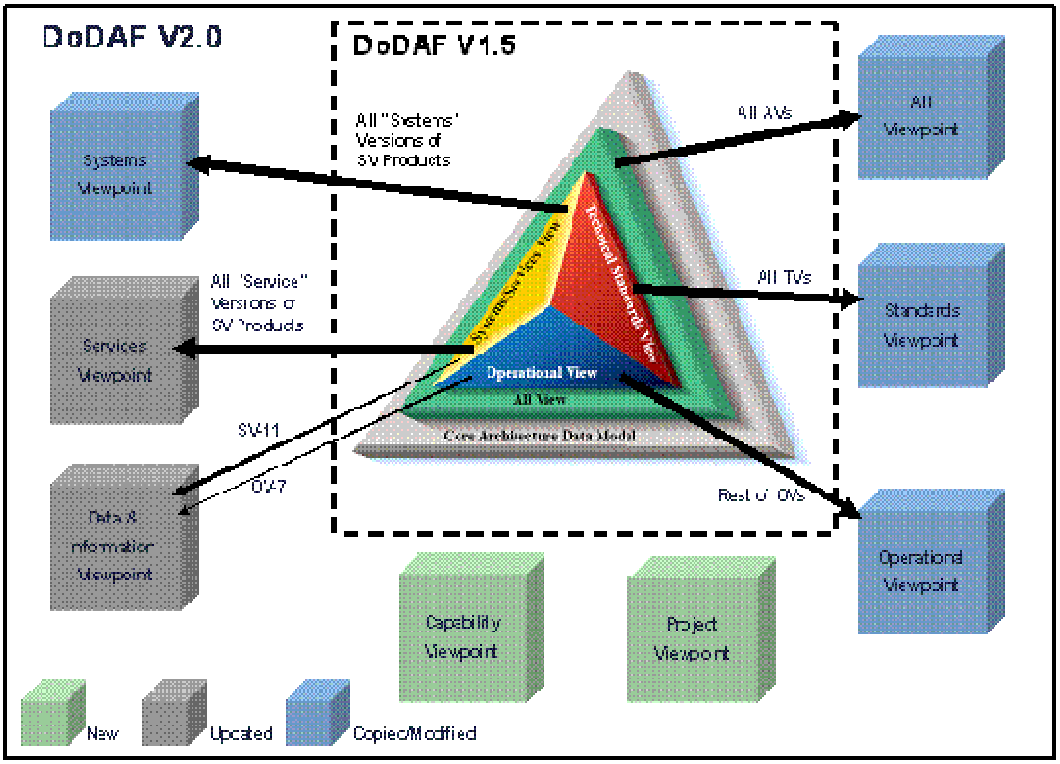
A presentation of these viewpoints is portrayed in graphic format below:



DoDAF Viewpoints

DoDAF V2.0 is a more focused approach to supporting decision-makers than prior versions. In the past, decision-makers would look at DoDAF offerings and decide which were appropriate to their decision process. An example is the JCIDS process architecture requirements inside the JCIDS documentation (ICD, CDD, CPD, etc.). Additionally, older version Architectural Description products were hard-coded in regard to content and how they were visualized. Many times, these design products were not understandable or useful to their intended audience. DoDAF V2.0, based on process owner input, has increased focus on architectural data, and a new approach for presenting architecture information has addressed the issues. The viewpoints categorize the models as follows:

- As illustrated below, the original viewpoints (Operational Viewpoint, Systems and Services Viewpoint, Technical Standards Viewpoint, and the All Viewpoint) have had their Models reorganized to better address their purposes. The Services portion of the older Systems and Services Viewpoint is now a [Services Viewpoint]() that addresses in more detail our net-centric or services-oriented implementations.



DoDAF V1.5 Evolution to DoDAF V2.0

- All the models of data (conceptual, logical, or physical) have been placed into the Data and Information Viewpoint rather than spread throughout the Operational Viewpoint and Systems and Services Viewpoints.
- The Systems Viewpoint accommodates the legacy system descriptions.
- The new Standards Viewpoint can now describe business, commercial, and doctrinal standards, as well as the technical standards applicable to our solutions, which may include systems and services.
- The Operational Viewpoint now can describe rules and constraints for any function (business, intelligence, warfighting, etc.) rather that just those derived from data relationships.
- Due to the emphasis within the Department on Capability Portfolio Management and feedback from the Acquisition community, the Capability Viewpoint and Project Viewpoint have been added through a best-of-breed analysis of the MODAF and NAF constructs.

Workshops have brought the Systems Engineering community and the architecture community closer together in defining the DoDAF architecture content that would be useful to the Systems Engineering process, and this has resulted in an understanding which the entire set of viewpoints and the underlying architectural data can be used in the System Engineering processes. There is not a set of separate System Engineering viewpoint or DoDAF-described Models as the system engineer and system engineering decision-makers can use the existing DoDAF-described Models and their own defined Fit-for-Purpose Views.

The approach to the presentation of Architectural Description moves away from static and rigid one-size-fits-all templates of architecture portrayals for architects. The term we have coined is "Fit-for-Purpose" presentation. Through various techniques and applications, the presentation of Architectural data increases customer understanding and architecture's usefulness to decision-making by putting the data underlying the architectural models into the context of the problem space for each decision-maker.

Viewpoint and DoDAF-described Model Descriptions

The following DoDAF Viewpoints and DoDAF-described Models are discussed below with some details, such as model uses and model descriptions:

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint

For the DoDAF-described Model descriptions, a major source of material was adapted from MODAF. In addition, a note on system engineering is included.

The Views described in DoDAF, including those that are legacy Views from previous versions of the Framework, are provided as pre-defined examples that can be used when developing presentations of architectural data.

DoDAF is prescribed for the use and development of Architectural Descriptions in the Department. Specific DoDAF-described Models for a particular purpose are prescribed by process-owners. All the DoDAF-described Models do not have to be created. DoDAF V2.0 is "Fit-for-Purpose", based on the decision-maker needs. DoDAF does not prescribe any particular Views, but instead concentrates on data as the necessary ingredient for architecture development. However, other regulations and instructions from both DoD and CJCS may have particular presentation view requirements. These Views are supported by DoDAF 2.0, and should be consulted for specific view requirements.

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

DoDAF Viewpoints and Models

All Viewpoint

There are some overarching aspects of an Architectural Description that are captured in the AV DoDAF-described Models. The AV DoDAF-described Models provide information pertinent to the entire Architectural Description rather than representing a distinct viewpoint. AV DoDAF-described Models provide an overview of the architecturectural effort including such things as the scope, context, rules, constraints, assumptions, and the derived vocabulary that pertains to the Architectural Description. It captures the intent of the Architectural Description to help ensure its continuity in the face of leadership, organizational, and other changes that can occur over a long development effort.

All Viewpoint Model Descriptions

Models	Descriptions
AV-1 Overview and Summary Information	Describes a Project's Visions, Goals, Objectives, Plans, Activities, Events, Conditions, Measures, Effects (Outcomes), and produced objects.
AV-2 Integrated Dictionary	An architectural data repository with definitions of all terms used throughout the architectural data and presentations.

Uses of All Viewpoint DoDAF-described Models. The AV DoDAF-described Models captures the scope of the architecture and where the architecture fits in relationship to other architectures. Another use of the All Viewpoint is for the registration of the architecture to support the net-centric goals of making Architectural Descriptions visible (Discoverable).

Mappings of the All Viewpoint DoDAF-described Models to the DM2 Concepts, Associations, and Attributes are in **DM2 Concepts, Associations, and Attributes Mapping to DoDAF-described Models**. The DM2 Concepts, Associations, and Attributes are described in the DoDAF Meta-model Data Dictionary.

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

DoDAF Viewpoints and Models

All Viewpoint

AV-1 Overview and Summary Information. The overview and summary information contained within the AV-1 provides executive-level summary information in a consistent form that allows quick reference and comparison between Architectural Descriptions. The written content of the AV-1 content describes the concepts contained in the pictorial representation of the OV-1.

The AV-1 frames the context for the Architectural Description. The AV-1 includes assumptions, constraints, and limitations that may affect high-level decisions relating to an architecture-based work program. It should contain sufficient information to enable a reader to select a single Architectural Description from among many to read in more detail. The AV-1 serves two additional purposes:

- In the initial phases of architecture development, it serves as a planning guide.
- When the architecture is built, the AV-1 provides summary information concerning *who*, *what, when, why*, and *how* of the plan as well as a navigation aid to the models that have been created.

The usage of the AV-1 is to:

- Scope the architecture effort.
- Provide context to the architecture effort.
- Define the architecture effort.
- Summarize the findings from the architecture effort.
- Assist search within an architecture repository.

Detailed Description:

An enterprise has an architecture, which is manifested through an Architectural Description (in this case, a DoDAF described Architectural Description). That Architectural Description consists of a number of populated views each of which is an instance of a specific model or a combination of model. DoDAF consists of a set of viewpoints and these are organized in terms of models. Each model is associated with a specific set of concerns that certain stakeholders have, and which the models constructed are intended to address. The stakeholder groupings tend to align with the model definitions within a viewpoint (so the DoDAF Operational Viewpoint relates to operational stakeholders, i.e., end users). Finally each Architectural Description has a rationale that governs the selection of Models that will be used and the scope of the underlying models. The AV-1 is intended to describe this.

The AV-1 is usually a structured text product. An architecting organization may create a template for the AV-1 that can then be used to create a consistent set of information across different architecture-based projects. While the AV-1 is often dispensed with or "retrofitted" to a finished architecture package, it's desirable to do it up-front because the AV-1 provides a summary of a given Architectural Description and it documents the following descriptions:

- Architectural Description Identification - Identifies the Architectural Description effort name, the architect, and the organization developing the Architectural Description. It also includes assumptions and constraints, identifies the approving authority and the completion date, and records the level of effort required to develop the Architectural

Description.

- Scope - Identifies the Viewpoints, DoDAF-described Models, and Fit-for-Purpose Views that have been selected and developed. The AV-1 should address the temporal nature of the Architectural Description, such as the time frame covered, whether by specific years or by designations such as "current", "target", or transitional. Scope also identifies the organizational entities and timelines that fall within the scope of the Architectural Description.
- Purpose and perspective - Explains the need for the Architectural Description, what it will demonstrate, the types of analyses that will be applied to it, who is expected to perform the analysis, what decisions are expected to be made based of each form of analysis, who is expected to make those decisions, and what actions are expected to result. The perspective from which the Architectural Description is developed is identified.
- Context - Describes the setting in which an Architectural Description exists. Context includes such things as: mission, doctrine, relevant goals and vision statements, concepts of operation, scenarios, information assurance context (e.g., types of system or service data to be protected, such as classified or sensitive but unclassified, and expected information threat environment), other threats and environmental conditions, and geographical areas addressed, where applicable. Context also identifies authoritative sources for the standards, rules, criteria, and conventions that are used in the architecture. Any linkages to parallel architecture efforts should be identified.
- Status - Describes the status of the architecture at the time of publication or development of the AV-1 (which might precede the architectural development itself). Status refers to creation, validation and assurance activities.
- Tools and File Formats Used - Identifies the tool suite used to develop the Architectural Description and file names and formats for the Architectural Models if appropriate.
- Assumptions and Constraints.
- Archtecture development schedule including start date, development milestones, date completed, and other key dates. Further details can be reflected in the Project Viewpoint.

If the architecture is used to support an analysis, the AV-1 may be extended to include:

- Findings - States the findings and recommendations that have been developed based on the architectural effort. Examples of findings include: identification of shortfalls, recommended system implementations, and opportunities for technology insertion.
- Costs - the architecture budget, cost projections, or actual costs that have been incurred in developing the architecture and/or undertaking the analysis. This might include integration costs, equipment costs and other costs.

During the course of developing an Architectural Description, several versions of the AV-1 may be produced. An initial version may focus the effort and document its scope, the organizations involved, and so forth. After other Models within an Architectural Description's scope have been developed and verified, another version may be produced to document adjustments to the scope and to other aspects of the Architectural Description that may have been identified. After an Architectural Description has been used for its intended purpose, and the appropriate analysis has been completed, a final version should be produced to summarize these findings for high-level decision-makers. In this version, the AV-1 and a corresponding graphic in the form of an OV-1 serve as an executive summary of the Architectural Description. The AV-1 can be particularly useful as a means of communicating the methods that have been applied to create models and the rationale for grouping these models. Viewing assumptions that have shaped individual models may also be included. In this form, the AV-1 needs to list each individual model and provide a brief commentary.

This could take several forms:

- It could refer to one or more DoDAF-described Models.
- It could refer to the DoDAF Community of Practice.
- It could refer to a focus for the work, e.g., integration or security.
- It could refer to a combination of these.

Finally, each Architectural Description has a rationale that governs the selection of the Models used and the scope of the underlying models as a result of employing the 6-Step Architecture Development Process. The AV-1 DoDAF-described Model is intended to describe the decisions made throughout that process.

AV-2: Integrated Dictionary >>

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

DoDAF Viewpoints and Models

All Viewpoint

AV-2: Integrated Dictionary. The AV-2 presents all the metadata used in an architecture. An AV-2 presents all the data as a hierarchy, provides a text definition for each one and references the source of the element (e.g., DoDAF Meta-model, IDEAS, a published document or policy).

An AV-2 shows elements from the DoDAF Meta-model that have been described in the Architectural Description and new elements (i.e., not in the DM2) that have been introduced by the Architectural Description.

It is essential that organizations within the DoD use the same terms to refer to a thing. Because of the interrelationship among models and across architecture efforts, it is useful to define common terminology with common definitions (referred to as taxonomies) in the development of the models within the Architectural Description. These taxonomies can be used as building blocks for DoDAF-described Models and Fit-for-Purpose Views within the Architectural Description. The need for standard taxonomies derives from lessons learned from early DoD Architectural Description development issues as well as from federation pilots conducted within the Department. Federation of Architectural Descriptions were made much more difficult because of the use of different terminology to represent the same architectural data. Use of taxonomies to build models for the architecture has the following benefits over free-text labeling:

- Provides consistency across populated views, based on DoDAF-described Models.
- Provides consistency across Architectural Descriptions.
- Facilitates Architectural Description development, validation, maintenance, and re-use.
- Traces architectural data to authoritative data sources.

This is facilitated by the DM2. Architectural Descriptions can often introduce new terms - possibly because the architecture is covering new technology or business activities. The purpose of the AV-2 is to provide a means to explain the terms and abbreviations used in building the architecture and, as necessary, submit them for review and inclusion into authoritative vocabularies developed by COIs that are pertinent to the Architectural Description content.

In the creation of any Architectural Description, reuse of authoritative external taxonomy content, e.g., the FEA Reference Models, or the Joint Common System Function List, or any listed in Architecture Resources, are important to aligning the architectural content across many descriptions to increase their understandability, interoperability, Architecture Federation, and compliance. A discussion on the use of taxonomies in the development of the AV-2 and the architecture effort is below.

Detailed Description:

The AV-2 content can be organized by the following areas within the DM2 that can be used to expedite architecture development:

- Capabilities: The taxonomy should minimally consist of names, descriptions, and conditions that may be applicable to performance measures.
- Resource Flow. The taxonomy should minimally consist of names of information

elements exchanged, descriptions, decomposition into constituent parts and subtypes, and mapping to system data elements exchanged.

- Activities (Operational Activities or Tasks). The taxonomy should minimally consist of names, descriptions, and decomposition into the constituent parts that comprise an activity.
- Activities (System or Service Functions). The taxonomy should minimally consist of names, descriptions, and decomposition into the constituent parts that comprise a system function.
- Performance Parameters. The taxonomy should minimally consist of names, descriptions, units of measure, and conditions that may be applicable to performance parameters.
- Performers: Performers can be persons, services, systems or organizations. The taxonomy should minimally consist of names, descriptions, breakdowns into constituent parts (e.g., a services comprising other services), and applicable categorizations. Each of the above types of performers is a candidate for a being a taxonomy.
- Skills: The taxonomy should minimally consist of names, descriptions, units of measure, and conditions that may be applicable to performance parameters.
- Standards: The taxonomy should minimally consist of categories of standards (e.g., DoD Information Technology Standards and Profile Registry [DISR]'s Service Areas).
- Triggers/Events: The taxonomy minimally consists of names, descriptions, and breakdown into constituent parts of the event or trigger and categorization of types of events or triggers.

Not all architectural data in a given taxonomy is useful in every case of architectural development. However, given the ongoing evolutionary change in organizations, services, systems, and activities, the value of using established, validated taxonomic structures that can be expanded or contracted as needed becomes obvious. Moreover, the development of new models over time is greatly simplified as understanding of the taxonomies is increased. Standard taxonomies, like DISR Service Categories, become building blocks for more comprehensive, quality architectural DoDAF-described Models and Fit-for-Purpose Views. The DoD Extensible Markup Language Registry and Clearinghouse and the Net-Centric Implementation Document (NCID) are potential sources for taxonomies.

In some cases, a specific community may have its own operational vocabulary. This local operational vocabulary may use the same terms in radically different ways from other operational communities. (For example, the use of the term track refers to very different concepts in the carrier battle group community than in the mine-sweeper community. Yet both of these communities are Navy operational groups and may participate together in littoral warfare task forces.) In these cases, the internal community versions of the models and views within the Architectural Description should use the vocabulary of the local operational community to achieve community cooperation and buy-in. Data elements need to be uniquely identified and consistently used across all viewpoints, models and views within the Architectural Description. These populated views should include notes on any unique definitions used and provide a mapping to standard definitions, where possible.

<< AV-1: Integrated Dictionary

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

DoDAF Viewpoints and Models

Capability Viewpoint

The Capability Viewpoint and the DoDAF-described Models within the viewpoint are introduced into DoDAF V2.0 to address the concerns of Capability Portfolio Managers. In particular, the Capability Models describe capability taxonomy and capability evolution.

The DoD increasingly employs incremental acquisition to help manage the risks of complex procurements. Consequently, there is a need to provide visualizations of the evolving capabilities so that Portfolio Managers can synchronize the introduction of capability increments across a portfolio of projects. The Capability Models included within DoDAF are based on the program and capability information used by Portfolio Managers to capture the increasingly complex relationships between interdependent projects and capabilities.

Another justification for the Capability Viewpoint is the increasing importance of transformational programs within the DoD (e.g., Global Exchange [GEX], Defense Acquisition Initiative [DAI]). These types of programs are focused on the delivery of capabilities and do not conform to the standard for project management and tend to be benefit-driven rather than capability delivery focused. An ability to view these transformational programs, and their interdependencies, provides a potentially powerful tool for DoD Enterprise Architects.

Capability Model Descriptions

Model	Description
CV-1: Vision	Describes a Project's Visions, Goals, Objectives, Plans, Activities, Events, Conditions, Measures, Effects (Outcomes), and produced objects.
CV-2: Capability Taxonomy	An architectural data repository with definitions of all terms used throughout the architectural data and presentations.
CV-3: Capability Phasing	The planned achievement of capability at different points in time or during specific periods of time. The CV-3 shows the capability phasing in terms of the activities, conditions, desired effects, rules complied with, resource consumption and production, and measures, without regard to the performer and location solutions
CV-4: Capability Dependencies	The dependencies between planned capabilities and the definition of logical groupings of capabilities.
CV-5: Capability to Organizational Development Mapping	The fulfillment of capability requirements shows the planned capability deployment and interconnection for a particular Capability Phase. The CV-5 shows the planned solution for the phase in terms of performers and locations and their associated concepts.
CV-6: Capability to Operational Activities Mapping	A mapping between the capabilities required and the operational activities that those capabilities support.
CV-7: Capability to Services Mapping	A mapping between the capabilities and the services that these capabilities enable.

Mappings of the Capability Viewpoint DoDAF-described Models to the DM2 Concepts, Associations, and Attributes are in ***DM2 Concepts, Associations, and Attributes Mapping to DoDAF-described Models***. The DM2 Concepts, Associations, and Attributes are described in the DoDAF Meta-model Data Dictionary.

The Capability Viewpoint DoDAF-described Models are discussed with examples in the DoDAF Product Development Questionnaire Analysis Report.

Use of Capability Viewpoint Models. The CV DoDAF-described Models are intended to provide support to various decision processes within the Department, one of which is portfolio management. Since the DoD has moved toward the delivery of capabilities, these models take on a more important role. Developing an architecture that includes the relationships necessary to enable a capability thread is essential to improving usability of architectures, as well as increasing the value of federation.

In the above context, a capability thread is similar to the result of a query that would be run on a particular capability. For example, if an architecture were to include operational activities, rules, and systems, a capability thread would equate to the specific activities, rules, and systems that are linked to that particular capability. The CV DoDAF-described Models are used to provide the strategic perspective and context for other architectural information.

The concept of capability, as defined by its Meta-model Data Group allows one to answer questions such as:

- How does a particular capability or capabilities support the overall mission/vision?
- What outcomes are expected to be achieved by a particular capability or set of capabilities?
- What services are required to support a capability?
- What is the functional scope and organizational span of a capability or set of capabilities?
- What is our current set of capabilities that we are managing as part of a portfolio?

Go to top of page ↑

DoDAF Viewpoints and Models

Capability Viewpoint - Capability Model Descriptions

CV-1: Vision

The CV-1 addresses the enterprise concerns associated with the overall vision for transformational endeavors and thus defines the strategic context for a group of capabilities. The purpose of a CV-1 is to provide a strategic context for the capabilities described in the Architectural Description. It also provides a high-level scope for the Architectural Description which is more general than the scenario-based scope defined in an OV-1.

The intended usage is communication of the strategic vision regarding capability development.

Detailed Description:

The CV-1 defines the strategic context for a group of capabilities described in the Architectural Description by outlining the vision for a capability area over a bounded period of time. It describes how high-level goals and strategy are to be delivered in capability terms. A CV-1 may provide the blueprint for a transformational initiative. The CV-1 may be primarily textual descriptions of the overarching objectives of the transformation or change program that the Enterprise is engaged in. Of key importance is the identification of Goals, together with the desired outcomes and measurable benefits associated with these.

Go to top of page ↑

DoDAF Viewpoints and Models

Capability Viewpoint - Capability Model Descriptions

CV-2: Capability Taxonomy

The CV-2 captures capability taxonomies. The model presents a hierarchy of capabilities. These capabilities may be presented in context of a timeline - i.e., it can show the required capabilities for current and future capabilities. The CV-2 specifies all the capabilities that are referenced throughout one or more architectures. In addition, it can be used as a source document for the development of high-level use cases and user requirements.

The intended usage of the CV-2 includes:

- Identification of capability requirements.
- Capability planning (capability taxonomy).
- Codifying required capability elements.
- Capability audit.
- Capability gap analysis.
- Source for the derivation of cohesive sets of user requirements.
- Providing reference capabilities for architectures.

In CV-2, the Capabilities are only described in the abstract - i.e., CV-2 does not specify how a capability is to be implemented. A CV-2 is structured as a hierarchy of capabilities, with the most general at the root and most specific at the leaves. At the leaf-level, capabilities may have a measure specified, along with an environmental condition for the measure.

When capabilities are referenced in operational or systems architectures, it may be that a particular facility, location, or organization or configuration meets more than one level of capability. The CV-2 is used to capture and organize the capability functions - required for the vision set out in the CV-1 Vision.

In contrast to AV-2 Integrated Dictionary, a CV-2 is structured using only one type of specialization relationship between elements: sub-supertype. A sub-supertype relationship is a relationship between two classes with the second being a pure specialization of the first.

In DoDAF V2.0, capabilities exist in space and over time, that is they are intended to provide a framework across the lifetime of the enterprise that is being modeled. This means that it is feasible to develop a capability taxonomy that can apply to all architecture phases.

In addition to the capability nomenclature, appropriate quantitative attributes and measures for that specific capability or function need to be included e.g., the required speed of processing, the rate of advance, the maximum detection range, etc. These attributes and measures will remain associated with the capability whenever it is used across the Architectural Description. The quantitative values expressed may be linked to specific phases (or be "As-Is" values and/or or "To-Be" targets).

The CV-2 has no mandated structure although the architectural data must be able to support the representation of a structured/hierarchal list. This structure may be delivered using textual, tabular or graphical methods. The associated attributes and measures for each capability can either be included on the main CV-2 or in tabular format as an appendix if the inclusion of the attributes and measures would over complicate the presentation of the populated view.

CV-1: Vision

CV-2: Capability Taxonomy

CV-3: Capability Phasing

CV-4: Capability Dependencies

CV-5: Capability to Organizational Development Mapping

CV-6: Capability to Operational Activities Mapping

CV-7: Capability to Services Mapping

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

DoDAF Viewpoints and Models

Capability Viewpoint - Capability Model Descriptions

CV-3: Capability Phasing

The CV-3 addresses the planned achievement of capability at different points in time or during specific periods of time, i.e., capability phasing. The CV-3 supports the capability audit processes and similar processes used across the different COIs by providing a method to identify gaps or duplication in capability provision. The CV-3 indicates capability increments, which should be associated with delivery milestones within acquisition projects (when the increments are associated with capability deliveries).

The intended usage of the CV-3 includes:

- Capability planning (capability phasing).
- Capability integration planning.
- Capability gap analysis.

Detailed Description:

The CV-3 provides a representation of the available capability at different points in time or during specific periods of time (associated with the phases - see CV-1 Vision model). A CV-3 can be used to assist in the identification of capability gaps/shortfalls (no fielded capability to fulfill a particular capability function) or capability duplication/overlap (multiple fielded capabilities for a single capability function).

The CV-3 is populated by analyzing programmatic project data to determine when projects providing elements of capability are to be delivered, upgraded and/or withdrawn (this data may be provided in part by a PV-2 Project Timelines model). Then capability increments identified can be structured according to the required capabilities determined in the CV-2 Capability Taxonomy model and the phases. Alternatively, a set of desired capability increments can be viewed and then compared to the project plans. In practice, the population of the model tends to iterate between considering the desired capability and considering what capability is planned to be delivered. The output from this iterative approach can be a table that represents the required capability phasing.

The CV-3 can be presented as a table consisting of rows representing Capabilities (derived from the CV-2 Capability Taxonomy model) and columns representing phases (from CV-1 Vision model).

At each row-column intersection in the CV-3 table, the capability increment that represents the change in Capability within that phase can be displayed. If the availability of the Capability spans multiple periods of time, then this can be indicated by an elongated color-coded bar. If there are no Capabilities planned to satisfy the Capability Requirements in that period of time then a blank space can be left.

A variant CV-3, in which the names of the projects that can deliver the capability increments are included, can identify capability gaps and shortfalls. The essence is the relationship between projects, capabilities and time. The model may be used to envisage the need for interventions in projects (to fulfill a capability gap) or to represent current plans (the availability of capability according to their delivery timescales).

Go to top of page ↑

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Capability Viewpoint - Capability Model Descriptions

CV-4: Capability Dependencies

The CV-4 describes the dependencies between planned capabilities. It also defines logical groupings of capabilities.

The CV-4 is intended to provide a means of analyzing the dependencies between capabilities. The groupings of capabilities are logical, and the purpose of the groupings is to guide enterprise management. In particular, the dependencies and groupings may suggest specific interactions between acquisition projects to achieve the overall capability.

The intended usage of the CV-4 includes:

- Identification of capability dependencies.
- Capability management (impact analysis for options, disposal etc.).

Detailed Description:

The CV-4 describes the relationships between capabilities. It also defines logical groupings of capabilities. This contrasts with CV-2 Capability Taxonomy model which also deals with relationships between Capabilities; but CV-2 only addresses specialization-generalization relationship (i.e., capability taxonomy).

A CV-4 shows the capabilities that are of interest to the Architectural Description. It groups those capabilities into logical groupings, based on the need for those elements to be integrated.

An approach for describing a CV-4 is graphical. In some cases, it may be important to distinguish between different types of dependency in the CV-4. Graphically, this can be achieved by color-coding the connecting lines or by using dashed lines. From a data perspective, the CV-4 can make use pre-existing capability dependency types in the DoDAF Meta-model; else new, specific dependency types can be created. The new dependency types need to be recorded the in the AV-2: Integrated Dictionary.

CV-1: Vision

CV-2: Capability Taxonomy

CV-3: Capability Phasing

CV-4: Capability Dependencies

CV-5: Capability to Organizational Development Mapping

CV-6: Capability to Operational Activities Mapping

CV-7: Capability to Services Mapping

Go to top of page ↑

DoDAF Viewpoints and Models

Capability Viewpoint - Capability Model Descriptions

CV-5: Capability to Organizational Development Mapping

The CV-5 addresses the fulfillment of capability requirements.

This model shows the planned capability deployment and interconnection for a particular phase. and should provide a more detailed dependency analysis than is possible using the CV-3 Capability Phasing model. The CV-5 is used to support the capability management process and, in particular, assist the planning of fielding.

The intended usage of the CV-5 includes:

- Fielding planning.
- Capability integration planning.
- Capability options analysis.
- Capability redundancy/overlap/gap analysis.
- Identification of deployment level shortfalls.

Detailed Description:

The CV-5 shows deployment of Capabilities to specific organizations. CV-5 models are specific to a phase. If a particular Capability is/was used by (or is due to be used by) a specific organization during that phase, it should be shown on the CV-5, mapped to the organization. The CV-5 may also show interactions between them (where these have been previously defined in a SV-1 Systems Interface Description or SvcV-1 Services Context Description). The CV-5, along with SV-8 Systems Evolution Description, SvcV-8 Services Evolution Description and PV-2 Project Timelines models can be regarded as amplifying the information contained in the CV-3.

To conduct a comprehensive analysis, several CV-5s can be created to represent the different phases. Although the CV-5s are represented separately, Capabilities may exist in more than one model. The information used to create the CV-5 is drawn from other DoDAF-described Models (PV-2 Project Timelines, CV-2 Capability Taxonomy, OV-4 Organizational Relationships Chart, SV-1 Systems Interface Description, SvcV-1 Services Context Description), and the timing is based on PV-2 Project Timelines indicating delivery of Capabilities to actual organizational resources, and also the point at which those organizational resources cease to use a particular Capability.

System interaction (from the SV-1 Systems Interface Description) or Service interaction (from the SvcV-1 Services Context Description) can be shown on a CV-5. In addition, where a Capability or resources is deployed across a number of Organizations, a parent Organization can be created for context purposes, and the Capability or resource stretched across the domain of the parent Organization.

The architect should not overwhelm the diagram with capabilities and organizations. A CV-5 should be seen as a summary of the delivery schedules for capabilities (hence it could be argued that it belongs in the PV Viewpoint). To prevent constraining the solution space, CV-5 should not be produced at the time of developing capability/user requirements, but after the solution is determined. Instead, the CV-5 should be more of an informative from a programmatic standpoint.

The CV-5 is usually based on a tabular representation, with the appropriate Organizational structure represented by one axis, and the capabilities by the other axis. Graphical objects representing Capabilities or resources can be placed in the relevant positions (intersections) relative to these axes.

CV-1: Vision

CV-2: Capability Taxonomy

CV-3: Capability Phasing

CV-4: Capability Dependencies

CV-5: Capability to Organizational Development Mapping

CV-6: Capability to Operational Activities Mapping

CV-7: Capability to Services Mapping

Go to top of page ↑

DoDAF

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Background

What is New in DoDAF V2.0

VisioBackground

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Capability Viewpoint - Capability Model Descriptions

CV-6: Capability to Operational Activities Mapping

The CV-6 describes the mapping between the capabilities required and the activities that enable those capabilities.

It is important to ensure that the operational activity matches the required capability. The CV-6 DoDAF-described Model provides a bridge between capability analyzed using CVs and operational activities analyzed using OVs. Specifically, it identifies how operational activities can be performed using various available capability elements. It is similar in function to the SV-5a Operational Activity to Systems Function Traceability Matrix. The capability to activity mappings may include both situations where activities fully satisfy the desired capability and those where the activity only partially meets the capability requirement.

The intended usage of the CV-6 includes:

- Tracing capability requirements to operational activities.
- Capability audit.

Detailed Description:

A CV-6 shows which elements of capability may be utilized in support of specific operational activities by means of a mapping matrix. If the CV-6 is created as part of a strategic architecture (i.e., before the creation of supporting operational models), it is recommended that the operational activities described in the CV-6 should be common functions. This model may be used indicate that an operational capability (perhaps reflecting a particular user requirement) does or does not fulfill the requirements for capability for a particular phase.

In principle, there could be a different CV-6 created for each phase of the capability development, or perhaps for different capability phasing scenarios. In most cases, it is considered that a single table can be constructed because the operational activities that are most likely relevant to this model may be relatively high-level. If capabilities associated are generic (see CV-1 Vision model), then they should have a well understood relationship with a standard set of operational activities and this relationship is unlikely to change over time.

This model is analogous to the SV-5a Operational Activity to System Function Traceability Matrix - but provides the interface between Capability and Operational Models rather than Operational to System Models.

The CV-6 can have a tabular presentation. The rows can be the Capabilities and the columns can be the Operational Activities. An X may indicate that the capability may be utilized in support of that activity whereas a blank indicates that it does not. Alternatively, a date or phase can indicate that the capability may support that activity by the date or phase indicated.

CV-7: Capability to Services Mapping. The CV-7 describes the mapping between the capabilities required and the services that enable those capabilities. It is important to ensure that

CV-1: Vision

CV-2: Capability Taxonomy

Go to top of page ↑

Background
Architecture Development
Meta Model
Viewpoints & Models
- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques
Configuration Management Overview
Acronyms List and Glossary of Terms

Site Map
Archives

DoDAF Viewpoints and Models

Capability Viewpoint - Capability Model Descriptions

CV-7: Capability to Services Mapping

The CV-7 describes the mapping between the capabilities required and the services that enable those capabilities. It is important to ensure that the services match the required capability. The CV-7 provides a bridge between capability analyzed using CVs and services analyzed using SvcVs. Specifically, it identifies how services can be performed using various available capability elements. It is similar in function to the SV-5a which maps system functions to operational activities. The capability to service mappings may include both situations where a service fully satisfies the desired capability and those where the service only partially meets the capability requirement.

The intended usage of the CV-7 includes:

- Tracing capability requirements to services.
- Capability audit.

Detailed Description:

The CV-7 describes the mapping between capabilities required and the services that those capabilities support. A CV-7 shows which elements of capability may be utilized in support of specific services by means of a mapping matrix. If the CV-7 is created as part of a strategic architecture (i.e., before the creation of supporting service models), it is recommended that the services used as part of the CV-7 are common functions. This model may be used indicate that an operational capability (perhaps reflecting a particular user requirement) does or does not fulfill the requirements for capability for a particular phase.

In principle, there could be a different CV-7 created for each phase of the capability development, or perhaps for different capability phasing scenarios. In most cases, it is considered that a single table can be constructed because the services that are most likely relevant to this model may be relatively high-level. If capabilities associated are generic (see CV-1 Vision model), then they should have a well understood relationship with a standard set of services and this relationship is unlikely to change over time.

This model is analogous to the SV-5a Operational Activity to System Function Traceability Matrix - but provides the interface between Capability and Service Models rather than Operational to System Models.

The CV-7 can have a tabular presentation. The rows can be the Capabilities and the columns can be the services. An X indicates that the capability may be utilized in support of that service whereas a blank indicates that it does not. Alternatively, a date or phase can indicate that the capability may support that service by the date or phase indicated.

CV-1: Vision

CV-2: Capability Taxonomy

CV-3: Capability Phasing

CV-4: Capability Dependencies

CV-5: Capability to Organizational Development Mapping

Go to top of page ↑

DoDAF Viewpoints and Models

Data and Information Viewpoint

DoDAF-described Models within the Data and Information Viewpoint provide a means of portraying the operational and business information requirements and rules that are managed within and used as constraints on the organizations business activities. Experience gained from many enterprise architecture efforts within the DoD led to the identification of several levels of abstraction necessary to accurately communicate the information needs of an organization or enterprise. The appropriate level or levels of abstraction for a given architecture are dependent on the use and the intended users of the architecture. Where appropriate, the data captured in this viewpoint needs to be considered by COIs.

DoDAF V2.0 incorporates three levels of abstraction that correlate to the different levels associated with most data models developed in support of the operations or business. These levels are:

- Conceptual.
- Logical.
- Physical.

Data and Information Model Descriptions

Model	Description
DIV-1: Conceptual Data Model	The required high-level data concepts and their relationships.
DIV-2: Logical Data Model	The documentation of the data requirements and structural business process (activity) rules. In DoDAF V1.5, this was the OV-7.
DIV-3: Physical Data Model	The physical implementation format of the Logical Data Model entities, e.g., message formats, file structures, physical schema. In DoDAF V1.5, this was the SV-11.

Mappings of the Data and Information Viewpoint DoDAF-described Models to the DM2 Concepts, Associations, and Attributes are in **DM2 Concepts, Associations, and Attributes Mapping to DoDAF-described Models**. There is traceability between the DIV-1 to the DIV-2 to the DIV3 as follows:

- The information representations in the DIV-1 are same, decomposed into, or factored into the data representations in the DIV-2. The DIV-1 information representations can range in detail from concept lists to structured lists (i.e., whole-part, super-subtype), to inter-related concepts. At the DIV-1 level, any relationships are simply declared and then at the DIV-2 level they are made explicit and attributed. Similarly, attributes (or additional relationships) are added at the DIV-2 level.
- The DIV-3's performance and implementation considerations usually result in standard modifications of the DIV-2 and so it traces quite directly. That is, no new semantics are introduced going from the DIV-2 to the DIV-3.

The DM2 Concepts, Associations, and Attributes are described in the DoDAF Meta-model Data Dictionary.

Uses of Data and Information Viewpoint DoDAF-described Models. The DIV DoDAF-described Models provide means of ensuring that only those information items that are important to the organization's operations and business are managed as part of the enterprise. They are also useful foundations for discussion with the various stakeholders of the architecture (e.g., decision-makers, architects, developers). These stakeholders require varying levels of detail to support their roles within the enterprise.

When building an architecture using a structured analysis approach, the items captured as part of the data model can be derived from the inputs and outputs associated to the organizations activities. Building the data model in this manner ties the data being managed within the architecture to the activities that necessitate that data. This provides a valuable construct enabling the information to be traceable to the strategic drivers of the architecture. This also enables the data to be used to map services and systems to the business operations. The conceptual data model would be a good tool to use when discussing this traceability with executive decision-makers and persons at that level.

The logical data model bridges the gap between the conceptual and physical-levels. The logical data model introduces attributes and structural rules that form the data structure. As evidenced by the content, this model provides more detail than the conceptual model and communicates more to the architects and systems analysts types of stakeholders. This is one model that helps bridge the gap between architecture and system development. It provides a valuable tool for generating requirements and test scripts against which services and systems can be tested.

Lastly, the physical data model is the actual data schema representative of the database that provides data to the services and applications using the data. This schema is usually a de-normalized data structure optimized to meet performance parameters. The physical data model usually can be generated from a well-defined logical data model then used by database developers and system developers or it can be developed separately from the logical data model (not the optimum method of development) and optimized by the database and system developers. This model can be used to develop XML message sets and other physical exchange specifications enabling the exchange of architecture information.

Metadata Groups Used to Create Data and Information Models. The previous DoDAF-described Models focused on particular areas within the DoDAF Meta-model from which the majority of the information within the models can be extracted. For example, the Capability Viewpoint DoDAF-described Models are in large part made up of data extracted from the Capability Metadata groups. The same is true for Project, Services and the like. The Data and Information DoDAF-described Models are somewhat different.

The Data and Information DoDAF-described Models contain information extracted from all of the metadata groups. Therefore, any information that an organization is managing using its enterprise architecture, should be captured within the Data and Information Models. As previously stated, there are levels of detail that are not included in all models (e.g., the conceptual data model is usually not fully attributed like the logical and physical) but the information item itself (e.g., capability, activity, service) should be represented in all models. Together, the three types of models help bridge the gap between architecture being used as requirements and architecture being used to support system engineering.

DIV-1: Conceptual Data Model

DIV-2: Logical Data Model

DIV-3: Physical Data Model

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Data and Information Viewpoint

DIV-1: Conceptual Data Model

The DIV-1, a new DoDAF-described Model in DoDAF V2.0, addresses the information concepts at a high-level on an operational architecture.

The DIV-1 is used to document the business information requirements and structural business process rules of the architecture. It describes the information that is associated with the information of the architecture. Included are information items, their attributes or characteristics, and their inter-relationships.

The intended usage of the DIV-1 includes:

- Information requirements
- Information hierarchy

Detailed Description:

The DIV-1 DoDAF-described Model describes the structure of an Architectural Description domain's information types and the structural business process rules (defined in the OV Models).

The Architectural elements for DIV-1 include descriptions of information entity and relationship types. Attributes can be associated with entities and with relationships, depending on the purposes of the Architectural Description.

The intention is that DIV-1 describes information or data of importance to the business (e.g., information products that might be referred to in doctrine, SOPs, etc.) whereas the DIV-3 Physical Data Model describes data relevant at the system-level.

The purpose of a given Architectural Description helps to determine the level of detail needed in this model. This level of detail is driven in particular by the criticality of the interoperability requirements.

Often, different organizations may use the same Entity name to mean very different kinds of information having different internal structure. This situation could pose significant interoperability risks, as the information models may appear to be compatible, e.g., each having a Target Track data Entity, but having different and incompatible interpretations of what Target Track means.

A DIV-1 may be necessary for interoperability when shared information syntax and semantics form the basis for greater degrees of information systems interoperability, or when an information repository is the basis for integration and interoperability among business activities and between capabilities.

The DIV-1 defines the Architectural Description's information classes and the relationships among them. For example, if the architecture effort is describing missile defense, some possible information classes may be trajectory and target with a relationship that associates a target with a certain trajectory. The DIV-1 defines each kind of information classes associated with the Architectural Description scope, mission, or business as its own Entity, with its associated attributes and relationships. These Entity definitions correlate to OV-2 Operational Resource Flow Description information elements and OV-5b Operational Activity

Model inputs, outputs, and controls.

The DIV-1 should not be confused with the DoDAF Meta-model. Architectural data types for the DoDAF (i.e., DoDAF-defined architectural data elements and DM2 entities) are things like Performer and Operational Activity. The DM2 does provide a specification of the underlying semantics for DoDAF-described Models such as DIV-1. DIV-1 describes information about a specific Architectural Description scope.

DIV-1: Conceptual Data Model

DIV-2: Logical Data Model

DIV-3: Physical Data Model

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Data and Information Viewpoint

DIV-2: Logical Data Model

The DIV-2 allows analysis of an architecture's data definition aspect, without consideration of implementation specific or product specific issues.

Another purpose is to provide a common dictionary of data definitions to consistently express models wherever logical-level data elements are included in the descriptions. Data definitions in other models include:

- Data described in a DIV-2 may be related to Information in an OV-1 High Level Operational Concept Graphic or and Activity Resource (where the Resource is Data) flow object in an OV-5b Operational Activity Model. This relation may be a simple subtype, where the Data is a proceduralized (structured) way of describing something. Recall that Information describes something. Alternatively, the relation may be complex using Information and Data whole-part (and overlap) relationships.
- The DIV-2 information entities and elements can be constrained and validated by the capture of business requirements in the OV-6a Operational Rules Model.
- The information entities and elements modeled in the DIV-2 also capture the information content of messages that connect life-lines in an OV-6c Event-Trace Description.
- The DIV-2 may capture elements required due to Standards in the StdV-1 Standards Profile or StdV-2 Standards Forecast.

Detailed Description:

The DIV-2 is a generalized formal structure in computer science. It directly reflects the paradigm or theory oriented mapping from the DIV-1 Conceptual Data Model to the DIV-2.

Possible Construction Methods: DoDAF does not endorse a specific data modeling methodology. The appropriate way to develop a logical data model depends on the technology chosen as the main design solution (e.g., relational theory or object-orientation). For relational theory, a logical data model seems best described using an entity relationship diagramming technique. For Object-Oriented, a logical data model seems best described using Class and/or Object diagrams.

In either case, attention should be given to quality characteristics for the data model. Definition and acceptance of data model quality measures (not data quality measures) for logical data models are sparse. There is some research and best practices. Framed as a software verification, validation, and quality factors, types of best practices include:

- Validation Factors - Was the Right Model Built?
- Information Requirements Fidelity.
- Conceptual, Logical, and Physical Traceability.
- Adherence to Government and Industry Standards and Best Practices.
- Domain Values.
- Resource Exchange and Other Interoperability Requirements.
- Net-Centric Factors.
  - XML Registration.

  - COI Participation.
  - DDMS Compatibility.
- Identifiers and Labels.
- Verification Factors - Was it Well Built?
- Design Factors.
- Compactness.
- Abstraction and Generalization.
- Ontologic Foundations.
- Semantic Purity.
- Logical and Physical Redundancy.
- Separation of Concerns.
- Software Quality Factors.
- Documentation.
- Naming Conventions.
- Naming and Business Languages.
- Definitions.
- Completeness.
- Consistency.
- Implementability.
- Enumerations/free text ratio.

An example design factor is normalization- essentially one representation for any particular real-world object. There are degrees of normalization with third normal form (3NF) being commonly used. At 3NF, there are no repeating attributes; instead techniques like lookup tables, super-subtyping to carry the common attributes at the supertype-level, and entity decomposition into smaller attribute groupings are used. For the DIV-2, care should be taken to avoid hidden overlaps, where there is a semantic overlap between concepts with different entity, attribute, or domain value names.

DIV-1: Conceptual Data Model

DIV-2: Logical Data Model

DIV-3: Physical Data Model

Go to top of page ↑

DoDAF Viewpoints and Models

Data and Information Viewpoint

DIV-3: Physical Data Model

The DIV-3 defines the structure of the various kinds of system or service data that are utilized by the systems or services in the Architectural Description. The Physical Schema is one of the models closest to actual system design in DoDAF. DIV-3 is used to describe how the information represented in the DIV-2 Logical Data Model is actually implemented.

While the mapping between the logical and physical data models is relatively straightforward, the relationship between the components of each model (e.g., entity types in the logical model versus relational tables in the physical model) is frequently one-to-many or many-to-many.

The intended usage of the DIV-3 includes:

- Specifying the system/service data elements exchanged between systems and/or services, thus reducing the risk of interoperability errors.
- Definition of physical data structure.
- Providing as much detail as possible on data elements exchanged between systems, thus reducing the risk of interoperability problems.
- Providing data structures for use in the system design process, if necessary.
- Providing a common dictionary of data implementation elements (e.g., tables and records in a relational database schema) to consistently express models wherever physical-level data elements are included in the descriptions.
- Providing as much detail as possible on the system or service data elements exchanged between systems, thus reducing the risk of interfacing errors.
- Providing system and service data structures for use in the system and service design process, if necessary.

Note that DoDAF talks about information in the Operational Viewpoint and data in the System Viewpoint or Services Viewpoint. The intention of this distinction is that DIV-2 Logical Data Model describes information of importance to the business, (e.g., information products that might be referred to in doctrine, SOPs etc.) whereas DIV-3 describes data relevant at the system or service-level.

Detailed Description:

The DIV-3 is an implementation-oriented model that is used in the Systems Viewpoint and Services Viewpoint to describe how the information requirements represented in DIV-2 Logical Data Model are actually implemented. Entities represent:

- System Resource flows in SV-4 Systems Functionality Description.
- System Resource elements specified in SV-6 Systems Resource Flow Matrix and SV-10c Systems Event-Trace Description.
- Service Resource flows in SvcV-4 Services Functionality Description.
- Service Resource elements specified in SvcV-6 Services Resource Flow Matrix and SvcV-10c Services Event-Trace Description.
- Triggering events in SV-10b Systems State Transition Description or SvcV-10b Services State Transition Description.

Events in SV-10c Systems Event-Trace Description or SvcV-10c Services Event-Trace Description.
- Elements required due to Standards in the StdV-1 Standards Profile or StdV-2 Standards Forecast.

For some purposes, an Entity relationship style diagram of the physical database design is sufficient. References to message format standards may be sufficient for message-oriented implementations. Descriptions of file formats may be used when file passing is the model used to exchange information. Interoperating systems may use a variety of techniques to exchange system data and have several distinct partitions in their DIV-3 with each partition using a different form.

Standards associated with entities are also often identified in the development of the DIV-3; these should be recorded in the StdV-1 Standards Profile. Structural Assertions - these involve static aspects of business rules - are best captured in the DIV-3.

Possible Construction Methods: DoDAF does not endorse a specific data modeling methodology. The physical data schema model specifies how the logical data model will be instantiated. The most predominant are the relational database management systems and object repository products. In addition, this model may employ other technology mechanisms, such as messages or flat files. The essential elements of a physical data schema model (in the case of a relational database) are: tables, records and keys. In an object-oriented data model, all data elements are expressed as objects; whether they are classes, instances, attributes, relationships, or events.

The appropriate way to develop a physical data model depends on the product chosen to instantiate the logical data model (e.g., a relational database management system [RDBMS]). A physical data schema model seems best described using an entity-relationship diagramming technique. For Object-Oriented data modeling, a physical data schema seems best described using by Class and/or Object diagrams. For other implementation technologies, such as message orientation, a reference to a message format standard might be more appropriate.

DIV-1: Conceptual Data Model

DIV-2: Logical Data Model

DIV-3: Physical Data Model

Go to top of page ↑

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Operational Viewpoint

DoDAF-described Models in the Operational Viewpoint describe the tasks and activities, operational elements, and resource flow exchanges required to conduct operations. A pure operational model is materiel independent. However, operations and their relationships may be influenced by new technologies, such as collaboration technology, where process improvements are in practice before policy can reflect the new procedures. There may be some cases, as well, in which it is necessary to document the way activities are performed, given the restrictions of current systems, to examine ways in which new systems could facilitate streamlining the activities. In such cases, operational models may have materiel constraints and requirements that need to be addressed. For this reason, it may be necessary to include some high-level system architectural data to augment information onto the operational models.

Uses of Operational Viewpoint DoDAF-described Models. The OV DoDAF-described Models may be used to describe a requirement for a “To-Be” architecture in logical terms, or as a simplified description of the key behavioral and information aspects of an “As-Is” architecture. The OV DoDAF-described Models re-use the capabilities defined in the Capability Viewpoint and put them in the context of an operation or scenario. The OV DoDAF-described Models can be used in a number of ways, including the development of user requirements, capturing future concepts, and supporting operational planning processes.

One important way that architectural modeling supports the definition of requirements is in terms of boundary definition. Boundary definition is a process that often requires a significant degree of stakeholder engagement; the described models provided by DoDAF provide ideal support for this interactive process. The DoDAF provides support to the concept of functional scope and organizational span. When performing analysis of requirements relative to a particular capability or capabilities, it is important to know the specific functionality intended to be delivered by the capability. It is also important to know the limits of that functionality, to be able to determine necessary interfaces to other capabilities and organizations. The use of OV DoDAF-described Models (e.g., Operational Resource Flow Description and Operational Activity Model) supports identification of the boundaries of capabilities, thus rendering the functional scope and organizational span.

Definition of user-level interoperability requirements is another use for which there is applicability of the Operational Viewpoint DoDAF-described Models. Within the Operational Viewpoint DoDAF-described Models, DoDAF supports interoperability analysis in a number of ways.

Operational models can be used to help answering questions such as:

- What are the lines of business supported by this enterprise?
- What activities are in place to support the different lines of business?
- What is the functional scope of the capability or capabilities for which I am responsible? This can be answered by a combination of information from the activity model and CV DoDAF-described Models.
- What is the organizational span of influence of this capability or capabilities?
- What information must be passed between capabilities?
- What strategic drivers require that certain data are passed or tracked? This can be

answered by a combination of data within the logical data model, information exchanges, activities, and CV DoDAF-described Models.

- What activities are being supported or automated by a capability or capabilities?
- What role does organization X play within a capability or capabilities?
- What are the functional requirements driving a particular capability?
- What rules are applied within a capability, and how are they applied?

Use of Operational Viewpoint DoDAF-described Models should improve the quality of requirements definitions by:

- Explicitly tying user requirements to strategic-level capability needs, enabling early agreement to be reached on the capability boundary.
- Providing a validated reference model of the business/operations against which the completeness of a requirements definition can be assessed (visualization aids validation).
- Explicitly linking functional requirements to a validated model of the business or operations activities.
- Capturing information-related requirements (not just Information Exchange Requirements [IERs]) in a coherent manner and in a way that really reflects the user collaboration needs.
- Providing a basis for test scenarios linked to user requirements.
- Capturing the activities for Process Engineering or Process Re-engineering.

Operational Model Descriptions

Model	Description
OV-1: High-Level Operational Concept Graphic	The high-level graphical/textual description of the operational concept.
OV-2: Operational Resource Flow Description	A description of the Resource Flows exchanged between operational activities.
OV-3: Operational Resource Flow Matrix	A description of the resources exchanged and the relevant attributes of the exchanges.
OV-4: Organizational Relationships Chart	The organizational context, role or other relationships among organizations.
OV-5a: Operational Activity Decomposition Tree	The capabilities and activities (operational activities) organized in a hierarchal structure.
OV-5b: Operational Activity Model	The context of capabilities and activities (operational activities) and their relationships among activities, inputs, and outputs; Additional data can show cost, performers or other pertinent information.
OV-6a: Operational Rules Model	One of three models used to describe activity (operational activity). It identifies business rules that constrain operations.
OV-6b: State Transition Description	One of three models used to describe operational activity (activity). It identifies business process (activity) responses to events (usually, very short activities).
OV-6c: Event-Trace Description	One of three models used to describe activity (operational activity). It traces actions in a scenario or sequence of events.

Mappings of the Data and Information Viewpoint DoDAF-described Models to the DM2 Concepts, Associations, and Attributes are in **DM2 Concepts, Associations, and Attributes Mapping to DoDAF-described Models**. The DM2 Concepts, Associations, and Attributes are described in the DoDAF Meta-model Data Dictionary.

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Operational Viewpoint

OV-1: High Level Operational Concept Graphic

The OV-1 describes a mission, class of mission, or scenario. It shows the main operational concepts and interesting or unique aspects of operations. It describes the interactions between the subject architecture and its environment, and between the architecture and external systems. The OV-1 is the pictorial representation of the written content of the AV-1 Overview and Summary Information. Graphics alone are not sufficient for capturing the necessary architectural data.

The OV-1 provides a graphical depiction of what the architecture is about and an idea of the players and operations involved. An OV-1 can be used to orient and focus detailed discussions. Its main use is to aid human communication, and it is intended for presentation to high-level decision-makers.

The intended usage of the OV-1 includes:

- Putting an operational situation or scenario into context.
- Providing a tool for discussion and presentation; for example, aids industry engagement in acquisition.
- Providing an aggregate illustration of the details within the published high-level organization of more detailed information in published architectures.

Detailed Description:

Each Operational Viewpoint relates to a specific point within the Enterprise's timeline. The OV-1 describes a mission, class of mission, or scenario. The purpose of OV-1 is to provide a quick, high-level description of what the architecture is supposed to do, and how it is supposed to do it. An OV-1 can be used to orient and focus detailed discussions. Its main utility is as a facilitator of human communication, and it is intended for presentation to high-level decision-makers. An OV-1 identifies the mission/scope covered in the Architectural Description. OV-1 conveys, in simple terms, what the Architectural Description is about and an idea of the players and operations involved.

The content of an OV-1 depends on the scope and intent of the Architectural Description, but in general it describes the business activities or missions, high-level operations, organizations, and geographical distribution of assets. The model frames the operational concept (what happens, who does what, in what order, to accomplish what goal) and highlight interactions to the environment and other external systems. However, the content is at an executive summary-level as other models allow for more detailed definition of interactions and sequencing.

It may highlight the key Operational concepts and interesting or unique aspects of the concepts of operations. It provides a description of the interactions between the Architectural Description and its environment, and between the Architectural Description and external systems. A textual description accompanying the graphic is crucial. Graphics alone are not sufficient for capturing the necessary architectural data.

The OV-1 consists of a graphical executive summary for a given Architectural Description with accompanying text.

During the course of developing an Architectural Description, several versions of an OV-1 may be produced. An initial version may be produced to focus the effort and illustrate its scope. After other models within the Architectural Description's scope have been developed and verified, another version of the OV-1 may be produced to reflect adjustments to the scope and other Architectural Description details that may have been identified as a result of the architecture development. After the Architectural Description has been used for its intended purpose and the appropriate analysis has been completed, yet another version may be produced to summarize these findings to present them to high-level decision-makers. In other cases, OV-1 is the last model to be developed, as it conveys summary information about the whole Architectural Description for a given scenario.

The OV-1 is useful in establishing the context for a suite of related operational models. This context may be in terms of phase, a time period, a mission and/or a location. In particular, this provides a container for the spatial-temporally constrained performance parameters (measures).

To describe this, the operational performance measures for desert warfare in Phase 1 may be different to those in Phase 2. The measures for jungle warfare in Phase 2 may be different to those for desert warfare in Phase 2.

The context may also explicitly involve a Mission. When the subject of the Architectural Description is a business capability rather than a battlespace capability, then some adjustment is needed in the use of terminology. However, the idea of having a high-level (Business) operational concept still makes sense and the graphical representation in OV-1 adds value to the more structured models that may be created.

OV-1 is the most general of the architectural models and the most flexible in format. However, an OV-1 usually consists of one or more graphics (or possibly a video-clip), as needed, as well as explanatory text.

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Operational Viewpoint

OV-2: Operational Resource Flow Description

The OV-2 DoDAF-described Model applies the context of the operational capability to a community of anticipated users. The primary purpose of the OV-2 is to define capability requirements within an operational context. The OV-2 may also be used to express a capability boundary.

New to DoDAF V2.0, the OV-2 can be used to show flows of funding, personnel and materiel in addition to information. A specific application of the OV-2 is to describe a logical pattern of resource (information, funding, personnel, or materiel) flows. The logical pattern need not correspond to specific organizations, systems or locations, allowing Resource Flows to be established without prescribing the way that the Resource Flows are handled and without prescribing solutions.

The intended usage of the OV-2 includes:

- Definition of operational concepts.
- Elaboration of capability requirements.
- Definition of collaboration needs.
- Applying a local context to a capability.
- Problem space definition.
- Operational planning.
- Supply chain analysis.
- Allocation of activities to resources.

Detailed Description:

The OV-2 depicts Operational Needlines that indicate a need to exchange resources. New to DoDAF V2.0, the OV-2 show flows of funding, personnel and materiel in addition to information. The OV-2 may also show the location of Operational facilities or locations, and may optionally be annotated to show flows of information, funding, people or materiel between Operational Activities. The Operational Activities shown in an OV-2 may be internal to the architecture, or may be external activities that communicate with those internal activities.

Use of OV-2 is intended to be logical. It is to describe who or what, not how. This model provides a focus for the operational requirements which may reflect any capability requirements that have been articulated but within the range of operational settings that are being used for operational architecture. In an "As-Is" architecture, an OV-2 may be used as an abstract (i.e., simplified) representation of the Resource Flows taking place in the Enterprise. An OV-2 can be a powerful way of expressing the differences between an "As-Is" Architectural Description and a proposed "To-Be" Architectural Description to non-technical stakeholders, as it simply shows how Resource Flows (or does not flow). The aim of the OV-2 is to record the operational characteristics for the community of anticipated users relevant to the Architectural Description and their collaboration needs, as expressed in Needlines and Resource Flows.

A specific application of the OV-2 is to describe a logical pattern of resource (information, funding, personnel, or materiel) flows. The purpose of an OV-2 model is to describe a logical pattern of Resource Flows. The logical pattern need not correspond to specific organizations, systems or locations, allowing Resource Flows to be established without prescribing the way that the Resource Flows are handled and without prescribing solutions. The OV-2 is intended to track the need for Resource Flows between specific Operational Activities and Locations that play a key role in the Architectural Description. OV-2 does not depict the physical connectivity between the Activities and Locations. The logical pattern established in an OV-2 model may act as the backbone onto which architectural elements may be overlaid - e.g., a SV-1 Systems Interface Description model can show which systems are providing the necessary capability.

The main features of this model are the Operational Resource Flows, and the location (or type of location/environment) where the resources need to be or are deployed, and the Needlines that indicate a need to exchange or share resources. An OV-2 indicates the key players and the interactions necessary to conduct the corresponding operational activities of OV-5a Operational Activity Decomposition Tree or OV-5b Operational Activity Model.

A Needline documents the required or actual exchanges of resources. A Needline is a conduit for one or more resource exchanges - i.e., it represents a logical bundle of Resource Flows. The Needline does not indicate how the transfer is implemented. For example, if information (or funding, personnel, or materiel) is produced at location A, routed through location B, and is used at location C, then location B would not be shown on the OV-2 - the Needline would go from Location A to Location C. The OV-2 is not a communications link or communications network diagram but a high-level definition of the logical requirement for resource exchange.

A OV-2 can also define a need to exchange items between Operational Activities and locations and external resources (i.e., Operational Activities, Locations, or Organizations that are not strictly within the scope of the subject Architectural Description but which interface to it either as important sources of items required within the Architectural Description or important destinations for items provided within the Architectural Description).

The OV-2 is intended to track the need to exchange items between key Operational Activities and Locations within the Architectural Description. The OV-2 does not depict the physical connectivity between the Operational Activities and Locations. The Needlines established in an OV-2 can be realized by resources and their interactions in a SV-1 Systems Interface Description model or SvcV-1 Services Context Description model. There may not be a one-to-one correspondence between an operational activity and a location in OV-2 and a resource in SV-1 Systems Interface Description model or SvcV-1 Services Context Description model. For example, an Operational Activity and location may be realized by two systems, where one provides backup for the other, or it may be that the functionality of an Operational Activity has to be split between two locations for practical reasons.

Needlines can be represented by arrows (indicating the direction of flow) and are annotated with a diagram-unique identifier and a phrase that is descriptive of the principal type of exchange - it may be convenient to present these phrases (or numerical labels) in a key to the diagram to prevent cluttering. It is important to note that the arrows (with identifiers) on the diagram represent Needlines only. This means that each arrow indicates only that there is a need for the transfer of some resource between the two connected Activities or locations. A Needline can be uni-directional. Because Needline identifiers are often needed to provide a trace reference for Resource Flow requirements (see OV-3 Operational Resource Flow Matrix), a combined approach, with numerical and text labels, can be used.

There may be several Needlines (in the same direction) from one resource to another. This may occur because some Needlines are only relevant to certain scenarios, missions or mission phases. In this case, when producing the OV-2 for the specific case, a subset of all of the Needlines should be displayed. There can be a one-to-many relationship from Needlines to Resource Flow (e.g., a single Needline in OV-2 represents multiple individual Resource Flows). The mapping of the Resource Flows to the Needlines of OV-2 occurs in the Operational Resource Flow Matrix (OV-3). For example, OV-2 may list Situation Report as a descriptive name for a Needline between two Operational resources. In this case, the Needline represents a number of resource flow (information in this case) exchanges, consisting of various types of reports (information elements), and their attributes (such as periodicity and timeliness) that are associated with the Situation Report Needline. The identity of the individual elements and their attributes are documented in OV-3 Operational Resource Flow Matrix model.

For complex Architectural Descriptions, OV-2 may consist of multiple graphics. There are several different ways to decompose OV-2. One method involves using multiple levels of abstraction and decomposing the Resource Flows. Another method involves restricting the Resource Flows and Needlines on any given graphic to those associated with a subset of operational activities. Finally it is possible to organize OV-2 in terms of scenarios, missions or mission phases. All of these methods are valid and can be used together.

Flows of Funding, Personnel and Material:

In addition to Needlines, Resource Flow Connectors can be used to overlay contextual information about how the Operational Activities and Locations interact via physical flows. This information helps to provide context for the business roles. Examples of Resource Flow Connector usage would be:

- Representing a logistics capability may have an interaction which involves supplying (physically delivering) personnel.
- Representing an air-to-air refueling capability may have an interaction with airborne platform capabilities which involves transfer of fuel.
- Representing a sensor capability may have an interaction with a target through a flow of physical energy that is sensed; this is not an information flow.

This is achieved by overlaying the Resource Flow Connectors on the diagram using a notation that is clearly distinct from Needlines (which only represent the requirement to flow resources).

Operational Activities:

The operational activities (from the OV-5b Operational Activity Model) performed may be listed on the graphic, if space permits. OV-2 and the OV-5b Operational Activity Model are complementary descriptions. OV-2 focuses on the Operational Resource Flows, with the activities being a secondary adornment. The OV-5b, on the other hand, places first-order attention on operational activities and only second-order attention on Resource Flows, which can be shown as annotations or swim lanes on the activities. In developing an Architectural Description, OV-2 and OV-5b Operational Activity Model are often the starting points and these may be developed iteratively.

OV-1: High-Level Operational Concept Graphic

OV-2: Operational Resource Flow Description

OV-3: Operational Resource Flow Matrix

OV-4: Organizational Relationships Chart

OV-5a: Operational Activity Decomposition Tree

OV-5b: Operational Activity Model

OV-6a, 6b, 6c: Introduction

OV-6a: Operational Rules Model

OV-6b: State Transition Description

OV-6c: Event-Trace Description

Go to top of page ↑

Background

Architecture Development

Meta Model

Viewpoints & Models

All Viewpoint

Capability Viewpoint

Data and Information Viewpoint

Operational Viewpoint

Project Viewpoint

Services Viewpoint

Standards Viewpoint

Systems Viewpoint

Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Operational Viewpoint

OV-3: Operational Resource Flow Matrix

The OV-3 addresses operational Resource Flows exchanged between Operational Activities and locations.

Resource Flows provide further detail of the interoperability requirements associated with the operational capability of interest. The focus is on Resource Flows that cross the capability boundary.

The intended usage of the OV-3 includes:

. Definition of interoperability requirements.

Detailed Description:

The OV-3 identifies the resource transfers that are necessary to support operations to achieve a specific operational task. This model is initially constructed from the information contained in the OV-2 Operational Resource Flow Description model. But the OV-3 provides a more detailed definition of the Resource Flows for operations within a community of anticipated users.

The Operational Resource Flow Matrix details Resource Flow exchanges by identifying which Operational Activity and locations exchange what resources, with whom, why the resource is necessary, and the key attributes of the associated resources. The OV-3 identifies resource elements and relevant attributes of the Resource Flows and associates the exchange to the producing and consuming Operational Activities and locations and to the Needline that the Resource Flow satisfies. OV-3 is one of a suite of operational models that address the resource content of the operational architecture (the others being OV-2 Operational Resource Flow Description, OV-5b Operational Activity Model, and DIV-2 Logical Data Model). Needlines are logical requirements-based collaboration relationships between Operational Activities and locations (as shown in OV-2 Operational Resource Flow Description). A Needline can be uni-directional.

A resource element (see DIV-2 Logical Data Model) is a formalized representation of Resource Flows subject to an operational process. Resource elements may mediate activity flows and dependencies (see OV-5b Operational Activity Model). Hence they may also be carried by Needlines that express collaboration relationships. The same resource element may be used in one or more Resource Flows.

The emphasis in this model is on the logical and operational characteristics of the Resource Flows being exchanged, with focus on the Resource Flows crossing the capability boundary. It is important to note that OV-3 is not intended to be an exhaustive listing of all the details contained in every Resource Flow of every Operational Activity and location associated with the Architectural Description in question. Rather, this model is intended to capture the most important aspects of selected Resource Flows.

The aspects of the Resource Flow that are crucial to the operational mission will be tracked as attributes in OV-3. For example, if the subject Architectural Description concerns tactical battlefield targeting, then the timeliness of the enemy target information is a significant attribute of the Resource Flow. To support the needs of security architecture, Resource Flows should also address criticality and classification. There is an important caveat on use of OV-3 for security architectures. In that context, it is important to identify every possible and required exchange.

There is not always a one-to-one mapping of OV-3 Resource Flows to OV-2 Operational Resource Flow Description Needlines; rather, many individual Resource Flows may be associated with one Needline.

The OV-3 information can be presented in tabular form. DoDAF V2.0 does not prescribe the column headings in an OV-3 Matrix.

Go to top of page ↑

DoDAF Viewpoints and Models

Operational Viewpoint

OV-4: Organizational Relationships Chart

The OV-4 shows organizational structures and interactions. The organizations shown may be civil or military. The OV-4 exists in two forms; role-based (e.g., a typical brigade command structure) and actual (e.g., an organization chart for a department or agency).

A role-based OV-4 shows the possible relationships between organizational resources. The key relationship is composition, i.e., one organizational resource being part of a parent organization. In addition to this, the architect may show the roles each organizational resource has, and the interactions between those roles, i.e., the roles represent the functional aspects of organizational resources. There are no prescribed resource interactions in DoDAF V2.0: the architect should select an appropriate interaction type from the DM2 or add a new one. Interactions illustrate the fundamental roles and management responsibilities, such as supervisory reporting, Command and Control (C2) relationships, collaboration and so on.

An actual OV-4 shows the structure of a real organization at a particular point in time, and is used to provide context to other parts of the architecture such as AV-1 and the CVs.

The intended usage of the role-based OV-4 includes:

- Organizational analysis.
- Definition of human roles.
- Operational analysis.

The intended usage of the actual OV-4 includes:

- Identify architecture stakeholders.
- Identify process owners.
- Illustrate current or future organization structures.

Detailed Description:

The OV-4 addresses the organizational aspects of an Architectural Description. A typical OV-4 illustrates the command structure or relationships (as opposed to relationships with respect to a business process flow) among human roles, organizations, or organization types that are the key players in the business represented by the architecture. An actual OV-4 shows real organizations and the relationships between them.

The more commonly used types of organizational relationship will be defined, in time, in the DoDAF Meta-model. DoDAF defines fundamental relationships between Organizational Resources; including structure (whole-part) and interaction. The interaction relationship covers most types of organizational relationship. An OV-4 clarifies the various relationships that can exist between organizations and sub-organizations within the Architectural Description and between internal and external organizations. Where there is a need for other types of organizational relationships, these should be recorded and defined in the AV-2 Integrated Dictionary as extensions to the DM2.

Organizational relationships are important to depict in an architecture model, because they can illustrate fundamental human roles (e.g., who or what type of skill is needed to conduct operational activities) as well as management relationships (e.g., command structure or relationship to other key players). Also, organizational relationships are drivers for some of the collaboration requirements that are viewed using Needlines.

Note that individual people are not viewed in DoDAF, but specific billets or Person Types may be detailed in an actual OV-4.

In both the typical and specific cases, it is possible to overlay resource interaction relationships which denote relationships between organizational elements that are not strictly hierarchical (e.g., a customer-supplier relationship).

The organizations that are modeled using OV-4 may also appear in other models, for example in the SV-1 Systems Interface Description as organizational constituents of a capability or a resource and PV-1 Project Portfolio Relationships where organizations own projects. In a SV-1 Systems Interface Description, for instance, the organizational resources defined in a typical OV-4 may be part of a capability or resources. Also, actual organizations may form elements of a fielded capability which realizes the requirements at the system-level (again, this may be depicted on a SV-1 Systems Interface Description).

A OV-4 may show types of organizations and the typical structure of those organizations. The OV-4 may alternatively show actual, specific organizations (e.g., the DoD) at some point in time. Alternatively, an OV-4 may be a hybrid diagram showing typical and actual organization structures.

- OV-1: High-Level Operational Concept Graphic
- OV-2: Operational Resource Flow Description
- OV-3: Operational Resource Flow Matrix
- OV-4: Organizational Relationships Chart
- OV-5a: Operational Activity Decomposition Tree
- OV-5b: Operational Activity Model
- OV-6a, 6b, 6c: Introduction
- OV-6a: Operational Rules Model
- OV-6b: State Transition Description
- OV-6c: Event-Trace Description

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background
Architecture Development
Meta Model
Viewpoints & Models
All Viewpoint
Capability Viewpoint
Data and Information Viewpoint
Operational Viewpoint
Project Viewpoint
Services Viewpoint
Standards Viewpoint
Systems Viewpoint
Models
Presentation Techniques
Configuration Management Overview
Acronyms List and Glossary of Terms

Site Map
Archives

DoDAF Viewpoints and Models

Operational Viewpoint

OV-5a: Operational Activity Decomposition Tree and OV-5b: Operational Activity Model

The OV-5a and the OV-5b describe the operations that are normally conducted in the course of achieving a mission or a business goal. It describes operational activities (or tasks); Input/Output flows between activities, and to/from activities that are outside the scope of the Architectural Description.

The OV-5a and OV-5b describes the operational activities that are being conducted within the mission or scenario. The OV-5a and OV-5b can be used to:

- Clearly delineate lines of responsibility for activities when coupled with OV-2.
- Uncover unnecessary Operational Activity redundancy.
- Make decisions about streamlining, combining, or omitting activities.
- Define or flag issues, opportunities, or operational activities and their interactions (information flows among the activities) that need to be scrutinized further.
- Provide a necessary foundation for depicting activity sequencing and timing in the OV-6a Operational Rules Model, the OV-6b State Transition Description, and the OV-6c Event-Trace Description.

The OV-5b describes the operational, business, and defense portion of the intelligence community activities associated with the Architectural Description, as well as the:

- Relationships or dependencies among the activities.
- Resources exchanged between activities.
- External interchanges (from/to business activities that are outside the scope of the model).

An Operational Activity is what work is required, specified independently of how it is carried out. To maintain this independence from implementation, logical activities and locations in OV-2 Operational Resource Flow Description are used to represent the structure which carries out the Operational Activities. Operational Activities are realized as System Functions (described in SV-4 Systems Functionality Description) or Service Functions (described in SvcV-4 Services Functionality Description) which are the how to the Operational Activities what, i.e., they are specified in terms of the resources that carry them out.

The intended usage of the OV-5a and OV-5b includes:

- Description of activities and workflows.
- Requirements capture.
- Definition of roles and responsibilities.
- Support task analysis to determine training needs.
- Problem space definition.
- Operational planning.
- Logistic support analysis.
- Information flow analysis.

Detailed Description:

The OV-5s and OV-2 Operational Resource Flow Description model are, to a degree, complements of each other. The OV-5s focuses on the operational activities whereas OV-2 Operational Resource Flow Description model focuses on the operational activities in relation to locations. Due to the relationship between locations and operational activities, these types of models should normally be developed together. An OV-5a or OV-5b describes the operational activites (or tasks) that are normally conducted in the course of achieving a mission or a business goal. The OV-5b also describes Input/Output flows between activities, and to/from activities that are outside the scope of the Architectural Description. The OV-5a and OV-5b are equally suited to describing non-military activities and are expected to be used extensively for business modeling.

The activities described in an OV-5a or OV-5b are standard Operational Activities which are mapped to corresponding capabilities in the CV-6 Capability to Operational Activities Mapping. Standard Operational Activities are those defined in doctrine, but which are not tailored to a specific system, i.e., they are generic enough to be used without closing off a range of possible solutions.

Possible Construction Methods: DoDAF does not endorse a specific activity modeling methodology. The OV-5b can be constructed using Integration Definition for Function Modeling (IDEF0) or Class Diagrams.

There are two basic ways to depict Activity Models:

- The Activity Decomposition Tree shows activities depicted in a tree structure and is typically used to provide a navigation aid.
- The Activity Model shows activities connected by Resource Flows; it supports development of an OV-3 Operational Resource Flow Matrix.

The OV-5a helps provide an overall picture of the activities involved and a quick reference for navigating the OV-5b.

OV-1: High-Level Operational Concept Graphic

OV-2: Operational Resource Flow Description

OV-3: Operational Resource Flow Matrix

OV-4: Organizational Relationships Chart

OV-5a: Operational Activity Decomposition Tree

OV-5b: Operational Activity Model

OV-6a, 6b, 6c: Introduction

OV-6a: Operational Rules Model

OV-6b: State Transition Description

OV-6c: Event-Trace Description

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background
Architecture Development
Meta Model
Viewpoints & Models
- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques
Configuration Management Overview
Acronyms List and Glossary of Terms

Site Map
Archives

DoDAF Viewpoints and Models

Operational Viewpoint

OV-6a: Operational Rules Model

An OV-6a specifies operational or business rules that are constraints on the way that business is done in the enterprise. At a top-level, rules should at least embody the concepts of operations defined in OV-1 High Level Operational Concept Graphic and provide guidelines for the development and definition of more detailed rules and behavioral definitions that should occur later in the Architectural definition process.

The intended usage of the OV-6a includes:

- Definition of doctrinally correct operational procedures.
- Definition of business rules.
- Identification of operational constraints.

Detailed Description:

The OV-6a specifies operational or business rules that are constraints on the way business is done in the enterprise. While other OV Models (e.g., OV-1 High Level Operational Concept Graphic, OV-2 Operational Resource Flow Description, and OV-5b Operational Activity Model) describe the structure and operation of a business, for the most part they do not describe the constraints and rules under which it operates.

At the mission-level, OV-6a may be based on business rules contained in doctrine, guidance, rules of engagement, etc. At lower levels, OV-6a describes the rules under which the architecture behave under specified conditions. Such rules can be expressed in a textual form, for example, If (these conditions) exist, and (this event) occurs, then (perform these actions). These rules are contrasted with the business or doctrinal standards themselves, which provide authoritative references and provenance for the rules (see StdV-1 Standards Profile). Operational Rules are statements that constrain some aspect of the mission or the architecture. Rules may be expressed in natural language (English) in one of two forms:

- Imperative - a statement of what shall be under all conditions, e.g., "Battle Damage Assessment (BDA) shall only be carried out under fair weather conditions."
- Conditional Imperative - a statement of what shall be, in the event of another condition being met. If battle damage assessment shows incomplete strike, then a re-strike shall be carried out.

As the model name implies, the rules captured in OV-6a are operational (i.e., mission-oriented) whereas resource-oriented rules are defined in the SV-10s or the SvcV-10s (OV-6 is the *what* to the SV-10's or SvcV-10's *how*). OV-6a rules can include such guidance as the conditions under which operational control passes from one entity to another or the conditions under which a human role is authorized to proceed with a specific activity.

A rule defined in textual form OV-6a may be applied to any Architectural element defined in an OV. A rule defined in a more structured way (i.e., for the purposes of sharing with other architects) should be defined in association with locations, operational activities or missions.

Rules defined in an OV-6a may optionally be presented in any other OV. For example, a rule "battle damage assessment shall be carried out under fair weather conditions" may be linked to the Conduct BDA activity in OV-5b. Any natural language rule presented (e.g., in a diagram note) should also be listed in OV-6a.

OV-6a rules may be associated with activities in OV-5a Operational Activity Decomposition Tree and OV-5b Operational Activity Model and can be useful to overlay the rules on an OV-5a Operational Activity Decomposition or OV-5b Operational Activity Model. OV-6a can also be used to extend the capture of business requirements by constraining the structure and validity of DIV-2 Logical Data Model elements.

Detailed rules can become quite complex, and the structuring of the rules themselves can often be challenging. DoDAF does not specify how OV-6a rules will be specified, other than in English.

From a modeling perspective, operational constraints may act upon Locations, Operational Activities, Missions, and Entities in Logical Data Models.

- OV-1: High-Level Operational Concept Graphic
- OV-2: Operational Resource Flow Description
- OV-3: Operational Resource Flow Matrix
- OV-4: Organizational Relationships Chart
- OV-5a: Operational Activity Decomposition Tree
- OV-5b: Operational Activity Model
- OV-6a, 6b, 6c: Introduction
- OV-6a: Operational Rules Model
- OV-6b: State Transition Description
- OV-6c: Event-Trace Description

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Operational Viewpoint

OV-6b: State Transition Description.

The OV-6b is a graphical method of describing how an Operational Activity responds to various events by changing its state. The diagram represents the sets of events to which the Activities respond (by taking an action to move to a new state) as a function of its current state. Each transition specifies an event and an action.

An OV-6b can be used to describe the detailed sequencing of activities or work flow in the business process. The OV-6b is particularly useful for describing critical sequencing of behaviors and timing of operational activities that cannot be adequately described in the OV-5b Operational Activity Model. The OV-6b relates events and states. A change of state is called a transition. Actions may be associated with a given state or with the transition between states in response to stimuli (e.g., triggers and events).

The intended usage of the OV-6b includes:

- Analysis of business events.
- Behavioral analysis.
- Identification of constraints.

Detailed Description:

The OV-6b reflects the fact that the explicit sequencing of activities in response to external and internal events is not fully expressed in OV-5a Operational Activity Decomposition Tree or OV-5b Operational Activity Model. Alternatively, OV-6b can be used to reflect the explicit sequencing of actions internal to a single Operational Activity or the sequencing of operational activities. OV-6b is based on the statechart diagram. A state machine is defined as "a specification that describes all possible behaviors of some dynamic view element. Behavior is viewed as a traversal of a graph of state interconnected by one or more joined transition arcs that are triggered by the dispatching of a series of event instances. During this traversal, the state machine executes a series of actions associated with various elements of the state machine."

State chart diagrams can be unambiguously converted to structured textual rules that specify timing aspects of operational events and the responses to these events, with no loss of meaning. However, the graphical form of the state diagrams can often allow quick analysis of the completeness of the rule set, and detection of dead ends or missing conditions. These errors, if not detected early during the operational analysis phase, can often lead to serious behavioral errors in fielded systems or to expensive correction efforts.

States in an OV-6b may be nested. This enables quite complex models to be created to represent operational behavior.

OV-1: High-Level Operational Concept Graphic

OV-2: Operational Resource Flow Description

OV-3: Operational Resource Flow Matrix

OV-4: Organizational Relationships Chart

Go to top of page ↑

DoDAF Viewpoints and Models

Operational Viewpoint

OV-6c: Event-Trace Description

The OV-6c provides a time-ordered examination of the Resource Flows as a result of a particular scenario. Each event-trace diagram should have an accompanying description that defines the particular scenario or situation. Operational Event/Trace Descriptions, sometimes called sequence diagrams, event scenarios, or timing diagrams, allow the tracing of actions in a scenario or critical sequence of events. The OV-6c can be used by itself or in conjunction with an OV-6b State Transition Description to describe the dynamic behavior of activities.

The intended usage of the OV-6c includes:

- Analysis of operational events.
- Behavioral analysis.
- Identification of non-functional user requirements.
- Operational test scenarios.

Detailed Description:

The OV-6c is valuable for moving to the next level of detail from the initial operational concepts. An OV-6c model helps define interactions and operational threads. The OV-6c can also help ensure that each participating Operational Activity and Location has the necessary information it needs at the right time to perform its assigned Operational Activity.

The OV-6c enables the tracing of actions in a scenario or critical sequence of events. OV-6c can be used by itself or in conjunction with OV-6b State Transition Description to describe the dynamic behavior of business activities or a mission/operational thread. An operational thread is defined as a set of operational activities, with sequence and timing attributes of the activities, and includes the resources needed to accomplish the activities. A particular operational thread may be used to depict a military or business capability. In this manner, a capability is defined in terms of the attributes required to accomplish a given mission objective by modeling the set of activities and their attributes. The sequence of activities forms the basis for defining and understanding the many factors that impact on the overall capability.

The information content of messages in an OV-6c may be related with the Resource Flows in the OV-3 Operational Resource Flow Matrix and OV-5b Operational Activity Model and information entities in the DIV-2 Logical Data Model.

Possible Construction Methods: DoDAF does not endorse a specific event-trace modeling methodology. An OV-6c may be developed using any modeling notation (e.g., BPMN) that supports the layout of timing and sequence of activities along with the Resource Flow exchanges that occur between Operational Activities/Locations for a given scenario. Different scenarios can be depicted by separate diagrams.

OV-1: High-Level Operational Concept Graphic

OV-2: Operational Resource Flow Description

OV-3: Operational Resource Flow Matrix

OV-4: Organizational Relationships Chart

Go to top of page ↑

DoDAF Viewpoints and Models

Project Viewpoint

The DoDAF-described Models within the Project Viewpoint describe how programs, projects, portfolios, or initiatives deliver capabilities, the organizations contributing to them, and dependencies between them. Previous versions of DoDAF took a traditional model of architecture in which descriptions of programs and projects were considered outside scope. To compensate for this, various DoDAF models represented the evolution of systems, technologies and standards (e.g., Systems and Services Evolution Description, Systems Technology Forecast, and Technical Standards Forecast).

The integration of Project Models (organizational and project-oriented) with the more traditional architecture models is a characteristic aspect of DoDAF V2.0-based enterprise Architectural Descriptions. These models expand the usability of the DoDAF by including information about programs, projects, portfolios, or initiatives and relating that information to capabilities and other programs, projects, portfolios, or initiatives thus expanding DoDAF's support to the portfolio management (PfM) process. Different levels of cost data can be captured in the architecture, based on the Process-owners requirements. An example is a Work Breakdown Structure, depicted as a Gantt chart.

Project Model Descriptions

Model	Description
PV-1: Project Portfolio Relationships	It describes the dependency relationships between the organizations and projects and the organizational structures needed to manage a portfolio of projects.
PV-2: Project Timelines	A timeline perspective on programs or projects, with the key milestones and interdependencies.
PV-3: Project to Capability Mapping	A mapping of programs and projects to capabilities to show how the specific projects and program elements help to achieve a capability.

Mappings of the Project Viewpoint Viewpoint DoDAF-described Models to the DM2 Concepts, Associations, and Attributes are in **DM2 Concepts, Associations, and Attributes Mapping to DoDAF-described Models**. The DM2 Concepts, Associations, and Attributes are described in the DoDAF Meta-model Data Dictionary.

Uses of Project Viewpoint DoDAF-described Models. As stated above, the Project Viewpoint DoDAF-described Models contain information that improves DoDAF's support to the portfolio management process. It is important to be able to look across portfolios (i.e., groups of investments) to ensure that all possible alternatives for a particular decision have been exhausted to make the most informed decision possible in support of the Department. Relating project information to the responsible organizations, as well as to other projects, forms a valuable architecture construct that supports PfM.

Incorporation of these models also makes the DoDAF a value-added framework to support the PPBE process. These models are especially applicable to the Programming Phase of the PPBE process. It is within this phase that the Program Objective Memorandum (POM) is developed. The POM seeks to construct a balanced set of programs that respond to the guidance and priorities of the Joint Programming Guidance within fiscal constraints. When completed, the POM provides a fairly detailed and comprehensive description of the proposed programs, which can include a time-phased allocation of resources (personnel, funding, materiel, and information) by program projected into the future. The information captured within the Project models (e.g., project relationships, timelines, capabilities) can be used within the PPBE process to develop the POM. Using these models enables decision-makers to perform well-informed planning and complements the use of the Capability Models.

The Project Models can be used to answer questions such as:

- What capabilities are delivered as part of this project?
- Are there other projects that either affect or are affected by this project? To what portfolios do the projects or projects belong?
- What are the important milestones relative to this project? When can I expect capabilities to be rendered by this project to be in place?

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Project Viewpoint

PV-1: Project Portfolio Relationships

The PV-1 represents an organizational perspective on programs, projects, portfolios, or initiatives.

The PV-1 enables the user to model the organizational structures needed to manage programs, projects, portfolios, or initiatives. It shows dependency relationships between the actual organizations that own the programs, projects, portfolios, or initiatives. This model could be used to represent organizational relationships associated with transformation initiatives along with those who are responsible for managing programs, projects, and portfolios. The PV-1 provides a means of analyzing the main dependencies between acquisition elements or transformation elements.

The intended usage of the PV-1 includes, but is not limited to:

- Program management (specified acquisition program structure).
- Project organization.
- Cross-cutting initiatives to be tracked across portfolios.

Detailed Description:

The PV-1 describes how acquisition projects are grouped in organizational terms as a coherent portfolio of acquisition programs or projects, or initiatives related to several portfolios. The PV-1 provides a way of describing the organizational relationships between multiple acquisition projects or portfolios, each of which are responsible for delivering individual systems or capabilities. By definition, this model covers acquisition portfolios or programs consisting of multiple projects and is generally not for an individual project. In essence, PV-1 is an organizational breakdown consisting of actual organizations (see OV-4 Organizational Relationships Chart model). The model is strongly linked with the CV-4 Capability Dependencies model which shows capability groupings and dependencies.

The PV-1 is hierarchical in nature. Higher-level groupings of projects (the organizations that own these projects) form acquisition programs or initiatives.

The intent of a PV-1 is to show:

- All of the acquisition projects delivering services, systems, or SoS within the acquisition programs under consideration.
- Cross-cutting initiatives to be tracked across portfolios.
- Other services, systems, and SoS which may have a bearing on the architecture.
- How the services or systems will be best integrated into an acquisition program.
- The nesting of acquisition programs to form a hierarchy.

A PV-1 is specific to a particular point in the project lifecycle. This may change through time, i.e., the projects may change as new services, systems and capabilities are introduced into the acquisition program. Hence, it is possible that an acquisition program could have more than one PV-1, each showing how the acquisition projects are arranged for relevant periods of time. This is achieved by tying the PV-1 model to a capability phase in the CV-3 Capability Dependencies model.

PV-1: Project Portfolio Relationships

PV-2: Project Timelines

PV-3: Project to Capability Mapping

Go to top of page ↑

DoDAF Viewpoints and Models

Project Viewpoint

PV-2: Project Timelines

The PV-2 provides a timeline perspective on programs. The PV-2 is intended primarily to support the acquisition and fielding processes including the management of dependencies between projects and the integration of DoDD 5000.1 Defense Acquisition System policies to achieve a successfully integrated capability. The PV-2 is not limited to the acquisition and fielding processes.

The intended usage of the PV-2 includes:

- Project management and control (including delivery timescales).
- Project dependency risk identification.
- Management of dependencies.
- Portfolio management.

Detailed Description:

The PV-2 provides an overview of a program or portfolio of individual projects, or initiatives, based on a timeline. Portfolios, Programs, Projects, and Initiatives may be broken into work streams to show the dependencies at a lower-level. For capability-based procurement, these work streams might conveniently be equated with JCA. Sometimes, however, it is more appropriate to consider these acquisition projects in their own right.

Where appropriate, the PV-2 may also summarize, for each of the projects illustrated, the level of maturity achieved across the DoDD 5000.1 Defense Acquisition System policies at each stage of the DAS lifecycle, and the interdependencies between the project stages.

The PV-2 is intended primarily to support the acquisition and fielding processes including the management of dependencies between projects and the integration of DoDD 5000.1 Defense Acquisition System policies to achieve a successfully integrated capability. However, the PV-2 is not limited to the acquisition and fielding processes. The information provided by the Model can be used to determine the impact of either planned or unplanned programmatic changes, and highlight opportunities for optimization across the delivery program. The inclusion of the DoDD 5000.1 Defense Acquisition System policy information allows areas of concern that are outside the immediate scope being considered. Areas of concern identified across the DoDD 5000.1 Defense Acquisition System policies, e.g., a shortfall in training resource, can be coordinated across a program or group of projects, each of which require additional activity to be initiated for successfully delivery according to the project/program schedule.

Although a PV-2 may be compiled for a single system project, with supporting work streams, the model becomes particularly useful when considering the dependencies between the multiple projects (or increments within them) that contribute to an acquisition program. Such an acquisition program may be an oversight organization or any other useful grouping of projects that have strong dependencies or contribute towards a common goal (see CV-1 Vision model). Typical use of PV-2 is to represent an individual system development for use in the CV-3 Capability Phasing, while an Integrated Product Team (IPT) may be delivering several systems simultaneously. While PV-2 is expected to support acquisition management for a program consisting of a portfolio of acquisition projects, it may sometimes be convenient to use a PV-2 timeline model for other purposes, e.g., to show temporal relationships between transformation initiatives at the strategic-level or for technology roadmapping.

A PV-2 graphically displays the key milestones and interdependencies between the multiple projects that constitute a program, portfolio, or initiative. Use of PV-2 should support the management of capability delivery and be aligned with the CV-3 Capability Phasing model, if one exists. One presentational format for a PV-2 can be a Gantt chart that displays the entire lifecycle of each project, together with dependencies between them.

Optionally, the Gantt chart may be enhanced to show the level of maturity for each of the DOTMLPF factors associated with that project at each key milestone. The colored icon can be a segmented circular pie chart, a regular polyhedron or any appropriate graphic, providing that the graphic is explained and covers all DAS requirements.

PV-1: Project Portfolio Relationships

PV-2: Project Timelines

PV-3: Project to Capability Mapping

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

DoDAF Viewpoints and Models

Project Viewpoint

PV-3: Project to Capability Mapping

The PV-3 supports the acquisition and deployment processes, including the management of dependencies between projects and the integration of all relevant project and program elements to achieve a capability.

The PV-3 maps programs, projects, portfolios, or initiatives to capabilities to show how the specific elements help to achieve a capability. Programs, projects, portfolios, or initiatives are mapped to the capability for a particular timeframe. Programs, projects, portfolios, or initiatives may contribute to multiple capabilities and may mature across time. The analysis can be used to identify capability redundancies and shortfalls, highlight phasing issues, expose organizational or system interoperability problems, and support program decisions, such as when to phase out a legacy system.

The intended usage of the PV-3 includes:

- Tracing capability requirements to projects.
- Capability audit.

Detailed Description:

The PV-3 describes the mapping between capabilities and the programs, projects, portfolios, or initiatives that would support the capabilities. This model may be used to indicate that a project does or does not fulfill the requirements for a capability for a particular phase.

This model is analogous to the SV-5a Operational Activity to System Function Traceability Matrix, but provides the interface between Capability and Project Models rather than Operational to System Models.

In principle, there could be a different PV-3 table created for each development phase of the program, project, portfolio, or initiative development, or perhaps for different phasing scenarios. In most cases, a single table can be constructed because the programs, projects, portfolios, or initiatives that are most likely relevant to this model can be relatively high-level. If capabilities associated are generic (see CV-1 Vision model), then they should have a well understood relationship with a set of programs, projects, portfolios, or initiatives and this relationship is unlikely to change over time.

The PV-3 can have a tabular presentation. The rows can be the Capabilities and the columns can be the programs, projects, portfolios, or initiatives. An X can indicate where the capability is supported by the programs, projects, portfolios, or initiatives whereas a blank can indicate that it does not. Alternatively, a date or phase can indicate when programs, projects, portfolios, or initiatives will support capabilities by the date or phase indicated.

PV-1: Project Portfolio Relationships

PV-2: Project Timelines

PV-3: Project to Capability Mapping

Go to top of page ↑

DoDAF Viewpoints and Models

Services Viewpoint

The DoDAF-described Models within the Services Viewpoint describes services and their interconnections providing or supporting, DoD functions. DoD functions include both warfighting and business functions. The Service Models associate service resources to the operational and capability requirements. These resources support the operational activities and facilitate the exchange of information. The relationship between architectural data elements across the Services Viewpoint to the Operational Viewpoint and Capability Viewpoint can be exemplified as services are procured and fielded to support the operations and capabilities of organizations. The structural and behavioral models in the OVs and SvcVs allow architects and stakeholders to quickly ascertain which functions are carried out by humans and which by Services for each alternative specification and so carry out trade analysis based on risk, cost, reliability, etc.

Services are not limited to internal system functions and can include Human Computer Interface (HCI) and Graphical User Interface (GUI) functions or functions that consume or produce service data to or from service functions. The external service data providers and consumers can be used to represent the human that interacts with the service.

Service Model Descriptions

Model	Description
SvcV-1 Services Context Description	The identification of services, service items, and their interconnections.
SvcV-2 Services Resource Flow Description	A description of Resource Flows exchanged between services.
SvcV-3a Systems-Services Matrix	The relationships among or between systems and services in a given Architectural Description.
SvcV-3b Services-Services Matrix	The relationships among services in a given Architectural Description. It can be designed to show relationships of interest, (e.g., service-type interfaces, planned vs. existing interfaces).
SvcV-4 Services Functionality Description	The functions performed by services and the service data flows among service functions (activities).
SvcV-5 Operational Activity to Services Traceability Matrix	A mapping of services (activities) back to operational activities (activities).
SvcV-6 Services Resource Flow Matrix	It provides details of service Resource Flow elements being exchanged between services and the attributes of that exchange.
SvcV-7 Services Measures Matrix	The measures (metrics) of Services Model elements for the appropriate timeframe(s).
SvcV-8 Services Evolution Description	The planned incremental steps toward migrating a

	suite of services to a more efficient suite or toward evolving current services to a future implementation.
SvcV-9 Services Technology & Skills Forecast	The emerging technologies, software/hardware products, and skills that are expected to be available in a given set of time frames and that will affect future service development.
SvcV-10a Services Rules Model	One of three models used to describe service functionality. It identifies constraints that are imposed on systems functionality due to some aspect of system design or implementation.
SvcV-10b Services State Transition Description	One of three models used to describe service functionality. It identifies responses of services to events.
SvcV-10c Services Event-Trace Description	One of three models used to describe service functionality. It identifies service-specific refinements of critical sequences of events described in the Operational Viewpoint.

Mappings of the Services Viewpoint DoDAF-described Models to the DM2 Concepts, Associations, and Attributes are in **DM2 Concepts, Associations, and Attributes Mapping to DoDAF-described Models**. The DM2 Concepts, Associations, and Attributes are described in the DoDAF Meta-model Data Dictionary.

Uses of Services Viewpoint DoDAF-described Models. Within the development process, the service models describe the design for service-based solutions to support operational requirements from the development processes (JCIDS) and Defense Acquisition System or capability development within the JCAs.

Some of the Services Viewpoint DoDAF-described Models are discussed with examples in the DoDAF Product Development Questionnaire Analysis Report.doc. This document can be viewed online in the public DoDAF Journal.

Go to top of page ↑

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-1: Services Interface Description

The SvcV-1 addresses the composition and interaction of Services. For DoDAF V2.0, SvcV-1 incorporates human elements as types of Performers - Organizations and Personnel Types.

The SvcV-1 links together the operational and services architecture models by depicting how resources are structured and interact to realize the logical architecture specified in an OV-2 Operational Resource Flow Description. A SvcV-1 may represent the realization of a requirement specified in an OV-2 Operational Resource Flow Description (i.e., in a "To-Be" Architectural Description), and so there may be many alternative SvcV models that could realize the operational requirement. Alternatively, in an "As-Is" Architectural Description, the OV-2 Operational Resource Flow Description may simply be a simplified, logical representation of the SvcV-1 to allow communication of key Resource Flows to non-technical stakeholders.

It is important for the architect to recognize that the SvcV-1 focuses on the Resource Flow and the providing service. This differs from a SV-1 System Interface Description which focuses on the System-to-System point-to-point interface, for which the Source System and Target System have an agreed upon interface. For the SvcV-1, the focus on the provider and the data provided is a Net-Centric Data Strategy tenet appropriate for a publish/subscribe pattern. This pattern is not the only type of service that can be captured in the SvcV-1.

Sub-services may be identified in SvcV-1 to any level (i.e., depth) of decomposition the architect sees fit. The SvcV-1 may also identify the Physical Assets (e.g., Platforms) at which Resources are deployed, and optionally overlay Operational Activities and Locations that utilize those Resources. In many cases, an operational activity and locations depicted in an OV-2 Operational Resource Flow Description may well be the logical representation of the resource that is shown in SvcV-1.

The intended usage of the SvcV-1 includes:

- Definition of service concepts.
- Definition of service options.
- Service Resource Flow requirements capture.
- Capability integration planning.
- Service integration management.
- Operational planning (capability and performer definition).

The SvcV-1 is used in two complementary ways:

- Describe the Resource Flows exchanged between resources in the architecture.
- Describe a solution, or solution option, in terms of the components of capability and their physical integration on platforms and other facilities.

Detailed Description:

A SvcV-1 can be used simply to depict services and sub-services and identify the Resource Flows between them. The real benefit of a SvcV-1 is its ability to describe the human aspects of an architecture and how they interact with Services. In addition, DoDAF has the concept of Capability and Performers (see the Capability Meta-model group in the LDM) which is used to depict Services, assets and people into a configuration, which can meet a specific capability. A primary purpose of a SvcV-1 model is to show resource structure, i.e., identify the primary sub-services, performer and activities (functions) and their interactions. SvcV-1 contributes to user understanding of the structural characteristics of the solution.

The physical resources contributing to a capability are either an organizational resource or a physical asset, i.e., a service cannot contribute alone (it must be hosted on a physical asset used by an organizational resource of both). Organizational aspects can now be shown on SvcV-1 (e.g., who uses a service). Resource structures may be identified in SvcV-1 to any level (i.e., depth) of decomposition the architect sees fit. DoDAF does not specifically use terms like sub-service and component as these terms often denote a position relative to a structural hierarchy. Any service may combine hardware and software or these can be treated as separate (sub) services. DoDAF V2.0 includes human factors (as Personnel Types and a type of Performer). Should an architect wish to describe a service which has human elements, then groupings of Services, Personnel Types and Performers should be used to wrap the human and service elements together.

A SvcV-1 can optionally be annotated with Operational Activities and Locations originally specified in OV-2 Operational Resource Flow Description. In this way, traceability can be established from the logical OV structure to the physical Service Model structure.

If a single SvcV-1 is not possible, the resource of interest should be decomposed into multiple SvcV-1 models.

Functions (Activities):

Some Resources can carry out service functions (activities) as described in SvcV-4 Services Functionality Description models and these functions can optionally be overlaid on a SvcV-1. In a sense SvcV-1 and SvcV-4 Services Functionality Description provide complementary representations (structure and function). Either could be viewed first, but usually an iterative approach is used to model these together gradually building up the level of detail in the service description. Note that the same type (class) of resource may be used in different contexts in a given SvcV-1. For this reason, the tracing of functions to resources is specified in context of their usage (see DM2 for details).

Resource Flows in SvcV-1:

In addition to depicting Services (Performers) and their structure, SvcV-1 addresses Service Resource Flows. A Service Resource Flow, as depicted in SvcV-1, is an indicator that resources pass between one service and the other. In the case of Services, this can be expanded into further detail in SvcV-2 Services Resource Flow Description model. A Service Resource Flow is a simplified representation of a pathway or network pattern, usually depicted graphically as a connector (i.e., a line with possible amplifying information). The SvcV-1 depicts all Resource Flows between resources that are of interest. Note that Resource Flows between resources may be further specified in detail in the SvcV-2 Services Resource Flow Description model and the SvcV-6 Services Resource Flow Matrix.

Interactions are only possible between services and systems. Service Resource Flows provide a specification for how the Resource Flow exchanges specified in OV-2 Operational Resource Flow Description Needlines are realized with services. A single Needline shown in the OV-2 Operational Resource Flow Description may translate into multiple Service Resource Flows. The actual implementation of Service Resource Flows may take more than one form (e.g., multiple physical links). Details of the physical pathways or network patterns that implement the interfaces are documented in SvcV-2 Services Resource Flow Description. Resource Flows are summarized in a SvcV-3a System-Service Matrix or SvcV-3b Service-Service Matrix and detailed definitions and attributes specific to each Service Resource Flows may be described in SvcV-6 Services Resource Flow Matrix.

The functions performed by the resources are specified in a SvcV-4 Service Functionality Description, but may optionally be overlaid on the Resources in a SvcV-1.

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-2: Services Resource Flow Description

A SvcV-2 specifies the Resource Flows between Services and may also list the protocol stacks used in connections.

A SvcV-2 DoDAF-described Model is used to give a precise specification of a connection between Services. This may be an existing connection or a specification of a connection that is to be made for a future connection.

The intended usage of the SvcV-2 includes:

- Resource Flow specification.

Detailed Description:

For a network data service, a SvcV-2 comprises Services, their ports, and the Service Resource Flows between those ports. The SvcV-2 may also be used to describe non-IT type services such as Search and Rescue. The architect may choose to create a diagram for each Service Resource Flow and the producing Service, each Service Resource Flow and consuming Service, or to show all the Service Resource Flows on one diagram, if this is possible.

Each SvcV-2 model can show:

- Which ports are connected.
- The producing Services that the ports belong to.
- The Services that the Service Resource Flows are consumed by.
- The definition of the Service Resource Flow in terms of the physical/logical connectivity and any protocols that are used in the connection.

Note that networks are represented as Services. The architect may choose to show other Services being components of the network, i.e., if they are part of the network infrastructure.

Any protocol referred to in a SvcV-2 diagram needs be defined in the StdV-1 Standards Profile.

Go to top of page ↑

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-3a: Systems-Services Matrix

A SvcV-3a enables a quick overview of all the system-to-service resource interactions specified in one or more SvcV-1 Services Context Description models. The SvcV-3a provides a tabular summary of the system and services interactions specified in the SvcV-1 Services Context Description for the Architectural Description. This model can be useful in support existing systems that are transitioning to provide services. The matrix format supports a rapid assessment of potential commonalities and redundancies (or, if fault-tolerance is desired, the lack of redundancies).

The SvcV-3a can be organized in a number of ways to emphasize the association of system-to-service interactions in context with the architecture's purpose.

The intended usage of the SvcV-3a includes:

- Summarizing system and service resource interactions.
- Interface management.
- Comparing interoperability characteristics of solution options.

Detailed Description:

The SvcV-1 concentrates on Service resources and their interactions, and these are summarized in a SvcV-3a or SvcV-3b. The SvcV-3a DoDAF-described Model can be a useful tool for managing the evolution of solutions and infrastructures, the insertion of new technologies and functionality, and the redistribution of Systems and Services and activities in context with evolving operational requirements.

Depending upon the purpose of the architecture, there could be several SvcV-3a DoDAF-described Models. The suite of SvcV-3a models can be organized in a number of ways (e.g., by domain, by operational mission phase, by solution option) to emphasize the association of groups of resource pairs in context with the Architectural Description's purpose.

The SvcV-3a is generally presented as a matrix, where the System and Services resources are listed in the rows and columns of the matrix, and each cell indicates an interaction between Systems and Services if one exists. Many types of interaction information can be presented in the cells of a SvcV-3a. The resource interactions can be represented using different symbols and/or color coding that depicts different interaction characteristics, for example:

- Status (e.g., existing, planned, potential, de-activated).
- Key interfaces.
- Category (e.g., command and control, intelligence, personnel, logistics).
- Classification-level (e.g., Restricted, Confidential, Secret, Top Secret).
- Communication means (e.g., Rim Loop Interface, Scalable Loop Interface).

DoDAF does not specify the symbols to be used. If symbols are used, a key for the symbols is needed.

SvcV-1 Services Context Description

SvcV-2 Services Resource Flow Description

SvcV-3a Systems-Services Matrix

SvcV-3b Services-Services Matrix

SvcV-4 Services Functionality Description

SvcV-5 Operational Activity to Services Traceability Matrix

SvcV-6 Services Resource Flow Matrix

SvcV-7 Services Measures Matrix

SvcV-8 Services Evolution Description

SvcV-9 Services Technology & Skills Forecast

SvcV-10abc Introduction to SvcV-10a, SvcV-10b and SvcV-10c

SvcV-10a Services Rules Model

SvcV-10b Services State Transition Description

SvcV-10c Services Event-Trace Description

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-3b: Services-Services Matrix

A SvcV-3b enables a quick overview of all the services resource interactions specified in one or more SvcV-1 Services Context Description models. The SvcV-3b provides a tabular summary of the services interactions specified in the SvcV-1 Services Context Description for the Architectural Description. The matrix format supports a rapid assessment of potential commonalities and redundancies (or, if fault-tolerance is desired, the lack of redundancies). In addition, this model is useful in support of net-centric (service-oriented) implementation of services as an input to the SvcV-10a Services Rules Model, SvcV-10b Services State Transition Description, and SvcV-10c Services Event-Trace Description, implemented as orchestrations of services.

The SvcV-3b can be organized in a number of ways to emphasize the association of service pairs in context with the architecture's purpose. One type of organization is a Service Hierarchy or Taxonomy of Services.

The intended usage of the SvcV-3b includes:

- Summarizing service resource interactions.
- Interface management.
- Comparing interoperability characteristics of solution options.

It is important to note that one usage of the Service-Service Matrix (SvcV-3b) can support a net- centric (service-oriented) implementation in describing the interactions between producing services and consuming services.

Detailed Description:

The SvcV-1 concentrates on Service resources and their interactions, and these are summarized in a SvcV-3a or SvcV-3b. The SvcV-3b can be a useful tool for managing the evolution of solutions and infrastructures, the insertion of new technologies and functionality, and the redistribution of Services and activities in context with evolving operational requirements.

Depending upon the purpose of the architecture, there could be several SvcV-3b DoDAF-described Models. The suite of SvcV-3b DoDAF-described Models can be organized in a number of ways (e.g., by domain, by operational mission phase, by solution option) to emphasize the association of groups of resource pairs in context with the Architectural Description purpose.

The SvcV-3b is generally presented as a matrix, where the Services resources are listed in the rows and columns of the matrix, and each cell indicates an interaction between Services if one exists. There are many types of information that can be presented in the cells of a SvcV-3b. The resource interactions can be represented using different symbols and/or color coding that depicts different interaction characteristics, for example:

- Status (e.g., existing, planned, potential, de-activated).
- Key interfaces.
- Category (e.g., command and control, intelligence, personnel, logistics).
- Classification-level (e.g., Restricted, Confidential, Secret, Top Secret).

- Communication means (e.g., Rim Loop Interface, Scalable Loop Interface).

DoDAF does not specify the symbols to be used. If symbols are used, a key for the symbols is needed.

SvcV-1 Services Context Description

SvcV-2 Services Resource Flow Description

SvcV-3a Systems-Services Matrix

SvcV-3b Services-Services Matrix

SvcV-4 Services Functionality Description

SvcV-5 Operational Activity to Services Traceability Matrix

SvcV-6 Services Resource Flow Matrix

SvcV-7 Services Measures Matrix

SvcV-8 Services Evolution Description

SvcV-9 Services Technology & Skills Forecast

SvcV-10abc Introduction to SvcV-10a, SvcV-10b and SvcV-10c

SvcV-10a Services Rules Model

SvcV-10b Services State Transition Description

SvcV-10c Services Event-Trace Description

Go to top of page ↑

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-4: Services Functionality Description

The SvcV-4 DoDAF-described Model addresses human and service functionality.

The primary purpose of SvcV-4 is to:

- Develop a clear description of the necessary data flows that are input (consumed) by and output (produced) by each resource.
- Ensure that the service functional connectivity is complete (i.e., that a resource's required inputs are all satisfied).
- Ensure that the functional decomposition reaches an appropriate level of detail.

The Services Functionality Description provides detailed information regarding the:

- Allocation of service functions to resources.
- Flow of resources between service functions.

The SvcV-4 is the Services Viewpoint counterpart to the OV-5b Operational Activity Model of the Operational Viewpoint.

The intended usage of the SvcV-4 includes:

- Description of task workflow.
- Identification of functional service requirements.
- Functional decomposition of Services.
- Relate human and service functions.

It is important to note that one usage of the SvcV-4 can support a net-centric (service-oriented) implementation in describing the producing services and consuming services. The Services Functionality Description information can support the registration of services in net-centric (service-oriented) implementation.

Detailed Description:

The SvcV-4 is used to specify the service functionality of resources in the architecture. The SvcV-4 is the behavioral counterpart to the SvcV-1 Services Context Description (in the same way that OV-5b Operational Activity Model is the behavioral counterpart to OV-2 Operational Resource Flow Description).

The scope of this model may be capability wide, without regard to which resources perform which service functions, or it may be resource-specific. Variations may focus on intra- or inter-resource data flows, or may simply allocate service functions to resources.

There are two basic ways to depict a SvcV-4:

- The Taxonomic Service Functional Hierarchy shows a decomposition of service functions depicted in a tree structure and is typically used where tasks are concurrent but dependent, such as a production line, for example.
- The Data Flow Diagram shows service functions connected by data flow arrows and data stores.

Within an Architectural Description, the SvcV-4 document service functions, the Resource Flows between those service functions, the internal system data repositories or service data stores, and the external sources and sinks for the service data flows, but not external to the Architectural Description's scope. They may also show how users behave in relation to those services.

- SvcV-1 Services Context Description
- SvcV-2 Services Resource Flow Description
- SvcV-3a Systems-Services Matrix
- SvcV-3b Services-Services Matrix
- SvcV-4 Services Functionality Description
- SvcV-5 Operational Activity to Services Traceability Matrix
- SvcV-6 Services Resource Flow Matrix
- SvcV-7 Services Measures Matrix
- SvcV-8 Services Evolution Description
- SvcV-9 Services Technology & Skills Forecast
- SvcV-10abc Introduction to SvcV-10a, SvcV-10b and SvcV-10c
- SvcV-10a Services Rules Model
- SvcV-10b Services State Transition Description
- SvcV-10c Services Event-Trace Description

Go to top of page ↑

Background
Architecture Development
Meta Model
Viewpoints & Models
All Viewpoint
Capability Viewpoint
Data and Information Viewpoint
Operational Viewpoint
Project Viewpoint
Services Viewpoint
Standards Viewpoint
Systems Viewpoint
Models
Presentation Techniques
Configuration Management Overview
Acronyms List and Glossary of Terms
Site Map
Archives

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-5: Operational Activity to Services Traceability Matrix

The SvcV-5 addresses the linkage between service functions described in SvcV-4 and Operational Activities specified in OV-5a Operational Activity Decomposition Tree or OV-5b Operational Activity Model. The SvcV-5 depicts the mapping of service functions (and, optionally, the capabilities and performers that provide them) to operational activities and thus identifies the transformation of an operational need into a purposeful action performed by a service solution.

During requirements definition, the SvcV-5 plays a particularly important role in tracing the architectural elements associated with system function requirements to those associated with user requirements.

The intended usage of the SvcV-5 includes:

- Tracing service functional requirements to user requirements.
- Tracing solution options to requirements.
- Identification of overlaps or gaps.

Detailed Description:

An SvcV-5 is a specification of the relationships between the set of operational activities applicable to an Architectural Description and the set of service functions applicable to that Architectural Description. The relationship between operational activities and service functions can also be expected to be many-to-many (i.e., one activity may be supported by multiple functions, and one function may support multiple activities). The service functions shown in the SvcV-5 may be those associated with capabilities and performers. More focused SvcV-5 models might be used to specifically trace system functions to operational activities if desired.

DoDAF uses the term Operational Activity in the OVs and the term Service Function in the SVs to refer to essentially the same kind of thing-both activities and service functions are tasks that are performed, accept inputs, and develop outputs. The distinction between an Operational Activity and a Service Function is a question of what and how. The Operational Activity is a specification of what is to be done, regardless of the mechanism used. A Service Function specifies how a resource carries it out. For this reason, the SvcV-5 is a significant model, as it ties together the logical specification in the OV-5a Operational Activity Decomposition Tree or OV-5b Operational Activity Model with the physical specification of the SvcV-4 Services Functionality Description. Service Functions can be carried out by Resources.

Care should be taken when publishing a SvcV-5 with status information. Any presentation should clearly state the date of publication, so that users can see when status information is old.

The SvcV-5 may be further annotated with Services, Capabilities, Performers executing Activities, and capabilities and performers that conduct the functions.

The SvcV-5 is generally presented as a matrix of the relationship between service functions and activities. The SvcV-5 can show requirements traceability with Operational Activities on one axis of a matrix, the System Functions on the other axis, and with an X, date, or phase in the intersecting cells, where appropriate.

An alternate version of the tabular SvcV-5 can allow the implementation status of each function to be shown. In this variant model, each service function-to-operational activity mapping is described by a traffic light symbol that may indicate the status of the service support. DoDAF V2.0 does not prescribe a presentation technique. These symbols are usually colored circles with the following possible representations:

- Red may indicate that the functionality is planned but not developed.
- Yellow may indicate that partial functionality has been provided (or full functionality provided but system has not been fielded).
- Green may indicate that full functionality has been provided to the field.
- A blank cell may indicate that there is no service support planned for an Operational Activity, or that a relationship does not exist between the Operational Activity and the Service Function.

SvcV-1 Services Context Description

SvcV-2 Services Resource Flow Description

SvcV-3a Systems-Services Matrix

SvcV-3b Services-Services Matrix

SvcV-4 Services Functionality Description

SvcV-5 Operational Activity to Services Traceability Matrix

SvcV-6 Services Resource Flow Matrix

SvcV-7 Services Measures Matrix

SvcV-8 Services Evolution Description

SvcV-9 Services Technology & Skills Forecast

SvcV-10abc Introduction to SvcV-10a, SvcV-10b and SvcV-10c

SvcV-10a Services Rules Model

SvcV-10b Services State Transition Description

SvcV-10c Services Event-Trace Description

Go to top of page ↑

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-6: Services Resource Flow Matrix

The SvcV-6 specifies the characteristics of the Service Resource Flows exchanged between Services. The focus is on resource crossing the service boundary. The SvcV-6 focuses on the specific aspects of the Service Resource Flow and the Service Resource Flow content in a tabular format.

In addition, this model is useful in support of net-centric (service-oriented) implementation of services. According to the Net-Centric Data Strategy, a net-centric implementation needs to focus in on the data in the Service Resource Flow, as well as the services that produce or consume the data of the Service Resource Flow. In a net-centric implementation, not all the consumers are known and this model emphasizes the focus on the producer and Service Resource Flow.

The intended usage of the SvcV-6 includes:

. Detailed definition of Resource Flows.

Detailed Description:

The SvcV-6 specifies the characteristics of Service Resource Flow exchanges between Services. The SvcV- is the physical equivalent of the logical OV-3 Operational Resource Flow Matrix and provides detailed information on the service connections which implement the Resource Flow exchanges specified in OV-3 Operational Resource Flow Matrix. Resource flow exchange solutions, whether automated or not, e.g., such as verbal orders, are also captured.

Service Resource Flow exchanges express the relationship across the three basic architectural data elements of a SvcV (Services, service functions, and Service Resource Flows) and focus on the specific aspects of the Service Resource Flow and the service resource content. These aspects of the service Resource Flow exchange can be crucial to the operational mission and are critical to understanding the potential for overhead and constraints introduced by the physical aspects of the implementation such as security policy and communications and logistics limitations.

The focus of SvcV-6 is on how the Service Resource Flow exchange is affected, in service-specific details covering periodicity, timeliness, throughput, size, information assurance, and security characteristics of the resource exchange. In addition, for Service Resource Flow of data, their format and media type, accuracy, units of measurement, applicable system data standards, and any DIV-3 Physical Data Models are also described or referenced in the matrix.

Modeling discipline is needed to ensure that the architecture models are coherent. Each Service Resource Flow exchange listed in the SvcV-6 table should be traceable to at least one Operational Resource Flow exchanged listed in the corresponding OV-3 Operational Resource Flow Matrix and these in turn trace to OV-2 Operational Resource Flow Description.

It should be noted that each resource exchanged may relate to a known service function (from SvcV-4) that produces or consumes it. However, there need not be a one-to-one correlation between data elements listed in the SvcV-6 matrix and the Resource Flows (inputs and outputs) that are produced or consumed in a related SvcV-4 because the SvcV-4 is more a logical solution, whereas the SvcV-6 is a more physical solution. In addition, Resource flows between known service functions performed by the same Services may not be shown in the SvcV-6 matrix. The SvcV-6 is about showing flows across service boundaries or a service boundary. If the Resource Flow is information, it may need to be reflected in the Data and Information Models.

The SvcV-7 Services Measures Matrix builds on the SvcV-6 and should be developed at the same time.

DoDAF does not prescribe the column headings in a SvcV-6 Matrix. Identifiers of the operational Resource Flow exchanges (OV-3) that are implemented by the Service Resource Flow Exchanges may be included in the table. All elements carried by the Resource Flow exchanges may be shown.

SvcV-1 Services Context Description

SvcV-2 Services Resource Flow Description

SvcV-3a Systems-Services Matrix

SvcV-3b Services-Services Matrix

SvcV-4 Services Functionality Description

SvcV-5 Operational Activity to Services Traceability Matrix

SvcV-6 Services Resource Flow Matrix

SvcV-7 Services Measures Matrix

SvcV-8 Services Evolution Description

SvcV-9 Services Technology & Skills Forecast

SvcV-10abc Introduction to SvcV-10a, SvcV-10b and SvcV-10c

SvcV-10a Services Rules Model

SvcV-10b Services State Transition Description

SvcV-10c Services Event-Trace Description

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-7: Services Measures Matrix

The SvcV-7 depicts the measures (metrics) of resources. The Services Measures Matrix expands on the information presented in a SvcV-1 Services Context Description by depicting the characteristics of the resources in the SvcV-1 Services Context Description.

In addition, this model is useful in support of net-centric (service-oriented) implementation of services. Service measures for Service Level Agreements for each service and may include number of service consumers, service usage by consumers, and the minimum, average and maximum response times, allowed down time, etc. Measures of interest for a Chief Information Office or Program manager may include measures that assess service reuse, process efficiency, and business agility.

The intended usage of the SvcV-7 includes:

- Definition of performance characteristics and measures (metrics).
- Identification of non-functional requirements.

Detailed Description:

The SvcV-7 specifies qualitative and quantitative measures (metrics) of resources. It specifies all of the measures. The measures are selected by the end user community and described by the architect.

Performance parameters include all performance characteristics for which requirements can be developed and specifications defined. The complete set of performance parameters may not be known at the early stages of Architectural Description, so it is to be expected that this model is updated throughout the specification, design, development, testing, and possibly even its deployment and operations lifecycle phases. The performance characteristics are captured in the Measures Meta-model group.

One of the primary purposes of SvcV-7 is to communicate which measures are considered most crucial for the successful achievement of the mission goals assigned. These particular measures can often be the deciding factors in acquisition and deployment decisions, and figure strongly in services analysis and simulations done to support the acquisition decision processes and system design refinement and be input or may impact decisions about Service Level Agreement content. Measures of Effectiveness (MOEs) and Measures of Performers (MOPs) are measures that can be captured and presented in the Services Measures Matrix model.

SvcV-7 is typically a table, listing user defined measures (metrics) with a time period association. It is sometimes useful to analyze evolution by comparing measures (metrics) for current and future resources. For this reason, a hybrid SvcV-7 Model which spans architectures across multiple phases may be useful.

SvcV-1 Services Context Description

SvcV-2 Services Resource Flow Description

SvcV-3a Systems-Services Matrix

Go to top of page ↑

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-8: Services Evolution Description

The SvcV-8 presents a whole lifecycle view of resources (services), describing how it changes over time. It shows the structure of several resources mapped against a timeline.

In addition, this model is useful in support of net-centric (service-oriented) implementation of services. This model can present a timeline of services evolve or are replaced over time, including services that are internal and external to the scope of the architecture.

The intended usage of the SvcV-8 includes:

- Development of incremental acquisition strategy.
- Planning technology insertion.

Detailed Description:

The SvcV-8, when linked together with other evolution Models such as CV-2 Capability Taxonomy, CV-3 Capability Phasing and StdV-2 Standards Forecast, provides a rich definition of how the Enterprise and its capabilities are expected to evolve over time. In this manner, the model can be used to support an architecture evolution project plan or transition plan.

A SvcV-8 can describe historical (legacy), current, and future capabilities against a timeline. The model shows the structure of each resource, using similar modeling elements as those used in SvcV-1. Interactions which take place within the resource may also be shown.

The changes depicted in the SvcV-8 DoDAF-described Model are derived from the project milestones that are shown in a PV-2 Project Timelines model. When the PV-2 Project Timelines model is used for capability acquisition projects, there is likely to be a close relationship between these two models.

SvcV-1 Services Context Description
SvcV-2 Services Resource Flow Description
SvcV-3a Systems-Services Matrix
SvcV-3b Services-Services Matrix
SvcV-4 Services Functionality Description
SvcV-5 Operational Activity to Services Traceability Matrix
SvcV-6 Services Resource Flow Matrix
SvcV-7 Services Measures Matrix
SvcV-8 Services Evolution Description
SvcV-9 Services Technology & Skills Forecast
SvcV-10abc Introduction to SvcV-10a, SvcV-10b and SvcV-10c
SvcV-10a Services Rules Model
SvcV-10b Services State Transition Description

SvcV-10c Services Event-Trace Description

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background
Architecture Development
Meta Model
Viewpoints & Models
- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques
Configuration Management Overview
Acronyms List and Glossary of Terms

Site Map
Archives

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-9: Services Technology and Skills Forecast

The SvcV-9 defines the underlying current and expected supporting technologies and skills. Expected supporting technologies and skills are those that can be reasonably forecast given the current state of technology and skills, and expected improvements or trends. New technologies and skills are tied to specific time periods, which can correlate against the time periods used in SvcV-8 Services Evolution Description model milestones and linked to Capability Phases.

The SvcV-9 provides a summary of emerging technologies and skills that impact the architecture. The SvcV-9 provides descriptions of relevant:

- Emerging capabilities.
- Industry trends.
- Predictions (with associated confidence factors) of the availability and readiness of specific hardware and software services.
- Current and possible future skills.

In addition to providing an inventory of trends, capabilities and services, the SvcV-9 also includes an assessment of the potential impact of these items on the architecture. Given the future-oriented nature of this model, forecasts are typically made in short, mid and long-term timeframes, such as 6, 12 and 18-month intervals.

In addition, this model is useful in support of net-centric (service-oriented) implementation of services. As technologies change, like incorporation of Representational State Transfer (REST) services in the Web Services Description Language, this model can present a timeline of technologies related services over time.

The intended usage of the SvcV-9 includes:

- Forecasting technology readiness against time.
- HR Trends Analysis.
- Recruitment Planning.
- Planning technology insertion.
- Input to options analysis.

The SvcV-9 can be presented in a table, timeline, or a Herringbone diagram.

Detailed Description:

A SvcV-9 summarizes predictions about trends in technology and personnel. Architects may produce separate SvcV-9 products for technology and human resources. The specific time periods selected (and the trends being tracked) can be coordinated with architecture transition plans (which the SvcV-8 Services Evolution Description can support). That is, insertion of new capabilities and upgrading or re-training of existing resources may depend on or be driven by the availability of new technology and associated skills. The forecast includes potential impacts on current architectures and thus influences the development of transition and target architectures. The forecast is focused on technology and human resource areas that are related to the purpose for which a given architecture is being described and identifies issues affecting that architecture.

If standards are an integral part of the technologies important to the evolution of a given architecture, then it may be convenient to combine SvcV-9 with the StdV-2 Standards Forecast into a composite Fit-for-Purpose View.

The SvcV-9 is constructed as part of a given Architectural Description and in accordance with the its purpose. Typically, this involves starting with one or more overarching reference models or standards profiles to which the architecture is subject to using. Using these reference models or standards profiles, the architect selects the service areas and services relevant to the architecture. The SvcV-9 forecasts relate to the StdV-1Standards Profile in that a timed forecast may contribute to the decision to retire or phase out the use of a certain standard in connection with a resource. Similarly, the SvcV-9 forecasts relate to the StdV-2 Standards Forecasts in that a certain standard may be adopted depending on a certain technology or skill becoming available (e.g., the availability of Java Script may influence the decision to adopt a new HTML standard).

Alternatively, the SvcV-9 may relate forecasts to Service Model elements (e.g., Services) where applicable. The list of resources potentially impacted by the forecasts can also be summarized as additional information in SvcV-9.

SvcV-1 Services Context Description

SvcV-2 Services Resource Flow Description

SvcV-3a Systems-Services Matrix

SvcV-3b Services-Services Matrix

SvcV-4 Services Functionality Description

SvcV-5 Operational Activity to Services Traceability Matrix

SvcV-6 Services Resource Flow Matrix

SvcV-7 Services Measures Matrix

SvcV-8 Services Evolution Description

SvcV-9 Services Technology & Skills Forecast

SvcV-10abc Introduction to SvcV-10a, SvcV-10b and SvcV-10c

SvcV-10a Services Rules Model

SvcV-10b Services State Transition Description

SvcV-10c Services Event-Trace Description

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

- Background
- Architecture Development
- Meta Model
- Viewpoints & Models
  - All Viewpoint
  - Capability Viewpoint
  - Data and Information Viewpoint
  - Operational Viewpoint
  - Project Viewpoint
  - Services Viewpoint
  - Standards Viewpoint
  - Systems Viewpoint
  - Models
- Presentation Techniques
- Configuration Management Overview
- Acronyms List and Glossary of Terms

- Site Map
- Archives

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-10a Services Rules Model

The SvcV-10a is to specify functional and non-functional constraints on the implementation aspects of the architecture (i.e., the structural and behavioral elements of the Services Model).

The SvcV-10a describes constraints on the resources, functions, data and ports that make up the Service Model physical architecture. The constraints are specified in text and may be functional or structural (i.e., non-functional).

The intended usage of the SvcV-10a includes:

- Definition of implementation logic.
- Identification of resource constraints.

Detailed Description:

The SvcV-10a describes the rules that control, constrain or otherwise guide the implementation aspects of the architecture. Service Rules are statements that define or constrain some aspect of the business, and may be applied to:

- Performers.
- Resource Flows.
- Service Functions.
- System Ports.
- Data Elements.

In contrast to the OV-6a Operational Rules Model, the SvcV-10a focuses physical and data constraints rather than business rules.

Constraints can be categorized as follows:

- Structural Assertions - non-functional constraints governing some physical aspect of the architecture.
- Action Assertions - functional constraints governing the behavior of resources, their interactions and Resource Flow exchanges.
- Derivations - these involve algorithms used to compute facts.

Where a Service Rule is based on some standard, then that standard should be listed in the StdV-1 Standards Profile.

Some Service Rules can be added as annotations to other models. The SvcV-10a then should provide a listing of the complete set of rules with a reference to any models that they affect.

SvcV-1 Services Context Description

SvcV-2 Services Resource Flow Description

SvcV-3a Systems-Services Matrix

Go to top of page ↑

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-10b Services State Transition Description

The SvcV-10b is a graphical method of describing a resource (or function) response to various events by changing its state. The diagram basically represents the sets of events to which the resources in the Activities respond (by taking an action to move to a new state) as a function of its current state. Each transition specifies an event and an action.

The explicit time sequencing of service functions in response to external and internal events is not fully expressed in SvcV-4 Services Functionality Description. SvcV-10b can be used to describe the explicit sequencing of the service functions. Alternatively, SvcV-10b can be used to reflect explicit sequencing of the actions internal to a single service function, or the sequencing of service functions with respect to a specific resource.

The intended usage of the SvcV-10b includes:

- Definition of states, events, and state transitions (behavioral modeling).
- Identification of constraints.

Detailed Description:

The SvcV-10b relates events to resource states and describes the transition from one state to another.

The SvcV-10b is based on the statechart diagram. A state machine is defined as "a specification that describes all possible behaviors of some dynamic view element. Behavior is viewed as a traversal of a graph of specific states interconnected by one or more joined transition arcs that are triggered by the dispatching of series of event instances. During this traversal, the state machine executes a series of actions associated with various elements of the state machine." Statechart diagrams can be unambiguously converted to structured textual rules that specify timing aspects of events and the responses to these events, with no loss of meaning. However, the graphical form of the state diagrams can often allow quick analysis of the completeness of the rule set, and detection of dead ends or missing conditions. These errors, if not detected early during the solution analysis phase, can often lead to serious behavioral errors in fielded capabilities and to expensive correction efforts.

The SvcV-10b models state transitions from a resource perspective, with a focus on how the resource responds to stimuli (e.g., triggers and events). As in the OV-6b Operational State Transition Description, these responses may differ depending upon the rule set or conditions that apply, as well as the resource's state at the time the stimuli is received. A change of state is called a transition. Each transition specifies the response based on a specific event and the current state. Actions may be associated with a given state or with the transition between states. A state and its associated actions specify the response of a resource or service function, to events. When an event occurs, the next state may vary depending on the current state (and its associated action), the event, and the rule set or guard conditions.

The SvcV-10b can be used to describe the detailed sequencing of service functions described in SvcV-4 Services Functionality Description. However, the relationship between the actions included in SvcV-10b and the functions in SvcV-4 depends on the purposes of the Architectural Description and the level of abstraction used in the models. The explicit sequencing of functions in response to external and internal events is not fully expressed in

SvcV-4 Services Functionality Description. SvcV-10b can be used to reflect explicit sequencing of the functions, the sequencing of actions internal to a single function, or the sequencing of functions with respect to a specific resource.

States in a SvcV-10b model may be nested. This enables quite complex models to be created to represent Services behavior. Depending upon the architecture project's needs, the SvcV-10b may be used separately or in conjunction with the SvcV-10c Services Event-Trace Description.

- SvcV-1 Services Context Description
- SvcV-2 Services Resource Flow Description
- SvcV-3a Systems-Services Matrix
- SvcV-3b Services-Services Matrix
- SvcV-4 Services Functionality Description
- SvcV-5 Operational Activity to Services Traceability Matrix
- SvcV-6 Services Resource Flow Matrix
- SvcV-7 Services Measures Matrix
- SvcV-8 Services Evolution Description
- SvcV-9 Services Technology & Skills Forecast
- SvcV-10abc Introduction to SvcV-10a, SvcV-10b and SvcV-10c
- SvcV-10a Services Rules Model
- SvcV-10b Services State Transition Description
- SvcV-10c Services Event-Trace Description

Go to top of page ↑

DoDAF Viewpoints and Models

Services Viewpoint

SvcV-10c Services Event-Trace Description

The SvcV-10c provides a time-ordered examination of the interactions between services functional resources. Each event-trace diagram should have an accompanying description that defines the particular scenario or situation. The SvcV-10c is valuable for moving to the next level of detail from the initial solution design, to help define a sequence of service functions and service data interfaces, and to ensure that each participating resource or Service Port role has the necessary information it needs, at the right time, to perform its assigned functionality.

The intended usage of the SvcV-10c includes:

- Analysis of resource events impacting operation.
- Behavioral analysis.
- Identification of non-functional system requirements.

Detailed Description:

The SvcV-10c specifies the sequence in which Resource Flow elements are exchanged in context of a resource or Service Port. Services Event-Trace Descriptions are sometimes called sequence diagrams, event scenarios or timing diagrams. The components of a SvcV-10c include functional resources or service ports, owning performer, as well as the port which is the subject for the lifeline.

Specific points in time can be identified. The Resource Flow from one resource/port to another can be labeled with events and their timing. The Service Event-Trace Description provides a time-ordered examination of the Resource Flow elements exchanged between participating resources (external and internal) or service ports. Each Event-Trace diagram should have an accompanying description that defines the particular scenario or situation.

The SvcV-10c is typically used in conjunction with the SvcV-10b Services State Transition Description to describe the dynamic behavior of resources. The data content of messages that connect Resource Flows in a SvcV-10c model may be related, in modeling terms, with Resource Flows (interactions, in SvcV-1 Services Context Description, SvcV-3a Systems-Services Matrix, and SvcV-3b Services-Services Matrix), Resource Flows (data, in SvcV-4 Services Functionality Description and SvcV-6 Services Resource Flow Matrix) and entities (in DIV-3 Physical Data Model) modeled in other models.

SvcV-1 Services Context Description

SvcV-2 Services Resource Flow Description

SvcV-3a Systems-Services Matrix

SvcV-3b Services-Services Matrix

SvcV-4 Services Functionality Description

SvcV-5 Operational Activity to Services Traceability Matrix

SvcV-6 Services Resource Flow Matrix

SvcV-7 Services Measures Matrix

SvcV-8 Services Evolution Description

SvcV-9 Services Technology & Skills Forecast

SvcV-10abc Introduction to SvcV-10a, SvcV-10b and SvcV-10c

SvcV-10a Services Rules Model

SvcV-10b Services State Transition Description

SvcV-10c Services Event-Trace Description

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

DoDAF Viewpoints and Models

Standards Viewpoint

The DoDAF-described Models within the Standards Viewpoint is the set of rules governing the arrangement, interaction, and interdependence of parts or elements of the Architectural Description. These sets of rules can be captured at the enterprise level and applied to each solution, while each solution's architectural description depicts only those rules pertinent to architecture described. Its purpose is to ensure that a solution satisfies a specified set of operational or capability requirements. The Standards Models capture the doctrinal, operational, business, technical, or industry implementation guidelines upon which engineering specifications are based, common building blocks are established, and solutions are developed. It includes a collection of the doctrinal, operational, business, technical, or industry standards, implementation conventions, standards options, rules, and criteria that can be organized into profiles that govern solution elements for a given architecture. Current DoD guidance requires the Technical Standards portions of models be produced from DISR to determine the minimum set of standards and guidelines for the acquisition of all DoD systems that produce, use, or exchange information.

Standard Model Descriptions

Models	Descriptions
StdV-1 Standards Profile	The listing of standards that apply to solution elements.
StdV-2 Standards Forecast	The description of emerging standards and potential impact on current solution elements, within a set of time frames.

Uses of Standards Viewpoint DoDAF-described Models. The Standards Viewpoint can articulate the applicable policy, standards, guidance, constraints, and forecasts required by JCIDS, DAS, System Engineering, PPBE, Operations, other process owners, and decision-makers.

Mappings of the Standards Viewpoint DoDAF-described Models to the DM2 Concepts, Associations, and Attributes are in **DM2 Concepts, Associations, and Attributes Mapping to DoDAF-described Models** and are described in the DoDAF Meta-model Data Dictionary.

Go to top of page ↑

DoDAF Viewpoints and Models

Standards Viewpoint

StdV-1: Standards Profile

The StdV-1 defines the technical, operational, and business standards, guidance, and policy applicable to the architecture being described. As well as identifying applicable technical standards, the DoDAF V2.0 StdV-1 also documents the policies and standards that apply to the operational or business context. The DISR is an architecture resource for technical standards that can be used in the generation of the StdV-1 and StdV-2 Standards Forecast.

In most cases, building a Standards Profile consists of identifying and listing the applicable portions of existing and emerging documentation. A StdV-1 should identify both existing guidelines, as well as any areas lacking guidance. As with other models, each profile is assigned a specific timescale (e.g., "As-Is", "To-Be", or transitional). Linking the profile to a defined timescale enables the profile to consider both emerging technologies and any current technical standards that are expected to be updated or become obsolete. If more than one emerging standard time-period is applicable to an architecture, then a StdV-2 Standards Forecast should be completed as well as a StdV-1.

The intended usage of the StdV-1 includes:

- Application of standards (informing project strategy).
- Standards compliance.

Detailed Description:

The StdV-1 collates the various systems and services, standards, and rules that implement and constrain the choices that can be or were made in the design and implementation of an Architectural Description. It delineates the systems, services, Standards, and rules that apply. The technical standards govern what hardware and software may be implemented and on what system. The standards that are cited may be international such as ISO standards, national standards, or organizational specific standards.

With associated standards with other elements of the architecture, a distinction is made between applicability and conformance. If a standard is applicable to a given architecture, that architecture need not be fully conformant with the standard. The degree of conformance to a given standard may be judged based on a risk assessment at each approval point.

Note that an association between a Standard and an architectural element should not be interpreted as indicating that the element is fully compliant with that Standard. Further detail would be needeed to confirm the level of compliance.

Standards Profiles for a particular architecture must maintain full compatibility with the root standards they have been derived from. In addition, the StdV-1 model may state a particular method of implementation for a Standard, as compliance with a Standard does not ensure interoperability. The Standards cited are referenced as relationships to the systems, services, system functions, service functions, system data, service data, hardware/software items or communication protocols, where applicable, in:

- SV-1 Systems Interface Description.
- SV-2 Systems Resource Flow Description.
- SV-4 Systems Functionality Description.

- SV-6 Systems Resource Flow Matrix.
- SvcV-1 Services Context Description.
- SvcV-2 Services Resource Flow Description.
- SvcV-4 Services Functionality Description.
- SvcV-6 Services Resource Flow Matrix.
- DIV-2 Logical Data Model.
- DIV-3 Physical Data Model.

That is, each standard listed in the profile is associated with the elements that implement or use the standard.

The protocols referred to Resource Flow descriptions (see SV-2 Systems Resource Flow Description or SvcV-2 Services Resource Flow Description) are examples of Standards and these should also be included in the StdV-1 listing, irrespective of which models they appear in or are referred from.

Go to top of page ↑

DoDAF Viewpoints and Models

Standards Viewpoint

StdV-2: Standards Forecast

The StdV-2 contains expected changes in technology-related standards, operational standards, or business standards and conventions, which are documented in the StdV-1 model. The forecast for evolutionary changes in the standards need to be correlated against the time periods mentioned in the SV-8 Systems Evolution Description, SvcV-8 Services Evolution Description, SV-9 Systems Technology & Skills Forecast, and SvcV-9 Services Technology & Skills Forecast models.

A StdV-2 is a detailed description of emerging standards relevant to the systems, operational, and business activities covered by the Architectural Description. The forecast should be tailored to focus on areas that are related to the purpose for which a given Architectural Description is being built, and should identify issues that affect the architecture. A StdV-2 complements and expands on the StdV-1Standards Profile model and should be used when more than one emerging standard time-period is applicable to the architecture.

One of the prime purposes of this model is to identify critical technology standards, their fragility, and the impact of these standards on the future development and maintainability of the architecture and its constituent elements.

The intended usage of the StdV-2 includes:

- Forecasting future changes in standards (informing project strategy).

Detailed Description:

The Standards Forecast DoDAF-described Model contains expected changes in standards and conventions, which are documented in the StdV-1 model. The forecast for evolutionary changes in the standards need to be correlated against the time periods mentioned in the SV-8 Systems Evolution Description, SvcV-8 Services Evolution Description, SV-9 Systems Technology & Skills Forecast, and SvcV-9 Services Technology & Skills Forecast models. One of the prime purposes of this model is to identify critical standards, their life expectancy, and the impact of these standards on the future development and maintainability of the Architectural Description and its constituent elements.

StdV-2 lists emerging or evolving standards relevant to the solutions covered by the Architectural Description. It contains predictions about the availability of emerging standards, and relates these predictions to the elements and the time periods that are listed in the SV-8 Systems Evolution Description, SvcV-8 Services Evolution Description, SV-9 Systems Technology & Skills Forecast, and SvcV-9 Services Technology & Skills Forecast models.

The specific time periods selected (e.g., 6-month and 12-month intervals) and the standards being tracked are coordinated with architecture transition plans (which the SV-8 Systems Evolution Description and SvcV-8 Services Evolution Description can support). That is, insertion of new capabilities and upgrading of existing solutions may depend on, or be driven by, the availability of new standards and models incorporating those standards. The forecast specifies potential standards and thus impacts current architectures and influences the development of transition and objective (i.e., target) architectures. The forecast is tailored to focus on standards areas that are related to the purpose for which a given architecture is being described and should identify potential standards affecting that architecture. If interface standards are an integral part of the technologies important to the evolution of a given architecture, then it may be convenient to combine StdV-2 with SV-9 Systems Technology & Skills Forecast or SvcV-9 Services Technology & Skills Forecast into a composite Fit-for-Purpose View. For other projects, it may be convenient to combine all the standards information into one composite Fit-for-Purpose View, combining StdV-2 with StdV-1 Standard Profile.

StdV-2 delineates the standards that potentially impact the relevant system and service elements (from SV-1 Systems Interface Description, SV-2 Systems Resource Flow Description, SV-4 Systems Functionality Description, SV-6 Systems Resource Flow Matrix, SvcV-1 Services Context Description, SvcV-2 Services Resource Flow Description, SvcV-4 Services Functionality Description, SV-6 Services Resource Flow Matrix, and DIV-2 Logical Data Model) and relates them to the time periods that are listed in the SV-8 Systems Evolution Description, SvcV-8 Services Evolution Description, SV-9 Systems Technology & Skills Forecast, and SvcV-9 Services Technology & Skills Forecast models. A system's evolution, specified in SV-8 Systems Evolution Description, or service's evolutions, specified in SvcV-8 Services Evolution Description, may be tied to a future standard listed in StdV-2. A timed technology and skills forecast from SV-9 Systems Technology & Skills Forecast or SvcV-9 Services Technology & Skills Forecast models is related to StdV-2 standards forecast in the following manner: a certain technology may be dependent on a StdV-2 standard (i.e., a standard listed in StdV-2 may not be adopted until a certain technology becomes available). This is how a prediction on the adoption of a future standard, may be related to standards listed in StdV-1 through the SV-9 Systems Technology & Skills Forecast or SvcV-9 Services Technology & Skills Forecast models.

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background
Architecture Development
Meta Model
Viewpoints & Models
All Viewpoint
Capability Viewpoint
Data and Information Viewpoint
Operational Viewpoint
Project Viewpoint
Services Viewpoint
Standards Viewpoint
Systems Viewpoint
Models
Presentation Techniques
Configuration Management Overview
Acronyms List and Glossary of Terms
Site Map
Archives

DoDAF Viewpoints and Models

Systems Viewpoint

The DoDAF-described Models within the Systems Viewpoint describes systems and interconnections providing for, or supporting, DoD functions. DoD functions include both warfighting and business functions. The Systems Models associate systems resources to the operational and capability requirements. These systems resources support the operational activities and facilitate the exchange of information. The Systems DoDAF-described Models are available for support of legacy systems. As architectures are updated, they should transition from Systems to Services and utilize the models within the Services Viewpoint.

Names of the models and their descriptions (in the **table below**) are provided below.

Systems Model Descriptions

Models	Descriptions
SV-1 Systems Interface Description	The identification of systems, system items, and their interconnections.
SV-2 Systems Resource Flow Description	A description of Resource Flows exchanged between systems.
SV-3 Systems-Systems Matrix	The relationships among systems in a given Architectural Description. It can be designed to show relationships of interest, (e.g., system-type interfaces, planned vs. existing interfaces).
SV-4 Systems Functionality Description	The functions (activities) performed by systems and the system data flows among system functions (activities).
SV-5a Operational Activity to Systems Function Traceability Matrix	A mapping of system functions (activities) back to operational activities (activities).
SV-5b Operational Activity to Systems Traceability Matrix	A mapping of systems back to capabilities or operational activities (activities).
SV-6 Systems Resource Flow Matrix	Provides details of system resource flow elements being exchanged between systems and the attributes of that exchange.
SV-7 Systems Measures Matrix	The measures (metrics) of Systems Model elements for the appropriate timeframe(s).
SV-8 Systems Evolution Description	The planned incremental steps toward migrating a suite of systems to a more efficient suite, or toward evolving a current system to a future implementation.
SV-9 Systems Technology & Skills Forecast	The emerging technologies, software/hardware products, and skills that are expected to be available in a given set of time frames and that will

	affect future system development.
SV-10a Systems Rules Model	One of three models used to describe system functionality. It identifies constraints that are imposed on systems functionality due to some aspect of system design or implementation.
SV-10b Systems State Transition Description	One of three models used to describe system functionality. It identifies responses of systems to events.
SV-10c Systems Event-Trace Description	One of three models used to describe system functionality. It identifies system-specific refinements of critical sequences of events described in the Operational Viewpoint.

Uses of System Viewpoint DoDAF-described Models. Within the development process, the DoDAF-described Models describe the design for system-based solutions to support or enable requirements created by the operational development processes (JCIDS) and Defense Acquisition System.

Mappings of the Systems Viewpoint DoDAF-described Models, to the DM2 Concepts, Associations, and Attributes are in **DM2 Concepts, Associations, and Attributes Mapping to DoDAF-described Models**. The DM2 Concepts, Associations, and Attributes are described in the DoDAF Meta-model Data Dictionary.

Go to top of page ↑

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Systems Viewpoint

SV-1: Systems Interface Description

The SV-1 addresses the composition and interaction of Systems. For DoDAF V2.0, the SV-1 incorporates the human elements as types of Performers - Organizations and Personnel Types.

The SV-1 links together the operational and systems architecture models by depicting how Resources are structured and interact to realize the logical architecture specified in an OV-2 Operational Resource Flow Description. A SV-1 may represent the realization of a requirement specified in an OV-2 Operational Resource Flow Description (i.e., in a "To-Be" architecture), and so there may be many alternative SV models that could realize the operational requirement. Alternatively, in an "As-Is" architecture, the OV-2 Operational Resource Flow Description may simply be a simplified, logical representation of the SV-1 to allow communication of key Resource Flows to non-technical stakeholders.

A System Resource Flow is a simplified representation of a pathway or network pattern, usually depicted graphically as a connector (i.e., a line with possible amplifying information). The SV-1 depicts all System Resource Flows between Systems that are of interest. Note that Resource Flows between Systems may be further specified in detail in SV-2 Systems Resource Flow Description and SV-6 Systems Resource Flow Matrix.

Sub-System assemblies may be identified in SV-1 to any level (i.e., depth) of decomposition the architect sees fit. SV-1 may also identify the Physical Assets (e.g., Platforms) at which Resources are deployed, and optionally overlay Operational Activities and Locations that utilize those Resources. In many cases, an operational activity and locations depicted in an OV-2 Operational Resource Flow Description model may well be the logical representation of the resource that is shown in SV-1.

The intended usage of the SV-1 includes:

- Definition of System concepts.
- Definition of System options.
- System Resource Flow requirements capture.
- Capability integration planning.
- System integration management.
- Operational planning (capability and performer definition).

The SV-1 is used in two complementary ways:

- Describe the Resource Flows exchanged between resources in the architecture.
- Describe a solution, or solution option, in terms of the components of capability and their physical integration on platforms and other facilities.

Detailed Description:

A SV-1 can be used simply to depict Systems and sub-systems and identify the Resource Flows between them. The real benefit of a SV-1 is its ability to show the human aspects of an architecture, and how these interact with Systems. In addition, DoDAF has the concept of Capability and Performers (see Capability Meta-model group in Section 2) which is used to gather together systems, assets and people into a configuration, which can meet a specific capability. A primary purpose of a SV-1 DoDAF-described Model is to show resource structure, i.e., identify the primary sub-systems, performer and activities (functions) and their interactions. SV-1 contributes to user understanding of the structural characteristics of the capability.

The physical resources contributing to a capability are either an organizational resource or a physical asset, i.e., a system cannot contribute alone (it must be hosted on a physical asset used by an organizational resource of both). Organizational aspects can now be shown on SV-1 (e.g., who uses System). Resource structures may be identified in SV-1 to any level (i.e., depth) of decomposition the architect sees fit. DoDAF does not specifically use terms such as, sub-System and component as these terms often denote a position relative to a structural hierarchy. Any System may combine hardware and software or these can be treated as separate (sub) Systems. DoDAF V2.0 includes human factors (as Personnel Types and a type of Performer). Should an architect wish to describe a System which has human elements, then Systems, Personnel Types and Performers should be used to wrap the human and system elements together.

A SV-1 can optionally be annotated with Operational Activities, Capabilities, and/or Locations originally specified in OV-2 Operational Resource Flow Description model. In this way, traceability can be established from the logical OV structure to the physical System Viewpoint structure. If possible, a SV-1 shows Systems, Physical Assets and System interfaces for the entire Architectural Description on the same diagram. If a single SV-1 is not possible, the resource of interest should be decomposed into multiple SV-1 models.

Functions (Activities):

Some Resources can carry out System Functions (Activities) as described in SV-4 Systems Functionality Description model and these functions can optionally be overlaid on a SV-1. In a sense, the SV-1 and the SV-4 Systems Functionality Description model provide complementary representations (structure and function). Either could be modeled first, but usually an iterative approach is used to model these together gradually building up the level of detail in the System description. Note that the same type (class) of resource may be used in different contexts in a given SV-1. For this reason, the tracing of functions to resources is specified in context of their usage (see DM2 for details).

Resource Flows in SV-1:

In addition to depicting Systems (Performers) and their structure, the SV-1 addresses Resource Flows. A Resource Flow, as depicted in SV-1, is an indicator that resources pass between one System and the other. In the case of Systems, this can be expanded into further detail in SV-2 Systems Resource Flow Description.

Interactions are only possible between Systems and Services. System Resource Flows provide a specification for how the operational Resource Flows Exchanges specified in Needlines (in the OV-2 Operational Resource Flow Description model) are realized with Systems. A single Needline shown in the OV-2 Operational Resource Flow Description model may translate into multiple System Resource Flows.

The actual implementation of a System Resource Flow may take more than one form (e.g., multiple physical links). Details of the physical pathways or network patterns that implement the interfaces are documented in SV-2 Systems Resource Flow Description. System Resource Flows are summarized in a SV-3b Systems-Systems Matrix. The functions performed by the resources are specified in a SV-4 System Functionality Description, but may optionally be overlaid on the Resources in a SV-1.

An Operational Viewpoint (OV) suite may specify a set of requirements - either as a specific operational plan, or a scenario for procurement. As OV-2 Operational Resource Flow Description, OV-5a Operational Activity Decomposition Tree, and OV-5b Operational Activity Model specify the logical structure and behavior, SV-1 and SV-4 Systems Functionality Description specify the physical structure and behavior (to the level of detail required by the architectural stakeholders). This separation of logical and physical presents an opportunity for carrying out architectural trade studies based on the architectural content in the DoDAF-described Models.

The structural and behavioral models in the OVs and SVs allow architects and stakeholders to quickly ascertain which functions are carried out by humans and which by Systems for each alternative specification and so carry out trade analysis based on risk, cost, reliability, etc.

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

SV-5a Operational Activity to Systems Function Traceability Matrix

SV-5b Operational Activity to Systems Traceability Matrix

SV-6 Systems Resource Flow Matrix

SV-7 Systems Measures Matrix

SV-8 Systems Evolution Description

SV-9 Systems Technology & Skills Forecast

Introduction to SV-10a, SV10b, and SV-10c

SV-10a Systems Rules Model

SV-10b Systems State Transition Description

SV-10c Systems Event-Trace Description

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

DoDAF Viewpoints and Models

Systems Viewpoint

SV-2: Systems Resource Flow Description

A SV-2 specifies the System Resource Flows between Systems and may also list the protocol stacks used in connections.

A SV-2 DoDAF-described Model is used to give a precise specification of a connection between Systems. This may be an existing connection, or a specification for a connection that is to be made.

The intended usage of the SV-2 includes:

- Resource Flow specification.

Detailed Description:

A SV-2 comprises Systems, their ports, and the Resource Flows between those ports. The architect may choose to create a diagram for each Resource Flow for all Systems or to show all the Resource Flows on one diagram if possible.

Each SV-2 model can show:

- Which ports are connected?
- The Systems that the ports belong to.
- The definition of the System Resource Flow in terms of the physical/logical connectivity and any protocols that are used in the connection.

Note that networks are represented as Systems. The architect may choose to show other Systems being components of the network, i.e., if they are part of the network infrastructure.

Any protocol referred to in a SV-2 diagram needs to be defined in the StdV-1 Standards Profile.

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

SV-5a Operational Activity to Systems Function Traceability Matrix

SV-5b Operational Activity to Systems Traceability Matrix

SV-6 Systems Resource Flow Matrix

SV-7 Systems Measures Matrix

SV-8 Systems Evolution Description

SV-9 Systems Technology & Skills Forecast

Introduction to SV-10a, SV10b, and SV-10c

SV-10a Systems Rules Model

SV-10b Systems State Transition Description

SV-10c Systems Event-Trace Description

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Systems Viewpoint

SV-3: Systems-Systems Matrix

A SV-3 enables a quick overview of all the system resource interactions specified in one or more SV-1 Systems Interface Description models. The SV-3 provides a tabular summary of the system interactions specified in the SV-1 Systems Interface Description model for the Architectural Description. The matrix format supports a rapid assessment of potential commonalities and redundancies (or, if fault-tolerance is desired, the lack of redundancies).

The SV-3 can be organized in a number of ways to emphasize the association of groups of system pairs in context with the architecture's purpose.

The intended usage of the SV-3 includes:

- Summarizing system resource interactions.
- Interface management.
- Comparing interoperability characteristics of solution options.

Detailed Description:

The SV-1 concentrates on System resources and their interactions, and these are summarized in a SV-3. The SV-3 can be a useful tool for managing the evolution of solutions and infrastructures, the insertion of new technologies and functionality, and the redistribution of systems and activities in context with evolving operational requirements.

Depending upon the purpose of the Architectural Description, there could be several SV-3s. The suite of SV-3 models can be organized in a number of ways (e.g., by domain, by operational mission phase, by solution option) to emphasize the association of groups of resource pairs in context with the Architectural Description purpose.

The SV-3 is generally presented as a matrix, where the Systems resources are listed in the rows and columns of the matrix, and each cell indicates an interaction between resources if one exists. Many types of interaction information can be presented in the cells of a SV-3. The resource interactions can be represented using different symbols and/or color coding that depicts different interaction characteristics, for example:

- Status (e.g., existing, planned, potential, de-activated).
- Key interfaces.
- Category (e.g., command and control, intelligence, personnel, logistics).
- Classification-level (e.g., Restricted, Confidential, Secret, Top Secret).
- Communication means (e.g., Rim Loop Interface, Scalable Loop Interface).

DoDAF does not specify the symbols to be used. If symbols are used, a key is needed.

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

SV-5a Operational Activity to Systems Function Traceability Matrix

SV-5b Operational Activity to Systems Traceability Matrix

SV-6 Systems Resource Flow Matrix

SV-7 Systems Measures Matrix

SV-8 Systems Evolution Description

SV-9 Systems Technology & Skills Forecast

Introduction to SV-10a, SV10b, and SV-10c

SV-10a Systems Rules Model

SV-10b Systems State Transition Description

SV-10c Systems Event-Trace Description

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

DoDAF

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

- Background
- Architecture Development
- Meta Model
- Viewpoints & Models
  - All Viewpoint
  - Capability Viewpoint
  - Data and Information Viewpoint
  - Operational Viewpoint
  - Project Viewpoint
  - Services Viewpoint
  - Standards Viewpoint
  - Systems Viewpoint
  - Models
- Presentation Techniques
- Configuration Management Overview
- Acronyms List and Glossary of Terms
- Site Map
- Archives

DoDAF Viewpoints and Models

Systems Viewpoint

SV-4: Systems Functionality Description

The SV-4 addresses human and system functionality.

The primary purposes of SV-4 are to:

. Develop a clear description of the necessary data flows that are input (consumed) by and output (produced) by each resource. . Ensure that the functional connectivity is complete (i.e., that a resource's required inputs are all satisfied). . Ensure that the functional decomposition reaches an appropriate level of detail.

The Systems Functionality Description provides detailed information regarding the:

. Allocation of functions to resources. . Flow of resources between functions.

The SV-4 is the Systems Viewpoint model counterpart to the OV-5b Activity Model of the Operational Viewpoint.

The intended usage of the SV-4 includes:

- Description of task workflow.
- Identification of functional system requirements.
- Functional decomposition of systems.
- Relate human and system functions.

Detailed Description:

The SV-4 is used to specify the functionality of resources in the architecture (in this case, functional resources, systems, performer and capabilities). The SV-4 is the behavioral counterpart to the SV-1 Systems Interface Description (in the same way that OV-5b Operational Activity Model is the behavioral counterpart to OV-2 Operational Resource Flow Matrix).

The scope of this model may be capability wide, without regard to which resources perform which functions, or it may be resource-specific. Variations may focus on intra- or inter-resource data flows, or may simply allocate functions to resources.

There are two basic ways to depict SV-4:

- The Taxonomic Functional Hierarchy shows a decomposition of functions depicted in a tree structure and is typically used where tasks are concurrent but dependent, such as a production line, for example.
- The Data Flow Diagram shows functions connected by data flow arrows and data stores.

The Taxonomic Functional Hierarchy may be particularly useful in capability-based procurement where it is necessary to model the functions that are associated with particular capability (see SV-5).

Within an Architectural Description, the SV-4 documents system functions, the Resource Flows between those functions, the internal system data repositories or system data stores, and the external producers and consumers for the system data flows, but not those external to the Architectural Description scope. They may also show how users behave in relation to those systems.

The functions are likely to be related to Operational Activities captured in OV-5a. Although there is a correlation between the Operational Activity Model (OV-5b) and the functional hierarchy of SV-4, it need not be a one-to-one mapping, hence, the need for the Function to Operational Activity Traceability Matrix (SV-5), which provides that mapping.

Systems are not limited to internal system functions and can include HCI and GUI functions or functions that consume or produce system data. The external system data producers or consumers can be used to represent the human that interacts with the system. The System Resource Flows between the external system data source/sink (representing the human or system) and the HCI, GUI, or interface function can be used to represent human-system interactions, or system-system interfaces. Standards that apply to system functions, such as HCI and GUI standards, are also specified during development of this model (and recorded in StdV-1).

A graphical variant of the SV-4 Data Flow model may be used with swim lanes. A system swim lane may be associated with:

- A System.
- A grouping of Capabilities and System Functions (usually based on a Physical Asset).
- A Performer executing an Activity.

Swim lanes are presented either vertically or horizontally. A function can be placed in the swim lane associated with the System, Resources or Performer executing an Activity that it is allocated in the solution architecture. This provides a graphical means of presenting the interactions between Systems or Capabilities (shown through system connections on SV-1) in functional terms. This is a powerful technique for visualizing the differences between alternative solution options (which may have a common set of functions).

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

SV-5a Operational Activity to Systems Function Traceability Matrix

SV-5b Operational Activity to Systems Traceability Matrix

SV-6 Systems Resource Flow Matrix

SV-7 Systems Measures Matrix

SV-8 Systems Evolution Description

SV-9 Systems Technology & Skills Forecast

Introduction to SV-10a, SV10b, and SV-10c

SV-10a Systems Rules Model

SV-10b Systems State Transition Description

SV-10c Systems Event-Trace Description

Go to top of page ↑

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Systems Viewpoint

SV-5a: Operational Activity to Systems Function Traceability Matrix

The SV-5a addresses the linkage between System Functions described in SV-4 Systems Functionality Description and Operational Activities specified in OV-5a Operational Activity Decomposition Tree or OV-5b Operational Activity Model. The SV-5a depicts the mapping of system functions and, optionally, the capabilities and performers that provide them to operational activities. The SV-5a identifies the transformation of an operational need into a purposeful action performed by a system or solution.

During requirements definition, the SV-5a plays a particularly important role in tracing the architectural elements associated with system function requirements to those associated with user requirements.

The intended usage of the SV-5a includes:

- Tracing functional system requirements to user requirements.
- Tracing solution options to requirements.
- Identification of overlaps or gaps.

Detailed Description:

An SV-5a is a specification of the relationships between the set of operational activities applicable to an Architectural Description and the set of system functions applicable to that Architectural Description. The relationship between operational activities and system functions can also be expected to be many-to-many (i.e., one activity may be supported by multiple functions, and one function may support multiple activities). The system functions shown in the SV-5a may be those associated with capabilities and performers. More focused SV-5a models might be used to specifically trace system functions to operational activities if desired.

DoDAF uses the term Operational Activity in the OVs and the term System Function in the SVs to refer to essentially the same kind of thing; both activities and functions are tasks that are performed, accept inputs, and develop outputs. The distinction between an Operational Activity and a Function is a question of what and how. The Operational Activity is a specification of what is to be done, regardless of the mechanism used. A System Function is specifies how a resource carries it out. For this reason, SV-5a is a significant model, as it ties together the logical specification in the OV-5a with the physical specification of the SV-4 Systems Functionality Description. System Functions can be carried out by Functional Resources (systems, performers executing activities, and performers).

The SV-5a is generally presented as a matrix of the relationship between system functions and operational activities. The SV-5a can show requirements traceability with Operational Activities on one axis of a matrix, the System Functions on the other axis, and with an X, date, or phase in the intersecting cells, where appropriate.

An alternate version of the tabular SV-5a can allow the implementation status of each function to be shown. In this variant model, each system function-to-operational activity mapping is described by a traffic light symbol that may indicate the status of the system support. DoDAF V2.0 does not prescribe a presentation technique. These symbols are usually colored circles with the following possible representations:

- Red may indicate that the functionality is planned but not developed.
- Yellow may indicate that partial functionality has been provided (or full functionality provided but system has not been fielded).
- Green may indicate that full functionality has been provided to the field.
- A blank cell may indicate that there is no system support planned for an Operational Activity, or that a relationship does not exist between the Operational Activity and the System Function.

Care should be taken when publishing a SV-5a with status information. Any presentation should clearly state the date of publication, so that users can see when status information is old.

SV-5a may be further annotated with Systems, Capabilities, Performers executing Activities, and capabilities and performers that conduct the functions.

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

SV-5a Operational Activity to Systems Function Traceability Matrix

SV-5b Operational Activity to Systems Traceability Matrix

SV-6 Systems Resource Flow Matrix

SV-7 Systems Measures Matrix

SV-8 Systems Evolution Description

SV-9 Systems Technology & Skills Forecast

Introduction to SV-10a, SV10b, and SV-10c

SV-10a Systems Rules Model

SV-10b Systems State Transition Description

SV-10c Systems Event-Trace Description

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

- Background
- Architecture Development
- Meta Model
- Viewpoints & Models
  - All Viewpoint
  - Capability Viewpoint
  - Data and Information Viewpoint
  - Operational Viewpoint
  - Project Viewpoint
  - Services Viewpoint
  - Standards Viewpoint
  - Systems Viewpoint
  - Models
- Presentation Techniques
- Configuration Management Overview
- Acronyms List and Glossary of Terms
- Site Map
- Archives

DoDAF Viewpoints and Models

Systems Viewpoint

SV-5b: Operational Activity to Systems Traceability Matrix

The SV-5b addresses the linkage between described in SV-1 Systems Functionality Description and Operational Activities specified in OV-5a Operational Activity Decomposition Tree or OV-5b Operational Activity Model. The SV-5b depicts the mapping of systems and, optionally, the capabilities and performers that provide them to operational activities. The SV-5b identifies the transformation of an operational need into a purposeful action performed by a system or solution.

During requirements definition, the SV-5b plays a particularly important role in tracing the architectural elements associated with system requirements to those associated with user requirements.

The intended usage of the SV-5b includes:

- Tracing system requirements to user requirements.
- Tracing solution options to requirements.
- Identification of overlaps or gaps.

Detailed Description:

An SV-5b is a specification of the relationships between the set of operational activities applicable to an Architectural Description and the set of systems applicable to that Architectural Description. The relationship between operational activities and systems can also be expected to be many-to-many (i.e., one activity may be supported by multiple systems, and one system may support multiple activities). The system shown in the SV-5b may be those associated with resources. More focused SV-5b models might be used to specifically trace system to operational activities if desired.

The SV-5b is generally presented as a matrix of the relationship between systems and activities and can be a summary of the Operational Activity to System Function Traceability Matrix (SV-5a). The SV-5b can show requirements traceability with Operational Activities on one axis of a matrix, the System Functions on the other axis, and with an X, date, or phase in the intersecting cells, where appropriate.

An alternate version of the tabular SV-5b model can allow the implementation status of each system to be shown. In this variant model, each system-to-operational activity mapping is described by a traffic light symbol that may indicate the status of the system support. DoDAF V2.0 does not prescribe a presentation technique. These symbols are usually colored circles with the following possible representations:

- Red may indicate that the system is planned but not developed.
- Yellow may indicate that partial system functionality has been provided (or full functionality provided but system has not been fielded).
- Green may indicate that full system functionality has been provided to the field.
- A blank cell may indicate that there is no system support planned for an Operational Activity, or that a relationship does not exist between the Operational Activity and the System Function.

Care should be taken when publishing a SV-5b with status information. Any presentation should clearly state the date of publication, so that users can see when status information is old.

The SV-5b may be further annotated with Capabilities, Performers executing Activities, and capabilities and performers that conduct the functions. This can be used to identify which systems can support a particular capability. The architect may also wish to hide the systems in a SV-5b so that the table simply shows the mapping from performers executing activities, and capabilities and performers to Operational Activities.

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

Hampton, VA April 11-15, 2011
Registration will be available at:
WWW.DODENTERPRISEARCHITECTURE.ORG
Targeted Date TBD
Co-hosted by DoD CIO Architecture, Standards & Interoperability Directorate and Joint Staff

DoDAF Viewpoints and Models

Systems Viewpoint

SV-6: Systems Resource Flow Matrix

The SV-6 specifies the characteristics of the System Resource Flows exchanged between systems with emphasis on resources crossing the system boundary.

The SV-6 focuses on the specific aspects of the system Resource Flow and the system Resource Flow content in a tabular format.

The intended usage of the SV-6 includes:

- Detailed definition of Resource Flows.

Detailed Description:

The SV-6 specifies the characteristics of Resource Flow exchanges between systems. The SV-6 is the physical equivalent of the logical OV-3 table and provides detailed information on the system connections which implement the Resource Flow exchanges specified in OV-3. Non-automated Resource Flow exchanges, such as verbal orders, are also captured.

System Resource Flow exchanges express the relationship across the three basic architectural data elements of a SV (systems, system functions, and system Resource Flows) and focus on the specific aspects of the System Resource Flow and the system resource content. These aspects of the System Resource Flow exchange can be crucial to the operational mission and are critical to understanding the potential for overhead and constraints introduced by the physical aspects of the implementation such as security policy and communications limitations.

The focus of SV-6 is on how the System Resource Flow exchange is affected, in system-specific details covering periodicity, timeliness, throughput, size, information assurance, and security characteristics of the resource exchange. In addition, the System Resource Flow elements, their format and media type, accuracy, units of measurement, and system data standard are also described in the matrix.

Modeling discipline is needed to ensure that the architecture models are coherent. Each system Resource Flow exchange listed in the SV-6 table should be traceable to at least one operational Resource Flow exchanged listed in the corresponding OV-3 Operational Resource Flow Matrix and these, in turn, trace to operation Resource Flows in the OV-2 Operational Resource Flow Description.

It should be noted that each data element exchanged may be related to the system function (from SV-4) that produces or consumes it. However, there need not be a one-to-one correlation between data elements listed in the SV-6 matrix and the data flows (inputs and outputs) that are produced or consumed in a related SV-4 Services Functionality Description. In addition, Data flows between system functions performed by the same systems may not be shown in the SV-6 matrix. SV-6 is about showing flows across system boundaries.

The SV-7 System Measures Matrix model builds on the SV-6 and should be developed at the same time.

DoDAF does not prescribe the column headings in a SV-6 Matrix. Identifiers of the operational Resource Flows from the OV-3 Operational Resource Flow Matrix that are implemented by the System Resource Flow Exchanges may be included in the table. All elements carried by the Resource Flow exchanges may be also shown.

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

SV-5a Operational Activity to Systems Function Traceability Matrix

SV-5b Operational Activity to Systems Traceability Matrix

SV-6 Systems Resource Flow Matrix

SV-7 Systems Measures Matrix

SV-8 Systems Evolution Description

SV-9 Systems Technology & Skills Forecast

Introduction to SV-10a, SV10b, and SV-10c

SV-10a Systems Rules Model

SV-10b Systems State Transition Description

SV-10c Systems Event-Trace Description

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

DoDAF Viewpoints and Models

Systems Viewpoint

SV-7: Systems Measures Matrix

The SV-7 depicts the measures (metrics) of resources. The Systems Measures Matrix expands on the information presented in a SV-1 by depicting the characteristics of the resources in the SV-1.

The intended usage of the SV-7 includes:

- Definition of performance characteristics and measures (metrics).
- Identification of non-functional requirements.

Detailed Description:

The SV-7 specifies qualitative and quantitative measures (metrics) of resources; it specifies all of the measures. The measures are selected by the end user community and described by the architect.

Performance parameters include all performance characteristics for which requirements can be developed and specifications defined. The complete set of performance parameters may not be known at the early stages of Architectural Description, so it is to be expected that this model is updated throughout the specification, design, development, testing, and possibly even its deployment and operations lifecycle phases. The performance characteristics are captured in the Measures Meta-model group.

One of the primary purposes of SV-7 is to communicate which measures are considered most crucial for the successful achievement of the mission goals assigned and how those performance parameters will be met. These particular measures can often be the deciding factors in acquisition and deployment decisions, and figures strongly in systems analysis and simulations done to support the acquisition decision processes and system design refinement. Measures of Effectiveness (MOEs) and Measures of Performers (MOPs) are measures that can be captured and presented in the Services Measures Matrix model.

The SV-7 DoDAF-described Model is typically a table listing user defined measures (metrics) with a time period association. It is sometimes useful to analyze evolution by comparing measures (metrics) for current and future resources. For this reason, a hybrid SV-7 model which spans architectures across multiple phases may be useful.

[SV-9 Systems Technology & Skills Forecast]

[Introduction to SV-10a, SV10b, and SV-10c]

[SV-10a Systems Rules Model]

[SV-10b Systems State Transition Description]

[SV-10c Systems Event-Trace Description]

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

Background

Architecture Development

Meta Model

Viewpoints & Models

- All Viewpoint
- Capability Viewpoint
- Data and Information Viewpoint
- Operational Viewpoint
- Project Viewpoint
- Services Viewpoint
- Standards Viewpoint
- Systems Viewpoint
- Models

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

DoDAF Viewpoints and Models

Systems Viewpoint

SV-8: Systems Evolution Description

The SV-8 presents a whole lifecycle view of resources (systems), describing how they change over time. It shows the structure of several resources mapped against a timeline.

The intended usage of the SV-8 includes:

- Development of incremental acquisition strategy.
- Planning technology insertion.

Detailed Description:

The SV-8, when linked together with other evolution Models, e.g., such as CV-3 Capability Phasing and StdV-2 Standards Forecast, provides a rich definition of how the Enterprise and its capabilities are expected to evolve over time. In this manner, the model can be used to support an architecture evolution project plan or transition plan.

A SV-8 can either describe historical (legacy), current, and future capabilities against a timeline. The model shows the structure of each resource, using similar modeling elements as those used in SV-1. Interactions which take place within the resource may also be shown.

The changes depicted in the SV-8 are derived from the project milestones that are shown in a PV-2 Project Timelines. When the PV-2 Project Timelines is used for capability acquisition projects, there is likely to be a close relationship between these two models.

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

SV-5a Operational Activity to Systems Function Traceability Matrix

SV-5b Operational Activity to Systems Traceability Matrix

SV-6 Systems Resource Flow Matrix

SV-7 Systems Measures Matrix

SV-8 Systems Evolution Description

SV-9 Systems Technology & Skills Forecast

Introduction to SV-10a, SV10b, and SV-10c

SV-10a Systems Rules Model

SV-10b Systems State Transition Description

SV-10c Systems Event-Trace Description

Go to top of page ↑

DoDAF Viewpoints and Models

Systems Viewpoint

SV-9: Systems Technology and Skills Forecast

The SV-9 defines the underlying current and expected supporting technologies and skills. Expected supporting technologies and skills are those that can be reasonably forecast given the current state of technology and skills as well as the expected improvements or trends. New technologies and skills are tied to specific time periods, which can correlate against the time periods used in SV-8 milestones and linked to Capability Phases.

The SV-9 provides a summary of emerging technologies and skills that impact the architecture. The SV-9 provides descriptions of relevant:

- Emerging capabilities.
- Industry trends.
- Predictions (with associated confidence factors) of the availability and readiness of specific hardware and software systems.
- Current and possible future skills.

In addition to providing an inventory of trends, capabilities and systems, the DoDAF-described Model SV-9 also includes an assessment of the potential impact of these items on the architecture. Given the future-oriented nature of this model, forecasts are typically made in short, mid and long-term timeframes, such as 6, 12 and 18-month intervals.

The intended usage of the SV-9 includes:

- Forecasting technology readiness against time.
- HR Trends Analysis.
- Recruitment Planning.
- Planning technology insertion.
- Input to options analysis.

The SV-9 can be presented in a table, timeline, or a Herringbone diagram.

Detailed Description:

A SV-9 summarizes predictions about trends in technology and personnel. Architects may produce separate SV-9 products for technology and human resources. The specific time periods selected (and the trends being tracked) are coordinated with architecture transition plans (which the SV-8 Systems Evolution Description model can support). That is, insertion of new capabilities and upgrading or re-training of existing resources may depend on or be driven by the availability of new technology and associated skills. The forecast includes potential impacts on current architectures and thus influences the development of transition and target architectures. The forecast is focused on technology and human resource areas that are related to the purpose for which a given architecture is being described and identifies issues affecting that architecture.

If standards are an integral part of the technologies important to the evolution of a given architecture, then it may be convenient to combine SV-9 with the StdV-2 Standards Forecast in a composite Fit-for-Purpose View.

The SV-9 is constructed as part of a given Architectural Description and in accordance with the Architectural Description purpose. Typically, this involves starting with one or more overarching reference models or standards profiles to which the architecture must conform. Using these reference models or standards profiles, the architect selects the service areas and services relevant to the architecture. The SV-9 DoDAF-described Model forecasts relates to the Standards Profile (StdV-1) in that a timed forecast may contribute to the decision to retire or phase out the use of a certain standard in connection with a resource. Similarly, SV-9 forecasts relate to the Standards Forecasts (StdV-2) in that a certain standard may be adopted depending on a certain technology or skill becoming available (e.g., the availability of Java Script may influence the decision to adopt a new HTML standard).

Alternatively, the SV-9 may relate forecasts to SV elements (e.g., systems) where applicable. The list of resources potentially impacted by the forecasts can also be summarized as additional information in a SV-9.

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

SV-5a Operational Activity to Systems Function Traceability Matrix

SV-5b Operational Activity to Systems Traceability Matrix

SV-6 Systems Resource Flow Matrix

SV-7 Systems Measures Matrix

SV-8 Systems Evolution Description

SV-9 Systems Technology & Skills Forecast

Introduction to SV-10a, SV10b, and SV-10c

SV-10a Systems Rules Model

SV-10b Systems State Transition Description

SV-10c Systems Event-Trace Description

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

- Background
- Architecture Development
- Meta Model
- Viewpoints & Models
  - All Viewpoint
  - Capability Viewpoint
  - Data and Information Viewpoint
  - Operational Viewpoint
  - Project Viewpoint
  - Services Viewpoint
  - Standards Viewpoint
  - Systems Viewpoint
  - Models
- Presentation Techniques
- Configuration Management Overview
- Acronyms List and Glossary of Terms
- Site Map
- Archives

DoDAF Viewpoints and Models

Systems Viewpoint

SV-10a: Systems Rules Model

The SV-10a specifies functional and non-functional constraints on the implementation aspects of the architecture (i.e., the structural and behavioral elements of the Systems Viewpoint).

The SV-10a DoDAF-described Model describes constraints on the resources, functions, data, and ports that make up the SV physical architecture. The constraints are specified in text and may be functional or structural (i.e., non-functional).

The intended usage of the SV-10a includes:

- Definition of implementation logic.
- Identification of resource constraints.

Detailed Description:

The Systems Rules Model DoDAF-described Model describes the rules that control, constrain or otherwise guide the implementation aspects of the architecture. System Rules are statements that define or constrain some aspect of the business, and may be applied to:

- Performers.
- Resource Flows.
- System Functions.
- System Ports.
- Data Elements.

In contrast to the OV-6a Operational Rules Model, SV-10a focuses on physical and data constraints rather than business rules.

Constraints can be categorized as follows:

- Structural Assertions - non-functional constraints governing some physical aspect of the architecture.
- Action Assertions - functional constraints governing the behavior of resources, their interactions and Resource Flow exchanges.
- Derivations - these involve algorithms used to compute facts.

Where a System Rule is based on some standard, then that standard should be listed in the StdV-1 Standards Profile.

Some System Rules can be added as annotations to other models. The SV-10a then should provide a listing of the complete set of rules with a reference to any models that they affect.

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

Go to top of page ↑

DoDAF Viewpoints and Models

Systems Viewpoint

SV-10b: Systems State Transition Description

The SV-10b is a graphical method of describing a resource (or system function) response to various events by changing its state. The diagram basically represents the sets of events to which the resources in the Activities respond (by taking an action to move to a new state) as a function of its current state. Each transition specifies an event and an action.

The explicit time sequencing of service functions in response to external and internal events is not fully expressed in SV-4 Systems Functionality Description. The SV-10b can be used to describe the explicit sequencing of the functions. Alternatively, SV-10b can be used to reflect explicit sequencing of the actions internal to a single function, or the sequencing of system functions with respect to a specific resource.

The intended usage of the SV-10b includes:

- Definition of states, events and state transitions (behavioral modeling).
- Identification of constraints.

Detailed Description:

The SV-10b relates events to resource states and describes the transition from one state to another. The SV-10b is based on the state chart diagram. A state machine is defined as "a specification that describes all possible behaviors of some dynamic view element. Behavior is modeled as a traversal of a graph of specific states interconnected by one or more joined transition arcs that are triggered by the dispatching of series of event instances. During this traversal, the state machine executes a series of actions associated with various elements of the state machine." State chart diagrams can be unambiguously converted to structured textual rules that specify timing aspects of events and the responses to these events, with no loss of meaning. However, the graphical form of the state diagrams can often allow quick analysis of the completeness of the rule set, and detection of dead ends or missing conditions. These errors, if not detected early during the solution analysis phase, can often lead to serious behavioral errors in fielded capabilities, or to expensive correction efforts.

The SV-10b models state transitions from a resource perspective, with a focus on how the resource responds to stimuli (e.g., triggers and events). As in the OV-6b Operational State Transition Description, these responses may differ depending upon the rule set or conditions that apply as well as the resource's state at the time the stimuli is received. A change of state is called a transition. Each transition specifies the response based on a specific event and the current state. Actions may be associated with a given state or with the transition between states. A state and its associated actions specify the response of a resource or function, to events. When an event occurs, the next state may vary depending on the current state (and its associated action), the event, and the rule set or guard conditions.

The SV-10b can be used to describe the detailed sequencing of functions described in SV-4 Systems Functionality Description. However, the relationship between the actions included in SV-10b and the functions in SV-4 Systems Functionality Description depends on the purposes of the architecture and the level of abstraction used in the models. The explicit sequencing of functions in response to external and internal events is not fully expressed in SV-4 Systems Functionality Description. SV-10b can be used to reflect explicit sequencing of the functions, the sequencing of actions internal to a single function, or the sequencing of functions with respect to a specific resource.

States in a SV-10b model may be nested. This enables quite complex models to be created to represent systems behavior. Depending upon the architecture project's needs, the SV-10b may be used separately or in conjunction with the SV-10c Systems Event-Trace Description.

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

SV-5a Operational Activity to Systems Function Traceability Matrix

SV-5b Operational Activity to Systems Traceability Matrix

SV-6 Systems Resource Flow Matrix

SV-7 Systems Measures Matrix

SV-8 Systems Evolution Description

SV-9 Systems Technology & Skills Forecast

Introduction to SV-10a, SV10b, and SV-10c

SV-10a Systems Rules Model

SV-10b Systems State Transition Description

SV-10c Systems Event-Trace Description

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

DoDAF Viewpoints and Models

Systems Viewpoint

SV-10c: Systems Event-Trace Description

The SV-10c provides a time-ordered examination of the interactions between functional resources. Each event-trace diagram should have an accompanying description that defines the particular scenario or situation.

The SV-10c is valuable for moving to the next level of detail from the initial solution design, to help define a sequence of functions and system data interfaces, and to ensure that each participating resource or System Port role has the necessary information it needs, at the right time, to perform its assigned functionality.

The intended usage of the SV-10c includes:

- Analysis of resource events impacting operation.
- Behavioral analysis.
- Identification of non-functional system requirements.

Detailed Description:

The SV-10c specifies the sequence in which Resource Flow elements are exchanged in context of a resource or System Port. Systems Event-Trace Descriptions are sometimes called sequence diagrams, event scenarios or timing diagrams. The components of a SV-10c include functional resources or system ports, owning performer as well as the port which is the subject for the lifeline.

Specific points in time can be identified. The Resource Flow from one resource/port to another can be labeled with events and their timing. The System Event-Trace Description provides a time-ordered examination of the Resource Flow elements exchanged between participating resources (external and internal) or system ports. Each Event/Trace diagram should have an accompanying description that defines the particular scenario or situation.

The SV-10c is typically used in conjunction with the SV-10b Systems State Transition Description to describe the dynamic behavior of resources. The data content of messages that connect Resource Flows in a SV-10c may be related with Resource Flows (the interactions in the SV-1 Systems Interface Description and SV-3 Systems-Systems Matrix), Resource Flows (the data in the SV-4 Systems Functionality Description and SV-6 Systems Resource Flow Matrix) and entities (in DIV-3 Physical Data Model) modeled in other models.

SV-1 Systems Interface Description

SV-2 Systems Resource Flow Description

SV-3 Systems-Systems Matrix

SV-4 Systems Functionality Description

SV-5a Operational Activity to Systems Function Traceability Matrix

SV-5b Operational Activity to Systems Traceability Matrix

SV-6 Systems Resource Flow Matrix

SV-7 Systems Measures Matrix

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

- Background
- Architecture Development
- Meta Model
- Viewpoints & Models
  - Models
  - Model Categories
  - Levels of Architecture
  - Architecture Interrogatives
  - Architecture Modeling Primitives
  - Mapping to DM2
- Presentation Techniques
- Configuration Management Overview
- Acronyms List and Glossary of Terms
- Site Map
- Archives

Models

Model List

The DoDAF-described Models that are available in DoDAF V2.0 are listed in the **table below**. The list provides the possible models and is not prescriptive. The decision-maker and process owners will determine the DoDAF-described Models that are required for their purposes. The DoDAF-described Models are grouped into the following viewpoints:

- All Viewpoint (AV)
- Capability Viewpoint (CV)
- Data and Information Viewpoint (DIV)
- Operational Viewpoint (OV)
- Project Viewpoint (PV)
- Services Viewpoint (SvcV)
- Standard Viewpoint (StdV)
- Systems Viewpoint (SV)

DoDAF V2.0 Models

Models	Descriptions
AV-1: Overview and Summary Information	Describes a Project's Visions, Goals, Objectives, Plans, Activities, Events, Conditions, Measures, Effects (Outcomes), and produced objects.
AV-2: Integrated Dictionary	An architectural data repository with definitions of all terms used throughout the architectural data and presentations.
CV-1: Vision	The overall vision for transformational endeavors, which provides a strategic context for the capabilities described and a high-level scope.
CV-2: Capability Taxonomy	A hierarchy of capabilities which specifies all the capabilities that are referenced throughout one or more Architectural Descriptions.
CV-3: Capability Phasing	The planned achievement of capability at different points in time or during specific periods of time. The CV-3 shows the capability phasing in terms of the activities, conditions, desired effects, rules complied with, resource consumption and production, and measures, without regard to the performer and location solutions.
CV-4: Capability Dependencies	The dependencies between planned capabilities and the definition of logical groupings of capabilities.
CV-5: Capability to	The fulfillment of capability requirements shows the

Organizational Development Mapping	planned capability deployment and interconnection for a particular Capability Phase. The CV-5 shows the planned solution for the phase in terms of performers and locations and their associated concepts.
CV-6: Capability to Operational Activities Mapping	A mapping between the capabilities required and the operational activities that those capabilities support.
CV-7: Capability to Services Mapping	A mapping between the capabilities and the services that these capabilities enable.
DIV-1:Conceptual Data Model	The required high-level data concepts and their relationships.
DIV-2: Logical Data Model	The documentation of the data requirements and structural business process (activity) rules. In DoDAF V1.5, this was the OV-7.
DIV-3: Physical Data Model	The physical implementation format of the Logical Data Model entities, e.g., message formats, file structures, physical schema. In DoDAF V1.5, this was the SV-11.
OV-1: High-Level Operational Concept Graphic	The high-level graphical/textual description of the operational concept.
OV-2: Operational Resource Flow Description	A description of the Resource Flows exchanged between operational activities.
OV-3: Operational Resource Flow Matrix	A description of the resources exchanged and the relevant attributes of the exchanges.
OV-4: Organizational Relationships Chart	The organizational context, role or other relationships among organizations.
OV-5a: Operational Activity Decomposition Tree	The capabilities and activities (operational activities) organized in a hierarchal structure.
OV-5b: Operational Activity Model	The context of capabilities and activities (operational activities) and their relationships among activities, inputs, and outputs; Additional data can show cost, performers, or other pertinent information.
OV-6a: Operational Rules Model	One of three models used to describe activity (operational activity). It identifies business rules that constrain operations.
OV-6b: State Transition Description	One of three models used to describe operational activity (activity). It identifies business process (activity) responses to events (usually, very short activities).
OV-6c: Event-Trace Description	One of three models used to describe activity (operational activity). It traces actions in a scenario or sequence of events.
PV-1: Project Portfolio	It describes the dependency relationships between the

Relationships	organizations and projects and the organizational structures needed to manage a portfolio of projects.
PV-2: Project Timelines	A timeline perspective on programs or projects, with the key milestones and interdependencies.
PV-3: Project to Capability Mapping	A mapping of programs and projects to capabilities to show how the specific projects and program elements help to achieve a capability.
SvcV-1 Services Context Description	The identification of services, service items, and their interconnections.
SvcV-2 Services Resource Flow Description	A description of Resource Flows exchanged between services.
SvcV-3a Systems-Services Matrix	The relationships among or between systems and services in a given Architectural Description.
SvcV-3b Services-Services Matrix	The relationships among services in a given Architectural Description. It can be designed to show relationships of interest, (e.g., service-type interfaces, planned vs. existing interfaces).
SvcV-4 Services Functionality Description	The functions performed by services and the service data flows among service functions (activities).
SvcV-5 Operational Activity to Services Traceability Matrix	A mapping of services (activities) back to operational activities (activities).
SvcV-6 Services Resource Flow Matrix	It provides details of service Resource Flow elements being exchanged between services and the attributes of that exchange.
SvcV-7 Services Measures Matrix	The measures (metrics) of Services Model elements for the appropriate time frame(s).
SvcV-8 Services Evolution Description	The planned incremental steps toward migrating a suite of services to a more efficient suite or toward evolving current services to a future implementation.
SvcV-9 Services Technology & Skills Forecast	The emerging technologies, software/hardware products, and skills that are expected to be available in a given set of time frames and that will affect future service development.
SvcV-10a Services Rules Model	One of three models used to describe service functionality. It identifies constraints that are imposed on systems functionality due to some aspect of system design or implementation.
SvcV-10b Services State Transition Description	One of three models used to describe service functionality. It identifies responses of services to events.
SvcV-10c Services Event-Trace Description	One of three models used to describe service functionality. It identifies service-specific refinements of critical sequences of events described in the

	Operational Viewpoint.
[StdV-1 Standards Profile]()	The listing of standards that apply to solution elements.
[StdV-2 Standards Forecast]()	The description of emerging standards and potential impact on current solution elements, within a set of time frames.
[SV-1 Systems Interface Description]()	The identification of systems, system items, and their interconnections.
[SV-2 Systems Resource Flow Description]()	A description of Resource Flows exchanged between systems.
[SV-3 Systems-Systems Matrix]()	The relationships among systems in a given Architectural Description. It can be designed to show relationships of interest, (e.g., system-type interfaces, planned vs. existing interfaces).
[SV-4 Systems Functionality Description]()	The functions (activities) performed by systems and the system data flows among system functions (activities).
[SV-5a Operational Activity to Systems Function Traceability Matrix]()	A mapping of system functions (activities) back to operational activities (activities).
[SV-5b Operational Activity to Systems Traceability Matrix]()	A mapping of systems back to capabilities or operational activities (activities).
[SV-6 Systems Resource Flow Matrix]()	Provides details of system resource flow elements being exchanged between systems and the attributes of that exchange.
[SV-7 Systems Measures Matrix]()	The measures (metrics) of Systems Model elements for the appropriate timeframe(s).
[SV-8 Systems Evolution Description]()	The planned incremental steps toward migrating a suite of systems to a more efficient suite, or toward evolving a current system to a future implementation.
[SV-9 Systems Technology & Skills Forecast]()	The emerging technologies, software/hardware products, and skills that are expected to be available in a given set of time frames and that will affect future system development.
[SV-10a Systems Rules Model]()	One of three models used to describe system functionality. It identifies constraints that are imposed on systems functionality due to some aspect of system design or implementation.
[SV-10b Systems State Transition Description]()	One of three models used to describe system functionality. It identifies responses of systems to events.
[SV-10c Systems Event-Trace Description]()	One of three models used to describe system functionality. It identifies system-specific refinements of critical sequences of events described in the Operational Viewpoint.

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

- Background
- Architecture Development
- Meta Model
- Viewpoints & Models
  - Models
  - Model Categories
  - Levels of Architecture
  - Architecture Interrogatives
  - Architecture Modeling Primitives
  - Mapping to DM2
- Presentation Techniques
- Configuration Management Overview
- Acronyms List and Glossary of Terms
- Site Map
- Archives

DoD EA Conference 2011

Hampton, VA April 11-15, 2011
Registration will be available at:
WWW.DODENTERPRISEARCHITECTURE.ORG
Targeted Date TBD
Co-hosted by DoD CIO Architecture, Standards & Interoperability Directorate and Joint Staff

Models

Model Categories

To aid the decision-maker and process owners, the DoDAF-described Models have been categorized into the following types:

- Tabular: Models which present data arranged in rows and columns, which includes structured text as a special case.
- Structural: This category comprises diagrams describing the structural aspects of an architecture.
- Behavioral: This category comprises diagrams describing the behavioral aspects of an architecture.
- Mapping: These models provide matrix (or similar) mappings between two different types of information.
- Ontology: Models which extend the DoDAF ontology for a particular architecture.
- Pictorial: This category is for free-form pictures.
- Timeline: This category comprises diagrams describing the programmatic aspects of an architecture.

DoDAF Architectural Descriptions are expressed in the form of sets of data, expressed as DoDAF-described Models, which can be classified into categories. The table below provides a summary of how the DoDAF-described Models can be sorted using the categories above and can provide insight for the decision-maker and process owners for the DoDAF-described Models needed.

DoDAF-Described Models Categorized by Type

Category / VP	Tabular	Structural	Behavioral	Mapping	Taxonomy	Pictorial	Timeline
All Viewpoint	AV-1				AV-2		
Capability	CV-1	CV-4		CV-6 CV-7	CV-2		CV-3 CV-5
Operational	OV-3	OV-2 OV-4	OV-6a OV-6b OV-6c		OV-5	OV-1	
System	SV-6 SV-7 SV-9	SV-1 SV-2	SV-4 SV-10a SV-10b SV-10c	SV-3 SV-5a SV-5b			SV-8
Standards	StdV-1 StdV-2						
Data and Information		DIV-1 DIV-2 DIV-3					
Service	SvcV-6 SvcV-7 SvcV-9	SvcV-1 SvcV-2	SvcV-4 SvcV-10a SvcV-10b SvcV-10c	SvcV-3a SvcV-3b SvcV-5			SvcV-8
Project		PV-1		PV-3			PV-2

Some of the DoDAF-described Models above were based on analysis of Ministry of Defence Architecture Framework (MODAF) and North Atlantic Treaty Organization (NATO) Architecture Framework (NAF) views and information requirements provided in the key process workshops by the subject matter experts. In addition, analysis on the DoDAF V1.5 products was performed by the DoDAF V2.0 Presentation Technical Working Group . The objective of the analysis was to determine if any product could be eliminated or if any product was created in every architecture effort. The OV-1 is the most created product at 92 percent of the projects. The SV-7 was the least created product at 5 percent. What is revealing is that there was not a product that could be deleted. The results of the survey are documented in the DoDAF Product Development Questionnaire Analysis Report online in the DoDAF Journal.

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background
Architecture Development
Meta Model
Viewpoints & Models
Models
Model Categories
Levels of Architecture
Architecture Interrogatives
Architecture Modeling Primitives
Mapping to DM2
Presentation Techniques
Configuration Management Overview
Acronyms List and Glossary of Terms

Site Map
Archives

Models

Levels of Architecture

In addition, based on the level of the architecture effort, the decision-maker and architect need to determine the DoDAF-described Models and Fit-for-Purpose Views needed. To assist, the table below uses the Zachman Framework with the levels of architecture overlaid for consideration by the decision-maker and architect. The table is only provided as input; DoDAF is not prescribing DoDAF-described Model or Fit-for-Purpose Views or presentations.

Zachman Framework with Levels of Architecture

Strategic Architectures apply to entire Department | Capability Architectures specific to CPM & Component Tiers | Solution Architecture: Materiel/Non-materiel | DoD EA { Strategic, Capability

	Layer	What (Data)	How (Function)	Where (Network)	Who (People)	When (Time)	Why (Motivation)
1	Scope Context Boundary **(Planner)**	List of things important to the business	List of processes the business performs	List of locations in which the business operates	List of organizations important to the business	List of events significant to the business	List of business goals/ strategies
2	Business Model Concepts **(Owner)**	e.g., Semantic or Entity-relationship Model	e.g., Business Process Model	e.g., Business Logistics System	e.g., Work Flow Model	e.g., Master Schedule	e.g., Business Plan
3	System Model Logic **(Designer)**	e.g., Logical Data Model	e.g., Application Architecture	e.g., Distributed System Architecture	e.g., Human Interface Architecture	e.g., Processing Structure	e.g., Business Rule Model
4	Technology Model Physics **(Builder)**	e.g., Physical Data Model	e.g., System Design	e.g., Technology Architecture	e.g., Presentation Architecture	e.g., Control Structure	e.g., Rule Design
5	Component Configuration **(Implementer)**	e.g., Data Definition	e.g., Program	e.g., Network Architecture	e.g., Security Architecture	e.g., Timing Definition	e.g., Rule Specification
6	Functioning Enterprise Instances **(Worker)**	e.g., Data	e.g., Function	e.g., Network	e.g., Organization	e.g., Schedule	e.g., Strategy

Go to top of page ↑

Background

Architecture Development

Meta Model

Viewpoints & Models

Models

Model Categories

Levels of Architecture

Architecture Interrogatives

Architecture Modeling Primitives

Mapping to DM2

Presentation Techniques

Configuration Management Overview

Acronyms List and Glossary of Terms

Site Map

Archives

Models

Architecture Interrogatives

A critical part of defining an architecture is answering what is known as, the set of standard interrogatives, which are the set of questions, who, what, when, where, why, and how, that facilitate collection and usage of architecture-related data. DoDAF provides a means of answering these interrogatives through the DoDAF Viewpoints and DoDAF-described Models, and the DoDAF Meta-model Data Groups, as the major parts of the DoDAF Conceptual Data Model (CDM).

The table below is a simple matrix that presents the DoDAF Viewpoints and DoDAF-described Models as they relate to the DoDAF Meta-model Groups, and how these viewpoints, models, and groups answer the standard interrogatives. When architecture is required to support decision-making, the matrix is useful in both data collection, and decisions on how to best represent the data in DoDAF-described Models that are appropriate to the purpose for which the architecture is created.

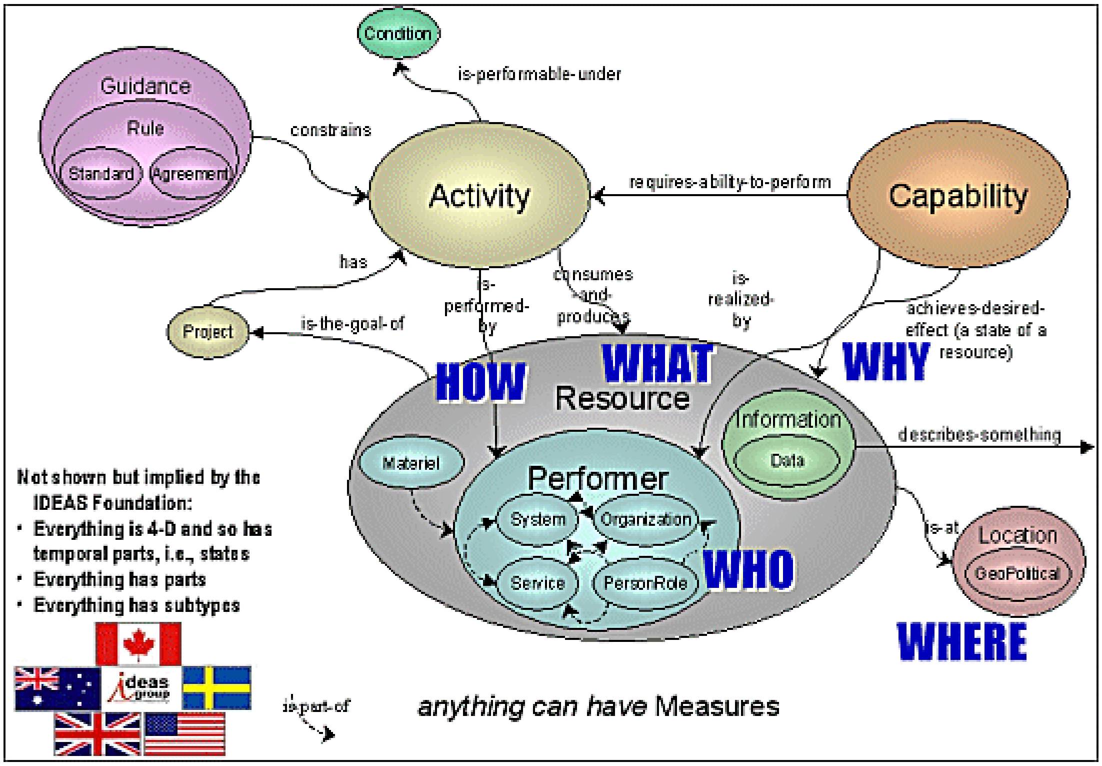
Standard Interrogatives Matrix

	What (Date)	How (Function)	Where (Network)	Who (People)	When (Time)	Why (Motivation)
Viewpoint	AV, DIV	OV, SV, SvcV	OV, SV, SvcV	OV	CV, OV, PV, SV, SvcV	AV, CV, OV, StdV, SV, SvcV
DoDAF-described Models	AV-2, DIV-1, DIV-2, DIV-3	OV-5a, OV-5b, OV-6a, b, c, SV-4, SV-10a, b, c, SvcV-10a, b, c	OV-2, SV-2, SvcV-2	OV-2, OV-4	CV-2, CV-4, OV-6c, PV-2, SV-8, SvcV-8, Sv-10c, SvcV-10c	AV-1, CV-1, OV-6a, StdV-1, StdV-2, SV-10a, SvcV-10a
Meta-model group	Information and Data, Project	Activity, Capability, Service, Measures	Location	Performer	All	Rules, Goals

As an example, a decision is required on changing a logistics transaction process (a composite of activities). The process is documented (how), to include the measures of performance, services required, and the capability supported by the action (activity). Data required to execute the process (what) is collected concurrently. Included in that data collection is the location and other administrative data on the place of process execution (where), and the performers of the action (who). The time frames required (when) and the Rules, Goals, and Expected Results (why) are also determined. These interrogatives impact on measures of performance. Each of these interrogatives can be represented by either a DoDAF-described Model or a Fit-for-Purpose View defined by the architectural development team that meets agency requirements. Either way, the models and views needed are created utilizing data defined and derived from the DoDAF Meta-model.

The architecture interrogatives are overlaid on the DM2 Conceptual Data Model below:

- The Data Description - What (DM2 generalizes to other Resources besides just Data)
- The Function Description - How (and also the Performer that performs the Function, Measures, Rules, and Conditions associated with)
- The Network Description - Where (generalized)
- The People Description - Who (DM2 includes Organizations)
- The Time Description - When
- The Motivation Description - Why (broadened to include Capability requirements)



Architecture Interrogative overlay on the DM2 Conceptual Data Model
(click to enlarge)

Go to top of page ↑

DoDAF
DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

- Background
- Architecture Development
- Meta Model
- Viewpoints & Models
  - Models
  - Model Categories
  - Levels of Architecture
  - Architecture Interrogatives
  - Architecture Modeling Primitives
  - Mapping to DM2
- Presentation Techniques
- Configuration Management Overview
- Acronyms List and Glossary of Terms

- Site Map
- Archives

DoD EA Conference 2011

Hampton, VA April 11-15, 2011
Registration will be available at:
WWW.DODENTERPRISEARCHITECTURE.ORG
Targeted Date TBD
Co-hosted by DoD CIO Architecture, Standards & Interoperability Directorate and Joint Staff

Models

Architecture Modeling Primitives

Work is presently underway within the Department to ensure uniform representation for the same semantic content within architecture viewing, called Architecture Modeling Primitives. The Architecture Modeling Primitives, hereafter referred to as Primitives, will be a standard set of viewing elements and associated symbols mapped to DM2 concepts and applied to viewing techniques. Use of the Primitives to support the collection of architecture content in concert with the Physical Exchange Specification will aid in generating common understanding and improving communication. As the Primitives concepts are applied to more viewing techniques, they will be updated in the DoDAF Journal and details provided in subsequent releases of DoDAF. When creating an OV-6c in Business Process Modeling Notation (BPMN), the primitives notation may be used. DoD has created the notation and it is in the DoDAF Journal. The full range of Primitives for DoDAF-described Models, as with the current BPMN Primitives, will be coordinated for adoption by architecture tool vendors. Examples of presentations can be viewed online in the public DoDAF Journal.

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Models

Mapping to DM2

A mapping of the DM2 Concepts (classes), Associations (relationships), and Attributes to DoDAF-described Models, is shown in the table below. In the DM2 Concept, Association, or Attribute column, the Black text is a concept or attribute, the Red text is an association, and the Green Text is the security attributes in the DM2.

Click on the image below to open or save the Excel worksheet.

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
3	Technical Term	Composite Definition	AV-1	AV-2	OV-1	OV-2	OV-3	OV-4	OV-5a	OV-5b	OV-6a	OV-6b	OV-6c	SV-1	SV-2	SV-3
4	Activity	Work, not specific to a single organization, weapon system or individual that transforms inputs (Resources) into outputs (Resources) or changes their state.	n	o		n	n		n	n	o	n	n	n	n	n
5	activityChangesResource	Represents that an activity was / is / will-be the cause of change in the effected object with a before-after relationship.	o								o	o	o			
6	activityChangesResourceTypeInstanceOfMeasure	activityChangesResource is a member of Measure	o								o	o	o			
7	activityPartOfCapability	A disposition to manifest an Activity. An Activity to be performed to achieve a desired effect under specified [performance] standards and conditions through combinations of ways and means.														
8	activityPartOfCapabilityTypeInstanceOfMeasure	activityPartOfCapability is a member of Measure														
9	activityPartOfProjectType	A wholePart relationship between a Project and an Activity (Task) that is part of the Project														
10	activityPerformableUnderCondition	Represents that an activity was / is / can-be/ must-be conducted under certain conditions with a spatiotemporal overlap of the activity with the condition.	o			o	o			o	o	o	o			
11	activityPerformableUnderConditionTypeInstanceOfMeasure	activityPerformableUnderCondition is a member of Measure								o	o	o	o			
		An overlap between a Performer and an Activity that is non-specific as to whether:														

DM2 Mapping

Go to top of page ↑

DoDAF DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Architecture Development

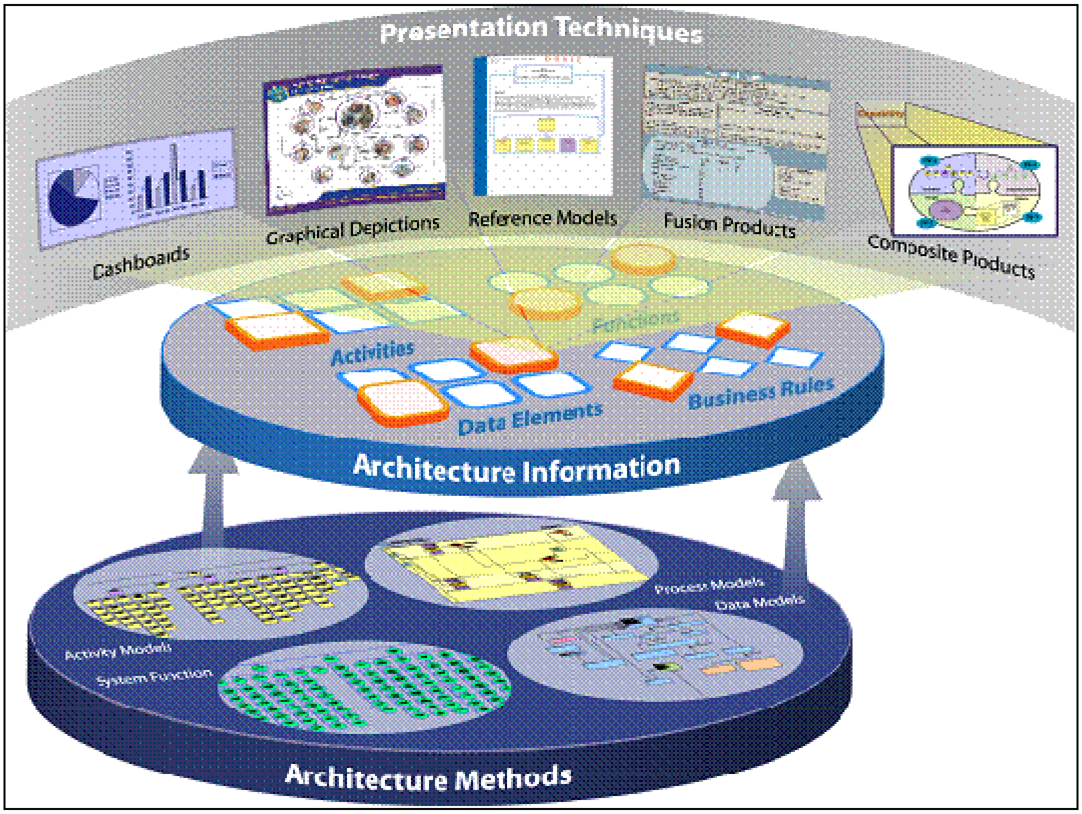
Architecture Presentation Techniques

While information is the lifeblood of enterprise architecture, it can be overwhelming to decision makers when presented in a raw format. Likewise, the structured methodology of modeling enterprise architecture information is both necessary and useful for creating Architectural Descriptions that can be shared between organizations. However, many of the 'traditional' architecture products are unwieldy because of their format and are useful only to trained architects. Many organizations develop a mandated architecture but make it expensive shelf-ware instead of using it to communicate important, accurate, and relevant information to the stakeholders who need it. Architects must be able to communicate architectural information in a meaningful way to process owners and other stakeholders, or the discipline of enterprise architecture will soon meet an untimely demise.

The results of architectural-related data collection need to be presentable to non-technical senior executives and managers at all levels. Many managers are skilled decision-makers, but have not had technical training in Architectural Description development. Since Architectural Description development efforts are designed to provide input to the decision-making process, representation of data needed is a logical extension of the overall process. This section describes these representations (architects call them models or views).

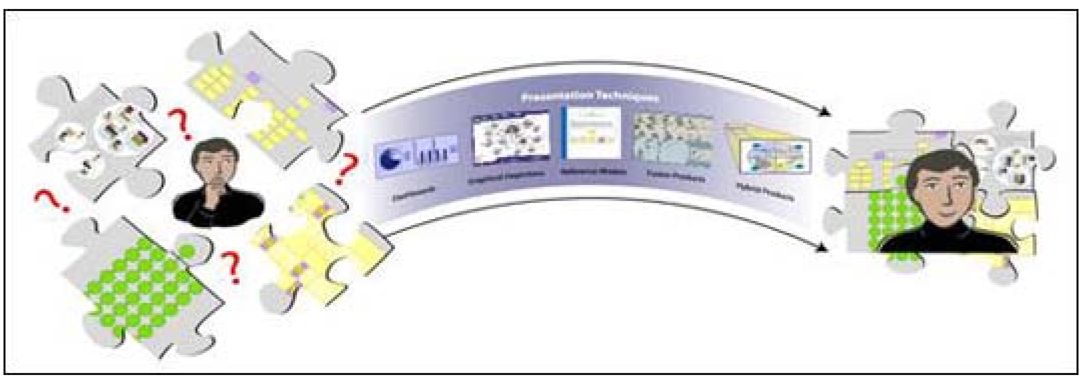
Overview

Effective presentation of business information is necessary for architects to tell the story of the architectural data with stakeholders. Since the purpose of the architecture discipline is to collect and store all relevant information about an enterprise, or some specific part of the enterprise, it can reasonably be assumed that the majority of information needed by an organization's decision makers is contained somewhere in the architectural data. Many of the existing architecture methods are valuable for organizing architectural information, but less valuable for communicating that information to stakeholders. Presentation views are always dependent on the quality of the architectural information that is collected through the rigor of architecture methods. As the figure below illustrates, presentation techniques pull from the architectural information store and display the data in a variety of meaningful ways to stakeholders.



Presentation Techniques

The presentation techniques and best practices described here were developed based on the idea that business information, captured both internally and externally to an organization's architecture in support of common user requirements, can be displayed in a way that enhances clarity and understanding, and facilitates decision-making. That often means complex technical information has to be 'translated' into a form for presentation that is useful to management. An 'Information Bridge', as shown in the figure below, is the link between the architect and management. The bridge provides the means to take technical information, and recast that information in graphical or textual terms that consistent with the culture of the organization.



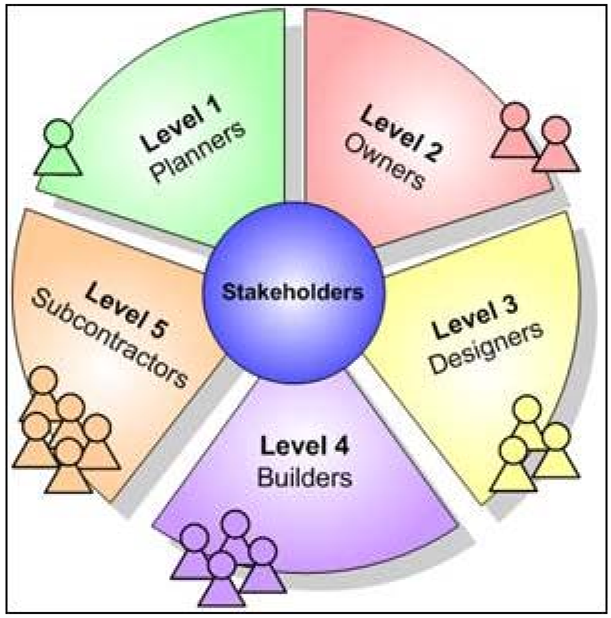
The Information Bridge

DoDAF V1.0 and V1.5 defined a set of products for visualizing, understanding, and assimilating the broad scope and complexities of an Architectural Description through graphic, tabular, or textual means. These products can still be produced, and are supported by the sets of DoDAF-described Models.

Choosing an Appropriate Presentation Technique

In any given business process, decisions must be made at multiple levels of the organization.

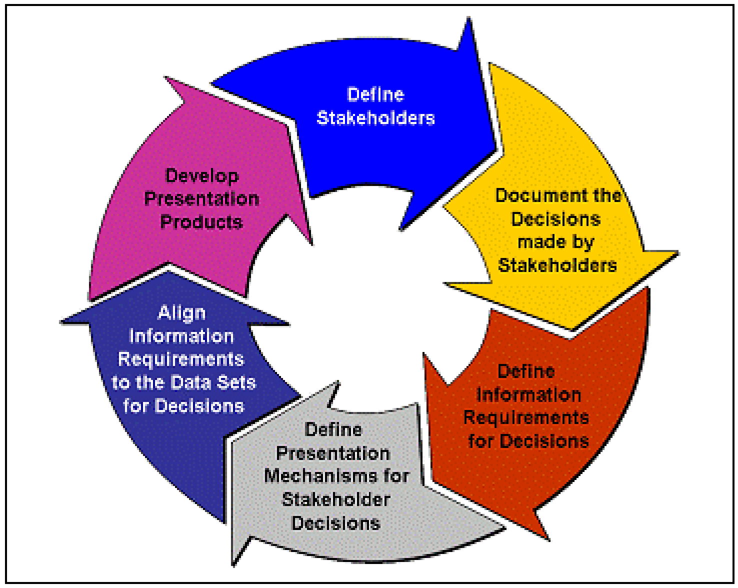
Whether one is a senior level executive, a process owner, or a system developer, he or she will need to make judgment calls based upon the available data. Each level of decision making, in turn, has both a unique purpose and understanding of Architectural Description, making it important to tailor the data to maximize its effectiveness. The presenter, with the help of an experienced architect, must determine the audience of a presentation before choosing the type of presentation technique to use. The figure below, based on the Zachman Framework, summarizes the multiple levels of decision makers within a typical organization that make up an audience.



Levels of Decision-Makers

Each level has differing requirements for presentation of data. Level 1 Planners may find a graphical wall chart more useful in making decisions, whereas a Level 4 Builder will most likely require a more technical presentation, one relating more directly to the Architectural Description. Level 5 sub-contractors are the workers who will perform the work required, and generally required varying levels of technical data and other information to accomplish their task.

Narrowing down the type of presentation required is done by asking the following question: What information does the decision maker need to make a data-supported decision? For each decision level there is a data set that can be manipulated using a presentation technique. After analyzing the audience and type of information, the presenter should consider the various types of techniques discussed in this section. The "Level of Decision-Makers" figure is a simplified representation of the presentation development process.



Presentation Development Process

It is imperative to realize that when choosing how to present data sets, there is no limit on what views to use. There are countless ways to display information to decision makers, and it is up to the presentation developer to determine the most effective way to accomplish this task.

This section describes a base of view development techniques to start from, each created to serve its own unique purpose. Details are provided on five different presentation techniques that have proven to be useful in engaging various audiences.

A more detailed discussion of DM2 Meta-model Groups is provided in the LDM, including a description and purpose for each group, the data capture method, and the use of each group. There are the ***DoDAF-described Models*** that derive from and conform to the DM2.

Alternatively, Fit-for-Purpose Views can be created, utilizing DoDAF-conformant data that provide other forms of graphical presentation. These use presentation that are more common to briefings and decision analysis. The five techniques commonly used are:

- Composite Views: Display multiple pieces of architectural data in formats that are relevant to a specific decision maker.
- Dashboards: Integrate abstracted architectural information for a given business context.
- Fusion Views: Display multiple pieces of architectural data and incorporate disparate pieces of information that are not captured within the Architectural Description.
- Graphics: Visually represent manipulated data.
- Reference Models: Capture the elements of the architectural data and translate those elements into text.

Fit-for-Purpose Views provide wide flexibility for the architect and process owner to create architectural views easily understood and useful to management for decision-making purposes. Each of these types of views is described below.

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background
Architecture Development
Meta Model
Viewpoints & Models
Presentation Techniques
Composite Views
Fusion Views
Reference Models
Configuration Management Overview
Acronyms List and Glossary of Terms

Site Map
Archives

Architecture Development

Composite Views

A composite view displays multiple pieces of architectural data in formats that are relevant to a specific decision maker. By drawing information from numerous sources, this presentation technique provides a holistic view for the audience. Contrasting two or more snapshots next to each other allow for an easy comparison of composite views. These views will be comprised of related architectural views that directly support each other (i.e., system functions in an SV-4 that support activities in an OV-5). The view can be graphically displayed in three dimensions to tie the pieces of architectural data together.

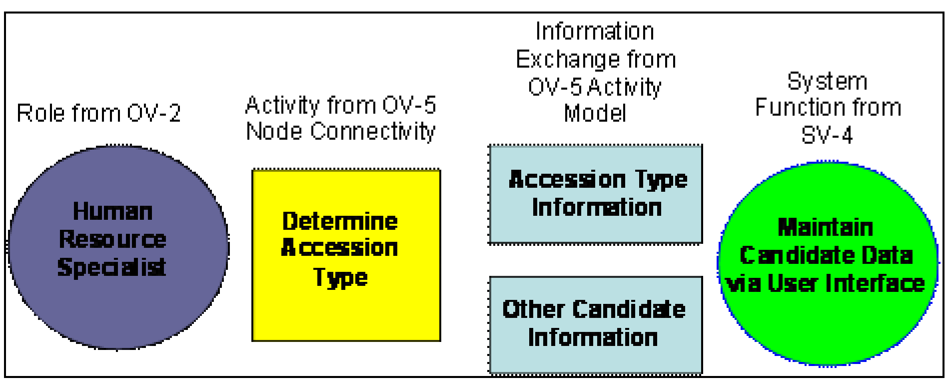
Purpose and Audience

Composite views allow decision makers to view important relationships in data without reading through large pieces of architectural data. Most business owners are interested only in their particular business area and its immediate interconnections. By placing relevant parts of architectural data directly in front of the audience, it is easier to gain a comprehensive understanding of the data in an efficient manner. The audience that will find these views most useful are:

- Process Owners who have direct staff oversight or technical systems expertise and require high level conceptual briefings.
- Designers-implementers of the initiative, who require information detailing specifics of implementation.
- Builders-System architects who require details on how to implement and use products.

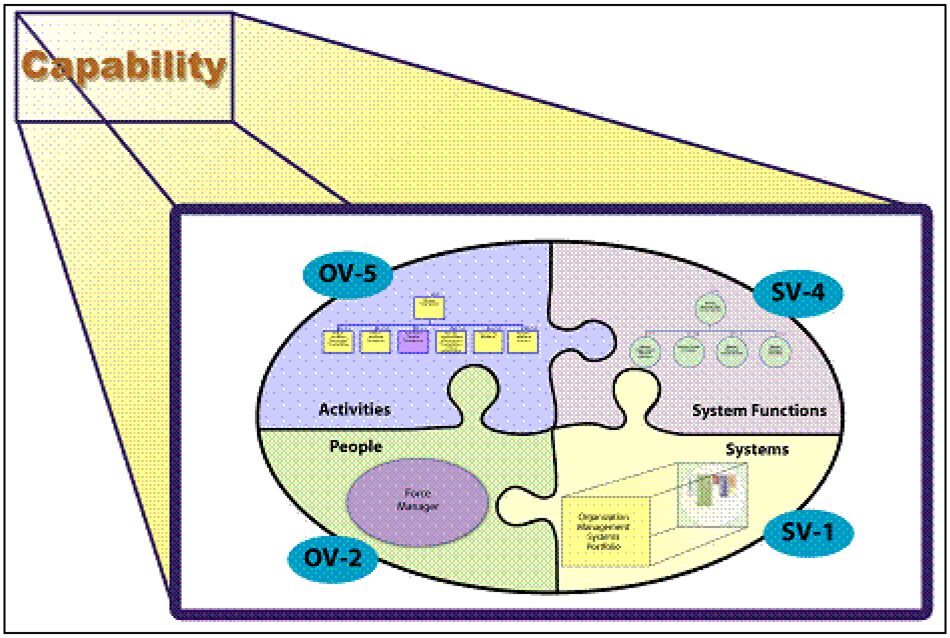
Examples

The example composite view figure illustrates a simplified example of a Composite View. The activity "Determine Accession Type" is supported by the system function "Maintain Candidate Data" via User Interface. The information to support this system function includes "Accession Type Information" and "Other Candidate Information". The activity is carried out by a "Human Resource Specialist".



Example Composite View

The figure below illustrates a final version of a different Composite View. Four architectural samples are displayed, and a three-dimensional Capability label lets the audience know the common tie.



Another Composite View

Composite views are ideal for explaining interconnections between Architectural Descriptions. The audience will more easily understand relationships in data by viewing manageable slices of mappings all at once. The developer of these views can interchange Architectural Descriptions easily, highlighting the most important parts for the audience. Composite views are neither wordy, nor oversimplified. Additionally, they can be used by a wide range audience.

Dashboard Views

Dashboards integrate abstracted architectural information for a given business context and are generally geared to displaying information required by a specific stakeholder. A well-constructed dashboard consists of a status, trend, or a variance to a plan, forecast, or budget (or combination thereof). Dashboards are generally user friendly, providing easy access to enterprise data to enable organizations to track performance and optimize decision-making. High-level decision makers generally like dashboards because dashboards are frequently used in other business contexts besides enterprise architecture, and decision makers have a familiarity with this presentation tool. In addition, the dashboard is formatted so key stakeholders can review valuable, insightful information at a glance to manage their organization's performance goals effectively.

Purpose and Audience

The visual qualities of a dashboard allow executives and managers to identify which of their business areas are successful and which are problem areas needing immediate attention. Like all enterprise architecture presentation techniques, the dashboard must be designed with the stakeholder audience in mind and should be geared towards the audience's specific goals. One of the most important goals in creating a dashboard is to deliver a highly intuitive tool that yields greater business insight for decision makers.

Since dashboards display highly aggregated and abstracted information, they are typically targeted to senior decision makers. However, they are also a great tool to share with junior architects to ensure they understand key business drivers and concepts as they take a deeper dive into their respective areas.

Examples

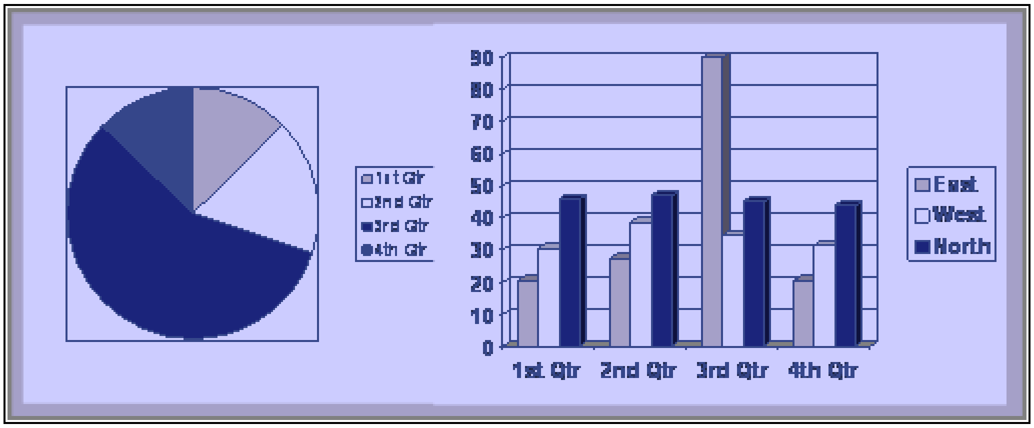
The visualization techniques table illustrates various visualization techniques that can be used to create a dashboard.

Visualization Techniques

Visualization Technique	Description	When to Use
Pie Chart	Pie charts can be used for representing small sets of information. However, they are generally considered poor data visualization for any data set with more than half a dozen elements. The problem with pie charts is that it is very difficult to discern proportional differences with a radically divided circle, except in the case of a small data set that has large value differences within it. Pie charts also pose a problem for labeling, as they are either dependent on a color or pattern to describe the different data elements, or the labels need to be arranged around the perimeter of the pie, creating a visual distraction.	Pie charts should be used to represent very small data sets that are geared to high-level relationships between data elements. Pie charts present summary level relationships, and should be used carefully for detailed analysis.
Bar Chart	Bar charts are an ideal visualization for showing the relationship of data elements within a series or multiple series. Bar charts allow for easy comparison of values, share a common measure, and are easily compared to one another.	Bar charts are best suited for categorical analysis but can also be used for short duration series analysis (e.g., the months of a year). A presenter needs to be aware of the risks in using bar charts if there is a data set that has one element with a large outlier value; this will render the visualization for the remaining data elements unusable. This chart scale is linear, and will not clearly represent the relationships between the remaining data elements.
Line Charts	Time series line charts are most commonly used with the time dimension along the X-axis and the data being measured along the Y-axis.	Use line charts when you would like to see trends over time in a measure, versus a side-by-side, detailed comparison of data points. Line charts are ideal for time series analysis where you want to see the progress of one or more measures over time. Line charts also allow for comparative trend analysis as you can stack multiple series of data into one chart.
Area Charts	Area charts can be considered a subset of the line chart, where the area under or above the line is	Area charts are good for simple comparisons with multiple series of data. By setting contrasting color

	shaded or colored.	hues you can easily compare the trends over time between two or more series.
Tables and Lists	Tables and lists contain large amounts of data that can be categorized into a list or divided into a table but cannot be easily compiled into a visual or numerical analysis tool.	Tables and lists are best used for information that either contains large lists of non-numeric data, or data that has relationships not easily visualized or does not lend itself to easy numeric analysis.

An illustration of the use of these techniques to create a dashboard.



Notional Dashboard

A dashboard is effective in demonstrating the number of systems supporting an activity or modifying a data element. It can provide data from a variety of sources to create a multi-disciplined and multi-dimensional performance feedback. It combines standard components and building blocks to create an executive dashboard that meets particular needs.

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense | Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

Background
Architecture Development
Meta Model
Viewpoints & Models
Presentation Techniques
- Composite Views
- Fusion Views
- Reference Models

Configuration Management Overview
Acronyms List and Glossary of Terms

Site Map
Archives

Architecture Development

Fusion Views

A fusion view is very similar to a composite view in that it displays multiple pieces of architectural data in formats that are relevant to a specific decision maker. However, a fusion view also incorporates disparate pieces of information that are not captured within the Architectural Description. Fusion views are frequently used to display information that is sensitive in nature and that is viewed only by certain stakeholders making specific decisions. For example, fusion views could be used to display funding information regarding a program or system.

Purpose and Audience

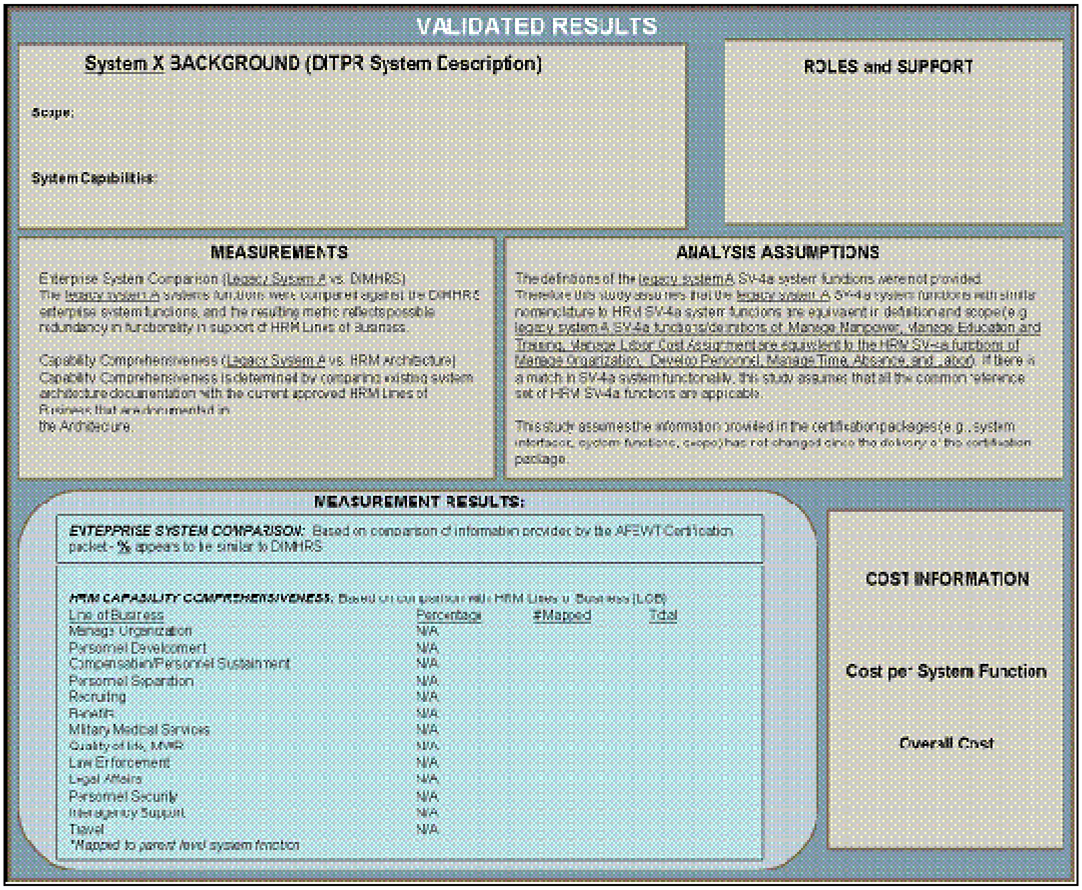
Fusion views serve as a single location for viewing disparate pieces of information from within and outside of the context of the Architectural Description. A fusion view can be used to bridge the gap between an enterprise architecture analysis, other analysis, and transformation processes. It is frequently used when making a decision that incorporates information that has been deliberately omitted from the Architectural Description.

Fusion views can be used by all members of the Development Team (i.e., Planners, Owners, Designers, Builders, and Subcontractors). Planners use them to review portfolio choices within the context of the Architectural Description and to determine how choices compare to the portfolio as a whole, as well as against an individual system or group of systems. Owners use fusion views to review current progress against planned goals, which may include cost and schedule data or to address capability gaps within the Architectural Description. Designers, Builders, and Subcontractors can use a more detailed fusion view to review implementation impacts associated with the development of a particular system and to show the complexity of the information involved.

Examples

The financial data fusion view figure incorporates financial data and support information into an analysis. The outside information commonly consists of financial data gathered from authorized sources or scheduling information and constraints gathered from a Work Breakdown Structure (WBS) or similar reporting mechanism. This can be tailored so that the user can use any data that is relevant to their needs.

Click image for larger view



Financial Data Fusion View

A fusion view is a powerful tool with the ability to portray accurately the relationships between different types of information. A fusion view can be used to provide a 360-degree view of a system, validate systems against Architectural Descriptions, show availability of services, or provide a perspective of a current environment (e.g., a viewpoint) that can be used in decision-making discussions.

Graphics Views

A graphic is a representation (as a picture, map, or graph) used especially for illustration of concepts. In the case of enterprise architecture, graphics views are used for the pictorial representation and manipulation of data. In other words graphics provide a visual representation of business information and processes. Graphical views can be of tremendous benefit in representing multiple concepts in a clean, simple design.

Purpose and Audience

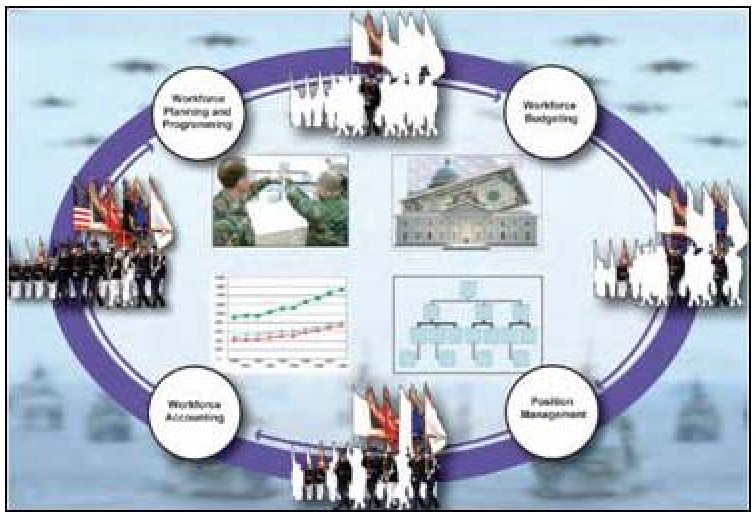
Graphical views provide a visual depiction of the information and are therefore targeted at visually oriented learners. When properly executed, a graphical view allows the intended audience to view the information in an uncluttered, easy to understand, and precise design. Additionally, graphical views can attract attention and cause interest. Most people understand pictures faster and easier than they do text or model-based documents. Graphical views provide the presenter with unlimited options for displaying their business concepts and for tailoring their product to the targeted audience.

Because of the lack of underlying complexity, a graphical view tends to be more abstract and is usually presented to high-level audiences. The identification of the target stakeholder level and the intended message is the first step in determining whether a graphical view is the appropriate tool for information delivery. The appropriateness of graphical views can only be determined once the message and stakeholder level have been identified. Graphical depictions of data and business processes can be tailored to any stakeholder level as long as the intended message and information can be represented in a logical, reader-friendly form. All levels of decision makers will find graphical views useful for high-level analysis.

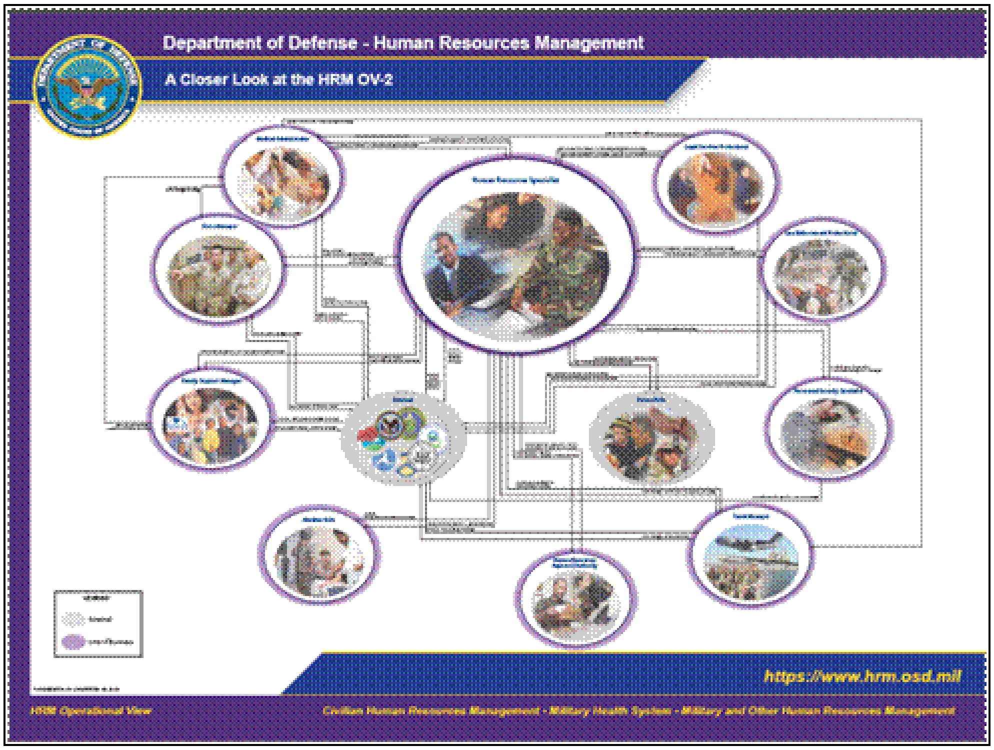
Examples

The use of graphical views is a common practice in DoD and non-DoD organizations. Because graphical views do not usually show the underlying complexity, it is important to remember that they are tied to details within the Architectural Description. As with dashboard views, if a stakeholder does not understand where the information came from, or if they lack faith in the detailed architectural information, then the graphical view will essentially be meaningless to them. It is also critical to emphasize the underlying architectural information when briefing the graphic to senior decision makers. An OV-1, for example, provides a high-level concept description of a business, and is usually the first, and can be the only architectural view a senior decision maker sees. In order for an OV-1 to have an impact, a decision maker must be able to see a direct correlation from the graphic view to the detailed aspects of the business.

The following figures illustrate this concept. Each part of the graphic view corresponds to a detailed area of the overall business, which will be represented and composed of a complex set of architectural views. The graphical views are also used to show the relationships between the business areas which come together to form a complete picture.



Non-prescriptive, Illustrative High-level Concept Description (OV-1)



Non-prescriptive, Illustrative High-level Operational Connectivity Description (OV-2)

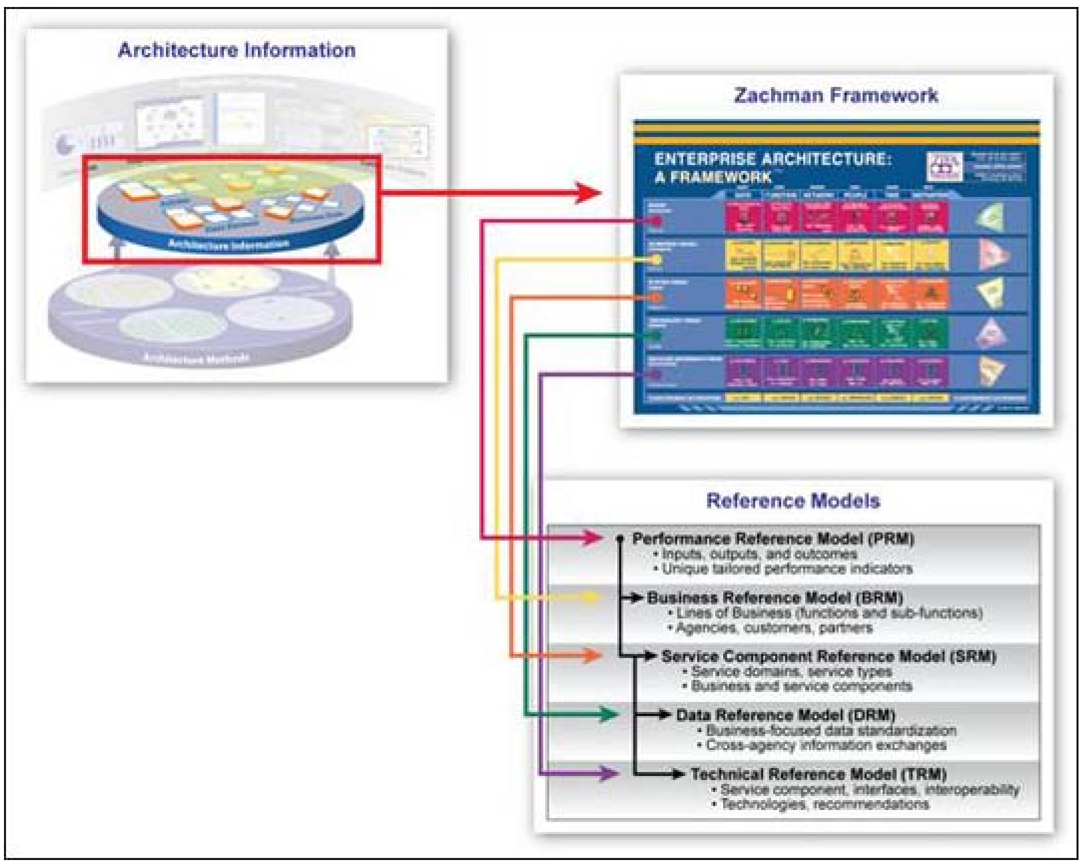
Graphical views enable the efficient communication of complex quantitative ideas. In a society that is fascinated with visual stimulation, the use of graphical views provides an attractive and efficient communications tool. When effectively designed, graphical views can facilitate understanding and recognition; promote analysis; and support learning and sharing of ideas.

Go to top of page ↑

Architecture Development

Reference Models

Reference models provide textual extractions of underlying architectural data. As the notional reference model figure below illustrates, reference models capture the elements of the architectural views, and translate those elements into text. This reference model provides a framework for describing important elements of the FEA in a common and consistent way. The FEA consists of five reference models: Performance Reference Model (PRM), Business Reference Model (BRM), Service Component Reference Model (SRM), Data Reference Model (DRM), and the Technical Reference Model (TRM). Through the use of this common framework and vocabulary, IT portfolios can be better managed and leveraged across the Federal Government.



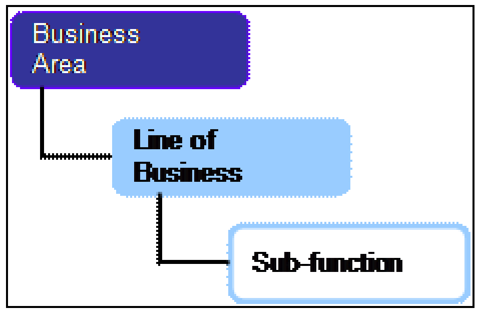
A Notional Reference Model

Purpose and Audience

Reference models are designed to facilitate cross-agency analysis, through the development of a common taxonomy and ontology for describing the business operations of Federal agencies, independent of any specific agency. Cross-agency analysis is used by planners and process owners to identify duplicate investments, gaps, and opportunities for collaboration within and across agencies. Collectively, the reference models comprise a framework for describing important elements of the FEA in a common and consistent way. Through the use of this common framework and vocabulary, IT portfolios can be better managed and leveraged across the Federal Government.

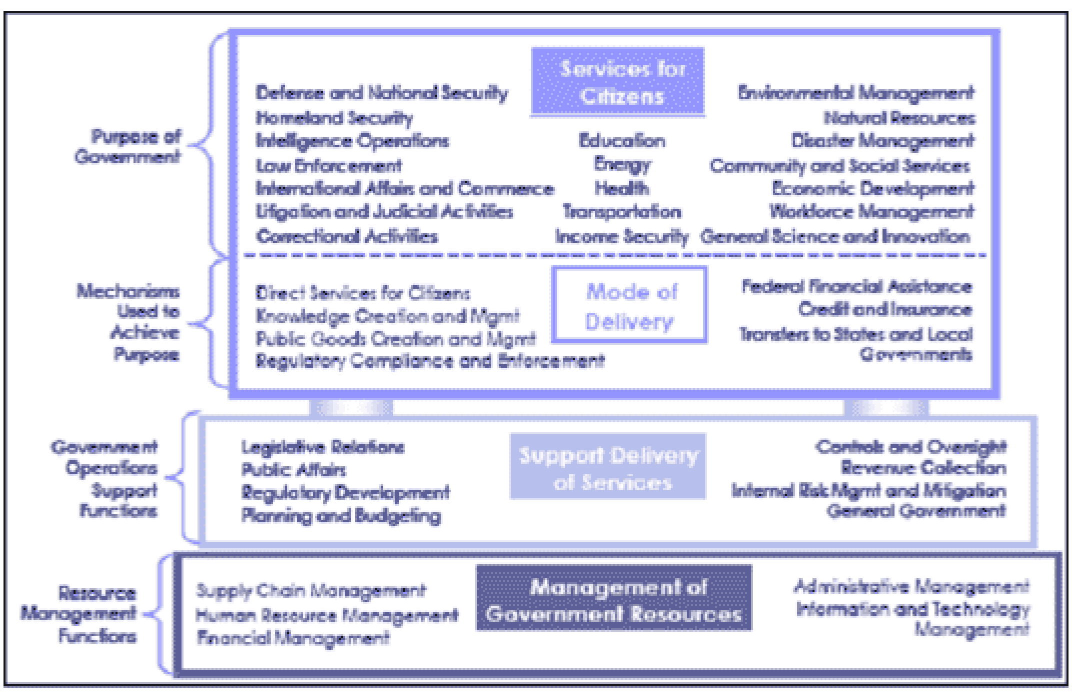
Examples

One example of a reference model is the FEA BRM. The BRM provides an organized, hierarchical construct for describing the day-to-day business operations of the Federal Government. While many models exist for describing organizations, (organization charts, location maps, etc.) this model presents the business using a functionally driven approach. The Lines of Business and Sub-functions that comprise the BRM represent a departure from previous models of the Federal Government that use antiquated, stove-piped, agency-oriented frameworks. The BRM is the first layer of the Federal Enterprise Architecture, and it is the main viewpoint for the analysis of data, service components, and technology:



BRM Structure

The BRM is broken into four areas: Services for Citizens, Mode of Delivery, Support Delivery of Services, and Management of Government Resources. The model's four Business Areas are decomposed into 39 Lines of Business. Each business line includes a collection of Sub-functions that represent the lowest level of granularity in the BRM. For example, the Environmental Management Line of Business encompasses three Sub-functions: (1) Environmental Monitoring and Forecasting; (2) Environmental Remediation; and (3) Pollution Prevention and Control. Within each Sub-function are the agency-specific business functions, processes, and activities:



BRM Areas

Go to top of page ↑

CM Overview

Configuration Management of the DoDAF Architecture Framework

CM provides an orderly way to facilitate change, based on a documented requirements baseline, and utilizing best practices in the change management process. This is intended to ensure that expectations are fully understood and realized in an efficient manner, including proper consideration of all potential impacts on customers and resources. CM is a necessary and critical process to assure an orderly and stable evolution of any Architectural Description and also to ensure that the DoDAF remains current in the face of evolving methods and techniques of Architectural Description creation and management.

This section provides a summary overview of the two primary a `spects of CM of DoD enterprise architecture efforts:

- CM guidance to developers of specific instance Architectural Descriptions prepared within DoD in accordance with the DoDAF.
- CM of the DoD Framework document content itself.

These CM activities are complementary with existing DoD CM processes for the DARS, the DoD Information Technology Standards Registry (DISR), and the Metadata Registry (MDR). A more comprehensive description of the overall CM Process is found online in the DoDAF Journal.

Configuration Management Authority

The CM Authority for the contents of the DoDAF document is the DoD CIO, Office of the Assistant Secretary of Defense (OASD) Enterprise Architecture & Standards Directorate.

Configuration Management Guidance for Program Managers

There are many benefits to the Department gained by adhering to a CM Program in the production of architectural data, thus providing consistency to the creation and utilization of presentation views, while still allowing flexibility in graphical presentation. These include:

- **Utilization of the DM2** (Conceptual, Logical and PES) in architectural data collection, organization, storage, and documentation.
- **Utilization of DoDAF technical guidance (Contained in Volume 2, and the DoDAF Journal)** in the creation and graphical representation of views, based on architectural data and a desired viewpoint. This is accomplished by:
  - DoDAF definition of attributes for common architectural views. Thus, there is a known basis for making change to architectural views, and a means for evaluating the effectiveness of that change according to the chosen viewpoint.
  - DoDAF representation of a common vocabulary and grammar for documenting Architectural Descriptions thus facilitating common understanding among DoD components, ensuring interoperability in exchanging architectural data and federation of individual Architectural Descriptions within a higher tier enterprise view.
- **Traceability of Requirements**. Architectural data can more easily be associated with baseline requirements, and, as requirements change, the associated impacts on present and future actions can more easily be evaluated, and more accurately reflect the change requirement.

Configuration Identification. Utilization of DoDAF data elements allows a consistent identification of Configuration Items (CIs), which are currently defined as:

- **The Vocabulary** – The Elements (e.g., process, system function, Capability) and Views (AV, OV, SV, StdV, etc.) that describe the behavioral, tabular, mapping, ontological, and structural representations of an Architectural Description. The metadata (e.g., Information about data in the Architectural Description).
- **The Grammar–** The formal conceptual and logical relationships between elements and products of the Vocabulary – The Conceptual and LDM.
- **The Presentation Guidelines** – "Fit-for-Purpose" viewpoints, dashboards, decision views, etc.
- **Methods and Process Guidelines.**
- **The DoDAF Document** – The narrative volumes comprising the DoDAF.

- **Organized Process**. Change activity is controlled through a known, documented, and organized process.
- **Improved Change Management**. Architectural data can be better managed to produce stable and consistent requirements to guide the development of interoperable systems, processes, and procedures.
- **Improved Analysis and Trades**. Analyses that better reflect customer need through common understanding and explicit documentation of architecture baselines and change evolution.

Configuration Management Implementation

Each Architectural Description effort must establish a CM process and document it in a CM Plan. This plan is submitted when each version or update to the Architectural Description is submitted to DARS for registration and discovery. In developing CM processes for Architectural Descriptions it is recommended that best practices be adopted such as those outlined in Electronic Industries Alliance (EIA) Standard EA-649. This a flexible, but well-defined standard employed most often at the enterprise level. Its flexibility lies in the ability to provide CM practices that can be selectively applied to the degree necessary for each of the areas to be covered under this plan.

Evaluating Architecture Changes

Appropriate evaluation criteria should be developed in the CM Plan and applied according to the scope and tier of the Architectural Description effort. The evaluation criteria must include factors that test compliance with the Net-Centric Reference Architectures and the DoD IE as outlined in Section 3.0 of the DoDAF and the Net-Centric Guidance contained in Volume 2. The results of architecture evaluations should be used to guide decisions for approving proposed changes, as well as in planning future extensions or updates to the Architectural Description.

The DARS Registration Process

Consistent with the federated architecture approach described in Section 3, essential architectural information must be registered with DARS so that discovery of reusable architectural data can be accomplished throughout the Department. Generally, and as further described in the instructions on registration contained online in the DARS, this consists of the Overview and Summary Information (AV-1) which can be completed online, and the Configuration Control Plan (CCP) that describes how the organization intends to manage and periodically update its information. Individual data entities and other artifacts are similarly registered in the DMR.

Configuration Control Board

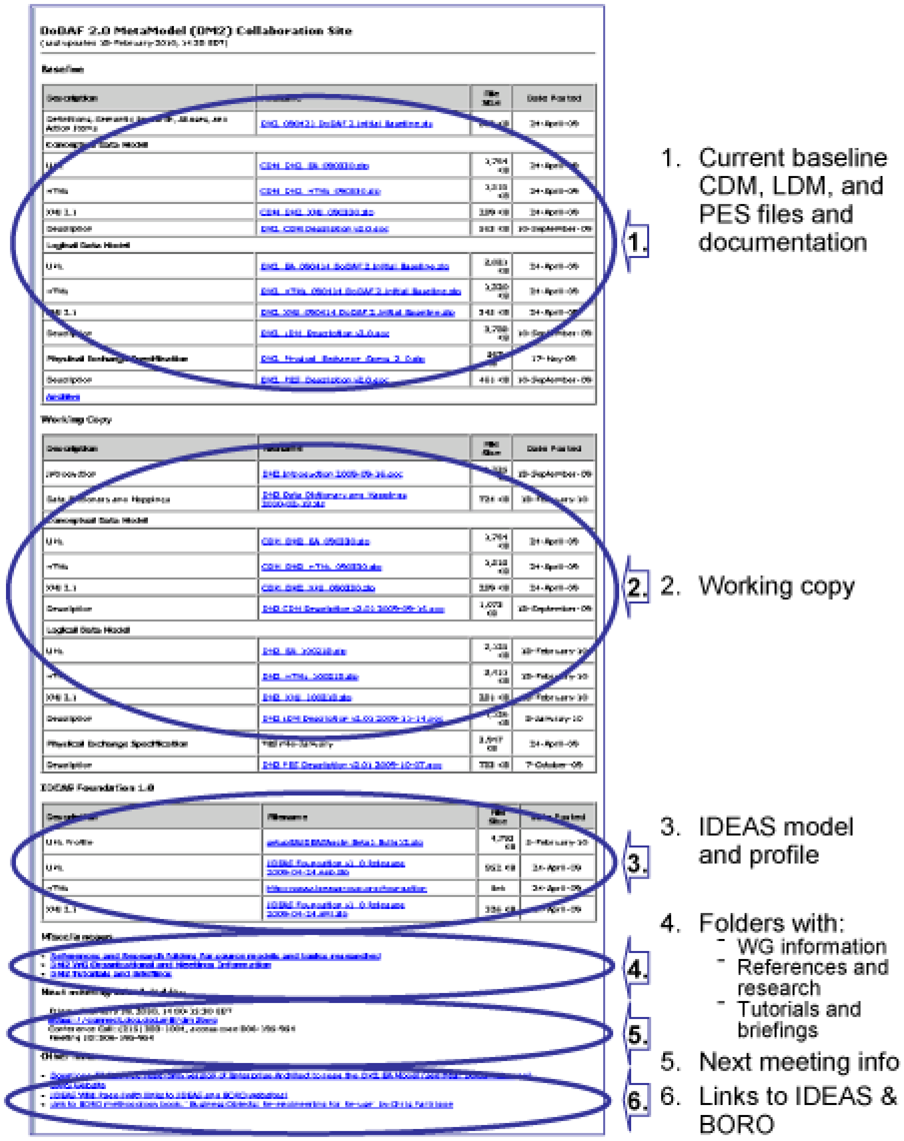
The DoDAF Configuration Control Board (CCB) provides an organized management review process to ensure validity, currency, and timeliness of architectural data described over time. The board provides CM and control carefully scoped and administered to reduce the burden and complexity of architecture sharing and maintenance, as well as update, while providing flexibility to the DoD community in the continued management of their architectural views and associated data. The CCB consists of members appointed by the Deputy DoD CIO, and includes representatives of the Joint Staff, the Office of the Secretary of Defense (OSD), the Military Services, Combatant Commands, and Defense Agencies.

Technical Working Groups

The CCB may, from time to time, establish technical working groups (TWG), as required, to oversee, review, and make recommendations to the board on specific technical aspects of the CM Program, or configuration items. TWGs provide the subject-matter expertise necessary to ensure that documents, the DM2, and other products under configuration control of the CCB are maintained in a responsible manner. TWGs, when tasked by the CCB, provide detailed and comprehensive technical review of proposed changes and recommendations to the CCB on action(s) to be taken that result from recommended changes.

In addition, there is a standing TWG for the DM2. DM2 change requests (action items) can be raised by any of the working group members or flow down from the CCB. A working copy of the DM2 is maintained, along with all reference and research materials and the current action item tracker. DM2 issues impacting the foundation are forwarded to the International Defense Enterprise Architecture Specification (IDEAS) Group for consideration. When a number of changes have accumulated, the TWG recommends a new DM2 baseline version be established and released. Upon, approval by the CCB, the new DM2 is published along with a record of changes from last baseline and a new working copy is setup.

Both permanent members of the CCB and members of all technical working groups are notified about all CCB meetings and all scheduled TWG sessions, as are the Combatant Commands and Defense Agencies.



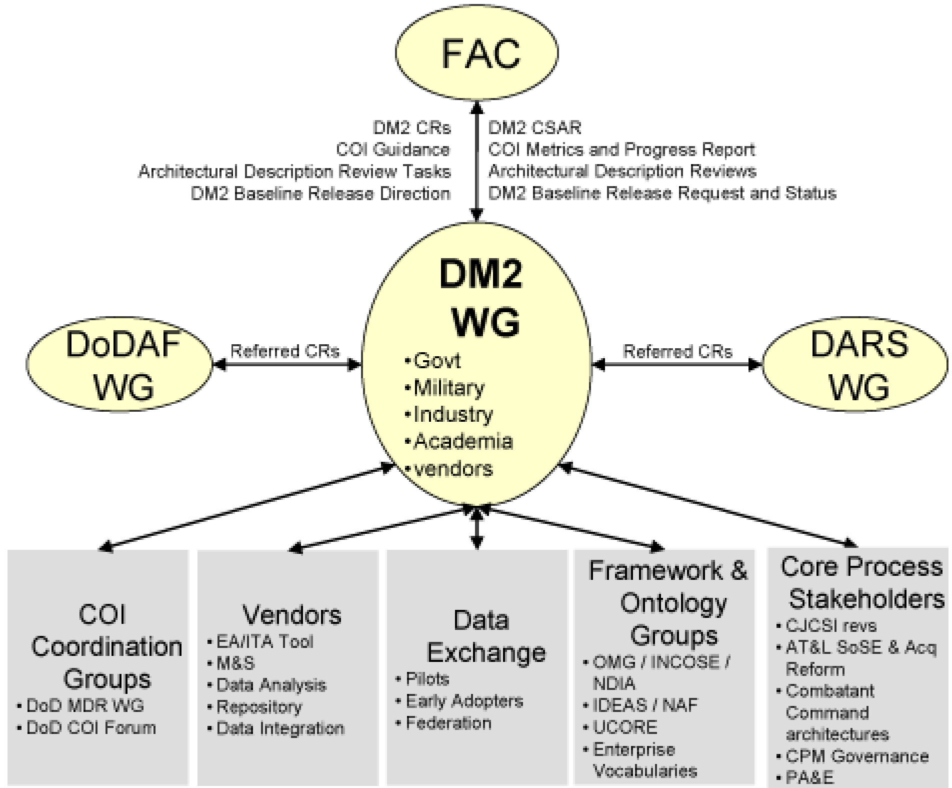
Topic Areas in the DM2 Collaboration Site

DM2 Working Group (WG)

The Configuration Management Authority for the DM2 is the DoD CIO. The management structure of the CM Program is in two parts: The Architecture and Standards Review Group (ASRG) and the DM2 Working Groups (WG).

The DM2 WG is the configuration management working body for the DM2. The DM2 WG was established during DoDAF 2.0 development and was transitioned to be the DM2 CM body. The DM2 WG oversees, reviews, and makes recommendations to the ASRG on specific technical aspects of the CM Program, or Configuration Items (CI). The DM2 WG provides the subject-matter expertise necessary to ensure that DM2 CI's under configuration control of the ASRG are maintained in a responsible manner. The DM2 WG when tasked by the ASRG, provides detailed and comprehensive technical review of proposed changes and recommendations to the ASRG on action(s) to be taken that result from recommended changes. The DM2 WG also acts as the DoD Enterprise Architecture COI Data Management Working Group (DMWG).

The DM2 WG interacts with the following organizations as shown in the figure below. Roles of these organizations with respect to DM2 CM are as follows:



1. Architecture and Standards Review Group (ASRG). The ASRG serves within the DoD CIO Enterprise Governance framework. The ASRG is subordinate to the DOD CIO Enterprise Guidance Board. It is chartered to: review architecture policy and guidance; identify DoD Information technology (IT) technical standards; oversee IT standards management; review architectures and enforce architecture policy; oversee DoD EA Federation; and enforce DoD Information Enterprise Architecture (IEA) compliance. The ASRG works through a dedicated secretariat, standing groups, and ad hoc working groups (Tiger Teams) to execute its responsibilities. Standing groups include the Information Technology Standards Committee (ITSC), Global Information Grid Technical Guidance Configuration Management Board (GTG CMB), the Architecture Review Group (ARG) and the Enterprise Reference Architecture Cell (ERAC). Ad hoc groups will be constituted as needed to work specific issues related to policy, compliance criteria, reference models, and related issues in the EA and standards domains. Support will be provided by member organizations, and existing groups will re-align under the ASRG as applicable.
   The ASRG provides the overall direction and management of DM2 CM and exercises approval authority over all changes proposed in any part of the DM2 CI's.
2. IDEAS Group. TBS
3. Industry Advisory and Standards Groups to include OMG and OASIS. TBS
4. Related COI's to include UCORE and C2 Core. TBS
5. Controlled Vocabulary groups. TBS
6. Pilots and Early Adopters. TBS
7. DoDAF WG. TBS
8. DARS TWG. TBS
9. DoD MDR WG. TBS
10. EA Tool Vendors. TBS

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Acronyms List and Glossary of Terms

Acronyms

Acronym	Definition
ADM	Architecture Development Method
AMETL	Agency Mission Essential Task List
ASD	Assistant Secretary of Defense
AT&L	Acquisition Technology and Logistics
AV	All Viewpoint
BEA	Business Enterprise Architecture
BMM	Business Motivation Model
BPMN	Business Process Modeling Notation
BPR	Business Process Reengineering
BRM	Business Reference Model
BT	Business Transformation
BTA	Business Transformation Agency
C4I	Command, Control, Communications, Computers and Intelligence
C4ISRAF	Command, Control, Communications, Computers, and Intelligence Surveillance Reconnaissance Architecture Framework
CADM	Core Architecture Data Model
CCB	Configuration Control Board
CCP	Configuration Control Plan
CDD	Capability Development Document
CDM	Conceptual Data Model
CIO	Chief Information Officer
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CJCSM	Chairman of the Joint Chiefs of Staff Manual
CM	Configuration Management
COI	Community Of Interest
COMSEC	Communications Security
CONOPS	Concepts of Operations
CPD	Capability Production Document

CPIC	Capital Planning and Investment Control
CPM	Capability Portfolio Management
CRM	Consolidated Reference Model
CV	Capability Viewpoint
CWID	Coalition Warrior Interoperability Demonstration
DAES	DoD Architecture Enterprise Services
DARS	DoD Architecture Registry System
DAS	Defense Acquisition System
DDMS	DoD Discovery Metadata Specification
DIEA	DoD Information Enterprise Architecture
DISR	DoD Information Technology Standards and Profile Registry
DITPR	DoD Information Technology Portfolio Repository
DIV	Data and Information Viewpoint
DM2	DoDAF Meta-model
DMR	DoD Metadata Registry
DoDAF	DoD Architecture Framework
DoDI	Department of Defense Instruction
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities
DPG	Defense Planning Guidance
DRM	Data Reference Model
EA	Enterprise Architecture
EAAF	Enterprise Architecture Assessment Framework
EAMMF	Enterprise Architecture Management Maturity Framework
EIA	Electronic Industries Alliance
E-ISP	Enhanced-Information Support Plan
FEA	Federal Enterprise Architecture
FEA-CRM	Federated Enterprise Architecture-Consolidated Reference Model
FEA-RM	Federal Enterprise Architecture Reference Model
FIPS	Federal Information Processing Standard
FISMA	Federal Information Security Management Act
GAO	Government Accountability Office
GIG	Global Information Grid
IC	Intelligence Community
ICD	Initial Capabilities Document
IDEAS	International Defence Enterprise Architecture Specification
IDEF0	Integration Definition for Activity Modeling

IE	Information Environment
IEA	Information Enterprise Architecture
INFOSEC	Information Security
IP	Internet Protocol
IRTPA	Intelligence Reform and Terrorism Prevention Act of 2004
ISE	Information Sharing Environment
ISE-EAF	Information Sharing Environment Enterprise Architecture Framework
ISM	Information Security Marking
ISO	International Standards Organization
IT	Information Technology
ITS/NSS	Information Technology/National Security Systems
JCA	Joint Capability Area
JCIDS	Joint Capability Integration and Development System
JCPAT	Joint C4I Program Assessment Tool
JCS	Joint Chiefs of Staff
JCSFL	Joint Common System Function List
JFCOM	Joint Forces Command
JMETL	Joint Mission Essential Task List
KM/DS	Knowledge Management/Decision Support
LDM	Logical Data Model
M3	MODAF Meta Model
MDA	Milestone Decision Authority
MDR	Metadata Registry
MOD	Ministry of Defence
MODAF	Ministry of Defence Architecture Framework
NAERG	Naval Architecture Elements Reference Guide
NATO	North Atlantic Treaty Organization
NCDS	Net Centric Data Strategy
NCE	Net-Centric Environment
NCSS	Net-Centric Services Strategy
NII	Networks and Information Integration
NIST	National Institutes for Standards & Technology
NSS	National Security Systems
OASD	Office of the Assistant Secretary of Defense
OASIS	Organization for the Advancement of Structured Information Standards
OMB	Office of Management and Budget
OMG	Object Management Group

OO	Object-Oriented
OOAD	Object-Oriented Analysis & Design
OSD	Office of the Secretary of Defense
OUSD	Office of the Undersecretary of Defense
OV	Operational Viewpoint
PDA	Personal Digital Assistant
PDCA	Plan, Do, Check, and Act
PDM	Physical Data Model
PES	Physical Exchange Specification
PFD	Process Flow Diagram
PL	Public Law
POM	Program Objective Memorandum
PPBE	Planning, Programming, Budgeting, and Execution
PRM	Performance Reference Model
PTD	Process Task Dependency
PV	Project Viewpoint
RA	References Architecture
RM	Reference Model
SADT	Structured Analysis and Design Technique
SE	Systems Engineering
SEP	Systems Engineering Plan
SIPRNET	Secret IP Router Network
SLC	Shelf Life Code
SOA	Service-Oriented Architecture
SRM	Service Component Reference Model
SV	Systems Viewpoint
TA	Tiered Accountability
TAFIM	Technical Architecture for Information Management
TEMPEST	Transient Electromagnetic Pulse Emanation Standard
TOGAF	The Open Group Architecture Framework
TRM	Technical Reference Model
TV	Technical Standards View
TWG	Technical Working Groups
U.S.	United States
UJTL	Universal Joint Task List
UK	United Kingdom
UML	Unified Modeling Language

UPDM	Unified Profile for DoDAF and MODAF
URL	Uniform Resource Locator
USD	Under Secretary of Defense
V&V	Validation & Verification
WBS	Work Breakdown Structure
XML	eXtensible Markup Language
XSD	XML Schema Definition

Glossary

Term	Definition
Activity	Work, not specific to a single organization, weapon system or individual that transforms inputs (Resources) into outputs (Resources) or changes their state.
Adaptability Measure	A measure of the ease with which Performers satisfy differing Constraints and Capability and Service needs.
Address	The name of a location along with the location-finding scheme that allows a location to be found from the name. Examples include postal address, email address, URL, datalink address.
Agreement	A consent among parties regarding the terms and conditions of activities that said parties participate in.
Capability	The ability to achieve a Desired Effect under specified [performance] standards and conditions through combinations of ways and means [activities and resources] to perform a set of activities.
Condition	The state of an environment or situation in which a Performer performs.
Constraint	The range of permissible states for an object.
Country	A political state or nation or its territory.
Data	Representation of information in a formalized manner suitable for communication, interpretation, or processing by humans or by automatic means. Examples could be whole models, packages, entities, attributes, classes, domain values, enumeration values, records, tables, rows, columns, and fields.
Desired Effect	The result, outcome, or consequence of an action [activity].
Domain Information	Types of information within the scope or domain of the architecture.
Effects Measure	Category of measures on Effect Objects
Facility	A real property entity consisting of underlying land and one or more of the following: a building, a structure (including linear structures), a utility system, or pavement.
Functional Standard	Functional standards set forth rules, conditions, guidelines, and characteristics.

GeoFeature	An object that encompasses meteorological, geographic, and control features mission significance
GeoPolitical Extent	A geospatial extent whose boundaries are by declaration or agreement by political parties.
Guidance	An authoritative statement intended to lead or steer the execution of actions.
Information	Information is the state of a something of interest that is materialized -- in any medium or form -- and communicated or received.
Installation	A base, camp, post, station, yard, center, or other activity, including leased facilities, without regard to the duration of operational control. An installation may include one or more sites.
Location	A point or extent in space that may be referred to physically or logically.
Maintainability Measure	A category of measures of the amount of time a Performer is able to conduct Activities over some time interval.
Materiel	Equipment, apparatus or supplies that are of interest, without distinction as to its application for administrative or combat purposes.
Measure	The magnitude of some attribute of an individual.
Measure Type	A category of Measures
Needs Satisfaction Measure	A category of quality measures that address how well a system meets the user's needs and requirements.
Organization	A specific real-world assemblage of people and other resources organized for an on-going purpose.
Organizational Measure	A category of quality measures that address how costly a Performer is to operate and maintain.
Performance Measure	A category of quality measures that address how well a Performer meets Capability needs.
Performer	Any entity - human, automated, or any aggregation of human and/or automated - that performs an activity and provides a capability.
Person Type	A category of persons defined by the role or roles they share that are relevant to an architecture.
Physical Measure	A category of measures of spatio-temporal extent of an Individual such as length, mass, energy, velocity
Port	An interface (logical or physical) provided by a System.
Project	A temporary endeavor undertaken to create Resources or Desired Effects.
Real Property	Land and improvements to land (i.e., facilities).
Region Of Country	A large, usually continuous segment of a political state or nation or its territory.
Region Of World	A large, usually continuous segment of a surface or space; area.

Resource	Data, Information, Performers, Materiel, or Personnel Types that are produced or consumed.
Rule	A principle or condition that governs behavior; a prescribed guide for conduct or action
Service	A mechanism to enable access to a set of one or more capabilities , where the access is provided using a prescribed interface and is exercised consistent with constraints and policies as specified by the service description. The mechanism is a Performer. The “capabilities” accessed are Resources -- Information, Data, Materiel, Performers, and Geo-political Extents.
Service Channel	A logical or physical communication path between requisitions and services.
Service Description	Information necessary to interact with the service in such terms as the service inputs, outputs, and associated semantics. The service description also conveys what is accomplished when the service is invoked and the conditions for using the service.
Service Level	A measurement of the performance of a system or service.
Service Port	A part of a Performer that specifics a distinct interaction point through which the Performer interacts with other Performers. This isolates dependencies between performers to particular interaction points rather than to the performer as a whole.
Site	Physical (geographic) location that is or was owned by, leased to, or otherwise possessed. Each site is assigned to a single installation. A site may exist in one of three forms: (1) Land only, where there are no facilities present and where the land consists of either a single land parcel or two or more contiguous land parcels. (2) Facility or facilities only, where the underlying land is neither owned nor controlled by the government. A stand-alone facility can be a site. If a facility is not a stand-alone facility, it must be assigned to a site. (3). Land and all the facilities thereon, where the land consists of either a single land parcel or two or more contiguous land parcels.
Skill	The ability, coming from one's knowledge, practice, aptitude, etc., to do something well.
Spatial Measure	A category of measures of the spatio-temporal location of an Individual.
Standard	A formal agreement documenting generally accepted specifications or criteria for products, processes, procedures, policies, systems, and/or personnel.
System	A functionally, physically, and/or behaviorally related group of regularly interacting or interdependent elements.
Technical Standard	Technical standards document specific technical methodologies and practices to design and implement.
Temporal Measure	A type of measure of time
Vision	An end that describes the future state of the enterprise, without regard to how it is to be achieved; a mental image of what the future will or could be like

Go to top of page ↑

DoDAF V2.0 Sitemap

Introduction, Overview, and Concepts: Introduces DoD architecture concepts and provides general guidance for development, use, and management of DoD architectures to help non-technical users understand the role of architecture in support of major decision support processes. The Primary audiences are Executives, Project Directors, & Managers. The resources are:

- Background information for DoDAF.
- Defining "Fit-for-Purpose" Architectures.
- An overview of the Framework, DoDAF-based architecture development guidelines, and the historical background for DoDAF.
- An Introduction to Enterprise Architecture, Federated Architecting, and Architecture Enterprise Services, and an introduction to the Federal Enterprise Architecture published by the OMB.
- An overview for architecture planning.
- Addressing customer requirements in architecture development.
- Methodology for architecture development.
- Presentation methods and graphical views.
- The DM2 Conceptual Model.
- Analytics in support of architecture-based management analysis.
- Security considerations for Architecture
- Guidance on configuration management (CM) of architectures, and the CM process for DoDAF.
- Relationships among DoDAF and other architecture frameworks.

Architectural Data and Models. Describes the Meta-model data groups, and their associated models from a technical viewpoint. The primary audience are architects, program managers, portfolio managers, and other technically oriented architecture users. The resources are:

- The Logical Data Model and the Meta-model Data Groups.
- DoDAF Views and Models.
- Mapping of DM2 concepts to DoDAF-described Models.

DoDAF Meta-model Physical Exchange Specification (DM2 PES). Relates the CDM structure, LDM relationships, associations, and business rules. The PES provides the constructs needed to enable exchange of data and derived information among users and COIs.

DoDAF Journal

The DoDAF Journal is a community of interest based discussion board. The Journal includes descriptions of best practices, lessons learned, example views and DM2 datasets, DoDAF model templates, DoDAF meeting presentations, and tutorial materials, and reference documents. It can be used by reference, component, capability, segment, and solution architects and core process stakeholders. Any member of the DoDAF community may submit material for publication and an editorial board will work with the authors to determine appropriateness, ensure public releasability, and make any needed changes to content.

Go to top of page ↑

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

Department of Defense

Home | DoDAF-DM2 WG | DoDAF Journal | DoD Meta Data Registry | IDEAS | Links

- Background
- Architecture Development
- Meta Model
- Viewpoints & Models
- Presentation Techniques
- Configuration Management Overview
- Acronyms List and Glossary of Terms
- Site Map
- Archives

DoDAF Archives

DoD Architecture Framework (DoDAF) v1.5

- Volume I
- Volume II
- Volume III

Go to top of page ↑

Privacy Policy | Web Policy | Contacts

DoDAF JOURNAL DoD DCIO

DoDAF News/Events

DoD EA Conference 2011
Hampton, VA April 11-15
Registration will be at:
www.dodenterprisearchitecture.org
Co-hosted by DoD CIO Architecture and Infrastructure Directorate and Joint Staff

Director's Corner

Welcome to the DoDAF Journal. The **DoDAF Journal** is a community of interest based discussion board. The Journal includes descriptions of best practices, lessons learned, example views and DM2 datasets, DoDAF model templates, DoDAF meeting presentations, and tutorial materials, and reference documents.

Privacy Policy

Web Policy

DoDAF V2.0 Journal

The **DoDAF Journal** is a community of interest based discussion board. The Journal includes descriptions of best practices, lessons learned, example views and DM2 datasets, DoDAF model templates, DoDAF meeting presentations, and tutorial materials, and reference documents. It can be used by reference, component, capability, segment, and solution architects and core process stakeholders. Any member of the DoDAF community may submit material for publication and an editorial board will work with the authors to determine appropriateness, ensure public releasability, and make any needed changes to content.

DoDAF Resources

- **Plenary Presentations** (12 AUG 10)
- **DoD EA Conference 2010 Presentations**

Best Practices/Guidelines
- **AV-2 Design**
- **OV-6c Design**

- **FAQs**
- **Journal Archives**
- **DoDAF-DM2 WG**
- **Contact Us**

Architecture Processes

Constructing an AV-2 & Architecture Primitives

Constructing an OV-6 w/ Architecture Primitives

Planning for Quality

Governance

Architecture Governance

Models

Component Models

Deployment Operational Models

Architecture Evaluation

Architecture Maturity: The PDCA Cycle

Architecture Self-Assessment

Compliance Review

Architecture Support in Decision Making

DoDAF V2.0 Exemplars

UPDM Search and Rescue (SAR) Diagrams and DoDAF 2 Markups

UPDM SAR DM2 PES XML Example files

Fit For Purpose Example
Capability Analysis

DoDAF JOURNAL DoD DCIO

DoDAF News/Events

DoD EA Conference 2011
Hampton, VA April 11-15
Registration will be at:
www.dodenterprisearchitecture.org
Co-hosted by DoD CIO Architecture and Infrastructure Directorate and Joint Staff

Director's Corner

Welcome to the DoDAF Journal. The **DoDAF Journal** is a community of interest based discussion board. The Journal includes descriptions of best practices, lessons learned, example views and DM2 datasets, DoDAF model templates, DoDAF meeting presentations, and tutorial materials, and reference documents.

Privacy Policy

Web Policy

Journal Home >> **Plenary Presentations 12 AUG 10**

What's New in DoDAF - DM2 V2.02
(Dave McDaniel)

DoDAF Training
(Walt Okon/Samantha Stokes)

DoDAF 2.0 Architectural Models-Views and Descriptions
(Shelton Lee)

DoDAF V2.0 Architecture Exemplars and Templates
(Shelton Lee)

JFCOM Joint Mission Thread (JMT) & DoDAF-DM2 Mapping
(Dave Dryer)

ASRG Update
(Alan Golombek)

UPDM Update
(Len Levine)

Model and Data Interchange at OMG
(Len Levine)

DoDAF Resources

Plenary Presentations (12 AUG 10)

DoD EA Conference 2010 Presentations

Best Practices/Guidelines
- **AV-2 Design**
- **OV-6c Design**

FAQs

Journal Archives

DoDAF-DM2 WG

Contact Us

Architecture Processes

Constructing an AV-2 & Architecture Primitives

Constructing an OV-6 w/ Architecture Primitives

Planning for Quality

Governance

Architecture Governance

Models

Component Models

Deployment Operational Models

Architecture Evaluation

Architecture Maturity: The PDCA Cycle

Architecture Self-Assessment

Compliance Review

Architecture Support in Decision Making

DoDAF V2.0 Exemplars

UPDM Search and Rescue (SAR) Diagrams and DoDAF 2 Markups

UPDM SAR DM2 PES XML Example files

Fit For Purpose Example
Capability Analysis

DoDAF JOURNAL DoD DCIO

DoDAF News/Events

DoD EA Conference 2011
Hampton, VA April 11-15
Registration will be at:
www.dodenterprisearchitecture.org
Co-hosted by DoD CIO Architecture and Infrastructure Directorate and Joint Staff

Director's Corner

Welcome to the DoDAF Journal. The **DoDAF Journal** is a community of interest based discussion board. The Journal includes descriptions of best practices, lessons learned, example views and DM2 datasets, DoDAF model templates, DoDAF meeting presentations, and tutorial materials, and reference documents.

Privacy Policy

Web Policy

Journal Home >> **DoD EA Conference 2010**

Presentations:

DoDAF V2.0 Update

UPDM Search & Recue (SAR) Exemplars

DoDAF V2.0 SAR Analysis and Fit-for-Purpose Exemplar

DoDAF V2.0 Way Ahead

DoDAF Resources

Plenary Presentations
(12 AUG 10)

DoD EA Conference 2010 Presentations

Best Practices/Guidelines
- **AV-2 Design**
- **OV-6c Design**

FAQs

Journal Archives

DoDAF-DM2 WG

Contact Us

Architecture Processes

Constructing an AV-2 & Architecture Primitives

Constructing an OV-6 w/ Architecture Primitives

Planning for Quality

Governance

Architecture Governance

Models

Component Models

Deployment Operational Models

Architecture Evaluation

Architecture Maturity: The PDCA Cycle

Architecture Self-Assessment

Compliance Review

Architecture Support in Decision Making

DoDAF V2.0 Exemplars

UPDM Search and Rescue (SAR) Diagrams and DoDAF 2 Markups

UPDM SAR DM2 PES XML Example files

Fit For Purpose Example
Capability Analysis

DoDAF JOURNAL DoD DCIO

DoDAF News/Events

DoD EA Conference 2011
Hampton, VA April 11-15
Registration will be at:
www.dodenterprisearchitecture.org
Co-hosted by DoD CIO
Architecture and Infrastructure
Directorate and Joint Staff

Director's Corner

Welcome to the DoDAF Journal. The **DoDAF Journal** is a community of interest based discussion board. The Journal includes descriptions of best practices, lessons learned, example views and DM2 datasets, DoDAF model templates, DoDAF meeting presentations, and tutorial materials, and reference documents.

Privacy Policy

Web Policy

Journal Home >> **DoDAF FAQs**

- Is DoDAF V2.0 mandatory?
- Do I have to create all those DoDAF-described Models?
- What must architecture tools do to comply with DoDAF V2.0?
- Where can I see exemplars of each DoDAF-described model?
- Is DoDAF useful outside DoD?
- When developing the viewpoints, do we have to list or show processes controlled by software, such as "receive crew data", "transmit crew data", "render crew data" or "process crew data", "provide transmit data"?
- How is server/workstation processing indicated in the architecture?
- What does DoDAF 2 consider an "External Performer" and how does the DM2 handle it?
- The DM2 appears very abstract. Is it just for guidance?
- The mathematics of the DM2 are difficult to learn. Is this really necessary?
- What is IDEAS?
- Is there a scientific basis for the DM2 and IDEAS?
- How do DM2 and IDEAS relate to OWL?
- Are there tools for DM2?
- IDEAS applies mathematics that are not normally taught in IT curriculums and so some learning is required. How do you learn IDEAS?
- Why was UML used for the DM2 Logical Data Model instead of an ontology tool?
- Why did this mathematics suddenly emerge as applicable?
- Why is AS&I spearheading the introduction of ontologic mathematics in DM2?
- What’s the difference between ontology and taxonomy?
- I hear the word “ontology” used a lot nowadays. Is it just another IT fad?
- Formal methods in computer science have been around for quite a while. They usually were too intractable and inaccessible. Why are we adopting them now?
- Some of the IDEAS and DM2 mathematics seem to be esoteric – addressing issues below the 90% or good enough level. Is this degree of precision really necessary?
- Who’s developing DM2 or IDEAS analysis tools?
- Why are there so many DM2 open action items?
- Is the DM2 done?
- How can the DoDAF / DM2 Working Group be effective if anybody is allowed to join and participate? Doesn’t it just become chaotic?
- Why didn’t DoD just adopt a commercial standard for EA data exchange?
- Is there a way to represent metrics with DM2 and what kinds?

Is DoDAF V2.0 mandatory?

While DoDAF is indeed prescribed for use in the development of architectural descriptions within the Department, DoDAF V2.0 currently serves as guidance. It is expected, however, that a growing number of commands and components will adopt V2.0. For such organizations, architectural descriptions they may have developed in accordance with prior versions of DoDAF should brought into compliance with V2.0 upon their next major release. In addition, architectural data should be stored in a data system – PowerPoint, Visio, Excel, etc. can only be used to present architectural information. For components within which the use of V2.0 is not mandated, it can still serve as an architecture best practices reference.

Do I have to create all those DoDAF-described Models?

No. DoDAF V2.0 does not prescribe any models – instead, it concentrates on data as the essential ingredients of any architecture development. It seeks to make architectural descriptions "Fit-for-Purpose", based on decision-maker needs. Process owners may therefore prescribe a specific set of DoDAF-described Models to answer a particular purpose. For example, regulations and instructions issued by both DoD and the Chairman of the Joint Chiefs of Staff (CJCS) contain particular requirements with respect to Presentation Views. In general, whatever combination of views – both DoDAF-described and user-tailored – legitimately answers a need, aligns well with the intended use of the architecture as a whole, AND can be justified per common-sense professional practice in architecture, is acceptable. Consult the regulations and instructions issued by your component for specific model and view requirements.

Go to top of page ↑

What must architecture tools do to comply with DoDAF V2.0?

It is only necessary to implement the Physical Exchange Specification (PES). Note that while architecture teams may evaluate tool sets and recommend specific tools based upon their capabilities in a given architecture environment, DoD does not plan to formally endorse, adopt, certify, or mandate any tool.

Where can I see exemplars of each DoDAF-described model?

See the DoDAF *Journal* – a compendium of DoDAF V2.0 background information, implementation guidance, news, and other content useful to the DoDAF architect and decision-makers alike.

Is DoDAF useful outside DoD?

Yes! Given the unprecedented, growing, and mutual dependence between DoD, Intelligence Community (IC), and Coalition architectures, we both encourage and expect the early adoption of DoDAF V2.0 principles outside the Department. As a vital partner and contributor to our nation's defense, the IC should continue to represent a significant portion of the DoDAF user base.

Go to top of page ↑

When developing the viewpoints, do we have to list or show processes controlled by software, such as "receive crew data", "transmit crew data", "render crew data" or "process crew data", "provide transmit data"?

The determination of whether to list the processes controlled by the software is reliant on the purpose of the architecture. If the purpose requires the processes controlled by the software, then it will be required. However, if it is not required at that level, it may be sufficient to indicate that "Provide Target Location" is the resource flow, rather than having multiple resource flows "Transmit Target Location data", "Receive Target Location Data", "Acknowledge Target Location Data", and "Receive Acknowledgement of Target Location Data".

How is server/workstation processing indicated in the architecture?

From a systems or services viewpoint, the server/workstation processes are Activities, but the related Performer is a System or Service (e.g., "CursorOnTarget Service")."

What does DoDAF 2 consider an "External Performer" and how does the DM2 handle it?

In DM2, a Performer can be categorized as internal or external, based on specific need, although such categorization may not be standard across all organizations. External Performers do not need to be modeled, as DM2 does not require documentation of Activities other than acknowledgement that an unknown producing or consuming Activity does, in fact, exist (see UPDM SAR DM2 markup examples). However, although an OV-2 diagram need not show implied, external Activities, the DM2 PES XML must show them, even if only as placeholders for subsequent completion such as during OV-5 development. It is this precision that addresses the “over-specification” problem of earlier DoDAF OVs.

Go to top of page ↑

The DM2 appears very abstract. Is it just for guidance?

No, the DM2 can be used for simple to very detailed and complex architectural descriptions by combining its elements appropriately. It has few elements making it seem abstract because it is not language, but mathematically, based. The DM2 Physical Exchange Specification (PES) is the prescribed data exchange format and semantics for DoDAF 2.0 conformance.

The mathematics of the DM2 are difficult to learn. Is this really necessary?

The predecessor of the DM2, the CADM, was language-based. It was a state-of-the-art Entity-Relationship model at the time. E-R models have been very successful and useful throughout the business and government communities. However, the nature of Enterprise Architecture entails integration and analysis of multiple independently-developed architectural descriptions. The CADM and E-R models that were name and definition based did not work for this purpose. Hence, the DM2 has brought to bear additional science to help achieve these DoD EA goals.

What is IDEAS?

IDEAS is the International Defence Enterprise Architecture Specification. It is an international project of the US , UK , AU, SW, and CA for the past 5 years to develop a way to exchange EA data in support of Coalition operations. Early on in the project it was recognized that we needed more precise and unambiguous ways to label data so the science of formal ontologies was brought to bear. The IDEAS ontology is first-order, extensional, and 4-dimensional, employing the mathematics of set theory and 4-D mereotopology.

Is there a scientific basis for the DM2 and IDEAS?

Yes, the mathematics and science underpinning DM2 and IDEAS have been in development for many years, particularly with the development of set theory in the 19th century. What is new is the application of that science to IT data representations, specifications, and models.

Go to top of page ↑

How do DM2 and IDEAS relate to OWL?

DM2 and IDEAS data can be represented in RDFS and OWL. Pure OWL makes some commitments that are incompatible with IDEAS so a fallback to the less-committal RDFS was necessary in those areas. An RDFS/OWL generator for and early version of IDEAS was developed and will be updated and included in the ModelFutures’ IDEAS Profile soon.

Are there tools for DM2?

A script for generating a DM2 database is available on CD at this conference and on the DM2 collaboration site – www.silverbulletinc.com/dm2. A bare-bones front-end (RDF triples generator) to the database will be available soon. Pilots and early adopters are building tools to generate and parse DM2. The UPDM Team is working on UPDM 2.0 which will be compatible with DM2. The AS&I team is working with other EA and M&S tool vendors to achieve DM2 compatibility. An RDFS/OWL generator is planned that will allow analysis by RDFS/OWL tools that comport with IDEAS ontology constructs.

IDEAS applies mathematics that are not normally taught in IT curriculums and so some learning is required. How do you learn IDEAS?

The DM2 collaboration site at www.silverbulletinc.com/dm2 has many resources, including DM2 description documents (CDM, LDM, PES / IDEAS), an IDEAS bibliography, 1,000's of reference documents, and a free electronic version of IDEAS Group member Dr. Chris Partridge's book, "Business Objects – Engineering for Reuse." In addition, on-site outreach tutorials can be requested through Mike.Wayson@osd.mil, membership in the DM2 Working Group is open to all by registering at www.silverbulletinc.com/dm2. This science is emerging as the future for knowledge representation for applications where integration of multiple heterogeneous data sources or automated algorithmic analysis or processing is required and so IDEAS learning is professional development that will be applicable to and open up future career paths.

Why was UML used for the DM2 Logical Data Model instead of an ontology tool?

A UML tool was used for the DM2 LDM. However, it is not a UML class model because the ModelFutures' IDEAS Profile turns the UML tool into an ontology tool. Existing ontology tools make commitments and lack features necessary for IDEAS. Consequently, the ModelFutures' IDEAS Profile was developed that allows the UML tool be used for ontology development in a simple yet thorough way.

Go to top of page ↑

Why did this mathematics suddenly emerge as applicable?

As IT has developed, greater indirection has been permissible. In similar vein to Codd's introduction of relational databases was enabled by higher performance IT, so too higher performance IT is now enabling the adoption of ontologic mathematics.

Why is AS&I spearheading the introduction of ontologic mathematics in DM2?

Enterprise Architecture is ambitious in supporting transformational processes in DoD. We know those transformations must be accomplished so we will have an agile and efficient defense. That makes it incumbent on AS&I to apply whatever science is needed to support the DoD's core processes.

What's the difference between ontology and taxonomy?

Technically, a taxonomy is a "type" structure, much like naïve set theory but with provisions to prevent paradoxes. So a taxonomy may represent categorizations of real world things (e.g., a simple set), subsets and super sets, categorizations of sets, and so on. An ontology goes beyond this an includes other types of relationships between concepts such as whole-part, overlaps, temporal whole-parts, etc.

I hear the word "ontology" used a lot nowadays. Is it just another IT fad?

Yes and no. As in all progressions in IT, there tends to be a bit of overselling. No doubt some ontology projects will fail to live up to expectations. There are many challenges in developing automation, whether for data integration or analysis, as there always have been. However, the newly adopted tools of ontology science – e.g., applying set theory, mereotopology, and 4-dimensionalism – will be long-lasting contributions.

Go to top of page ↑

Formal methods in computer science have been around for quite a while. They usually were too intractable and inaccessible. Why are we adopting them now?

The key to simultaneously achieving user understandability and rigorous formality in the DM2 is the layering: the Conceptual Data Model (CDM), Logical Data Model (LDM), Physical Exchange Specification (PES), and IDEAS Foundation. The formality in DM2 is largely hidden in the IDEAS Foundation layer which most users will never need to look at or understand.

Some of the IDEAS and DM2 mathematics seem to be esoteric – addressing issues below the 90% or good enough level. Is this degree of precision really necessary?

90% level disambiguation and semantic precision works well for human-readable and interpreted data, as we fill-in missing information and bring to bear interpretive knowledge or for rehearsed automated processing -- when the programmers or database administrators can iterate and trial-and-error towards proper processing of the exchanged data. Automated processing by non-rehearsed algorithms, e.g., by integration or analysis algorithms by heretofore new data sources, can be very sensitive to flaws in datasets such as imprecisions, ambiguities, or unstated incompletions.

Who's developing DM2 or IDEAS analysis tools?

This is just starting. We anticipate at least these two categories: M&S tools and entailment tools. M&S tools will be able to ingest DM2 datasets and, because of the precision and disambiguity afforded by DM2, be able to "run" or "execute" the architectural models to measure performance and/or effectiveness of proposed architectures. Entailment tools, some of which exist today and can operate on RDF, RDFS, and OWL datasets, will be able to carry out the logical implications of DM2 datasets whereupon contradictions and inconsistencies can be detected. For instance, an interoperability assessment tool might entail that two systems need to interact in some way (e.g., exchange data) but that is contradicted by all the means available to do so.

Go to top of page ↑

Why are there so many DM2 open action items?

The application of ontology science to Enterprise Architecture descriptions is new. There are still many things the community does not yet know how to represent mathematically. We could always fall back on language-based representations but we know that will result in improperly integrated or analyzed data. In other words, the DM2 Working Group is the forum for clearly defining and disambiguating EA concepts in the DoD. Membership in the DM2 Working Group is open to all by registering at www.silverbulletinc.com/dm2. The DoDAF / DM2 Action Item tracker is updated weekly and is available for download there.

Is the DM2 done?

Yes! Version 2.0 was baselined May 2009 and version 2.01, with 68 fixes and improvements, was baselined Feb 2010. However, as the DoD EA community seeks to represent additional things, as DM2 pilots and early adopters develop, and as concepts evolve – e.g., Services, Capabilities – the DM2 will respond to the community's needs. This done by a formal Configuration Management (CM) process by the DM2 Working Group, a subordinate body to the Federated Architecture Council (FAC). Membership in the DM2 WG is open to all by registering at www.silverbulletinc.com/dm2.

How can the DoDAF / DM2 Working Group be effective if anybody is allowed to join and participate? Doesn't it just become chaotic?

Remarkably, the WG is very effective even with 100's of members. The reason for this is the process and business rules established and documented in the DoDAF / DM2 Configuration Management (CM) Plan which can be obtained at the DM2 Collaboration Site, www.silverbulletinc.com/dm2. Although the process and rules are subject to modification, once agreed-to, they provide a principled basis for discussion, debate, and analysis of potential issues.

Why didn't DoD just adopt a commercial standard for EA data exchange?

Existing commercial data exchange formats do not meet the representation requirements for DoDAF architectural descriptions or are tool or tool-type specific. For instance, the XMI UML model interchange standard is specific to UML tools and consequently has many elements that are not applicable to non-UML tools. The DM2 Conceptual and Logical Data Models are the

DoD expression of required data semantics for EA descriptions; the DM2 Physical Exchange Specification (PES) is a simple tool- and methodology-neutral format for EA data exchange between databases, repositories, EA development tools, EA analysis tools, authoritative data sources, EA reporting tools, and M&S tools.

Go to top of page ↑

Is there a way to represent metrics with DM2 and what kinds?

The DM2 represents metrics as in IDEAS as what may be thought of a “measure sets.” The DM2 defined several broad categories of metrics (measures) and then allows users to define as many additional types of measures as needed. Measures can be associated with any DoDAF concepts, e.g., Systems, Resource Flows, Capabilities, Desired Effects. Measures can be at a technical performance level (e.g., MOPs) up to operational effectiveness levels (e.g., MOEs).

How are temporal models handled in DM2?

DM2 is founded on IDEAS which is 4-dimensional. So all real-world things are modeled as per their spatial and temporal extent. In other words, everything in DM2 is temporal. DM2 and IDEAS have elements for temporal boundaries and before-after and temporal-whole-part relationships to model any form of temporal behavior. For more on 4-dimensionalism, see, e.g., http://en.wikipedia.org/wiki/Four-dimensionalism or a very popular book, Sider, Theodore; “Four Dimensionalism: An Ontology of Persistence and Time”; Oxford University Press, Oxford ; 2001.

How are Services modeled in DM2?

The DoD defines services as a mechanism to access capabilities (or resources.) The DM2 models Services as types of Performers that have a Service Port that is described by a Service Description. The Service has relationships to the Resources that are accessed. The Service Description is a type of Architectural Description and so it can have all the structure of an Architectural Description, including functionality, behavior, rules, information schemas, etc. New service concepts emerging from OASIS, OMG, and other organizations are being considered by the DM2 Working Group for incorporation in later DM2 baseline versions.

How can I implement the DM2?

All DM2 implementers should join the DM2 Working Group so they will be up to date on all developments, actions in-progress, and gain access to DM2 resources. In addition, the DoDAF / DM2 AS&I has resources to assist DM2 pilots and early adopters. Contact Mike.Wayson@osd.mil to request assistance in your pilot or implementation project.

I don’t see how to model requirements vs. solutions in DM2. Is it possible?

Yes! DM2 supports multiple levels of reification, indeed, as many as are needed by your project. Each level of reification is an architectural description that becomes rules that constrain the next level. Conversely, each artifact at a level can trace its pedigree to a higher level using DM2’s Pedigree model. With DoDAF 2, you are no longer restricted to just the OV “requirements” level and SV/TV “solution” level, but can have as many levels of reification as are needed, with each level having whatever mix of operational, capability, systems, services, or technical description as is appropriate for your project.

Go to top of page ↑

Architecture Processes

Constructing an AV-2 & Architecture Primitives

Constructing an OV-6 w/ Architecture Primitives

Planning for Quality

Architecture Evaluation

Architecture Maturity: The PDCA Cycle

Architecture Self-Assessment

Compliance Review

Architecture Support in Decision Making

Governance

Architecture Governance

Models

Component Models

Deployment Operational Models

DoDAF V2.0 Exemplars

UPDM Search and Rescue (SAR) Diagrams and DoDAF 2 Markups

UPDM SAR DM2 PES XML Example files

Fit For Purpose Example

Capability Analysis

DoDAF JOURNAL DoD DCIO

DoDAF News/Events

DoD EA Conference 2011
Hampton, VA April 11-15
Registration will be at:
www.dodenterprisearchitecture.org
Co-hosted by DoD CIO Architecture and Infrastructure Directorate and Joint Staff

Director's Corner

Welcome to the DoDAF Journal. The **DoDAF Journal** is a community of interest based discussion board. The Journal includes descriptions of best practices, lessons learned, example views and DM2 datasets, DoDAF model templates, DoDAF meeting presentations, and tutorial materials, and reference documents.

Privacy Policy

Web Policy

Journal Home >> **DoDAF Journal Archives**

Archived DoDAF Journal Content

Content Archived	Date Archived	Replacement Content	Notes
AV-2 Design	22 Dec 09	AV-2 Design	
OV-6c Design	22 Dec 09	OV-6c Design	
Essential DoDAF	03 Feb 11		

Architecture Processes

Constructing an AV-2 & Architecture Primitives

Constructing an OV-6 w/ Architecture Primitives

Planning for Quality

Governance

Architecture Governance

Models

Component Models

Deployment Operational Models

Architecture Evaluation

Architecture Maturity: The PDCA Cycle

Architecture Self-Assessment

Compliance Review

Architecture Support in Decision Making

DoDAF V2.0 Exemplars

UPDM Search and Rescue (SAR) Diagrams and DoDAF 2 Markups

UPDM SAR DM2 PES XML Example files

Fit For Purpose Example
Capability Analysis

DoDAF JOURNAL DoD DCIO

DoDAF V2.02

DoDAF News/Events

DoD EA Conference 2011
Hampton, VA April 11-15
Registration will be at:
www.dodenterprisearchitecture.org
Co-hosted by DoD CIO Architecture and Infrastructure Directorate and Joint Staff

Director's Corner

Welcome to the DoDAF Journal. The **DoDAF Journal** is a community of interest based discussion board. The Journal includes descriptions of best practices, lessons learned, example views and DM2 datasets, DoDAF model templates, DoDAF meeting presentations, and tutorial materials, and reference documents.

Journal Home >> **DoDAF V2.0 Journal Contacts**

Policy Issues for DoDAF:

Michael Wayson, Michael.Wayson@osd.mil, (703) 607-0482

For DoDAF:

Shelton Lee, shelton.lee@lmco.com, (703) 916-7340

For DoDAF Meta-model (DM2):

Dave McDaniel, davem@silverbulletinc.com, (703) 892-6062

Submit website recommendations or comments

DoDAF Resources

- **Plenary Presentations** (12 AUG 10)
- **DoD EA Conference 2010 Presentations**

Best Practices/Guidelines
- **AV-2 Design**
- **OV-6c Design**

- **FAQs**
- **Journal Archives**
- **DoDAF-DM2 WG**
- **Contact Us**

Architecture Processes

Constructing an AV-2 & Architecture Primitives

Constructing an OV-6 w/ Architecture Primitives

Planning for Quality

Governance

Architecture Governance

Models

Component Models

Deployment Operational Models

Architecture Evaluation

Architecture Maturity: The PDCA Cycle

Architecture Self-Assessment

Compliance Review

Architecture Support in Decision Making

DoDAF V2.0 Exemplars

UPDM Search and Rescue (SAR) Diagrams and DoDAF 2 Markups

UPDM SAR DM2 PES XML Example files

Fit For Purpose Example
Capability Analysis

Privacy Policy

Web Policy

DoDAF

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

DoD EA Conference 2011

Hampton, VA April 11-15, 2011
Registration will be available at:
WWW.DODENTERPRISEARCHITECTURE.ORG
Targeted Date TBD
Co-hosted by DoD CIO Architecture, Standards & Interoperability Directorate and Joint Staff

DoDAF V2.0 Contacts

Policy Issues for DoDAF:

Michael Wayson, Michael.Wayson@osd.mil, (703) 607-0482

For DoDAF:

Shelton Lee, shelton.lee@lmco.com, (703) 916-7340

For DoDAF Meta-model (DM2):

Dave McDaniel, davem@silverbulletinc.com, (703) 892-6062

Contact DoDAF Website Administrator:

richard.k.myers@lmco.com

or submit form below for any website recommendations, changes or comments.

Name:

Email:

Telephone:

Organization:

Subject:

Comment/Request:

Send

Go to top of page ↑

DoDAF

DoD Architecture Framework Version 2.02
DoD Deputy Chief Information Officer

Search

DoD EA Conference 2011

Hampton, VA April 11-15, 2011
Registration will be available at:
WWW.DODENTERPRISEARCHITECTURE.ORG
Targeted Date TBD
Co-hosted by DoD CIO Architecture, Standards & Interoperability Directorate and Joint Staff

Links to Resources

Defense Knowledge Online DoDAF Homepage (requires login or CAC)

Ministry of Defence Architecture Framework

International Defence Enterprise Architecture Specification

DARS: DoD Architecture Registry System (DARS)

DoD MDR: Metadata Registry

DoD IEA: Department of Defense Information Enterprise Architecture (DoD IEA)