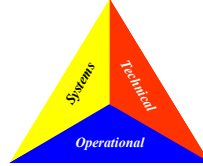


## Department of Defense Architecture Framework (DoDAF)



The Information Technology Management Reform Act (ITMRA), also known as the Clinger-Cohen Act of 1996, Chief Information Officers of all U.S. Government Agencies are assigned responsibility for “developing, maintaining, and facilitating the implementation of a sound and integrated information technology architecture for the executive agency.” In October 1996, the Principal Deputy Assistant Secretary of Defense for C3I and Joint Staff/J6 established the C4ISR Architecture Working Group. The effort resulted in the publication of the C4ISR Architecture Framework, in December 1997. The utility of the C4ISR Architecture Framework, combined with both Federal and DoD policy encouraging the use of enterprise architectures, led DoD to evolve the document into the DoD Architecture Framework (DoD AF), in early 2002.

The DoD Architecture Framework, Version 1.0, defines a common approach for Department of Defense (DoD) architecture description development, presentation, and integration. The Framework is intended to ensure that architecture descriptions can be compared and related across organizational boundaries, including Joint and multinational boundaries.

The purpose of the DoD Architecture Framework Version 1.0, is to provide guidance for describing architectures. The Framework provides the rules, guidance, and product descriptions for developing and presenting architecture descriptions that ensure a common denominator for understanding, comparing, and integrating architectures.

### Modeling DoDAF Architectures in UML

Although the DoD Architecture Framework was originally grounded in Structured Analysis and Design techniques, provision has been made for the application of Object Oriented Analysis and Design techniques and for use of the Unified Modeling Language (UML) in modeling certain aspects of the DoD Architecture Framework. However, the current recommendation is limited to a “collection of UML diagram types that convey the same information content as the Framework products.” Many significant aspects of the Framework do not have recommended UML equivalents. Moreover, in some cases the standard UML semantics have been informally modified [or interpreted] to adapt conventional model elements to the broader [i.e. non-software] purpose of the DoD AF. Consequentially, it is difficult to develop a unified, comprehensive, and consistent architecture model in the UML according to existing guidelines.

However, the UML is a flexible language that is, in fact, adaptable to many domains not directly concerned with software design and development. It has been constructed in a manner that incorporates provisions for extending the language to suit a variety of particular applications, such as the DoD AF. The most common extension mechanism is a UML “profile” that is used to add certain constraints and particular semantics to the basic UML constructs - described in the UML Metamodel – to specialize the language. At Ilium Technologies, we have developed and employed a UML profile to completely represent and describe the DoD Architecture Framework in the Unified Modeling Language.

### Ilium Technologies DoDAF Profile

In the middle 1980’s, Object Oriented Analysis and Design (OOAD) emerged as major trend in software development. In the 1990’s, the utility of OOAD in modeling business processes and enterprise architecture had become accepted and even “best” practice in many sectors. In the same period, the Unified Modeling Language has become the standard representation for OOAD in virtually all communities.

The UML is a rigorous, principled and flexible modeling language that supports a wide range of applications. For many, it is also “intuitive” in that it proceeds from, and is grounded in, the same philosophical

practice that underpins all modern science and technology. Classification, inheritance and ontology form the introductory portion of virtually every scientific, mathematical and technical course offered by any educational institution in the modern world. Thus the essential analytical techniques favored in OOAD are learned by most people in their academic years. Applying that basic knowledge to UML models is straightforward.

The DoD Architecture Framework has provided for the use of UML in developing compliant architectures. Volume 2 of the specification notes: "During the last few years, Unified Modeling Language (UML) has emerged as the dominant and most prevalent language for OO modeling irrespective of the development process used. The Object Management Group (OMG) characterizes UML as "a general-purpose modeling language for specifying, visualizing, constructing and documenting the artifacts of software systems, as well as for business modeling and other non-software systems" [OMG, 2000]."

"The UML representation has been introduced in this version of the Framework to assist architects who choose to use OO methodologies. This representation includes a collection of UML diagram types that convey the same information content as the Framework products." <sup>1</sup>

The Ilium Technologies DoDAF Profile is intended to facilitate and improve the representation of DoD architectures with a specialization of the UML adapted to the DoD AF. The DoD AF UML Profile specification provides users with a complete MOF-based metamodel and a UML profile. This approach facilitates exchange with and use of a wide range of popular UML CASE tools (e.g. Rational Rose, Tau G2, Rhapsody, Together, etc.) and MOF-based tools and repositories. The Profile contains descriptions of two Metamodels that, together, provide a comprehensive basis for representing an architecture in the DoD Architecture Framework.

As is the common practice, a MOF-based "virtual" metamodel of basic DoD AF stereotypes is captured as an object-oriented model expressed using a suitably restricted subset of the UML notation. The UML elements used in this specification are:

- Associations and Association Classes with attributes.
- Classes with attributes.
- Interfaces with operations.
- Models with attributes.
- Nodes with attributes.
- Operations
- Packages.
- The object constraint language, OCL, for expressing well-formedness constraints.
- For convenience, tables of element stereotypes and abbreviated semantics are included in each section.

The DoDAF Metamodel then describes the structure and essential content of an architecture developed according to the DoD Architecture Framework, using the model elements defined in this profile. Ilium Technologies analysts have been using this Profile to develop a number of DoDAF architectures in a range of military operational domains (e.g. UAV, Command and Control). We are also actively working with an OMG Special Interest Group to help develop an OMG standard profile for the DoDAF. When such a standard is adopted, we expect to be able to support a smooth and rapid transition to that standard.

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<sup>1</sup> DoD Architecture Framework, Volume 2, p 2-8