Abstract

This article explores the development and use of enterprise architecture as an important tool to support the Army in its effort to strive toward new goals and improve performance. The term enterprise architecture is used to refer to a comprehensive description of all of the key elements and relationships that make up the enterprise operational capabilities, and gain important short- and long-term benefits.

About the Author

Fernando Mezquita is an electronics engineer and a test director with the Electronic Proving Ground, Fort Huachuca, Arizona. He has a B.S. in Computer Science and Engineering from California State University, Long Beach. He is also a graduate of the Army Management Staff College Sustaining Base Leadership and Management (SBLM) Program. He is an AAW member and certified Level III in Test and Evaluation, Level III in Systems Engineering, and Level I in program management. He previously served for 8 years with the Information Systems Engineering Command, Fort Huachuca, Arizona, as team lead for the Army Materiel Command (AMC) enterprise architecture project under the guidance of the AMC Chief Information Officer. He has more than 22 years of civil service experience and is an Army Achievement Medal for Civilian Service recipient.

"There are two ways of spreading light: to be the candle or the mirror that reflects it."
Edith Wharton, 1862-1937

The Army's Way Ahead Challenge: Enterprise Architecture as an Essential Tool to Support the Army's Transformation Effort

In July 2004, the Department of the Army published a short guide called the *Army's Way Ahead*. General Peter J. Schoomaker, USA Chief of Staff, stated in the foreword that "The purpose of that document is to provide the reader with a short guide to the Army's Way Ahead. Our Army is at war and at the same time is looking for ways to transform its combat and institutional elements to best meet the needs and requirements of our nation's National Security and Military strategies. The challenge sounds simple – move the Army from the current force to a future force. Yet it may be seemingly difficult to achieve in an efficient and timely manner. The end-result of this exercise will be a more relevant and Ready Army with a joint and expeditionary mindset. The Transformed Army organizational structures will become the glue that will enable and hold our new missions, processes and the people that execute them, together.

This article discusses the role and importance of enterprise architecture in the ability to successfully manage and support the current Army transformation efforts. It will begin with an enterprise architecture overview, continue with an examination of the Department of Defense Architecture Framework (DoDAF) and then consider how the Army can go about creating an enterprise architecture using DoDAF. Subsequently, it will consider how enterprise architecture should be used to support the Army transformation effort. Finally, it will consider how enterprise architecture can be used to align organizational goals and how business processes can be aligned with Information Technology (IT). The term "IT" means any equipment or interconnected system or subsystem of equipment, that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by an executive agency.

Enterprise Architecture: An Overview

Enterprise Architecture (EA) is about understanding all of the different elements that go to make up the enterprise and how those elements interrelate. The term *EA* is used to refer to a comprehensive description of all of the key elements and relationships that make up an organization: Definition of the enterprise direction and business purpose, nature of business, including its structure, functions, organizations and so forth.

EA is not a collection of documents and plans. It is a model of how all of the EA Areas of Interest (EAAI) of an organization fit together. The EAAI are:

- list of things or data important to the enterprise (what);

- list of functions or processes the enterprise performs (how);
- list of locations in which the enterprise operates (where);
- list of people or organizations important to the enterprise (who);
- list of events significant to the enterprise (when);
- and list of enterprise goals and strategies (why).

An Enterprise or organization must rely on IT to improve in all of these EAAI. The EA will be an important tool to define how the enterprise-IT alignment should be achieved.

Enterprise Architecture Framework

A Framework for EA is a comprehensive, logical structure for descriptive representations (i.e. models, or design artifacts) of any complex organization. For this reason, an EA framework, as applied to Enterprises, is helpful for sorting out very complex, technology and methodology choices and issues that are significant both to general management and to technology management.

In summary, an EA framework is:

- Simple - it is easy to understand.
- Comprehensive - it addresses the enterprise in its entirety. Any issues can be mapped against it to understand where they fit within the context of the enterprise as a whole.
- A language - it helps you think about complex concepts and communicate them precisely with few, non-technical words.
- A planning tool - it helps you make better choices as you are never making choices in a vacuum. You can position issues in the context of the enterprise and see a total range of alternatives.
- A problem-solving tool - it enables you to work with abstractions, to simplify, to isolate simple variables without losing sense of the complexity of the Enterprise as a whole. That is, what they are doing, and what they are NOT doing.

Department of Defense Architecture Framework (DoDAF)

There are many different approaches to describing the elements of EA. DoD organizations (Office of the Secretary of Defense, the Military Departments, the Chairman of the Joint Chiefs of Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, Defense Agencies, Field Activities, and all other organizational entities) are required to be in compliance with DoDAF for all the architectures developed subsequent to December 1, 2003. DoD has established policy and procedures that direct the use of integrated architectures to support Capital Planning and Investments, Joint Capabilities Integration and Capabilities System, and National Security Systems. In addition, the Information Technology Management Reform Act (ITMRA) / Clinger Cohen Act (CCA) of 1996 mandates that the Chief Information

Officer (CIO) of each executive agency is responsible for developing, maintaining, and facilitating the implantation of a sound and integrated information technology for the executive agency. More information on DoDAF can be found at http://www.defenselink.mil/nii or http://www.pentagon.gov/nii/doc/ .

DoDAF defines a common approach for Department of Defense (DoD) architecture description development, presentation, and integration. The Framework enables architecture descriptions to be compared and related across organizational boundaries, including Joint and multinational boundaries. DoDAF is at the heart of the Command, Control, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) which is used by DoD to support the planning, decision making, and end execution of integrated systems both at the enterprise level and/or project level. The domain of systems engineering and the essential DoDAF elements are tightly coupled and synonymous for building systems that are cost effective and will meet users real needs.

DoDAF contains 27 architecture products (views) that capture information about the architecture. DoDAF products are robust in terms of capturing the EAAI information and provide a comprehensive analysis of key architectural components by:

- providing forward and reverse engineering to capture legacy and evolving modernized components in the enterprise
- using the capture information to conduct architecture and system studies
- providing a greater understanding of key integration challenges being experienced in the enterprise.

In the Framework, there are three major perspectives (i.e., views) that logically combine to describe an architecture description. These are the Operational View (OV), Systems View (SV), and Technical Standards View (TV). Each of the three views depicts certain architecture attributes. Some attributes bridge two views and provide integrity, coherence, and consistency to architecture descriptions. Each view is composed of sets of architecture data elements that are depicted via graphic, tabular, or textual products. DoD also defined the necessary entities and relationships for architecture data in the Core Architecture Data Model (CADM).

In the course of developing the products, one or more references, such as the Joint Technical Architecture and others, may be required to ensure that specific architectures are complete and in conformance with current policy and formal direction. These references are described in the DoDAF Deskbook under Universal Reference Resources.

A DoDAF compliant architecture is defined to be an “integrated architecture” when products and their constituent architecture data elements are developed such that architecture data elements defined in one view are the same (i.e., same names, definitions, and values) as architecture data elements referenced in another view. The term “integrated architecture” refers to an architecture description that has integrated Operational, Systems, and Technical Standards Views. There are common points of reference linking the OV and the SV and also linking the SV and the TV.

The OV is a description of the tasks and activities, operational elements, and information exchanges required to accomplish DoD missions. DoD missions include both warfighting missions and business processes. The OV contains graphical and textual products that comprise an identification of the operational nodes and elements, assigned tasks and activities, and information flows required between nodes. It defines the types of information exchanged, the frequency of exchange, which tasks and activities are supported by the information exchanges, and the nature of information exchanges.

The SV is a set of graphical and textual products that describes systems and interconnections providing for, or supporting, DoD functions. DoD functions include both warfighting and business functions. The SV associates systems resources to the OV. These systems resources support the operational activities and facilitate the exchange of information among operational nodes.

The TV is the minimal set of rules governing the arrangement, interaction, and interdependence of system parts or elements. Its purpose is to ensure that a system satisfies a specified set of operational requirements. The TV provides the technical systems implementation guidelines upon which engineering specifications are based, common building blocks are established, and product lines are developed. The TV includes a collection of the technical standards, implementation conventions, standards options, rules, and criteria organized into profile(s) that govern systems and system elements for a given architecture.

There are some overarching aspects of architecture that relate to all three of the views. These overarching aspects are captured in the All-Views (AV) products. The AV products provide information pertinent to the entire architecture but do not represent a distinct view of the architecture. AV products set the scope and context of the architecture. The scope includes the subject area and timeframe for the architecture. The setting in which the architecture exists comprises the interrelated conditions that compose the context for the architecture. These conditions include doctrine; tactics, techniques, and procedures; relevant goals and vision statements; concepts of operations; scenarios; and environmental conditions.

DoDAF will define a common approach for EA description, development, presentation, and integration for both warfighting operations and Army business processes. DoDAF will ensure that EA description can be compared and related across Joint and Army organizational and mission area boundaries. DoDAF will also provide a common virtual space for Joint and Army architectures based upon the ARCADM and instantiated in the DoD Architecture Repository System (DARS).

Supporting the Army Transformation Effort

An Army EA is a far-reaching concept that comprises the vision, principles, business rules, business processes and strategic direction. The Army EA will be an important tool needed to bridge the gap between the Army's current force and the future force. EA concepts have been around since the early 1980s, EA projects are often

reduced to nothing more that elaborate exercises Information technology (IT) with little or no effort put into documenting and analyzing the enterprise strategic direction and business processes. Their critical mission of defining and linking business, systems and technology is rarely achieved. It is important to note that EA is not only an IT project. To support this enterprise perspective, the DoDAF will provide project structure for developing a comprehensive EA.

The EA supports the six major institutional processes. These processes are:

- Business Process Reengineering (BPR)
- Planning, Programming, Budgeting, and Execution (PPBE) process
- Organization development
- Capability needs determination
- Research, development, and acquisition (RDA)
- Operations support.

The EA will provide Army decision makers with information, common terms and concepts, procedures, models, and presentation products that can support operational, planning, and modernization requirements.

The EA will also provide the Army with a thorough and rigorous methodology to determine strategy-to-task traceability for all of the following within the Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities (DOTMLPF) construct:

- Doctrine - Architectures provide a basis for determining whether standard operating procedures are a fit for the required activities or if they require modification in moving from the "As-Is" to the "To-Be" enterprise architecture.
- Organization: Through aggregation of the operational nodes identified in the enterprise architecture, along with geographical, political, and real world constraints, the correct organizational fit can be determined.
- Training: The correct type of training required by the personnel to complete the activities identified in the EA can be identified through analysis.
- Materiel: The appropriate equipment required to complete the activities in the Operational View is identified in the Systems View; it is, therefore, traceable directly to strategy and business rules identified in the Operational View.
- Leadership: Command relationships, roles, and responsibilities with respect to the activities in the Operational View are identified.
- Personnel: The Operational View provides a basis for analysis of the correct type and number of personnel required to accomplish the identified activities.
- Facilities: The Operational View in the context of geographical, political, and real-world constraints determines the requirements for facilities.

The information store in a DARS architecture repository will be available to perform modeling the existing processes accurately, simulations, investigations to enforce efficient processes, change not-so-efficient processes, examine different options and outcomes, how things are running, time bottlenecks, and organizational management issues. Remember that in order to fully understand the enterprise, we need to answer the time-honored questions of **who**, **what**, **when, why**, and **how** things are happening.

The analysis facilitated by an EA methodology will provide full strategy-to-task requirements traceability. This methodology can be a key transformation enabler for realizing the vision of Decision Superiority outlined in ***Joint Vision 2020***:
"*... to take advantage of superior information converted to superior knowledge to achieve "decision superiority" – better decisions arrived at and implemented faster than an opponent can react, or in a non-combat situation, at a tempo that allows the force to shape the situation or react to changes and accomplish its mission.*"

The proposed Army EA should be a complete model of The Army enterprise. A master plan which acts as an integrating force between aspects of The Army enterprise planning such as goals, visions, strategies and governance principles. The Army EA will be a tool to help the Army leadership think about the Army as a whole, see relationships, ask questions, identify problems. Or run simulations to help make decisions about changes they are considering. The Army EA will capture a wide variety of information, establish relationships among various documents and diagrams and store all the information together in a single data repository.

EA is a tool for thinking with a potential to provide great benefits when dealing with the complexities and dynamics of the information-age Army that heavily depends on IT:

- Align Information Technology (IT) with current and future business goals
- Transform business processes driving strategic and tactical results
- Reuse solutions across the Army
- Discover areas for application consolidation
- Justify budget based on ongoing assessment of initiative value
- Deliver products designed for implementing the EA through the Systems
- Development life cycle
- Analyze, visualize and make supportable, trackable decisions based on how architectural changes affect the Army
- prioritization of IT initiatives, relative costs and business benefits along with a clear display of decision factors.

Developing and executing an EA that complies with DoDAF and complies with Office of Management and Budget (OMB) criteria will be a challenge. But it's worth the effort. It will ensure that IT provides measurable business value — better decision-making, new operating efficiencies, lower costs and more — as the Army transitions to the Future Force.