Breakout Session

Exploring the Differences between Enterprise and System Architectures — A Look at the Different Methods, Tools, and Techniques

James Martin
Kevin Kreitman
Jeff Diehl
Scott Bernard
Abstract

• **Point:** Most of the ground system architectures for military systems use the DOD Architecture Framework (DODAF).

• **Counterpoint:** It might be more appropriate in many cases to use the Federal Enterprise Architecture Framework (FEAF) or perhaps even a different framework.

• This panel will explore the different approaches to architectural modeling of enterprises (like FEAF) versus warfighting systems (per DODAF).
  – We will look at case studies where FEAF and DODAF have been applied and extract lessons learned to determine when each framework is appropriate.
  – We will develop the selection criteria to assist in the planning stages of an architecture task for determining the best one or more frameworks to use.
Enterprise Architecture Example

Census Enterprise Architecture

Slide 3
Potential Work Items

• **Definitions**
  - System
  - Enterprise
  - (System) Architecture
  - (Enterprise) Architecture

• **Architectural Goals**
  - Enterprise Architecting
  - Systems Architecting

• **Framework Benefits**
  - DODAF
  - FEAF
  - Others?

• **Case Studies**
  - NOAA
  - AFSCN
  - Others?

• **Lessons Learned**
  - For above and others

• **Selection Criteria**
  - Key attributes of each framework
  - Key drivers of architecture
Topics

1. Introductions
2. DOD Architecture Framework
3. Federal Enterprise Architecture Framework
4. Air Force Enterprise Architecture Framework
5. Discussion
Introductions

• **Background**
  – Development (mainly)
  – Military
  – Other

• **Technology Domain**
  – Space
  – Airplane
  – Avionics
  – Ground
  – Communications

• **Business Domain**
  – Commercial
  – Aerospace
  – Defense
  – Other Government
  – Other

• **Discipline**
  – Systems Engineering
  – Software Engineering
  – Hardware Engineering
  – Other

• **Job Responsibility**
  – Management
  – Architecting
  – Engineering
  – Other

• **Architecture Level**
  – Enterprise
  – Mission
  – Program
  – System
  – Software
An Architecture has Multiple Views

A view represents the whole system from a particular viewpoint

Reduces perceived complexity through separation of concerns

Architecture views are an end result of doing “architecting”
The Three Main Views in the DOD Architecture Framework

- **Operational View**: Identifies what needs to be accomplished and who does it.
  - What Needs to Be Done
  - Systems that Support Information Exchanges
  - Information Exchanges
  - Who Does It
  - Required to Get It Done

- **Systems View**: Relates systems and characteristics to operational needs.
  - Specific System Capabilities Required to Satisfy Information Exchanges

- **Technical Standards View**: Prescribes standards and conventions.
  - Technical Standards Criteria Governing Interoperable Implementation/Procurement of the Selected System Capabilities
  - Basic Technology Supportability
  - New Technical Capabilities

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THE AEROSPACE CORPORATION

Slide 9
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<th>View Type</th>
<th>Framework Product</th>
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Tiered Hierarchy of Architectures

TIER 0
National / Int’l Architectures
US, NATO, Other Countries

TIER 1
Department / Federal Architectures
DOD, IC, HLS, DOC, DOT, …

TIER 2
Cmd/Service/Agency Architectures
Air Force, Army, Navy, …

TIER 3
Mission Area / X-MA Architectures
Space, Wx, Combat Ops, Mobility, …

TIER 4
Program / Node Architectures
MILSTAR, AFSCN, AOC, …

Enterprise Architectures
Architectures for Mission Areas, Programs, Nodes & Systems
Air Force & Federal Frameworks are the “Context” for DODAF
The FEAF Components

- DODAF Technical View
- DODAF Operational View
- DODAF Systems View

Current - Segments - Models - Target

Strategic Direction

Transitional Processes

Standards

Business Architecture

Technology Architecture

Business Models

Sub-Architecture Models

Business Drivers

Technology Drivers
OMB’s Family of Reference Models

The Federal Enterprise Architecture (FEA) is being constructed through a collection of inter-related “reference models” designed to facilitate cross-agency analysis and opportunities for collaboration.

- **Performance Reference Model (PRM)**
  - Government-wide Performance Measures & Outcomes
  - Line of Business-Specific Performance Measures & Outcomes

- **Business Reference Model (BRM)**
  - Lines of Business
  - Agencies, Customers, Partners

- **Service Component Reference Model (SRM)**
  - Capabilities and Functionality
  - Services and Access Channels

- **Data Reference Model (DRM)**
  - Business-focused data standardization
  - Cross-Agency Information exchanges

- **Technical Reference Model (TRM)**
  - IT Services
  - Standards

Source: “Enterprise Architecture: Your Blueprint for Transformation”
Norman Lorentz, OMB, Chief Technology Officer

October 7-8, 2002
The AF "ENTERPRISE" (a mission area decomposition)

THE AF "ENTERPRISE"

- SPACE
  - COMBAT OPS
  - ISR
  - MOBILITY
  - WEATHER
  - INFOSTRUCTURE
    - INFO MGMT
    - INFO ASSURANCE
    - TRANSPORT/COMPUTING
    - MODELLING/SIMULATION

- SPECIAL OPS
  - AIR TRAFFIC MGMT

- BUSINESS SUPPORT
  - FINANCIAL SERVICES
    - COMPTROLLER
    - LEGAL SERVICES
  - ACQUISITION
    - ACQUISITION
    - CONTRACTING
  - PERSONNEL AFFAIRS
    - PERSONNEL
    - HEALTH SERVICES
    - CHAPLAIN
    - PUBLIC AFFAIRS
    - QUALITY & MANPOWER
  - LOGISTICS
    - MATERIAL MGMT
    - LOGISTICS PLANS
    - CIVIL ENGINEERING
    - SERVICES
    - MUNITIONS
    - TRANSPORTATION
    - SUPPLY
    - MAINTENANCE

○ = MISSION AREAS

SOURCE: "Enterprise Architecting", AF-CIO/A, Aug 02
Air Force Enterprise Architecture Framework

AF-EAF Inputs & Outputs

Architecture Drivers & Inputs

GOVERNANCE & GUIDANCE
- Legislation (e.g. CCA)
- Directives, Policy & Instructions
- Air Force Arch Guidance & Charters

ARCHITECTURE INPUTS
- Strategic Vision & Plans
- CONOPS & Capabilities
- Requirements (e.g. ORDs)
- Task Lists (e.g. AFTL, UJTL)
- External Architecture (e.g. GIG Arch.)
- Other Mission, Business, & System Info

AF Enterprise Architecture Descriptions

Air Force Architecture Reference Models

Mission Area & Cross Mission Area Architecture Views & Products

Program & Node Architecture Views & Products

Architecture Uses & Impacts

- PPBS Process
- Joint Capabilities Integration & Development
- Acquisition
- Planning & Operations
- EA Life Cycle Process
- Other Uses

Relationship to FEAF and DODAF

AF Enterprise Architecture Descriptions

Air Force Architecture Reference Models

Mission Area & Cross Mission Area Architecture Views & Products

Program & Node Architecture Views & Products

Relevant Architecture Frameworks

Federal Enterprise Architecture Framework (FEAF)

DOD Architecture Framework (DODAF)

Relevant Reference Models & Views

Five Reference Models (Adapted from FEAF)

Architectural Perspectives

Operational View

Technical View

System View

Example Architectures at Different Levels

**TIER 0**

National / Int’l Architectures
US, NATO, Other Countries

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Department / Federal Architectures
DOD, IC, HLS, DOC, DOT, …

**TIER 2**

Cmd/Service/Agency Architectures
Air Force, Army, Navy, …

**TIER 3**

Mission Area / X-MA Architectures
Space, Wx, Combat Ops, Mobility, …

**TIER 4**

Program / Node Architectures
MILSTAR, AFSCN, AOC, …

Integrated Global Environmental Observing System (IGEOS)
Global Information Grid (GIG)
AF Space & C4ISR Conops
NOAA Observing System Architecture (NOSA)
Combat Operations Mission Area
Spacelift Mission Area
Integrated Overhead Sigint Architecture (IOSA)
SBR, SBIRS, SBSS, MilSatCom, …
Mapping from 5-Tier Hierarchy to Air Force-EAF Perspectives

**Tier 0**
- National / Int’l Architectures
  - US, NATO, Other Countries

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**Tier 4**
- Program / Node Architectures
  - MILSTAR, AFSCN, AOC, ...

- Architecture Perspectives
  - Air Force Architecture Reference Models
  - Mission Area & Cross Mission Area Architecture Views & Products
  - Program & Node Architecture Views & Products
Architectures are “Nested” into Higher Level Architectures

WARNING: Architecture at a higher level is the intersection of lower levels, NOT the union of lower levels.
Discussion

• What are the different objectives at the different “tiers” of architecture?
  – Federal and Department
  – Service and Agency
  – Mission Area
  – Program and Node

• What are the pros and cons of each architecture framework?
  – Federal
  – DOD
  – Air Force
  – Home Grown?