



**BUSINESS
TRANSFORMATION
AGENCY**

BEA DEVELOPMENT METHODOLOGY

March 11, 2011

Version History

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Acronym List

Acronym	Definition
APG	Architecture Product Guide
AV	All Viewpoint (DoDAF)
AV-1	Overview and Summary (BEA)
BEA	Business Enterprise Architecture
BDM	BEA Development Methodology
BECCM	Business Enterprise Common Core Metadata
BIP	BEA Improvement Proposal
BMA	Business Mission Area
BPM	Business Process Modeling
BPMN	Business Process Modeling Notation
BPR	Business Process Reengineering
BRS	BEA Reporting Service
BTA	Business Transformation Agency
CBM	Core Business Mission
CCB	Configuration Control Board
CIO	Chief Information Officer
CM	Configuration Management
CMD	Configuration Management Document
COE	Center of Excellence
COI	Community of Interest
COTS	Commercial Off-the-Shelf
CSE	Common Supplier Engagement
CR	Change Request
CV	Capability Viewpoint
DBSAE	Defense Business Systems Acquisition Executive
DBSMC	Defense Business Systems Management Council
DIV	Data and Information Viewpoints
DKO	Defense Knowledge Online
DoD	Department of Defense
DoDAF	DoD Architecture Framework
DOORS	Dynamic Object Oriented Requirements System
E2E	End-to-End Business Flows
EE	Enterprise Elements
EP&I	Enterprise Planning and Investment
ERP	Enterprise Resource Planning
ETP	Enterprise Transition Plan
FM	Financial Management
HRM	Human Resources Management
HTML	HyperText Markup Language
IV&V	Independent Verification and Validation
LRP	Laws, Regulations and Policies
MSSM	Materiel Supply & Services Management
OSD	Office of the Secretary of Defense
OV	Operational Viewpoint
PSA	Principal Staff Assistant
RPILM	Real Property & Installation Lifecycle Management
SMP	Strategic Management Plan
SOA	Service Oriented Architecture
StdV	Standards Viewpoint
SvcV	Services Viewpoint
SV	Systems Viewpoint
TP&R	Transformation Priorities and Requirements

Acronym	Definition
WSLM	Weapon System Lifecycle Management

1 Introduction

Purpose

The *BEA Development Methodology* (BDM) document describes the overall approach and process for developing the Business Enterprise Architecture (BEA), one of the primary tools used to drive transformation within the Department of Defense (DoD) Business Mission Area (BMA). The BDM reflects the current methodology for developing the BEA, incorporating lessons learned across the architecture development life-cycle and identifying best practices from the successful development of previous releases of the BEA.

The BDM provides an initial overview of the scope of the BEA, reviews the development approach used to analyze the information that becomes BEA content; details the process steps in the BEA release cycle; and identifies the technology and tools used to develop the BEA.

The BDM is intended for an audience that is familiar with the DoD Architecture Framework (DoDAF V2.0) and the overall BEA content and purpose.

This document has been updated to reflect the methodology used in the current release of the BEA, *BEA 8.0*, delivered March 11, 2011.

Related Documents

Other source documents for executing the processes outlined in this document include the *Architecture Product Guide* (APG), the *BEA Configuration Management Document* (CMD), and the *DoD Strategic Management Plan* (SMP).

The major milestones for the Enterprise and Component Systems and Initiatives that are critical to achieving the transformation priorities depicted in the BEA are outlined in the *Enterprise Transition Plan* (ETP). Although the ETP is a separate document, it integrates and cross-references to the BEA at appropriate common touch points.

While the BEA and ETP provide a blueprint and roadmap, respectively, for defense business transformation, the *Congressional Report on Defense Business Operations* provides a status against the previous year's ETP. Together, these three products provide the Department's target environment (BEA), how to get to that target environment (ETP), and progress towards that target environment (Congressional Report).

This documentation provides the guidance for BEA development.

2 BEA Scope

The BEA is developed based on a set of integrated DoDAF V2.0 viewpoints. The BEA DoDAF V2.0 viewpoints are: All Viewpoint (AV), Capability Viewpoint (CV), Data and Information Viewpoint (DIV), Operational Viewpoint (OV), Services Viewpoint (SvcV), Standard Viewpoint (StdV), and Systems Viewpoint (SV). Each DoDAF V2.0 viewpoint is composed of a set of architecture products and models as described in the *Architecture Product Guide*. The BEA defines the DoD business transformation priorities, their supporting business capabilities and enabling systems and initiatives. The updating of the BEA is driven by the Strategic Management Plan (SMP) and the End-to-End (E2E) Business Flows.

The BEA is focused on a set of Core Business Missions (CBMs). By focusing on a defined set of CBMs, the BEA provides the foundation to accelerate outcome-based architecture development and implementation going forward.

The BEA scope is any function, process, rule, data, or technology that requires use in a standard manner to support or describe the business enterprise. This scope is further defined within the CBMs. At the DoD Enterprise level, the CBMs have been identified as the highest priority transformation initiatives and serve as the focus of the BEA 8.0 development effort.

The scope of the BEA is primarily bounded by the following five CBMs:

- Financial Management (FM)
- Human Resources Management (HRM)
- Real Property & Installation Lifecycle Management (RPILM)
- Materiel Supply & Services Management (MSSM)
- Weapon System Lifecycle Management (WSLM)

Complete definitions of the CBMs can be found in the AV-2, the BEA integrated dictionary.

Within this scope, BEA development is focused on providing tangible outcomes that answer the following four questions known as the “Golden Questions”:

- Who are our people? What are their skills? Where are they located?
- Who are our industry partners, and what is the state of our relationship with them?
- What assets are we providing to support the warfighter, and where are these assets deployed?
- How are we investing our funds to best enable the warfighting mission?

For each CBM, the business capabilities and enabling systems and initiatives required to meet transformation objectives are derived from the Golden Questions and frame the content of the BEA. To support this analysis, derivative questions are developed. Samples of derivative questions are listed below:

1. Who are our personnel (e.g., active, reserve, guard, civilian)?
2. What is the member’s/employee’s service/organization? (Army, Navy, Air Force, Marine Corps)?
3. How many members/employees are in theater?
4. Who are our suppliers?
5. What products and services do they provide?
6. Where are our suppliers located?

3 BEA Development Approach

This section addresses the development approach used to analyze and incorporate information to develop BEA content. The approach involves defining the requirements, working with an integrated team, and managing the release cycle to completion.

DoD Strategic Management Plan (SMP)

The SMP provides an executive overview of the Department's overall strategic planning and management framework and describes the integrated activities that comprise the Department's performance management system. This enables the leadership of the Department to enhance productivity by focusing resources on the key levers that drive success. It also establishes five top-level priorities for business operations. These priorities are intended to engage all levels of the organization in a cross-functional, holistic way from the executives who define strategy, to process and functional owners who translate strategy to policy, to the line managers responsible for operational execution. The key outputs the SMP are goals and measures, and associated key initiatives, for improving the performance of DoD business operations.

End-to-End Business Flows (E2E)

E2E Business Flows describe the business capabilities being implemented in the Commercial Off-the-Shelf (COTS)/Enterprise Resource Planning (ERP) programs being implemented in DoD. Because the business flows span the CBMs, the mappings to BEA artifacts allow the BEA to better support the development of business capabilities from an enterprise perspective beyond just the COTS/ERP programs. This alignment also improves the allocations of BEA requirements to guide system implementations, investment management decisions, and portfolio management.

The following E2Es have been identified:

1. Acquire to Retire
2. Budget to Report
3. Concept to Product
4. Cost Management
5. Deployment to Retrograde/Redeployment
6. Environmental Liabilities
7. Hire to Retire
8. Market to Prospect
9. Order to Cash
10. Plan to Fulfill
11. Procure to Pay
12. Proposal to Reward
13. Prospect to Order
14. Service Request to Resolution
15. Service to Satisfaction

DoD Executive Management determines which of the E2Es are targeted for a BEA Release by applying the priorities from the SMP.

Business Enterprise Common Core Metadata (BECCM) Communities of Interest (COI)

The BECCM has been instituted to govern the information exchanged between and across CBMs at the DoD Enterprise Tier. BEA data requirements that require resolution is submitted to the BECCM. The BECCM serves as arbiter of the current CBM Communities of Interest (COI) within the DoD. There is a BMA COI for each CBM.

In this role as arbiter, the BECCM has the responsibility to:

- Promote common data exchange standards and vocabularies
- Identify and facilitate resolution of conflicts and overlaps

- Identify and document common core data and metadata

The BECCM carries out these responsibilities in support of its goals as identified in the BECCM Charter dated June 17, 2009. The following list comprises multiple goals as outlined in the Charter that directly impact the way architecture federation works within the DoD.

- Provide processes to identify and mediate gaps in common vocabulary standards across the DoD
- Facilitate coordination, provide oversight, and lead governance of information exchanged at the Enterprise Tier between BMA COIs aligned to the Defense Business Systems Investment Review Boards
- Identify and recommend prioritization of existing authoritative data sources and data reconciliation capabilities, while minimizing proliferation of new data elements in new services and systems.

Federation relies heavily on the use of taxonomies to provide the structure to which enterprise architectures link/align thus creating the federation. This, in turn, emphasizes the importance of the BECCM COI in facilitating the operation of federated architectures within the Department. Following the guidance of the BECCM Charter, the overarching taxonomy used to federate architectures within the BMA is overseen and coordinated by the BECCM COI.

While the BECCM COI is ultimately responsible for the BMA terms and how they are used to enable BMA federated architectures, it must work in concert with other governing bodies established to support federated architectures within the entire Department.

“Top Down and Bottom Up” Approach to BEA Development

BEA 8.0 continues to provide additional value to the Department’s BMA by evolving the BEA to better suit the uses of key stakeholders (i.e., Investment Managers, System Developers and Integrators). This additional value is demonstrated in two areas and provided by:

- Enterprise Transformation
 - Improving system-level information, capturing the target environment and capturing planned enterprise services in support of a Service-Oriented Architecture (SOA) and Cloud Computing
 - Improving BEA ability to facilitate system interoperability and development by focusing on top-down data initiatives, identified by the CBMs Principal Staff Assistants (PSAs), which are used as a source of system requirements. In addition, identification of system resource flows and development of appropriate business rules are focuses which will allow the BEA to become more implementable.
- Enterprise Capabilities
 - Improving BEA Business Capability¹ threads (i.e., BEA integrated information related to a specific capability) through tighter integration between architecture products
 - Using Business Capabilities to aid in scoping BEA content development for each release.

The above improvements allow a mixture of Business Capability, technical integration and standardization, and enterprise systems and services framework content to describe the target environment. To coordinate and balance these architecture development efforts they address these various types of requirements, BTA has adopted a “top-down and bottom-up” approach to architecture development as shown in Figure 1, BEA Development Approach.

¹ The Business Transformation Guidance defines a Business Capability as “The ability to execute a specific course of action. It can be a single business enabler or a combination of business enablers (e.g., business processes, policies, people, tools, or systems information) that assist an organization in delivering value to its customer.”

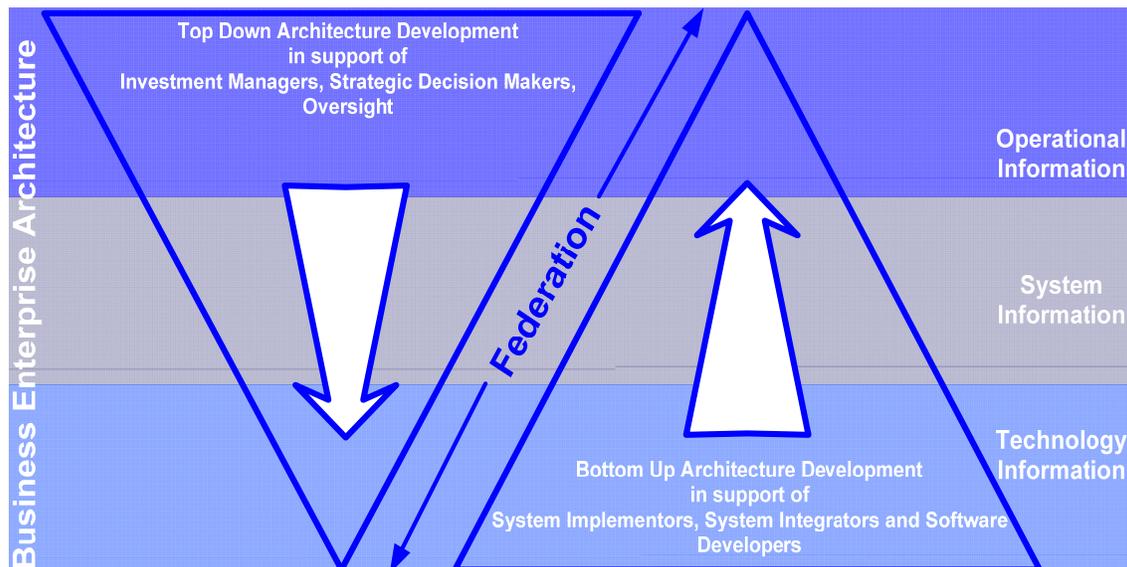


Figure 1, BEA Development Approach

The “top-down” portion of the approach pertains to architecture development from a strategic perspective with the PSAs and other DoD Business Mission Area as the primary sources of requirements.² It entails the identification of Business Capability gaps and improvements and uses these gaps and improvements to guide architecture content for a particular release. In this context, architecture content is developed starting with the BEA Improvement Proposal (BIP) and builds out the necessary OV, DIV, SvcV, SV and StdV product information to support the appropriate stakeholders.

The “bottom-up” portion of the approach considers architecture development and implementation from a tactical perspective. This approach provides support to engineering of solutions through alignment to BEA requirements. The solutions being engineered and architected equate to the systems developed and implemented at the Enterprise level as shown in Figure 2, Conceptual Structure Supporting BEA “Bottom-Up” Development. In this approach, the enterprise systems and enterprise data standards are used to drive the SV product information and products that complement the OV and DIV information generated via the “top-down” portion of the approach. This tactical information is used to determine the appropriate leveling of architecture content from the enterprise systems, ensuring that the BEA is capable of supporting implementation of services and systems.

The target enterprise-level architectural information is incorporated into the BEA while the non-enterprise level architectural information is federated to the BEA and owned and maintained by the appropriate Components and/or Programs consistent with the principle of tiered accountability.³ The DIV-2 is a fundamental bridge for supporting the Conceptual Structure Supporting the BEA “bottom-up” Development. To make this model relevant to transformation and for supporting the warfighter requirements, it is imperative that the DIV-2 be developed using authoritative Data Elements along with meta-data supported and published by the PSAs from the Office of the Secretary of Defense (OSD).

Federation helps bring together the “bottom-up” architecture information gleaned from enterprise systems analysis and the “top-down” information gleaned from the business capability analysis. Systems information that is identified as being appropriate to the Component or Program levels shall be included in the appropriate Component or Program architectures and federated to the BEA. The same is true for the “top-down” architecture information in that it also shall be federated to the BEA, if deemed as Component or Program level information. More detailed information on the concept of federation is contained in the *BMA Federation Strategy and Roadmap* and the *GIG Architecture Federation Strategy*.

² The requirements of these users are usually documented in the forms of Strategic Plans and other architectures. Therefore, these items may also serve as sources of requirements.

³ In the case of BTA and its enterprise systems, the non-enterprise level information shall be maintained within the Defense Business Systems Acquisition Executive (DBSAE).

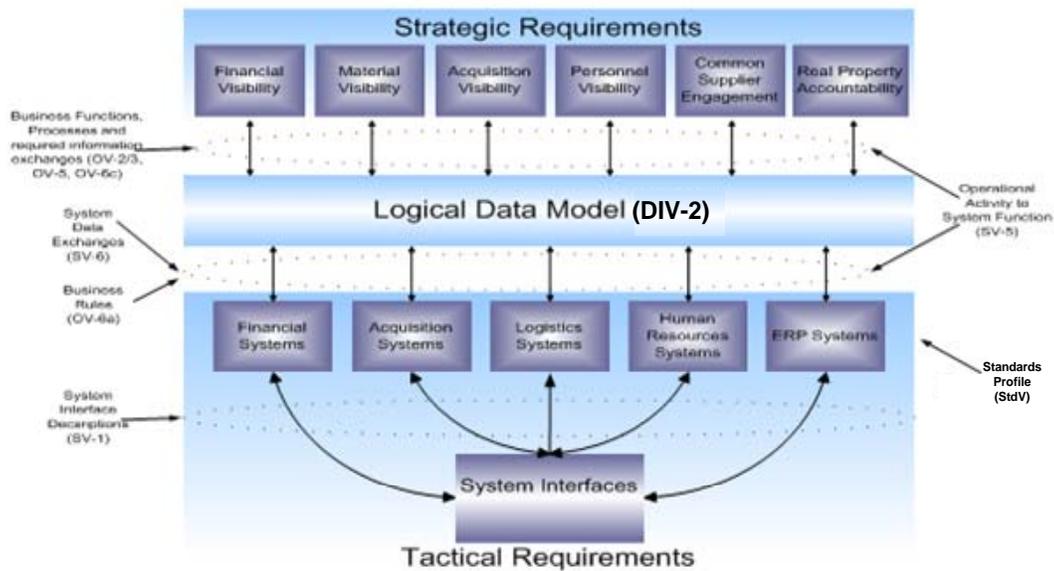


Figure 2, Conceptual Structure Supporting BEA “Bottom-Up” Development

BEA Content Development

In previous BEA releases, the BEA was developed using a “Spiral Development Process”. Although this process enabled successful development of previous releases, the BTA realized that the methodology used to develop the BEA must evolve in concert with the evolution of the content. Thus a parallel development process, depicted in Figure 3, BEA Parallel Development Process, was adopted for BEA 7.0. This process modification involved multiple resources performing real-time content architecture development and integration within workshops. The parallel development process enabled delivery of a fully integrated product suite that met significantly tighter deadlines.

In addition to modifying the content development process, the BTA allowed remote access to stakeholders enabling their participation during phases of the BEA development life-cycle with which they were previously uninvolved. This proved to be an agile and effective development process that will be continued in future releases. As the process improves, the BTA will continue to share with other architecture development efforts proven processes, techniques and technology capabilities thus realizing the Architecture and Information Management’s vision of being recognized as an architecture Center of Excellence (CoE). The set of DoDAF V2.0 products determined to be necessary and sufficient to the meet current BEA objectives and complete the development sequence deployed during each BEA release is presented in [Figure 3, BEA Parallel Development Process](#).

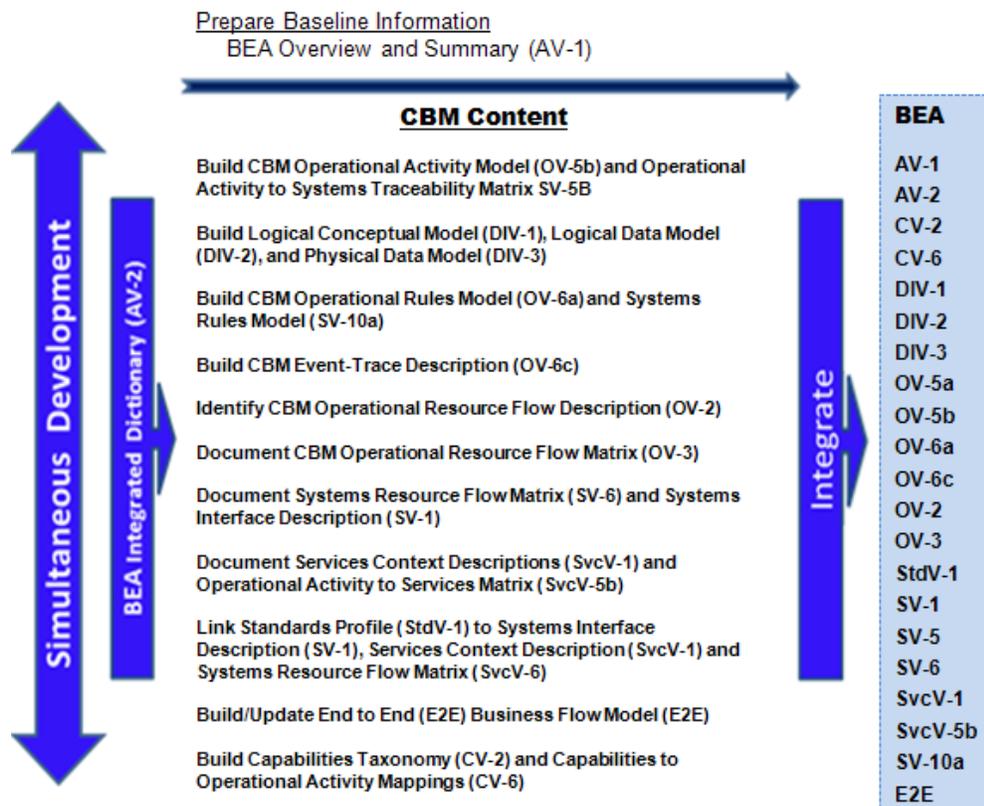


Figure 3, BEA Parallel Development Process

As evidenced within the content list of the above BEA Products, the BEA is evolving toward conformance with DoDAF V2.0 and its data-centric theme. The parallel development 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, V1.5, or V2.0 products). The BEA has adopted several of the DoDAF V2.0 Meta Model (DM2) constructs which define architectural data elements and enable the integration and federation of Architecture Descriptions.

DoDAF V 2.0 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.⁴

The set of DoDAF V2.0 products delivered in the BEA provides transformation planners and system developers/implementers with answers to the questions presented in [Figure 4, Uses of BEA Products to Answer Question](#).

⁴ Benefits as described on the DoD Deputy Chief Information Officer's DoDAF 2.0 web page <http://cio-nii.defense.gov/sites/dodaf20/6-step.html>

BEA Product	Product Use
AV-1 Scope	Executive Overview
AV-2 Integrated Dictionary	Terms and Definitions
CV-2 Capability Taxonomy	What are the capabilities?
CV-6 Capabilities to Operational Activities	How are the capabilities supported?
DIV-1 Conceptual Data Model	What data is required?
DIV-2 Logical Data Model	What data is required?
DIV-3 Physical Data Model	What data is required?
OV-5a Operational Activity Decomposition	What gets done?
OV-5b Operational Activity Model	What gets done?
OV-6a Business Rules	What are the business constraints?
OV-6c Event Trace Description	How do things get done?
OV-2 Operational Nodes	Who does what?
OV-3 Information Exchange	Who says what to whom?
StdV-1 Standards Profile	Which standards define the IT profile?
SV-1 System Interfaces	Which IT systems support what gets done?
SV-5 System Functions Map	What can be supported by IT systems?
SV-6 System Data Exchange	What data is sent between systems?
SvcV-1 Services Context Description	Which SOA Services support what gets done?
SvcV-5b Service Traceability Matrix	What is supported by SOA Service
SV-10a System Rules	What are the system constraints?
E2E End-to-End	How does the business flow?

Figure 4, Uses of BEA Products to Answer Questions

Integrated Development Team

Throughout the process, Independent Verification and Validation (IV&V) support was included as an embedded member of the development team to provide near real-time input for timely resolution. IV&V reports on deliverables subsequent to each architecture release. Within both aspects of BEA development (i.e., the “top-down and bottom-up” approach as well as the “parallel development process”), BTA makes strong use of an integrated development team. Development of the BEA is performed via collaborative effort between two primary groups: content providers and architecture builders. Requirements that drive BEA content are provided by CBM representatives both within and outside of the BTA TP&R Directorate. For CBM representatives that are organizationally outside of the BTA, TP&R serves as the coordinator for ensuring appropriate scope and participation is provided for each BEA release. The BTA Enterprise Planning and Investment (EP&I) Directorate is responsible for translating the content provided by CBM representatives into DoDAF V2.0 products that conform to BEA product guidelines while managing the release schedule and ensuring architecture integration with the ETP.

Collaboration among the following two groups occurs at various levels and through multiple forums:

- **CBM Leadership:** A CBM Lead is identified for each of the Business Enterprise Priorities to lead the content development effort and approve CBM content for each release. The CBM Leads coordinate issue resolution across the CBM efforts and work closely with the BEA Chief Architect to manage the BEA release scope and schedule.
- **CBM Teams:** Integrated product development teams comprising content providers⁵ and architecture builders are established for each CBM or planned capability improvement. Team members include appropriate CBM representatives, BTA support (e.g., EP&I and ETP members), contractor support, and other support staff, to include representatives from the IV&V teams.

⁵ In this context, the requirements that generate the content are provided by an extended group of stakeholders to include the Enterprise Integration Directorate of BTA as a representative of the Components and Enterprise Resource Planning (ERP) systems, the DBSAE as owner of the enterprise systems, and the PSAs.

The specific roles and responsibilities for developing the BEA are described in [Table 1, BEA Development Roles and Responsibilities](#).

Table 1, BEA Development Roles and Responsibilities

Role	Responsibility
Architecture Development Team	<ul style="list-style-type: none"> • Provide architecture tool support • Develop Hypertext Markup Language (HTML) products and generate architectural builds in the tool • Deliver the final BEA to the public web site
CBM Lead	<ul style="list-style-type: none"> • Create the BEA Improvement Proposals • Identify and authorize work on proposed capability improvements to be included in the BEA • Approve Change Requests
CBM Subject Matter Expert	<ul style="list-style-type: none"> • Provide business expertise for development of content and functional verification of the BEA
BEA Chief Technical Architect	<ul style="list-style-type: none"> • Establish the proposed architecture drivers • Act as final arbiter for BIPs with respect to release content issues • Delegate responsibilities for coordinating technical analysis and resource allocation across the Product Teams • Approve Change Requests
Architect	<ul style="list-style-type: none"> • Assist in the development of the BIPs, managing the Change Requests • Define and implement architecture content changes • Participate in HTML and Product Reviews
BEA Support Staff	<ul style="list-style-type: none"> • Support decision-making forums by scheduling and facilitating meetings, and documenting decisions on meeting minutes • Collect and manage information on the physical and electronic BEA Information Hub team work space
Configuration Management (CM)	<ul style="list-style-type: none"> • Support the configuration management tools • Propose configuration control procedures and processes • Manage the CR workflow
Contractor Architecture Lead	<ul style="list-style-type: none"> • Approve work effort allocation for CRs • Propose changes to the architecture
Enterprise System Owner	<ul style="list-style-type: none"> • Provide support to the “Bottom-up” analysis portion of the BEA Development Approach • Ensure that system-level information is accurately used to affect BEA content
Independent Verification & Validation (IV&V) Reviewer	<ul style="list-style-type: none"> • Monitor and measure compliance to standards and external review comments • Assess both architecture integration and usability
Release Manager	<ul style="list-style-type: none"> • Oversee overall schedule, development and deliverables

BEA Release Cycle

The BEA is released on an annual basis, concurrent with the Congressional Report that details the progress made on the Department of Defense’s business transformation efforts. Informational Releases can be published between annual releases. This allows updated BEA products to be made available prior to the annual release.

Planning for each release begins with the identification of specific gaps or business capability improvements to be addressed in a future release of the BEA. These gaps or business capability improvements are documented in the form of BEA Improvement Proposals (BIPs). BIPs are generated and submitted from multiple sources and may include proposed BEA modifications resulting from:

- Emerging or existing functionality from each CBM

- Planned capability improvements addressing CBM capability gaps
- Identification or modification of DoD Enterprise systems or initiatives
- Integration of existing architecture products from a technical or content perspective
- Deferred Change Requests and Feedback Tickets generated from previous releases
- Findings and Recommendations from the CBM representatives or the BEA Overview and Summary Information document (AV-1)
- Changes to Laws, Regulations, and Policies (LRP)
- Revisions to BEA-related guidance information, such as the DoDAF V2.0 or the BEA Compliance Guidance
- Visualization enhancements to the BEA
- Additions and extensions to architecture development environment tools, methods and procedures
- Development or revision of supplementary products

All of these sources are examined and prioritized by the PSAs and the CBM representatives. The EP&I Directorate, in conjunction with BTA Leadership, determine the drivers for the next release. This development process requires each BIP to be described in terms of the business capabilities affected by the improvement(s), its impact across the Core Business Missions, the level of effort required to architect a solution to the gap, and the specific architecture products that must be modified to complete the proposed effort and enable improved BEA scoping and planning decisions. Each BIP must support the SMP Business Priorities, and Goals. At the end of the development cycle, the work that was planned is reviewed against work accomplished to determine if the BIPs have been satisfied as planned at the beginning of the release cycle.

The key milestones for releases and the approximate timeframes for key activities within the high-level release process are presented in Figure 5, Sample BEA Release Timeline. Although relative timing of milestones will differ from release to release, this type of timeline has been used for overall release planning to depict the key milestones in the process. The sample indicates two Informational Releases prior to the annual BEA Release.

It is supported by more detailed project plans that specify development periods, milestones, dependencies and responsible persons for all approved development work for a specific BEA release.

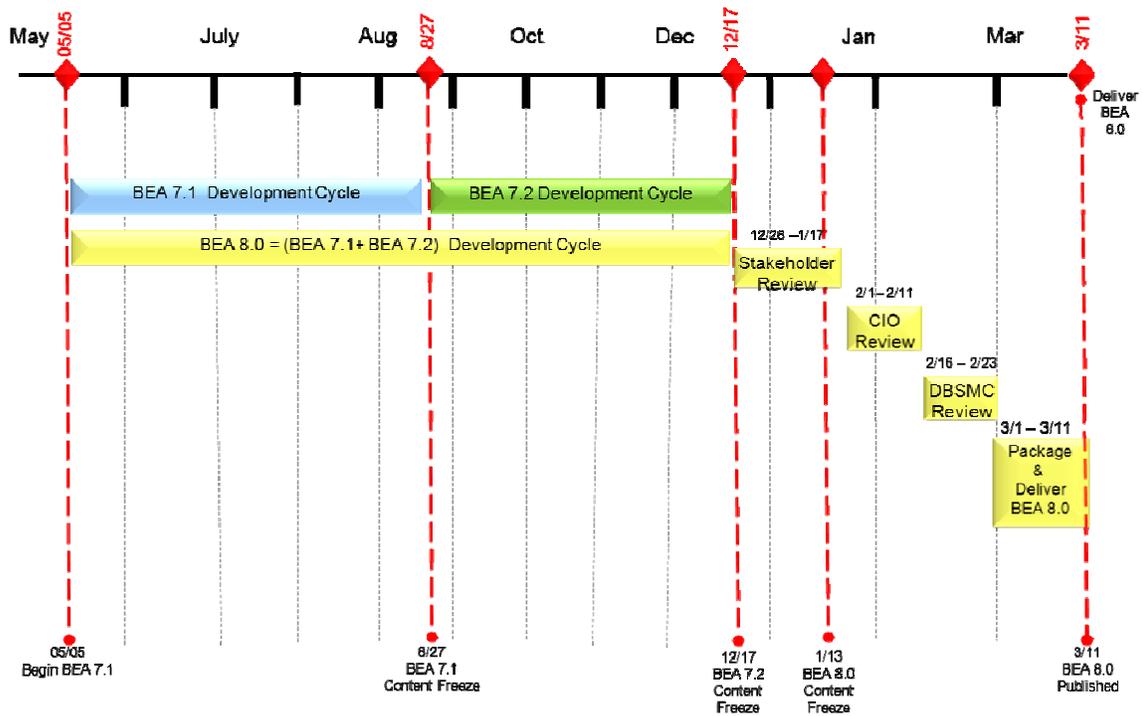


Figure 5, Sample BEA Release Timeline

In order to optimize the time available for BEA content development, the identification of high-level scope and preliminary planning for a subsequent release begins during the second half of the development cycle of the current release. Also, during that time, an effort to refine the AV-1 at the conclusion of product development is undertaken to identify gaps in the architecture and incorporate findings and recommendations for future architecture content.

4 BEA Development Process

The high-level activities performed within each BEA release cycle consist of the following:

1. Development Cycle
 - Develop Scope for the Release
 - Plan the Release
 - Develop the Release
 - Workshop Reviews
2. Conduct External Reviews
 - Stakeholder
 - Chief Information Officers (CIO)
 - Defense Business Systems Management Committee (DBSMC)
3. Package and Deliver the Release

This section presents an overview of the BEA development cycle. Detailed information for defining BEA products is available in the BEA APG.

The following three configuration management artifacts control the BEA Development Process:

1. BEA Improvement Proposal (BIP)
2. Change Requests (CR)
3. Tickets

Each BIP addresses the Business Priorities and Goals identified in the SMP. BIPs provide the rationale, change description and impact on one or more BEA products. BIPs may designate BEA business product changes for new BEA products or features. CRs are work requests issued for approved BIPs. CRs are implemented to change content within the BEA. Tickets are work requests that are created to fix errors discovered in content or the website.

The *BEA Configuration Management Plan* describes in detail how the BIPs, CRs and Tickets are used and implemented. Please refer to that document for more information.

Development Cycle

The development cycle is an iterative process that can produce informational releases prior to the annual BEA release. The following activities may be repeated for each informational and annual release.

4.1.1 Develop Scope for the Release

Each release begins with the receipt of prioritized gaps or business capability improvements for the BEA and a high-level timeline for release activities. This process is triggered by the identification of a focused body of work to be added to a specific release of the BEA, or by the identification of gaps or non-conformances that must be corrected in a specific release of the BEA. During this process, the BIP is completed for proposed changes, approved by the IRBs and CRs are created. The CBM AV-1s are then created to describe the scope of the body of work to be completed.

The major tasks performed during scope development are as follows.

4.1.1.1 Develop and Approve BEA Improvement Proposals

BIPs are developed by the primary stakeholders and submitted to the Architecture Development Lead and Chief Technical Architect for review. While the scope of the proposed changes may impact multiple CBMs, one CBM team is designated as the primary stakeholder and will be responsible for coordinating content changes during the development process. The socialization and validation process for the proposed BIPs includes a review of

proposed scope to ensure the work proposed can be accomplished during the release cycle. The selected BIPs are presented to the BTA Director for final review and approval by the IRBs. Approved BIPs for a specific release become the basis for scheduled development as detailed in Change Requests.

4.1.1.2 Create and Approve Change Requests

Change Requests (CR) are created for each approved BIP to track and manage each major focused body of work planned for the release. The CR is attached to the BIP to ensure traceability to the original scoping document. CRs are managed and approved according to the process documented in the *Configuration Management Plan*.

CRs need to identify specific changes to architecture products and contain documentation that allows verification of intended changes in the architecture tool. The approval by the Configuration Control Board (CCB) of a CR indicates that changes to the specified DoDAF V2.0 products are necessary and should be developed within the scope outlined in the BIP. Changes that impact the ETP/CR are also reviewed with the ETP team. For example, if a new Business Capability is being introduced, its definition must be included in the Enterprise Transition Plan/CR. Approval of CRs by the CCB indicates agreement on the schedule and resources to develop the BEA release.

4.1.1.3 Develop AV-1

Concurrently with approval of the BIPs, an initial CBM Overview and Summary Information (AV-1) document is developed to describe the scope of planned changes with respect to each CBM. The CBM AV-1 structure and content is based on DoDAF V2.0 guidelines and includes the CBM purpose and perspective, context, and information about the scope of work to be performed for the release. The scope of the CBM AV-1 should reflect the approved BIPs for each release. The initial BEA AV-1 is developed from the CBM AV-1 documents to provide a total overview of the BEA release. Near the conclusion of product development, the AV-1 is updated to incorporate CBM Findings and Recommendations and to reflect the actual work that was completed.

4.1.2 Plan the Release

A detailed plan for the release is developed, after the scope has been identified, based on the approved BIPs that have been selected for the release. Resource requirements for CBM functional experts and BTA modeling support are determined based on the functional scope and architecture products impacted by each planned capability improvement. Workshops must be carefully planned to provide a stable baseline for sequential changes and to optimize resource utilization. The major tasks performed during release planning are updating the integrated schedule and approving CRs.

4.1.2.1 Update Integrated Schedule

Through a process of balancing resources against scope requirements, a detailed schedule is developed for each BIP to identify the start and stop dates for development, integration and product review. If the proposed content exceeds available time and resources, this process will feed back to scoping for adjustments to the release content. Alternatively, time and resources are adjusted to accommodate the prioritized scope.

4.1.2.2 Approve Change Requests

CRs are nominally written, analyzed to determine the work to be done, and finally submitted for CCB approval prior to the beginning of the Workshops for the parent BIP. The BEA Chief Technical Architect or representative, Contractor Chief Architect or representative, and Configuration Management Lead vote on the approval of CRs. This step represents “authorization” to do the work.

4.1.3 Develop the Release

Architecture development begins once the CRs have been approved and is conducted by CBM Teams working in parallel to develop CBM-specific DoDAF V2.0 products. During this process, pre-workshops are conducted to collect requirements and changes to update the architecture products. During a series of development workshops, the requirements are analyzed in detail, the architecture products updated per each CR and impacts to other architecture products are identified. During the final workshop session, all changes are checked to include any

impacts on the E2E mappings. A Walkthrough session is conducted at the end of the development phase to ensure that all content issues have been addressed. The completed product is then presented to the CBMs for approval. This process ends with CBM approval of the developed CR. As cross-CBM touch points and/or shared objects are addressed, CBM teams work collaboratively to ensure consensus and real-time integration. The major tasks performed during release development follow.

4.1.3.1 Conduct Pre-Workshop Activities

The principle purpose of the pre-workshop is to enable the stakeholders to develop the initial version or changes to the BEA models based on their Business Process Reengineering (BPR) efforts and to collaborate with other stakeholders to successfully integrate their bodies of work into the BEA. These working sessions may serve to familiarize other CBM Teams with the content so as to identify impacts across architecture models and products.

To facilitate this effort a working area, commonly referred to as a “Sandbox” is made available in the System Architect tool. Working with the approved BIP and a first cut but not approved CR, draft models are prepared, changed, and updated as necessary as part of the analysis to address the requirements. Where applicable, the results of CBM-led BPR efforts are brought forward for incorporation into the BEA. These artifacts serve as the basis for obtaining approval of the CR normally no earlier than a month prior to the Workshop through the CCB. The CCB approval enables the architects to begin modifying the BEA development encyclopedia with the developed changes and models prior to the formal workshops.

4.1.3.2 Conduct Workshop Activities

With CR approval and development encyclopedia updates accomplished, formal workshop activities begin. Architecture products are reviewed and refined during workshops based on the parallel development process outlined in Figure 3. During each product development workshop, diagrams are marked up and meeting minutes are recorded to document discussions and decisions. After each workshop, modelers analyze decisions, identify impacts to other architecture products, apply changes to the architecture repository and prepare questions for the next workshop session. A workshop concludes when participants agree the updated diagrams and definitions match the decisions documented in the meeting minutes and the product meets the objectives defined in the CRs and the BIPs.

4.1.3.2.1 Develop Supporting Products

In addition to the work products specifically listed in the DoDAF V2.0, supporting products are developed and included in the BEA to provide management perspective and architectural context. Supporting products include the BEA Summary, the LRP Repository and the HTML version of the BEA.

BEA Summary: At the conclusion of each release, a summary document is developed that explains the changes between the current and previous release as well as any new supporting products or visualization features being delivered. Architecture configuration management statistics are also provided that, over time, will provide a guide as to the size and impact of change from one release to another.

LRP Repository: With each BEA release, a series of LRP Baseline reports are delivered as well as a repository database of all of the source documents as a tool for the functional community to use. These supplemental reports cover those laws, regulations and policies that are mapped into the BEA, which remains the authoritative source for laws, regulations and policies. The LRP Repository is delivered with the BEA to provide users with the current set of compliance constraints and their linkages to the BEA. The scope of each baseline includes all authoritative constraint information delivered in that version of the BEA, as well as any additional authoritative source updates approved by the CBMs.

HTML: HTML is developed to format and present the integrated BEA in a more user friendly version than that presented in the core architecture development tool. HTML requirements (identified during scoping) provide guidance for new web content or navigation capabilities (for example, linking System definitions to the ETP). Draft HTML is used during Product Review sessions. Creating the linkage with the ETP is critical to HTML development.

After the architecture products are completed in a workshop, a Walkthrough session is conducted to ensure that the changes made in the workshop are correct, fully integrated and complete within the scope of the BIP and the related CRs. Participants include the Workshop Facilitator, the involved Architects, representatives from the IV&V team, and all stakeholders affected by the changes agreed to in the workshops. Product checklists and architecture reporting tools are used to review the completed product for architectural integrity and conformance to modeling guidelines. All outstanding questions and remaining issues are documented and action items are assigned for resolution at the conclusion of the Walkthrough session.

When significant issues arise during the Walkthrough, the Workshop Facilitator schedules additional work sessions to obtain resolution. A new Walkthrough session will be scheduled to ensure that the resolution is agreed upon by all stakeholders. Once this is accomplished the CBM Vote will be scheduled.

4.1.4 Workshop Reviews

4.1.4.1 Ongoing Workshop Reviews

The BEA is delivered in two formats; System Architect and HTML. During the workshops both formats are reviewed to ensure the quality and usability of the models and artifacts included in the release.

4.1.4.2 Ongoing Integration Reviews

The BEA is a fully integrated architecture. DoDAF V2.0 defines an Integrated Architecture as one in which architecture data elements are uniquely identified and consistently used across all products and views within the architecture. During the development of the models and artifacts, ongoing integration reviews, which include technical reviews and a functional review of the updated BEA and supporting models and artifacts, are done. The technical reviews verify proper linkages between architecture models and artifacts. The functional reviews verify that diagrams and definitions accurately reflect intended outcomes based on the scope of the release. Tickets are opened to document any defects or deficiencies against each architecture model or artifact. Tickets are processed through the CCB. Normally, the Ticket submitter verifies the final resolution of the Ticket. The model and artifact development is complete when all CRs have been reviewed and all Tickets have been completed, cancelled or deferred.

4.1.4.3 Ongoing HTML Reviews

The purpose of the HTML Review is to test the usability of the HTML and to verify that it meets requirements defined in the HTML specification. During the development of the models and artifacts ongoing HTML reviews are performed. As part of reviews, both internal and external linked are checked using automated tools and manual efforts. Tickets are opened to document any defects or deficiencies identified. Normally, the Ticket submitter verifies the final resolution of the Ticket. The HTML reviews are complete when all HTML functions have been reviewed and all Tickets have been completed, cancelled, or deferred.

Following the Walkthrough Session all provided artifacts relating to the CR is posted to the “Virtual Folders” on the BTA portal for review by the CBM stakeholders. A vote is conducted, recorded and attached to the CR documentation. If a CBM Stakeholder concurs with the work completed, but with comments, the comments are adjudicated or addressed through the creation of a Feedback Ticket in the CR process. CBM Approval indicates that the business information is properly represented in the architecture product.

Conduct External Reviews

After the Development Cycle has been completed three external reviews are performed. The purpose of the external reviews of the BEA is to allow external stakeholders to review and provide BTA with comments and insights prior to the general publication of the release. Examples of external reviews include the reviews by Component CIOs. During this review cycle, BEA and ETP content are aligned and a review website is populated, tested and made available for access by the External Review audience. A kickoff presentation for the External Review is developed which announces the timeline, scope and process for review activities and communication of feedback. Findings and Recommendations from the Final BEA AV-1 from the prior release are also provided.

Upon receiving and coordinating disposition of comments from the External Review participants, the BTA in turn will communicate the final resolution or disposition of comments back to the submitters. A final presentation for delivery to external customers is developed and delivered stating the results of the External Review session. Results are also presented to the DBSMC, which is the final approval authority for the delivery of the BEA.

During these reviews, the BEA is also socialized with other appropriate stakeholders, such as PSAs, CBM Leadership, and Component representatives.

4.1.5 Stakeholder Review

Upon the completion of all development work under the scope of all BIPs included in the Release, the Stakeholders perform a comprehensive review across the full suite of changes in the architecture release along with a review of the website. Issues are normally documented as Feedback Tickets, though a template available on Defense Knowledge Online (DKO). Comments are adjudicated and appropriate changes are made to the BEA content.

4.1.6 CIO Review

The CIO Review checks the To-Be state outlined in the BEA for alignment to the DoD strategic plans. Also reviewed are process improvement considerations. Comments from the CIO Review are adjudicated and appropriate changes are made to the BEA content.

4.1.7 DBSMC Review

The DBSMC Review checks the To-Be state outlined in the BEA, for impacts on portfolio management and compliance. Comments from the DBSMC Review are adjudicated and appropriate changes are made to the BEA content.

4.1.8 Security Information Assurance Review

All documents that are to be uploaded and displayed on DKO must undergo a Security Information Assurance Review. The documents are first reviewed by the BTA Security office which then submits the documents to the Washington Headquarters Service for review and approval.

Package and Deliver the Release

At this point in the release cycle, the BEA has been accepted by the CBMs and the external review customers. The BEA HTML is then integrated with other deliverables, to include the LRP, and tested. This testing includes checking for broken document links in the HTML and verifying the links to the documents loaded to DKO. The DKO documents are organized into three folders. The first folder contains reference documents such as: BEA APG, BEA BDM, Guidelines, DoDAF V2.0 Volumes, etc. The second folder contains all the diagram versions of the E2Es. The third folder contains the briefing materials used for SOA presentations. At the successful conclusion of testing, the BEA is packaged and produced on a Compact Disc and delivered to the Government. Upon Government acceptance, the new release is posted to the BTA Web site.

During execution of Package and Deliver activities, stakeholders continue to review BEA products for identification of issues with the current release. The following types of issues can be identified:

In-scope: Issues that are directly related to the scope of work described in a BIP,

Out of scope: Issues that are outside the scope of work described in a BIP.

Content-related: Issues that are concerned with the architectural content.

Non-content related: Issues that are related to the format and display of architectural content.

Changes to the architecture that are identified post CBM acceptance will be managed by creating two new CRs; one for in-scope content related issues and one for in-scope non-content related issues. The new CRs are created by the Chief Technical Architect and the support team. Tickets will be issued for non-content related corrections.

All out-of-scope content related issues identified by CBM Team personnel should be documented in the CBM AV-1 Findings and Recommendations. Out-of-scope content related issues identified by EP&I or IV&V personnel should be documented in a Feedback Ticket.

All non-content related issues that are not HTML related are recorded as a Ticket. All non-content related discrepancies that are HTML related are recorded as a Ticket. In-scope content or HTML related issues that cannot be completed due to schedule will be documented in a Ticket and automatically deferred.

5 Using Technology to Support the Release

Several key capabilities and supporting tools are critical for the development of the BEA. These capabilities include; Configuration Management (CM), Requirements Management, Issues/Bug Tracking, Architecture Development, Architecture Visualization, and Architecture Reporting.

5.1 Configuration Management

Configuration Management spans all aspects of the BEA. At a high level there are three categories of BEA configuration management including; document control, source code control, architecture repository control. Each BEA delivered artifact is checked into a CM tool and assigned a version label with the BEA release number. The CM Team provides daily operational support.

5.1.1 Document Control

A document control tool is required to maintain various versions of BEA related documents. The BTA uses the DKO to perform this function. The DKO provides a CM shared repository that can be accessed by BTA users and other stakeholders interested in the various documents. When a document is completed it is checked into the DKO and automatically versioned. If changes are required the document it is checked for modification an updated version of the document is checked back into the DKO. The version history of BEA documents are maintained in the DKO document repository.

5.1.2 Source Code Control

The software source code developed to support the various BEA software tools is versioned using an internal BTA Microsoft product called Visual Safe Source (VSS). VSS maintains a central repository accessible to select software developers on the BEA team. As code is created it is checked into VSS by developers; VSS maintains a history of each stage of a software modules development cycle. Developers can easily role back to previous versions of code and also compare working versions of code with previous versions. Upon completion of a project of software capability, all associated code is tagged with a specific release number. All the code associated with a release tag can be retrieved at any time.

5.1.3 Architecture Repository Control

At the end of each release the BEA database that contains the architectural artifacts for an entire BEA release is copied into an archive repository. The archive repository holds an archived database for each official BEA release. In addition one month worth of BEA database daily tape backups are created and maintained by the BTA help desk on a regular basis.

5.2 Requirements Management

BEA requirements are captured in a BIP's Capture capability; which resides in a web based tool called Enterprise Elements (EE). The BIP's Capture tool reflects the life span of a release by a capturing and tracking a combination of BIP's, CR's, and tickets. Collectively these modules document the requirements, activities, and changes associated with a BEA release from the initial stages of a release to completion. The BIP's Capture capability allows users to document programmatic issues, requested architecture changes, established priorities, and task ownership from submission to resolution. The tool also tracks the state of each entered item as it progresses through the various stages of the process. The BIP Capture Tool provides a single point of control for communication among team members on the status of recorded issues. It also provides additional functions that permit generation of queries and reports. The CM Team provides daily operational support for this tool.

5.3 Issue/Bug Tracking

BEA support system issues and support software bugs are reported in the Issues/Bug Tracking tool. The capability is implemented within EE. This Issues/Bug Tracking tool enables users to identify software system bugs, issues, and enhancements. The progression and state of each entered item is tracked as it progress through the various stages of resolution. The Issue/Bug Tracking tool provides a single point of control for communication among team members on the status of record support system issues. It also provides additional functions that permit generation of queries and reports.

5.4 Architecture Development

An architecture development toolset is used to produce DoDAF V2.0 products. The definitions, techniques and standards to produce the DoDAF V2.0 products are contained in the APG.

Figure 6, BEA Primary DoDAF V2.0 Products depicts the BEA DoDAF V2.0 products with linkages and the main data exchanges or flows. The shapes of the products designate the type of product, i.e., All Viewpoint, Operational Viewpoint, Data and Information Viewpoint, Systems Viewpoint, Service Viewpoint or Standards Viewpoint.

The BEA artifacts are initially captured in an IBM tool called System Architect (SA). SA provides BEA architects and stakeholders with the ability to graphically create and modify DoDAF artifacts on a daily basis. The architectural data is also automatically and periodically copied from SA to a central Oracle based repository. The Oracle repository is a central repository for various BTA data stores and is currently accessible by the Enterprise Elements (EE) application and by the Enterprise Tools (eTools) applications.

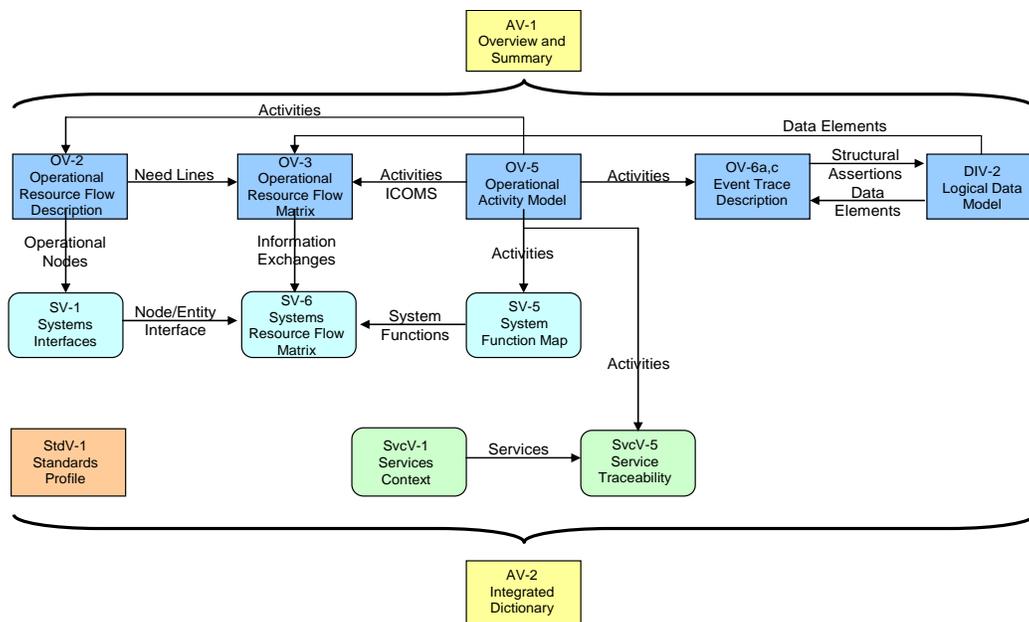


Figure 6, BEA Primary DoDAF V2.0 Products

5.4.1 Laws, Regulations and Policies (LRP) Repository

The LRP Repository interfaces with the architecture development data to allow information to be linked between the LRP Repository and the BEA. Once in the LRP Repository, information can be linked to compliance constraints in the BEA. Elements of LRPs (constraints) are associated with appropriate architectural elements (such as Business Process Modeling [BPM] Processes) in the BEA. Once associations are made, gap reports are produced showing existing processes without constraints. This interface is refreshed after each new encyclopedia build is updated.

Utilizing the results of this interface and additional data, controls can be associated with architecture objects. Reports can then be generated which include architecture object/control associations for the BEA, by CBM or any gap among architecture objects and controls.

5.5 Architecture Visualization (BTA Portal)

The BTA Portal is a public web site that contains web based illustrations of BEA architectural artifacts for each release. The BTA Portal is accessible to stakeholders and other DoD partners. The site contains an ongoing library of each BEA release, and users can browse through each release to investigate and visualize all architectural artifacts.

5.6 Architecture Artifacts Reporting Tools

Reporting tools are organized by architecture product and object. Reports can be run by modelers, primarily during development, or participants of Walkthroughs and External Reviews to analyze integration issues and address the impact of proposed changes.

The application used for ad-hoc analysis and reporting of the BEA architecture is called Enterprise Tools (eTools). eTools is a thin client web based application that provides users with the ability to dynamically analyze BEA artifacts. eTools currently provides 3 different analytical capabilities; Compare, Threads and BEA Reports(BRS). A brief description of each capability is described below:

5.6.1 Threads Capability

The BEA Threads capability provides detailed mappings of selected related BEA artifacts. The eTools application allows users to create ad-hoc reports that identify relationships between BEA artifacts; enabling users to quickly and accurately identify possible gaps and to analyze the impact of changes throughout the architecture. Users select artifacts from a tree of available objects; once an object is selected users are then presented with a different set of objects that relate to the previously selected object. This process is repeated until a final query criterion is specified; the criterion is processed and results in a report that specifies the content of the requested architectural relationships in the BEA.

5.6.2 Compare Capability

The BEA Compare Capability creates reports that compare definitions and diagram characteristics between two encyclopedias and enable users to confirm if updates to the BEA were made correctly. Users can visually select and compare relationships between architectural artifacts from different versions of the BEA. The comparison report specifies if artifacts have been updated, deleted, or created. The changes are indicated in both a color code as well textually.

5.6.3 BRS Capability

This capability enables users to create, save, and run a number of reports against the BEA architecture and is designed to check target encyclopedias for compliance to modeling guidelines as stated in the APG. Reports are classified into two categories; information and exceptions. Exception reports check for a set of error conditions and informational reports enable users view ad-hoc content of the BEA. BRS queries are creating using a Resource Definition Framework (RDF) based query language called SPARQL.

The eTools application is currently available to BEA architects. However, there are future plans to make eTools reporting capabilities available to other DoD stakeholders and interested parties.

6 Summary

The *BEA Development Methodology* is a living document that outlines the methodology and repeatable process used to evolve the BEA. At the conclusion of each BEA release, the BDM and related documents are reviewed and updated to incorporate any lessons learned and new development methods developed during the release. The intent is not to continuously reinvent the process and approach to developing the BEA, but to refine the methodology as appropriate to adjust to real-time learning that supports the BTA goal to produce an architecture that can be harnessed as an executive decision-making mechanism while simultaneously supporting the implementation of information technology systems and services.

Appendix A: References

BEA Architecture Product Guide, March 11, 2011

BEA Configuration Management Plan, Version 8.0, March 11, 2011

Federation Strategy and Roadmap Version 2.4a, January 29, 2008

Business Transformation Guidance, Version 1.1, July 6, 2007

DoD Architecture Framework, Version 2.0, May 18, 2009

Enterprise Transition Plan, September 2010

DoD Strategic Management Plan, December 2011

GIG Architecture Federation Strategy, Version 1.2, 01 August 2007