Business Mission Area (BMA) Architecture Federation Strategy and Roadmap

29 January 2008

Version 2.4a

Version History

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1.0	03 August 2006	Federation Team	Initial Release
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2.4a	29 January 2008	Federation Team	Version 2.4 updated to include an Executive Summary

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Executive Summary

The Business Mission Area (BMA) Federation Strategy and Roadmap v2.4 describes the means to achieve the Department of Defense (DoD) vision for business transformation – delivering that support interoperability, data sharing and discovery and delivery of business services. It describes the authority and responsibility of the BMA Chief Technical Officer (CTO) and Chief Architect (CA) to facilitate and guide the execution within existing technical and business investment governance structures, in compliance with the *Ronald W. Reagan National Defense Authorization Act (NDAA) for Fiscal Year 2005.*

The BMA Federation Strategy and Roadmap v2.4 expands upon the DoD Global Information Grid (GIG) Architecture Federation Strategy by describing the BMA strategy for linking Component/Service/Agency (C/S/A) and Program architectures to the Business Enterprise Architecture (BEA) to form the BMA portion of the GIG[1]. In addition, it describes the infrastructure, products, services, capabilities and actions to implement architecture federation and deliver business services across the BMA and from tier to tier within the DoD. The strategy is consistent with the July 2007 *Defense Acquisition Transformation Report to Congress[2]*, prepared by the Secretary of Defense that states the BEA as an Enterprise Architecture (EA) focuses on:

Notional GIG Architectural Vision
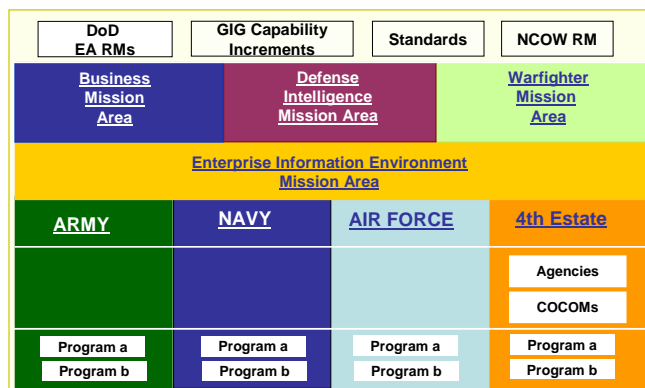
"Systems transformation supports federation by improving system-level information and capturing the targeted environment and planned Enterprise services and associated information in support of a Service-oriented Architecture."

Implementing the BMA SOA Environment
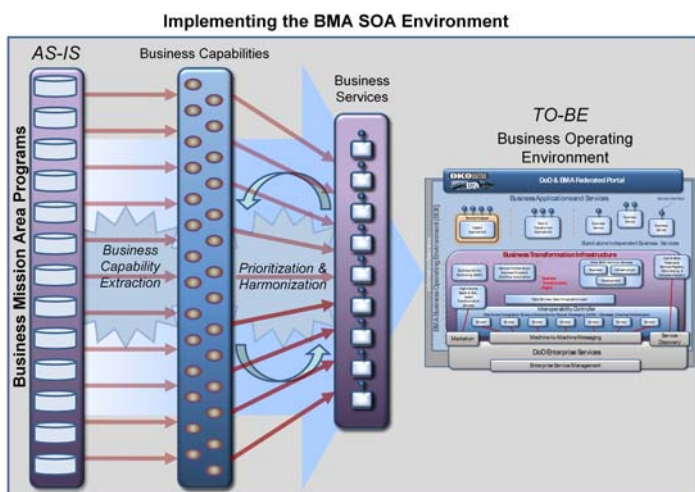
SOA is a mechanism by which business capabilities can be aligned with the technical infrastructure in support of an agile business strategy. GAO describes SOA as an "approach for sharing functions and applications across an organization by designing them as discrete, reusable, business-oriented services"[3]. The Office of the BMA CTO and CA collaborated with the Chief Information Officers (CIOs) representing the Military Services, Defense Agencies, Combatant Commands, Mission Areas and the DoD enterprise to develop a SOA strategy and the supporting Service-oriented environment, termed the Business Operating Environment (BOE). The BOE leverages industry best practices to federate architectures, develop capability requirements and support the delivery of portfolios of business capabilities based on collections of "services" orchestrated across the Department. In this construct, over time existing DoD systems become deployed as discreet business services within the BOE.

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[1] The *DoD Enterprise Architecture Federation* which encompasses the Global Information Grid (GIG) Architecture Federatio*n* located in the Defense Architecture Registry System (DARS) available online at https://dars.disa.mil. Also, see the figure, the *Global Information Grid (GIG) Federated Architecture Approach (Notional)*, in the *Global Information Grid (GIG) Architectural Vision for a Net-Centric, Service-oriented DoD Enterprise, Version 1.0,* prepared by the DoD CIO and dated June 2007.

[2] *Defense Acquisition Transformation Report to Congress, John Warner National Defense Authorization Act Fiscal Year 2007 Section 804, Report to Congress, prepared by the Secretary of Defense, July, 2007*

[3] *GAO, DEFENSE BUSINESS TRANSFORMATION, A Comprehensive Plan, Integrated Efforts, and Sustained Leadership Are Needed to Assure Success*, GAO-07-229T (Washington, D.C.: Nov. 16, 2006).

The BMA Federation Strategy and Roadmap v2.4 as covers the following areas:

- How standards, specifications, tools and procedures enable the DoD to identify gaps in capability delivery and manage architecture compliance to specific business rules, policies and procedures contained within the BEA;

- How to drive and stay on the path to rapidly assemble and catalog reusable business services, decompose monolithic applications into business services, and re-compose these services into new business processes and services in support of changing business priorities through the BOE;
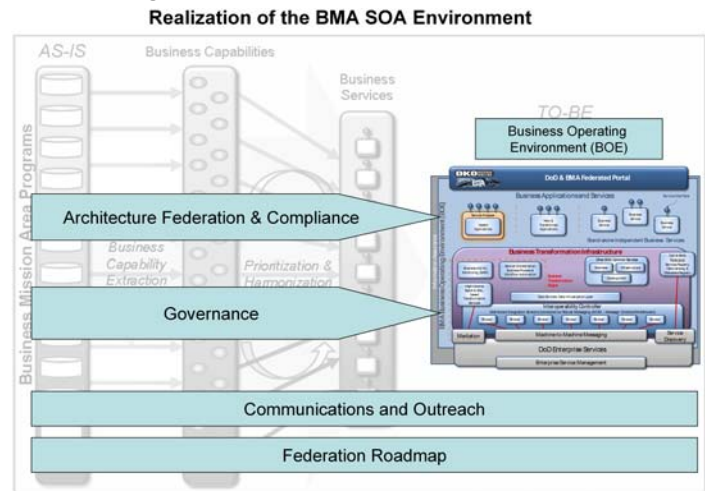
Realization of the BMA SOA Environment

- How to govern the transition from the current state enterprise to a Business Operating Environment that manages the service lifecycle and allows for the directed and self-promoted identification of services as candidates for enterprise-wide business service;

- How to create a durable, coherent transition to a transformational infrastructure by identifying, leveraging and nurturing appropriate stakeholder communities; and

- How to implement near term business services under the evolving DoD Enterprise Service capabilities provided by the Defense Information Systems Agency (DISA).

The BMA Federation Strategy and Roadmap v2.4 provides guidance to ensure the sharing of information, rationalizing capabilities and improving interoperability across the Department. Within Tiered Accountably, Architecture Federation provides a common reference for target systems and initiatives to insure interoperability and the basis for certification.

Services are invoked within an agile, decentralized business environment to empower DoD decision makers with trusted, accessible and understandable information.

<u>Services</u> provide innovative value-added capabilities
- Without contracts worth hundreds of millions;
- With Agility to changing business requirements; and
- With Reuse of legacy components.

<u>Federation</u> enables the best services to be found internally and externally to DoD
- Without violating tiered accountability;
- Without building massive architectures; and
- With matching funding to actual usage.

1. Introduction

In 2005, the Department of Defense (DoD) assigned responsibility for directing, overseeing, and executing its business transformation and systems modernization efforts to the Defense Business Systems Management Committee (DBSMC). The DBSMC is chaired by the Deputy Secretary of Defense and serves as the highest ranking governance body for business systems modernization activities. According to its charter, the DBSMC provides strategic direction and plans for the Business Mission Area[4] (BMA) in coordination with the Warfighting Mission Area (WMA) and Enterprise Information Environment Mission areas (EIEMA). The DBSMC is also responsible for reviewing and approving the Business Enterprise Architecture (BEA) and the Enterprise Transition Plan (ETP). In addition, the DBSMC recommends policies and procedures required to integrate DoD business transformation and attain cross-department, end-to-end interoperability of business systems and processes.[5]

In March 2007, the DoD issued through the Business Transformation Agency (BTA),[6] updates to two of its primary transformational tools; Version 4.1 of its BEA, which "describes the Department's Business Mission Area"[7] (See *Section 2 - BMA Architecture Federation and Compliance Mechanisms* and *Section 2.6 - Gap - Areas Not Covered by the BEA*, for details), and its ETP. The BEA, through operational and systems views and technical standards, guides and constrains the implementation of BMA Enterprise and Combatant Command, Services, and Agencies (C/S/As)[8] systems to meet business capabilities. The ETP makes visible program milestones against the BEA.

The Office of the Chief Architect (CA) of the DoD BMA resides within the office of the Deputy Under Secretary of Defense for Business Transformation (DUSD (BT)) and works with the DBSMC and BTA on business transformation efforts. The CA is responsible for providing expert guidance and oversight in the design, development, and modification of federated architectures supporting the BMA. The CA serves as an advisor for the development of requirements and extensions of DoD Net-Centric Enterprise Services (NCES). In this advisory role, the CA collaborates with the Office of the DoD Chief Information Officer (CIO) which is responsible for the DoD Global Information Grid (GIG) Federation Strategy.[9]

According to the DoD Memorandum titled the *DoD and Intelligence Community Commitment to an Interoperable Services-Based Environment*:

> "There is a compelling need to share information and improve interoperability within and across the DoD and IC. The DoD Chief Information Officer (CIO) and the Director of National Intelligence (DNI) CIO are collaborating to achieve seamless sharing and multi-partner operations by driving a shift to web-based capabilities in a services-based environment. This environment, with information available from different

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[4] See *DoD Instruction 8115.02, "Information Technology Portfolio Management Implementation",* dated October 30, 2006, which describes the Business Mission Area: "The BMA ensures that the right capabilities, resources, and materiel are reliably delivered to our warfighters: what they need, where they need it, when they need it, anywhere in the world. In order to cost-effectively meet these requirements, the DoD current business and financial management infrastructure - processes, systems, and data standards - are being transformed to ensure better support to the warfighter and improve accountability to the taxpayer. Integration of business transformation for the DoD business enterprise is led by the Deputy Secretary of Defense in his role as the Chief Operating Officer of the Department."

[5] See OSD 01886-05, *Memorandum from the Deputy Secretary of Defense, Subject: Department of Defense (DoD) Business Transformation; Charter for the Defense Business Systems Management Committee,* dated February 7, 2005. It states the DBMSC roles and responsibilities include "Establish (ing) strategic direction and plans for the Business Mission Area (BMA), in coordination with the Warfighting and Enterprise Information Environment Mission Areas."

[6] See *Memorandum from the Deputy Secretary of Defense, Subject: Establishment of the Defense Business Transformation Agency (BTA),* dated October 7, 2005, and *DoD Memorandum from the Deputy Under Secretary of Defense For Business Transformation and the Deputy Under Secretary of Defense For Financial Management, Subject: DoD Memorandum from the Deputy Secretary of Defense Subject: Organization of the Defense Business Transformation Agency,* dated February 3, 2006.

7 See the Defense Acquisition Transformation Report to Congress, John Warner National Defense Authorization Act Fiscal Year 2007 Section 804, Report to Congress, prepared by the Secretary of Defense, July, 2007, which states "Defense business transformation is guided by the BEA, which provides a common reference for target systems and initiatives in order to ensure interoperability and integration."

[8] For the purposes of this document the term Combatant Command, Services, and Agencies (C/S/As) refers to the BMA Component tier.

[9] See the *DoD Enterprise Architecture Federation Strategy Draft Version 1.01* dated December 2006 and under development by the prepared by the DoD CIO / Assistant Secretary of Defense for Networks & Information Integration.

providers across the DoD and IC enables better analysis and decision-making through data aggregation, fusion and increased access to additional sources of information…

"The DoD and IC share a vision for a services-based environment that leverages technologies to provide access to information and business processes, and interoperable infrastructure and standards to enable discovery, availability and trust."[10]

This "Services-based environment" and "interoperable infrastructure and standards" is best met through a Service-oriented Architecture (SOA) paradigm. Meeting this "Service-oriented" vision through the implementation of a federated architecture is a primary focus of the BMA CA. While SOA has been defined many ways by many organizations in both the public and private sectors, Government Accountability Office (GAO) describes it as an "approach for sharing functions and applications across an organization by designing them as discrete, reusable, business-oriented services."[11]

According to the July 2007 *Defense Acquisition Transformation Report to Congress*, prepared by the Secretary of Defense, the BEA as an Enterprise Architecture (EA) focuses on:

"Systems transformation, business capability improvement, and architecture federation…

"Systems transformation supports federation by improving system-level information and capturing the targeted environment and planned Enterprise services and associated information in support of a Service-oriented Architecture."

"The Department rationalizes the Enterprise by rethinking how systems and services are provided – at what level, via what programs, through what approach. Specifically, the Defense Business Systems Management Committee determines and the Business Transformation Agency (BTA) implements systems and services that are appropriate to provide interoperable standards at the Enterprise and the Components' levels to support specific mission needs. As part of the rationalization process, the BTA focuses on Enterprise-wide data standards and solutions to implement systems, standards, and information visibility. Data standards help provide both interoperability and the ability to compare and aggregate information across the Enterprise."[12]

The BMA CA[13] has the primary responsibility for facilitating the execution of the strategy identified in this BMA Federation Strategy and Roadmap in order to meet the objectives stated by the Secretary of Defense and enable a durable and coherent transition to the DoD BMA SOA and for federating the architecture with the military services and defense agencies.

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[10] *DoD Memorandum from the Assistant Director of National Intelligence, Chief Information Officer, and the Assistant Secretary of Defense for Networks and Information Integration, Chief Information Officer, Subject: Department of Defense (DoD) and Intelligence Community (IC) Commitment to an Interoperable Services-Based Environment*, dated July 13, 2007.

[11] *GAO, DEFENSE BUSINESS TRANSFORMATION, A Comprehensive Plan, Integrated Efforts, and Sustained Leadership Are Needed to Assure Success, GAO-07-229T (Washington, D.C.: Nov. 16, 2006).* A service-oriented architecture is an approach for sharing functions and applications across an organization by designing them as discrete, reusable, business-oriented services. These services need to be, among other things, (1) self-contained, meaning that they do not depend on any other functions or applications to execute a discrete unit of work; (2) published and exposed as self-describing business capabilities that can be accessed and used; and (3) subscribed to via well-defined and standardized interfaces instead of unique, tightly coupled connections. Such a service orientation is thus not only intended to promote the reduced redundancy and increased integration that any architectural approach is designed to achieve, but to also provide the kind of flexibility needed to support a quicker response to changing and evolving business requirements and emerging conditions.

[12] See the *Defense Acquisition Transformation Report to Congress, John Warner National Defense Authorization Act Fiscal Year 2007 Section 804, Report to Congress, prepared by the Secretary of Defense, July, 2007.*

[13] In this role the BMA Chief Architect supports BMA Mission Area Lead, i.e., the Under Secretary of Defense for Acquisition, Technology, and Logistics. See *DoD Directive 8115.1, "Information Technology Portfolio Management"*, dated October 10, 2005, which states "The Under Secretary of Defense for Acquisition, Technology, and Logistics shall … Serve as the lead and manage the BMA portfolio, in coordination with the SD(NII)/DOD(CIO), the Under Secretary of Defense (Comptroller), and the Under Secretary of Defense for Personnel and Readiness…" Also see *DoD Instruction 8115.02, " Information Technology Portfolio Management Implementation"* , dated October 30, 2006, which states "Primary responsibilities of Mission Area Leads are to: establish sub-portfolios within each Mission Area, establish strategic direction for the Mission Area that aligns to the Enterprise strategic plan (i.e., the Quadrennial Defense Review (QDR) Report) and GIG Integrated Architecture and guidance..."

Purpose

This document expands upon the DoD GIG Architecture Federation Strategy[14] and the concepts of net centricity[15], while providing detail on how various aspects of architecture federation will be applied to the BMA. The architecture federation strategy described herein aligns with and follows the guidance given by the overall DoD federation enterprise architecture strategy depicted in Figure 1-1: *Notional View of DoD Architecture Federation.*[16]

The BMA's concept of federation represents the BMA's strategy for linking BMA architectures to the BEA to form the BMA portion of the GIG. This document details products, services, capabilities and actions to implement architecture federation and deliver business services across the BMA and from tier to tier[17] within the DoD. Specific areas covered include:

- **BMA Architecture Federation and Compliance Mechanisms** – How tools and procedures enable the DoD to identify gaps in capability delivery and manage architecture compliance to specific business rules, policies and procedures contained within the BEA;

- **BMA Business Operating Environment (BOE)** – How to drive and stay on the path to rapidly assemble and catalog reusable business services, decompose monolithic applications into business services, and re-compose these services into new business processes and services in support of changing business priorities;

- **Governance of Service Delivery across the Business Enterprise Service Lifecycle[18]** – How to govern the transition from the current state enterprise to a Business Operating Environment that manages the service lifecycle and allows for the directed and self-promoted identification of services as candidates for enterprise-wide business services;

- **Consistent Approach to SOA through Communications and Outreach** – How to create a durable, coherent transition to a transformational infrastructure by identifying, leveraging and nurturing appropriate stakeholder communities; and

- **BMA Federation Roadmap** – How to implement near term (milestones appearing in the BMA Roadmap and Timeline, Appendix E) business services under the evolving DoD Enterprise Service capabilities provided by the Defense Information Systems Agency (DISA).

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[14] See the *DoD Global Information Grid (GIG) Architecture Federation Strategy* dated August 6, 2007, and prepared by the Architecture and Interoperability Directorate, OSD/NII/CIO.

[15] The *Department of Defense Enterprise Architecture Federation Strategy Draft Version 1.01,* dated December 2006, was prepared by the DoD CIO.

[16] The *DoD Enterprise Architecture Federation* which encompasses the GIG (Global Information Grid) Architecture Federatio*n* located in the Defense Architecture Registry System (DARS) available online at https://dars.disa.mil. Also, see the figure, the *Global Information Grid (GIG) Federated Architecture Approach (Notional)*, in the *Global Information Grid (GIG) Architectural Vision for a Net-Centric, Service-oriented DoD Enterprise, Version 1.0,* prepared by the DoD CIO and dated June 2007.

[17] The phrase "tier to tier" refers to the interaction and linkages between the BMA Enterprise, Component and Program tiers, which are defined in the policy of Tiered Accountability,, as first addressed in the September 2006 version of *BMA Federation Strategy and Roadmap* document. In it DoD addresses responsibility for the production of architecture at each layer of the DoD Enterprise. Each tier – Enterprise, Component, and Program – has specific goals, as well as responsibilities to the tiers above or below it. Consequently, under Tiered Accountability (TA) each existing architecture remains substantially autonomous, yet inherits certain rules, policies, procedures and services from higher-level architectures and provides various services (and imposes roles on) tiers below. In this way, the federation recognizes the need for autonomy but ensures linkages and alignment of architectures from the Program level up to the Enterprise level. It is important to note that, although the federation is depicted as having defined tiers of Enterprise, Component and Program, there are cases where a Component, via Title 10 for example, has the authority to define or oversee enterprise-wide policies, procedures and standards or to own an Enterprise-wide solution.

[18] See *DoD Directive 8115.1, "Information Technology Portfolio Management",* dated October 10, 2005, and *DoD Instruction 8115.02, "Information Technology Portfolio Management Implementation"*, dated October 30, 2006."


Figure 1-1: Notional View of DoD Architecture Federation
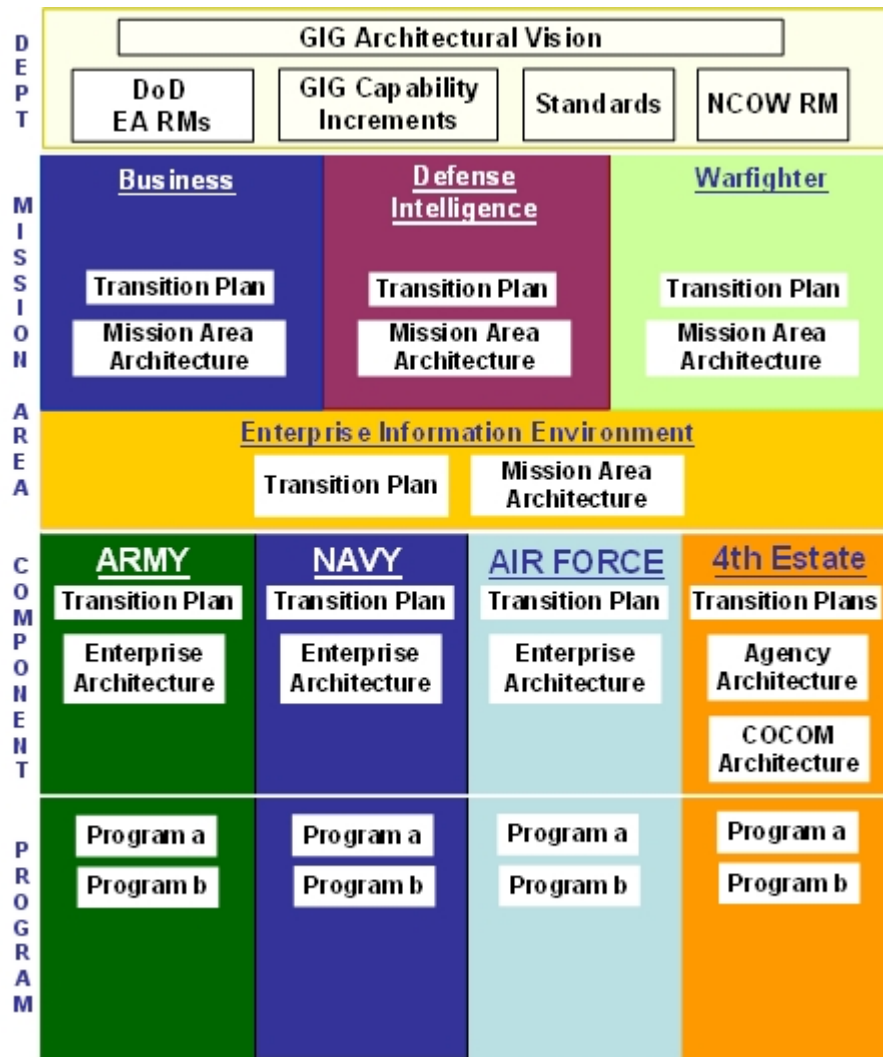
2. BMA Architecture Federation and Compliance Mechanisms

BMA architecture federation is diverse and complex. It must provide for discovery of architectures and linking to the other mission area architectures from their Enterprise, C/S/As or Program tiers. It must enable compliance with the *Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005* (FY05 NDAA), through the BEA, in a manner consistent with the Office of Management and Budget (OMB) Performance Improvement Lifecycle[19] and GAO expectations of progress relative to the use of architecture and execution of the Federation Strategy and Roadmap.

The Secretary of Defense, in the July 2007 *Defense Acquisition Transformation Report to Congress,* stated:

"The BEA describes the Department's Business Mission Area. Defense business transformation is guided by the BEA, which provides a common reference for target systems and initiatives in order to ensure interoperability and integration. Together with other DoD architectures… it provides the architectural framework for the Department's business information infrastructure. It describes the Department's targeted business processes, data standards, business rules, operating requirements, and information

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[19] See the E-Gov website at http://www.whitehouse.gov/omb/egov/ for more information on the OMB Performance Improvement Lifecycle.

exchanges to support the priorities, systems, and initiatives that enable these capabilities. BEA development focuses on providing tangible outcomes for specific priorities and on developing an architecture that is linked, realistic, and actionable. The BEA is focused on three key areas: systems transformation, business capability improvement, and architecture federation. Systems transformation supports federation by improving system-level information and capturing the targeted environment and planned Enterprise services and associated information in support of a Service-oriented Architecture."[20]

BMA's architecture federation mechanism is focused on business architectures within the DoD which are primarily represented by DoD Architecture Framework (DoDAF) products. Architecture federation and the Business Operating Environment (BOE)'s technical federation provide a vision for DoD business transformation through improved business processes and capabilities, delivered through transformational systems and services supporting interoperability and data sharing. This latter requires evolving the BEA around a data-centric bottom-up approach supporting Service Oriented Architectures (SOA) and providing mechanisms enabling architecture discovery and registration.

BMA's architecture compliance mechanism is focused conceptually on a Business Capability Lifecycle (BCL). The BCL is an Investment Management (IM) framework linked to the OMB Performance Improvement Lifecycle and to the BEA through BEA compliance tools.

This section describes these mechanisms and outlines gaps not covered by the BEA.[21]

2.1. Overall Vision for BMA Architecture Federation

Architecture federation refers to those services and capabilities that enable linkages between the various architectures within the BMA, as shown in *Figure 2-1: BMA Architecture Federation* .

Figure 2-1: BMA Architecture Federation

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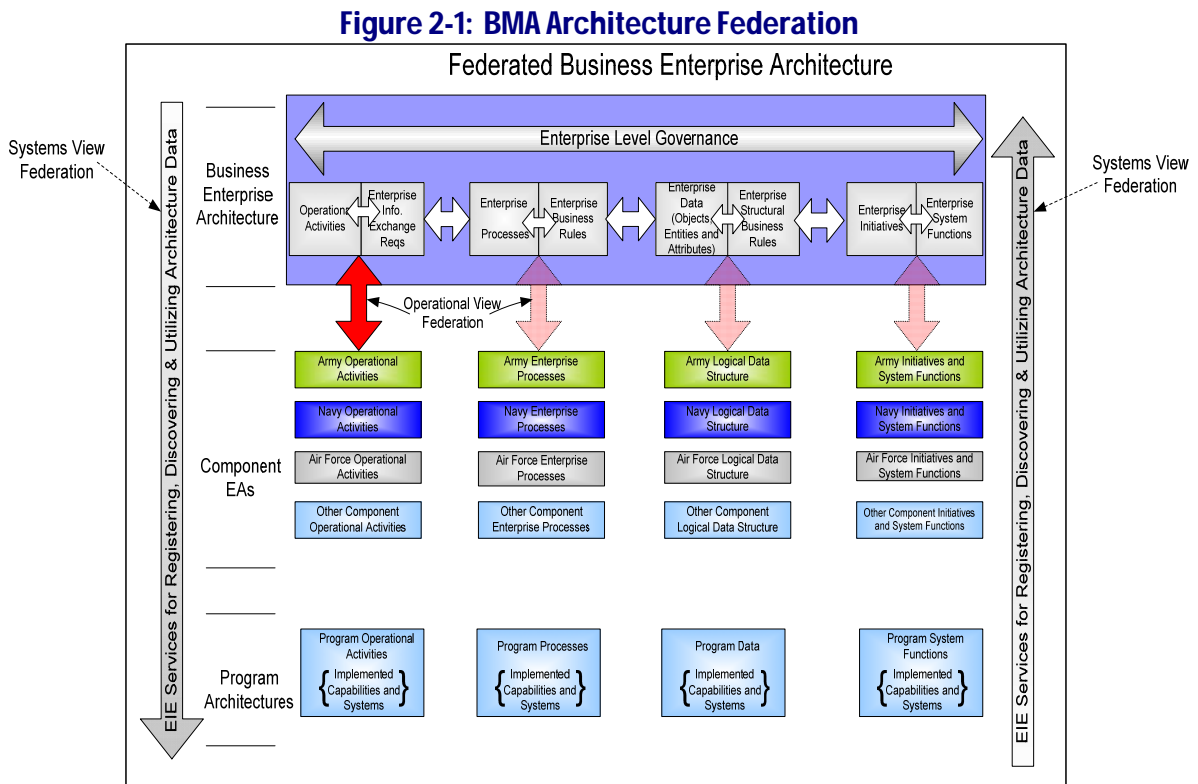
[20] See the *Defense Acquisition Transformation Report to Congress, John Warner National Defense Authorization Act Fiscal Year 2007 Section 804, Report to Congress, by the Secretary of Defense,* dated July, 2007.

[21] See the *Draft Business Enterprise Architecture Concept of Operations (CONOPS)*, dated July 31, 2007.

C/S/As and Programs link to the Department's Enterprise tier through BMA architecture federation DoD BMA Services, using the BEA as the BMA Enterprise tier's common core or capstone architecture. Gaining visibility across the various business architectures enables decision-makers to identify gaps in needed business capabilities as well as gaps in delivery of previously identified and architected capability needs.

Federation is carried out via use of the BEA as the high-level taxonomy to which the other Mission Areas, C/S/As and Programs align[22]. *Figure 2-1: BMA Architecture Federation* provides a conceptual view of the vision for federation using the information within the BEA. Currently, architecture federation begins with semantic alignment of operational activities within the different architectures. This alignment begins with the BEA and is carried out through aligning common vocabularies established by Communities of Interest[23] (COIs) in response to BMA Enterprise, Component and Program tier requirements for information exchange. Other BEA information (e.g., processes, rules, system functions) may be added to the federation equation depending on the direction set by the Investment Review Board (IRB) Chair processes and requirements as identified within the *DoD Enterprise Architecture Federation Strategy*.[24]

2.2. BEA Evolution Supporting Business Transformation and SOA

Releases 3.0 through 4.1 of the BEA developed and evolved as a top-down TO-BE integrated architecture. This type of integrated architecture serves well for guiding compliance according to NDAA 2005 (See *Section 2.5 - Architecture Federation Linkage - BEA Compliance*), but improvements can be made to them so they more adequately support transformation using present day capability delivery mechanisms such as small foot print services within a SOA.

While earlier versions of the BEA were built from the top-down (capability-based through analysis of business activities, processes and requirements), BEA 5.0 will be built from both the bottom-up and the top-down. In other words, existing DoDAF products, including those focused on activities, will use as input what is learned from analyzing BMA Enterprise tier data and data relationships in Defense Business Systems Acquisition Executive's (DBSAE) Systems and other BMA Enterprise Systems. See *Section 3.7.1.3 Standardized Enterprise Information Exchanges through the BTI* for further discussion.

Future versions of the BEA will more heavily rely on data ontologies. The Standard Financial Information Structure (SFIS) for Financial Visibility and the ontology work done for Real Property Accountability are examples of this approach. A focus on ontology ultimately leads to Enterprise common vocabulary for the subset of the BMA represented in the Logical Data Model (OV-7) of the BEA according to the DoDAF. This process is depicted in *Figure 2-2: BEA Evolution.*

This method is intended to produce a vocabulary at the BMA tier for the systems being studied. This vocabulary will both support the migration of BMA systems toward services and mapping for federation, and corresponding vocabularies in the other tiers of the DoD. To help achieve this federation and net centricity from tier to tier, the BMA will continue to establish and manage COIs in conjunction with other mission areas. This approach makes visible the different COI vocabularies and allows for true data sharing and interoperability within and across BMA tiers and between the enclaves the COIs represent. Through either adopting data standards or mediation, the intent of *DoDD 8320.02 G, Guidance for Implementing Net-Centric Data Sharing,* will be met independent of the technology applied.

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[22] The BEA contains at high level representation for DoD BMA activities, regardless of whether they are managed at the BMA Enterprise or Component tier, so C/S/As have an "anchor" in the BEA for asserting compliance of investments that are necessary to complete their mission.

[23] A Community of Interest (COI) is a collaborative group of users who must have a shared vocabulary to exchange information in pursuit of their shared goals, interests, missions or business processes. For a discussion on COIs and their role in *DoD Directive 8320.02, "Data Sharing in a Net-Centric Department of Defense*, see DoD COI Directory at http://www.defenselinkextranet.itis.osd.mil/cio-nii/coi for COI Frequently Asked Questions. COIs in the BMA are discussed in Table 4-1 Role of BMA Participants - Tiered Rights and Responsibilities. Also, COIs in the BMA, how they are identified, staffed, governed and how they align to the strategy discussed in this document will be addressed in the *Net-Centric Data Sharing Strategy for the BMA Acquisition Community,* of which a draft version was completed on May 30, 2007.

[24] The *DoD Enterprise Architecture Federation Strategy Draft Version 1.01,* dated December 2006, provides direction on architecture federation and the mechanisms used to accomplish it.

Figure 2-2: BEA Evolution
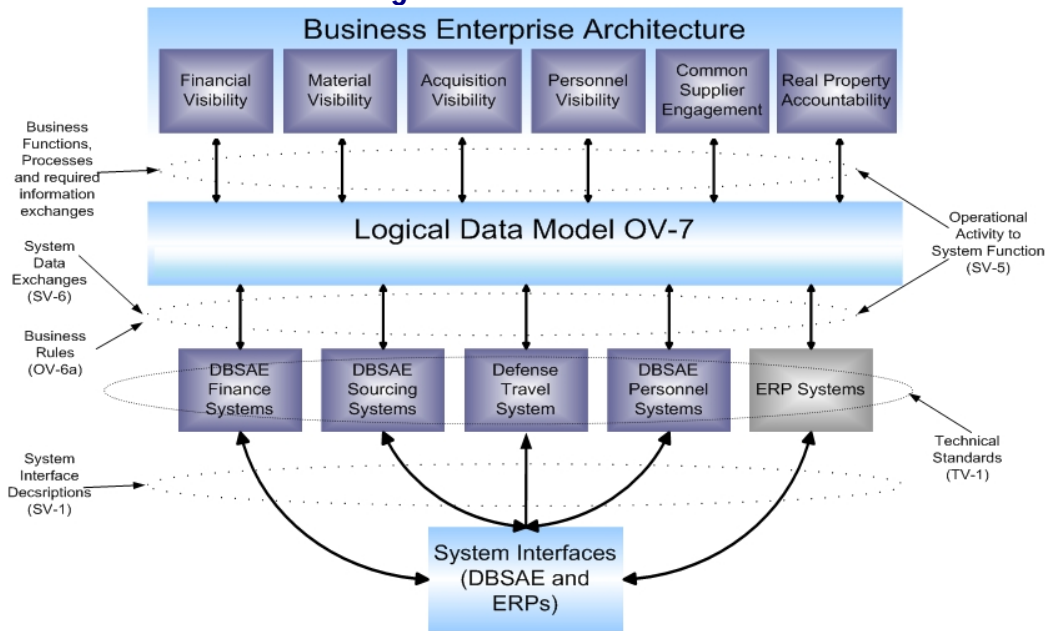
2.3. Enterprise Architecture Services Enabling Federation

Return on investment from the federation of the BMA architectures and other DoD architectures with the BEA (i.e., the Federated BEA) will be realized as DoD providers continue to populate their Enterprise Architectures (EAs) with data and products that satisfy a variety of anticipated and unanticipated consumer needs.

The following paragraphs elaborate on those concepts. Additional information is in the referenced source.

2.3.1. Metadata

The *DoD Discovery Metadata Specification (DDMS) V1.3* provides the specification for discovery metadata, which will be the baseline for architecture discovery metadata. Metadata elements needed to support the EA user services described herein are defined and proposed for DoD EA COI acceptance as the standard for net-centric federated EA services.

2.3.2. Registration

Owners of repositories federated with the main DoD repositories will be responsible for implementing mechanisms to collect metadata specific to their local environment. In order to allow appropriate discovery of local shared data and metadata, owners will be responsible for ensuring these repositories and the collected metadata are visible, accessible, and understandable to both users and machine search mechanisms. These repository owners are those who control metadata at any tier defined under Tiered Accountability.

2.3.3. Discovery

The Federated BEA will leverage a federated metadata discovery capability. Specifics on the implementation of this tool will be contained in the *DoD Enterprise Architecture Federation Strategy*.

2.4. Investment Management Framework

Federation of the BMA architecture is structured to guide and constrain Information Technology (IT) investment management decisions not only through a Federated BEA and enabled through the use of IM frameworks which are federated by extending the OMB Performance Improvement Lifecycle through a DoD BMA Business Capability

Lifecycle. As such, the BEA provides a mapping of capability[25] delivery towards meeting Enterprise and C/S/As objectives across all tiers of the BMA. IM Frameworks are supported by an information environment structured around architecture.

2.4.1. Federated IM Frameworks

The Federal Enterprise Architecture (FEA) describes a Results-oriented Architecture as developed and implemented within the context of the three-phase Performance Improvement Lifecycle: *architect, invest and implement.* Each lifecycle phase is comprised of tightly integrated processes used to transform an agency's top-down strategic goals and bottom-up customer needs into a logical series of work products. The Performance Improvement Lifecycle, as shown in *Figure 2 3: OMB's FEA Performance Improvement Lifecycle*, applies Enterprise, Component and Program-level architectures[26] to prioritize IT investments and support program management and execution to optimize the agency operating environment. The Performance Improvement Lifecycle demonstrates that at the Federal level, tiered accountability is the most effective method to deliver capabilities across the enterprise. The BEA serves as the segment level architecture for the BMA Segment of the DoD.

Figure 2-3: OMB's FEA Performance Improvement Lifecycle
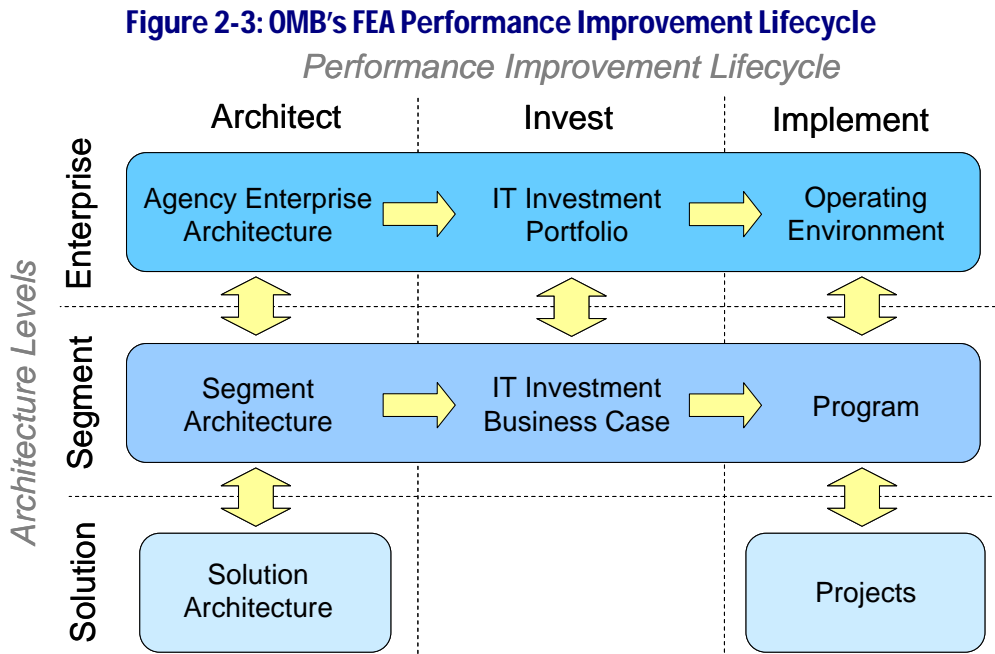
The BCL diagram shown in *Figure 2-4: DoD BMA Business Capability Lifecycle* depicts a logical process whereby business problems are analyzed, decomposed, described and presented to the leadership of a functional community for approval. Upon approval, the best program solution, if material, can be identified and described in such a way that it can be acquired and executed in a rapid, low cost and low risk manner.

The BCL implements tiered accountability by requiring functional sponsors to rigorously define problems before beginning a solution analysis, and institutionalize enterprise management of business capabilities by consolidating requirements, acquisition, and compliance to BEA.

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[25] The term "Capability" refers to the BMA the term "Business Capability", defined 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. The Joint Capability Area (JCA) as described by the JCA Management Plan focuses on the WMA. Efforts are currently underway to rationalize between the BMA and WMA usage of this term.

[26] The DoD BMA term "Mission Area" is equivalent to the FEA term of segment. Similarly, the term "Program" is equivalent to the FEA term "solution".

Figure 2-4: DoD BMA Business Capability Lifecycle
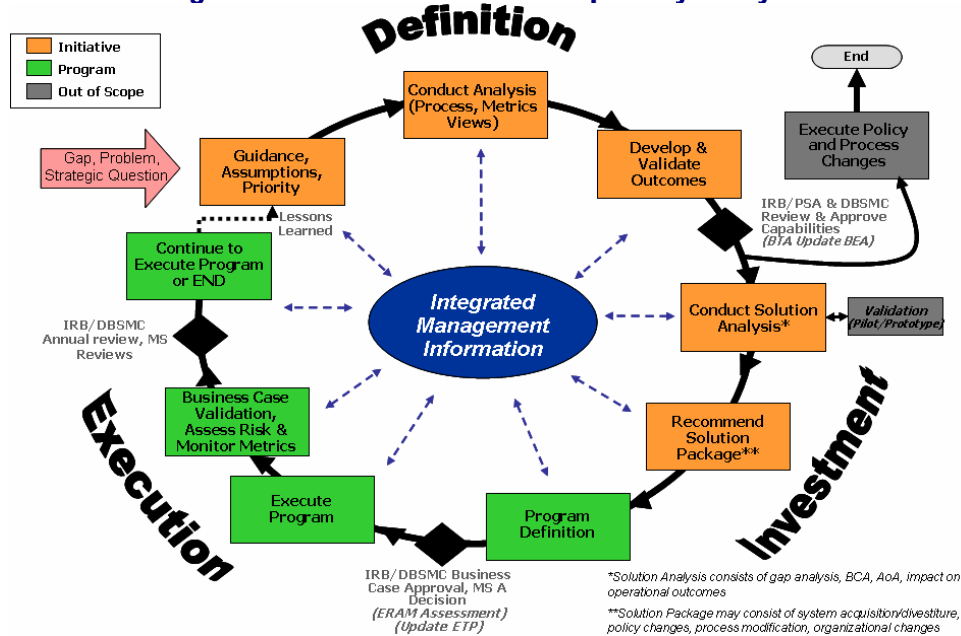
The implementation of BCL will change the current roles and responsibilities of the DBSMC, the IRBs, the Joint Capabilities Integration and Development System (JCIDS), and the Defense Acquisition System (DAS). These changes will be formally documented into the appropriate DoD Directives, DoD Instructions, and Chairman of the Joint Chiefs of Staff Instruction 3170 (CJCSI).

2.5. Architecture Federation Linkage - BEA Compliance

The BEA and ETP link each of the BMA Components into the "Thin" Enterprise layer of the Federation. This means providing an Enterprise Business Capability[27] to the DoD by providing standards to ensure interoperability or directly providing Enterprise Shared Services or systems in the BOE of the BMA.

Within the DoD's global business systems inventory, each core business system maps to the BEA through its own DoDAF architectural elements. This mapping is traceable across all departmental business systems to visually illustrate how critical business capabilities[28] identified by Business Enterprise Priorities (BEPs) are being delivered. IRBs use the information, as scoped by the BEA, to identify overlaps and gaps in capability delivery in order to assess and direct resource allocations.

The FY05 NDAA requires the DoD to certify business systems are compliant with the BEA before any funding, if the total cost of development/modernization/enhancement is greater than $1M, is released for investment/modernization. To assist C/S/As and Programs with this assessment, the BTA offers a BEA compliance tool. The BEA Compliance Tool provides three services: 1) allows the user to scope their system relative to the BEA products, thereby filtering out inapplicable elements, 2) allows the user to assert compliance to the BEA, and 3) allows the user to save reports documenting the assessment.

The BEA includes an integrated set of DoDAF products (i.e., All Views (AV), System Views (SVs), Operational Views (OVs) and Technical Views (TVs)). For each view, there are corresponding business system assessment areas, such as program controls, business rules, and standard data elements. This assessment approach is structured to demonstrate

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[27] The BMA term Enterprise Business Capability refers to a business capability which, due to its scope, is inherently placed at the Enterprise level or has been determined by the DBSMC to be Enterprise-wide. Also, an instantiation of a business capability at the Enterprise level.

[28] Critical business capabilities are those that have been prioritized by BEP/s as requiring near-term redress through the Acquisition Lifecycle.

alignment of a business system's architecture products to equivalent BEA DoDAF products. *Figure 2-5: BEA Product Relationships* depicts relationships among BEA products relevant to federation.

Figure 2-5: BEA Product Relationships
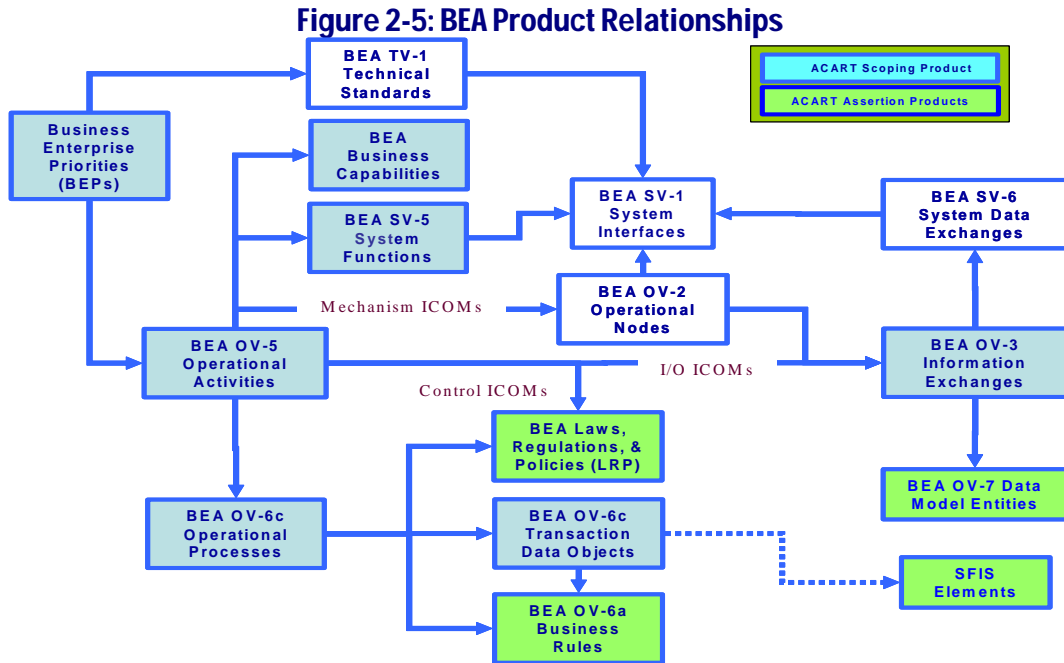
In *Figure 2-5: BEA Product Relationships* the blue boxes represent filtering mechanisms, and the green boxes represent assertion mechanisms:

- Activities filter information exchange requirements (IERs) and Business Processes;
- Information exchanges filter data entities;
- Business processes filter Laws, Regulations and Policies (LRPs), process-related business rules, and data objects;
- Data objects filter data-related business rules and taxonomy elements (e.g. SFIS); and
- Taxonomy elements (e.g., SFIS) allow assertion to the SFIS checklist.

Using BEA Compliance Tools will help assure the Operational View of the BEA and the Operational View of C/S/As architectures are federated. See the Defense Business Transformation website located at http://www.defenselink.mil/dbt/ for the current state of one example of a BEA Compliance Tool.

2.6. Gap - Areas Not Covered by the BEA

The IM Framework and BEA compliance are constrained by the content contained in the BEA. BEA versions released prior to Version 5.0 focused solely on the DoD's BEPs[29]. Systems and Initiatives delivering capabilities and functionality not incorporated within the BEPs were not covered within either of these processes. Such systems are reviewed and approved by the IRBs and DBSMC based on a review of their stand-alone architecture. However, no capability exists today to review these systems in context with similar systems based on a look across their architectures. Therefore, they do not currently fall within the IM Framework and are not subject to BEA compliance. These systems may be subject to Core Business Mission (CBM) EA Compliance to receive system certification.

Systems with capabilities that currently are not in the BEA, but fall within the BMA, are viewed as candidates for new BEA requirements which may be incorporated in future releases of the architecture. Additionally, the establishment of federated architecture repositories provides important cataloging, navigation and search services (essential to Enterprise Architecture Description Federation) for all participating business architectures, including those whose capabilities are

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[29] Focus on the Business Enterprise Priorities represents a "top-down" approach to architecture development. Release 5.0 and beyond will be developed via a "top-down AND bottom-up" where architecture usage gaps and system-level information, in addition to capability gaps addressed via the Business Enterprise Priorities, are used to drive architecture development.

not in the current release of the BEA. Federation solutions that take into account all business capability needs of the DoD will continue to be explored within the BMA. See Appendix D for an example of how a Program, whose activities lie outside the scope of the current BEA, gets included in the FEA.

3. BMA Business Operating Environment

3.1. Overall Vision

This section discusses the delivery of BMA software applications (Services) within a SOA. SOA allows the composition of functionality and data from almost any application into services and orchestrating these services as an automated business process. This is in alignment with the NCES objective of "transform(ing) legacy applications and information stores into a suite of interoperable services, available with appropriate information assurance mechanisms to anyone connected to the network."

The ecosystem of the BMA SOA is the BOE which comprises metadata, applications, systems, a unifying Portal and the Business Transformation Infrastructure (BTI), as shown in Figure 3-1: *The Business Operating Environment (BOE)*. DoD Enterprise Services are the foundational basis for the BOE and will be utilized wherever possible.

Figure 3-1: The Business Operating Environment (BOE)
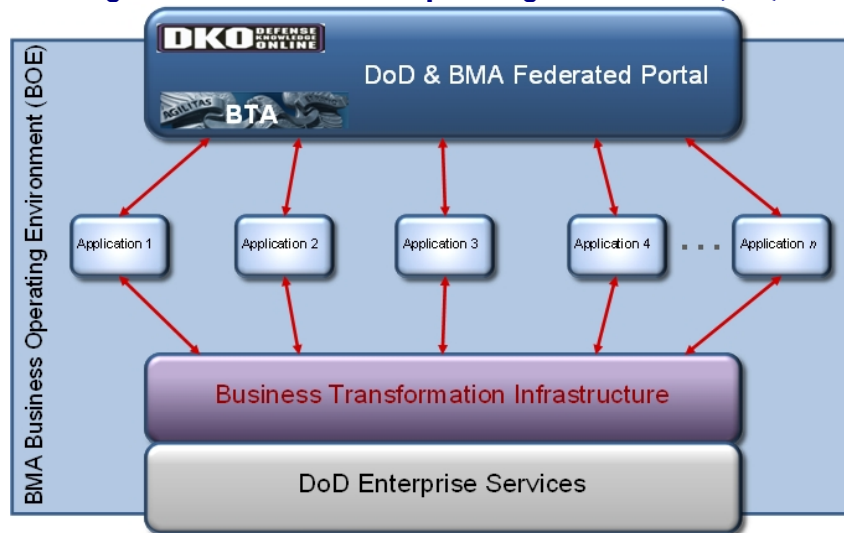
The BOE will identify the open standards to be used and the initial set of loosely coupled interconnected and interoperable business services, following the tenets of net-centricity[30]. Additionally, such services will be identified and implemented through federated architecture, C/S/As and COI processes, leveraging the facilities of the BOE as appropriate. The BOE will enable interoperation and interconnection of business systems and applications[31] when they need to exchange information, expose functionality, or consume information. The BOE provides the standards, policies and technical infrastructure needed to share BMA services with the other DoD Mission Areas according to DoD CIO policy and guidance. For a discussion of the how BOE standards are governed through the technical governance structure[32] please refer to *Section 4. Governance and Figure 4 -1: Service Delivery Governance and Technical Governance Framework.*

Federation through SOA is intended to create interoperable execution of Enterprise and C/S/A business systems in the BMA. This is accomplished while using the Defense Knowledge Online (DKO) and complying with and leveraging the

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[30] See *DoD Directive 8320.02, "Data Sharing in a Net-Centric Department of Defense"*, dated December 2004; Certified Current as of 23 April 2007; *DoD 8320.2-G, "Guidance for Implementing Net-Centric Data Sharing"*, dated 12 April 2006 and "*DoD Directive 8320.03, "Unique Identification (UID) Standards for a Net-Centric Department of Defense"*, dated 23 March 2007.

[31] In this context, an application can also be a service or component.

[32] The technical governance structure is analogous to the DoD IC Services and Data Engineering Governance structure, See Section 4 – Governance

GIG and other Government models for net centricity. Actual system and application federation is achieved when the BMA systems connect to infrastructure capabilities provided within the BOE, or by the EIEMA following the designated standards. Examples are Single Sign-on Services including Identity Management, Authentication and Authorization.

3.1.1. DoD Enterprise Services

DoD Enterprise Services are the capabilities of the EIEMA Computing Infrastructure Domain provided in order to ensure robust platform and network facilities for the implementation and operation of the BOE. DoD Enterprise Services include Core Enterprise Services, a common set of enterprise services which provide awareness of, access to and delivery of information on the GIG. Thus, the operation and maintenance of the physical DoD Enterprise component of the BOE is the joint responsibility of the EIEMA and, by directive, DISA. As C/S/A services are identified as candidate BMA Enterprise Services, the BMA may request the C/S/A continue to operate the service on the behalf of the enterprise. The C/S/A's acquisition program would continue to own and operates the physical infrastructure of such a candidate BMA Enterprise Service even though it was identified as a component of the BOE.

3.1.2. CBM Extensions of the BMA

The CBM extensions of the BMA (e.g., the Human Resources Management Enterprise Architecture) will allow system owners to map their systems to the Enterprise Architecture specific to a CBM. Once a capability has been identified for integration into the BEA, that portion of the CBM EA is integrated into the BEA. By virtue of being integrated with or federated to the CBM segment, the system will be in compliance with the BEA. This allows the system owner to assert, to the appropriate IRB/ Principal Staff Assistant (PSA), their compliance with that segment Enterprise Architecture that may be needed for system certification. Please see 4.2 Role of BMA Participants in Governance and Table 4.1: Role of BMA Participants - Tiered Rights and Responsibilities for a more detailed discussion.

3.2. BOE Guiding Principles

The BOE is guided by principles formulated to keep BMA and EIEMA-based federation aligned with the net-centric guidance of DoD while providing support for business transformation. These principles are:

- **Incorporation of Information Assurance (IA):** The development of the BOE will incorporate and address the requirements for IA as an integral part of the infrastructure. These IA requirements will be implemented in conformance with appropriate standards and directives[33]. This will be accomplished in coordination with a designated IA representative from each of the PSAs and C/S/As.

- **Adherence to Standards:** The BOE should promote openness and vendor neutrality as well as business process, system and data interoperability through adherence to appropriate open standards. There is an emerging industry consensus on the standards and areas for standardization needed, which are delineated in Appendix F: BMA Federation Strategy: BOE SOA Standards Organization and Status.

- **Data Visibility, Accessibility, and Understandability to Support Decision Makers:** By implementing activities, including those described in *DoD Net-Centric Data Strategy*[34], authorized users in the DoD can find, reuse, and understand BMA data and services. The BMA/BOE and EIEMA capabilities provide participants with protocols and standards for information sharing.

- **Loosely Coupled Services:** The BOE will enable the creation of BMA services for the DoD SOA providing value-added services built on EIEMA provided capabilities. As described by this document, the Business Mission Area will become a "suite" of services and applications, with implemented cross-enterprise business processes.

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[33] See *DoD Directive 8500.01E, "Information Assurance (IA)"*, certified current on April 23, 2007.

[34] See *DoD Directive 8320.02, "Data Sharing in a Net-Centric Department of Defense"*, dated December 2004; Certified Current as of 23 April 2007.

- **Authoritative Sources of Trusted Data:** The BOE should provide metadata repositories for BMA data producers to register their data sources and increase their visibility, while providing consumers a way to find authoritative data sources.

- **Metadata-Driven Framework for Separation from Technical Details:** This allows users of the environment to be separated from technical details by allowing consumers and services to query metadata as needed. This approach leverages both the Capabilities and the services provided by the BOE or those to be provided by the NCES, such as search, discovery and Enterprise registries.

- **Support Use of Open Source Software:** The BOE will use open source software solutions on an equal footing with regular commercial offerings, with due consideration given to support and proven reliability. This will allow DoD to realize benefits in cost and source availability that can come from open source software.

- **Emphasize Use of Service-Enabled Commercial Off-the-Shelf (COTS) Software:** Commercial tools allow the provisioning of existing or legacy applications for participation in a SOA. The BOE will support this movement to SOA and encourage acquisitions appropriate to SOA creation within the policies and standards outlined as part of the BOE.

- **Participation in DoD Enterprise:** The BOE builds on the DoD Enterprise Services to provide value-added services focused on the BMA. The BMA/BOE and EIEMA capabilities provide the services for enabling the interconnection and interoperability of BMA systems and applications regardless of tier (BMA Enterprise, Component or Program). Assignment to provide a service could be either at the Enterprise level and/or to C/S/As. Integration will occur between services based on the OV-7 of the BEA and the technical data standards defined by the Core Enterprise Services.

- **Support Mobility - Users & Devices:** As appropriate, BOE technology should support a wide range of devices being used by a highly mobile and intermittently-connected user community.

3.3. Business Applications

Business applications are the main carriers of business function and process automation. Business applications can be categorized in three broad groups. The first group consists of legacy applications, which have not (and may never be) transformed technically and do not directly support the technology required to take advantage of the SOA infrastructure. The second group consists of those new applications built for SOA and existing applications that have been transformed to work in a SOA. The third group consists of specific business services independently implemented and are a finer granularity than traditional applications.

Legacy applications that provide important capability to the mission area can be adapted to this strategy through external means. A wrapper exposes the functionality of the legacy application as web services. It also provides a consumer facility for the legacy applications to consume web services and therefore interoperate with other BMA applications and services through this infrastructure.

Transformed and new applications natively expose functionality as web services and do not require wrapping. They are built to provide and/or consume web services, foster reuse, support use of authoritative sources, and participate in an enterprise SOA. They will leverage the infrastructure laid out here for interoperation with other BMA applications and services. However, they may still be large applications in the traditional mold, provided by a single development effort or COTS vendor.

The third category represents the long term objective situation in which individual capabilities are delivered as independent, loosely-coupled services, orchestrated into business processes through the facilities of the Business Process and Workflow Automation components. Such independent services can be built and made available to the BMA much faster than traditional applications, and can be swapped out for better implementations as needed, with minimal to ongoing business operations. They are a means of getting functionality available more quickly so that users don't have to wait for everything in order to get anything.

Please refer to *Section 4. Governance* which describes how various categories of BMA business applications will be transformed in a SOA environment using BMA SOA governance framework.

3.4. The BOE and the DoD Enterprise Services

DoD Enterprise Services provide the foundation for the BOE[35]. The overall BOE also includes other product lines, such as "Software as a Service" (SaaS) components, and Collaboration, Portal and Content Discovery and Delivery. As an integral part of the GIG, the BOE is dependent on other elements of the GIG to achieve the goals for interconnection and interoperation. The methodology for achieving service use within the BMA is based on creating and operating the value-added services of the BOE as a SOA infrastructure that does not duplicate or re-invent the infrastructure and services provided by EIEMA.

The BOE complements the EIEMA-provided services in situations including:

- Creating BMA Value Added Services;

- Providing BMA with Shared Services not provided by the DoD Enterprise Services; and

- Providing Capability when DoD Enterprise Services are not yet available.

3.5. Systems Federation Support Across the BMA Enterprise Service Lifecycle

The BOE will provide facilities to support federation of systems and users across the full system development lifecycle from design and development, to deployment and installation, and to ongoing production operation. See *Section 4.3.1. BMA Enterprise Service Lifecycle* for a detailed discussion of the lifecycle, its governances and graphical depiction.

Build time designers and developers can access the service and metadata registries and repositories provided by EIEMA and the BOE on the GIG. This will allow them to publish or discover services to the GIG repositories, orchestrate individual services into a composite service, deploy a service into a staging or production area and monitor its execution through the use of Business Activity Monitoring (BAM). These tools help to accomplish federation.

Applications that do not have all their behavior and connections to their runtime environment established at development time are configured at installation or at deployment by appropriate metadata.

Major support for services by EIEMA and the BMA/BOE occurs at application runtime. EIEMA and the BMA/BOE provide the secure, reliable messaging and brokering facilities interconnecting applications and enabling interoperation of independently developed services. It provides standard message definitions and is used by applications in performing data edits and validation and access to services from other applications and common services.

3.6. DoD and BMA Federated Portal

The DoD is adopting DKO as its federated portal. DKO could provide a single point of entry for all DoD users, using Common Access Card (CAC) based authentication for single sign-on, and policy-based security enforcement. It provides users access to capabilities through a Web browser, making the primary search and navigation vehicle across the various facilities available in a Web environment, and allowing users to have and develop personalized views into those facilities. It provides access to Web client interfaces of those various facilities. And it provides access to DoD SaaS facilities such as the DoD Enterprise Collaboration Service, and the federated GIG content, data asset and federated search and discovery.

The BMA vision for this federated approach is shown in *Figure 3-2: The BMA Vision for a DKO Federated Portal Architecture*. The strategy is that autonomous content managers can work within the framework of a single portal to provide specialized content or capabilities. Over time, there will be a wide range of facilities available to BMA users, such as personalization, real-time dashboards, syndicated content, such as Really Simple Syndication (RSS), and subscription-

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[35] DoD Enterprise Services include but are not limited to those in the NCES Service-Oriented Architecture Foundation (SOAF) Product Line.

based news feeds. Additionally, standard business and productivity applications required for people to carry out their regular work will be accessible through the portal.

Lightweight Identification and Authentication (I&A) and authorization facilities are necessary to allow access for external users such as vendors to have access to DoD business applications, such as in the case of receipt and acceptance through Wide Area Workflow. The BMA vision is that this mechanism will move to a distributed, attribute-based facility for I&A and authorization, based on the industry-developed Trusted Secure Collaboration Protocol (TSCP).

Figure 3-2: The BMA Vision for a DKO Federated Portal Architecture
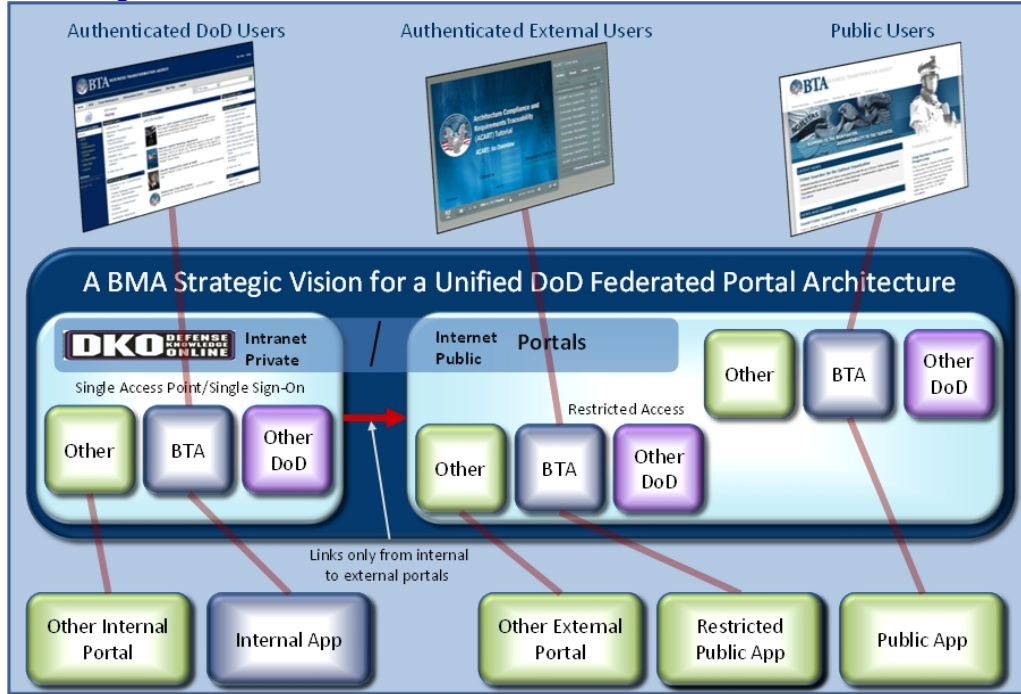
3.7. Structure of the BTI within the BOE

BMA SOA is supported by the BTI, *Figure 3-3: Showing the BTI within the BOE*. DoD business information moves between end-users and Enterprise and C/S/As applications and services.

The entry point and coordination are provided by the federated DoD and BMA portals in which the capabilities accessible through the BMA portal can be embedded as portlets in other DoD portals. Users have access to shared information published to shared spaces, through enterprise information visibility data services. Both portal facilities and various BMA applications and systems use the BTI for interoperation and interconnection.

Through EIEMA capabilities and the BTI, the BMA will be able to participate in business processes that span DoD and partner military organizations. Thus the BMA can support coalition Business Capability automation. *Figure 3-3: Showing the BTI within the BOE* is described in the following paragraphs.

Figure 3-3: Showing the BTI within the BOE
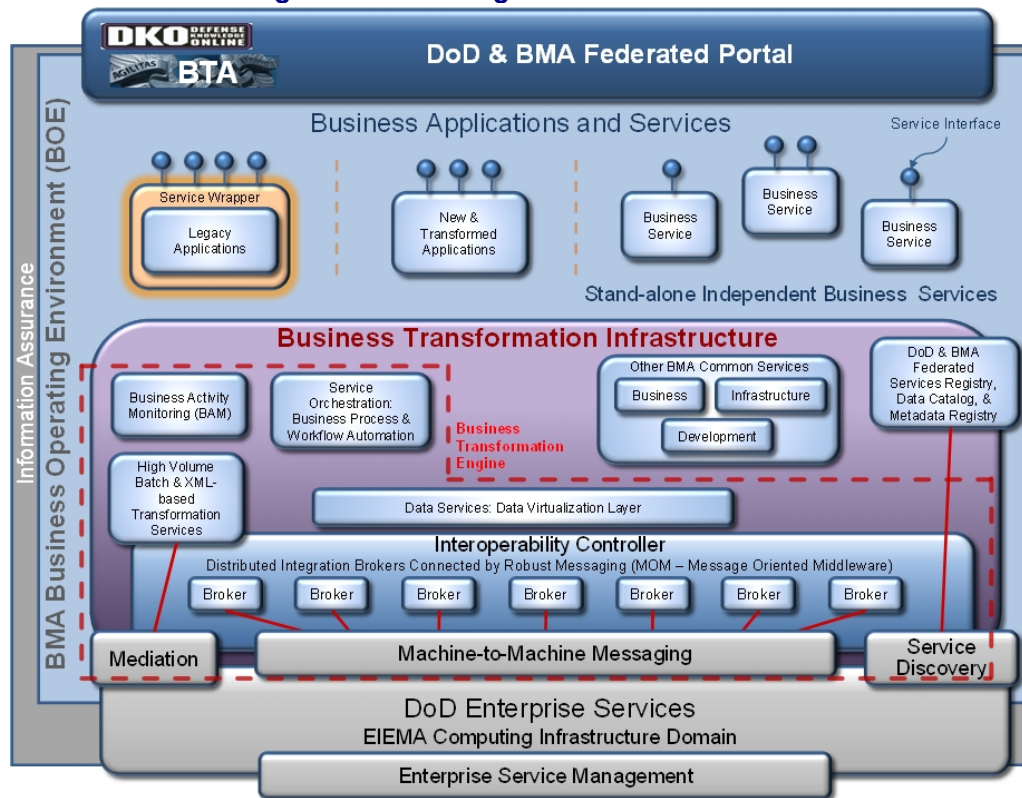
3.7.1. Business Transformation Infrastructure (BTI) Details

The BTI supports and enables interoperation and interconnection of business systems, services, and applications. This includes component applications that need to share information, expose functionality, or consume functionality across the Enterprise. The direct users of the BTI are development environments used by BMA and BTA developers, and the BMA applications and services. This is in line with the standard industry notion that the components in a SOA are intended for machine consumption (as in the World Wide Web Consortium's (W3C) Semantic Web Initiative). On future years, BMA applications may include legacy systems that must be "wrapped" in order to provide and consume BTI and other application services. These wrapped legacy applications will run with transformed and new applications that make use of the BTI natively. In both cases the Capabilities and functionality of the applications are made available as registered services in the overall BMA SOA. Infrastructure level facilities from DoD C/S/As are also software applications and services that interoperate with the BTI on behalf of C/S/As systems. As part of the GIG, all of this capability rides on the facilities of the EIEMA Computing Infrastructure Domains (CIDs).

3.7.1.1. Components of the BTI

The BOE/BTI includes the following facilities, many of which will be provided as DoD Enterprise Service capabilities or as federated participants in those services:

Services Registry provides developers and software applications searchable information on available machine/software services. Registry information includes the interface definitions, parameters of invocation, and rules of engagement per the Description Language (WSDL). The registry also provides end users with a list of available web and portal applications, that is, services in the second sense noted above. The DoD Service Registry is used for this purpose.

Metadata Registry and Repositories store DDMS search metadata, the document and data schemas, policy, and other information needed to drive the services of the BTI. BOE registries and repositories will be federated as appropriate.

Common BMA Services for use by applications and other services, include: *Business Enterprise Services* that can provide value across all business applications, such as Business Intelligence and Knowledge Management; *Infrastructure Services* involved

in the operation and leveraging of the BTI by applications; and *Development Services* that aid developers and system administrators in design and deployment of applications and services within the BMA SOA.

Business Transformation Engine (BTE) is a group of close-knit Capabilities that form the core of the SOA, the interoperability and interconnection support, for BMA applications and systems. 'Close-knit" does not mean that services realizing these capabilities are not loosely coupled, as appropriate to a SOA, but that the capabilities are organized around a common goal or purpose, and united in supporting a SOA.   The BTE is further described in the next section.

3.7.1.2.   Components of the Business Transformation Engine (BTE)

The core of the BTI is generically designated the BTE. The BTE is the central organizing facility of the BTI tying together both the services provided by and through the BTI, and the applications and systems of the BOE. This establishes the common foundation infrastructure for a SOA environment to realize the federation strategy. It provides infrastructure Capabilities in support of application interoperation and interconnection. It includes the following components common to current SOA infrastructures:

Business Activity Monitoring (BAM) Facility provides a capability to monitor business systems at the technical levels of transactions and performance and the ability to monitor more abstract business levels to determine how business operations are performing. Typically BAM provides input to Business Intelligence Engines and Dash Boards.

Service Orchestration Facilities: Process Automation and Workflow provides a flexible and adaptable means to describe business processes that can be utilized by both human and machine means in order to marshal the various functional features[36] found in systems and applications across the BMA. This need is met through the facilities of the Process Automation and Workflow component of the BTE which provides Service Orchestration. Business personnel use this capability to link services to automate business processes and to create composite services that may themselves be used in higher level automated business processes.

Mediation Services make use of metadata and rules to provide the ability to translate and validate information sent through the BOE. Such facilities promote data interoperability throughout the BMA without requiring change or update to existing systems and applications, or changes to existing DoD C/S/As infrastructures.

Data Services Data Virtualization Layer facilities are a key mechanism for achieving the goals of Net-Centric data sharing. As depicted in *Figure 3 4: Data Virtualization Layer Provides Standard Data Services Across the BMA* this is a means for aggregating and exposing disparate data sources as either Web or SQL Services, providing standard eXtensible Markup Language (XML) or Structured Query Language (SQL) schemas describing the service's data. The services do not house or store the data, but respond to a query or service invocation by obtaining the data from the underlying data sources and presenting them in a standard way.

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[36] Functionality exposed as services in a SOA.

Figure 3-4: Data Virtualization Layer Provides Standard Data Services Across the BMA
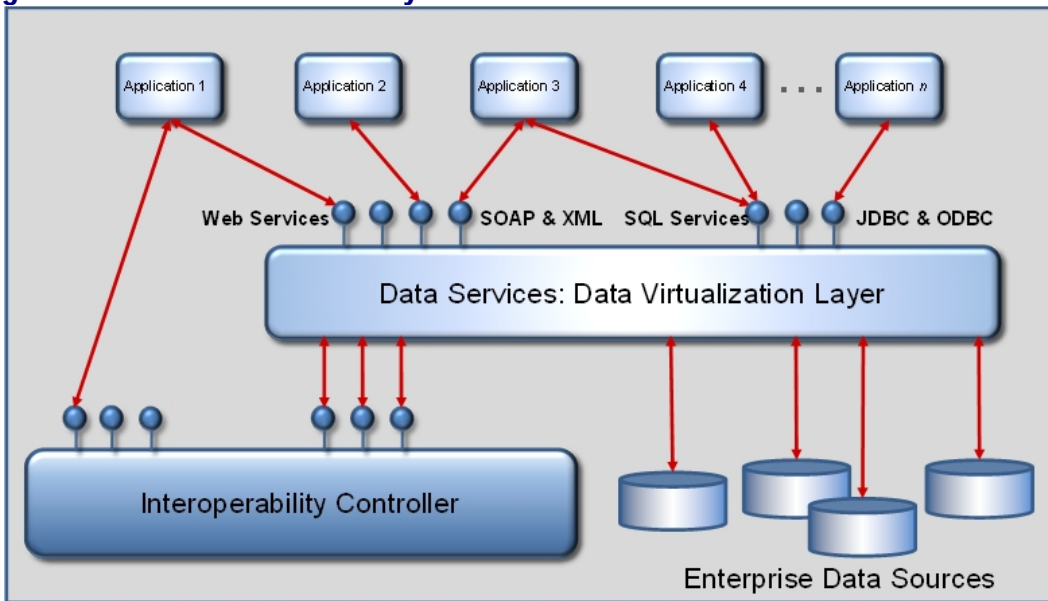
Interoperability Controller - Just as the BTE is the central organizing facility of the BTI, the Interoperability Controller is the central organizing component of the BTE. It provides the foundation for the BTE through distributed integration brokers, connected by messaging enabling a scalable integration environment and control of the various aspects of interoperability operations within the BOE. It is an architectural level description of the central capability of the BTE. This strategy bases the Interoperability Controller on the Machine-to-Machine Messaging DoD Enterprise Service. This is shown in *Figure 3-5: The Interoperability Controller Built on DoD Enterprise Service Capabilities.*

Figure 3-5: The Interoperability Controller Built on DoD Enterprise Service Capabilities
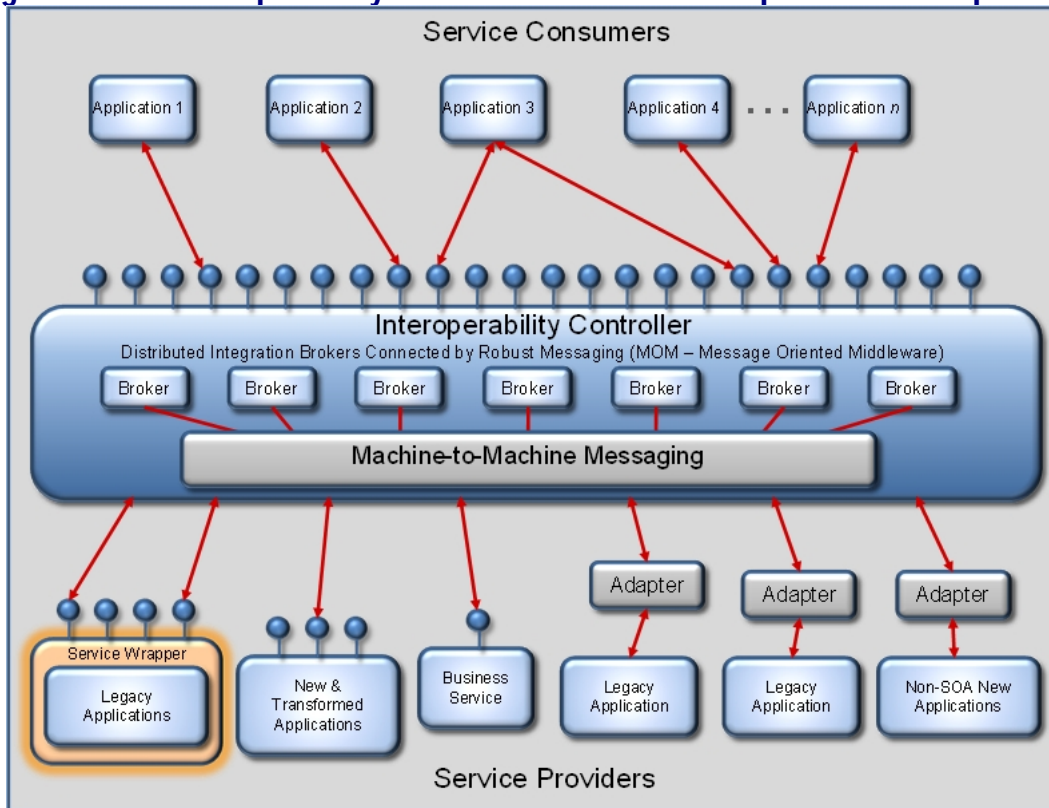
By establishing the Interoperability Controller as an intermediary layer in the infrastructure between service consumers and service providers, the BTI provides a means for implementation of an interception layer in uses of services. Automatic mediation of the messages involved is one example, allowing the service consumer to use the standard message in invoking the service as exposed by the Interoperability Controller, while the service provider, which may be a legacy application, sees its own familiar message formats. Another example is the provision in the interception layer of an IA policy enforcement point, eliminating the need of all consumers and providers to be knowledgeable of IA policy and to be enforcers of that policy. An example is shown in *Figure 3-6: The Interoperability Controller Implements the Interception Pattern, Providing Value-Added Services*.

Figure 3-6: The Interoperability Controller Implements the Interception Pattern, Providing Value-Added Services
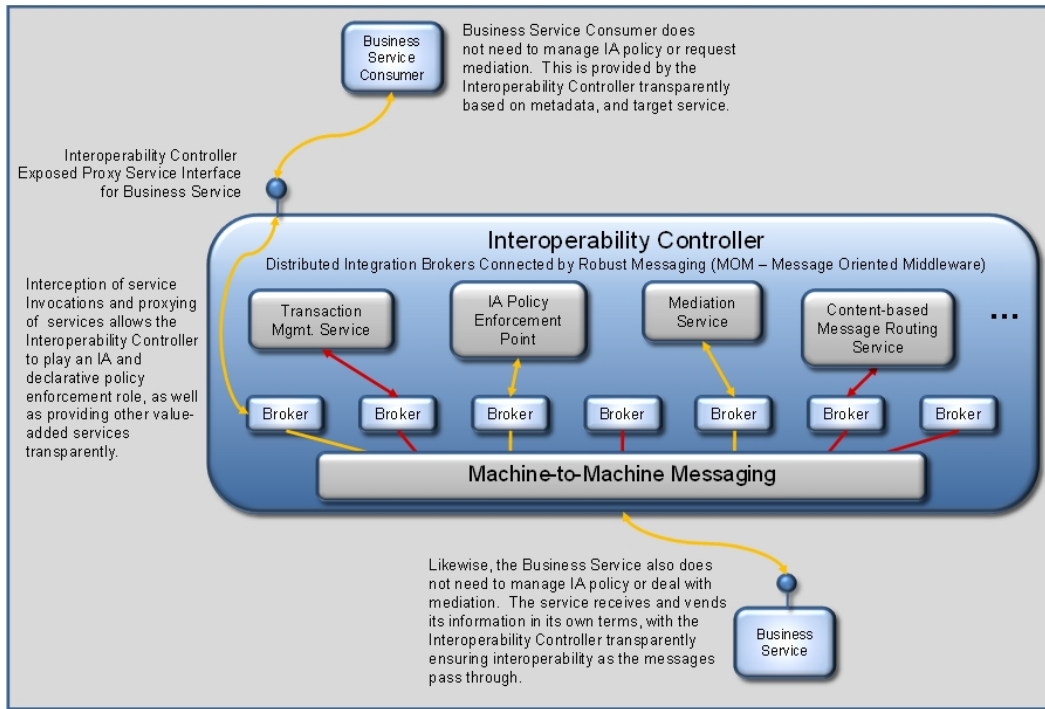
3.7.2. Using the BTI in the BMA

The following paragraphs describe the basic approach to bringing the BTI into use.

3.7.2.1. Standardized Enterprise Information Exchanges through the BTI

The BOE provides the SOA infrastructure to interconnect enterprise level systems, as well as to exchange data with BMA C/S/As through SOA mechanisms depicted in *Figure 3-7: BMA Vision of Standardized Enterprise Information Exchanges through the BTI*.

Local vocabularies and messages are developed by COIs. A COI comes together as a group of information users and providers (the COI participants) around a need to exchange information within a particular subject area. The COI identifies or defines a local shared vocabulary and message set to implement the exchange of information among participants in the COI. In addition, the COI defines metadata to provide formal and machine-consumable semantics for the shared messages and vocabulary. This metadata is called *Semantic Metadata* in *Figure 3-7*. Each participant provides information for the exchanges from a variety of systems within their purview; each may need to provide information from the exchanges between systems. While the long term goal within each participant's purview is to use the local shared vocabulary and messages internally, participants may invoke the mediation DoD Enterprise Service to transform their information to and from the local shared message formats and vocabulary. These transformations are driven by the semantic mappings to the defined semantic metadata.

When communicating outside of the COI, the COI either provides messages in the BMA Common Vocabulary and Message format, or the BOE will invoke the Mediation Service to transform from the local shared messages and vocabulary to the BMA Common Messages. These transforms may be automatically constructed by the Mediation Service based on the semantic mappings. The BMA Common Messages are in the BEA.

For C/S/As, each COI produces a package of metadata, including its vocabulary (whether Acquisition, Finance, Personnel, etc), definitions, semantic relations among terms, contextual information, identification of authoritative sources, and business rules governing access constraints. The various COI vocabularies are aligned by the C/S/As, which manage issues such as term ambiguity and vocabulary configuration management.

Figure 3-7: BMA Vision of Standardized Enterprise Information Exchanges through the BTI
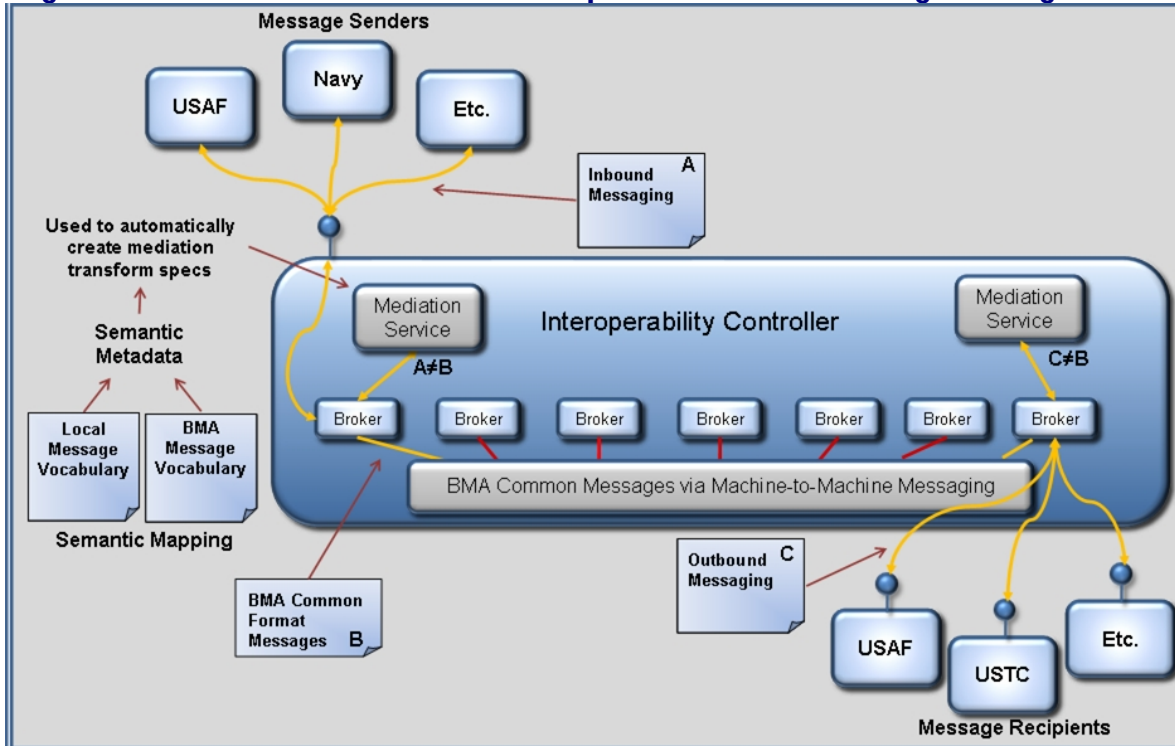
As shown in *Figure 3-7*, *Message Senders* can send a message without needing to know the message format expected by the recipient, or even the common format that flows through the infrastructure layer. Value added services in the BTI that are aware of the common format may take action (security, transactionality, etc.) on behalf of the sender. The infrastructure invokes mediation as needed (Inbound Message formats A does not equal BMA Common Message format B) to transform the supplied message to the common format. A sender may already use the common format, in which case the mediation service is bypassed.

Message Recipients get the message in the format they expect, without being aware of the transformations or value-added operations that have taken place along the way when Outbound Message format C does not equal BMA Common Message format C. Again, a recipient may already use the common format, in which case the mediation service is bypassed.

BMA Common Messages use a vocabulary based on DoD and IC Universal Core Data Schema (aka the Universal Core) and BMA Enterprise extensions, also found in the BEA.

Mediation Transforms are built automatically from semantic mappings of source and target message formats and vocabularies to the semantic metadata.

3.7.2.1.1. Prioritize and Connect to the BTI

The benefits of systems federation via the BTI are realized when systems, applications, and services are connected or "plugged into" it. As BMA leadership determines the priorities for business transformation activities, the prioritization

will drive connection to the BTI. Systems, services, and applications will be hosted on the BTI in response to the prioritized Business Capabilities outlined in the ETP.

3.7.2.1.2. Connecting Services and Legacy Applications

In order to interoperate within the BTI, any application, service, or system must follow the protocols and standards published by the Enterprise. These include:

- Web services standards Simple Object Access Protocol (SOAP) and WSDL for direct communication;
- Use of XML for the BMA standard message sets defined for the application functional area;
- Use of mediation for message sets external to the BMA standard message sets;
- Use of services available through EIEMA or the BTI by discovering their interfaces in the service registry;
- Definition and registration of a service for business functionality of priority to the Enterprise;
- Definition and registration of a service for accessing any source of data of priority to the Enterprise; and
- Registration of data asset repositories or service registries with the BTI for federation of search and discovery.

3.7.2.1.3. Connecting Infrastructures

The BTI enables a federation of the Enterprise business infrastructure and C/S/As with appropriate infrastructures. There is no additional requirement on C/S/A's to construct their internal infrastructures in any particular way. C/S/As reference the implementation guidance provided in the Office of the Secretary of Defense (OSD) Net-Centric Implementation Documents (NCIDs)[37], currently in refinement stages, to aid compliance with GIG Interoperability requirements/standards and the Net-Ready Key Performance Parameter (NR-KPP)[38]. They may choose to implement a local infrastructure and connect it to the BTI to enable interoperability, or they may choose to use the BTI as their interoperability infrastructure to interconnect their local applications. It is assumed that all such infrastructures will leverage DoD Enterprise Service's. A schematic of this aspect of the BMA Federation Strategy is shown in *Figure 3-8: BMA Architecture Federation*.

#### Figure 3-8: BMA Architecture Federation
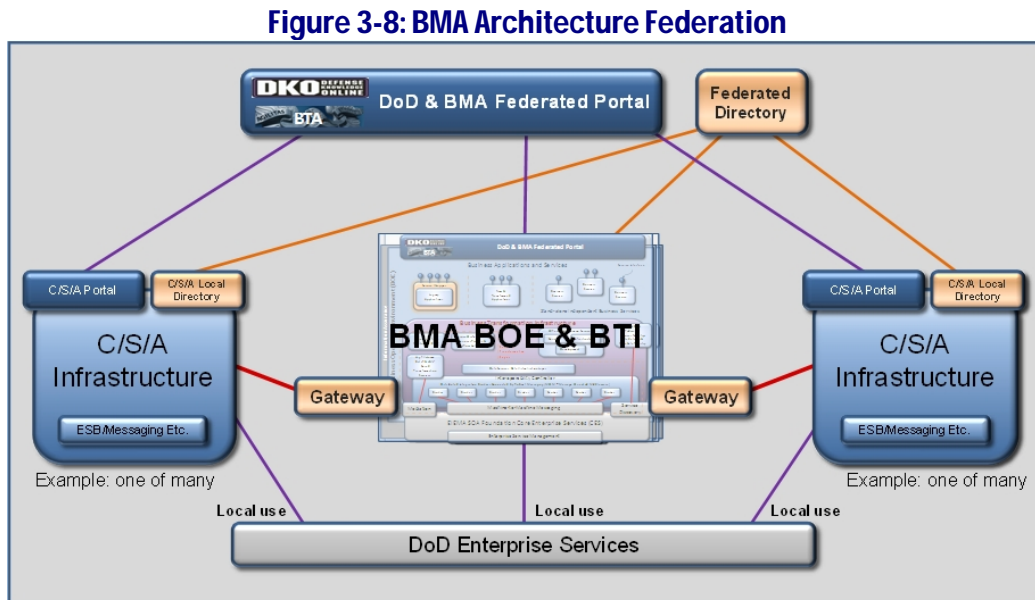
3.7.3. EIEMA DoD Enterprise Services

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[37] The Enterprise Service EW SSEB, led by ASD(NII) oversees development of the NCIDs

[38] NR-KPPs are discussed in the *Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6212.01D Interoperability and Supportability of information Technology and National Security Systems* dated March 8, 2006.

3.7.3.1. Information Assurance and EIEMA Security Services

Security Services are leveraged from the EIEMA DoD Enterprise Services in order to authenticate and provide security across the users and information of the BMA. These services are part of a broader, policy and best practices-based Information Assurance capability throughout the GIG.

3.7.3.2. EIEMA Service-oriented Architecture Foundation DoD Enterprise Services

DoD Enterprise Services will be used throughout the BMA. For instance, the needed Message-Oriented Middleware infrastructure called for in the Interoperability Controller can be provided by the Messaging DoD Enterprise Service depending on how the BTE is acquired and implemented. Also, as noted in *Section 3.1.2. CBM Extensions of the BMA*, some DoD Enterprise Services require that Mission Areas provide capability for the service in a federated, recursive fashion. For example, if a primary DoD Enterprise Service were a search service, it would be designed to invoke Mission Area and C/S/As search services across the information for which each organization has responsibility.

4. Governance

4.1. Purpose

To effectively execute the BMA Federation Strategy and Roadmap and transform DoD business operations towards a BOE using SOA, a SOA governance framework must exist within the Enterprise, C/S/As, and Program levels of the BMA. The BMA approach is to embed the requirements for BMA SOA Enterprise service delivery governance and BMA SOA technical governance, into the charters of existing governance bodies.

This section will address:

- The Framework for Service Delivery Governance and Technical Governance
- The Role of Different BMA Participants in Governance
- Rights and Responsibilities of BMA Participants
- BMA Service Lifecycle and Service Delivery Governance including BMA / BTA Structures and Processes
- Technical Governance of BOE and its Components
- Governance of SOA Communications, Education and Outreach

The existing governance bodies and processes that can be leveraged to provide this framework for BMA SOA Enterprise service delivery governance are those inherently identified in the FY05 NDAA; the DBSMC[39] , as chaired by the Deputy Secretary of Defense, DoD IRBs, and the transformation tools and processes that support them: BEA, ETP, Business Transformation Guidance (BTG), and the BCL. *Figure 4 1: Service Delivery Governance and Technical Governance Framework*, which is heavily based upon the Senior Enterprise Services Governance Group (SESGG) Governance Model, illustrates this framework.

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[39] Under the FY05 NDAA, the DBSMC sets the business priorities of the Department, identifying gaps in business capabilities that need addressing and establishing them as the Business Enterprise Priorities (BEPs) of the Department. The DBSMC also approves recommended solutions to business capability needs and monitors their implementation. In doing so, the DBSMC references information pulled from all layers of the Department's federated business architecture – from the BEA to Program-level architectures.

By establishing the Business Enterprise Priorities, the DBSMC determines where and when specific capabilities are addressed within the federated business architecture. When the DBSMC approves systems delivering capabilities that are not covered by a BEP, their architecture remains at the Component and Program level. The DBSMC may, however, determine that a capability needs to be addressed as an enterprise capability and thus included in the BEA. Component and Program architectures are then adjusted appropriately.

Finally, the DBSMC is responsible for approving IRB certifications of all business system investments over $1 million over the lifetime of the system. To operationalize this requirement, the DBSMC has charged the C/S/As with conducting BEA compliance assessments of all systems requiring certification prior to submission to the IRBs. The Business Transformation Agency (BTA) has developed guidelines and a dedicated toolset (described herein) to facilitate theses assessments.

Figure 4-1: Service Delivery Governance and Technical Governance Framework
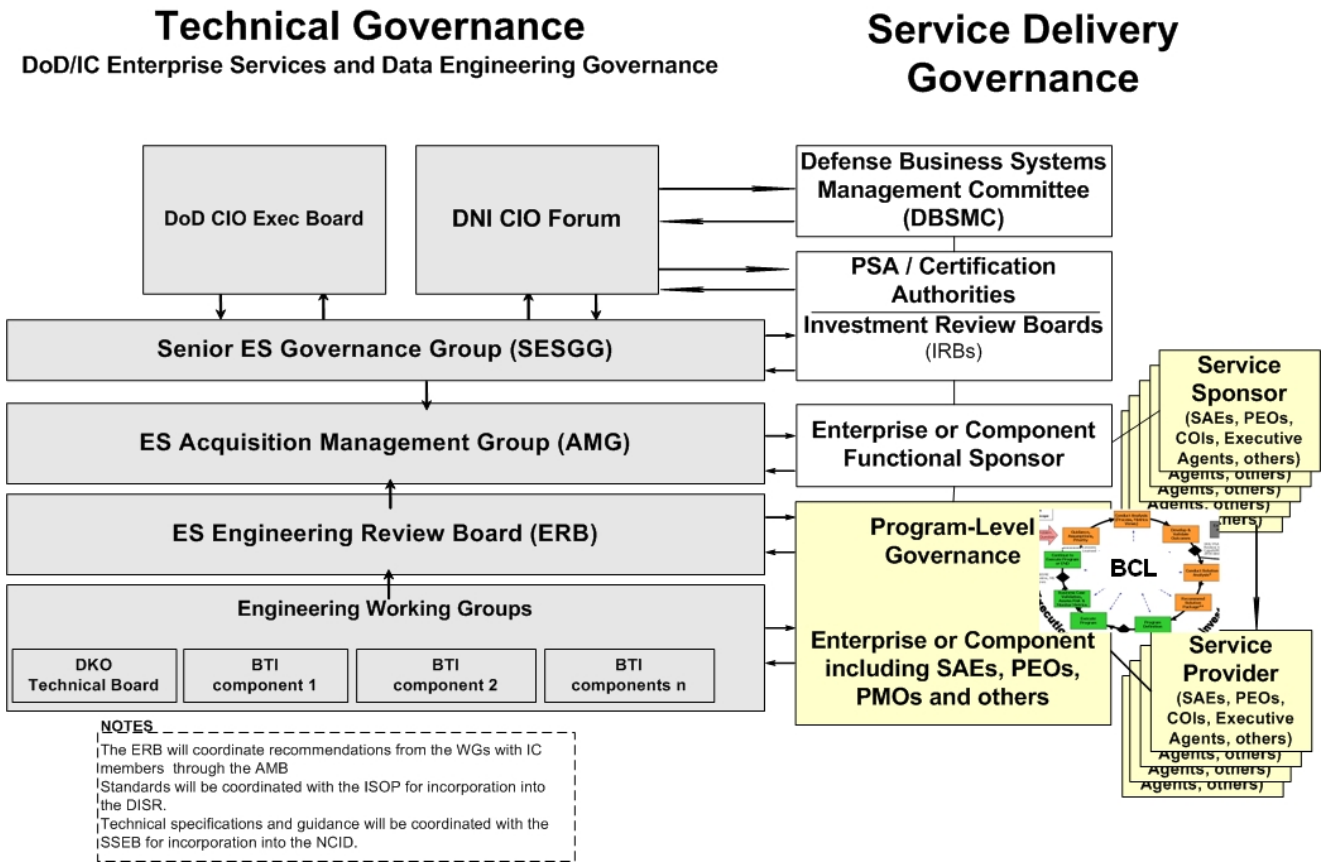
As BMA Enterprise services rely upon the existence of the BTI, so the technical governance and service delivery governance are linked. Technical governance, including that of the BTI within the BOE, and the governance of the BMA Enterprise services exist and operate side-by-side as a holistic governance model[40]. The intent of this holistic model is to involve and include all the key organizational management elements that exist to support a service across the lifecycle of the service. These include program management, portfolio management, architecture management, management of end-to-end business processes as represented in the architecture, functional goals, requirements management and management of the BTI technical standards elements.

4.2. Role of BMA Participants in Governance

The BMA Enterprise, C/S/As, and Program tiers align with the policy of Tiered Accountability. The DoD Enterprise is the tier that provides cross mission area and cross domain engineering services and infrastructure support as EIEMA capabilities; this tier is represented here by DoD IC Services and Data Engineering Governance structure shown in the above *Figure 4-1: Service Delivery Governance and Technical Governance Framework.*

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[40] For a discussion of the Holistic model in reference to ERP programs, see the U.S. Army PEO EIS & Software Engineering Center's Enterprise ERP/SOA Resource Center, available at http://www.army.mil/ESCC/erp/gov.htm#img1.

Table 4-1: Role of BMA Participants - Tiered Rights and Responsibilities

Tier	Rights	Responsibilities
DoD Enterprise	• Address technical standards and specifications and other service-interoperability issues identified by the BMA Enterprise • Review, synchronize, and recommend approval of BOE and BTI standards, specifications (including their implementation guidance), and reference implementations in accordance with approved Enterprise-Wide Systems Engineering (EWSE) implementation guidance to the Enterprise Services Architecture Oversight Group (ES AOG). • Ensure the development of an Architecture Development Methodology (ADM) • Guide the development of an ADM • Maintain the ADM	• Provide SOA Technical Governance through the DoD IC Services and Data Engineering Governance structure • Make DoD Enterprise components (currently identified as Service-oriented Architecture Foundation (SOAF) NCES 1.0)) of the BTI available to the BMA • Insure DoD Enterprise components of the BTI interoperate with the BMA components of the BTI • Identify technical and implementation dependencies and coordinate implementation schedules linked to the BMA managed components of the BTI • Receive input regarding the performance of the infrastructure supporting the operation of the Enterprise services and make recommendations for the expansion of the software and/or hardware base to support these services. Recommend performance trade-offs to resolve Enterprise services issues, and/or make recommendations to the ES AOG for further issue resolution, as required. • Support BMA Enterprise Service Lifecycle through facilitation of engineering, testing and certification
BMA Enterprise	• Impose policies and constraints on C/S/As and Programs in order to achieve cross-BMA interoperability • Prioritize Business Capabilities • Govern the identification and promotion process of BMA Enterprise business services from within the Enterprise, C/S/As and Programs • Govern the process of selecting an Enterprise authoritative source for BMA Enterprise business services and insure that duplicate systems/services from within the Enterprise, C/S/As and Programs do not exist at an Enterprise level • Identify, establish and govern COIs for the BMA Enterprise tier, C/S/As and Program tier • Identify new requirements or changes to existing requirements for the SOAF provided by NCES and other DoD Enterprise services	• Define the protocols and standards for connecting to BMA/BTI and pass to DoD Enterprise as EIEMA capabilities • Make the BMA managed components of the BTI infrastructure available to the BMA • Insure BMA components of the BTI interoperate with DoD Enterprise components of the BTI • Identify technical and implementation dependencies and coordinate implementation schedules linked to DoD Enterprise managed components of the BTI • Manage the BMA Enterprise Service Lifecycle • Provide Service Delivery Governance • Insure that only BMA Enterprise Services are not redundant in their feature functionality, unless redundancy is a required and desired outcome for the Enterprise

Tier	Rights	Responsibilities
BMA Component	• Impose policies and constraints on Programs within the component as deemed necessary by the component • Where not constrained by the Enterprise, autonomously manage architecture and technology standards and adhere to the requirements established in the Enterprise Architectures • Govern the identification process of C/S/As shared business services from within the C/S/As or Programs • Govern the process of selecting an Enterprise authoritative source for the C/S/As shared business services and terminate duplicative systems/services from within the C/S/As and Programs • Identify, establish and govern COIs as needed for the C/S/As and Program tier • Recommend COIs for the BMA Enterprise tier	• Support component's implementations consistent with BMA/BTI and EIEMA guidance, protocols and standards • Insure that within a component's specific service domain, the component does not have redundant services unless required and desired as an outcome for the component
BMA Program	• Where not constrained by the Enterprise or C/S/As, autonomously manage architecture and technology standards and adhere to the requirements established in the Enterprise Architectures • Identify, establish and govern COIs as needed for the Program tier • Recommend COIs for the BMA Component and Enterprise tier • Use the ADM	• Use BMA/BTI and EIEMA guidance, protocols and standards so that local infrastructure interoperates with the BTI and EIEMA

4.3. BMA Enterprise Service Lifecycle and Services Delivery Governance

The existing BMA and BTA governance processes and structures support the Enterprise Service Lifecycle. Here it is vectored to address meeting business capability needs through the BMA Enterprise Services Lifecycle.

4.3.1. BMA Enterprise Service Lifecycle

The BMA Enterprise Lifecycle encompasses build time and run time governance, as depicted in *Figure 4-2: BMA Enterprise Service Lifecycle*:

Build time Governance includes:
- Service Definition - Prioritization of needs against the BEA which includes the prioritization of business requirements and modeling of business processes against the BEA;
- Service Development – Design, development, which may include adoption, promotion, or creation of atomic and the composition of composite services, and certification.

Run time Governance includes:
- Service Operation – Deployment to the Enterprise; operation and management; and deprecation at obsolescence with an indication of the end of life date.

Figure 4-2: BMA Enterprise Service Lifecycle
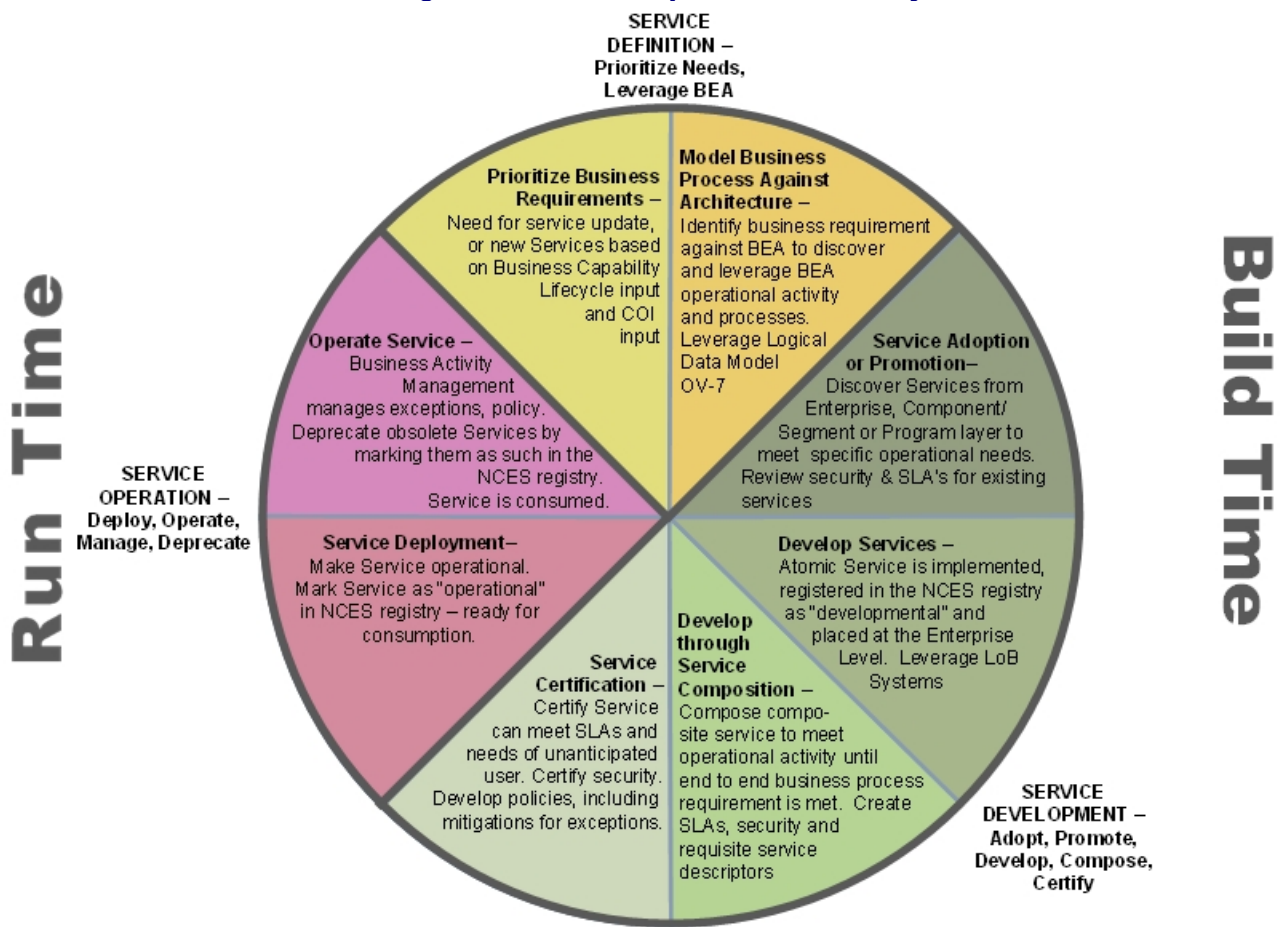
For each BMA Business Capability a specific, controlled set of BMA Enterprise services are certified, made operational and available for Development Usage, and published to the DoD Metadata Repository and NCES Service Registry at the BMA Enterprise tier. A Service Committee is identified to sponsor the service through its lifecycle.

Gaps are closed and services acquired through a strategy of first promoting, then adopting and finally creating services. In the first strategy, promotion, an existing BMA Enterprise Systems' system functions and/or authoritative data sources are opportunistically examined as service candidates for promotion to a BMA Enterprise Service through "wrapping" or "transformation". In promotion, "Wrapped legacy" or "transformed" BMA Enterprise Services are created when there exists a BMA Enterprise system function and, or an authoritative data source at the BMA Enterprise tier. If a need cannot be met through promotion then it is met through the second strategy of adopting an existing service from the Component or Program tier of the BMA or another mission area.   A service available for adoption should be currently operational, published to the DoD Metadata Repository and NCES Service Registry be ready to meet requirements identified by a BMA Service Level Agreement (SLA). If such as service does not exist and the promotion and adoption strategies cannot be used, the third strategy, creation of BMA Enterprise service through "wrapping" or "transformation" of a BMA C/S/As or Program system function, or an authoritative data. Such systems are visible through the DoD Information Technology Portfolio Repository (DITPR). Where neither a service nor system function candidate exists, a new atomic or composite service may be created.

After a strategy for obtaining a service has been determined, and the service has been developed and composed, it must be certified as a BMA Enterprise Service ready for consumption by the community at large with appropriate security and access restrictions placed upon it. After certification, it is made available and discoverable DoD Metadata Repository and NCES Service Registry. In the case where a wrapped, transformed or new service is updating or replacing an existing service, the existing service is deprecated and an end of life date is identified for it. It is still available for use, but not for development.

4.3.2. Service Delivery Governance BMA Structures and Processes

BTA directorates work directly with representatives of Enterprise and C/S/As constituencies and the BEPs to gather input and validation of potential capabilities to be met through BMA Enterprise services. Based on the input of PSAs, the Transition Planning and Performance (TPP) Directorate builds and refines the BEA and ETP to show service planning, promotion and availability, which drives resource execution to acquire services. The Investment Management Directorate, through processes described in *Section 2.6 Investment Management Framework*, defines and funds programs to provide services in compliance with business cases and IRB requirements. However, for BMA Enterprise services, the evaluation is done by the Service Sponsor, and the execution is done by the Service Provider, which in either case may be the DBSAE, or a C/S/As SAE or Program Senior Acquisition Executive (SAE). The Enterprise Integration Directorate pushes the SOA paradigm into the field to enable the execution of SOA by the BMA Component and Program tier participants, and the C/S/As Program Managers (PMs) and Program Executive Officers (PEOs) with ownership of BMA Enterprise Systems.

4.3.2.1. Communities of Interest

BMA Mission Area Leadership has a responsibility in managing BMA COIs and developing interoperability for the Mission Area[41]. COIs are formed to establish data sharing through common vocabularies and potentially meet operational needs through services. Please refer to *Section 3.7.2.1. Standardized Enterprise Information Exchanges through the BTI* for details on COIs in the BTI[42].

Stakeholders, including SAEs as a Component Acquisition Executives (CAE) and PEOs, participate in BMA Enterprise COIs, and have representation through their Component in BEPs, IRBs, the DBSMC, the Technical Governance framework and as Service Sponsors, Service Providers and Service Consumers.

4.3.2.2. Service Sponsors

Service Sponsor is the stakeholder group that identified the need for the service to the enterprise, thus representing service consumers. During the BCL and the BMA Enterprise Service Lifecycle, the DBSMC or IRBs confirms the Service Sponsor.

For BMA Enterprise Services, potential services may be self-identified by stakeholders as potential Service Sponsors participating in the federation. Business needs drive needs for services through the BCL. A Service Sponsors may be a Component System Acquisition Executive (CAE), DBSAE, may be a stakeholder from any existing or future BMA acquisition program, whether at the Enterprise level or at any C/S/As, or be a COI's executive sponsor or another unanticipated stakeholder group.

4.3.2.3. Service Providers

Currently the Service Provider develops and operates, and, until the GIG Federated Development and Certification Environment (FDCE) is in place, certifies services[43]. During the BCL and the BMA Enterprise Service Lifecycle, the DBSMC or an IRB confirms the Service Provider based on input from the Service Sponsor.

A Service Provider may be from any existing or future BMA acquisition program, whether at the Enterprise level or at any C/S/As. The acquisition program's CAE's Program Executive Offices and Program Management Offices, in the role of a service provider, may evaluate and execute these needs and determine the means of adoption, promotion or

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[41] See *DoD 8320.2-G, "Guidance for Implementing Net-Centric Data Sharing"*, dated April 12, 2006, and issued under the authority of *DoD Directive 8320.02, "Data Sharing in a Net-Centric Department of Defense"*, which was certified current as of 23 April 23, 2007. DoD 8320.2-G places the onus on Mission Areas and Mission Area Leads to govern COIs to achieve the intent of DoDD 8320.02.

[42] For more information on BMA COIs see the draft *Net-Centric Data Sharing Strategy for the BMA Acquisition Community*.

[43] Currently there is a DoD effort lead by the DISA CTO, the GIG FDCE (Federated Development and Certification Environment), to create a certification process for all DoD "web" services including machine to machine service and man to machine services. Until the GIG FDCE is in place, the onus is on the Service Provider to certify services.

creation of BMA Enterprise Services as it pertains to an acquisition program. The approval for this rests with the acquisition program's Milestone Decision Authority (MDA).

Thus CAEs are responsible for Operation of their services (the services where they are the Service Provider, whether these are at the BMA Enterprise, Component or Program tier) where for a specific Quality of Service (QoS) according to the SLA.

4.3.2.4. Service Consumers

The Service Consumer is an end user or a complex service(s) that consume multiple services. The consumer can be anticipated or unanticipated. A Service Consumer will except the general SLA or negotiate a custom SLA to meet their service needs as well as QoS. *Figure 4-4: BMA Service Composition and Operation* illustrates these concepts and relationships.

4.3.2.5. The Role of Senior Acquisition Executives and Program Executive Officers

As service sponsors, SAEs and PEOs' roles regarding the program are not changed. Rather, the acquisition program is now also a program providing a service, and the SAE and PEO for this program must govern this service from a build time and run time aspect. Services that are atomic BMA Enterprise Service(s) or are composed into a composite BMA Enterprise Service(s) provide the QoS based on the SLA. The service sponsor, when a service provider, is responsible for operating the service based on the SLA.

However, services must interoperate across tiers. SAEs and PEOs from the BMA Enterprise, Component and Program tiers may serve as atomic Service Providers to a Composite Service that acts as a Service Consumer. Also, SAEs and PEOs from the BMA Enterprise, Component and Program tiers may serve as Composite Service Providers that is providing an BMA Enterprise Service. *Figure 4-4: BMA Service Composition and Operation* illustrates these concepts and relationships.

Figure 4-3: BMA Service Composition and Operation
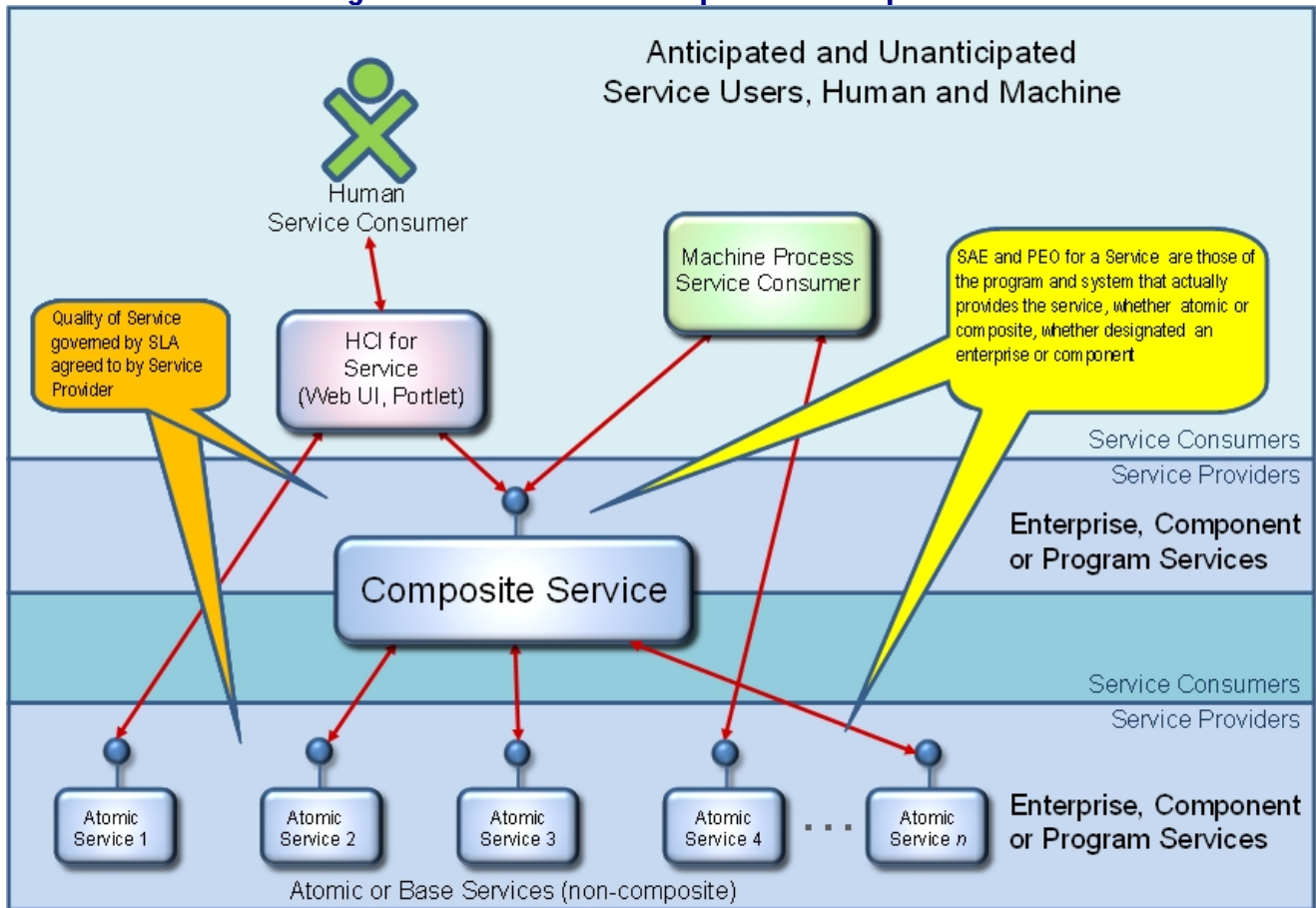
4.4. Technical Governance - Governing the BTI and BOE

In regard to SOA technical governance, the DoD IC Services and Data Engineering Governance structure, depicted in *Figure 4-1: Service Delivery Governance and Technical Governance Framework*, as led by the DoD CIO Executive Board and DNI CIO Forum, provides the existing and appropriate governance bodies and process.

In this framework, the ES AOG and the ES Engineering Review Boards (ERB) advise and inform the SESGG regarding relevant technical recommendations. The ERB[44] coordinates the gathering of recommendations from the different working groups. The working groups provide specific technical specifications and technical analysis for each focus area. These include currently defined areas such as the Content Discovery Working Group (CDWG), Service Oriented Architecture Foundation Working Group (SOAF WG), the Collaboration Interoperability Working Group (CIWG), the Defense Knowledge Online (DKO) Working Group and the Metadata Registry Working Group (MRWG). As other components of the BTI are acquired, the focus of working groups could be expanded or additional working groups formed to address the focus areas for each component.

The SESGG assesses these recommendations and then provides advice and analysis to both DoD CIO Executive Board and the DNI CIO Forum, whom in turn provide guidance back to the SESGG. The SESGG takes this guidance and form's Policy and Implementation Guidance for execution downward through the governance structure.

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[44] The *Enterprise Services Engineering Review Board (ES ERB) Charter, Version 1.0*, dated May, 15, 2007, was presented to board members for review at the board's first meeting on May 17, 2007. The objectives of the ERB identified in the charter are to: a) "Recommend approval in coordination with the IT Standards Oversight Panel (ISPO) and the Enterprise-Wide Systems Engineering (EWSE) Senior Systems Engineering Board (SSEB) enterprise service standards, specifications and reference implementations across DoD and DNI"; b) "Charter and monitor ES working groups and tiger/teams", including those that would provide governance of BTI C/S/As identified in Section 3.5.1 of this document, and c) "Identify ES technical dependencies and infrastructure performance issues".

4.4.1. Governing the BOE and BTI

Through its services, the BOE will enable delivery of the capabilities and priorities established by the DBSMC and IRBs. In this manner, it serves as a technical delivery mechanism for delivering automated functionality to and from systems and users across the GIG. Thus, BOE plays an important role in the DBSMC / IRB decision making process regarding optimal solutions for Departmental business capability needs. To properly fill this role and ensure effective and efficient operations, the BOE will require the establishment, monitoring and enforcement of appropriate policies, standards and procedures. Jointly DoD IC Services and Data Engineering Governance structure and the BMA governance structure provide the existing and appropriate governance bodies and process. Accordingly, BOE governance is shared. *Table 4 1: Role of BMA Participants - Tiered Rights and Responsibilities* provides further detail on roles.

It will be necessary to address issues and adjudicate conflicts between various BMA participants and stakeholders, and to integrate BOE activities with the enterprise-wide activities. *Table 4-2: Governance Requirements for Systems Federation* shows needed governance to realize the benefits of systems federation.

Table 4-2: Governance Requirements for Systems Federation

Category	Governance Requirement
BMA COIs	Establish, identify and manage BMA COIs so as to allow: • BMA Enterprise tier to resolve issues affecting its stakeholders • Meet operational needs through services • Increase information sharing, volume, speed and reach to known and unanticipated users • Provide organization and maintenance construct for data • Provide and consent of community stakeholders The above allows BMA COIs to: • Identify data assets such as files, databases and BMA Enterprise Services. • Make data assets visible, accessible, and understandable (i.e., tagged and discoverable) • Define shared vocabularies within COIs and between COIs. • Register semantic and structural metadata to the Metadata Registry (MDR).
Data Management Processes	Define the processes for making changes to: • BMA metadata, services interfaces and service capabilities. • The semantic among data definitions. Define the processes for: • Identification, prioritization, ownership assignment, and definition of Authoritative Sources for publication according to the Enterprise publication policy. • Registering metadata in a metadata repository and posting metadata to those repositories within the shared space. • Registering services in the BTI and managing any changes to that metadata.

Category	Governance Requirement
Policies	Establish policies for ensuring that shared services and data are sufficiently documented to: • Enable the automation of mediation and translation of data between interfaces. • Help potential service and data providers determine what to make available to the Enterprise as services and supporting data standards and message sets. • Help potential consumers comprehend structural and semantic meanings of data and determine how to use it appropriately. • Help consumers identify authoritative data. • Establish policies for ensuring that shared services and data are appropriately resourced to support demand. • Establish processes for accommodating increased usage of shared services and data as a result of unanticipated users.
Incentives and Metrics	Establish the incentives and metrics that will be used to encourage and monitor: • Development and publishing of semantic and discovery metadata. • Use of IT services including DoD Enterprise Services, BMA Common Services, and other transformed application services. • Responsiveness to new end user data and application needs.
Service Management Processes	Define the processes for: • Identifying and prioritizing BTI Services implementation • Wrapping Legacy application functions to expose services in the BOE. • Making changes to BTI Services so that those changes do not adversely affect other applications or services that use the services. This includes retiring BMA infrastructure services, as well as making changes to active BMA infrastructure services. • Automating the management of SLAs.
Quality Management Processes	Define the processes for: • Ensuring the quality and accuracy of the data and metadata posted to the shared space. • Creating and modifying metrics. • Testing and accrediting services • Evaluating and refining the end user experience within the BOE
Compliance Processes	Define the processes for ensuring that: • Metadata tagging guidelines adhere to DoD Net-Centric Data Strategy. For example, the authoritative data source tagging must fit into the DDMS. • Services adhere properly to BMA/BTI and EIEMA standards. For example, Business Enterprise Services are registered and available through the Service Discovery DoD Enterprise Service. • The BMA members conform to BMA governance processes, the BMA Federation Strategy and Roadmap, and the federation strategy for DoD. • Enterprise scalability for unanticipated users is included as a critical requirement in solution requirement and design review checklists.

4.5 Governance of SOA Communications, Education and Outreach

The objective of the governance of SOA Communications, Education and Outreach is to ensure the activities described in *Section 5. Socialize and Educate DoD Stakeholders* are vetted, understood and agreed upon.

Educational capabilities exist within the DoD. To the greatest extent possible, these capabilities and their communities should be trained to deliver educational content required for the SOA transition.

In order to effect the above, a Communications and Education Steering Group will be established.   This group will have oversight to ensure that communications and education activities across the BMA in support of the SOA transition are coordinated and executed by the appropriate parties, and are vetted , understood and agreed upon before they happen.

5. Socialize and Educate DoD Stakeholders

5.1. Purpose

The purpose of socialization and education of DoD Stakeholders, at both the C/S/As and Enterprise level, is to incrementally promote services from Enterprise and, or C/S/As System Functions to meet Business Capability Gaps. The BMA strategy will primarily rely upon communications and educational activities to meet these objectives.

The challenge is to deploy an approach that meets a common core of needs for all DoD Services and Agencies, while allowing the truly unique needs to still be met. This challenge is reflected in *Figure 5-1: Stakeholder Pyramids.*

Figure 5-1: Stakeholder Pyramids

Stakeholder Pyramids
for affected Stakeholder
Organizations
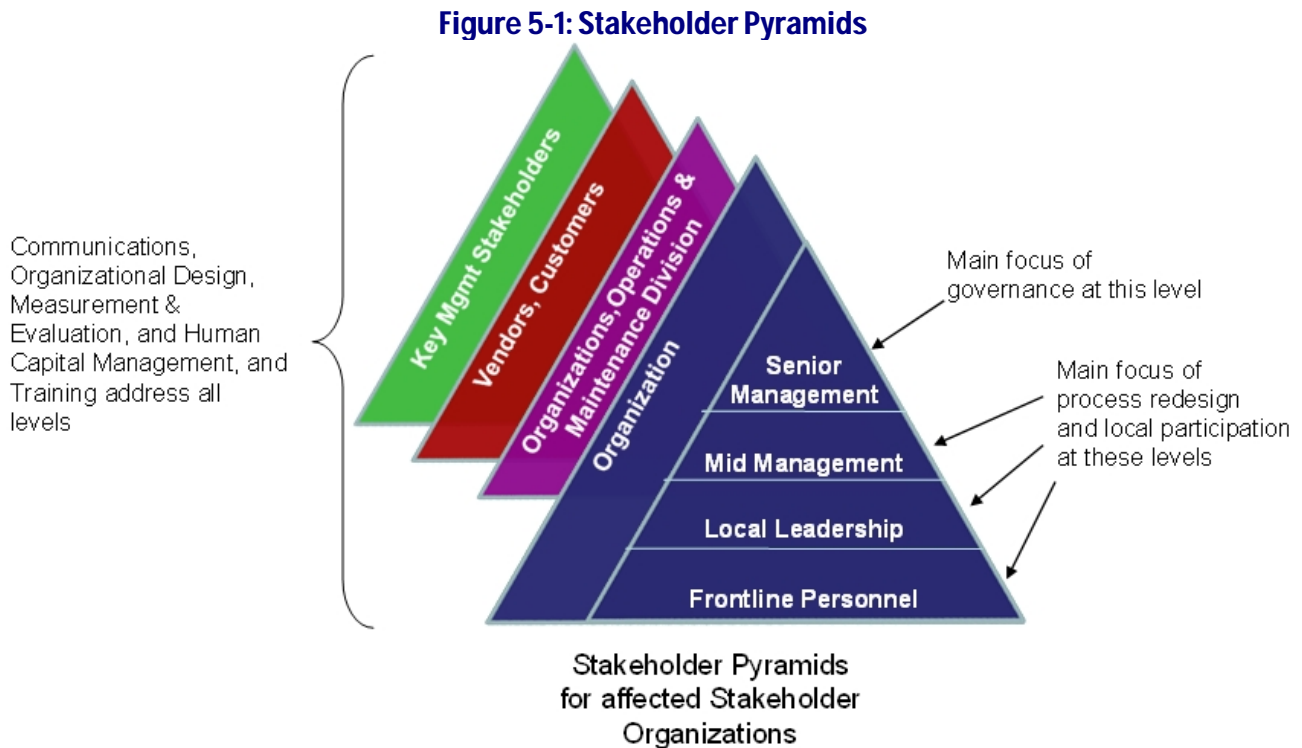
This challenge is partly technical, but to a great extent it is an organizational change management challenge that can be met through a comprehensive communications and education campaign.

5.2. Approach to Change

The BMA approach to addressing technology driven change, such as in the case of the SOA transition, is implemented through activities shown in *Figure 5 2: BMA EA Architecture Federation Change Management Concept.*

The first stage of this approach is to define the inputs for the Socialization and Education Plan, which fleshes out communications and education strategies and plans for developing and delivering them:

- Identify BMA Programs of Record implementation and deployment events, activities, participants and goals that may be impacted; and
- Identify stakeholder audiences, communication needs and channels through a stakeholder analysis and mapping.

The second stage of this approach is to identify the inputs into a Communications and Education schedule of events and the actual communications as key messages that need to be delivered:

- Collaborate with existing SOA initiatives, their plans and approaches; and
- Identify communications and education tools and vehicles that would be deployed through communications and educations strategies.


Figure 5-2: BMA EA Architecture Federation Change Management Concept
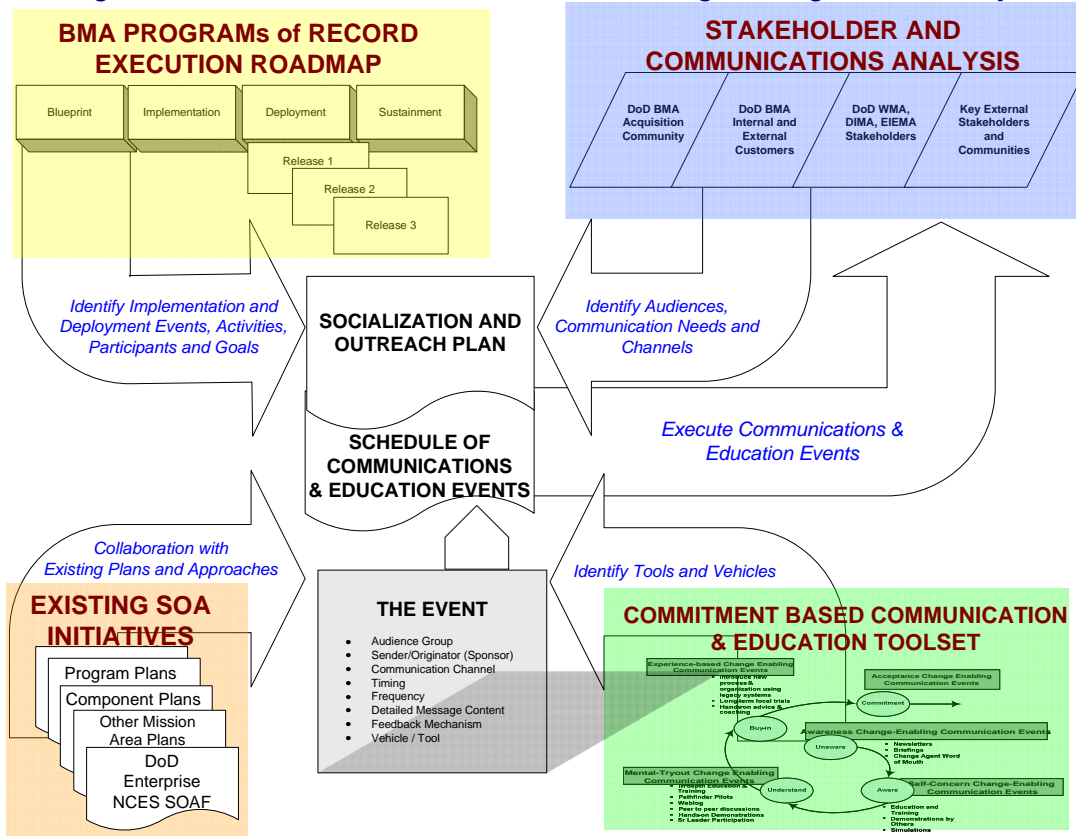
Each communication identified in the Communications schedule of events includes specifics on the:

- Audience/Group
- Sender/Originator (Sponsor)
- Communication Channel
- Timing
- Frequency
- Detailed Message Content
- Feedback Mechanism
- Vehicle / Tool

5.3. Enterprise, C/S/As and Program Stakeholder Participation

A successful, evolving transition to SOA would be reflected in the activities of relevant stakeholders as follows:

- **Develop system capabilities using services**. As new systems are developed, new data formats will be used first;
- **Provide services from existing services**. Legacy data formats will be registered in the MDR. New data formats and style sheets are to be registered;
- **Participate in Architecture Reviews**. This work will be coordinated and facilitated through existing Enterprise Architecture processes and structures and meet the requirements established in DoD CIO policy and guidance.
- **Identify Communities of Interest and Centers of Excellence locations**. Within these locations Subject Matter Experts (SMEs) expertise will guide design and implementation for modularity to support re-use. Business processes supported by Business Enterprise Systems should be identified and described. These locations will also provide input to leader/sponsorship playbooks.

5.4. Communications Outreach Objectives and Strategies

The Communications component has two main objectives: 1) Drive the commitment of all personnel affected by change by providing them with the right information at the right time and by creating an environment in which personnel are involved in the transformation; 2) Provide support for the overall Service Delivery life cycle of activities from beginning to end, including the governance of Business Enterprise Service operations and maintenance post deployment. This includes providing the necessary background education.

The Communications objectives are met by executing a systematic process that includes:
- Analysis of different stakeholder groups as audiences with specific needs for information;
- Identifying and selecting communications appropriate and effective communications channels;
- Analyzing system impacts and the objectives of changing the organization to create key message themes and specific message content; and
- Developing and delivering communications and educational events through appropriate tools and ensuring that this work happens in an environment that allows feedback to be collected from audiences and funneled to an assessment functions.

The analysis of these stakeholders and our expectations for them were discussed in sections above.

The strategies or tools that may be used for communication to DoD Stakeholders are the following:

- All publications of the Federation Strategy Playbook, covering service registration in a net-centric environment; service consumption, provisioning, and standards; and Service Sponsor / Provider / Consumer Playbooks;
- Road shows based on a stakeholder analysis and needs assessment at both the Enterprise and C/S/As level;
- Speaking Engagements at various facilities, such as Defense Acquisition University (DAU) or conferences;
- Multi-media e-learning events, such as video-conferences, web-conferences and Continuous Learning Modules (CLMs); and
- BMA Federation Team website.

5.5. Education Objectives and Strategies

The Education component's objective is to provision all people involved in the change with the background and skills they need to effectively deal with the process of change and prioritize, select, develop, operationalize, manage, use, support or maintain the deployed Business Enterprise Services.

The approach that will be taken to educate DoD Stakeholder is as follows:

- Provide existing or initial education which, will be done via the internet;

- Work with existing educational capabilities through a DoD University and College Outreach program;
- Identify and leverage existing education content;
- Develop and deploy education curricula and content, including that which is for acquisition management, using tools such as instructor led training, computer based training, e-Learning, blended training, war-game exercises, simulations, large group events and other forms through forums to include those provided by the DoD University and College outreach program;
- Work with Services and Agencies to integrate SOA education into their communities learning paths; and
- Integrate educational material into training of personnel at existing programs.

6. Federation Roadmap

Please refer to Appendix E: BMA Federation Strategy: Systems View Roadmap Timeline for a detailed illustration of the Federation Roadmap, including specific milestones.

DoD has begun to move forward with the following steps for realizing the Federation Strategy:

- Conceptual Solution Development – including updates to the BMA Federation Strategy and Roadmap, of which this is one;
- Establish and Promulgate Governance Structure in Conjunction with DoD Stakeholders and Compliance with DoD Architecture Federation – as discussed in *Section 4. Governance*;
- Socialization and Education of stakeholders – as discussed in *Section 5. Socialize and Educate DOD Stakeholders*;
- Establish initial BTI as SOA Test and Production Environment – as discussed below; and
- Business Enterprise Services – as discussed in *Section 3. BMA Business Operating Environment*, *Section 4.3.2.BMA Service Lifecycle and Service Delivery Governance BMA Structures and Processes*, and discussed in the following section.

6.1 Make Operational BMA Enterprise Services

The BMA through the BTA will schedule and implement multiple BMA Enterprise Services to begin leveraging value from the SOA solving targeted integration problems and filling key capability gaps. The goal is to identify and deploy services that, when completed, can provide capabilities proven beneficial toward the successful transformation of the DoD. Initial Systems which may provide candidate services include those from any BMA Enterprise acquisition program and C/S/As acquisition program.

For all service candidates "TO BE" the BTA BCL process will be followed. Leveraging efforts currently underway have the goal that the BMA Enterprise Services can be made operational in three to six month time periods

During the course of the effort to build the BTI, close coordination with stakeholders across the DoD will ensure that the BTI provides needed foundation services and capabilities in a timely fashion to support the BMA Enterprise Service Lifecycle.

In the course of building out the BTI, a SOA test environment that can support and incorporate necessary DoD Enterprise Services (including Service Discovery, Service Security, Enterprise Service Management, Collaboration, Personal Identity Management, and Federated Search) and BTI components will be incrementally stood-up. Upon maturation, this will become the SOA production environment.

Appendix A: Acronym List

Acronym	Description
ACART	Architecture Compliance And Requirements Traceability
ADM	Architecture Development Methodology
AMG	Acquisition Management Group
AV	All Views
ASD NII	Assistant Secretary of Defense for Networks & Information Integration
BAM	Business Activity Monitor
BCL	Business Capability Lifecycle
BEA	Business Enterprise Architecture
BEP or BEPs	Business Enterprise Priority or Business Enterprise Priorities
BMA	Business Mission Area
BOE	Business Operating Environment
BTA	Business Transformation Agency
BTE	Business Transformation Engine
BTG	Business Transformation Guidance
BTI	Business Transformation Infrastructure
CA	Chief Architect
CAC	Common Access Card
CAE	Component Acquisition Executive
CBM	Core Business Mission
CDWG	Content Discovery Working Group
CID	Computing Infrastructure Domain
CIO	Chief Information Officer
CIWG	Collaboration Interoperability Working Group
CJCS	Chairman of the Joint Chiefs of Staff
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CLM	Continuous Learning Module
COCOM	Combatant Command
COI	Community of Interest
CONOPS	Concept of Operations

Acronym	Description
COTS	Commercial-Off-The-Shelf
C/S/As	Combatant Command, Services, and Agencies
CA	Chief Architect
DAE	Defense Acquisition Executive
DARS	Defense Architecture Registry System
DAS	Defense Acquisition System
DAU	Defense Acquisition University
DBSAE	Defense Business Systems Acquisition Executive
DBSMC	Defense Business Systems Management Committee
DDMS	DoD Discovery Metadata Specification
DIMA	Defense portion of Intelligence Mission Area
DISA	Defense Information Systems Agency
DISR	Defense Information Standards Registry
DITPR	DoD Information Technology Portfolio Repository
DKO	Defense Knowledge Online
DNI	Director of National Intelligence
DoD	Department of Defense
DoDAF	DoD Architecture Framework
DoDD	DoD Directive
DSA	Defense Support Activities
DUSD	Deputy Under Secretary of Defense
DUSD (BT)	Deputy Under Secretary of Defense for Business Transformation
EA	Enterprise Architecture
EI	Enterprise Integration
EIEMA	Enterprise Information Environment Mission Area
ERB	Enterprise Services Engineering Review Board
ERP	Enterprise Resource Planning
ES	Enterprise Services
ES AOG	Enterprise Services Architecture Oversight Group
ETP	Enterprise Transition Plan

Acronym	Description
EWG	Enterprise Working Groups
EWSE	Enterprise-Wide Systems Engineering
FDCE	Federated Development and Certification Environment
FEA	Federal Enterprise Architecture
FY	Fiscal Year
GAO	Government Accountability Office
GIG	Global Information Grid
GIG CES	GIG Core Enterprise Services
GUI	Graphical User Interface
HCI	Human Computing Interface
IA	Information Assurance
I&A	Identification and Authentication
IC	Interoperability Controller
IC	Intelligence Community
IER	Information Exchange Requirement
IM	Investment Management
IRB	Investment Review Board
ISPO	IT Standards Oversight Panel
IT	Information Technology
JCA	Joint Capability Area
JCIDS	Joint Capabilities Integration Development System
LRP	Laws, Regulations and Policies
MDA	Milestone Decision Authority
MDR	Metadata Registry
MRWG	Metadata Registry Working Group
NCES	Net-Centric Enterprise Services
NCID	Net-Centric Implementation Document
NCOW RM	Net-Centric Operations & Warfare Reference Model
NDAA	Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005
NII	Networks & Information Integration

Acronym	Description
NR-KPP	Net-Ready Key Performance Parameter
ODBC	Open Database Connectivity
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
OV	Operational View
PA&E	Program Analysis and Evaluation
PCA	Pre-Certification Authority
PEO	Program Executive Officer
PfM	Portfolio Management
PSA	Principal Staff Assistant
PM	Program Manager
QDR	Quadrennial Defense Review
QoS	Quality of Service
RM	Reference Model
RSS	Really Simple Syndication
SaaS	Software as a Service
SAE	Senior Acquisition Executive
SESGG	Senior Enterprise Services Governance Group
SFIS	Standard Financial Information Structure
SLA	Service Level Agreement
SME	Subject Matter Expert
SOA	Service-oriented Architecture
SOAF	Service-oriented Architecture Foundation
SOAF WG	Service-oriented Architecture Foundation Working Group
SOAP	Simple Object Access Protocol
SQL	Structured Query Language
SSEB	Senior Systems Engineering Board
SV	Systems View
TA	Tiered Accountability
TPP	Transformation Planning and Performance

Acronym	Description
TPR	Transformation Priorities and Requirements
TSCP	Trusted Secure Collaboration Protocol
TV	Technical View
UDDI	Universal Description Discovery and Integration
UI	User Interface
UID	Unique Identifier
USAF	United States Air Force
USD (AT&L)	Under Secretary of Defense for Acquisition, Technology and Logistics
USD (P&R)	Under Secretary of Defense for Personnel and Readiness
USD (C)	Under Secretary of Defense Comptroller
USTRANSCOM	United States Transportation Command
USTC	
W3C	World Wide Web Consortium
WG	Working Group
WMA	Warfighting Mission Area
WSDL	Web Services Description Language
XML	eXtensible Markup Language
XSLT	eXtensible Stylesheet Language Transformations

Appendix B: Definition of Terms

Term	Definition
Application	The system or problem to which a computer is applied. Reference is often made to an application as being either of the computational type (arithmetic computations predominate) or of the data processing type (data handling operations predominate).[45]
Acquisition Program	An Acquisition Program is a directed, funded effort that provides a new, improved, or continuing material, weapon or information system or service capability in response to an approved need. See DoDD 5000.1.
Authoritative Source	The source of data that is designated as the definitive source of the data, whether through law and regulation, or through Enterprise and community decisions as to what source should be taken as ground truth (and for what purposes or audiences).
Business Activity Monitoring	This component of the BTE provides a capability to monitor business systems at the technical levels of transactions and performance.
Business Capability	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.
Business Enterprise Architecture	A blueprint to guide and constrain investments in DoD organizations, operations, and systems as they relate to or impact business operations. It will provide the basis for the planning, development, and implementation of business management systems that comply with Federal mandates and requirements and will produce accurate, reliable, timely, and compliant information for DoD staff.
Business Enterprise Priority	An area where transformed business operations will provide improved Warfighter support, reduced costs, and better regulatory compliance. A BEP is formulated based on requirements identified by the Warfighter, the C/S/As, and the BTA. Initial priorities are: *1) Personnel Visibility 4) Materiel Visibility* *2) Acquisition Visibility 5) Real Property Accountability* *3) Common Supplier Engagement 6) Financial Visibility*
Business Mission Area (BMA)	The role of the BMA is to deliver products and services required by the WMA to accomplish assigned objectives. The Global Information Grid (GIG) Architecture identifies four interdependent entities, or Mission Areas, within DoD Enterprise Architecture. These Mission Areas are Warfighting (WMA), Business (BMA), DoD portion of Intelligence (DIMA), and Enterprise Information Environment (EIEMA).
Business Operating Environment (BOE)	The Business Operating Environment (BOE) is the entire IT ecosystem of the Business Mission Area. It includes common facilities like the Portal, the business applications and services, and the common enabling and empowering infrastructure that is termed the Business Transformation Infrastructure (BTI).
Business Process Management (BPM)	Business Process Management is a field of knowledge at the intersection between management and information technology, encompassing methods, techniques and tools to design, enact, control, and analyze operational business processes involving humans, organizations, applications, documents and other sources of information[46].

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[45] Joint Publication 1-02, "Department of Defense Dictionary of Military and Associated Terms," 12 April 2001 (As Amended Through 13 June 2007).

[46] Wikipedia, The Free Encyclopedia.

Term	Definition
Business Transformation Engine (BTE)	The BTE is the central organizing facility of the BTI, providing the substrate that ties together both the services provided by and through the BTI, and the applications and systems of the BMA.
Business Transformation Infrastructure (BTI)	The Business Transformation Infrastructure (BTI) is the enabling infrastructure that supports and enables interoperation and interconnection of business systems and applications, including Component's applications that need to do the following across federation boundaries: exchange information, expose functionality, or consume functionality.
Capability	See "Business Capability".
Certification Authority	The designated PSA with responsibility for review, approval, and oversight of the planning, design, acquisition, deployment, operation, maintenance, and modernization of Defense business systems. Primary authorities for certification of the system are: USD (P&R) – Under Secretary of Defense (Personnel & Readiness); USD (AT&L) – USD (Acquisition, Technology & Logistics); USD (C) (Comptroller); and ASD (NII) – Assistant Secretary of Defense (Networks and Information Integration).
component	System element or constituent.
Component	DoD service or agency.
Component Architecture	An architecture that reflects critical Component capabilities and can be used to instantiate compliance with those Component-specific requirements necessary to achieve transformation objectives.
Core Business Mission	A defined area of responsibility with functions and processes that provides end-to-end support to the Warfighter.
Core Enterprise Services	EIEMA provided common set of enterprise services which provide awareness of, access to, and delivery of information on the GIG.
Defense Acquisition Executive	The Defense Acquisition Executive (DAE) is the USD (AT&L) who has reasonability for supervising the Defense Acquisition System. The DAE takes precedence on all acquisition matters after the Secretary and the Deputy Secretary. See DoDD 5000.1.
Defense Acquisition System	The Defense Acquisition Systems is the management process by which the Department of Defense provides effective, affordable, and timely systems to users. See DoDD 5000.1.
Defense Business Systems Management Committee	Chaired by the Deputy Secretary of Defense, the DBSMC is the highest authority providing top-level governance to coordinate Defense business system modernization and to link improvements in Business Capabilities to the Warfighter. The DBSMC is composed of the Deputy Secretary of Defense, the Under Secretaries, and the Chairman of the Joint Chiefs of Staff (CJCS); the Secretaries of the Military Departments and the heads of the Defense Agencies, the Combatant Commanders of United States Transformation Command (USTRANSCOM) and Joint Forces Command; the Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer (NII/CIO); and the Director of Program Analysis and Evaluation (PA&E) in an advisory role.
DoD Enterprise Services	IT services that provide the foundation for DoD service and data providers by delivering and managing the underlying capabilities from which communities build and receive the services they need to meet their business and information processing needs.

Term	Definition
Enterprise Architecture	Enterprise Architecture is a strategic information asset base, which defines the business mission, the information necessary to perform the mission, the technologies necessary to perform the mission, and the transitional processes for implementing new technologies in response to the changing mission needs.
Enterprise Business Capability	A business capability which, due to its scope, is inherently placed at the Enterprise level or has been determined by the DBSMC to be Enterprise-wide. Also, an instantiation of a business capability at the Enterprise level.
Enterprise Transition Plan	Designed to guide and track the business transformation of DoD Business Mission Area. Includes activities associated with developing the plan and framework for moving from the "As Is" to the "To Be" using strategic plans, Business Capabilities, and architecture information. Key elements include the objectives, schedules, funding, and migration information for the systems and initiatives supporting DoD's Business Enterprise Priorities.
Federated Architecture	A loosely coupled collection of information assets that accommodates the uniqueness and specific purpose of disparate architectures and allows for their autonomy and local governance while enabling the enterprise to benefit from their content. It provides an approach for aligning, locating and linking disparate architectures and architecture information via information exchange standards to deliver a seamless outward appearance to users. Its content describes mission capabilities and the IT capabilities necessary to respond to changing mission needs.
Federation	In a Federation, 2 or more parties agree to both remain 2 or more parties, and/but to work together according to precisely defined rules – this is in essence the underlying concept of a SOA
Functional Features	Functionality exposed as services in a SOA that create a feature.
Global Information Grid	"The globally interconnected, end-to-end set of information capabilities, associated processes, and personnel for collecting, processing, storing, disseminating and managing information on demand to Warfighters, policy makers, and support personnel. The GIG includes all owned and leased communications and computing systems and services, software (including applications), data, security services, and other associated services necessary to achieve Information Superiority. It also includes National Security Systems as defined in section 5142 of the Clinger-Cohen Act of 1996 (reference (b)). The GIG supports all DoD of Defense, National Security, and related Intelligence Community missions and functions (strategic, operational, tactical, and business), in war and in peace. The GIG provides capabilities from all operating locations (bases, posts, camps, stations, facilities, mobile platforms, and deployed sites). The GIG provides interfaces to coalition, allied, and non-DoD users and systems." (Source: DODD 8100.1).
Interoperability Controller	The central organizing component of the BTE. It provides the foundation—the distributed integration brokers connected by robust messaging— that provides the means for the BTI to provide a scalable integration environment and control various aspects of interoperability operations within the BMA.
Investment Review Board	A body established and chartered by the Certification Authorities (CAs) to provide investment review of the CAs business systems. Each IRB will assess modernization investments relative to their impact on end-to-end business process improvements that support Warfighter needs. IRB membership includes representatives from the C/S/As and the Joint Chiefs of Staff.
IT Ecosystem	An IT community and its environment interacting and functioning as a unit.
Legacy System	An existing system that is designated for termination when the capability is absorbed by an interim or core system or if the capability is no longer required.

Term	Definition
Milestone Decision Authority	The Milestone Decision Authority (MDA) is the designated individual with overall responsibility for a program. The MDA shall have the authority to approve entry of an acquisition program into the next phase of the acquisition process and shall be accountable for cost, schedule, and performance reporting to higher authority, including Congressional reporting. See DoDD 5000.1.
Metadata	Data that describe other data. Generally, a set of metadata describes a single set of data, called a resource.[47]
Net-Centric	Exploitation of advancing technology that moves from an application centric[48] to a data-centric[49] paradigm – that is, providing users the ability to access applications and services through web services – an information environment comprised of interoperable computing and communication components
Net-Ready Key Performance Parameter (NR-KPP)	The NR-KPP is used to assess information needs, information timeliness, information assurance, joint interoperability and supportability, and net-ready attributes required for both the technical exchange of information and the end-to-end operational effectiveness of that exchange. The NR-KPP consists of measurable, testable, or calculable characteristics and/or performance metrics required for the timely, accurate, and complete exchange and use of information.
Ontology	A rigorous and exhaustive organization of some knowledge domain that is usually hierarchical and contains all the relevant entities and their relations; foundation of machine manageable semantics for vocabularies, messages and data schemas.
Principal Staff Assistants	The Under Secretaries of Defense, the Director of Defense Research and Engineering, the Assistant Secretaries of Defense, the General Counsel of the DoD of Defense, the Comptroller of the DoD of Defense, the Assistants to the Secretary of Defense, and the OSD Directors or equivalents who report directly to the Secretary or Deputy Secretary of Defense. (Source: DoDD 5100.81, DoD of Defense Support Activities (DSAs))
Program Architecture	Define operational, system, and technical requirements for the scope of a specific program of record.
Program Manager	The Program Manager (PM) is the designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. The PM shall be accountable for credible cost, schedule, and performance reporting to the MDA. See DoDD 5000.1.
Pre Certification Authority (PCA)	PCAs are responsible for assessing compliance with the BEA and the Component architectures, and for pre-certifying that those systems forwarded to the IRB for certification meet the conditions for certification.
Really Simple Syndication	A web standard for a Web content syndication format; it is an unusual standard, in that it is maintained by Harvard Law School.

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[47] Wikipedia, The Free Encyclopedia

[48] Application-Centric – focusing on the application as the foundation or starting point. In an application-centric system, the program is loaded first, which in turn is used to create or edit a particular type of data structure.

[49] Data-Centric – focusing on the central design data repository as the foundation or starting point. In a data-centric system, the data is primary and services manipulate the data.

Term	Definition
Service	1) A Military Service; The United States Military Services: Army, Air Force, Navy, and Marine Corps (capitalized in this document). 2) Discrete business offering; a business capability made available to others. 3) Software Component; "A mechanism to enable access to one or more capabilities, where the access is provided using a prescribed interface and is exercised consistent with constraints and policies as specified by the service description". – DoD Net-Centric Services Strategy. 4) "Software as a Service" (SaaS) "SaaS is defined as an application owned, delivered and managed remotely by one or more providers, where the provider delivers an application based on a single set of common code and data definitions, which are consumed in a one-to-many model by all contracted customers at any time, on a pay-for-use basis or as a subscription based on usage metrics."[50]
Service-oriented Architecture (SOA)	An architecture that is comprised of independent services and orchestration functionality to compose business processes from these and other services.
Tiered Accountability	An approach to business transformation that is based on dividing the planning and management of systems and initiatives between Enterprise and Component levels.
The Universal Core	A universal core data schema that enables information sharing.

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[50] Gartner Inc..

Appendix C: Reference Documents

No.	Referenced Document	Date
1	*Business Enterprise Architecture*	15 March 2006 Version 3.1
2	*Business Enterprise Architecture (BEA) Compliance Guidance*	10 April 2006
3	*Business Mission Area (BMA) Net-Centric Strategy, Version 4.0*	29 March 2005, Version 4.0
4	*Business Transformation Guidance*	21 June 2006
5	*CJCS Manual 3170.01B, Operation of the Joint Capabilities Integration and Development System*	11 May 2005,
6	*DoD of Defense Discovery Metadata Specification (DDMS)*	29 July 2005, Version 1.3
7	*DoD of Defense Enterprise Transition Plan Volume 1: Defense Business Transformation Overview*	30 September 2005
8	*DoD Architecture Framework, Volume I, Volume II, and Volume III*	23 April 2007 Version 1.5
9	*DoD Directive 4630.05, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)"*	5 May 2004; Certified Current as of 23 April 2007
10	*The Department of Defense Enterprise Architecture Federation Strategy*	December 2006 Draft Version 1.01
11	*DoD Instruction 4630.8, "Procedures for Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS),"*	30 June 2004
12	*DoD IT Business Systems Investment Certification and Annual Review Process User Guidance*	
13	*DoD Investment Review Process Overview and Concept of Operations for Investment Review Boards (IRB CONOPS)*	17 may 2005
14	*The Net-Centric Enterprise Information Assurance (IA) Strategy Annex to DoD IA Strategic Plan*	26 April 2006
15	*Government Computer News, DoD To build EA from the Ground Up, Dawn S. Onley, http://www.gcn.com/print/25_14/40918-1.html*	5 June 2006
16	*Initial Capabilities Document (ICD) for BEA Implementation of the Architecture Compliance And Requirements Traceability (ACART) Capability*	7 June 2006
17	*Net Centric Operations & Warfare Reference Model Target Technical View, Version 1.1*	October 2005
18	*Section 332, Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005*	2005
19	*Business Transformation Guidance (BTG)*	July 2006
20	*GAO, DEFENSE BUSINESS TRANSFORMATION, A Comprehensive Plan, Integrated Efforts, and Sustained Leadership Are Needed to Assure Success, GAO-07-229T (Washington, D.C.: Nov. 16, 2006)*	11 November 2006
21	*DoD Discovery Metadata Specification V 1.3*	
22	*Net-Centric Data Sharing Strategy for the BMA Acquisition Community*	30 May 2007 Draft Version 0.7
23	*DoD Directive 8320.02, "Data Sharing in a Net-Centric Department of Defense"*	2 December 2004; Certified Current as of 23 April 2007

No.	Referenced Document	Date
24	DoD 8320.2-G, "Guidance for Implementing Net-Centric Data Sharing"	12 April 2006
25	Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6212.01D Interoperability and Supportability of information Technology and National Security Systems dated March 8, 2006.	8 March 2006
26	OSD 01886-05, Memorandum from the Deputy Secretary of Defense, Subject: Department of Defense (DoD) Business Transformation; Charter for the Defense Business Systems Management Committee	7 February 2005
27	DoD Memorandum from the Assistant Director of National Intelligence, Chief Information Officer, and the Assistant Secretary of Defense for Networks and Information Integration, Chief Information Officer, Subject: Department of Defense (DoD) and Intelligence Community (IC) Commitment to an Interoperable Services-Based Environment	3 February 2007
28	DoD Memorandum from the Deputy Secretary of Defense, Subject: Establishment of the Defense Business Transformation Agency (BTA)	7 October 2005
29	DoD Memorandum from the Deputy Under Secretary of Defense For Business Transformation and the Deputy Under Secretary of Defense For Financial Management, Subject: Organization of the Defense Business Transformation Agency	3 February 2006
30	Global Information Grid (GIG) Architectural Vision for a Net-Centric, Service-oriented DoD Enterprise, Version 1.0, prepared by the DoD CIO	June 2007
31	Defense Acquisition Transformation Report to Congress, John Warner National Defense Authorization Act Fiscal Year 2007 Section 804, Report to Congress, prepared by the Secretary of Defense	July 2007
32	Draft DoD Instruction 8210.aa, Global Information Grid (GIG) Architecture Development, Maintenance, and Use	
33	Draft Business Enterprise Architecture Concept of Operations (CONOPS)	31 July 2007
34	DoD Global Information Grid (GIG) Architecture Federation Strategy Version 1.2	1 August 2006
35	DoD Directive 8115.1, "Information Technology Portfolio Management",	10 October 2005
36	DoD Directive 8320.03, "Unique Identification (UID) Standards for a Net-Centric Department of Defense"	23 March 2007
37	DoD Instruction 8115.02, " Information Technology Portfolio Management Implementation"	30 October 2006
39	DoD Instruction 5000.2, "Operation of the Defense Acquisition System"	12 May, 2003
40	DoD Directive 8500.01E, "Information Assurance (IA)"	24 October 24, 2002; Certified Current as of 23 April 2007

Appendix D: OV-5 Mapping Example

As discussed in Section *2.5 Architecture Federation Linkage – BEA Compliance* and Section *2.6 Gap – Areas Not Covered by the BEA*, architecture federation pertains to the mapping of C/S/As Enterprise and Program Architecture information to like information contained in the BEA. This mapping starts with the OV-5 Node Tree.

There are multiple possible outcomes when attempting to map to the BEA OV-5 Node Tree.

1. A C/S/As or Program activity maps directly to an activity or activities of the BEA.
2. A C/S/As or Program activity maps to an activity or activities of the BEA but the Program's sub-activities do not have mappings to the BEA.
3. A C/S/As or Program activity and corresponding sub-activities do not map to the BEA but perform business functions that may apply to other C/S/As or Programs.

Figure 6-1: BEA OV-5 Node Tree Mapping Example is illustrative of each of these examples.

C/S/As/Program Activities Mapping Directly to the BEA
In this example, a Program analyzes its operational activities and finds that the BEA operational activities it supports are related to the Manage Acquisition Business Functional Areas activity. Within the Program's list of activities, it identifies that its activities map directly to three sub-activities of the BEA's Manage Acquisition Business Functional Areas activity. This is illustrated via the pink and green boxes with the bold red outlines. It is important to note that the Program activities do not have to have the same names or definitions as BEA activities to be mapped to those activities. When analyzing activities one needs to consider all elements of an activity (i.e., definition and ICOMs).

C/S/As/Program Sub-Activities not Mapping the BEA
In this example we use the same higher level BEA activities as above. Here the Program has concluded that the activities that it initially identified as mapping to the BEA have sub-activities that are not in the BEA. In this case, the mapping is still performed as described above but the Program's sub-activities do not have BEA equivalents. Through federation, the Program's sub-activities would still be displayed as part of the federation but as sub-activities of the Program-specific activities. In other words, for this Program to federate to the BEA it would map/align this portion of its activity hierarchy, exactly as it is structured within the Program architecture, to the appropriate higher level activity(s) of the BEA. This is illustrated via the pink and green boxes without the bold red highlights.

C/S/As/Program Activities Do Not Map to the BEA
This example directly relates to supporting gap identification and the ability to perform thorough cross-C/S/As and cross-Program analysis. Here the Program concludes that its activities, after reviewing definitions and ICOMs, do not have functional equivalents in the BEA. This could be due to a variety of reasons to include, but not limited to, the following:

- The activities are part of a Business Enterprise Priority that has not been fully "fleshed out" in the BEA,

- The activities are actually outside the scope of the current BEA,

- The activities have not been deemed Enterprise functions but are necessary for the BMA,

In this case, in order for the Federated Enterprise Architecture to be exemplary of DoD Enterprise, it should include these types of activities in order for organizations that perform similar functions to be included in the federation. This example is illustrated via the orange boxes within *Figure 6-1: BEA OV-5 Node Tree Mapping Example*.

Figure 6-1: BEA OV-5 Node Tree Mapping Example
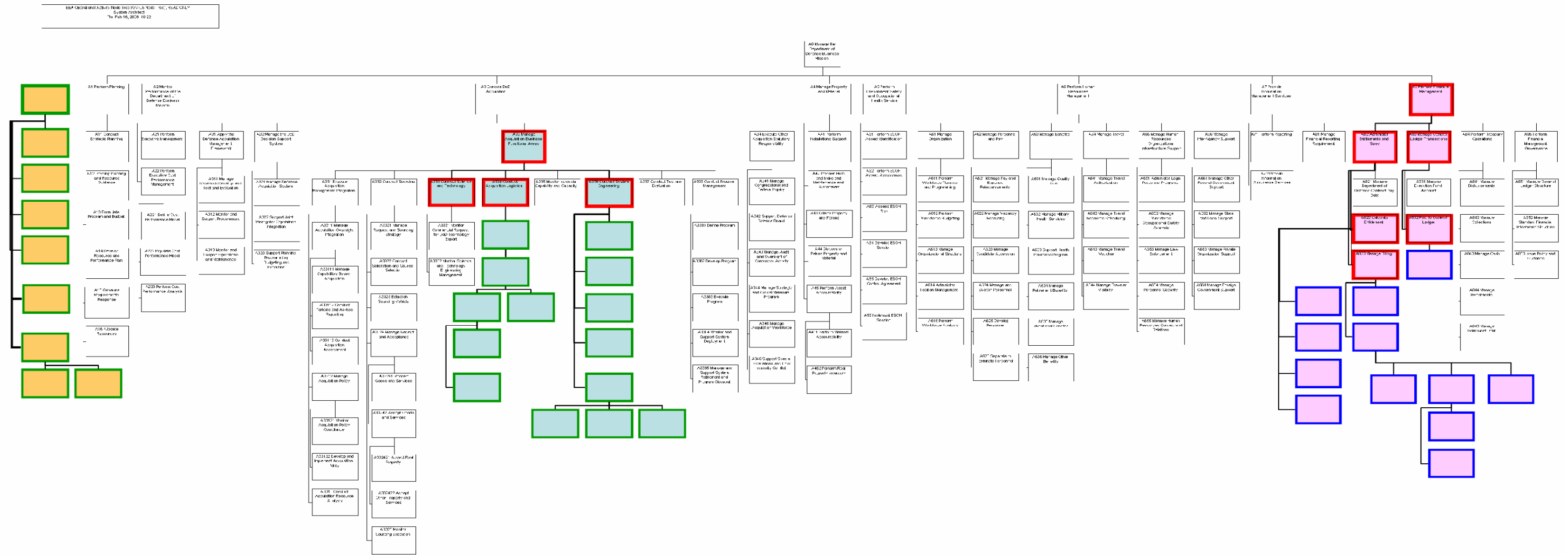
Component/Program OV-5 Activities that overlap with BEA activities

Component/Program OV-5 sub-activities that map to higher- level BEA activities. These activities are important for federation and context purposes

Component/Program OV-5 Activities that do not map to BEA activities

Figure 6-2: BMA Federation Strategy: Systems View Roadmap & Timeline

BMA Federation Strategy: Systems View Roadmap Timeline
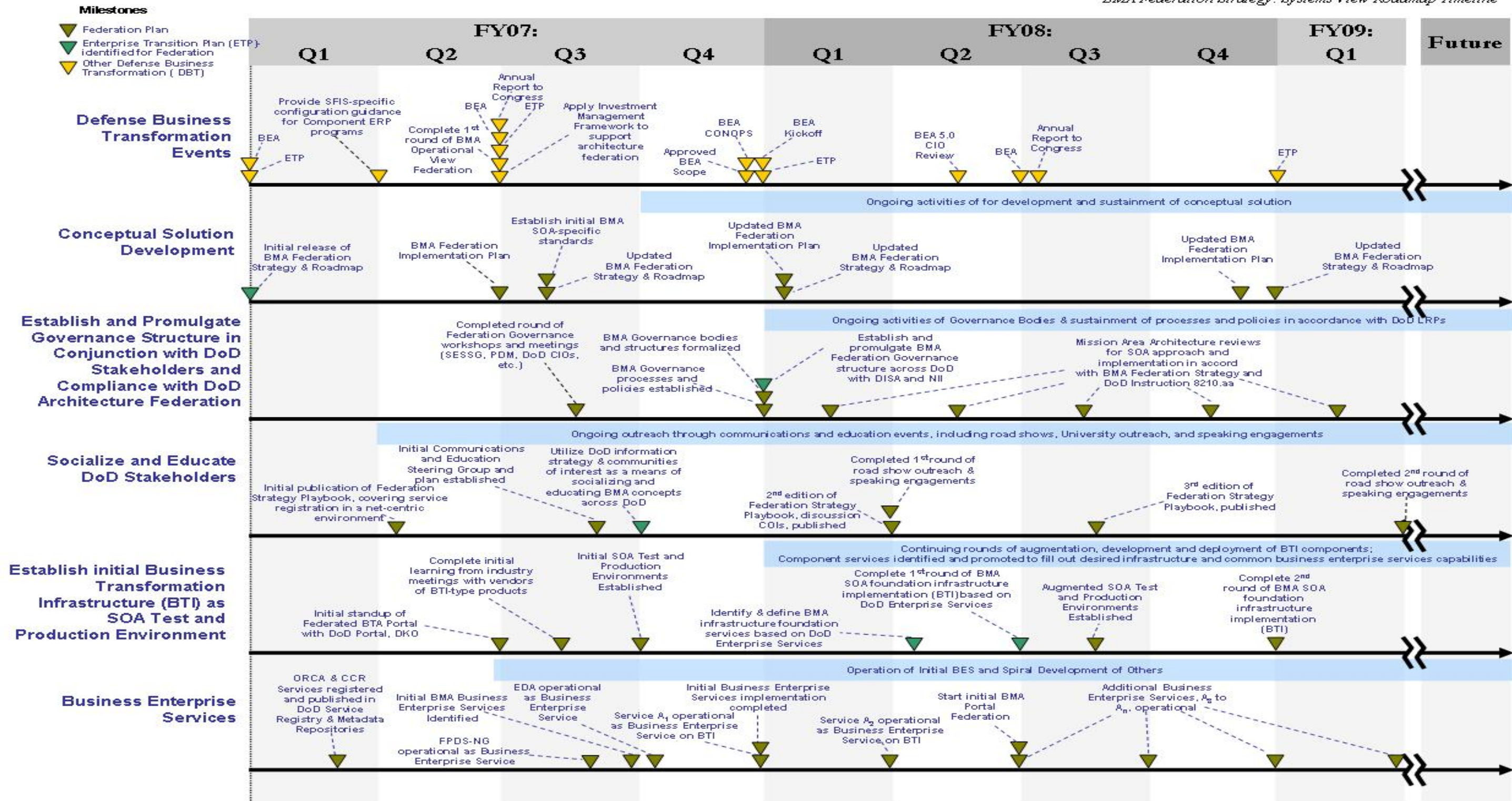
Department of Defense Business Mission Area CTO and CA

25 September 2007

Appendix F: BMA Federation Strategy: BOE SOA Standards Organization and Status

This appendix delineates our view of an emerging industry consensus (not necessarily an exhaustive view) of the standards involved in an Enterprise SOA. Standards needed for systems federation via SOA and the BOE include, among others, current Defense Information Standards Registry (DISR) versions of those set forth in the DISA Memorandum by the Chief Technology Officer, "Proposed Standards for Implementing GIG Enterprise Services" of December 27, 2005, as well as standards covering the content passed across the BOE as messages and transactions, and vendor neutral open standards for SOA. The DISA CTO Memo provides a minimum baseline for implementation of GIG Services, SOA and the BOE infrastructure. In the table provided here, we indicate where current DISR standards are involved and where each of the standards cited in the DISA CTO Memo occur. Both the DISR and the BEA TV-1 include needed standards not directly relevant to implementing an SOA, and these are not included here. Many standards cited here are not yet in the DISR, and work needs to be done to promote their inclusion as the DoD and the BMA move toward an open standards-based, commercial best practices SOA. The BMA Federation Team will work with the BTA BEA team to ensure that there is harmony and alignment with the BEA TV-1.

Area	Spec/Standard	Stds Body	Version	Status	DISR Status	Croom	Members
Web Services Interoperability Profiles							
	Basic Profile	WS-I	1.1	Final Spec	Mandated		
	Attachments Profile	WS-I	1.0	Final Spec	Not in DISR		
	Simple SOAP Binding Profile	WS-I	1.0	Final Spec	Not in DISR		
	Basic Security Profile	WS-I	-	Working Group Draft	Not in DISR		
	REL Token Profile	WS-I	-	Working Group Draft	Not in DISR		
	SAML Token Profile	WS-I	-	Working Group Draft	Not in DISR		
	Conformance Claim Attachment Mechanism (CCAM)	WS-I	1.0	Final Spec	Not in DISR		
	Reliable Asynchronous Messaging Profile (RAMP)	Ind. Cnstm.	1.0	?	Not in DISR		IBM, Ford
Metadata Specifications							
	WS-Policy	Ind. Cnstm.		Public Draft	Not in DISR		BEA, IBM, Microsoft, SAP, Sonic, Verisign
	WS-PolicyAssertions	Ind. Cnstm.		Public Draft	Not in DISR		BEA, IBM, Microsoft, SAP
	WS-PolicyAttachments	Ind. Cnstm.		Released Draft	Not in DISR		BEA, IBM, Microsoft, SAP, Sonic, Verisign
	WS-Discovery	Ind. Cnstm.		Draft	Not in DISR		Microsoft, BEA, Canon, Intel, webMethods
	MetadataExchange	Ind. Cnstm.		Public Draft	Not in DISR		BEA, CA, IBM, Microsoft, SAP, SUN, webMethods
	Universal Description, Discovery and Integration (UDDI)	OASIS		Standard	Mandated		
	Web Services Description Language (WSDL)	W3C	1.1	Recommendation	Mandated		
	Web Services Description Language	W3C	2.0	Working Draft	Not in DISR		
	Resource Description Facility (RDF)	W3C		Recommendation	Mandated		
	Web Ontology Language (OWL)	W3C		Recommendation	Mandated		
	Defense Discovery Metadata Specification (DDMS)	DoD	1.3	Standard	Mandated		
Security Specifications							
	WS-Security: SOAP Message Security	OASIS		Standard	Mandated		
	WS-Security: Kerberos Binding	OASIS		Working Draft	Not in DISR		
	WS-Security: SAML Token Profile	OASIS		Standard	Not in DISR		
	WS-Security: X.509 Certificate Token Profile	OASIS		Standard	Not in DISR		
	WS-Security: Username Token Profile	OASIS		Standard	Not in DISR		
	WS-SecurityPolicy	Ind.		Public Draft	Not in DISR		IBM, Microsoft, RSA Security, Verisign

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		Cnstm.					
	WS-Trust	Ind. Cnstm.		Initial Draft	Not in DISR		BEA, CA, IBM, Layer 7, Microsoft, Netegrity, Oblix, Open Network, Ping Identity, Reactivity, RSA Security, Verisign, Westbridge Technology
	Identity Web Services Framework (ID-WSF) 1.0	Liberty	1.0		Emerging		
	WS-SecureConversation	Ind. Cnstm.		Public Draft	Not in DISR		BEA, CA, IBM, Layer 7, Microsoft, Netegrity, Oblix, Open Network, Ping Identity, Reactivity, RSA Security, Verisign, Westbridge Technology
	eXtensible Authorization Control Markup Language (XACML)	OASIS	2.0	Standard	Mandated		
	x.509 Public Key Certificate Format	IETF		RFC	Mandated		
	Transport Layer Security (TLS)	IETF	1.0	RFC	Mandated		
	Security Assertion Markup Language (SAML)	OASIS	2.0	Standard	Mandated		
	XML Key Management Specification (XKMS)	W3C		W3C Note	Not in DISR		
Web Services Management							
	Working Draft – WSMF Foundation	Ind. Cnstm.		Working Draft	Not in DISR		HP
	Working Draft – WSMF Events	Ind. Cnstm.		Working Draft	Not in DISR		HP
	Working Draft – WSMF Web Services Management (WSM)	Ind. Cnstm.		Working Draft	Not in DISR		HP
	WS-Management	Ind. Cnstm.		Published Specification	Not in DISR		AMD, Dell, Intel, Microsoft, SUN
	Management Using Web Services (MUWS)	OASIS		Standard	Mandated		
	Management of Web Services (MOWS)	OASIS		Committee Draft	Mandated		
Web Service Transactions							
	WS-Business Activity	Ind. Cnstm.		Published	Not in DISR		Microsoft, BEA, IBM
	WS-Atomic Transaction	Ind. Cnstm.		Published	Not in DISR		Microsoft, BEA, IBM
	WS-Coordination	Ind. Cnstm.		Published	Not in DISR		Microsoft, BEA, IBM
	WS Composite Application Framework (WS-CAF)	Ind. Cnstm.		Committee Draft	Not in DISR		Arjuna, Fujitsu, IONA, Oracle, SUN
	WS-Context (WS-CTX)	OASIS		Committee Draft	Not in DISR		
	WS-Coordination Framework (WS-CF)	OASIS		Committee Draft	Not in DISR		
	WS-Transaction Management (WS-TXM)	OASIS		Committee Draft	Not in DISR		
Business Process Modeling, Monitoring and Management							
	Business Process Execution Language (BPEL) for Web Services (BPEL4WS)	OASIS		Standard	Not in DISR		
	Business Process Management Language (BPML)	BPMI.org		BPML	Not in DISR		
	WS Choreography Model Overview	W3C		Working Draft	Not in DISR		
	Web Services Choreography Description Language (CDL4WS)	W3C		Working Draft	Not in DISR		
	Web Service Choreography Interface (WSCI)	W3C		Note	Not in DISR		
	XML Process Definition Language (XPDL)	wfMC			Not in DISR		

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	Business Process Modeling Notation (BPMN)				Not in DISR		
Resource Handling Specifications							
	Web Services Resource Framework (WSRF) Family of Specifications	OASIS		standards family	Not in DISR		
	WS-BaseFaults (WSRF)	OASIS		Working Draft	Not in DISR		
	WS-ServiceGroup (WSRF)	OASIS		Working Draft	Not in DISR		
	WS-ResourceProperties (WSRF)	OASIS		Working Draft	Not in DISR		
	WS-ResourceLifeTime (WSRF)	OASIS		Working Draft	Not in DISR		
	WS-Transfer	Ind. Cnstm.		Working Draft	Not in DISR		BEA, CA, Microsoft, Sonic, Systinet
XML Specifications							
	eXtensible Markup Language(XML) 1.0	W3C		Recommendation	Mandated		
	XML 1.1	W3C		Recommendation	Emerging		
	Namespaces in XML	W3C		Recommendation	Mandated		
	XML Information Set (Infoset) 1.0	W3C		Recommendation	Not in DISR		
	XML Information Set (Infoset) 1.1	W3C		Recommendation	Not in DISR		
	XML Schema	W3C		Recommendation	Mandated		
	XML-binary Optimized Packaging (XOP) 1.0	W3C		Recommendation	Not in DISR		
	XML-Encryption	W3C		Recommendation	Mandated		
	XML-Signature	W3C		Recommendation	Mandated		
	XML Stylesheet Language Transformation (XSLT)	W3C	1.0	Recommendation	Mandated		
SOAP Specifications							
	SOAP 1.1	W3C	1.1	Recommendation	Mandated		
	SOAP 1.2	W3C	1.2	Recommendation	Emerging		
	SOAP Message Transmission Optimization Mechanism	W3C		Recommendation	Not in DISR		
	Resource Representation SOAP Header Block	W3C		Recommendation	Not in DISR		
Web Standards							
	HyperText Transfer Protocol (HTTP)	W3C	1.1	Recommendation	Mandated		
	HyperText Markup Language (HTML)	W3C	4.1	Recommendation	Mandated		
	XHTML	W3C	1.1		Mandated		
	Cascading Style Sheets (CSS)	W3C	Level 2	Recommendation	Mandated		
	Web Distributed Authoring and Versioning (WebDAV)	W3C		Recommendation	Mandated		
	Web Services for Remote Portlets (WSRP)	OASIS			Mandated		
Internet							
	Internet Protocol Version 6 (IPv6)	IETF	6	Recommendation	Mandated		
	Multi-media Internet Mail Extensions (MIME)	IETF	1.1	Recommendation	Mandated		
	Secure Multi-media Internet Mail Extensions (S-MIME)	IETF	1.1	Recommendation	Mandated		
	Cryptographic Message Syntax (CMS)	IETF	1.1	Recommendation	Mandated		
Messaging Specifications							
	WS-Notification	OASIS		Working Draft	Not in DISR		
	BaseNotification	OASIS		Public Review Draft	Not in DISR		
	BrokeredNotification	OASIS		Public Review Draft	Not in DISR		

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	WS-Topics	OASIS		Working Draft	Not in DISR		
	WS-Addressing	W3C		Candidate Recommendation	Emerging		
	WS-Eventing	Ind. Cnstm.		Public Draft	Emerging		BEA, CA, IBM, Microsoft, SUN, Tibco
	WS-Enumeration	Ind. Cnstm.		Public Draft	Not in DISR		BEA, CA, Microsoft, Sonic, Systinet
	WS-Reliability	OASIS	1.1	Standard	Emerging		
	Really Simple Syndication (RSS)	Harvard		Specification	Not in DISR		
	Atom Syndication Specification	IETF		Standard	Not in DISR		
Message Content							
	OAGIS Business Object Documents (OAGIS BODs)	OAG	1.1	Recommendation	Not in DISR		
	Dublin Core	DCMI	1.04	ISO Standard 15836	Mandated		
	Universal Business Language (UBL)	OASIS	2.0	Recommendation	Not in DISR		
	ebXML Core Components	OASIS	1.04	Technical Specification	Not in DISR		