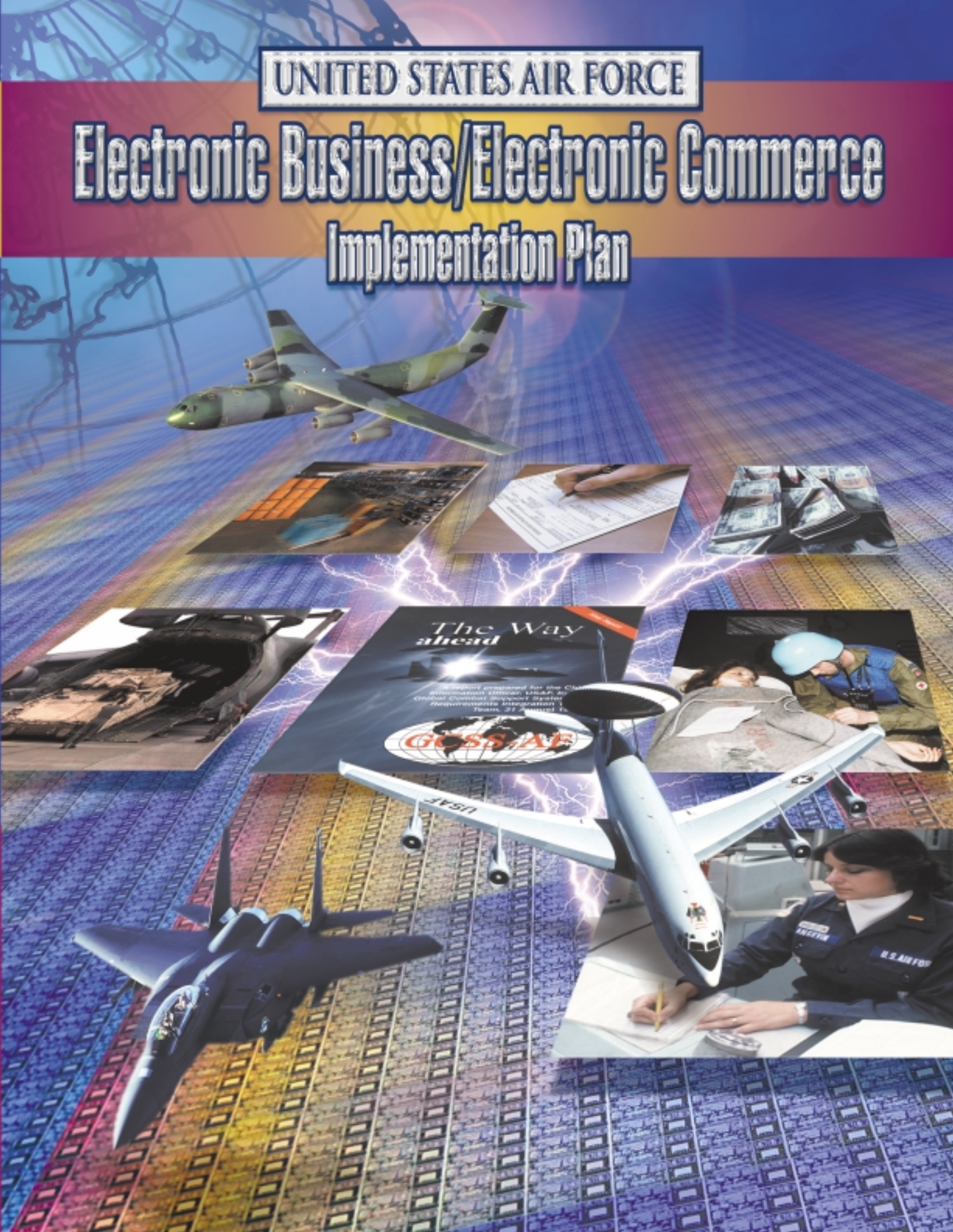
UNITED STATES AIR FORCE

Electronic Business/Electronic Commerce

Implementation Plan



United States Air Force Electronic Business/Electronic Commerce Implementation Plan

February 2000

The Assistant Secretary of Defense for Command, Control, Communications, and Intelligence tasked us to develop an Air Force EB/EC Implementation Plan. In response, I directed the Air Force Global Combat Support Systems (GCSS-AF) Directorate to write the plan, with emphasis on supporting the Air Expeditionary Force via the GCSS infrastructure. The plan meets my expectations by focusing not only on the Air Expeditionary Force (AEF), but also on EB/EC integration across all functional areas.

This plan is an enabler for understanding EB/EC and GCSS-AF and it:

- Focuses on supporting AEF and cross-functional area information requirements
- Explains the Air Force EB/EC vision and business direction
- Identifies key EB/EC projects and initiatives
- Describes the GCSS-AF integration framework
- Provides a brief tutorial on information security, Public Key Infrastructure, and Common Access Cards
- Provides a list of actions to enhance EB/EC process and technology implementation

The result will be:

- Integrated knowledge directly supporting warfighters, commanders, and functional users at all echelons.
- Decisions based on more complete and accurate information
- Faster execution of those decisions
- A more effective and lethal fighting force

In short, our approach will provide us the timely, accurate, and trusted information necessary to maintain our information superiority vital to meeting the variety of Air Force missions worldwide.

This plan is thought-provoking and focuses our attention on this important topic. It is a living document that will be of great value to us as we integrate EB/EC into our overall GCSS-AF efforts to attain the goals outlined in Joint Vision 2010.

LAWRENCE J. DELANEY
Chief Information Officer

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Chapter 1
Introduction

Unprecedented technology advances, increasing demands for constrained resources, urgent needs for enhanced information, and mandates for reduced response times are conditions indicative of the changing corporate and defense landscape. Success in both environments depends on dramatically restructuring business practices, information management systems, and technical infrastructures.

Joint Venture 2010 goals and the Expeditionary Aerospace Force (EAF) concepts are the primary Air Force methodologies for organizing, training, equipping, and sustaining a force capable of meeting 21st century military operational requirements. The Global Combat Support System–Air Force (GCSS-AF) represents an integral enterprise concept directed toward meeting these requirements by providing for the development, integration, and deployment of agile combat support information systems. To this end Electronic Business/Electronic Commerce (EB/EC) concepts and technologies will be integrated into GCSS-AF as a key means of achieving cost savings, removing process inefficiencies, improving the quality and speed of meaningful management information, and enabling a reduced deployment footprint.

This plan showcases the Air Force vision and business direction. It highlights the role of EB/EC in coordinating guidance and providing the enabling tools to achieve an enterprise-wide electronic environment. More importantly, however, it represents the enduring principle through which the Air Force will meet functional area requirements to provide world-class combat support and timely, accurate, and trusted information to the Air Expeditionary Force commander.

BACKGROUND

The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence)—the Chief Information Officer (CIO) for the Department of Defense (DoD)—issued a memorandum in May 1999 that disseminated the *DoD Electronic Business/Electronic Commerce (EB/EC) Strategic Plan*.[1] The memorandum required that the Joint Electronic Commerce Program Office (JECPO) develop a DoD EB/EC implementation plan. It also directed the Military Services, Defense Finance and Accounting Service (DFAS), Defense Logistics Agency (DLA), and Defense Information Systems Agency (DISA) to develop or update

[1] Department of Defense, *DoD Electronic Business/Electronic Commerce (EB/EC) Strategic Plan*, May 1999.

EB/EC implementation plans for their respective areas of responsibility based on the *DoD EB/EC Strategic Plan*.

The *DoD EB/EC Strategic Plan* was founded in Defense Reform Initiative Directive (DRID) #43[2] and CIO Guidance and Policy Memorandum No. 2-8190-031199, *Defense-Wide Electronic Commerce*. The plan sets forth the summary-level direction for the Department to obtain a seamless flow of electronic business-to-business transactions and achieve increased efficiency. It provides the vision, mission, goals, and strategies for the DoD EB/EC Program. Finally, the plan gives the management structure and processes for implementation, integration, and coordination of EB/EC efforts.

The Air Force has embraced the EB/EC concept as a way to reduce the cost of its operations while improving their quality. In the past, paper and batch processing of information have determined the Air Force's business culture. By reengineering its business practices to be paperless and relying on Internet technology or commercial software, the Air Force should be able to

- reduce data entry, mailing, and paper processing costs;
- improve the accuracy and communication of information;
- increase the confidence of Air Force leaders in that information; and
- speed the processes that deliver materiel and services.

Recently the Air Force Vice Chief of Staff reiterated the Air Force's commitment and support to EB/EC initiatives in a memorandum on 1 November 1999 to the staff.[3]

The increased use of personal computers (PCs) and Internet throughout our society has made the following possible:

- Consumers can buy nearly everything on-line from anywhere in the world.
- People can send electronic messages at any time to their family, friends, and business associates.
- Students and other information seekers have access to an ever-growing library of on-line information.

The Federal Government and DoD have embraced this revolution in IT and established formal EB/EC programs. The Federal Electronic Commerce Program, co-chaired by representatives from the General Services Administration and DoD,

[2] Department of Defense, Deputy Secretary of Defense, *Department of Defense Reform Initiative Directive #43 – Defense-wide Electronic Commerce, DRID #43,* memorandum, 20 May 1998*;* http://www.defenselink.mil/dodreform/drids/drid43.html.

[3] Appendix A.

"coordinates, monitors, and reports on the development of electronic commerce within the federal government." JECPO was established as a DoD focal point to accelerate the integration of EB/EC techniques into DoD operations.

Sponsored by JECPO, the Electronic Commerce Resource Center (ECRC) Program serves as a representative example of various initiatives targeting the expansion of EB/EC concepts. It provides the following services through regional centers:

- Technology development activity—providing integrated EC solutions that help small businesses and other government suppliers to become agile and responsive to the changing marketplace
- Outreach—reaching out to make clients aware of EC, Internet, and various technologies and their benefits
- Education and training—providing courses in emerging and special EC technologies for nominal fees
- Technical support—providing consulting services to resolve problems using EC technologies.

The vision is that the ECRCs will serve as catalysts for a network of small- and medium-sized enterprises to adopt EC that will help them provide DoD and other Federal organizations with low-cost, high-quality goods and services. Additional information related to ECRCs can be found at http://www.ecrc.ctc.com/.

Evolution of Electronic Concepts in DoD

The Secretary of Defense introduced the EB concept in a Defense Reform Initiative Report (DRIR) in November 1997. EB advances the application of electronic data interchange (EDI) beyond the traditional realm of EC into all Air Force functional areas (Table 1-1). The areas include civil engineering, communications, logistics plans, manpower, maintenance, munitions, personnel, supply, financial management, transportation, acquisition and procurement, medical, and services.[4]

[4] Department of the Air Force previously published the United States Air Force Electronic Commerce/Electronic Data Interchange (EC/EDI) Strategy, 12 July 1995, in response to Federal requirements for a government-wide program for conducting Federal procurement and other business activities through EC. This implementation plan begins implementation of the goals and objectives originally established in that strategic plan.

Table 1-1. Evolution of Electronic Concepts in DoD

Date	Concept	Definition	Event
May 1988	EDI	The paperless (electronic) exchange of trading documents using standardized document formats.	DoD memorandum required that DoD components make maximum use of EDI.
September 1993	EC	The interchange and processing of information via electronic techniques for accomplishing transactions based on application of commercial standards and practices.	National Performance Review recommended government program for conducting federal procurement through EC.
November 1997	EB	The application of EC techniques and solutions to business processes, including all DoD business activities.	DRIR established DoD EB/EC program office.

This plan begins the process of implementing EB/EC as directed in the DoD EB/EC Strategic Plan with a unique focus that is to ensure implementation supports the entire Air Force enterprise via the GCSS-AF integration framework (IF).

AIR FORCE VISION

The DoD and Air Force vision for EB/EC is to have an enterprise-wide electronic environment by 2010, where best business practices and enabling technologies are used to facilitate the efficient exchange of business information. This environment results in streamlined and rapid response to the warfighters for supporting Air Force missions.

For the Air Force, EB/EC is broadly defined as the end-to-end digital exchange of information needed to conduct business. It is the business environment created by the application of commercial standards and practices to automate the management and exchange of information. It is the paperless exchange of business, scientific, technical, planning, budget, and requirements information using the Internet, EDI, electronic mail (e-mail), electronic bulletin boards, electronic funds transfer (EFT), and other similar technologies.

Assumptions

Continued EB/EC implementation assumes the following:

- Functional areas and major commands (MAJCOMs) will support the efforts of the Air Force CIO to oversee implementation of EB/EC into GCSS-AF.
- A public key infrastructure (PKI) and smart card policy will be in place to support EB/EC implementation.
- Functional areas will coordinate EB/EC requirements for infrastructure and bandwidth with the GCSS-AF Directorate before initiating projects.

- Functional area representatives will analyze their business processes and seek business process improvement and reengineering advice as the first step in their EB/EC projects.
- The Air Force will leverage technology to the maximum extent feasible to meet existing and emerging business requirements.
- A command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) operational architecture analysis will be synthesized for the Air Force cross-functional architecture.

Constraints

The following constraints apply:

- The GCSS-AF architecture must contain elements of the DoD EB/EC architecture.
- Adequate resources must be programmed and available to support functional area and GCSS-AF requirements.

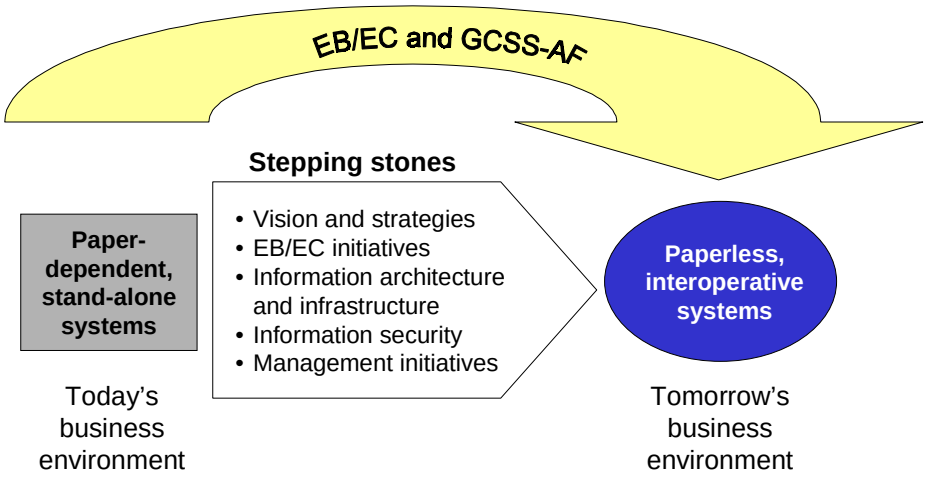
DYNAMIC PROCESS

Today's business environment is constantly subjected to explosive growth in technological capability. However, change to business processes and the resources required to implement them have not kept pace. The future Defense environment must depend equally on both a technologically innovative weapon system capability and its associated support infrastructure. To achieve the desired end state, DoD and Air Force must maintain the requisite flexibility and knowledge to determine when and how to move forward. The comprehensive, "big bang" change is not realistic. Affordable change must be iterative and innovative. Likewise, change management must provide a framework that can accommodate the infusion of continuously evolving technology as well as a business environment that can readily adapt to these improvements. This plan serves as the cornerstone for the development of a dynamic and evolving Air Force support infrastructure.

PLAN CONTENT

This plan addresses primary activities for the Air Force to realize its EB/EC vision. Figure 1-1 shows the activities as stepping stones from the Air Force support environment of today to the target environment of tomorrow.

Figure 1-1. Today to Tomorrow



The remainder of this plan is organized as follows:

- *Air Force EB direction.* Chapter 2 presents the Air Force EB/EC vision by defining its strategic goals and objectives for GCSS-AF and EB/EC, and the strategies for achieving them.

- *Initiatives propelling EB/EC.* Chapter 3 discusses ongoing EB/EC initiatives, both internal and external to the Air Force, for modernizing business processes. The efforts include DoD mandated programs, policies, and architectures as well as Air Force initiatives related to GCSS-AF, infrastructure integration, and electronic records management.

- *EB architectural impacts.* Chapter 4 describes a conceptual view of how the Air Force will conduct EB by 2010. This conceptual view represents the future relationships among the functional business operations and the enabling information technology (IT) and systems. Improvement of business operations will rely on the continuing development of operational architectures by functional process owners and enabling system and technical architectures by infrastructure developers, such as DISA and system owners in the major commands and joint agencies.

- *Information security.* Chapter 5 addresses information security, which allows information sharing critical to EB/EC processes but prevents unauthorized access.

- *Management requirements.* Chapter 6 describes the near- and long-term management tasks to further implement EB/EC goals and objectives. It addresses information sharing within and among functional areas, where appropriate.

In addition, this plan includes the following appendixes:

- Appendix A contains the memorandum by the Air Force Vice Chief of Staff on supporting EB/EC initiatives.
- Appendix B identifies DoD EB/EC policies.
- Appendix C describes electronic records management.
- Appendix D contains a case study for the Air Force EB/EC architecture.
- Appendix E contains a case study for secure EB/EC data exchange.
- Appendix F contains the memorandum by the Deputy Secretary of Defense on adopting and implementing smart cards.
- Appendix G identifies the EB/EC roles and responsibilities for Air Force organizations.
- Appendix H describes the enterprise requirements generation and integration process.
- Appendix I provides a list of Air Force points of contact for EB/EC issue coordination and information dissemination.
- Appendix J assesses the implications of creating incentives for adopting EB.
- Appendix K is a list of abbreviations used in this report.

The plan incorporates appropriate Air Force strategies and architectures to provide a comprehensive picture of GCSS-AF and EB/EC activities. It includes information on the DoD and Air Force EB/EC efforts to modernize business processes. The plan emphasizes reengineering business processes in conjunction with the application of information technology. It identifies the people who will carry out implementation, describes actions to implement GCSS-AF and EB/EC, and explains how, to the maximum extent possible, they will be accomplished.

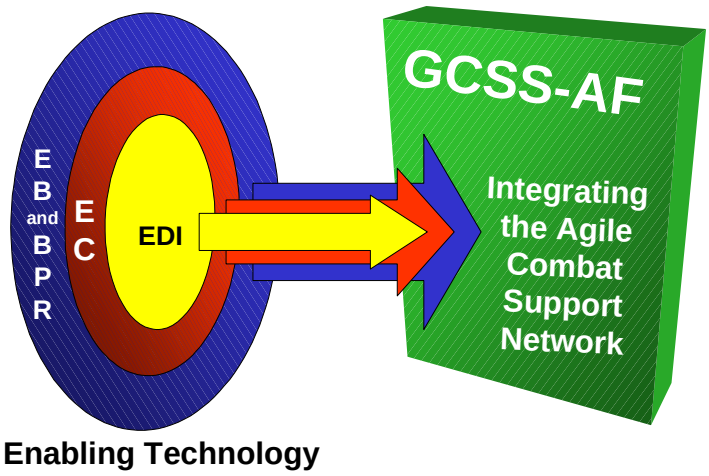
Chapter 2
Air Force Electronic Business Direction

PURPOSE

The purpose of this plan is to identify and describe actions leading to an integrated Air Force EB environment that captures best business practices, fosters the use of cost-effective enabling technologies, and aggressively facilitates the GCSS-AF mission to provide *agile combat support* to the Aerospace Expeditionary Force (AEF) and other Air Force-supported warfighters.

The Air Force will implement EB/EC[1] in concert with GCSS-AF. Figure 2-1 depicts the evolutionary expansion of enabling technologies and the application of those capabilities toward the integration of interoperable business applications. Implementation will be evolutionary. Success will be measured by how effectively Air Force customers are served.

Figure 2-1. Air Force EB/EC Scope



[1] This term includes electronic business to indicate that EB/EC encompasses all business processes and not only acquisition transactions. The *DoD EB/EC Strategic Plan* uses the term "electronic business operations" synonymously with EB/EC. The *DoD EB/EC Strategic Plan* describes its terms as follows: "This emphasis on EB permits the Department to advance the concept of electronic commerce (EC) beyond the traditional perceptions of purchasing and paying using standard transaction sets. The concept of electronic business advances our thinking and opportunities to include the relationships between a consumer and supplier and take advantage of the significant process improvement and reengineering opportunities available through the implementation of EB/EC concepts and technologies. This further permits expanding functional applications beyond supply, procurement, and accounting to enabling process improvements in other functional areas, such as health, personnel, systems acquisition, and science and technology."

With the end of the Cold War, the Air Force undertook the task of repositioning itself to meet new national defense goals. To find better ways of doing business, management has emphasized the business strategies of the 1980s and 1990s—namely, business process reengineering (BPR), benchmarking, time compression in logistics and force response times, and total quality management. The ultimate goal is to downsize infrastructure while improving operational efficiency and flexibility. This goal is difficult to achieve without the technological tools to change how the Air Force conducts its business processes. EB/EC offers that philosophy and those tools.

By providing an electronic means to share information quickly and accurately between users in a secure environment, EB/EC permits smarter and more timely decision-making. Moreover, it offers a new perspective on how business processes might work and new opportunities for the Air Force to reengineer its business processes to take advantage of leading-edge technologies. To obtain full benefit from the new technologies, EB/EC initiatives need to include BPR as a first step.

Air Force MAJCOMs and functional process managers are making progress in improving business operations. Improvements are led by Principal Staff Assistants (PSAs) to the Secretary of Defense, such as the Deputy Under Secretary of Defense (Acquisition Reform); Defense Agencies and joint program offices, such as DISA and JECPO; and Air Force managers, such as the Director, GCSS-AF, and the Air Force CIO. The list of initiatives is substantial.[2]

GOALS AND OBJECTIVES

The Air Force EB/EC goals and objectives are derived from the draft GCSS-AF Operational Requirements Document, the report *The Way Ahead* by the GCSS-AF Requirements Integration Tiger Team (GRITT)[3], and guidance set forth in the DoD Electronic Business/Electronic Commerce (EB/EC) Strategic Plan and other plans relevant to improving EB.

The GCSS-AF subscribes to the following DoD EB/EC guiding principles in pursuing electronic business operations (EBO) goals and objectives:

- EB/EC implementers will incorporate process improvement or reengineering techniques and use best business practices to achieve efficiencies.

- EB/EC processes and tools will be used to facilitate global data sharing and integration of cross-functional business processes in DoD and between the Department and its business partners.

[2] Chapter 3 discusses these initiatives—internal and external to the Air Force.

[3] GCSS-AF Requirements Integration Tiger Team, *The Way Ahead*, report prepared for the Air Force CIO, 31 August 1999.

- Flexible, interoperable solutions that do not prohibit or impede the use of new or emerging technologies will be implemented.
- Industry EB/EC standards and commercial off-the-shelf (COTS) solutions will be used when they offer the best capabilities, offer flexibility, and minimize life-cycle costs.
- EB/EC solutions will afford the data security that users require without degrading the processes they replace.

Table 2-1 summarizes the Air Force EB/EC goals and objectives.

Table 2-1. Air Force EB/EC Goals and Objectives

Goal	Objective
1. Integrate and coordinate Air Force EB/EC activities and guidance	1.1 Coordinate and provide an integrated view of Air Force EB/EC initiatives 1.2 Provide principal EB/EC point of contact for the Air Force with other government components and industry
2. Transition appropriate EB/EC transactions to a common approach, preferably a distributed object architecture	2.1 Employ and champion a common distributed object architecture approach in communicating EBO requirements and activities 2.2 Identify and prioritize desired EBO improvements and the distributed object architecture necessary for implementing improvements 2.3 Implement business process improvements in conjunction with implementing new EB/EC technologies 2.4 Maintain a transitional support environment for legacy and alternative evolving technologies supporting the information exchange process
3. Secure EBO through the GCSS-AF System and Security Architectures under the GCSS-AF IF	3.1 Accelerate use of information security and smart card technology 3.2 Employ risk management techniques to reduce risk and ameliorate its possible effects
4. Champion best EB/EC practices and integration of EB/EC initiatives	4.1 Educate Air Force personnel about EB/EC capabilities and opportunities 4.2 Publicize EB/EC best practices and establish a best practices groupware site in the GCSS-AF Web site 4.3 Maximize the use of business process reengineering to obtain optimal efficiency gains through the implementation of EB/EC

Table 2-1. Air Force EB/EC Goals and Objectives (Continued)

Goal	Objective
5. Ensure that Air Force EBO technical infrastructure is integrated with the Air Force Global Grid Architecture	5.1 Share architectural views within the Air Force and with other DoD components so technical infrastructure development can promote interoperability 5.2 Share information exchange requirements (IERs) among functional process owners to promote business process improvements and data sharing
6. Ensure Air Force functional areas identify cross-functional data sharing requirements to the GCSS-AF Requirements Integration Directorate (GRID) to solicit support for insertion of EB/EC into the functional area data sharing process	6.1 Champion insertion of the most modern and appropriate EB/EC-related information technologies 6.2 Identify and prioritize desired cross-functional EB/EC technology insertion opportunities and work closely with the customer to provide assistance with advice, technical support, limited funding assistance, and POM advocacy at the Air Force Board.

STRATEGIES

This plan seeks to achieve the EBO goals and objectives with the following four strategies:

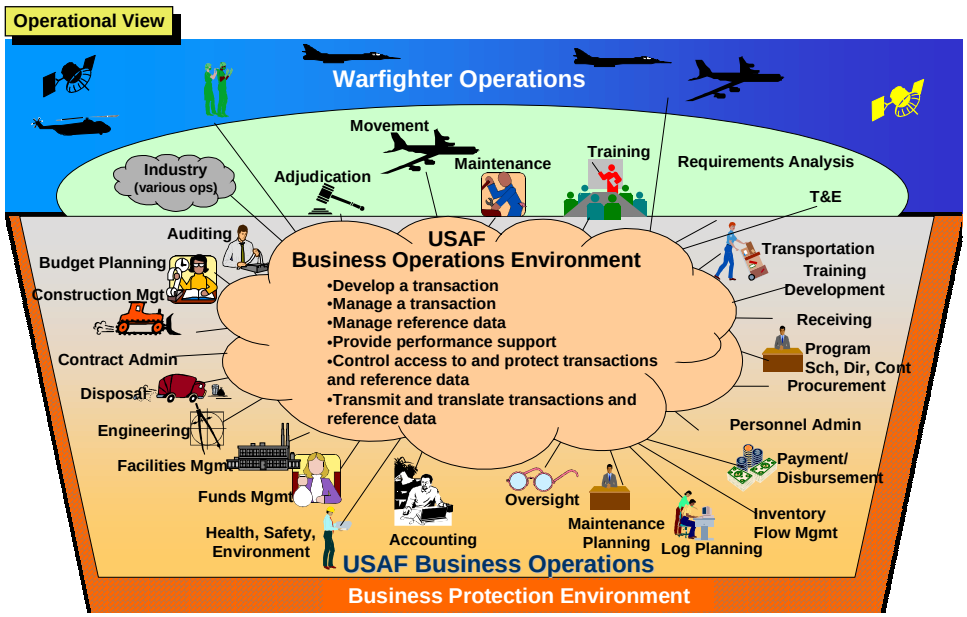
- Show the relationships among EB/EC initiatives and how they contribute to Air Force missions
- Champion initiatives and its enablers throughout the Air Force and serve as the GCSS-AF focal point for EBO improvement
- Identify requirements that GCSS-AF must satisfy to ensure requirements are integrated into an agile combat support system
- Prepare, staff, and manage inputs into the Planning, Programming, and Budgeting System (PPBS) that will rationalize and expedite the network of initiatives and its enablers.

The first two strategies work in concert to identify the strengths and weaknesses of the network of initiatives and actions for promoting an agile combat support system and improving communications among initiative owners and stakeholders. These strategies should be implemented by an Air Force EB/EC Integration Committee co-chaired by the Director of GCSS-AF and the Air Force CIO. One product should be a comprehensive view of the network and a set of framed

opportunities[4] for improving it. The "to be" architecture of this comprehensive view, represented by Figure 2-2, is described in Chapter 4.

The last two strategies focus on managing requirements for improved EBO through the PPBS and monitoring their implementing solutions. The Director of GCSS-AF will implement these strategies by prioritizing the improvement opportunities. MAJCOMs and functional managers will manage appropriate improvements through Air Force and GCSS-AF channels. The outcome should be a rationalized and integrated network of combat support initiatives and actions resulting in a world-class agile combat support system for the Air Force and its warfighters.

Figure 2-2. Air Force High-Level Operational EB/EC Philosophy



Note: T&E = test and evaluation.

[4] Framed opportunities have characteristics and relationships to the network of related activities that are clearly defined. Their costs and benefits have been identified and compared with common criteria.

Opportunities for improving EBO include providing assistance with (1) innovation or changes to functional business processes enabled by IT, (2) technical implementation of projects and interfaces, and (3) synergism of linking information networks and sharing data in creative ways.[5]

[5] The executive summary of the *DoD EB/EC Strategic Plan* states, "The concept of electronic business advances our thinking and opportunities to include the relationships between a consumer and supplier and take advantage of the significant process improvement and reengineering opportunities available through the implementation of EB/EC concepts and technologies. This further permits expanding functional applications beyond supply, procurement and accounting to enabling process improvements in other functional areas, such as health, personnel, systems acquisition and science and technology."

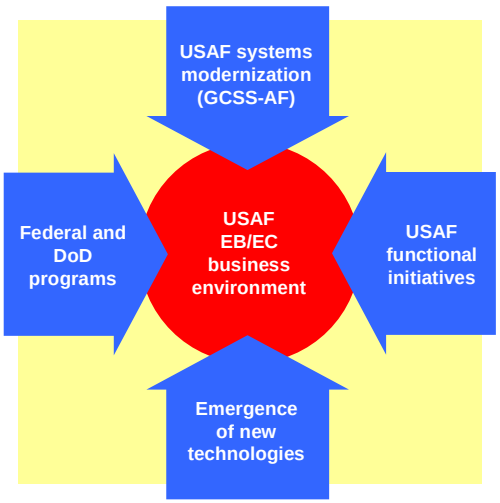
Chapter 3
Initiatives Propelling EB/EC

This chapter discusses the EB/EC revolution in IT and provides an inventory of current EB/EC initiatives affecting the Air Force. The initiatives are EB/EC projects that are oriented toward functional business process improvements or technology improvements that may apply to many Air Force functional areas. This chapter concludes with a discussion of requirements for electronic records management, the Air Force infrastructure, and the necessity to integrate functional and technical requirements in a mutually supportive environment.

EB/EC initiatives are propelled by the following four drivers (see Figure 3-1):

- EB/EC has been designated by Federal and DoD policymakers as the preferred way of doing business. Many commercial business practices are being adopted to improve DoD's business processes.
- Personnel in Air Force functional areas have established EB/EC projects to improve their performance or reduce costs.
- Agile combat support is required to the deployed AEF commander across the spectrum of military operations. To meet this requirement, the Air Force is committed to developing an EB/EC enabled GCSS-AF platform.
- New EB/EC technology applications continue to be developed as today's businesses emphasize information management.

Figure 3-1. EB/EC Drivers



In addition, each area is affected by the pressures originating from changes by commercial-sector trading partners.

FUNCTIONALLY ORIENTED PROJECTS

Because EB/EC makes use of technology tools (such as the Web, EDI, e-mail, EFT, electronic catalogs, and smart cards), it permeates almost all business areas. Ongoing DoD and Air Force EB/EC projects reflect this broad scope and diversity of applications. Although they may use common tools or have common objectives, they are often independent efforts.

Table 3-1 lists representative EB/EC projects by functional area.[1] (DoD projects are also shown as Air Force projects since the Air Force has and will continue to participate in DoD EB/EC initiatives.) Following the table, EB/EC in each functional area is discussed along with a brief discussion of prominent projects and system improvements.

Table 3-1. Representative EB/EC Projects

Functional area	Project	DoD and Air Force	Air Force only
Acquisition and procurement			
	Central Contractor Registration	X	
	Joint Electronic Document Access/Electronic Document Access	X	
	Electronic Mall	X	
	Electronic Posting System		X
	International Merchant Purchase Authorization Card	X	
	Past Performance Automated Information System	X	
	Standard Procurement System	X	
	Menu Assisted Data Entry System II		X
	Technical Data Package Material Information System	X	
	Wide Area Workflow	X	
	Web Invoicing System	X	
Financial Management			
	Automated Business Services System		X
	Electronic Funds Transfer	X	
	Automated Purchase Card System		X
	Electronic Leave and Earnings Statements	X	
	Customer Automation and Reporting System	X	
	Leave Reengineering		X
	Employee/Member Self-Service	X	
	Defense Travel System	X	

[1] Additional EB/EC projects are described on the Air Force EC Web site at http:\\ecommerce.af.mil.

Table 3-1. EB/EC Projects (Continued)

Functional area	Project	DoD and Air Force	Air Force only
Personnel			
	Civilian Personnel Decision Support Software		X
	Defense Civilian Personnel Data System	X	
	Military Modernization Program		X
	Defense Integrated Military Human Resource System	X	
	Personnel Process Improvements	X	
	Virtual Interactive Personnel		X
	COREDOC		X
	Personnel Automated Record Information System		X
	Employee Benefit Information System		X
Medical			
	Theater Medical Information Program	X	
	U.S. Transportation Command Regulating and Command and Control Evacuation System	X	
	Defense Medical Logistics Standard Support (DMLSS) Program	X	
	DMLSS Module—Customer Area Inventory Management	X	
	DMLSS Module—Facility Management	X	
	Medical Logistics and Finance System Interface Reengineering	X	
	Medical Emall	X	
	Medical Deployment and Readiness Reengineering	X	
	Medical Logistics Prime Vendor EC Project	X	
	Aeromedical Services Information Management System		X
	Aerospace Physiology Information Management System		X
	Dental Data System		X
	Health Standards Resource System	X	
	Reserve Component Preventive Health Assessment		X
	Web-Based Integrated Training System		X
	Reserve Dental Data System		X
Logistics			
	Adoption of Commercial EDI Standards	X	
	Modernization of Materiel Management Systems	X	
	Joint Ammunition Management Standard System	X	
Transportation			
	Global Transportation Network	X	
	Cargo Movement Operations System		X
	Virtual Airline	X	
	Consolidated Air Mobility Planning System	X	
	Unit Level Planning and Scheduling	X	
Headquarters			
	Headquarters Information Project Office		X
	Headquarters Air Force 2002		X

Table 3-1. EB/EC Projects (Continued)

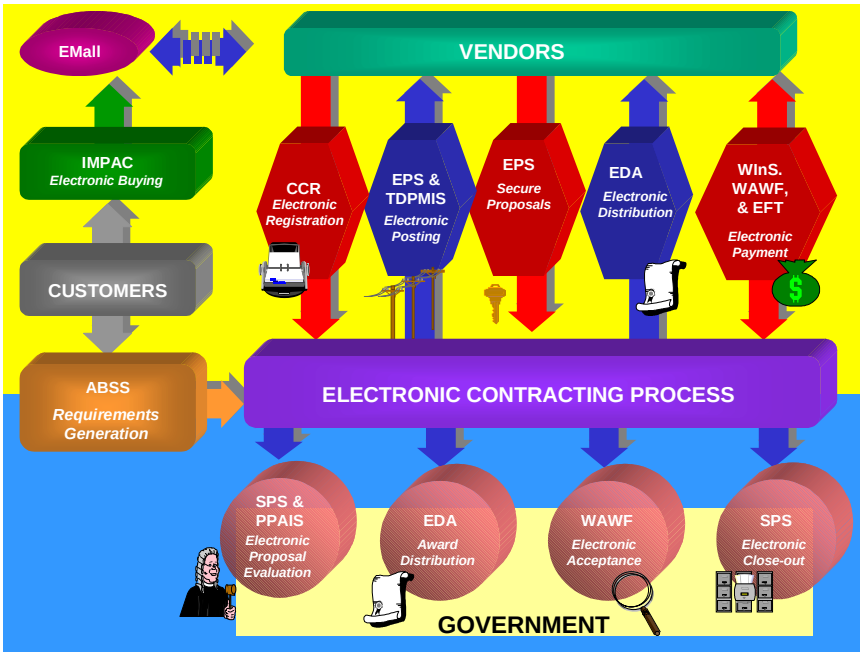
Functional area	Project	DoD and Air Force	Air Force only
Other			
	Information and Resource Support System		X
	Electronic Publishing		X
	Electronic Legal and Ethical Advice		X
	Electronic Training		X

Acquisition and Procurement

On 21 May 1997, the Secretary of Defense mandated a paperless contracting process by 1 January 2000. Consequently, EB/EC applications and projects are widespread in the acquisition and procurement community because it has migrated to paperless, electronic contracting. A paperless contracting process incorporates EB/EC technologies across all aspects of contracting, including requirements definition, contractor selection, contract writing, administration, payment and accounting, auditing and contract reconciliation, and closeout. Paperless contracting involves the implementation of standard procurement and payment systems, development of electronic linkages among all phases of the acquisition process, and vendor processes that allow DoD to take advantage of private-sector distribution capabilities and electronic data processing.

The Air Force view of electronic contracting incorporates procurement and financial EB/EC applications (Figure 3-2).

Figure 3-2. Air Force Electronic Contracting



Note: ABSS = Automated Business Services System; CCR = Central Contractor Registration; EDA = Electronic Document Access; EPS = Electronic Posting System; IMPAC = International Merchant Purchase Authorization Card; PPAIS = Past Performance Automated Information System; SPS = Standard Procurement System; TDPMIS = Technical Data Package Material Information System; WAWF = Wide Area Workflow; WInS = Web Invoicing System.

The Air Force plan is to continue to work through DoD and internal committees, groups, and developers to enhance the capabilities of these applications:

- *Central Contractor Registration (CCR).* This application allows DoD personnel to identify validated DoD trading partners; all are required to register in the CCR in order to do business with the Federal Government.

- *Joint Electronic Document Access/Electronic Document Access (JEDA/EDA).* This capability allows access to contracts and modifications on-line by authorized DoD personnel who use COTS Web browser software and the Adobe Acrobat Reader.[2] DFAS also uses these posted documents for vendor payments. Additionally, JEDA provides electronic distribution of contractual documents.

- *Electronic Mall (EMall).* This application allows customers to browse through Internet-based electronic catalogs; compare products, prices, delivery terms, and payment options; and purchase on-line the product that best suits their needs. The Air Force *Country Store* and the future

[2] The Joint Electronic Document Access (JEDA) is a Web-based front end to EDA that permits contract attachments, such as statements of work, drawings, and specifications not provided by EDA. JEDA is a joint Navy, Marine, and Air Force initiative.

Information Technology Superstore are EMall applications for software and hardware.

- *Electronic Posting System (EPS).* This application provides a single point of entry for acquisition notices and solicitations. It permits government buyers to publicize business opportunities on the Internet and contractors to obtain information on opportunities throughout the Federal Government.[3] Air Force deployment of EPS was completed 15 April 1999.[4]

- *International Merchant Purchase Authorization Card (IMPAC).* The government purchase card allows a holder to purchase goods and services with a value of $25,000 or less (micro purchases) directly from vendors.

- *Past Performance Automated Information System (PPAIS).* This application collects and provides access to information about contractors and their performance that may be used by authorized DoD acquisition personnel.

- *Standard Procurement System (SPS).* SPS is an integrated system consisting of a contractor-furnished application, operational data, a relational database management system (RDBMS), government-furnished client-server and stand-alone hardware, operating systems, and client-server local area network (LAN) and wide area network (WAN) connectivity. The SPS supports DoD procurement functions, which include the acquisition of supplies and services with a vision to include major weapons systems and product centers.

- *Menu Assisted Data Entry System II (MADES II).* MADES II is a compilation of Federal Acquisition Regulation-based systems developed to automate and standardize selected facets of the Air Force contract writing process.

- *Technical Data Package Material Information System (TDPMIS).* This pilot application, a cooperative effort by the National Technical Information Service (NTIS) of the Department of Commerce and DoD, is testing the viability of making DoD technical data package materials relating to active DoD solicitations available on the Web. The Technical Data System (TeDS) will replace TDPMIS and will provide the ability to locate and distribute technical data and serve as a national repository to include historical data on solicitation-specific national stock numbers. Additionally, Source View, a COTS product that allows base civil engineers

[3] EPS was developed as a pilot program by General Services Administration's Office of Acquisition Policy in partnership with the Departments of Interior, Treasury, and Transportation; the Air Force; and National Aeronautics and Space Administration.

[4] JECPO is sponsoring the DoD Business Opportunities Web site as an electronic portal solution providing a single point of entry and search mechanism for vendors to locate and access DoD solicitations on-line. DoD Business Opportunities integrates the Air Force's EPS with the posting systems of the Army, Navy, DLA, and DISA.

to develop construction drawings in ".cal" formats, is used in the contracting process to help contractors understand the cost and full scope of the requirement.

- *Wide Area Workflow (WAWF).* This prototype supports DoD efforts to reduce unmatched disbursements in the DoD receipt, acceptance, entitlement, and payment process through sharing data and electronic documents. It allows government personnel to accept goods and services electronically, allows the vendor to invoice electronically, and provides electronic notification of these actions to the payment office.

- *Web Invoicing System (WInS).* This application enables paper-based vendors to send invoices electronically with little or no cost.

Financial Management

As shown in Figure 3-2, financial EB/EC initiatives such as ABSS and IMPAC are key ingredients to the DoD paperless contracting process. However, other financial EB/EC initiatives exist that are aimed at making financial interfaces with DoD personnel paperless. The Office of the Assistant Secretary of the Air Force for Financial Management and Comptroller is participating in the implementation and enhancement of these EB/EC applications:

- *Automated Business Services System (ABSS).* When customers identify procurement requirements, this Air Force financial system administers and manages the commitment of funds and relays the requirements to the contracting process.

- *Electronic Funds Transfer (EFT).* In conjunction with CCR, this application allows government electronic payments on all Federal contracts.

- *Electronic Leave and Earnings Statements (E-LES).* This DFAS application will make leave and earnings statements available by e-mail.

- *Employee/Member Self-Service (E/MSS).* This DFAS service will allow DoD employees to update pay information by using a PC (to access the pay system via the Web) or a touch-tone telephone (via the Interactive Voice Response System, IVRS).

- *Defense Travel System (DTS).* The Military Traffic Management Command is developing this system that will allow travelers to initiate travel requests and automates the processing of travel vouchers, including voucher calculations.

- *Automated Purchase Card System***.** The system automates the payment process of the government purchase card transactions in Air Force financial services offices.

- *Customer Automation and Reporting System (CARE).* A Web-based system being developed by US Bank for its government purchase card (IMPAC) customers, including the Air Force. The system, when fully operational, will permit credit card transactions to be reviewed by the billing official on-line, will accelerate the payment process, and permit the Air Force to achieve higher rebates resulting from faster file turn times. CARE will employ rule sets that permit the consolidation of multiple fund citations in a single account. Air Force implementation will commence in May 2000 and continue through the end of the fiscal year.

- *Leave reengineering.* A prototype system being developed will automate leave processing and eliminate paper transactions and multiple entries of leave data.

Personnel

The Defense Civilian Personnel Management Service leads DoD efforts to create regional service delivery and modern personnel data systems. To achieve the workforce savings envisioned by regionalization while improving service, the DoD and Air Force personnel community initiated the following:

- *Defense Civilian Personnel Data System (DCPDS).* This effort replaces legacy personnel systems with a modern system called the DCPDS. It represents the world's largest human resource system and is based on COTS software (i.e., Oracle).

- *Civilian Personnel Decision Support Software (CPDSS).* CPDSS maintains information on employee experience. It contains data from the DCPDS CE file and other experience coded from an employee's resume. CPDSS replaces Headquarters Air Force Merit for Career Programs and will be used to determine an employee's eligibility for job vacancies.

- *Military Modernization Program (MILMOD).* The Air Force is applying improved service capabilities to the existing Personnel Data System (PDS) in anticipation of an eventual DoD replacement system. PDS is undergoing an extensive series of technology and functionality enhancements to permit a more integrated approach to managing the life cycle of military personnel activities (e.g., recruitment, training, pay, awards).

- *Defense Integrated Military Human Resource System (DIMHRS).* This long-range development project will be a single integrated, all Service, all component military personnel pay management and information system. DIMHRS will support the complete military personnel life cycle through the full spectrum of military operations. The core of the system will consist of common functions and appropriate interfaces to support unique component and Service functions.

- *Personnel Automated Record Information System (PARIS).* The electronic personnel file receives Standard Form 50s via the Personnel Process Improvement (PPI) system and manually scanned documents. The documents are viewable by the civilian personnel office at the serviced bases and the Air Force Personnel Center (AFPC). The database is maintained by AFPC/DPC. The Air Force civilian personnel community has implemented this document management system to provide secure, Web-access to official personnel folders.

- *Employee Benefits Information System (EBIS).* This vendor-developed application provides civilian employees with access to general information on all aspects of Federal benefits and entitlements as well as providing a mechanism for viewing and updating their benefits information. This system will allow users, via the Web, to access, create, or replace a personal identification number (PIN) with a social security number. This system conducts on-line benefits transactions that allow a user to view current and projected Federal employee health benefits (FEHB). This information also includes Federal employee group life insurance (FEGLI) and thrift savings plan (TSP) enrollments. Users can also perform changes to FEHB, TSP, and FEGLI; waive FEHB and FEGLI enrollments; and complete employee benefits statements on retirement and TSP annuity estimated and project future account balances.

- *Personnel Process Improvement.* This represents the development of a series of applications, such as the following:

  - *Virtual Interactive Personnel (VIP).* This Internet-based application is an electronic handbook to provide information and routine guidance on all areas of civilian personnel management. Expert system modules provide advice on personnel management and administration responsibilities. Together, VIP and expert system modules form the *Knowledge-Based System (KBS).*

  - *COREDOC*. COREDOC is available as a PC or client-server package from the Air Force Personnel Center. COREDOC provides series and occupational information as well as many DoD Standard Core Personnel Documents.[5]

Medical

The overall Air Force goal for medical support is to ensure healthy people are available to support the Air Force mission. To achieve that goal, DoD and Air Force medical service organizations are dedicated to modernization through business process reengineering and technology insertion. The explosion of

[5] The Air Force Standard Core Personnel Document (SCPD) Library provides an Internet access to personnel documents that Air Force managers, supervisors, and personnel specialists can use to establish new positions, revise current positions, and fill existing civilian positions.

IT advances in biomedicine promises to change the way military healthcare is practiced, delivered, taught, and learned. Medical support will be provided in a more streamlined organization with a "smaller forward footprint" based on a technology-driven approach to healthcare.

Military medicine is faced with a diverse set of requirements. For example, Public Law 105-85 requires the Secretary of Defense to establish a system to assess the medical condition of members of the Armed Forces deployed outside the United States as part of contingency plans and combat operations. To achieve an end-to-end medical status visibility of personnel, medical providers must ensure the availability of inpatient and outpatient data coming from the theater.

The Theater Medical Information Program (TMIP), a DoD initiative, is anticipated to meet a requirement to link the integrated and improved Air Force Office of the Medical Surgeon General applications under a single umbrella and link them with legacy medical logistics applications currently included in the Defense Medical Logistics Standard Support (DMLSS) System. Within the Air Force, TMIP is viewed as a computerized patient record that contains all information and is available to the theater Air Force medical units. The legacy systems have several stand-alone applications that are candidates for TMIP integration.

Telemedicine is another example of how the joint medical community views the future (see article below).

Joint Science and Technology Plan for Telemedicine

Military telemedicine is the application of physiological and medical knowledge, through simulations and systems integrated with information and telecommunication technologies, to facilitate operational and medical decision-making, enhance medical training, and deliver medical treatment across all barriers. Telemedicine derives its capabilities from technological advances in a number of fields, including telecommunications, space sciences, materials science, computer and software engineering, artificial intelligence, perceptual psychology, robotics, and medicine. Telemedicine also reflects health care's contribution to and utilization of the theater military command and communications system.

Before an operational deployment, telemedicine capabilities could improve joint readiness by providing medical forces with access to intelligent computer-aided medical instruction, collaborative mission rehearsal, and realistic medical and surgical simulations. Such capabilities could greatly enhance the ability of military health care providers to attain combat trauma skill proficiency, maintain currency of medical skills, and develop expertise in joint unit-level operations through iterative rehearsal of simulated missions.

During combat operations, telemedicine could provide battlespace awareness of the health status of warfighters and units, allowing line and medical commanders to monitor, measure, predict, and manage the health of the force. These capabilities could be realized through the use of real-time physiological sensors, large-scale distributed medical databases, computerized patient records, and medical situational awareness as a component of the intelligence, surveillance, and reconnaissance network. Real-time knowledge of the physiological status of U.S. forces would add a new dimension to situational awareness, enabling commanders to predict warfighter and unit effectiveness, optimize utilization of forces and minimize casualties, and identify casualties rapidly when they occur.

In addition, telemedicine technologies could be critical enablers for battlespace health care delivery because they would enable the capability to keep pace with and deliver quality care to highly mobile, dispersed forces. When illness and combat trauma strike, telemedicine would allow commanders to improve the effective employment of medical forces. It would also provide new capabilities for predictive diagnostics; digital image acquisition devices; three-dimensional image processing; clinically focused teleconsultation systems; and better informed, less invasive surgical treatment that improves clinical outcomes. Telemedicine capabilities would also allow casualties to be managed across the echelons of care, and provide the advanced diagnostic and resuscitative capabilities, artificial intelligence-based prognostics, and enroute monitoring and interventions that enable more critically injured patients to be evacuated before they are fully stabilized.

Evolving technologies can be applied to solve uniquely military health-related problems. To achieve the best result, integration with other DoD modernization initiatives is required in the areas of information systems, telecommunications, and focused logistics systems.

- The TRANSCOM (U.S. Transportation Command) Regulating and Command and Control Evacuation System), or TRAC^{2}ES, is an important telemedicine initiative that tracks and directs patients from the point of injury through the evacuation chain to a hospital. It will match transportation lift capability and medical treatment facility beds with patient medical treatment needs.

- The DMLSS System is a major DoD modernization initiative to provide the best medical logistics AIS. It will replace many Military Service medical logistics systems. The mission of DMLSS is to improve medical logistics responsiveness dramatically at reduced costs and develop a high-quality, integrated system for all DoD medical logisticians in peacetime

and wartime. The two major DMLSS elements are retail and wholesale. A major AIS development effort characterizes DMLSS—Retail, while several design and development efforts involving small systems and applications characterize DMLSS—Wholesale. DMLSS development has been guided by state-of-the-art technical systems engineering, including EC/EDI, bar coding, and wireless technology. DMLSS EB/EC initiatives include the following:

- *Medical Logistics Prime Vendor EC Project.* Recently completed, this 3-year DoD project reengineered and standardized electronic purchase orders for pharmaceuticals and most medical-surgical supplies for all DoD medical treatment facilities (MTFs). It converted DoD medical prime vendor program ordering points from a multi-vendor, order-entry system to an EDI environment. The environment allows Air Force MTFs to communicate with their medical prime vendors using a single standard, tri-Service ANSI X.12 medical purchase order.

- *Customer Area Inventory Management (CAIM).* CAIM was designed to overcome many common and Service-specific inventory management problems. It will identify stocks of core and static items, manage stockage levels, build orders to the source of supply, apply barcode technology to reduce inventory errors, and provide materiel by unit of measure or unit of issue.

- *Facility Management (FM).* FM is a multi-phased module that provides MTF managers with the ability to manage maintenance and repair activities, manage funds, maintain graphical space and asset management information for space decision-making, and produce automated work requests.

- *Medical Logistics and Finance System Interface Reengineering.* This project is reengineering the business processes between the medical logistics system and the DFAS finance system using standard ANSI X.12 transaction formats.

- *Medical EMall.* This project is expanding the DoD EMall to allow customers to place orders for medical supplies via the Web.

- *Medical Deployment and Readiness Reengineering.* This project is reengineering the process of planning, acquiring, and distributing medical materiel in support of deployable units and force readiness.

The Air Force medical community has several functional EB/EC initiatives in various stages of consideration and development, including the following:

- *Aeromedical Services Information Management System (ASIMS).* ASIMS will schedule, track, and report troop medical history and automate the centralization of Air Force prevention data.

- *Aerospace Physiology Information Management System (APIMS).* APIMS schedules physiology training for aircrews, tracks instructor and aircrew exposure to training profiles, and generates analytical management programs.

- *Dental Data System (DDS).* DDS compiles readiness, productivity, manning, and expense data for the Air Force Dental Service for readiness and population health projections.

- *Health Standards Resource System (HSRS).* HSRS is a multifunctional, multidisciplinary tri-Service system that will interface several DoD legacy information systems. The mission is to bring together manpower, education and training, personnel, and finance through the use of a single integrated information system to enhance the execution of healthcare and medical readiness. The project will enhance Air Force ability to compile Air Force Medical Service information requirements into a single comprehensive data-sharing environment that supports the warfighters.

- *Reserve Component Preventive Health Assessment (RCPHA).* RCPHA is a Web-based system being developed by Air Force Reserve Command (AFRC) to support the annual health assessment requirement to ensure each Reserve Component member is fit to deploy. RCPHA incorporates non-flying physical examinations, occupational health physical examinations, periodic flying and special operational duty physical examinations, results of pre-fitness test screening, and unique military medical requirements in one program.

- *Web-Based Integrated Training System (WBITS).* WBITS is a Web-based training management system developed by AFRC to assist its medical units. It includes scheduling, tracking, and requirements determination functions and provides command oversight of the multifaceted medical training program.

- *Reserve Dental Data System (RDDS).* RDDS automates functions (e.g., scheduling, tracking) of the reserve dental program for AFRC medical units.

Logistics

Since the 1960s, the Military Services and Defense Agencies have relied on automated systems to manage their logistics functions. These systems were generally stand-alone, functional-oriented systems that usually integrated processes only at one location. To communicate between these systems, standard DoD transactions were developed. System-to-system communication between DoD systems and systems used by commercial trading partners was difficult because the standard transactions were not commercial standards.

Today, the following major initiatives for moving from old to new IT will allow for online real-time communication among all logistics trading partners:

- *Adoption of commercial EDI standards.* Released on 9 December 1998, DRID #48, *Adoption of Commercial EDI Standards for DoD Logistics Business Transactions*, seeks an orderly transition of automated systems and business processes and adoption of internationally open systems and commercial standards. DRID #48 promotes an increased reliance on process improvement and reengineering based on commercial best business practices. In addition, a DoD policy guidance memorandum[6] and draft policy guidance[7,8] being coordinated require that the Military Services develop implementation plans. These documents mark the beginning of a major initiative to migrate the DoD logistics environment from a series of vertical domains using 1960s technology to the DoD vision of an integrated, process-oriented, shared data environment that can meet tomorrow's logistics mission.

  DRID #48 is significant because it affects both the intra- and inter-service exchange of logistics information. Implementation of DRID #48 is complicated by similar data transformations in other vertical Air Force functional domains (e.g., acquisition, finance) where data sharing across vertical domains is taking place. Because of these complications GCSS-AF architecture development is best served by an open architecture approach that will provide for the interchange between legacy and evolving applications across a complex network of intra-Service, inter-Service and Agency, and private-sector trading partners. Some of the exchanges will be ANSI X12-based, while others will not be.

[6] Under Secretary of Defense (Acquisition and Technology), *Policy Guidance for Department of Defense (DoD) Use of Electronic Data Interchange (EDI) Standards in Logistics Applications*, memorandum, 14 September 1999.

[7] Under Secretary of Defense (Acquisition and Technology), *Department of Defense Reform Initiative Directive (DRID) #48—Adoption of Commercial EDI Standards for DoD Logistics Business Transactions—December 9, 1998*, memorandum, 7 May 1999.

[8] Joint Electronic Commerce Program Office, *Department of Defense Reform Initiative (DRID) #48—Adoption of Commercial EDI Standards for DoD Logistics Business Transactions—Draft Implementation Plan*, memorandum, 21 September 1999.

The Air Force has identified the scope and impact of this requirement with respect to existing requirements, asset management, retail and wholesale supply, cataloging, technical data, maintenance, transportation, disposal, and planning systems. The Air Force DRID #48 implementation plan will recognize the need for a coordinated strategy relying on system modernization, technical refreshment, sustainment, elimination and migration. The Air Force point of contact for DRID #48 implementation is HQ USAF/ILXI, and this office coordinates its activities with the GCSS-AF Directorate.

- *Modernization of materiel management systems.* The Army and DLA have embarked on modernization efforts to replace their legacy materiel management systems with enterprise resource planning (ERP) packages. ERP combines a single information platform with enterprise-wide materiel and capacity planning control relevant to all trading partners in a supply chain. ERP packages are COTS solutions to the integration of information across all functional processes of an enterprise.

  Although the Air Force does not have a major initiative to replace its legacy materiel management system with an ERP package, the Air Force has adopted an ERP package at the Aerospace Maintenance and Regeneration Center. This very successful COTS application originated in a DoD effort to introduce Manufacturing Resource Planning II (MRP II) concepts at maintenance depots.

  All DoD modernization efforts are carefully evaluating the impact of employing COTS solutions because of the need to provide additional system functionality within the legislative and policy guidance.[9] COTS solutions also are in line with EB/EC guiding principles, and ERP packages are EB/EC applications.

- *Joint Ammunition Management Standard System (JAMSS).* The current Defense ammunition management system consists of wholesale and retail systems operating in a vertical environment by Military Service and function. Information exchange is based on legacy system transactional exchange and is supplemented by at least two independently defined, proprietary transaction formats designed to operate within a Service's operating environment. JAMSS is a Joint Service initiative (under Air Force program office sponsorship) to develop a Joint Service, standard ammunition management system employing DRID #48-directed commercial standards for data exchange and the integration of commercial best business practices.

[9] The guidance is in the Information and Technology Act (Clinger-Cohen) of 1996, Government Performance and Results Act of 1993, Government Management Reform Act of 1994, and Office of Management and Budget Memorandum 97-02, *Funding Information Systems Investments* (Raines' Rules).

The JAMSS development effort is categorized into eight sectors: cataloging, inventory management 1 (IM1) (consisting of requisitioning and materiel accountability), inventory management 2 (IM2) (consisting of stratification and end-item requirements), transportation, production, maintenance, program objective memorandum (POM) (including funding and contract support), and demilitarization. The cataloging development phase is scheduled for completion in December 1999. The requirements determination process for IM1 was completed in October 1999. JAMSS Release 1 will involve the development of a wholesale-level capability. Subsequent releases will replace legacy retail systems.

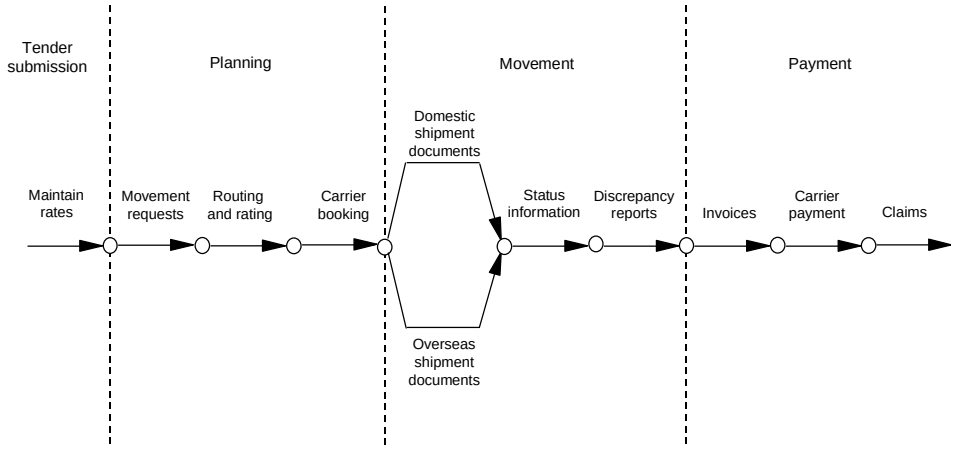
Transportation

In every major deployment during the 20th century, DoD was plagued by a lack of visibility over shipments and units entering a theater of operations. During Operations Desert Shield and Storm, more than 20,000 containers of military materiel (of a total of 40,000) entering the theater had to be opened, inventoried, resealed, and then reinserted into the transportation system because military personnel in the theater did not know their contents. The movement of troops was also hampered by the lack of visibility over personnel moving into, within, and out of the theater. In addition, 60 percent of all patients evacuated from the theater were transported to the wrong destination.[10]

To overcome these shortcomings, the transportation communities have improved visibility through automated data entry, electronic data exchange, and improved networking among systems, agencies, and the private sector. Most recently, the Kosovo deployment benefited by the increased intransit item visibility of forces deploying from CONUS sites. In addition, the DoD is reengineering its transportation processes and creating a paperless business environment using EDI. The 1996 implementation plan for the Defense Transportation EDI Program cites 11 EDI applications in the four areas of freight movement (Figure 3-3).

[10] Department of Defense, *Defense Intransit Visibility Integration Plan*, Revised 1997, May 1997, p. iii.

Figure 3-3. EDI Applications for Transportation



U.S. Transportation Command is sponsoring the following capabilities that are key to comprehensive intransit visibility:

- *Global Transportation Network (GTN)*. GTN is an automated information system that supports transportation users and providers with intransit visibility of DoD shipments. Through the DoD EC infrastructure, GTN accepts EDI status messages from air, truck, rail, and water carriers.

- *Cargo Movement Operations System (CMOS)*. CMOS is an Air Force system operating in a joint environment at more than 200 locations. It provides transportation units with timely data to plan cargo movements, schedule shipments into the transportation pipeline, control shipment units to maximize the use of transportation resources, and reduce transportation costs. CMOS provides accurate and timely information in support of shipment decisions, preplanning shipment consolidation, and shipment mode selection.

  CMOS is required to maintain interfaces with several transportation, finance, manpower, supply, asset visibility, and private-sector shipper applications. It also makes use of EB-related methodologies and technologies. CMOS can exchange legacy system, EDI, and independently defined file structure transactions in electronic and manual modes. It also uses smart card and radio frequency technologies and is postured to expand to the use of smart cards. Enhancements being evaluated include Web-based technology and a deployable CMOS version.

Desert Shield/Desert Storm also revealed problems in air mobility scheduling. For example, the Air Mobility Command manages commercial air carriers on a mission by mission basis. During Desert Shield/Desert Storm, this practice increased air mobility costs as mission changes caused differences between the amount contracted for and the amount needed, and additional contracts were needed to resolve shortfalls. It also caused disruption to commercial schedules for airlines

activated to support the conflict because they could not take advantage of slack periods in their schedules to accommodate Air Mobility Command's needs.

To overcome these problems, the Defense Transportation System has the goal of developing an integrated, real-time workflow and scheduling environment using emerging technologies. Key initiatives focus on scheduling at the following three echelons:

- *Virtual Airline.* Virtual Airline will generate a new approach for managing commercial air carrier missions. The approach will leverage the command and control systems of commercial airlines. They will be able to reschedule aircraft to meet Defense needs and the needs of their commercial customers. At an enterprise level, dynamic DoD mobility requirements in a crisis will be met more effectively.

- *Consolidated Air Mobility Planning System (CAMPS).* For Air Mobility Command's Tanker-Airlift Control Center, CAMPS will help in operational planning to provide "least cost" mission scheduling.

- *Unit-Level Planning and Scheduling (ULPS).* Development of this new capability for Air Mobility Command's Command and Control Information Processing System has involved prototype models for air and maintenance crew scheduling. ULPS will involve an aerial port scheduler, a fuels master scheduler, a maintenance master scheduler, and an aircrew squadron master scheduler. The aircrew scheduler will be fielded at all Air Mobility Command bases by March 2000. In developing ULPS, the U.S. Transportation Command plans to use XML (Extensible Markup Language) as the information exchange mechanism.

Appendix D discusses the integration of the transportation initiatives within the context of an EB/EC architecture to demonstrate the potential for a seamless, technologically current information environment.

Headquarters

Headquarters Air Force (HAF) initiated a pilot project known as the Headquarters Information Project (HIP) to improve the HAF information environment. The HIP is chartered with a narrow focus (the Headquarters), and the plan for information improvement encompasses the entire HAF. Development and deployment of solutions will be accomplished through "spirals" emphasizing quick delivery of capability and flexibility in support of evolving user needs.

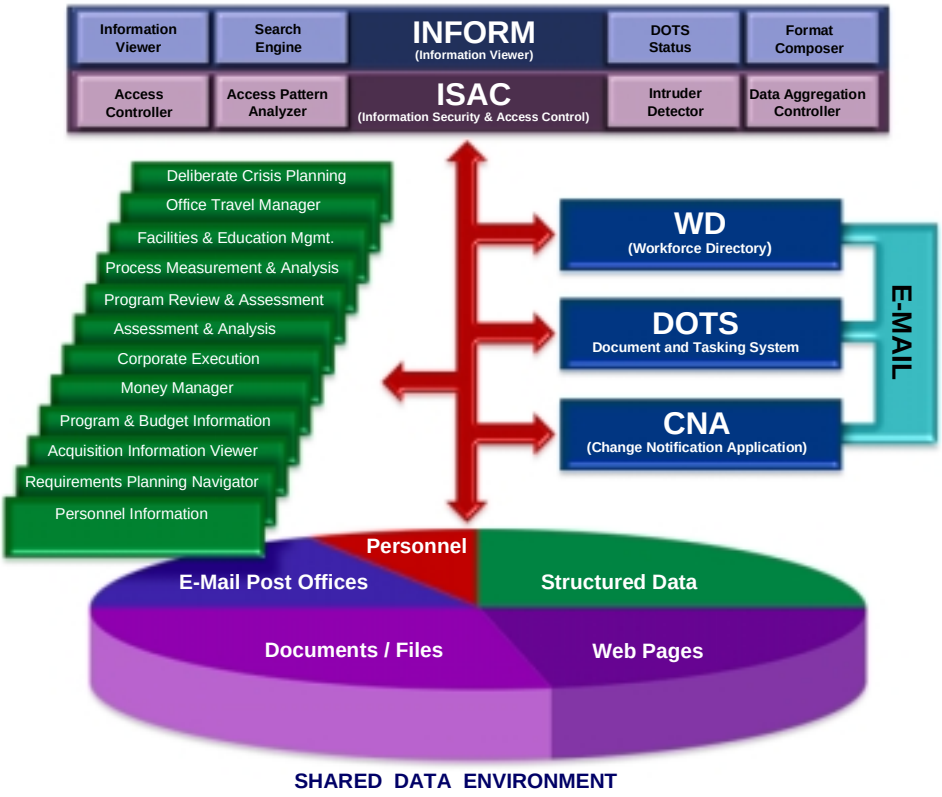
- *Headquarters Information Project Office*. Since the early 1960s, HAF personnel have used their initiative and limited resources to meet data automation challenges. An unforeseen consequence of these efforts is proprietary data and data formats that hinder EDI and parallel goals outlined in the DoD EB/EC Strategic Plan and DRID #43. Early in 1997,

HAF functional leaders in concert with the Air Force CIO determined to engage the unique HAF data environment and create a shared data environment (SDE). The recently established HIP Office (HIP-O), using a combination of technology innovations (e.g., PKI, smart cards), GCSS-AF infrastructure policy, and HAF 2002 BPR decisions, develops plans and oversees projects relating to issues within HAF.

Figure 3-4 reflects HIP-O's "system concept" operating approach that consists of the following:

- Single security and access layer (ISAC)
- Standardized data and metadata applications (SDE)
- Consistent presentation layer to the HAF action officer (INFORM).

Figure 3-4. Headquarters Information Program Concept



Following the BPR decisions by HAF 2002 teams, HIP-O will lead in outlining data automation solutions for the new HAF business processes. An SDE, which will result from the symphony of harmonized applications, will save time and resources and reduce staff frustration.

The vision that precipitated establishing the HIP-O, with ongoing coordinated efforts, will leverage future HAF data automation resource outlays more efficiently. The partnership of HAF 2002 BPR and HIP-O data management expertise, in conjunction with the GCSS-AF Requirements Integration Directorate, manifests HAF support of DoD EDI, EB, and EC policy.

- *Headquarters Air Force 2002.* HAF 2002 is the Air Force Secretariat and Air Staff response to a congressionally mandated 25 percent headquarters reduction. The Secretary of the Air Force and the Chief of Staff of the Air Force chartered a team to find alternatives to a "distributed cuts" approach for reducing the staff assigned at HAF. The call for "efficiency and effectiveness" required the review of all processes used to complete headquarters work.

  Through BPR, *HAF 2002* intends to improve the efficiency and effectiveness of the headquarters by the following:

  - ➤ Cutting costs
  - ➤ Eliminating waste
  - ➤ Minimizing non-value-added work
  - ➤ Improving quality-of-life working environment.

  BPR is the preferred method to identify key entry points for employing EB/EC techniques. Through BPR, the application of best business practices, and the efficient use of technology, HAF 2002 can identify significant process improvements and recommend solutions to reach EB/EC goals.

Other

Other important EB/EC projects are also underway in various Air Force organizations. The following three projects are reflective of the changing Air Force business landscape:

- *Information and Resource Support System (IRSS).* IRSS is an automated system that will provide an Air Force-wide capability to develop, collaborate, and coordinate Mission Needs Statements, Capstone Requirements Documents, and Operational Requirements Documents. It was developed by the IRSS System Program Office, Air Force Laboratory, Wright-Patterson AFB for operational use at eight user command headquarters and Headquarters U.S. Air Force. IRSS supports individual, organizational, and Air Force-wide data views via client-server architecture, encompassing all MAJCOMs and several forward operating locations. HQ USAF/XPX is building on the IRSS functional baseline (V 5.2) to develop

a collaborative planning capability, currently planned for release in mid-2000. The enhanced version will be known as V 6.0. HQ USAF/XPX's goal is to integrate Air Force planning and requirements communities separated by organizational and geographic boundaries.

- *Electronic publishing*

  - The Air Force Materiel Command (AFMC) introduced electronic publishing to its customers in November 1994 at an estimated savings of almost $2.5 million per year.

  - Air Force Departmental Publishing (AF/DP-O) has an Electronic Transaction System (ETS) project to make standard publications and forms accessible Air Force-wide through a central Web site. The ETS project includes a significant BPR initiative to change many publications and forms to an electronic format. ETS will provide for storage, indexing, viewing, searching, ordering, printing, and distribution capabilities through one master catalog and database for the Air Force electronic and physical product inventory. ETS will be fielded at all Air Force bases by the end of 1999. The next phase will involve the addition of classified materials and is anticipated for completion during the summer of 2000, pending Air Force and DoD decisions related to data security.

- *Electronic legal and ethical advice.* The AFMC legal office also has designed a Web site that provides information on legal and ethical issues to help individuals and counselors. Information on conflicts of interest, post-government employment, financial disclosure, and acceptance of gifts is now on-line. As a result, the office no longer has to produce enormous amounts of printed materials for distribution. In addition, interested persons no longer have to visit the law office for pamphlets, point papers, training materials, and similar items.

- *Electronic training.* The Education and Training Division of AFMC has the Education and Training Management System, known as ETMS Web. It is designed to aid in the identification of training requirements and management of training resources and classes. ETMS Web continues to grow as users demand more enhancements. For example, the Individual Development Plan module allows supervisors to create an employee record that includes desired training courses, status of requests, and short- and long-term goals.

TECHNOLOGY-ORIENTED INITIATIVES

Several JECPO initiatives are developing enablers to EB/EC that are related to application development and information processing, transfer, and security. They are described in the following subsections.

Application Development

Two pillars of DoD EB/EC implementation are (1) *electronic interoperability* within the DoD enterprise and between DoD and its Federal and private-sector business partners[11]; and (2) *use of commercial applications and standards* (i.e., COTS or tailored COTS products).[12] JECPO established the following activities to assist customers in product evaluation:

- *COTS evaluation process.* This process was developed as a means for JECPO to assist functional areas in evaluating COTS products for supporting new or enhanced business requirements.
- *EC network monitoring.* This monitoring capability focuses on operational issues, such as end-to-end performance, transaction monitoring and tracking, fault correlation and filtering, provisioning, short-term and long-range planning, configuration management, and help desk functions.[13]

Information Processing, Transfer, and Security

Two additional pillars of EB/EC are (1) an infrastructure that maximizes the use of *commercial communication systems and commercial standards*[14], and (2) the establishment of *privacy and security measures* that instill trust and confidences in EB/EC processes.[15] The JECPO technical EB/EC architecture[16], which is incorporated into the GCSS-AF architecture, contains current and forecasted standards for information processing, transfer, and security (Table 3-2).

Table 3-2. JECPO Technical Standards for EB/EC

Current	Emerging (Goal: Flexible architecture)
Information processing standards	
Data management	Government EDI ICs
RDBMS—SQL	Industry EDI ICs
Data interchange	XML
EDI—FIPS 161-2: ANSI X12, UN/EDIFACT, HL7	Smart cards
Document—HTML, SGML	Workflow
Graphics—CGM, JPEG, GIF	STEP and PDML
Product Data—CAD/CAM	Business Object Document (BOD)

[11] Objective 1.1 of *DoD EB/EC Strategic Plan*.

[12] Objective 1.2 of *DoD EB/EC Strategic Plan*.

[13] The *DoD Joint Electronic Commerce Program Strategic Implementation Plan* has more information on these activities.

[14] Objective 1.3 of *DoD EB/EC Strategic Plan*.

[15] Objective 1.4 of *DoD EB/EC Strategic Plan*.

[16] See http://eblibrary.hq.dla.mil/ebecarch/dod_ebecarch.html for more information on the JECPO EB/EC architecture.

Table 3-2. JECPO Technical Standards for EB/EC (Continued)

Current	Emerging (Goal: Flexible architecture)
Information transfer standards	
Applications support	IPv6
E-mail—SMTP/MIME and MIME/EDI	Web-based push
File transfer—FTP	New EDIINT standards
Directory/directory access—X.500, LDAP(v3)	SNMP v3
Naming—DNS	
World Wide Web	
HTTP—HTTP 1.1	
URL—URL/URI/mailto	
Transport—TCP	
Networking—IP	
Net/system management—SNMP, various MIBs	
Information system security standards	
Information processing security	IPsec to Transport Layer Security (TLS)
Protocols—X12.58	PKI Exchange (PKIX) Working Group standards
Passwords—FIPS 112	Smart cards
Information transfer security	Secure electronic transaction
Protocols—SSL, S/MIME, IPsec, EDIINT	
Sign/hash—DSS, MD5, SHS	
Encryption—DES/3DES, RC2, RC4, RC5	
Certificates—X.509v3; PKCS 1, 7, 9, 10, 11	

Note: ANSI = American National Standards Institute; CAD = computer-aided design; CAM = computer-aided manufacturing; CGM = Computer Graphics Metafile; DNS = Domain Name Server; EDIFACT = EDI for Administration, Commerce, and Transportation; EDIINT = EDI Internet; FTP = File Transfer Protocol; GIF = Graphics Interchange Format; HTML = Hypertext Markup Language; HTTP = Hypertext Transfer Protocol; IC = implementation convention; IP = Internet Protocol; MIB = Management Information Base; MIME = Multi-purpose Internet Mail Extension; PDML = Product Data Markup Language; SGML = Standard Generalized Markup Language; SMTP = Simple Mail Transfer Protocol; SNMP = Simple Network Management Protocol; SQL = Structured Query Language; SSL = secure socket layer; STEP = Standard for the Exchange of Product Model Data; UN = United Nations; URI = Universal Resource Identifier; URL = Uniform Resource Locator.

The specific roles and issues associated with the critical implications of security, PKI, and smart card technology are addressed in more detail in Chapter 5.

GCSS-AF

The concept of a Global Combat Support System (GCSS) stems from the need to provide the warfighters with a real-time integrated view of the entire spectrum of combat support throughout all phases of combat, from mobilization through redeployment. “GCSS is *not* a new application, a single system, nor a replacement for the Services or DoD agency systems. Instead, GCSS is a strategy for enhancing

combat support effectiveness through improved system interoperability of a myriad of currently disassociated and independent applications, systems, and data."[17]

GCSS-AF's genesis was in an Air Force program to modernize base-level information systems. Today its contribution toward achieving agile combat support, rapid global mobility, and information superiority is vital.

Joint Mission Needs Statement General Capabilities of GCSS

(1) *Information access.* Access to information enables the force provider to meet mission needs by providing accurate and timely data to mobilize and deploy trained and ready forces. The supported commander (e.g., Commander in Chief; Service component; Commander, Joint Task Force) needs to employ forces and sustain the fight. Finally, the warfighter must have the tools necessary to redeploy and regenerate the forces at any designated location worldwide. To meet these needs, each functional area of logistics, transportation, finance, health affairs (medical), personnel, and acquisition needs to have access to data and, through systems, applications, decision tools, and models, be able to transform the data into information. GCSS will give the warfighter, trainer, and analyst access to the data through one worldwide net and one focused picture of the extended battlespace from the combat support provider to the foxhole.

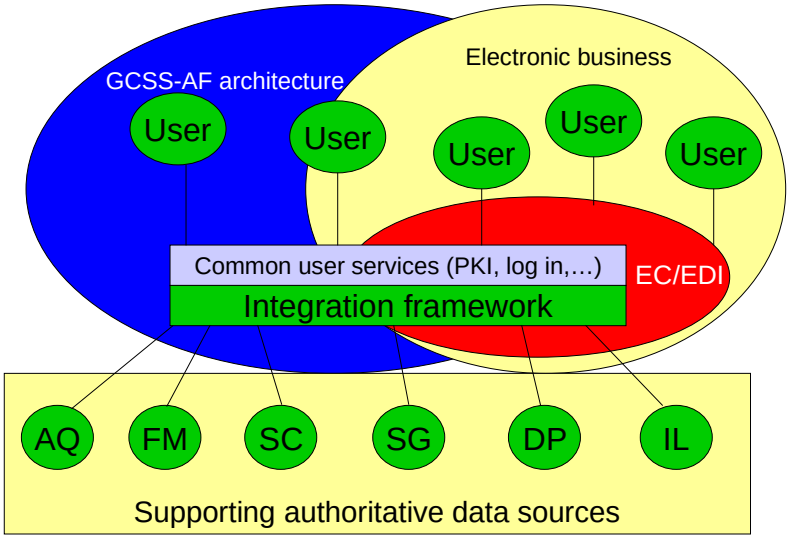
(2) *Technology insertion*. GCSS should include readiness status reporting on all force and sustainment supplies in-theater, in-transit, in-process, and in-storage; collaborative (combined) operations and planning; and simulated rehearsals of individual, unit, weapon equipment, and supply deployments. GCSS should provide automated tools that will assist in the planning the deployment, redeployment, reconstitution, and regeneration of forces.

(3) *Information integration*. The integration of information is the ability to access combat support data from across the spectrum of combat support systems, integrate and correlate the data, and present the data in a fashion suitable for efficient planning. This information must be obtained quickly to provide timely assistance to the joint force commander in planning and conducting operations.

In its report, the GCSS-AF Requirements Integration Tiger Team (GRITT) depicted the overlap between GCSS-AF and EB/EC in an illustration, which is Figure 3-5.

[17] Joint Chief of Staff, *Global Combat Support System, Concept Paper*, 1 May 1997, p. 4.

Figure 3-5. GRITT-Identified GCSS-AF and EB/EC Interdependencies



Note: AQ = Acquisition; DP = Personnel; FM = Financial Management; IL = Installations and Logistics; SC = Systems and Computers; SG = Surgeon General.

The GRITT reviewed the current situation and identified factors limiting the implementation of the GCSS-AF concept. To overcome the factors, they proposed a strong champion (i.e., the Air Force CIO) and streamlined acquisition management so the Air Force can use technology to create an environment of shared combat support, business processes, and information. The resultant environment would ensure that agile combat support becomes a reality in the Air Force.

ELECTRONIC RECORDS MANAGEMENT

Public law and Federal Government policy specify the requirements for retention and management of information as the basis for supporting the conduct of business. The adoption of an EB methodology necessitates a transition from a paper based to an electronic records management environment. Although electronic records management (ERM) spans all data management realms, it is significant to EB/EC implementation because of its impact on automated business functions, business rule determinations, application and data base design, record-keeping requirements, and overall information management development.

ERM requirements will be met through the implementation of an ERM system (ERMS). An ERMS provides for the storage, retrieval, and disposal of records based on an approved disposition schedule. The Assistant Secretary of Defense for Command, Control, Communications and Intelligence established FY03 as the goal for department-wide implementation of an ERMS. DoD 5015.2-STD, *Design Criteria Standard for Electronic Records Management Software Applications*, outlines the functional requirements and procedural guidance required for all records management systems.

The migration to a digital information environment throughout DoD will align business practices to mission needs. The ERMS will support this work through the use of a records management application (RMA) and database management system (DBMS). The ERMS will also provide a methodology for automating most aspects of document processing, including sharing, access control, and archiving of official records. The Air Force will employ a hierarchical storage management methodology that will provide for the automatic movement of records from a network storage device to a slower, higher volume storage media.

In December 1999 the Configuration Control Board for the Joint Technical Architecture–Air Force (JTA-AF) approved a standard electronic records management software for Air Force use. PS Software RIMS Studio Version 7.1 is the Air Force recommended ERMS software.

Appendix C has additional information on ERM.[18]

EB/EC INFRASTRUCTURE INTEGRATION

The Air Force infrastructure can be categorized as the following major subsystems:

- Defense Information Infrastructure (DII), the "outside the gate" portion, which provides long-haul communications services
- Base Information Infrastructure, which provides data communication services to on-base customers, including connectivity to the base metropolitan area network
- The "last 400 feet," which provides connectivity from the metropolitan area network to the user terminal
- Information appliance, which is the user interface to the DII.[19]

In many cases, existing Air Force information transport systems cannot support the requirements for conveying integrated voice, data, video, imagery, and sensor information streams.[20] However, the successful implementation of EB/EC initiatives requires the fundamental assurance that information exchange demands can be met by the supporting infrastructure. GCSS-AF will not build a new communications infrastructure but will use the Air Force Global Grid architecture that allows access to information regardless of user location.

[18] Appendix C was prepared by the Air Force Communications Agency, Information Services Branch (AFCA/GOR).

[19] GCSS-AF Requirements Integration Tiger Team, *The Way Ahead*, report prepared for the Air Force CIO, Annex K, 31 August 1999.

[20] Ibid.

Infrastructure planning and continuous refinement of communications and information support requirements will significantly increase the probability of effective fielding of systems. This is accomplished, in part, by following the C4 and Intelligence Support Plan (C4ISP) and by obtaining Certificates of Networthiness and Certificates to Operate. Successful, wide-scale EB/EC implementation in the Air Force depends on the ability of

- functional managers to identify and coordinate shared data requirements supporting vertical and cross-vertical domains;
- functional managers to convey requirements that must be met by the infrastructure;
- infrastructure managers to ensure available capacity on the infrastructure and provide secure and reliable exchange of information; and
- technology managers to design and develop an architecture that will serve the open exchange of all support requirements.

The overall process is dynamic and will evolve substantially as technology capabilities increase and business processes are refined. Therefore, an open and integrated approach to development and design between the functional and technical business areas needs to remain a priority in infrastructure management and development efforts. This issue is discussed further in Chapters 4 and 6.

SUMMARY

This chapter lists major Federal, DoD, and Air Force EB/EC initiatives and reflects their relationships to the supporting infrastructure. It is not a complete list of all Federal, DoD, and Air Force EB/EC initiatives. This plan (Chapter 6) also has an action item for the GCSS-AF Directorate to maintain a list of Air Force EB/EC initiatives.

Chapter 4
EB Architectural Impacts

For the Air Force to achieve its goal of efficient and secure end-to-end exchange of digital information and realize the full potential of EB, each organizational element needs to communicate its requirements and initiatives clearly. This effort requires an appropriate management structure to communicate, institutionalize, and propagate EB solutions throughout the Air Force. To accomplish this effort effectively, an understanding is needed of the effect that EB process and technology enablers have within the context of the GCSS-AF architecture and the supporting infrastructure of the Air Force Global Grid.

Technology advances and process changes have had dramatic effects on the conduct of business. Perhaps the most relevant example is the Internet browser, which fundamentally changed the business landscape quickly. This EB technology and process enabler facilitates the rapid, cost-effective dissemination of information.

In this chapter we discuss how EB processes and IT enablers affect the GCSS-AF architecture. Next we discuss the architectural umbrella provided by GCSS-AF, with its supporting infrastructure, its relationship to EB, and the need to support current technologies. We then offer the outline of a methodology and discuss tools and technology that can facilitate the rapid identification of reusable components.[1] This framework[2] is intended to supplement and enhance the GCSS-AF architecture by providing a mechanism to select, prioritize, and expand components that have vertical and cross-functional domain applicability. The chapter concludes with a brief discussion of transitional architecture issues.

ARCHITECTURAL RELATIONSHIP

A key technology recommendation in *The Way Ahead* is to "accelerate initiatives seeking to exploit new technologies."[3] To accomplish this recommendation effectively and ensure strategic interoperability with the other Services, the Command,

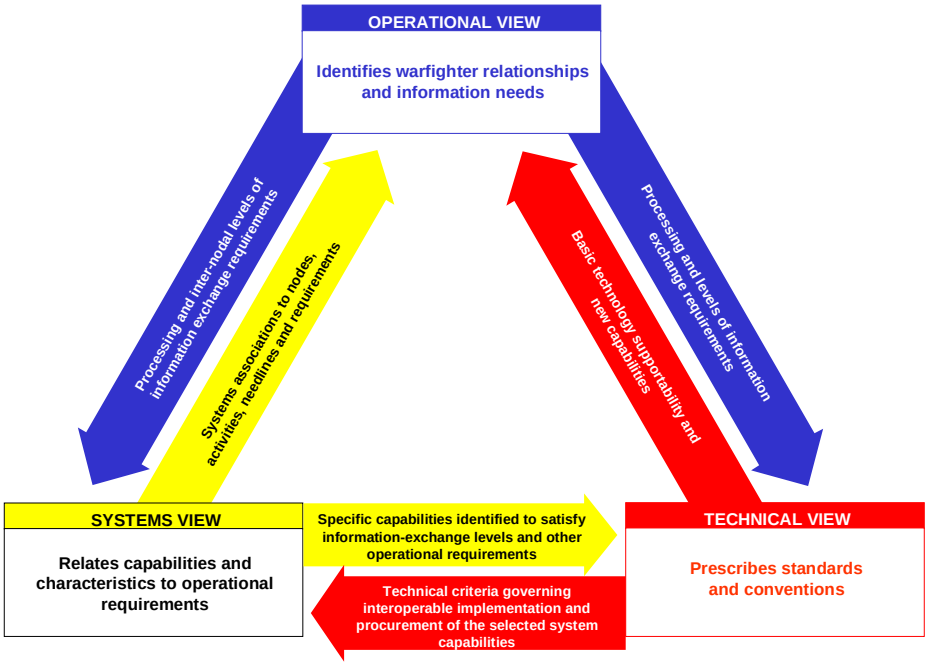
[1] A reusable component is defined as any entity that can be used in several programs and any standard, reusable, previously implemented unit that is used to enhance the programming language constructs and develop applications. Source: Donald G. Firesmith and Edward M. Eykholt, *Dictionary of Object Technology,* SIGS Books, Inc., 1995.

[2] A framework is defined as any large reusable, generic specification, design, code, and test pattern of part of an application, consisting primarily of classes that implement common capabilities. Source: Donald G. Firesmith and Edward M. Eykholt, *Dictionary of Object Technology,* SIGS Books, Inc., 1995.

[3] GCSS-AF Requirements Integration Tiger Team, *The Way Ahead*, report prepared for the Air Force CIO, 31 August 1999.

Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) architecture provides a benchmark that can be adapted and extended to provide a comprehensive GCSS-AF framework (Figure 4-1). To institutionalize EB/EC as a key element in GCSS-AF, it must be embedded into the GCSS-AF architectural framework. GCSS-AF is based on DoD GCSS, which is a collection of support systems built on the DII Common Operating Environment (COE) and is interoperable with the Joint Technical Architecture (JTA).

Figure 4-1. C4ISR Framework



The integration into the architectural views depicted in Figure 4-1[4] can be achieved by using the architecture as a basis for documenting the views. This will ensure consistency in approach and the ability to incorporate and institutionalize appropriate solutions. Table 4-1 discusses the architectural views and the potential EB influences on them.

[4] Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Architecture Working Group, *Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Architecture Framework*, Version 2.0, 18 December 1997.

Table 4-1. EB Influences on Architecture

Architectural view	EB influence
Operation A description of the tasks and activities, operational elements, and information flows required for accomplishing or supporting a military operation	EB process enablers are components of the operational view, and they can be specific to a functional area or cross-functional (e.g., process elimination or organizational realignment caused by BPR).
Systems A description, including graphics, of systems and interconnections providing for, or supporting, warfighting functions	EB technology enablers are components of the systems view as they relate to the technology supporting functional processes in the Air Force.
Technical A limited set of rules governing the arrangement, interaction, and interdependence of system parts or elements; the purpose is to ensure that a conformant system satisfies a set of requirements	Existing and emerging standards affect EB, and those that may be candidates for widespread adoption belong in the technical view.

Chapter 3 describes the growing number of EB initiatives internal and external to the Air Force. A framework for analysis, assimilation, and institutionalization is required to manage this wave of technology and process solutions effectively. The GCSS-AF architecture provides this framework.

GCSS-AF ARCHITECTURAL FRAMEWORK

To accommodate the information needs of the AEF of the future, the Air Force has initiated the implementation of a dynamic and flexible architecture. This implementation includes the iterative migration to an architecture that is component-centric[5] and standards-based. As previously indicated, GCSS-AF will not deploy a new communications infrastructure, but will use the existing Air Force Global Grid Architecture using new and existing resources.

From the DoD perspective, "GCSS is a strategy for enhancing combat support effectiveness through improved system interoperability of a myriad of currently disassociated and independent applications, systems, and data."[6] The GCSS-AF architecture recognizes the need to accommodate a variety of technologies used in the EB/EC environment. An example is the continued implementation and extension of EDI to support EB/EC in the Air Force. As this and other

[5] In this context the term "component-centric" applies to the concept of developing an architecture focusing principally on the use of components (e.g., standard, reusable, units used to enhance the programming language constructs and develop applications). Initially, this effort could take the form of BODs, eventually transitioning to a more advanced form of object technology.

[6] Joint Chiefs of Staff, *Global Combat Support System Concept Paper*, Version 1, May 1, 1997, p. 4.

technologies continue to evolve and change, they will be assessed continually for how they fit in the GCSS-AF framework.

Strategic Goals

To provide the technology and flexibility to modernize the agile combat support domain in the Air Force, the GCSS-AF architects focused on the desired end-state to develop the goals in Table 4-2.

Table 4-2. GCSS-AF Architecture Goals

Strategic goal	Objective
Improve day-to-day support operations Merge the operational and support domains into a single command and control environment	Insert robust technology Reduce redundant software functions Improve security Reduce costs (while enabling faster response) and increase reliability

Design Goals

The design approach of the GSCC-AF architecture is based on the use and reuse of components. This component-based approach allows the Air Force to achieve the design goals and objectives in Table 4-3.

Table 4-3. GCSS-AF Design Goals

Design goal	Design objective
Enable an incremental evolution of the enterprise architecture versus a revolution	A standards-based migration to a cohesive architecture Integration of legacy systems with minimal or no modifications Modernization of already integrated legacy systems without impacting their current interfaces Migration of legacy systems as opportunities present themselves
Facilitate business component development	Allow developers to focus on business logic Minimize development time Simplify integration Reuse fielded capabilities

Table 4-3. GCSS-AF Design Goals (Continued)

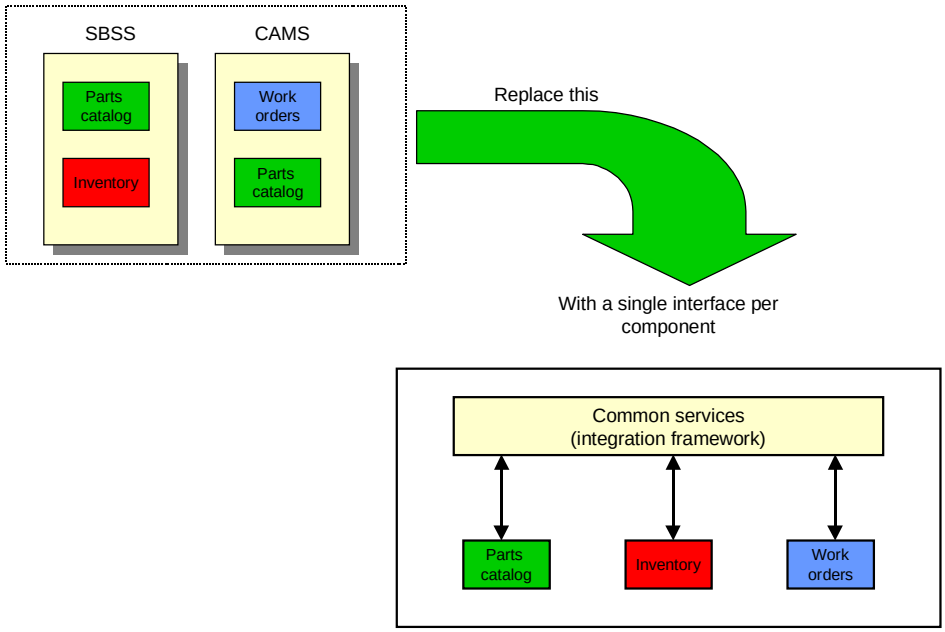
Design goal	Design objective
Achieve scalability, extensibility, supportability, and ability to modify	Scale to Air Force enterprise operation Extend components without impact to other components Ability to redefine application applicability to "localities" (e.g., bases) dynamically Replace integration components without impacting business components Minimize impact of data schema changes on application Make data accessible within and outside of domains
Maximize use of the existing infrastructure	Achieve platform independence and language independence for systems in GCSS Support centralized or distributed servers

Implementation Approach

The key for addressing the strategy and design goals of GCSS-AF to migrate to a component-based architecture is the development of an integration framework (IF). The IF is an architectural philosophy that enables GCSS-AF to provide common services[7] and communication with rules to enforce the discipline required to support the information-sharing needs of the Air Force. The role of the IF is to provide common services that enable sharing and reuse of components. This component architecture concept is illustrated in Figure 4-2. The goals and objectives of the IF using this approach are listed in Table 4-4. Common services (i.e., selected service functions provided through the Common Object Request Broker Architecture [CORBA]) and information exchange relative to the architecture (i.e., the use of message-oriented middleware [MOM] as the transport mechanism and BODs as the content-based component) are discussed after Table 4-4. In this way the Air Force leverages the strengths of each aspect of the IF rather than relying on a single approach.

[7] Service is defined as any behavior provided by a given part of a system. Source: Donald G. Firesmith and Edward M. Eykholt, *Dictionary of Object Technology,* SIGS Books, Inc., 1995.

Figure 4-2. Component Architecture



Note: CAMS = Core Automated Maintenance System; SBSS = Standard Base-Level Supply System.

Table 4-4. GCSS-AF IF Philosophy

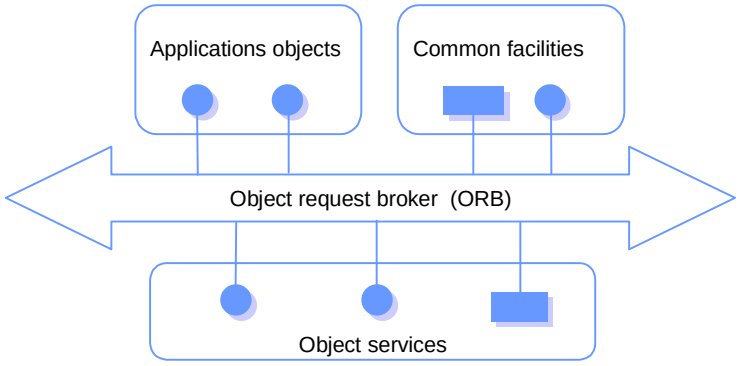
IF goal	Implementation objectives
Use component-based common object request broker architecture framework and applications Specify and develop for today and tomorrow Follow commercial best practices, architectural standards, and use of COTS	Provide Web browser access Have standard approved security services Use modern data transfer services Provide enterprise directory services Support integration of legacy systems and achieve migration gradually

COMMON OBJECT REQUEST BROKER ARCHITECTURE

To support common services required by the IF, the GCSS-AF architects have selected several enabling technologies. Standard services (e.g., event service, transaction, and time) will be provided by CORBA. The CORBA object management architecture (Figure 4-3) establishes a point-to-point connection between the object reference in one process and the actual object implementation in another process. An object reference contains the host and port number where the object implementation resides. This results in one network connection between a client process holding the object reference and the server process holding the object implementation. This network connection is a limited resource because if a

host is removed from the network, the server object cannot be migrated to another host without informing all clients that currently hold object references.

Figure 4-3. CORBA Object Management Architecture



MESSAGE-ORIENTED MIDDLEWARE

MOM augments the IF by providing an interface via messages rather than direct call methods as required by CORBA. MOM is primarily a middleware that facilitates communication between distributed applications. MOM sends a message from one application to another using a queue as an interim step. Messages are sent to a queue and remain in it until they are retrieved by the server application. The advantage to this approach is that the server application does not need to be available when the message is sent; instead the server can retrieve the message at any time. This approach can be compared to person-to-person communication via e-mail. A person can send an e-mail with a high priority to one or several recipients. The recipients of the message do not have to be on-line to receive the message. They retrieve their messages when they log into their e-mail service. When they log in, they may chose to read this message before all other messages since it was sent with a high priority.

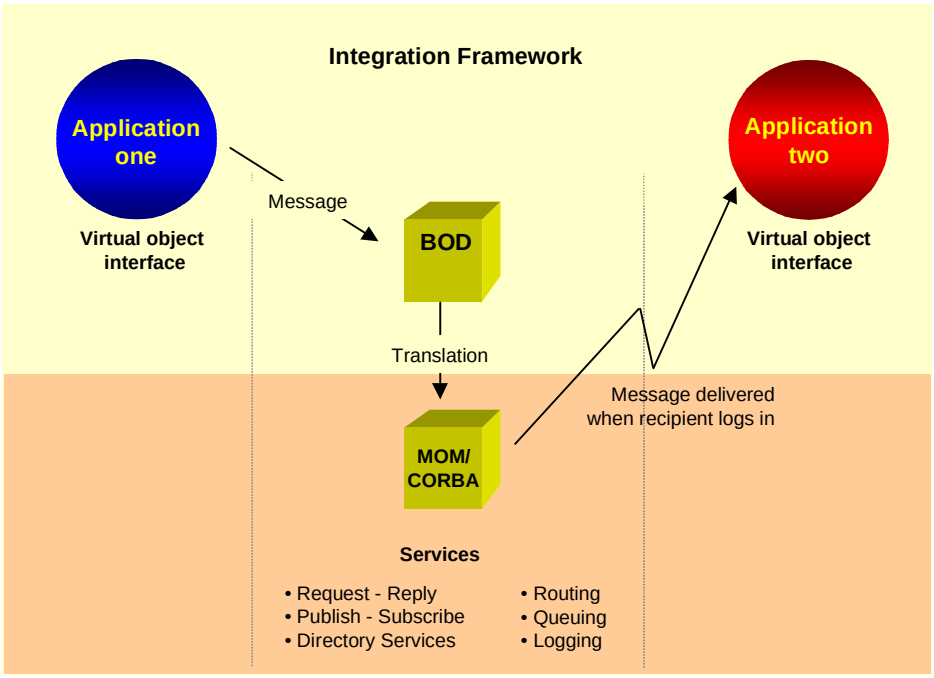
BUSINESS OBJECT DOCUMENT

While CORBA and MOM are the service and transport respectively, GCSS-AF will use BOD as a content-based, virtual business object model to enterprise business application interoperability. This interoperability is achieved without the requirement to implement a software application in a specific object-oriented technology. The BOD was developed by the Open Applications Group, Inc., whose members consist of leading enterprise software vendors. The members' vision was to improve software integration and reduce costs dramatically, while increasing the agility of organizations to react to changing business needs.

The BOD is not an object. It is an application architecture that carries out the requested business event. For two or more components to be linked, events and services are communicated through the IF (Figure 4-4). The IF provides services,

such as publish and subscribe, request and reply, transport mechanisms, data mapping tools, integration routing, and logging capabilities. This capability can be compared to providing automatic translation services between English and French with the IF services in MOM and CORBA providing delivery of the translation.

Figure 4-4. GCSS-AF Integration Framework



ENABLING TECHNOLOGIES FOR MESSAGE-BASED ARCHITECTURES

Current enabling technologies for message-based architectures include message queuing middleware and CORBA, which are integral to the IF. They can be enhanced by the use of XML. XML is a meta-language using tags to define data (i.e., a markup language using a portable format readable by computers and people). In combination with message broker technology, XML serves as a standard format for transmitting packages of data. Message queuing middleware further enables this process by adding program-to-program communication. Programs within a single application or within separate applications communicate by writing and reading messages to and from queues. The middleware enables the design and implementation of advanced application architectures as part of an enterprise architecture framework. CORBA is an enabling technology for developing distributed object systems on heterogeneous platforms. When combined, these technologies offer a powerful way to integrate application architectures and applications.

EB ARCHITECTURAL ANALYSIS PHILOSOPHY

To be useful to the Air Force, EB enablers and solutions need to be documented and disseminated consistently. Although this need is very evident, EB is a relatively new concept. The impacts that its implementation will have on an organization are not easily predictable. As EB initiatives continue to be implemented, common business areas and components, which cross functional domains and provide an opportunity for reuse, will be identified. The dynamic nature of technology and the complexity of the functional domains it supports often cause a lag or gap in information dissemination. To enable the evolution of EB/EC, the vertical functional domains should specialize to deal with their uniqueness, but they also need to leverage the cross-functional dimensions to achieve network and community benefits.

Composite Architecture Approach

The composite approach focuses on creating cross-domain functionality by specifying external interfaces. The approach is concerned with a systematic practice for reuse activities and enterprise component development. Component architectures require careful identification of end products, components, component interrelationships, and policy for delegation of responsibility and security. Developing a new component, or assembling one from reusable components, calls for rich interface specifications and mutual obligations among Air Force organizational domains. The composite architecture approach is compatible with the GCSS-AF IF guidelines and is concerned with the following:

- Defining a cross-functional architecture
- Standardizing and streamlining data sharing and access
- Using common services (e.g., security, data transfer)
- Supporting rules on how to access data and functionality.

It is assumed that a C4ISR operational architecture analysis will be synthesized for the cross-functional GCSS-AF architecture. A composite architecture is the combination of two or more viewpoints of a component or architectural view. If key architectural components (e.g., external interfaces) can be identified and architectural patterns recognized, unknown portions of the architecture can be inferred. This approach takes into account the vertical domain's application interfaces to functional domains and their cross-domain usability. This approach is accomplished by applying the C4ISR framework with the combined viewpoint of the following:

- *Vertical functional domain architectures*—simply the architecture describing each Air Force functional domain (e.g., acquisition, personnel, and medical)

- *Cross-functional domain architectures*—the bridge between the functional user requirements and the vertical functional domains (e.g., request for supply, paying a vendor).

UNIFIED MODELING LANGUAGE—A TOOL

The consolidation and merging of several popular object-oriented modeling methods has resulted in the unified modeling language (UML). The UML is the emerging dominant standard notation for object-oriented analysis and design of systems. The Object Management Group (OMG) has adopted this language as the standard object-oriented notation and meta-model.

A significant benefit of UML is that it was designed to be independent of the analysis and design method used. Within UML, use case diagrams communicate top-level interfaces and dependencies and also provide a means of being domain-specific. The use case diagrams enable the modeler to begin with a business-level analysis of the scenarios of system components. Each use case diagram describes a scenario and the sequence of activities and interactions (e.g., sequence diagrams and activity diagrams that result in a process diagram and its narrative). At a later phase, architects can "expand" the work to develop class (e.g., object) diagrams that can be used to provide reusable components that cut across functions.

Although object-oriented techniques are used to describe an architecture, the resultant system need not be constructed exclusively with object-oriented constructs. An object-oriented architecture provides a technical architecture that is vertically specific to a functional domain.

Architecture Development Methodology

The following steps document the scope of an architecture development methodology:

- Select a high-impact function from each architecture domain—medical, personnel, logistics, acquisition, financial, and contracting.
- Use real use cases (e.g., human interaction, organization and systems interaction) to capture operational views of the current systems that is called the "as is" architecture. For example, architects are concerned with the following:
  - ➤ Business operations environment
  - ➤ Connections to stakeholders and customers
  - ➤ Interfaces to complete transactions
  - ➤ Management of reference data

- ➤ Management of transaction data
- ➤ Recording transactions.

◆ These concerns are expressed in essential use cases to distill the abstract conceptual view that is called the "to be" for an enterprise architecture. Meanwhile, architects are also concerned with ranking for decision-making elements that are

- ➤ evident to a user and are performed,
- ➤ hidden or transparent to a user, and
- ➤ frill (i.e., optional).

These steps are a means to capture customers, providers, and goals and note decisions and alternatives for a high-level architecture vision. Later architects can "expand" selected use cases to provide reusable components that cut across functions. For the implementation architecture, libraries can be assembled from business rules and reusable components that are developed from expansions of the high-impact use cases and managed as a service of the interim GCSS-AF architecture.

Reengineering Example

The following example of a vertical function domain architecture describes a problem, the current architecture, and the target architecture. Additional examples and a discussion of vertical and cross-functional architectures can be found in Appendix D.

VERTICAL DOMAIN: HEALTH CARE SYSTEMS

Public Law 105-85 requires the Secretary of Defense to establish a system to assess the medical condition of members of the Armed Forces deployed outside the United States as part of contingency plans and combat operations.

PROBLEM

To achieve end-to-end supply chain management from a customer perspective, an infrastructure is needed to support EB/EC. If medical providers had confidence that the inpatient and outpatient data from a theater were accurate, many more medical records and diagnostic reports would be available automatically today. In fact, Web-based technology to monitor and track data quality is a priority of the Air Force Office of the Medical Surgeon General. Web-based technology could be a reuse component for GCSS-AF, especially for logistics, as well as the military health services for patient care, billing and administration, and executive information reporting systems in theater, supply, and sustainment implementation architectures.

CURRENT ARCHITECTURE: "AS IS"

The current architecture consists of stand-alone applications that are candidates for TMIP integration. The following six applications are from other agencies:

- Defense Blood Standard System (from the Army)
- Radiation Exposure/Occupational Health Module
- Medical Reference Component
- Patient Encounter Module (a joint tool being modified for TMIP)
- Medical Analysis Tool
- Composite Health Care System NT (from Joint Services).

A use case for the current system would show each of the previous stovepipe applications as stand-alone components, often serving the same organizations and people, but lacking automated interfaces. In the concept for reuse, various roles (e.g., patient, provider, and medical logistician) will have access through TMIP.

TARGET ARCHITECTURE: THEATER MEDICAL INFORMATION PROGRAM

An overarching future requirement of TMIP is to link the integrated and improved Medical Surgeon General applications under the TMIP umbrella and interface them with legacy medical logistics applications integrated in the DMLSS system. An example is the Prime Vendor program that saves money formerly tied up in inventory. Prime Vendor supports a direct on-line link to vendors. Each hospital or clinic buys pharmaceuticals and medical and surgical supplies through direct on-line transaction, instead of contacting the central warehouse in Philadelphia, PA.

Business cycle times are shortening (medical providers see a patient every 15 minutes), and this increase in time requirements often exceeds IT capabilities. Of significance, in the next 2 to 3 years, storage and access for a life-long history of medical records (longitudinal patient record) to meet the data required for analysis and trending will begin to emerge. Trending from longitudinal records is essential to answer questions (such as, What caused the Gulf War syndrome?) and will be provided by the Composite Health Care System that jointly integrates a computer-based patient record system. Complex, cross-organizational unit analysis is unavailable now because current medical histories are paper-based.

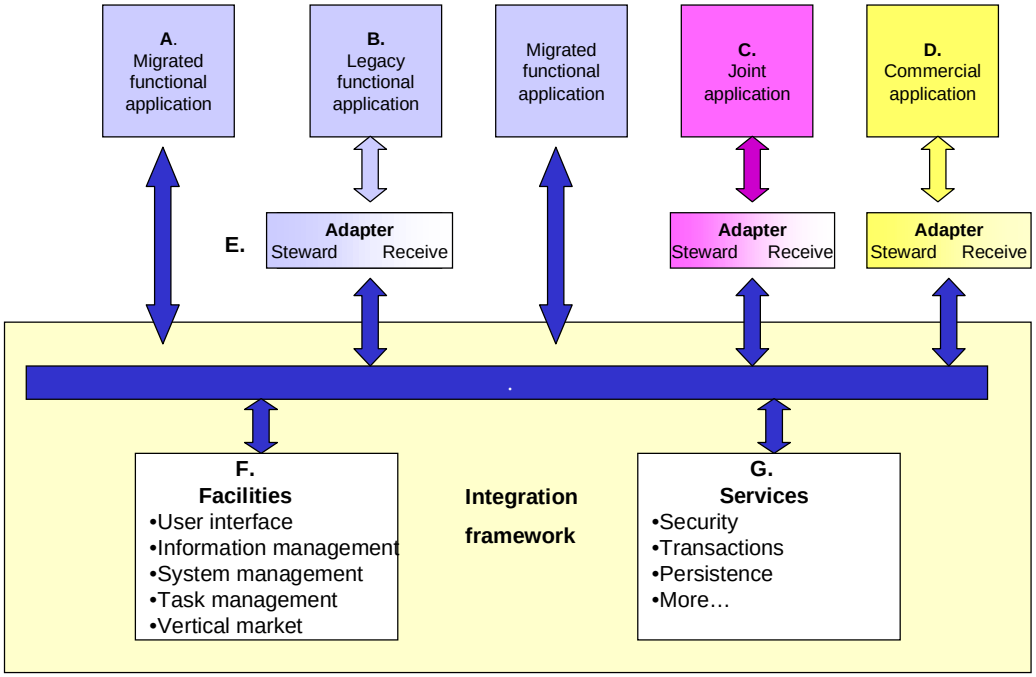
TMIP's Air Force vision is similar; the vision is a computerized patient record that contains all information and is available to the theater Air Force medical units. Whether it is a dog tag, smart card, or flash card, an acquisition "flyoff" will select a single device from field tests.

LEGACY SYSTEM TRANSITIONAL ARCHITECTURE

Applications are not built in isolation. Legacy applications cannot simply be ported. Reuse opportunities need to consider all interfaces. Overall, a more adaptive approach is to port data for EB legacy integration and extract common business rules for enterprise sharing. This transition must support a range of legacy systems until commonality of environments and architectures is achieved. The continuum of legacy systems support is imperative to ensure interoperability between trading partners. The GCSS-AF architecture approach proposed supports shared business rules, common interfaces, and new components added as mobile agents (e.g., for rate solicitation, financial portfolios for trading partners, transportation routing and rating, prime vendor purchase order, backorder status tracking, traffic movement guarantees, and performance measurement).

The near-term enterprise-level transitional architectural concept (Figure 4-5) shows how the IF can be used to migrate existing legacy systems. This approach leverages the significant and on-going investment by GCSS-AF.

Figure 4-5. Transitional Architecture Use of GCSS-AF IF



- The GCSS-AF architecture components will, for the foreseeable future, take a variety of forms. They range from fully modern applications comprised of components that are based on Internet technologies, such as Web browser clients (A), to existing Air Force legacy functional systems (B), to Joint standard systems (C), and to commercial applications (D) that can be configured to support Air Force mission requirements.

- The IF is comprised of modern enterprise quality commercial infrastructure software (e.g., middleware supporting an “any-to-any” mapping and dynamic updating capability) that enables more effective interaction of functional information systems by establishing a robust open system information bus. The IF capabilities are made available to the entire combat support domain equally. The infrastructure capabilities provided via the IF have a high degree of generic applicability to all information systems, such as security. For example, all information systems need to limit access to information to only authorized individuals. Implementing that security goal as a service component in the IF for all functional systems provides a consistent and cost-effective solution.

  - IF services and facilities will be made available to functional systems through Application Program Interfaces (APIs) based on open commercial standards. These APIs will connect functional applications to the GCSS-AF information bus (e.g., message brokers and middleware COTS). Functional systems constructed using similar Internet technologies will be able to integrate directly to the IF, while legacy systems or systems with dissimilar technologies will require an interface component (E). This interface component will expose the data the functional system has stewardship for to the information bus, and will supply the data the functional system needs from the rest of the combat support domain.

  - Based on Internet technologies, the infrastructure facilities (F) and services (G) include capabilities to implement or manage a broad range of application characteristics and essential capabilities.

  - For a data stewardship/receiver group, a facility would be a directory that uses mission application metadata to locate components or methods and execute object calls to those components. For example, the on-line metadata only supports the business processing of the mission applications. It drives the object environment. The off-line engineering repository (i.e., warehouse) supports the engineering development and life cycle management of the environment. Predefining data access also supports defining access permissions and will be increasingly critical as the GCSS-AF lead agency determines classifications for aggregated data.

The GCSS-AF architecture, comprised of the IF and the Application Framework, offers a very powerful approach for maximizing the goals of EB/EC. By designing systems to use the IF’s information bus or designing interface components to integrate systems, mission applications can exchange information securely between one another. At the same time they can also make more data available to meet the user needs. Transitional architectures will remain dynamic as the Air Force moves to object oriented formats and evaluates new technologies.

SUMMARY

To accelerate initiatives seeking to exploit new technologies and leverage the re-use of components, a framework for selection, documentation, and analysis is crucial. The composite architecture offers an approach that is consistent with the GCSS-AF architectural direction and is a complementary extension. The transitional architecture offers an orderly, controlled migration from the "as is" architectures with their legacy systems to the GCSS-AF "to be" architecture.

Chapter 5
Information Security

INTRODUCTION

The primary objective of information security as it relates to EB/EC is to identify the technical security standards that must be met to satisfy a specified level of security for a given business functionality. Information security considerations must address both personnel security as well as system security.

Air Force information protection architectures and policy comply fully with DoD policy. They continue to evolve as DoD policy is refined and technology matures. Although system security is critical, this chapter focuses primarily on issues associated with personnel security, with particular emphasis on PKI and smart cards, as they relate to EB/EC implementation.

General

Information security consists of measures to protect friendly information systems by preserving the availability, integrity, and confidentiality of the system and the information contained in the system. Protection includes communications security, computer security, and emission security. The Air Force will use standard information protection tools to safeguard computers and their connected equipment. An information protection architecture, as a component of GCSS-AF, will document those tools as well as the appropriate situations and configuration for their use. It will also deal with authentication requirements.

Information protection architectures are designed to protect information being exchanged by Air Force information systems. Software limitations reflect inherent risks because they are embedded within the environment where business is conducted. To deal with this risk, DoD is developing policy guidance for mobile code, categorization, and risk mitigation techniques that must be employed.[1] However, compliance must guarantee, from a technical perspective, interoperability between Air Force systems. It must also, from a functional

[1] Assistant Secretary of Defense (Command, Control, Communications, and Intelligence), Draft DoD Directive, *Mobile Code*, December 1999. Mobile code is defined as software modules obtained from remote systems, transferred across a network, and then downloaded and executed on a local system without explicit installation or imitation of execution by the recipient. Malicious code is defined as software modules designed, employed, distributed, or activated with the intention of compromising the performance or security of information systems and computers, increasing access to those systems, disclosing unauthorized information, corrupting information, denying service, or stealing resources.

perspective, permit the open exchange of information among business applications and trading partners.

Defense-Wide Information Assurance Program

The Department of Defense has established the Defense-Wide Information Assurance Program (DIAP). DIAP provides a common management framework and central oversight to protect the Defense Information Infrastructure (DII). A key tenet of DIAP is the recognition that information assurance is not only a technical issue, but a core factor in operational readiness.

No single solution ensures the protection of information and the associated information infrastructure. A variety of layered, defensive mechanisms and practices will be established to protect the required level of network security. Therefore, DoD has developed a "defense-in-depth strategy," which includes tools such as those provided by the National Security Agency and DISA to assess the robustness and security of networks (e.g., system monitoring, firewalls, routers) and utilizes multiple layers of physical and logical protection combined with intrusion detection systems that monitor each layer.[2]

The defense-in-depth strategy also includes "red teams," which are technically qualified groups who simulate cyber attacks against information systems, networks, and infrastructures to identify security vulnerabilities and help develop protections against future attacks. Finally, the defense-in-depth strategy includes a pilot program for authenticating digital signatures for electronic transactions using commercial technology.

PUBLIC KEY INFRASTRUCTURE

PKI is the combination of software, encryption technologies, and services that enable an enterprise to protect the security of its communications and business transactions in electronic media. PKI integrates digital certificates, public-key cryptography, and certificate authorities (CAs) into an enterprise network security architecture.

PKI supports five crucial services:

- *User identity.* Identify and authenticate the user.
- *Access control.* Identify and authenticate the user for the purposes of gaining remote access to electronic media by use of digital keys issued by a third party.

[2] Hamre, John, J., 21 December 1999 *Office of the Secretary of Defense (OSD) Network Security Policy*, Department of Defense, Washington, DC.

- *Information confidentiality.* Ensure that only the intended recipient has access to the information through encryption.
- *Information integrity.* Prove that transmitted information is unchanged by use of an "electronic fingerprint."
- *Non-repudiation.* Satisfy the legal requirements for user authenticity by using digital signature technologies.

PKI represents a more secure mechanism than ink on paper, is easily implementable, uses commercial technology, is user friendly, and is stealthy in use.

The expanding use of the Internet and EB/EC is requiring organizations in every field and industry to use PKI to build relationships founded on trust with employees, partners, and customers. With public key digital signatures, relying companies in any electronic transaction can verify authenticity among participants and ensure the electronic data transmissions retain integrity. Additionally, companies can use digital certificates to replace easily compromised IDs and passwords, enabling a secure "single log-in" that can also be a security barrier to hacking. Ultimately, PKI can allow trusted users to safely access sensitive data, such as financial, personnel, and medical records, and take advantage of e-mail authenticated.

Appendix E provides additional information on PKI and a commercial example of its application.

PKI Components

A typical enterprise's PKI encompasses the following:

- Issuance of digital certificates to individual users and servers
- End-user enrollment software
- Integration with corporate certificate directories
- Tools for managing, renewing, and revoking certificates
- Related services and support.

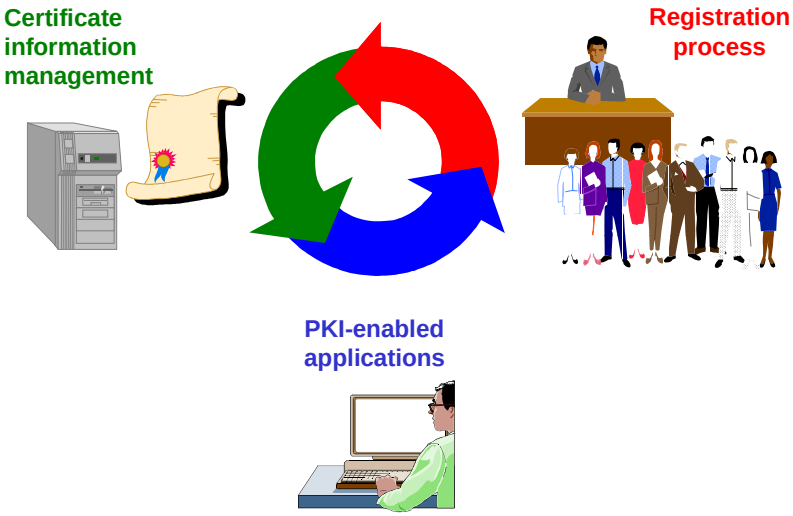
Figure 5-1 depicts the major components of PKI. Registration activities are responsible for assembling certificate requests and all appropriate information needed to issue a certificate. A registration official forwards this information to the appropriate CA.

A CA uses this information to create a public key certificate and sign it with the CA's private key. The CA is responsible for creating certificates, transmitting certificates to a public directory, and managing certificates. Additional certificate

management includes maintaining a publicly accessible Certificate Revocation List (CRL) and renewing user certificates.

Issuance of a public key certificate does not automatically permit access to a PKI-enabled application. Application managers must initiate an action to register authorized users to permit access to each application.

Figure 5-1. PKI Components



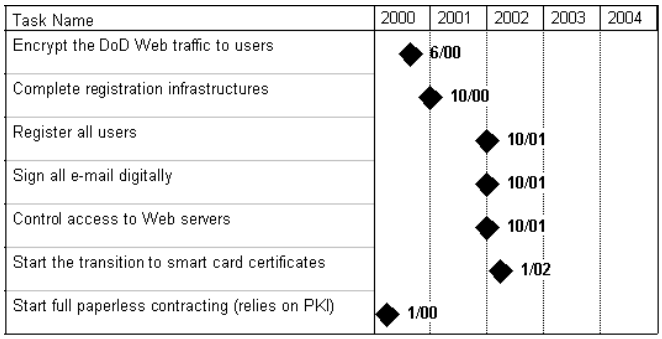
DoD Policies for PKI

DoD is committed to using public key technologies to further the objectives of the commercial community and DoD's military and business affairs. To accelerate the adoption of PKI technology, DoD has fielded a medium-assurance pilot and intends to transition the pilot initiative for full service across multiple application and classification domains.

For DoD EB/EC vendor interoperability and trust assurance, DoD has established an Interim External Certificate Authority (ECA) to provide validated and acceptable certificates recognized by the Defense Department. The Interim ECAs should change to full ECAs during early 2000.

Figure 5-2 provides the DoD timeline for key PKI activity.

Figure 5-2. DoD PKI Timeline (Fiscal Years)



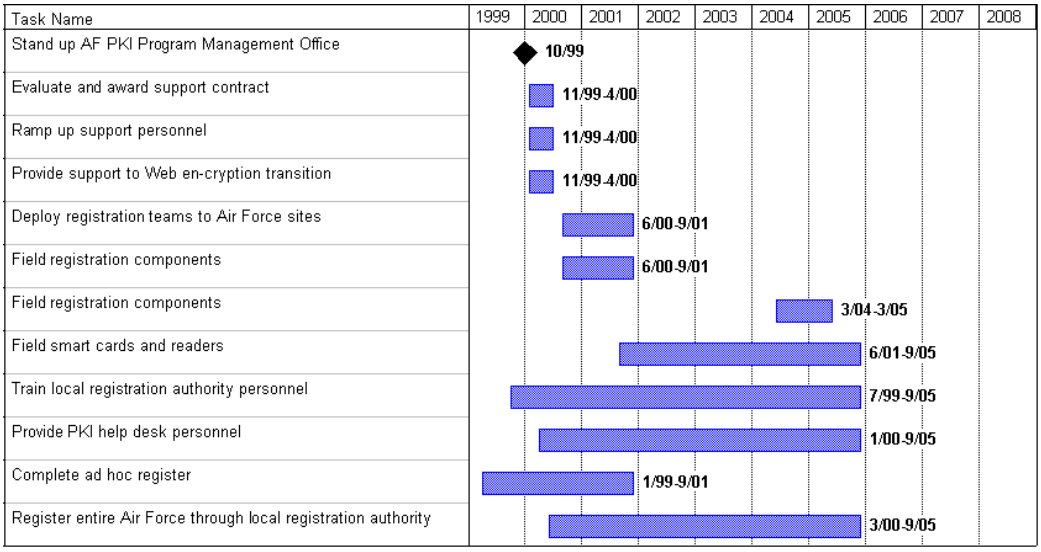
Air Force PKI Strategy

The immediate Air Force objective is to employ PKI to sign any electronic contract document and provide the vendor the ability to verify the "signature." Air Force plans address the three major components of PKI (i.e., management, registration, and PKI-enabled applications).[3]

The Air Force deployment schedule for PKI meets the DoD timeline for initiation of PKI utilization. In addition to the PKI user registration schedule, all Air Force internal Web servers must have SSL encryption by June 2000. Moreover, by October 2001, all Air Force Web sites must perform access control by public key authentication.

The registration infrastructure is required to be in place at 108 bases, plus another 50 Air Force sites, by December 2000.

Figure 5-3. Air Force PKI Schedule (Fiscal Years)



[3] For additional PKI-related information, see the Air Force PKI Program Management Office Web site at http://www.kelly.af.mil/cpsg/directorates/zs/pki/default.htm.

Responsibility to identify the need for PKI digital signature and encryption capabilities resides with the "owner" of the system or data. Thus far, the Air Force has identified the following EB/EC applications that require public key capabilities:

- ABSS
- DCPDS
- Defense Message System (DMS)
- Defense Protective System (DPS)
- DTS
- EDA
- EPS
- GCSS-AF
- Information and Resource Support System (IRSS)
- WAWF.

SMART CARDS

Smart cards are portable devices, similar to the size of a credit card, which contain an integrated circuit chip, may contain one or more technologies used to store information related to an individual, and may be used in one or more applications. A smart card may contain updateable or static technologies, such as a magnetic stripe, bar code, digitized photo, and other printed information.

Smart cards will serve as the primary vehicle to store user public key certificates. Smart cards carrying certificates inherent in PKI offer an approach to trust in the virtual world that integrates the familiar card form with the computing capability to provide strong authentication to computers, networks, and the Internet. However, it also creates a security risk by virtue of its reliance on information and the pervasiveness of the smart card. To overcome this problem, a means of authenticating the user and the level of access must be employed to limit access to only authorized users.

From an EB/EC perspective, the smart card is seen as a key to reengineering and streamlining paper-based and labor-intensive business practices. The technologies available on the card serve as powerful enabling tools for decreasing infrastructure and increasing the flow of information and EB.

DoD Smart Card Strategy

Generally, the DoD intends to use smart cards for authentication and information retrieval from data stores, not exclusively as a data storage device. In DoD, smart cards will employ the use of public key technologies to authenticate a user. Appendix B identifies DoD policy for use of smart cards, in conjunction with PKI, in operational and business applications. The initial implementation of smart card technology will be as a common access card (i.e., standard identification card). It will also serve as DoD's primary platform for an authentication token. Department of Navy will take the lead in preparing a smart card Operational Requirements Document for submission not later than 31 January 2000. The Air Force CIO has designated the AF/SC as the organization to serve as its smart card office.[4]

Because of the recent nature of these DoD decisions, Navy is still developing its smart card strategy. The Air Force will coordinate all smart card strategy within the context of DoD guidance.

Air Force Smart Card Strategy

The Air Force considers the smart card to be one of several enabling tools available to support EB/EC implementation. The Air Force will apply smart card technology in concert with DoD standards and policy, leveraging and closely coordinating with the efforts in Air Force, other Services, DoD, federal agencies, and industry partners to enhance readiness and improve business processes throughout the enterprise. Smart cards will serve as the key hardware token in support of authentication, access control, and PKI strategies.

Current Air Force short-term objectives include:

- *Program management.* Assemble the necessary resources to manage the program.
- *Architecture.* Identify Air Force data requirements and determine the specific applications for implementation.
- *Applications.* Identify high-volume, quick-win uses; develop a business plan for future applications and implementations; integrate smart card and other technologies in business process reengineering initiatives; and enable smart card interfaces with existing and planned follow-on systems.
- *Communications.* Obtain the necessary endorsements from Air Force leadership and develop a plan for improving the understanding and acceptance of smart card usage among application users and customers.

[4] Deputy Secretary of Defense, *Smart Card Adoption and Implementation,* memorandum, 10 November 1999.

- *Training plan.* Establish and enhance the overall training infrastructure to incorporate smart card technology and make smart card information easily and widely available.

- *Infrastructure.* Support DoD initiatives for the issuance and management of card and certificate management, identify and support specific Air Force infrastructure requirements, and coordinate Air Force-wide implementations.

Long-term objectives are evolving. Current Air Force plans are to adopt smart cards to support identifying and authenticating personnel; granting access to data stores, buildings, and equipment; and digitally signing electronic documents.[5] Vision foresees Air Force use of the smart card as a means to hold other information about the user (e.g., Geneva Convention information, such as name, rank, and number; and blood group, vaccination data, and other medical information). However, the risks of exposing financial, privacy, and similar information in a combat environment are considered significant; therefore, the expansion of smart card use beyond authentication and access requirements may be limited for the foreseeable future.

The Air Force policy on the use of smart card technology is evolving in concert with DoD policy and implementation guidance, and full documentation will be provided as it is available.

SUMMARY

Information security plays a crucial role in overall successful GCSS-AF and EB/EC implementation. Integral to security are PKI and individual user smart cards. Development of each program's security architecture and application of security mechanisms remain a mutual responsibility of technical and functional organizations, and full interoperability among all users is a crucial requirement. This plan (Chapter 6) cites an action to coordinate EB/EC information security issues.

[5] For example, each PC will be equipped with a smart card reader, where the card is placed and retained while operating the PC. A complete transition from diskette-based to smart card-based PKI certificates is to be accomplished by FY03.

Chapter 6
Management Requirements

This chapter provides a comprehensive approach for implementing the Air Force EB/EC program. The critical success factors and management actions reflect the requirements to meet the dynamic information demands placed on Air Force functional areas through the adoption of improved business practices and use of technology advances in support of tomorrow's warfighter needs.

OVERVIEW

Critical EB/EC success factors can be classified into two categories—program management and technology management—that are defined as follows:

- *Program management*. This category consists of factors associated with managing the business aspects of the EB/EC program.
- *Technology management*. This category consists of factors that contribute to the management and adoption of technology in support of the business environment.

Each factor has short- and long-term perspectives that need to be documented with action items tailored to the Air Force EB/EC timeline and planning horizon. No factor is applicable in isolation. Most factors tend to blend across categories and should not be considered solely as either program or technology management oriented. Execution requires the thoughtful, coordinated consideration of all issues in reaching effective decisions and actions.

Table 6-1 summarizes the critical success factors and related action items to institutionalize EB/EC implementation in the Air Force.

Table 6-1. Critical Success Factors and Related Action Items

Critical success factor	Action items
EB/EC planning and oversight	Directives and guidance Consolidate EB/EC requirements Establish an EB/EC integration committee Advocate EB/EC integration in GCSS-AF Represent Air Force EB/EC Champion initiative integration Sponsor GCSS-AF Requirements Board

Table 6-1. Critical Success Factors and Related Action Items (Continued)

Critical success factor	Action items
Military Service and agency plans	Apply DoD guiding principles Track, maintain, and publish schedules
Program funding requirements	Champion the common method for communicating business process requirements Develop guidance for an Air Force EB/EC pilot project initiative Obtain, catalog, track, and report funding profiles
Process methodology	Champion a common method for communicating common business process requirements Develop guidance for EB/EC project initiatives
Program outreach	Promote awareness and understanding Publicize Air Force EB/EC initiatives Provide incentives for EB/EC implementation
Architecture	Insert EB/EC into GCSS-AF and other architectures Advocate open GCSS-AF architecture Determine network control requirements
Technology determination	Develop EB/EC doctrine Corporately manage technical resources Advocate technology configuration management Identify interface responsibility Advocate electronic records management Advocate adequate communications infrastructure
Data quality	Participate in data quality initiatives Disseminate data quality policies and guidelines.
Security	Coordinate EB/EC information security policy recommendations Ensure EB/EC security requirements are incorporated into programs
COTS and GOTS	Champion the analysis and use of COTS and government off-the-shelf (GOTS)
Performance measurement	Develop balanced scorecard-based performance metrics

DISCUSSION OF CRITICAL SUCCESS FACTORS

EB/EC Planning and Oversight

As part of the GCSS-AF initiative, EB/EC will be an integral part of GCSS-AF implementation to avoid conflicting lines of responsibility and authority. The lead agency will not usurp the responsibilities of cognizant functional organizations. However, it will be responsible for integrating top-down directives and functioning as an advocate for coordination among business, technical, and operational domains.

With respect to EB/EC program oversight, cognizant functional organizations will be responsible for preparing POM requirements for GCSS-AF and EB/EC projects. All such POM submissions will be forwarded to the GRID for evaluation and fit into the GCSS-AF support framework. A well defined requirements integration process is necessary to identify integration opportunities as part of an enterprise-wide information environment. This process must identify, document and prioritize user needs and supporting information as well as identify candidate components to implement these requirements. Following the assessment process, recommendations will be provided to the Air Force CIO, the GCSS-AF POM advocate at Air Force Board.

Appendix G identifies the specific EB/EC roles and responsibilities for Air Force organizations.

ACTION ITEMS

To facilitate the success of the EB/EC role:

- *Directives and guidance.* Identify existing DoD and Air Force directives and guidance documents that relate to the Air Force EB/EC program. Analyze existing documentation, conduct a gap analysis, and determine redundancies, inconsistencies and gaps in guidance. Develop new directives and guidance, as required, to meet Air Force requirements.

- *Consolidate EB/EC requirements.* Identify roles and responsibilities necessary to meet the organizational mission.[1] Identify the links to GCSS-AF components and the methodology for the most beneficial implementation of EB/EC requirements.

- *Establish an EB/EC integration committee.* Establish and chair an Air Force working group to identify and coordinate the functional and technical requirements to optimize EB/EC implementation across all domains. Ensure all technology issues are referred to the EB/EC integration committee for consideration and input to GCSS-AF development.

- *Advocate EB/EC integration in GCSS*-AF. Serve as the advocate for Air Force EB/EC considerations in the implementation of GCSS-AF.

- *Represent Air Force EB/EC.* Serve as the principal Air Force representative in matters related to EB/EC issues at all appropriate federal government, DoD, Military Service, and national and international standards body and consortium meetings.

- *Champion initiative integration.* Serve as the principal Air Force advocate for an integrated assessment of all Service EB/EC initiatives. Articulate the impact of an unbalanced approach to program priorities.

[1] See Appendix G for additional information regarding roles and responsibilities.

- *Sponsor GCSS-AF Requirements Board*. Sponsor a requirements integration process that will, in close cooperation with functional staffs, look for improvement opportunities, define those opportunities at a high level, and direct a course of action. Together with functional and warfighting process owners, analyze the identified integration need and document those actions needed to implement the process and IT support required. Consolidate approved requirements into the current requirements list, prioritized, and included in an integrated POM input. See Appendix H for a detailed draft proposal for the requirements generation and integration process.

Military Service and Agency Plans

Interoperability for the exchange of information will be accomplished in coordinated manner across Military Service and agency lines. Successful coordination requires the development and sharing of plans and schedules. Exactly comparable technical solutions are not necessary if the open and interoperable exchange of information is permitted.

ACTION ITEMS

To achieve the desired level of coordination:

- *Apply DoD guiding principles.* Support the Military Services and Defense agencies in applying DoD guiding principles for EB/EC implementation to ensure the application of best business practices and the use of open exchange, e.g., non-proprietary, mechanisms.

- *Track, maintain, and publish schedules.* Integrate all EB/EC implementation schedules using project management software. Provide an integrated implementation schedule for all EB/EC-related initiatives on a regular basis.

Program Funding Requirements

Successful EB/EC program implementation cannot be accomplished without a comprehensive plan for investment in BPR initiatives. The initiatives provide the framework for adopting best business practices, supporting the migration from existing legacy systems to more open architectures that facilitate information exchange, and infusing technology to support the information needs of the warfighters.

Organized financial oversight is crucial for ensuring the coordinated, balanced, and continuous advancement of EB/EC implementation. The EB/EC program organization is not expected to assume all PPBS responsibilities. However, it needs sufficient visibility into program funding requirements to advocate and coordinate EB/EC activities across the Air Force.

ACTION ITEMS

To achieve the desired level of coordination:

- *Champion the common method for communicating business process requirements.* Identify guidelines functional areas can use to fully document their business process requirements. Advocate that by following those guidelines, future improvement initiatives, transitions, and technology infusions are considerably easier, and will contribute to ensuring projects that are compatible with the AF architecture and its capacity to handle traffic, and that the proper technologies are being applied.

- *Develop guidance for an Air Force EB/EC pilot project initiative.* Establish a venue and criteria (e.g., cost benefit analysis, improved readiness) for evaluation of candidates. Balance proposed initiatives against infrastructure's ability to support the effort, coordinate implementation dates, and identify additional impacts and methods for resolution. Monitor pilot program initiatives. Provide recommended criteria for institutionalizing pilot program initiatives.

- *Obtain, catalog, track, and report funding profiles.* Obtain EB/EC initiative funding profiles from each functional and technical domain. Compile and summarize all funding profiles and regularly report the status of all initiatives.

Process Methodology

Consistent with the direction to create a GCSS-AF requirements lead agency is the need to identify a single advocacy for EB/EC process methodology responsibility. The current environment has little accountability for an enterprise-wide process orientation (i.e., supply chain management). Instead, unless strong incentives act otherwise, vertical domain areas will continue to flourish.

Some standardization of data and process have evolved in vertical domains and among domains. However, this has not yet proven to be a universal activity for purposes of cross-domain standardization activity. Commercial best business practices reflect significant efficiencies that result in a process orientation that considers all aspects of the process enterprise. Comparable success in the Air Force depends on the acceptance and institutionalization of a paradigm shift to an enterprise-wide, integrated process orientation.

ACTION ITEMS

To achieve the desired level EB/EC process orientation integration:

- *Champion a common method for communicating business process requirements.* Identify guidelines for use by functional organizations to fully document business process requirements. Advocate that by following those guidelines future improvement initiatives, transitions, and technology infusions are considerably easier with respect to architecture compatibility, the ability to accommodate transaction volumes, and alignment with acceptable data exchange technologies. Work with data standardization organizations to identify the criteria, methodology, and minimal requirements for standardization (both process and data) that support process interoperability.

- *Develop guidance for EB/EC project initiatives.* Establish a venue and criteria (e.g., cost benefit analysis, improved readiness) for evaluation of Air Force EB/EC pilot project initiatives. Balance proposed initiatives against the infrastructure's ability to support the initiative, coordinate implementation dates, and identify additional impacts and methods for resolution. Monitor pilot project initiatives. Provide recommended criteria for institutionalizing pilot program initiatives.

Program Outreach

Awareness, training, and readily available information are critical to the removal of any threatening environment and serves as a knowledge base for process owners and developers.

ACTION ITEMS

To achieve the desired level of awareness for Air Force EB/EC initiatives:

- *Promote awareness and understanding.* Appendix I provides a list of Air Force points of contact that will serve as a valuable resource in the dissemination of EB/EC related information. When EB/EC impacts the work environment or the employee, functional communities will prepare an employee awareness brochure and/or briefing to inform employees of the benefits of incorporating EB/EC into their business processes. The brochure/briefing should explain the impact EB/EC will have upon the individual and the organization. When EB/EC affects user acceptance and training, the AIS program office should develop a brochure/briefing to educate employees on changes to expect in the reengineered organization. It is also recommended that AIS program office solicit employee suggestions during the process.

- *Publicize Air Force EB/EC initiatives.* Identify and catalog all ongoing and planned Air Force EB/EC initiatives. Make information on all initiatives readily available to all personnel. Identify lessons learned. Continuously monitor private-sector initiatives and business trends. Promote information sharing across all domains.

- *Provide incentives for EB/EC implementation.* Recognize that organizations enter into EB/EC relationships to reduce their costs and/or improve their performance. Assist Air Force EB/EC initiatives in identifying incentives to overcome any disincentive stemming from the potential cost of resolving problems with EB/EC tools.[2] (Appendix J presents work conducted by the DoD Incentives for Adoption of Electronic Business Working Group[3] to assess the implications for incentivizing the adoption of EB. Although the work was focused broadly at the public and private sectors, it serves as a model for Air Force initiatives.)

Architecture

The Air Force will face a major challenge in transitioning to tomorrow's GCSS-AF component-based architecture from the development and implementation perspectives as well as from the standpoint of managing the transition while supporting warfighter IERs. The key to GCSS-AF success will be the ability to define top-level interfaces and dependencies among functional domains. This ability will, in turn, support the development of a cross-functional domain architecture that will serve as the bridge between requirements and functional vertical domains.

A comprehensive understanding is needed of the implications for architecture development among all Air Force functional and technical domains. Certainly, GCSS-AF implementation has issues far beyond EB/EC integration. However, a clear strategy for managing the development and transition and the associated implications for EB/EC functional domains needs to be developed and agreed to by all appropriate parties.

[2] Electronic Commerce Coalition Working Group Web site, http://www.ndia.org:8080/~eccwg. This action derives from the Deputy Secretary of Defense's action to establish the DoD-Industry Electronic Commerce Business Executive Group and Working Groups. This group will propose EB reform recommendations that will improve the quality of information systems and services to the warfighters and DoD business practices. The group will also help introduce industry's best EB/EC practices into DoD. Four working groups addressing issues resulted from recommendations of the EC Conference held on 4 May 1999. The working groups will focus on the following: incentives for adoption of EB, EB information security, EB performance measures, and EB software quality and interoperability.

[3] Ibid.

ACTION ITEMS

To achieve the desired level of awareness regarding Air Force architecture development:

- *Insert EB/EC into GCSS-AF and other architectures.* Champion the insertion of EB/EC concepts in the GCSS-AF architecture.

- *Advocate open GCSS-AF architecture.* Serve as the liaison and advocate for EB/EC matters in the GCSS-AF environment. Facilitate timely and appropriate information exchange among all functional and technical domains. Ensure that GCSS-AF development implications for all Military Service and agency IERs are identified to the applicable trading partners. Ensure that an open architecture approach identifies all interface and data transformation requirements for the smooth, open, and transparent exchange of information. Establish an interface management mechanism in GCSS-AF for data transition for all internal and external transaction exchange, new system developments, and legacy system transitions throughout the GCSS-AF development. Facilitate the development of all related timelines.

- *Determine network control requirements.* Develop criteria and procedures for approval of an application program to operate on the enterprise network.

Technology Determination

Technology advances and ability of the functional domain to leverage those technologies are not often synchronized. Similarly, investment issues associated with technology adoption indicate that a new technology may be justifiable. Technology use decisions should be based on adequate return on the investment, cost of technology sustainment, and compatibility (e.g., protocol, data format, security, etc.) with the Air Force infrastructure.

A pure IT solution frequently acts to suboptimize a business process. Likewise, comprehensive business process requirements must be identified to permit the application of the most appropriate technology. Therefore, decisions related to technology changes must balance the advantages associated with new technology carefully with functional requirements and costs associated with changes.

ACTION ITEMS

To achieve the optimum use of technology in support of functional domain requirements:

- *Develop EB/EC doctrine.* Develop an Air Force doctrine that identifies the requirements for functional area interoperability and criteria for how and when technology will be applied in support of the requirements.

- *Corporately manage technical resources.* Identify and track the execution of those technical resources required to support Air Force EB/EC initiatives. Coordinate with GCSS-AF and other Military Services and Defense Agencies, as appropriate, to ensure that adequate technical resources are available to support planned requirements.

- *Advocate technology configuration management.* Establish a liaison within GCSS-AF to maintain an awareness and inventory of new and evolving technologies. Identify and track the technologies employed by the Air Force, other Military Services and Defense agencies, and private-sector trading partner communities. Develop a methodology for determining when evolving technology should be adopted by GCSS-AF in support of Air Force EB/EC functions.

- *Identify interface responsibility.* Identify the interface requirements associated with each technology used by Air Force trading partners to ensure the consistent and transparent exchange of information. Develop an Air Force policy recommendation on the responsibility to establish and maintain interfaces when an incompatibility with a trading partner arises.

- *Advocate electronic records management.* Advocate that proponents of EB/EC initiatives design, develop, and implement EB/EC solutions to interface with archival and record management functions. Ensure compliance with DoD 5015.2-STD for all EB/EC records management. Ensure proper archival and future access to data manipulated by EB/EC solutions through approved records management applications.

- *Advocate adequate communications infrastructure.* Ensure that all volume, formatting, syntactical, and timeliness of exchange requirements are identified by functional domains. Develop a methodology for ensuring that a sufficiently robust communications infrastructure can satisfy functional domain requirements.

Data Quality

Data quality should begin at the information source. However, inconsistencies in the application of quality control mechanisms mean that it is a constant concern to functional and technical domains.

ACTION ITEMS

To manage the data quality issue:

- *Participate in data quality initiatives.* Identify data quality initiatives in DOD and the Air Force and incorporate data quality management and configuration control in EB/EC policies.

- *Disseminate data quality policies and guidelines.* Research, analyze and disseminate commercial and DOD data quality policy and guidelines. Monitor the progress of data quality management initiatives and pass lessons learned to benefit Air Force data quality management personnel.

Security

Information security requirements may be defined by DoD, functional domains, and technical domains. With respect to EB/EC considerations, risk assessment analysis should be used to balance the requirements to conduct business, meet the requirements for system operating specifications, assess and satisfy the risk of data exposure, and meet the intent of policy direction.

ACTION ITEMS

To manage security risk requirements:

- *Coordinate EB/EC information security policy recommendations.* Develop EB/EC information security policy recommendations and compliance procedures for use in GCSS-AF development. Include recommendations for data accumulation, electronic signatures, PKI, smart cards, encryption, and firewalls.

- *Ensure EB/EC security requirements are incorporated into programs.* Identify and document EB/EC data security requirements for inclusion in the GCSS-AF technical, operational and system architectures and Air Force policy and guidance. Facilitate discussions to develop consensus between functional and technical domains where conflicting objectives arise to optimize security integration between business rules and operational requirements.

COTS and GOTS

The use of COTS and GOTS software is consistent with DoD policy direction to adopt commercial best business practices when possible. However, functional and technical domains rarely adopt the business rules inherent in the acquired software. Instead, large amounts of funds are expended to adapt the software to meet existing business practices. This practice also means an additional sustainment cost throughout the software life cycle. Use of COTS/GOTS requires careful

consideration of the ability of the functional and technical domains to adapt to rather than alter the software.

ACTION ITEM

To manage the use of COTS/GOTS software:

- *Champion the analysis and use of COTS and GOTS.* Develop a series of evaluation criteria for use in determining the usability of COTS and GOTS software. Advocate the use of BPR techniques and cost-benefit analysis as a part of the decision process to ensure the best decision is adopted.

Performance Measurement

The Air Force needs to optimize EB/EC efforts across current and Joint Vision 2010 strategies. Appropriate high-level metrics must be available for all functional business areas that can be consistently applied by all management levels involved in decision-making The balanced scorecard[4] provides a performance measurement framework for optimizing strategic performance for the short- and long-term based on balancing the external with internal measures and the financial with non-financial measures. The standard balanced scorecard identifies measures from the customer, financial, internal business process, and learning and growth perspectives. The Performance Measures for Electronic Business Working Group[5], which is addressing performance measurement throughout DoD, hypothesizes that EB/EC balanced scorecard measures may change in a product's life cycle.

ACTION ITEM

To develop an optimized EB/EC performance measurement system:

- *Develop balanced scorecard-based performance metrics*. Identify short- and long-term objectives. Use as required the guidance contained in existing Air Force Policy documents for developing performance planning practices.[6] Identify how measures in each perspective can support the objectives. Identify high-level metrics that match the perspectives to meet the objectives. Screen program-level metrics for links to strategic objectives via the balanced scorecard strategic measures.

[4] Robert S. Kaplan and David P. Norton, *Balanced Scorecard*, Harvard Business School Press: Boston, MA, 1996.

[5] Electronic Commerce Coalition Working Group Web site, http://www.ndia.org:8080/~eccwg.

[6] For example, performance measurement indicators may be included in documents, such as the Air Force Strategic Plan Volume II (Air Force Performance Plan) and the Air Force Information Technology Management Plan.

SUMMARY

This concludes the *Air Force EB/EC Implementation Plan*. It is ambitious in scope and will require close cooperation between AF-CIO/GRID and functional areas to achieve our objectives. The Plan is a living document and will continue to evolve. It provides direction for meeting tomorrow's challenges and is a model for integrating technology and best business practices into GCSS-AF and across functional organizations. Most importantly, it focuses attention on a methodology for supporting and integrating user requirements into GCSS-AF to support the warfighter.

Appendix A
Memorandum

This appendix contains the memorandum by the Air Force Vice Chief of Staff on supporting EB/EC initiatives.

DEPARTMENT OF THE AIR FORCE
OFFICE OF THE CHIEF OF STAFF
WASHINGTON, DC

01 NOV 1999

MEMORANDUM FOR ALMAJCOM-FOA-DRU

FROM: HQ USAF/CV
1670 Air Force Pentagon
Washington, DC 20330-1670

SUBJECT: Support of Electronic Business/Electronic Commerce Initiatives

The Secretary of Defense's Defense Reform Initiative focuses on changing DoD's acquisition, logistics, and financial business practices to enable us to become more competitive. The Air Force continues to take a comprehensive look at our business processes and has reengineered many using advanced technologies to provide better support to the warfighter.

Today, there are a number of paperless contracting initiatives underway in our acquisition, logistics, and financial communities to support DEPSECDEF's paperless contracting goal of 1 Jan 00. These initiatives (Atch 1) are taking place at the base level and embrace DoD's Electronic Business/Electronic Commerce strategic plan as well. Most of these tools represent cross-functional partnerships and have far-reaching implications. One prime example is the Automated Business Services System where funding availability/commitment data is passed electronically at the beginning of the process and continues to "flow" all the way to Defense Finance and Accounting Services for payment. Additionally, there are other DoD-wide or AF tools that are being fielded to meet this goal. It is imperative that we begin utilizing these new tools as quickly as they are fielded. Our mandate is to complete as many actions as practicable using our electronic tools including e-mail and electronic distribution systems. These changes will ensure continued world class support to the 21st Century Air Expeditionary Force.

The Air Force has pledged our support of these initiatives to the SECDEF. I expect you to lend your full support for the implementation and use of these initiatives.

LESTER L. LYLES
General, USAF
Vice Chief of Staff

Attachment:
EB/EC Initiatives

AIR FORCE ELECTRONIC COMMERCE INITIATIVES:

Automated Business Services System (ABSS). This is a SAF/FM initiative to send the purchase request/funding document (PR/FD) electronically to the Contracting Office. Information is captured once and flowed to relevant coordinating/certifying offices. This process eliminates physical coordination of hardcopy documents, precludes multiple data entries, reduces errors and delays associated with manual processes, and expedite delivery of goods or service to the requiring office.

Electronic Mall (EMall). This Joint Electronic Commerce Program Office (JECPO) effort establishes a single point of entry and search capability for all Internet-based DoD electronic catalogs. Customers can purchase both products and services via one of three electronic "corridors": commodities, information technology, and services/construction. Military Services and Defense Agencies field "stores" along these corridors. Once fully deployed, EMall will provide one-stop visibility for ordering as well as visibility into the status of the orders. Use of pre-competed, pre-priced contracts plus use of the IMPAC card for orders less than $25K significantly reduces time needed to obtain supply items.

Electronic Posting System (EPS). This GSA government-off-the-shelf product serves as the AF's central repository for requirements/solicitations. EPS expands the potential vendor base by allowing improved, easy access and search of AF-wide requirements. In addition, it works in concert with JECPO's DoD Business Opportunities (BUSOPPS) page supporting the single entry point for DoD requirements. Benefits of this system include elimination of redundant AF systems, time and cost avoidance of printing/copying, mail distribution/preparation and postage/mailing, particularly in the area of construction drawings. Near term enhancements will allow vendors to submit proposals electronically.

Electronic Document Access (EDA). Defense Finance and Accounting Service (DFAS) initiative. EDA transmits contract award documents (basic contracts and modifications) to DFAS. This process greatly reduces unmatched disbursements and associated penalty payments through improved matching of receipt and invoice. AF realizes cost avoidance in postage, time, and duplication of lost or misplaced documents.

Joint Electronic Document Access (JEDA). JEDA is a joint Navy/Marine/AF initiative. It is a web-based front-end to EDA which allows for contract attachments such as statements of work, drawings, and specifications not permitted by EDA. JEDA also allows for internal paperless distribution to all AF contract recipients. Benefits include cost avoidance in postage, time, and effort associated with manual distribution of paper based contracts.

Wide Area Workflow (WAWF). This is a combined Paperless Contracting Implementation Planning Team/DFAS effort. When coupled with EDA, WAWF gives DFAS the complete file with which to marry up the contract and modifications, the invoice(s), and the receipt/acceptance documentation. Data entry errors are reduced through automatic field population and EFT payments are expedited.

AF metrics resulting from above initiatives can be obtained at:
www.peoarbs.navy.mil/airforce/metrics/default.asp
AF Paperless metric POC is Carrie.Cardwell@pentagon.af.mil (SAF/AQCI)

Appendix B
DoD EB/EC Policies

On 11 March 1999, the DoD CIO issued Guidance and Policy Memorandum No. 2-8190-031199, *Defense-wide Electronic Commerce*. The memorandum states the following the policy of DoD:

- Employ EB/EC concepts and technologies in conducting all process improvement and reengineering efforts. This use will permit incorporation of proven commercial market approaches to disseminate information in an electronic form to the right person or activity, at the right time, with the objective of reducing process cycle times. The DoD will also perform the following:
  - ➤ Implement EB/EC initiatives that incorporate best business practices to garner efficiencies and promote operational effectiveness through significant response cycle time reduction.
  - ➤ Facilitate global data sharing, appropriate security measures, and integration of cross-functional business processes between the Department and its business partners.
- Implement flexible, interoperable, open solutions that do not prohibit or impede the use of new or competing technology solutions to the maximum extent practical.
- Use industry EB/EC standards and COTS solutions to the maximum extent practical.
- Implement EB/EC security solutions that afford data security based upon user and statutory requirements while sustaining or improving the processes that they replace.
- Establish and use EBO that employs EB/EC principles, concepts, and technologies in the conduct and administration of its military and business processes.
- Plan, develop, and implement EB/EC from a DoD-wide perspective to provide for integrated and uniform program direction and planning.
- Facilitate and support DoD components' efforts to implement EB/EC consistent with the Department's strategic goals and objectives.

- Apply EB/EC processes to operate with DoD's trading partners to achieve integration within and among the DoD components and the private sector.

- Ensure all EB/EC operations employ continuous process improvement, including employment of the best applicable business practices using national, international, or commercial standards; a common information infrastructure; and best "fit" security solutions. EB/EC will use the DoD common information infrastructure, security solutions, and a common set of best business practices for interactions across DoD's functional areas.

- Protect intellectual property rights, guarantee data integrity and privacy rights, and foster interoperability.

- Cooperate with other Federal Departments and agencies to develop and implement an EB/EC operational architecture in support of a government-wide EB/EC program.

- Use end-to-end standards-based solutions for EB/EC security that are compatible and interoperable with publicly available security solutions. Ensure transaction confidentiality is maintained, audit trails are established commensurate with business needs and currently accepted practices, and system resources are protected from disruption or exploitation. EB/EC information needs to be exchanged, processed, stored, manipulated, and disseminated with the assurance that it is not being exploited, modified, or disrupted by adversaries, interlopers, or competitors. Comply with national and DoD polices and directives for the protection of classified information (e.g., DoD Directive 5200.28, DoD Directive 5300.1-R).

- Describe and adhere to GCSS-AF (including operational, systems, and technical views) in accordance with DoD's C4ISR architecture and framework.

Appendix C
Electronic Records Management

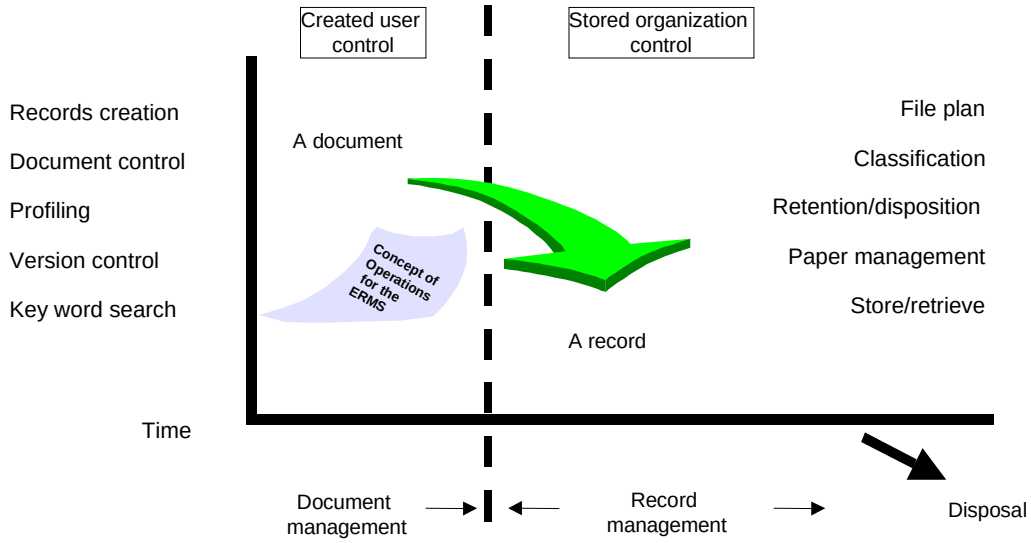
INTRODUCTION

Public law prescribes the requirements for the Air Force to manage its information as records to document its policies and business transactions. All EB/EC functional areas generate records electronically that must be managed in accordance with public law and DoD and Air Force policy. Electronic records management (ERM) is accomplished using automated techniques to manage records on varied storage media (e.g., electronic, paper, microform). This requirement is met by implementing electronic record-keeping processes or an electronic records management system (ERMS).

Electronic information systems that automate business functions may be required to incorporate aspects of electronic record-keeping or make records available to the ERMS, depending on design characteristics. Electronic record-keeping involves the development of automated processes to manage electronic records. The automated processes support not only the preservation of an electronic record's content, but also its context and structure over time. An ERMS is an electronic information system that meets an agency's needs to collect, organize, and categorize records to facilitate their preservation, retrieval, use, and disposition (36 CFR 1234.2). The agency records officer provides guidance on meeting this requirement.

The ERMS implementation provides a cross-functional application that facilities an integrated, automated work environment to increase the accuracy and effectiveness of functional processes and improve the quality and timeliness of Air Force decision-making. The ERMS provides for the storage, retrieval, and disposal of official government records based on established disposition schedules. The ERM software is the controller used as the window device to manage the information produced by other software applications. Timely, accurate, and trusted information must be organized, controlled, and available to support deployed and contingency forces, and any possibility of inexact information will severely affect the operational mission of these units. Technology makes it possible to find, track, and target anything that moves on the Earth's surface, and electronic records management ensures decisions are documented and recorded in official information systems. In this era of EB operations, documented decisions and audible financial reports must be available, located, and delivered in a timely and efficient manner (Figure C-1).

Figure C-1. Records Management



In this appendix we first provide background information on the requirements to manage electronic records. Next we describe the concepts for the ERMS. We then discuss the implementation process and operations of the system. We further discuss that a recommended software product has been approved by the Joint Technical Architecture–Air Force (JTA-AF) as a standard electronic records management software for the Air Force. We conclude with a brief discussion of support needed to maintain the system.

BACKGROUND

In response to federal law and a business process reengineering effort, the Assistant Secretary of Defense for Command, Control, Communications and Intelligence established the goal of FY03 for implementing an ERMS. DoD has had to deal with dwindling resources, reduction in administrative manpower, increased use of office automation, and pressure to open its records for public consumption. With the proliferation of PCs throughout the Air Force, technology provides users the ability to create official records electronically without providing a viable ERMS to maintain them in accordance with federal law. DoD 5015.2-STD, *Design Criteria Standard for Electronic Records Management Software Applications*, describes the functional requirements and procedural guidance for any records management application used in DoD. The Air Force developed supplementary requirements that have been incorporated into the Global Information Grid Infrastructure Initiative, “Inside the Gate,” Operational Requirements Document. The ERM software provides the ability to manage records in all media, thereby providing for one record-keeping system to manage all official records for the Air Force.

ERMS DESCRIPTION

The migration to a standard digit information flow throughout DoD aligns business practices to mission needs. The ERMS provides the methodology for automating most aspects of document processing to include sharing, access control, and archiving (life cycle).

The ERMS consists of hardware, software, procedures, training, and technical support. The ERMS architecture is consistent with the JTA-AF. The ERMS will operate over two network enclaves. The unclassified ERMS will manage Sensitive Information or information on the Unclassified Internet Protocol Router Network. A parallel, independent ERMS will manage the Secret Internet Protocol Router Network for Secret and Top Secret Collateral information. The records management software must be certified by the Joint Interoperability Test Command (JITC) in accordance with the standards in DOD 5015.2-STD. Any software must also be certified as compliant with the DII Common Operating Environment (COE). The ERMS must have full functional availability except for limited planned backup and maintenance periods.

The ERMS will operate on commercially available servers. Dedicated ERMS servers will likely be used for storage of software, electronic records, and ERMS overhead files. A combination of redundant array of independent disks systems, optical storage devices, or a mass storage device (such as magnetic tape library) should be used based on a hierarchical storage management plan. Optimizing future technical advancements in mass storage access will enhance reliability.

In a hierarchical storage management, data move automatically from hard disk drives to a slower, higher-volume storage media. Software constantly monitors hard disk capacity and moves data from one storage level to the next based on usage, age, category, and other criteria as specified by the network or system administrator. It may also move information from a lower performance layer to a higher performance layer if it meets the usage criteria. The layers include the following:

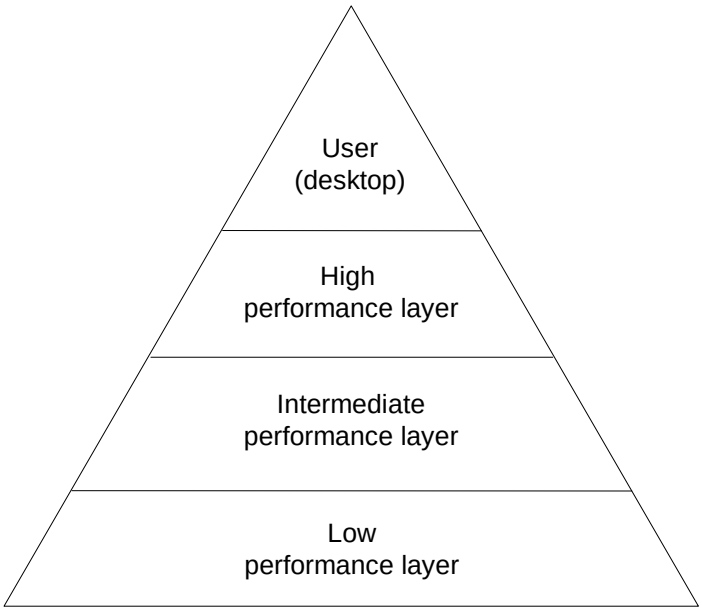
- *High-performance layer*. A network storage device physically represents this layer. The device usually consists of hard disk drives in a file server configuration or as a redundant array of independent disks. Access speed to information is usually milliseconds.

- *Intermediate-performance layer*. A mass storage device, such as an optical jukebox, represents this performance layer. The user accesses information stored on this layer less frequently, and access times are usually only seconds.

- *Low-performance layer*. A mass storage device, such as a magnetic tape library, is characteristic of this layer, although optical media are also used.

Access time for information on this layer is measured in seconds to minutes. (See Figure C-2.)

Figure C-2. Hierarchical Storage Management Plan



Tape backups and uninterruptible power capabilities are required to ensure no loss of data. The ERMS must function in a client-server or Web-based environment. The user generally operates a desktop PC and requires limited records management functions for routine filing and searching. Records managers operate from similar desktop PCs, but require a more robust capability, which likely use more hard disk space.

The ERMS consists of Records Management Application (RMA) and database management system (DBMS) software components. The RMA should be a COTS application certified in accordance with DoD 5015.2-STD. It could conceivably incorporate the capability of managing a database, but more likely interfaces with a separate COTS DBMS. The RMA uses a Windows standard graphical user interface to the system. The interface allows users to file records from office information functional applications. It allows users to file, search for, and retrieve electronic records or brief descriptions of paper and other nondigital records. The RMA will likely consist of interface tools that will allow for development of customized interfaces to other government or commercial applications. This customized interface provides the ability to capture records in other legacy systems that do not have an interface built within the systems. The DBMS is an existing commercial DBMS that uses SQL and is open database compliant. It performs the filing, searching, and retrieving actions on all records for a base or location. The DBMS is normally transparent to the user.

ERM Implementation

ERMS implementation must provide minimal disruption to the user during transition. Initial ERMS workload, both in terms of quantity of records and traffic on the base network, will be heavy, until the previously archived electronic records are loaded into the new ERMS. For base implementation management and coordination, wing commanders will assign a central point of contact (probably the Base Records Manager, BRM) to facilitate the base implementation plan. The BRM is responsible for managing the ERMS implementation in coordination with the major command ERMS point of contact and ERMS Air Force PMO. This structure facilitates communications and coordination during implementation by allowing the major command ERMS point of contact to deal with a single person at each base. The major command ERMS point of contact will publish an implementation schedule for each base. Implementation schedules will be coordinated by the respective BRMs to establish the official schedules.

ERM Operations

The Air Force need to provide the right information to the decision-makers at the right time is met through the electronic environment; however, it is also critical to manage the electronic information to preclude information buildup. The ERMS will satisfy the information management need by providing an integrated, automated work environment to responsibly, accurately, and efficiently locate and provide the needed information in official records. The ERMS will give records managers the ability to store and manage records on all media, while providing users an enhanced tool for filing and retrieving records electronically. All users will require a basic understanding of records management rules, operational processes of the ERMS, and need for sharing information with decision-makers. Users will see the ERMS as an additional capability incorporated into the software applications on their desktop computers. After a document is designated a record, it will be filed into the ERMS database almost as easily as it is now filed on the user's hard drive or a locally shared network drive. When a record is filed, it is assigned a record identifier. Subsequent changes to documents that have been designated as records result in new records being created with different identification data. Metadata information or metafiles on electronic records will be generated automatically when the records are filed. Entering information into the RMA "metafiles," which include the physical storage location of the paper record, is not needed to maintain control of current and new paper records. The key to any storage management scheme is the user's ability to retrieve information quickly when needed. Thus, records infrequently accessed do not require retrieval as fast as records constantly in use. When records reach an inactive point in the life cycle, they can be moved to a different performance layer. Keeping information stored on high-response media only slows user access to frequently used information. Therefore, the key to an effective accessibility model is a layered structure that places the information in performance layers based on the frequency of accessing the information. Performance layers have slower response times as

they shift further from the user in media type. Retrieval actions will result in a copy of the record in the format it was provided to the RMA for filing. Minimum search parameters will be author, subject, and creation date. When requested, the RMA will provide the user with a copy of the electronic record. The ERMS will provide notification when records are due for disposal consideration. Records will not be deleted without concurrence and action by an authorized individual. When records are deleted, they will not be recoverable.

Recommended Software Product

On 17 December 1999, the Configuration Control Board for the JTA-AF approved a standard electronic records management software for the Air Force. JTA-AF recommends PS Software RIMS Studio Version 7.1 as the product for an Air Force ERMS operating on desktop computers. PS RIMS Version 7.1 was certified by DISA and JITC in October 1998 as compliant with DoD 5015.2-STD. PS RIMS manages electronic and nonelectronic records. The workstation software is the same for a typical user and a records manager; the only difference is the level of functionality available to the user. An icon can be included in the directory listing (like the Windows Recycle Bin) or placed on the desktop that allows the user to drag and drop documents into a filing bin. The software structures and secures information; allows file management, searching, and reporting; manages file containers and their locations; and applies the retention and disposition schedules to the records.

The designation of a recommended product is imperative to provide users the ability to comply with federal and DoD policies for managing official Air Force records. It minimizes the number of diverse applications available to perform electronic records management functions on Air Force computer systems. Each software application requires training, operating procedures, and troubleshooting skills, and standardization is critical from operational and financial standpoints.

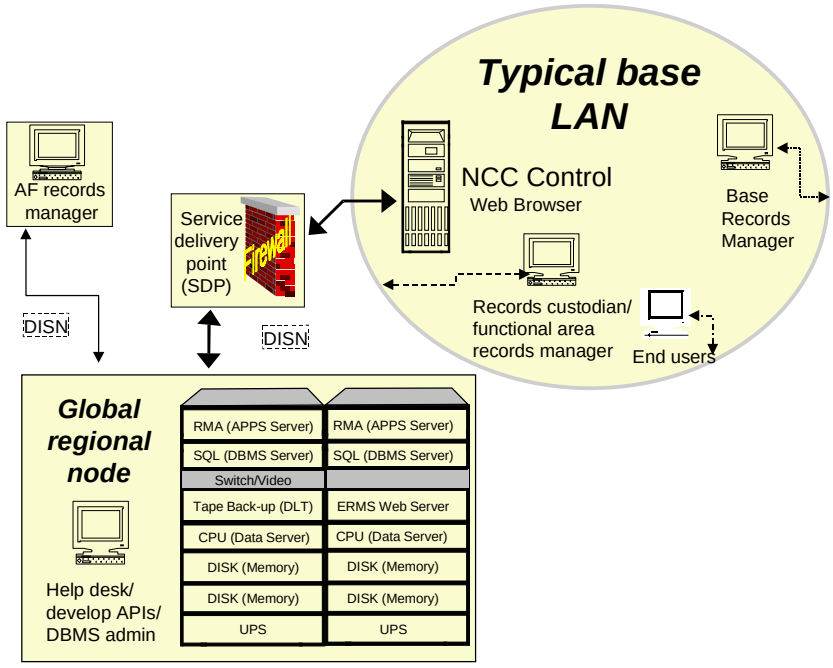
The IF architectural philosophy of GCSS-AF enables the ERMS software to provide the common records management functions to support the needs of all functional processes.

ERMS Support

The support strategy is to minimize the government’s life-cycle cost by using a mix of government and contractor support. Software (RMA and DBMS) is expected to have annual licensing fee requirements. Use of commercial warranties, technical support, technological refreshments and upgrades should be negotiated as part of annual software licensing agreements. Initial training for the base records manager, systems administrators and workgroup managers, records managers, CORs, records custodians, and users, as necessary will be included in the initial support.

A central support activity will have overall responsibility for the ERMS by providing database administration functions, managing a centralized Air Force Help Desk, developing customized interfaces, and providing depot-level software maintenance (Figure C-3).

Figure C-3. System Description



Note: API = application program interface; CPU = central processing unit; DISN = Defense Information Systems Network; UPS = uninterruptible power supply.

This notional system description (Figure C-3) provides a high-level concept on how the users and records managers will access the ERMS to perform records management functions for official Air Force records.

Appendix D
Electronic Business/Electronic Commerce and the Global Combat Support Systems-Air Force Architecture

This appendix contains an approach for the incorporation of state of the art practices and technologies into the emerging GCSS-AF.

Electronic Business/Electronic Commerce and the Global Combat Support System-Air Force Architecture

February 2000

E. Zeisler

Air Force Project 03005541

MITRE

Table of Contents

Enterprise Architecture Introduction and Background

The goal of this appendix is to recommend an approach for the AF to incorporate state of the art electronic business/electronic commerce (EB/EC) practices and technologies into the emerging GCSS-AF. The enterprise architecture (EA) approach presented is not the targeted GCSS-AF architecture; rather, it is an approach to composing requirements for the architecture, and leveraging capabilities for electronic commerce technology.

The appendix will define components of the Air Force EB/EC methodology. Obvious components include downward directed Joint Electronic Commerce Program Office (JECPO) EB/EC-related projects, as well as those included in the GCSS-AF architecture. The methodology focus is on integrating the JECPO, Air Force Communications and Information Center (AFCIC), and GCSS-AF architectures into an EB/EC methodology capable of providing support to both the warfighter and supporting functionals. The methodology will consider PKI integration as an extension of EB capability to ensure business transaction security when conducting business using the Internet,[1] both within the Air Force and with external industry trading partners.

The methodology to achieve EB/EC integration with the GCSS-AF architecture includes the following steps:

1. Identify new enterprise resource planning (business) components that support EB/EC goals - cross-reference Air Force Operational Requirements.
2. Analyze Commercial-off-the-shelf (COTS) fit with legacy for new component ware.
3. Analyze COTS fit with GCSS-AF Integration Framework (IF) for each functional domain. Functional domains overlay, thus the IF provides generalized infrastructure services for combat and mobility operations and support.
4. Define scenarios and proof of concept pilots for fully integrating EB/EC methodology and tools into the GCSS-AF architecture and IF.
5. Assemble legacy inputs for testing with new COTS - validate legacy rules and outputs with new COTS, capabilities and platforms [includes Workstations, Storage Devices, Printers, DII COE, Ops Sys, VTC, Collab Tools, and DMS].
6. Insert new capabilities to fit with the acquisition of IF technology and in concert with Air Force modernization plans.

For more detailed guidance on problem definition and collection of domain information, operational concept and requirements, reference [36].

[1] An example follows. "It is important that Web users have a reliable mechanism to help them decide which agents, services, or active content they can trust. Digital signatures allow one to attach digitally signed assertions to on-line documents. These signatures serve to identify the origin and integrity of a document." Currently, industry is working on the EB Digital Signature Initiative. The result will have applications in a number of domain including IPR, privacy, and content control [http://www.w3.org/TR/NOTE-framework-970706.html].

A functional domain is defined herein to be all the required services, business methods, and business constraints for end-to-end information flow that depends on (makes use of) the function. An individual might ask: "How can we create an enterprise architecture across GCSS-AF?" Should we architect globally for all missions and functions (logistics, medical, contracting, finance…), or first develop an architecture for each mission and functional domain?" The answer is both; a mission and functional area must be specified together with key interdependent business constraints and support services, before defining the services and information flows globally across related areas for the enterprise.

Foremost, enterprise architects need to separate business components from technical components and services[2]. A business component that is highly abstracted may or may not result in a deployed systems component. A highly abstract business component, like combat support, almost certainly will require decomposition with only some parts making it into the future implemented systems and technical architectures.

In general, business object components do not span the architecture life cycle - they are part of a high level viewpoint, as expressed in the C4ISR Architecture Framework. Further, the community at large is still learning about how or whether Enterprise Resource Planning (ERP) and enterprise architecture can be performed as a business service, because there are so many differences in the ways businesses (missions) deploy. To illustrate, standard workflow specifications from the business community are slow to mature. Unless community constituents can agree on the semantic business model and process constraints, attempts to implement enterprise business services are fraught with risk. EB/EC services have been included in this appendix as a guide to scope community needs.

Document Inputs

Before describing the cross-functional view for joint GCSS, clear differentiation among GCSS-AF, the IF, and EB for respective architecture approaches (Table 1) must be established. Lockheed Martin Federal Systems (LMFS) in Oswego, NY is developing the GCSS-AF Architecture and the GCSS-AF Integration Framework. Adding the EB perspective introduces a need for an approach that will incorporate the kinds of abstract services listed in the Attachment C, entitled "Architecture EB/EC Services." By leveraging recent directions for distributed computing platforms, Web-centric Internet technology, DOD target architectures, component based software architecture, and next generation DARPA architectures, the enterprise architecture enables a collection of components participating in a confederation to coordinate sharing and exchange of information, even as individual components retain their autonomy. Retaining autonomy means that a component determines the information to be shared, which components may

[2] Obviously, having technical services like persistence is essential for an implementation of the EA, especially with the kind of flexibility that alternative persistence strategies provide for the purpose of ensuring a robust and consistent Battle-space.

participate in the sharing, and maintains its freedom to modify its shared interface. With little modification, the IF architecture will be able to incorporate these EB/EC services.

Table 1. The Who, What, Where, When, and Goals of GCSS-AF Architecture

	GCSS-AF	GCSS-AF Integration-Framework (IF)	Electronic Business
WHO	GCSS-AF Contract vehicle – Lockheed Martin Federal Systems (LMFS) is prime.	Architecture Community - e.g., Combat Support Architecture Council - Adjudicates application components from integration framework components	DoD focal point is DoD CIO reporting to Joint Electronic Commerce Program Office (JECPO). The Director, DLA and Director, DISA, using EC resources within their respective organizations, form the Joint Electronic Program Office responsible for accelerating the application of electronic business practices and associated information technologies to improve DoD acquisition processes and support sustainment life-cycle practices.
WHAT Scope and Enabling Technology	Scope: Entire combat support domain -All systems that are not GCCS. , Joint GCSS captures relevant data from functional databases (e.g., personnel, logistics, finance), interprets the shared data, and translates it into information used for Decisions	Scope: DII COE platform -(technology example) Netscape Enterprise Web Server Visigenics Object Request Broker JAVA (JDK 1.1.6) Solaris 2.5.1 HP-UX 10.20 Microsoft Windows NT 4.0	Scope- OSD's organization elements and services that span the spectrum of electronic commerce functions. (technology example) X.12 support technology, XML, Smart Card, Public Key Infrastructure (PKI) COTS, Information Assurance Tools, etc.
WHERE (URL)	(as of 01 Feb 2000) GCSS Internet home page and joint operational architecture at http://www.disa.mil/line/gcss.html	Developers guide - http://web2.ssg.gunter.af.mil/di_infrastructure/	Home site http://www.acq.osd.mil/ec/index.htm Architecture http://eblibrary.hq.dla.mil/EBECArch/DOD_EBECArch.html Defense Reform Initiative http://www.defenselink.mil/pubs/dodreform/chapter1.html IETF W3C standards activity related to the US "Framework for Global Electronic Commerce" http://www.w3.org/TR/NOTE-framework-970706.html

WHEN	The Defense Planning Guidance for FY 1999 - 2003 formalized the C4I for the Warrior concept by initiating Joint Vision 2010 (JV2010). JV2010 embraces information superiority and technological advances to transform traditional warfighting and lead U.S. forces to increased joint-ness and military effectiveness. Includes the four pillars of JV2010 Focused Logistics.	GCSS-AF Integration Framework V2.0 to 3.0[3] will include expanded CORBA services, MOM COTS, Web enabled Expanded data services & Data warehousing, expanded BOD services, Full PSS object interface COTS, Multi-RDBMSs Off-the-shelf legacy wrappers, full PKI support, expanded security services [New encryption algorithms, Enterprise security alerts], Enterprise admin services, Integrated logging, Digital signatures SSL, Single Sign-On, Role based access	• By January 1, 2000, government credit card payment is mandatory. (sample) • Paperless environments - The Program Manager for Combat Mobility Systems reports an overall estimate of net cost avoidance of $1 million per year through 2004. (sample)
GOALS	Compatible with IF Goals; battlespace for GCSS with infrastructure services required by all domains and information flows across all domains	Distributed AF Development and testing Environment, Acquisition and Legacy Migration Planning Support: COTS products Built on the COE And IAW industry standards (CORBA) To provide common services and utilities making functionality and data available to users in a very disciplined manner Plus rules: + on how to access data & functionality + on how to build application layer + on how to integrate with IF	The vision is to accelerate the integration of electronic commerce techniques into DoD operations. --contracting process for major weapons systems will be paper free - Use of electronic catalogs and electronic "shopping malls" to put buying decisions into the hands of the people who need the products. --paper free systems for weapons support and logistics --discontinue volume printing of all DoD-wide regulations and instructions, making them available exclusively through the Internet or CD-ROM --prime vendor contracts for maintenance, repair, and operating materials will be available for every major installation in the United States --Reengineering the travel system,

[3] Version 2.0 is due out in March 2000. Many of the services and capabilities outlined in the table will be incorporated in V2.0. The current task order also includes a version 2.1 scheduled for Oct 00, which will be a refinement of services provided in 2.0, but no significant increase in functionality. The Integration Framework, although identified separately, is the foundation of GCSS-AF.

			incorporating state-of-the-art business procedures and techniques. --Reengineering the DoD system for moving household goods, making streamlined procedures available to all military personnel --Replacing the traditional military "just-in-case" mindset for logistics with the modern business "just-in-time" mindset.

A measure of success for the enterprise architecture strategy is the ultimate achievement of EB business goals and objectives, as stated in Table 1.

Note that GCSS-AF is much more than a single task order on the Lockheed contract for the GCSS-AF IF. It is an integral part of the entire combat support domain architecture. The Systems Requirements Specifications (SRS) developed under the Lockheed contract are binding on all mission applications for the technical architecture.

1 Cross Functional Domain Architecture

Although there are many EB/EC activities across GCSS-AF, functional communities have done very little real planning on how they will migrate their stovepiped mission applications into the GCSS-AF architecture. Too many people misunderstand GCSS-AF as a system composed of a group of projects, rather than a continuing definition of information flow across domains using the infrastructure services required by all domains.

Approaches that need to be harmonized in the overall implementation of GCSS-AF IF are the:

1. Methodology for contrasting existing AF mission architectures with the envisioned GCSS-AF interoperable architecture; and
2. Methodology for component delivery for the GCSS-AF Near-term Architecture (adaptations over the next 3 to 5 years).

Note that COTS tools/methods can fit to any phase of architecture life cycle and no single tool is sufficient for all phases[4]. Attachment D of this paper describes detail on the above subject matter. More information is also available at http://www.omg.org/library/.

GCSS-AF inter-domain EB occurs in three ways for combat operations, space operations, and special operations and mobility support [35]:

1. External to the Air Force for cross-functional implementations with commercial service providers.
2. In the Joint community, particularly for joint GCSS, involving CINC-JTF decision-making and supporting information management.
3. Internal to the Air Force, for needed extensions that allows stand-alone application systems to interoperate across domains.

Next, this appendix will explore the target interfaces and architecture in the joint GCSS-AF community for EB (item two above).

1.1 Functional View of Architecture across the Joint Community

Architects must adjudicate key, joint application components with each Service legacy system for integration with the near-term architecture. By analyzing the outputs of legacy applications, essential embedded legacy business rules can be preserved in tandem with adapting new industry practices and EB technology.

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[4] Unified Modeling Language can be used for comparing "as is" and "to be" architectures and for tracking requirements). COTS choice will depend on what architecture phase a system is currently in. UML can be used for systems architecture design to enable architecture driven simulations which allow designers to change an architecture proactively prior to implementation

For joint GCSS, interfaces involve CINC-JTF decision-making and provide information exchange for all GCSS programs. Table 2 illustrates similarities for all GCSS programs, regardless of the Service/Agency affiliation.

Table 2. Similarities across GCSS Programs

SIMILARITIES ACROSS THE GCSS-AF AND OTHER GCSS PROGRAMS	
In common, all the GCSS architectures, whether Army, Marines, Navy or AF, insist on interoperability and in the future aim toward "Exploring innovative approaches and "leap-ahead" capabilities…that support transformation of the US military." The problem is how to transition demonstration of systems and still remain component-specific e.g. keep the AF or Navy goal and still provide a unified capability. – Without a unified federated environment and tools to make decisions, you will see a string of logons, passwords, ID's and log tracking results. Although priorities may differ, the Army, Navy and Marines have EB goals in common with GCSS-AF.	▪ COMMON COMPONENTS ▪ PROCESS & DATA DRIVEN ▪ STANDARD GUI ▪ EMBEDDED TRAINING ▪ WEB CAPABLE ▪ INDUSTRY STANDARD ▪ UNIFIED LOOK AND FEEL ▪ REDUCTION IN TRAINING ▪ ORACLE DATABASE ▪ DISTRIBUTED DATA ▪ DATA REPLICATION ▪ INTEGRATED DATA ▪ INFOSEC ▪ NETWORK ENABLED ▪ DII/Y2K COMPLIANT ▪ FUSED DATA ▪ MANAGEMENT DATA

1.1.1 Joint GCSS

A technique to tie together underlying requirements for Automated Information Systems (AISs) is needed. If each GCSS logistics Operational Requirements Document (ORD) refers to a different picture of how things are done, DoD will perpetuate systems that fail to interoperate.

The GCSS Joint Requirements provide an initial set of 57 combat support information capabilities and requirements to assist users in prioritizing specific requirements for near term incorporation into the combat support component of the Global Command and Control System (GCCS) Common Operational Picture (COP). The joint requirement maps selected system/program capabilities to major tasks (surrogate requirements) in the GCSS Operational Architecture. The resulting requirements are decomposed for the systems architecture and, ultimately, for the system implementation.

1.1.2 Joint GCSS AIS and Logistics Requirements Processes

For the first time, CINCs are generating their own requirements in AIS and logistics. In the Joint arena, requirements gathering has historically occurred from the bottom up when Service/Agency level requirements were proposed to the CINCs, (e.g., from depot level upward in each Service/Agency).

The means for achieving the logistics mission of providing CINCs and Commanders with personnel, supplies and materiel necessary to achieve his/her objectives requires steady cash flow and solid relationships with suppliers. Services and Agencies each have budgeting and accounting activities, which tie into Defense Financial Accounting System (DFAS), creating a complex requirements process. Recently, the Joint Chiefs of Staff [5] has been ensuring certification of joint war-fighting capabilities and providing oversight for Automated Information Systems (AIS)/GCSS and logistics Joint asset management.

1.2 Functional View of Architecture across the GCSS-AF Community

Next, this appendix will explore the target interfaces and architecture serving GCSS-AF via external service provider relationships and EB.

One can apply EB goals like "just-in-time" inventory and paperless processing across the community, for programs such as Total Assets Visibility (TAV). These goals apply for both retail and wholesale elements of the supply chain:

For the Retail Supply chain– airplanes on the flight line need:

- Good demand data capture from maintenance, correlated for OPTEMPO, to predict future demand to ensure inventory levels can be tailored to meet demand at the lowest cost.

For the Wholesale Supply chain a description follows:

- Visibility at depot air bases for worldwide repairs requires (a) knowing what to repair; (b) what piece parts are available and quantifying resource capacity; and (c) having ability to distribute the items. To wholesalers, the engine is data.
- Visibility at Air Logistics Centers (ALCs) for worldwide repairs requires a reliable communications network to suppliers for services.

Within the Air Force, EB is used to purchase varied items, from administrative office supplies to operational airlift.

[5] --Requirements and Acquisition Divisions (J-8) and oversight JROC Secretariat, Resources and Assessment Directorate, Intelligence and C-4

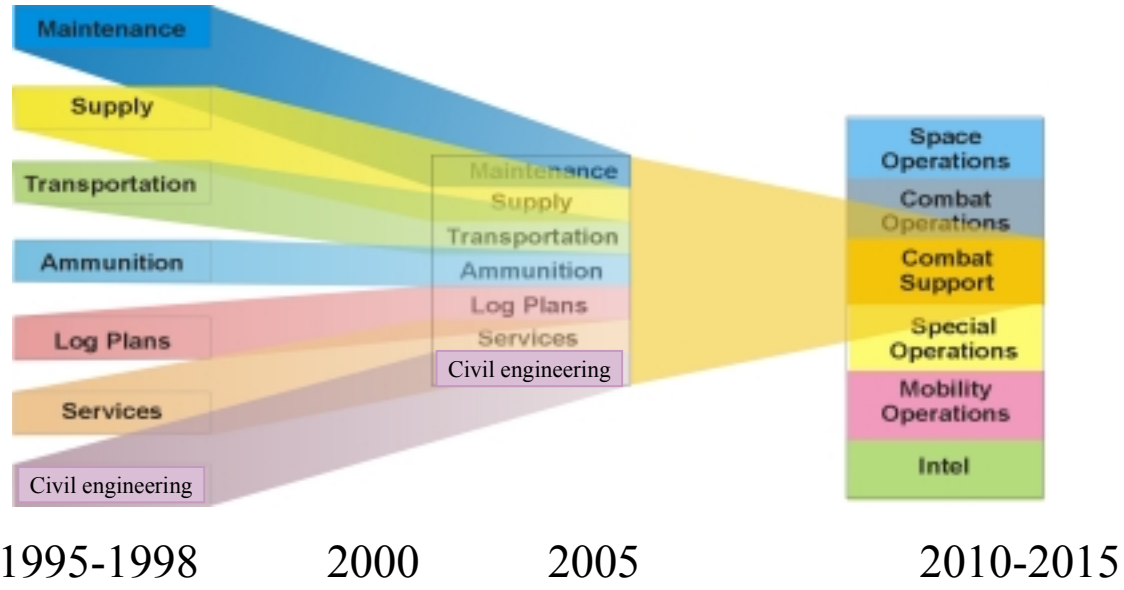

Figure 1. AF/IL Functional Business Processes.

(Source: AF/IL Logistics Community Manager Briefing, August 1999)

The cross-functional logistics community is illustrated in Figure 1. On the left are stovepipe Logistics functions; in the middle, these functions are merging into a unified combat support system, and on the right they are integrated with C^4I. Dependencies across civil engineering, transportation, supply, ammunition, and maintenance operations each require individual architectures to decompose unique functions before reconstituting relationships across functional areas to create a composite architecture.

1.2.1 Architecture across Contracting, Finance, and the Logistics Communities

Dependencies across contracting, finance, and logistics will require new components for the GCSS-AF architecture to accomplish an adequate legacy system wrapper or adaptation layer.[6] Components were defined earlier as (possibly) being composed of other components to form a hierarchy. Characteristics of this hierarchy can be the states, interfaces, behavior and constraints for a composite architecture including legacy adaptations and new components. Further, components may be treated separately from composition. When the composition subset/superset is a composite of functionality, like logistics material management, the composition has its own state, behavior, constraints,

[6] Perspective taken assumes component interfaces as a separate adaptation layer that sits between the legacy mission and support applications/databases and the middleware backplane/bus. At the top, an umbrella, enterprise management interface enables domains management in a hierarchical manner. The domains management support is for inter-domain component coordination. That is, component interfaces are built to the enterprise interface rules, and, passed though the adaptation layer with or without change. The adaptations are derived from application requirements to evolve and incorporate as-yet-unknown, new technologies.

interface, methods, etc. Adaptations are derived from application requirements to evolve and create new compositions and incorporate as –yet unknown, new technologies. The first step in creating a composite architecture is decomposing independent functions to reconstitute relationships for managing business data/objects and managing dynamics (rules/events). For example, building an air base requires the integrated activities of many different, administratively independent, functional disciplines, including civil engineering (ILE), acquisition (AQ), financial management (FM), etc. Depicting business activity for the purpose of a systems architecture means that each functional area must be clearly understand for its individual EB component interfaces (both inter-GCSS-AF and intra GCSS-AF). From an enterprise viewpoint, the inter-GCSS-AF information flows are more difficult to reach agreement on.

1.2.2 EB/EC in the Logistics Community

Retail logistics functions provide information for decision support on demand patterns. That information, transformed using marginal analysis techniques, is passed back to suppliers who perform functions to stock/store/order replacement parts and ensure order fulfillment. Picture creating a prime vendor relationship with the complexity of the overlapping logistics community functions in Figure 1; the legacy GCSS-AF logistics community represents 147 Standard AF Logistics Systems in 7 Functional Areas Integrated across the Air Force C2 Enterprise. There are many classes of retail/wholesale/maintenance and transportation logistics items, and many that are aggregated for reporting and AF Total Assets Visibility tracking. To begin, a retailer (for airplanes, civil engineering,[7] or ammunition) must decide when to submit a purchase order to:

(1) AMC; or
(2) Commercial vendor; or
(3) DLA.

Consider that, unlike some commodities which can be stereotyped or have a set consumption pattern, materials for airplanes are harder to manage. Frequently, airplane parts may not be commercially available. Called lumpy ordering patterns, the retailer may not know what Air Force organization the customers are or will be. For all these reasons, the Air Force is less likely to take risks with low inventory on numerous airplane parts. Inventories are quickly reduced on fast moving, common items such as screws and engine items e.g., contract with Boeing Corp. for the logistics item management function and for C-17 total weapon systems sustainment. In essence, the Air Force would be well served to adopt EB/EC processes and technologies to insure two-way information exchange between its weapon system managers and its private sector partners, thereby integrating the private sector activities into the Air Force business model. Elsewhere in the GCSS-AF logistics community, EB projects are on the increase, as exemplified by:

[7] Exceptions in civil engineering – uses a different supply system, for direct vendor delivery.

- Vehicle maintenance using EB/EC. Vehicle parts support is outsourced to the private sector and orders are communicated using EB/EC. This is an example of a DoD Logistics community initiative to become X.12 compliant;
- The Group Operational Passenger System [GOPAC] system, inherited from the Army, will be WEB enabled for the domestic part of the buying model.[8]

To illustrate the kind of horizontal decision-making an end-to-end architecture must support, a given AF wholesale logistics activity could mainly be responsible for weapon systems support, generating maintenance work orders for air craft and generating supply requisitions to keep the weapons systems operational. To provide truly cross-functional decision-making support, the architecture should tie this workflow to spare parts (contracting for supply and maintenance) and inventory processing plus cost accounting and finance. EB/EC is the best methodology for integrating these diverse functions to provide cross-functional decision-making support [9]. For more detailed information on EB technology see http://www.w3.org/TR/NOTE-framework-970706.html.

1.2.3 Adding EB/EC Requirements to Logistics [9]

Ideally, requirements are described in precise language that is mathematically founded at all stages of the life cycle to enable validation. Identifying new enterprise resource requirements (logistic business components) which incorporate EB will require wider intra-AF and inter-agency involvement than has heretofore been practiced to specify a logistics combat support system. EB concepts should be reflected in Mission Needs Statements (MNSs), Operational Requirements Documents (ORDs) or experimental Concepts of Operations (CONOPS). Figure 2 illustrates one impact of EB on GCSS-AF business to meet the goal of having prime vendor contracts for maintenance, repair, and operating materials for every major installation in the United States. Clearly, there will be architectural impacts on the communications network infrastructure and information flows as this goal is realized.

[8] March – April timetable – GOPAC users in the field [local traffic managers at wing bases] enter requirements, which are sent to TRANSCOM Military Command Center, and passed to AMC/DOY, then automatically to industry. The process improves on the earlier scenario: bidding process is based on cost of services versus fixed rates. Must be a Civil Reserve Air Fleet (CRAF) carrier to participate. Choice is no longer by entitlement but by pricing.

[9] For EB technologies reference the "Department of Defense Joint Electronic Commerce Program Strategic Implementation Plan" [9]. Also see JECPO web site at http://www.acq.osd.mil/ec/
Also see http://www.w3.org/TR/NOTE-framework-970706.html, W3C Activities Related to the US "Framework for Global Electronic Commerce"

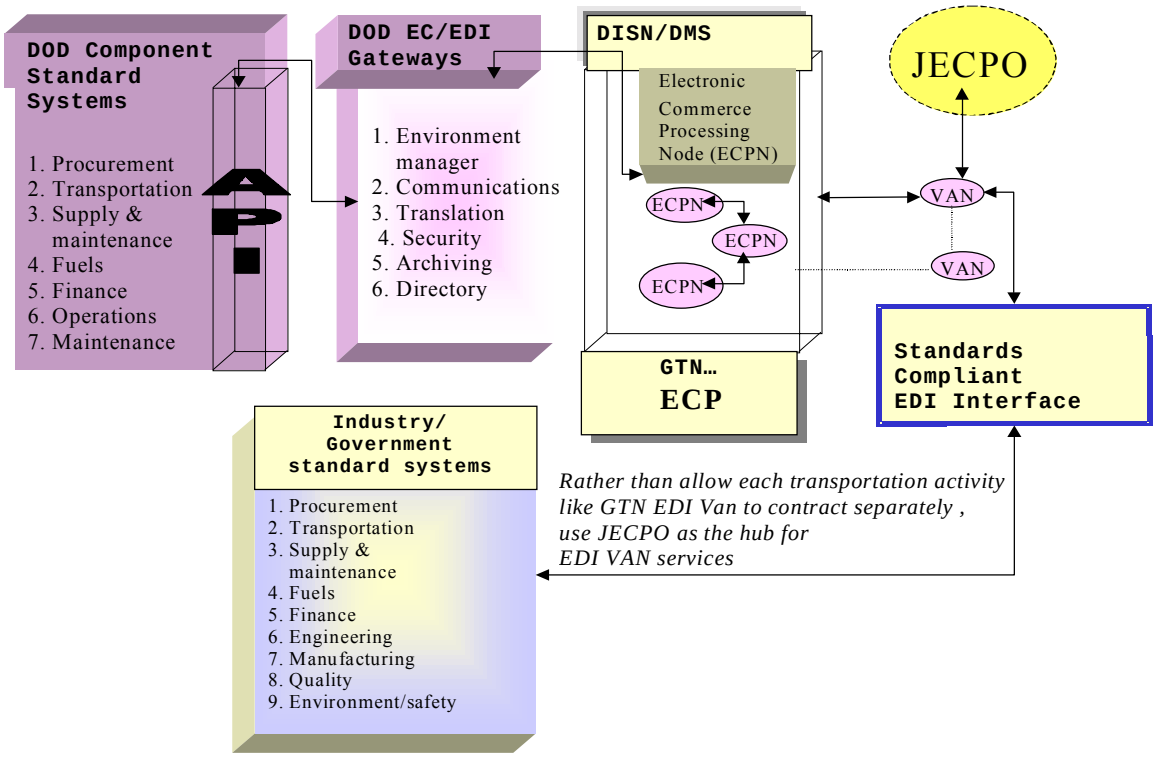

Figure 2: EDI Access under JECPO Umbrella

Across domains, multiple alternatives exist today for conducting business with outside suppliers. These include Value Added Networks connected to DISA's Electronic Commerce Processing Node (ECPN), the Global Transportation Network (GTN) EDI VAN contractor[10], the Federal Telecommunications Services (FTS) 2000 contract, and point-to-point high speed dedicated lines. All of these alternatives have advantages and disadvantages and are discussed in the referenced 1996 plan [21]. The USTRANSCOM air component, Air Mobility Command (AMC), has chosen to make the Department of Defense Joint Electronic Commerce Program (JECPO) the hub for its EDI services. In theory, this will eliminate redundancy arising from having each transportation activity contract separately with their carriers.

While there are numerous ways to conduct EB, these methods must be coordinated. Historically, AF/SC has focused on communications architectures and infrastructure requirements, while the functional communities have focused on functional requirements. The cross-functional GCSS-AF architecture must bring together these communities.[11] In this manner, economies of scale can be realized across the Air Force, much like USTRANSCOM has realized across its component commands.

[10] VANs are not the preferred choice due to cost and many EDI solutions are providing their own network support services, like logging X.12 transactions and using COTS for back-end adaptations to/from X.12 formats, syntax or business semantics.

[11] LCM, Defense Finance and Accounting Service (DFAS), AF acquisition components - Electronic Systems Center (ESC), Material Systems Group (MSG), Standard Systems Group (SSG), MAJCOMs, DISA, Air Force Material Command (AFMC) - Acquisition (AQ), FM, Defense Planning (DP), SG, Installations and Logistics (IL), etc., plus industry, congress, OSD CIOs, Principal Staff Assistants (PSAs), CINC and Joint Staff.

1.3 Scenarios for Cross-Functional Architecture – Data Quality

Architecture across the Medical and Logistics functions can run up against different priorities set by each functional community. The medical community is approaching data quality issues head on, whereas other functional communities choose more circumspect approaches to data quality. For example, the USAF Surgeon General patient informatics division monitors biometric data quality metrics and collects data globally from the MSG MAJCOM and Medical Treatment Facilities (MTFs), and practices that strategy even in the clinics, to monitor the quality of data submitted for outpatient record keeping. This community has policies, strategies and a web site to support their quantitative justification for resource decisions [more information is at Afmoa_sgoi.brooks.af.mil].

Contrasted with the Medical community's emphasis on data quality rather than EB, the Logistics community has made important strides in meeting their EB goals, with less emphasis on data quality. Why is this important? When planning an information flow that crosses communities, one must consider the differences in departmental/Agency priorities. If data mapping is performed for a gateway like prime vendor contracts, how will low quality data or immature EB on either side of a pair-wise interface affect the end-result? How will it affect time to deploy and deployment effectiveness, both end objectives of such initiatives?

1.3.1 Scenario #1: Military Health Service Mission End-to-End

By imagining EB/EC support to the Military Health Service (MHS) mission end-to-end, the steps in Table 3 trace a logical concept for integration across vertical domains:

Table 3: Logical Concept for MHS

STEPS
• An airman steps on a nail
• That episode goes into the government patient record. As the record travels on its way to the master MHS patient database, the system notifies the Unit Commanders and commanders along the line (wing surgeon) of the patient's condition location and diagnosis.
• The master patient record in CONUS is updated and the medical supply system performs automated ordering just as the patient gets a tetanus shot.
• If new logistics supplies are needed, such as a new pair of boots, that function is transparently completed for the airman.
Episode of Care — An occurrence or incident that is part of a progression or larger sequence, as in a period in which a disease or other health condition exists, measured from its onset to its resolution.

Here, medical episode information is sent to the Unit Commander electronically one time. A government computerized patient record contains a complete set of episodes a patient has experienced. A complete collection of episodes will be available in-theater to Medical Services personnel and the Unit Commander, to the extent it affects mission planning.

Currently, the medical logistics component allows users to order items on a list for a unit. Users can optimize the order based on criteria (e.g., criticality, cost). Also, COTS software at the site is used to manage on-hand assets/commodities and order what is needed. Note that the forward-deployed elements may not use all this functionality. Defense Medical Logistics Standard Support (DMLSS) systems development for both retail and wholesale medical logistics integration "has been guided by state-of-the-art technical systems engineering including Electronic Commerce/Electronic Data Interchange (EC/EDI), bar coding, and wireless technology." [http://www.tricare.osd.mil/dmlss/overview.html]

1.3.2 Scenario #2: HQ AMC/DOY (Contract Airlift Division) External Interface Lacks EC Capability

In the past, Air Force functional area specialists have maintained data stability with standards and further managed information by specializing functions down to their simplest event chain/parts. While this practice supports standard operating procedures, unfortunately, it can simultaneously institutionalize outdated business practice that is hidden inside departmental function and lexicon. An example of specialized function is taken from the Contracting Officer, Headquarters Air Mobility Command (AMC) Directorate, DOY (Director of Operations), which is concerned with:

- Buying expansion airlift services and supporting gateways for international commercial airlift,
- Interfacing to billing – copies of the delivery orders go to United States Transportation Command (USTRANSCOM) for user billing, and to the Finance Center in Omaha for carrier invoices.

For this specialized, overseas AMC transportation function, the carrier must be a Civil Reserve Air Fleet (CRAF) carrier. Selection of the air carrier is by entitlement - most entitlements go to carriers that already have contracts. Therefore, these contracts are not cost-competitive. Domestic purchases, however, use a different system. The extent of automation had been use of an electronic bulletin board with dial-up. This has been replaced by a combination of email and phone calls to the carriers. The future AMC vision, featuring EB/EC, has been named Virtual Airlines and is detailed in Attachment G, entitled Sample USE CASES for the GCSS-AF Architectures.

2 Vertical Domain Architectures

Next, this appendix will explore the target interfaces and architecture that are internal to the Air Force. Internal interfaces provide needed extensions that allow stand-alone application systems to interoperate across domains.

In the previous section, cross-functional domain architectures were discussed. Here a single functional domain architecture moving toward EB provides valuable lessons learned for implementation.

2.1 Health Care Systems

Public Law 105-85 requires the Secretary of Defense to establish a system to assess the medical condition of members of the Armed Forces deployed outside the United States as part of contingency plans and combat operations.

2.1.1 General Findings

High data quality is central to automation activities in the Medical Health System (MHS). In fact, high data quality will enable statutory requirements. As discussed previously, data quality is a central feature of EB/EC. The statements below are indicative of the importance of data quality to MHS personnel.

If the medical providers had confidence the inpatient and outpatient data coming from the theater were accurate, many more medical records and diagnostic reports could be available automatically today.

In fact, Web based technology to monitor and track data quality is a priority of the Air Force Office of the Medical Surgeon General (MSG). This web-based technology could be a re-use component for the GCSS-AF, especially for logistics, as well as the Military Health Services for patient care, billing and administration, and executive information reporting systems in-theater, supply and sustainment implementation architectures.

To achieve end-to-end medical supply chain management from a customer perspective, there must be a data quality infrastructure to support electronic business and electronic commerce.

For a scenario where confidence that the inpatient and outpatient episode data is accurate, there must be an infrastructure in place for information management. That is not to imply it is desirable to load everything for all longitudinal patient records worldwide. Rather, with an infrastructure in place to verify, prioritize, load, analyze, and disseminate information, the infrastructure is available when it is needed for histograms and preventative health care. Lawsuits attributed to Agent Orange and the Gulf War

Syndrome illustrate the need for accuracy and consistency in medical record keeping. In terms of EB components, quality of service and authentication mechanisms should drive selection. Think of the secure, trusted medical shopping agent as shopping for the latest medical diagnosis and case history of former veterans that match symptoms with Gulf War Syndrome. Secure and trusted agents must be used that proactively seek out potential buyers and sellers of medical information to negotiate on behalf of agents. Imagine a battlefield commander able to use an electronic market for "expertise" to determine the type of poison gas that is affecting his troops. Imagine a secure, trusted shopping agent that can negotiate to find a drastically different approach to analyze Gulf War Syndrome. Distributed databases on the Internet will help scientists wade through a deluge of information, and beyond that measure the integrity of the information they retrieve.

Barriers to Successful Medical Record Keeping

1. Issues associated with the Privacy Act and access to data pose greater difficulties than technical issues associated with gigabyte chips (e.g., Smart Cards). Smart cards have not yet been implemented by the Air Force.
2. Need for COE standards for Smart card hardware to prevent multiple incompatible reader/writer systems.
3. Lack of a single, standard information model for medical lexicon - there is no single, agreed upon standard medical dictionary of terms. Even though the government has a standard model, vendors may use a different model.[12]
4. Bandwidth and infrastructure to handle audio/video exchange on the Web; all medical facilities are now being equipped with Video Teleconferencing (VTC)[13].

2.1.2 Scenario #1: TMIP Architecture

An overarching future requirement of the Theater Medical Information Program (TMIP) is to link the integrated and improved Medical Surgeon General (MSG) applications under the TMIP umbrella and interface them with legacy medical logistics applications that are integrated today in a package called,[14] Defense Medical Logistics Standard Support (DMLSS) system. In this context, EC is currently only being heavily used by the medical logistics applications.

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[12] Likewise, a difficult aspect of end-to-end supply chain integration is that members of the supply chain must all agree on data interchange standards, and each must install software capable of communicating with their partners.

[13] Imagine the WEB as a macro video teleconferencing session where guests join and leave. See also, http://www.uk.research.att.com/vnc/index.html, - A practical introduction VNC (stands for Virtual Network Computing). It is, in essence, a remote display system that allows you to view a computing 'desktop' environment not only on the machine where it is running, but from anywhere on the Internet and from a wide variety of machine architectures.

[14] The vision of DMLSS is to meet the peacetime and wartime requirements of Medical Treatment Facilities (MTFs), field medical units at an affordable price through innovative ideas, and reengineered business processes to provide the best medical logistics Automated Information System (AIS) in Department of Defense (DoD) and United States health care.

An illustration of this point is the Prime Vendor program that saves money formerly tied up in inventory. The program supports a direct online link to vendors so that each hospital or clinic buys pharmaceuticals and medical/surgical supplies through direct online transaction, as opposed to going through the central, national warehouse in Philadelphia PA.

In the next two to three years, storage and access for a life-long history of medical records (longitudinal patient record) to meet the volume of data imperative for analysis and trending will begin to emerge. Trending from longitudinal records is essential to answer questions like what caused the "Gulf War Syndrome" and will be provided via the Composite Health Care Systems (CHCS) that jointly integrates a computer based patient record system. Complex, cross-organizational unit analysis is unavailable now because medical histories are currently paper-based.

Fortunately, TMIP's Air Force vision is in concert with the CHCS joint vision for a computerized patient record that contains all information and is available to theater Air Force medical units:

1. User has the proper permissions to generate Patient Visibility reports.
2. A Patient Visibility report is displayed, which contains a listing of the patient's health service episodes (HSE) logged during the current deployment.
3. The system displays a report containing the patient's complete deployed medical history captured in theater.

EB "best practice" applications will support patient tracking to provide the Commander and staff the ability to view an airman's medical history information, obtained during the current deployment:

1. Capability to read and write a minimal set of patient demographic data supported at all echelons.
2. Information management (IM) capabilities to protect and monitor the health of the population at risk; IM for the provision of health care.

Additionally, recording medical diagnoses, using the most current version of standard outpatient diagnostic codes, will enable population studies before exposure to events.

The "as is" and "to be" architectures for TMIP are in Attachment G. They describe an architecture that integrates six stovepipe applications[15] and tools from across AF and adds new components to achieve improved functionality.

The TMIP concept is for a "lighter, smaller hospital" footprint. To achieve this concept, TMIP is exploiting EB. In the future, the Area of Responsibility (AOR) CINC will have access to medical logistics. Be it dog tag, smart card or flash card, TMIP acquisition fly-off at year-end '99 will select a single device from field tests.[16] Using the WWW as a

[15] six applications are re-used from other AF agencies: DBSS from Army - Defense Blood Standard System, REOHM - Radiation Exposure/Occupational Health Module, MRC - Medical Reference Component, PEM - Patient Encounter Module - Joint tool being modified for TMIP, MAT - Medical Analysis Tool Composite Health Care System (CHCS) NT from Joint Services.

[16] E.g., 8 MB version at Target for $30. Smart cards are $1 or less. Concept is all military will have one.

network that accesses large servers of data much like we used to interconnect databases, industry is looking to catalog XML Data Type Definitions (DTD's) for global directories. For more detail, visit http://www.sciam.com/1999/0599issue/0599bosak.html.[17]

TMIP uses XML standards-enabled technology for data portability and data sharing. For instance, (a) XML Patient: The XML document that contains patient data; (b) HSE: The XML document that contains admission or discharge data; (c) Bed Report: The XML document that contains information about the availability of beds. COTS tools are available, which apply XML –based proposals to the problem of negotiations and counter-proposals. Applying an XML shopping agent, an agent can search distributed databases on the Internet, wading through a deluge of information, get a match, and negotiate a purchase with a supplier.

Medical providers of the future will sign an electronically captured medical event, using COTS software in CHCS II Increment 2 (SnareWorks TM) which applies security, for electronic signature. Also, the software has a new module for tracking event completion (see candidates for re-use in Section 4). GOTS implementation software will notify a supervisor if a data entry/authorization person has neglected to complete an electronic signature to move a patient record forward in the chain. Most importantly, incomplete clinical visits that have appended lab records, pharmaceutical, pathology and radiology reports and are held back only by lack of a signature, can be flagged for timely warning to prevent delays.

Think of the implications that a component like this could have in the Logistics community to identify delayed assets/arrival of shipments throughout the logistics community as it provides support to the warfighter.

TMIP CHCS integration paves the way to "re-use" of the just-mentioned signature notification component in future EB enabled GCSS-AF architectures.

2.1.3 Scenario #2: Enabling PKI

Scenario: Success with the PKI Infrastructure for Internet security, A Case Study
The goal of this implementation was to establish a trusted trading partner relationship internal to the DOD: AF units needed to exchange suicide data. The objective was to encrypt data sent between commands (servers) and field units (clients). Information Technology (IT) could provide software to secure data (secure sockets layer –2), but not certificates. Security is required when disseminating data on Air Force personnel with attempted suicide episodes.

[17] In terms of XML and the second-generation WWW, the combination of hypertext and a global Internet started a revolution. The new ingredient XML, is poised to finish the job of information exchange, but that assumes we have intelligent, consistent business models

The organization embarked upon investigation of certificates, discovering commercial contractors outside the command were unable to support certificate authority for Public Key Infrastructure (PKI) and that situation was unfortunately, repeated across AF service bases for MSC. However, the DISA PKI office provides infrastructure that can enable certificates to be issued within a thirty to sixty day timetable (see attachment on architecture WWW sites). Criterion categories can be built with PKI to accept connections by category. For example, only entries for .gov or .mil domains are allowed; entry is restricted for a group of user-id's and by password.

Pursuing the DISA solution, Air Force personnel could fill out a series of forms, obtain a certificate, and install the certificate on the WEB server that would run HTTP Secure [HTTPS]. They successfully encrypted 128 bit PKI encapsulated suicide event data from a field location. Specifically, an AF base in Yakota AFB in Japan exchanges PKI certified data with Brooks AFB in San Antonio, Texas. Yakota AFB is one of ninety locations globally using the approach whenever a mental health expert at a base hospital needs to encrypt suicide data.

The DISA solution preserves patient confidentiality because network sniffers obtain no usable data. Patient data is now encrypted. Encryption is negotiated on the fly, depending on how the service is configured.

2.2 Logistics Systems

Immeasurable time is consumed in determining which system has the "right" data for a job across functional communities e.g., working outside the logistics community, especially depots, people often speak to one another in stock numbers. For instance, vertical logistics analysis for ammunition and fuel at the depot level is remarkably different from a headquarters' overall assessment. One often doesn't know if the number of widgets "26" is a number from a single depot, multiple depots, an airfield or what the aggregate specifically represents? Consider that there are approximately 1,192,000 logistics personnel who (a) provide users with timely and accurate information on the location, movement, status, and identity of units, personnel, equipment, and supplies and (b) act upon that information to access in-process, in-storage, and in-transit items and assets. Consider that:

- These items and assets are categorized as either "due in from maintenance" or "due in from procurement" in DoD inventory management systems. This requires horizontal integration of the supply and transportation activities and one-time data capture.
- Interfacing across domains further complicates matters: DISA D7 requirements, espousing a war fighter perspective, differ from J4 and Air Force requirements for logistics, financial and acquisition requirements.
- Databases like Total Asset Visibility (TAV) or GTN may provide indications of item location in the supply chain location. But, to ascertain location with a high degree of confidence still requires phone calls.

To sum up, there are issues for business data analysis, as well as implementation issues for information currency and location, and for business data stewardship. Today, there are multiple, existing Air Force logistics sites distributed at geographically different locations. Each site produces data products based on heterogeneous inputs from external agencies, prime and sub contractors, suppliers, and service providers. Further, nearly half of the personnel in the forces (combat, direct support, and other) are logisticians. Estimated logistics costs amount to about one-third of total DoD costs; maintenance related costs are about half of estimated logistics costs.

In brief, it would be impossible to standardize or semantically reconcile a large percent of the logistics information model in the near-term, for end-to-end service. The near-term approach must be directory driven (for directory naming reconciliation), and focused on data reconciliation for key data passed across standard interfaces. The directory driven architecture differs from other architecture types in that it does not attempt to architect a complete semantic data model or business model. The focus is on building a directory infrastructure for routing management knowledge. The directory tree provides the larger enterprise context, allowing the user to drill down to share data across the enterprise. A domain can be composed of cross-operational, system, and technical architecture views. For the system architecture view, directory driven means directory objects are composed into tree structures to represent part-whole hierarchies. Naming (host) and location (object) transparency are achieved through treating combinations of directory components uniformly, e.g., identifying a general purpose management information tree (accountID, networkID, serviceID) and identify a domain naming service adapter to traverse proprietary directory systems. Potential benefits are to simplify inter-domain searches, ship fewer objects cross the distributed interface, and enable scalability through design for directory replication, caching and distribution.

2.2.1 General Findings

It is perhaps self-evident that each of the vertical domains today primarily focus on, and are optimized for, business measures that are within a specific business area boundary, rather than measures that look at the entire supply chain.

It is also evident that in spite of the Command focus on business areas, the financial relationships across the supply chain are confusing and bureaucratic.

Since the DoD culture is unlikely to change, real business process improvement must come about through evolution. This is accomplished by leveraging existing, specialized business rules, often driven by regulation, and ensuring rules are maintained independent from process. In architecture, that approach is sometimes called "separation of concerns."

An important lesson learned is that formulating when-where-how to use EB needs to be performed on a case-by-case basis.

2.2.2 Scenario #1: Standard Base Supply System

ESC/IL will develop a new refresh supply system for Standard Base Supply System (SBSS). The initial effort generated by the tasking for a new supply system was unsuccessful. Logistics transportation contracting had been directed to use the Standard Procurement Systems (SPS), which performs electronic commerce for normal materiel contracting. Initially, customers attempted to re-use the generic system, but now plans are to build (re-institute) an interface to leverage and extend benefits from a formula that computes air miles given longitude and latitude. The module was developed by National Imagery Management Agency [NIMA]. Using the algorithm, the current system can put in codes that show an entire planned air route – including non-mandatory airport stops for refueling where there is no material on-load/off-load.

The lesson here is that one cannot simply throw away an old process when a better one is discovered. Migration means preserving unique "specializations." In operational architecture terms, a moderate number of business components are [37]:

1. Utility business components, such as a calendar, address book, number generator, are applicable to several systems but are often overlooked.

2. Process business components, such as order placement and product pricing are the process part of the model and the most volatile and changing category because they represent workflow.

3. Entity business components, such as customer, order, and end-product, are the structural parts and are the most stable

During MITRE's interviews with AF personnel, it came to our attention that discretionary military shoppers had been taking time from their primary jobs to function to search the WWW for parts availability. The consequence of this search activity is an aircraft maintenance technician loses productive time using a WWW system to find a part and he/she is not performing his/her primary job/tasking.

In the Lessons Learned from the last example, a primary on is architects need to plan systems embedded with "roles" so that developers can implement roles, as well as role constraints for a process business component and prevent the wrong person from doing a WWW search on a parts database. This is easily implemented though meta models, user profiles and templates. Consumer and supplier roles can exist within an implemented system and not just outside it. The WWW can be used effectively to incorporate new business roles and processes in an organization[18]. Air Combat Command (ACC) has

[18] a) Role registration
Product or service customization - A set of role oriented interfaces through which a tool can be installed, invoked and removed.
A role model is used with the objective of separating out the supply/demand relationships. Roles are available for policy adjudication, contracts management, credit checking, etc. Roles enable you to adapt "Infrastructure Ownership" approaches.

adopted an EB/EC program for purchasing desktop computing equipment, examined in Scenario #2.

2.2.3 Scenario #2: ACC Computer Store at Langley AFB

By implementing E-Mall buyer and sellers models, new service level agreements can be negotiated driven by policy. As a consequence, government contracts personnel can propagate changes to supplier relationships by invoking their contract change operations. Air Combat Command (ACC) is taking the EB goal stated earlier seriously: Use of electronic catalogs and electronic "shopping malls" to put buying decisions into the hands of the people who need the products.

ACC has adopted an EB/EC program for purchasing desktop computing equipment. The Computer Store success incorporates coordination procedures for routing an order within its approval chain immediately before an order is accepted. This virtual computer store has been called “The ACC Way.” The vital ingredients bringing about change are voluntary, as the organization shifts in response to the WWW. Here, the outcome is to forge new patterns for interoperability, visibility, quality assurance, and tracking. For example, when the Computer Store buyer crosses a dollar threshold (above $1M), the next development step will be to obtain GSA Schedules electronically. The goal to integrate schedules electronically will require initiating business relationships with vendors, previously virtually non-existent. One of the major outcomes of this activity was re-engineered EB. EB will happen via innovative voluntary initiatives, like a computer store, as well as through DoD directives. Either way, all actors must be customer focused.

The goal for the successful ACC EB endeavor was to overcome difficulty with inter-connecting non-standard personal computers (PCs) purchased by ACC personnel. Additionally, ACC was responding to a 1997 survey, which disclosed significant time spent researching PCs (what to buy and build) over and again. Although the most efficient approach would have been to constrain PC buying to several vendors, managers knew that would be unacceptable to their AF customer, who already had a large base of existing, installed PCs and trained users. Therefore, objectives were to gain reasonable control over PC standards, while offering customers a range of choices.

> *Objective One:* Present Information to the customer as choices - 7 vendors for notebook and desktop systems. The automated system compares product offerings with user requirements. PCs are rank ordered on the basis of the number of user requirements satisfied and additional features are highlighted.
> *Objective Two:* Capture purchase data for more expensive items (historically, a manual process) and replace the man-hour intensive order-entry process.

An overarching EB goal for the computer store was to meet the imperatives of the Clinger-Cohen Act, which requires the Government manage purchase orders through CIO-approved configuration management.

The computer store implementation approach has been to automate management of all Technology Appliances (Desktop PCs and Notebooks) bought through a browser. The basis for the strategy is to include Configuration Management (CM) for the electronically entered "buy" information for any new inventory.

Benefits are:

1. Allows Headquarters to manage licenses that are distributed across both CONUS and OCONUS bases.
2. Allows Headquarters to track inventory and demonstrate to auditors configuration management capability. The system can upgrade software over the network. Enterprise Management Services are accomplished using Microsoft Systems Management Software (SMS) to inventory software and hardware for purchases.

Concept - Designed to be more than a store:

A Standards Systems Group (SSG) Contract Vehicle has enabled web-based ordering mechanisms for the entire Air Combat Command at Langley AFB. The web-enabled system is built for individuals who manage IT (PC licensing) at an organizational level where competitive pricing is a major consideration. Besides supporting purchasing, the store adds validation checks on the Web Site; i.e., a technology purchase is reviewed and a budget organization is notified. Steps include:

1. Customer registration with an authorized financial advisor (one time);
   - The web site is used to retrieve and display an order.
2. Automated procedures load money against a smart card and ensure approval is made on each order against the approval chain;
   - Routing against the approval chain is accomplished via email notification,
   - Coordination on an order is performed before the order button shows up on screen at entry site; and
   - Usually there is less than 5 minutes delay until the order coordination and approval process is executed.
3. An historical record is generated concerning details of the purchase (e.g. personnel, organization, PC configuration).

The "Purchase" module of the system was available July 1999. During August and September, the system processed over $8 million worth of sales, even as a non-mandatory capability. ACC personnel ordered 6,200 computers.

- Estimates are for approximately $17 million cost savings over four years for centralized purchasing (87,000-90,000 licenses for Air Combat Command).
- Estimates are 90 % of all IT appliances will be managed with this process.

2.2.4 Scenario #3: Transportation EDI Program

During high volume contingency operations, such as Desert Shield / Desert Storm, AMC used commercial assets on a "mission by mission" basis. In simple terms, this means that specific planes and crews were assigned to a specific job, without giving the participating commercial air carriers the "big picture." Using commercial carriers in this manner ignored their primary strengths: their command and control systems and air operations personnel [21].

The Defense Transportation Electronic Data Interchange (EDI) Program implementation plan defines project expansion to implement EDI throughout the Defense Transportation System (DTS) for eleven transportation processes, many of which interact with GCSS-AF across domains. For example, maintaining rates for the buyer and sellers model, and planning for carrier booking are two EDI effected processes. Figure 3 illustrates the logistics transportation EDI processes that effect freight movement, and applies to Air Mobility Command (AMC) when an Air Force Unit requests airfreight transportation, as distinguished from sea or land. The current AMC plans call for commercial air providers to airlift 93% of all military passengers and 40% of all military cargo. AMC currently spends about $600 million a year during peacetime operations on commercial lift assets [21]. In logistics transportation, the Air Force uses X.12 for shipment information (movement and status data), bills of lading, tenders (transactions for bidding and responses to providing transportation).

Enabling Technology: Logistics Transportation
In Figure 3, the overarching eleven EDI processes are depicted in four categories, as identified by the Defense Transportation EDI Program Implementation Plan (DTEDI), for U.S. Transportation Command (USTRANSCOM). Within each category, the business processes above the arrows leverage benefits from EDI techniques. In some cases, those processes achieved operational capability using X.12 and continue to expand new carrier trading partners: e.g., voluntary/negotiated tender of rates. The EDI transaction set applicable to AMC is the 602, X12.126 Transportation Services Tender.

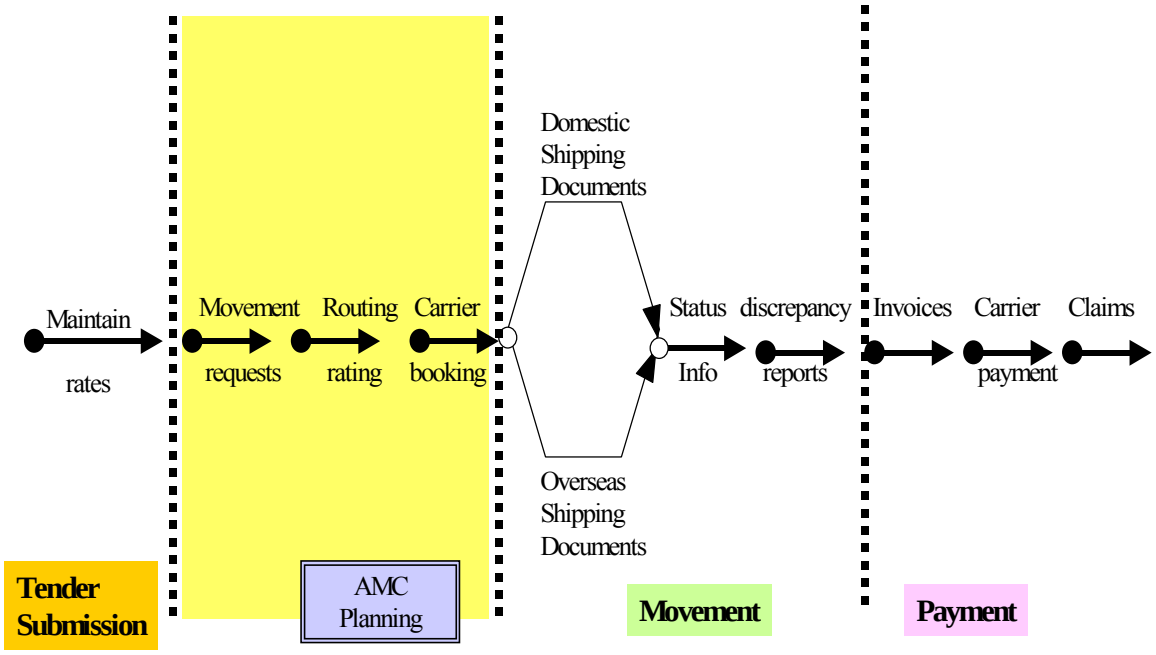

Figure 3. Transportation EDI Processes impact GCSS-AF for AMC operations.

Two aspects of AMC planning are highlighted. First, a WWW enhancement to the Consolidated Air Mobility Planning System (CAMPS) is identified. Second, the future planning function is envisioned for improved carrier interfaces in the "Virtual Airlines Project" to enable commercial airlines' participation in the "big picture." At a high level, route planning and carrier participation play together when:

a) DOD customers initiate a requirement for transport of goods:
   - Decision-making begins (called modality determination) with a decision on type of transport for assets (air, land or sea).
   - An Air Force Component (air-movement) is given the tasking.

b) Command and Control (C^2) customers will gain "One-stop EB/EC shopping:" :
   - Air billing and refueling requirements will be supported with WEB best business practice.
   - Joint planning and contingency requirements will be supported.
   - EC will have developed an established relationship with the commercial world called "virtual airline" to plan ahead for commercial aircraft use.
   - The Global Transportation Network system provides input/output for status information on scheduling and assets tracking.

2.2.5 Scenario #4: CAMPS

Air freight logistics, a component of the Transportation vertical domain, is advanced as compared with other vertical functional domains that are adapting EB practices, although implementations for passengers and personal property are less complete. The "as is" and

"to be" architectures for CAMPS are located in Attachment G. They describe snapshots of an architecture that provides Air Mobility Command (AMC) with a system for the planning and scheduling of AMC assets in support of peacetime, crisis, contingency, and wartime operations. CAMPS will incorporate the baseline functionality of two legacy AMC systems, which in the "stovepipe" mode exchange a minimal amount of data. CAMPS will migrate these systems to an integrated architecture compatible with the GCSS-AF DII Common Operating Environment (COE) and EB goals.

CAMPS integration of legacy systems for use in central planning and decentralized execution is just one aspect of the AMC concept. The larger goal is one-stop shopping for C^2 information. AMC has established an electronic commerce relationship with commercial airlines for approximately 1400 aircraft, and envisioned a business relationship with commercial airlines called virtual airline, which is described next.

2.2.6 Scenario #5: Virtual Airlines C^2 Project

As mentioned previously, legacy external interfaces to commercial carriers are managed in a less than optimal manner. Scheduling and execution of air mobility transportation will become more cost-effective using automated EB with broader categories of flights, planning rules and monitoring. The Virtual Airline C^2 Project is sponsored jointly by Defense Advanced Research Project's Agency (DARPA) and AMC. The purpose of the project is to develop a prototype system; called the Virtual Airline Integration and Evaluation Tool (VALIENT), which would create a "Virtual Airline" from commercial air carriers. The primary users of the system would be operators from AMC and representatives from the commercial air carriers. Virtual Airline Project improves upon the existing process where the air carrier receives tasking without the context of the overall lift requirements or the knowledge of other carriers' participation [27,28,31].

Figure 4 depicts the Virtual Airline method of using commercial air. All parties are informed of the requirements and are involved in the process of determining the tasking. In the future, commercial carriers and the Air Force will share many tools, but today the Air Force only uses some tools commercial carriers use. Tools have high impact on improved business process. For instance, one tool helps carriers identify excess capacity in their current schedules. Another, the Carrier Strength Assessment Tool assesses the strength of each commercial carrier. The strength of a carrier is determined by the number and type of assets that are located near a staging area and by its capability to meet the demand at that staging area. For example, American Airlines has a maintenance base, a crew base, and a major presence at all three New York airports (Kennedy, LaGuardia, and Newark). It also has large, transatlantic capable aircraft. This makes American Airlines a prime candidate for providing long haul airlift out of McGuire AFB, NJ. On the other hand, Southwest has maintenance and crew bases at BWI (Baltimore-Washington International Airport) but no transatlantic capable aircraft, making it a good airlift candidate if there is domestic airlift demand to be fulfilled from Andrews AFB, MD [27,28]. Additional information can be found at the Virtual Airline web site http://www.metsci.com/va/virtual_airline.html.

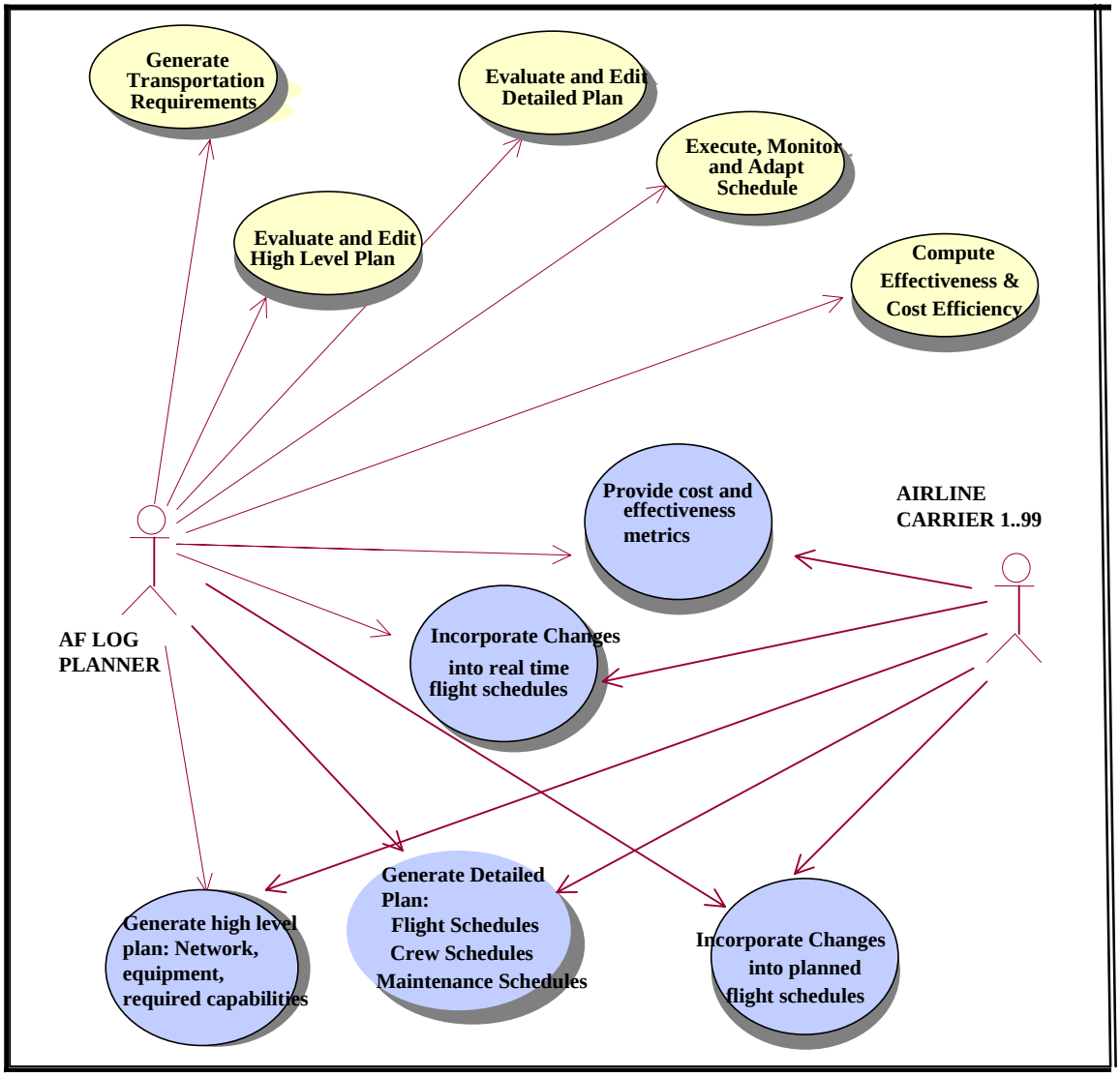

Figure 4. Virtual Airline - From Transport Requirements through Detailed Planning.

2.3 Conclusions

Why an architecture?

1. E-Mall is just one business application that presents new ways to arrange payment and present bills aggregated from multiple sources. See Attachment C for E-mall description.
2. Virtual Airline is another business application that is re-arranging itself by decentralizing the unit planning and scheduling activity to achieve improved global business processes.
3. A Single Data Collection Point for USAF Surgeon General (SG) office Medical Operations Agency facilitates the flow of Air Force biometrics data. In theory, the collection point provides Web-based tools and information for MTFs, MAJCOMs and Regions from a restructured organization.

If the vertical domains are re-arranging themselves in new ways to provide EB service, then how can these vertical domains be implemented without an architecture to communicate the new arrangements? An architecture to capture and adjudicate changing organizations and partnerships is required. Internet technology will change process flow and re-engineer information flow in dynamic ways. The architectures effected by these process flow changes must be adaptable to support on-the-fly infrastructures. Thus, in the architecture approach, a key component will be an adaptation mechanism to provide translations and interpretations for dynamic situations.

3 Recommended Near-term GCSS-AF Architecture Approach

The near-term architecture approach will leverage the significant and on-going investment made in the GCSS-AF architecture and its associated Integration Framework. Functional application migration will occur over the next three to five years. Figure 5 highlights the approach.

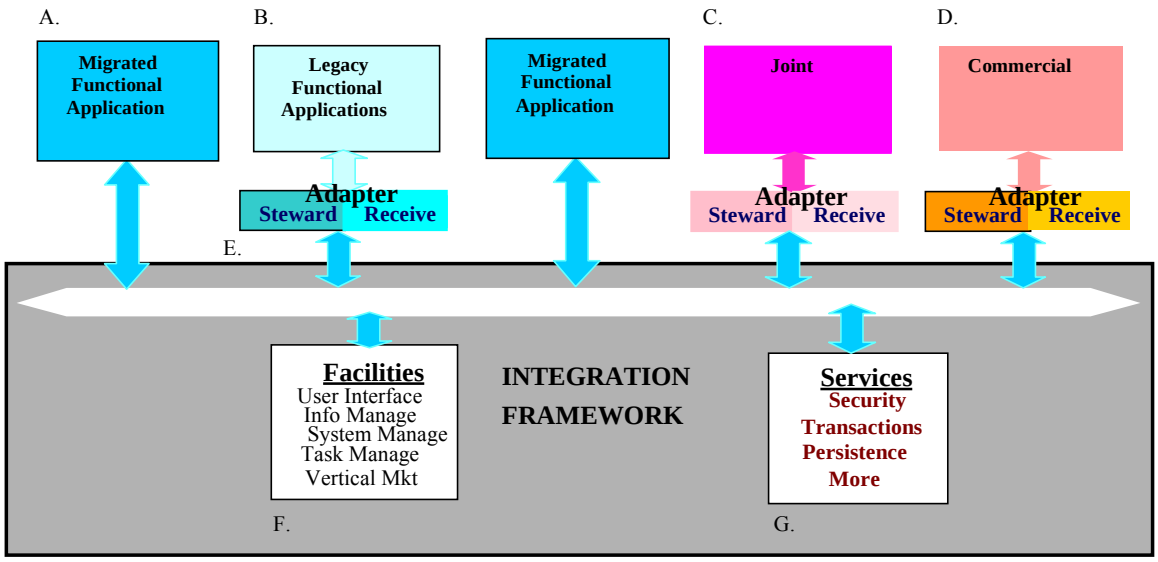

Figure 5. Near-term EB/EC Architecture Uses GCSS-AF Integration Framework In Functional, Joint and Commercial Areas.

(Sources: SSG/Defense Information Infrastructure (DII) Division and Lockheed Martin)

1. The components will for the foreseeable future take a variety of forms, ranging from fully componentized modern applications based on internet technologies such as web browser clients (A), to existing Air Force legacy functional systems (B), to Joint standard systems (C) and finally, to commercial applications which can be configured to support Air Force unique mission requirements.
2. The Integration Framework (IF) is comprised of modern enterprise quality commercial infrastructure software that enables more effective interaction of functional information systems by establishing a robust open system information bus. The IF capabilities are made available to the entire combat support domain equally. The infrastructure capabilities provided via the IF are those which have a high degree of generic applicability to all information systems, such as security. For example, all information systems have a need to limit access to information to only authorized individuals. Implementing that security goal as a service component in the IF, for all functional systems to use provides a consistent and cost effective solution.

(1) IF services and facilities will be made available to functional systems through Application Program Interfaces (APIs) based on open commercial standards. These APIs will connect functional applications to the GCSS-AF information bus e.g., message brokers and middleware COTS. Functional systems constructed using similar internet technologies will be able to integrate directly to the IF, while legacy systems or systems with dissimilar technologies will require an interface component (E). This interface component will expose the data the functional system has stewardship for to the information bus, and will supply the data the functional system needs from the rest of the combat support domain.
(2) Based on internet technologies, the infrastructure facilities (F) and services (G) include capabilities to implement or manage a broad range of application characteristics and essential capabilities.
(3) For a data stewardship/receiver group, a facility would be a directory that uses mission application meta data to locate components or methods and to execute object calls to those components. For example, the on-line metadata only supports the business processing of the mission applications. It drives the object environment. The off-line engineering repository (warehouse) supports the engineering development and life cycle management of the environment. Predefining data access also supports defining access permissions, and will be increasingly critical as the GCSS-AF Requirements Integration Directorate (GRID) examines classifications for aggregated data.

3. Adapter components may or may not be required to integrate with joint and commercial applications, but will, for the near-term invariably be essential for legacy system integration. For instance, an interface component, links a legacy steward for a data subset with a list of receivers, to publish how many precision guided munitions of a specific configuration are on hand at a particular location. Stewards for Combat Support legacy data may be known, already defined, difficult to discern, difficult to find, or any combination of these. GCSS-AF will better document interfaces (methods, input parameters, output parameters, and lots of metadata) that will make it much easier for outsiders (any other domain/subdomain) to understand what data is where and how it flows in this environment. The emphasis on data stewardship, as distinguished from data ownership, is consistent with the GCSS-AF Requirements Integration Tiger Team (GRITT) direction as stated in [32].

The GCSS-AF architecture, comprised of the Integration Framework and the Application Framework, offers a very powerful approach to maximizing the goals of EB/EC. By either designing their systems to use the IF information bus, or designing interface components to integrate systems that cannot directly interact with the IF, mission applications can exchange information securely between one another, and at the same time can make more data available to meet the needs of the warfighter.

3.1 Overview of GCSS-AF Architecture Approach

EB is driving organizations to move from a local, static model of systems to a global, dynamic model and to implement enterprise services that respond to that shift. In a global Web community, the distributed computing environment is multi-vendor, non-uniform, dynamic, and subject to continuous end-to-end component failure and constant information change. Reliance on Internet interoperability strategies and underlying communication protocols has become the de facto standard for transferring information between diverse and physically separated systems. A GCSS-AF enterprise architecture proposal to enable the evolution to EB is described in the following paragraphs. The approach suggests a multi-level data sharing hierarchy using a common directory information tree (depicted in Figure 6). The approach formulates assuming an infrastructure will exist for qualified representatives (stewards, owners) to manage value-added business components and ensure a high quality, ratified business architecture, and decision-making based on both precedence and capture of legacy business rules. The directory tree shown in Figure 6 has registered, relative, distinguished names used by the DMS system (non-colored). Unregistered names being defined in standards committee [IETF] are indicated in color; and those at the bottom would be for local use.

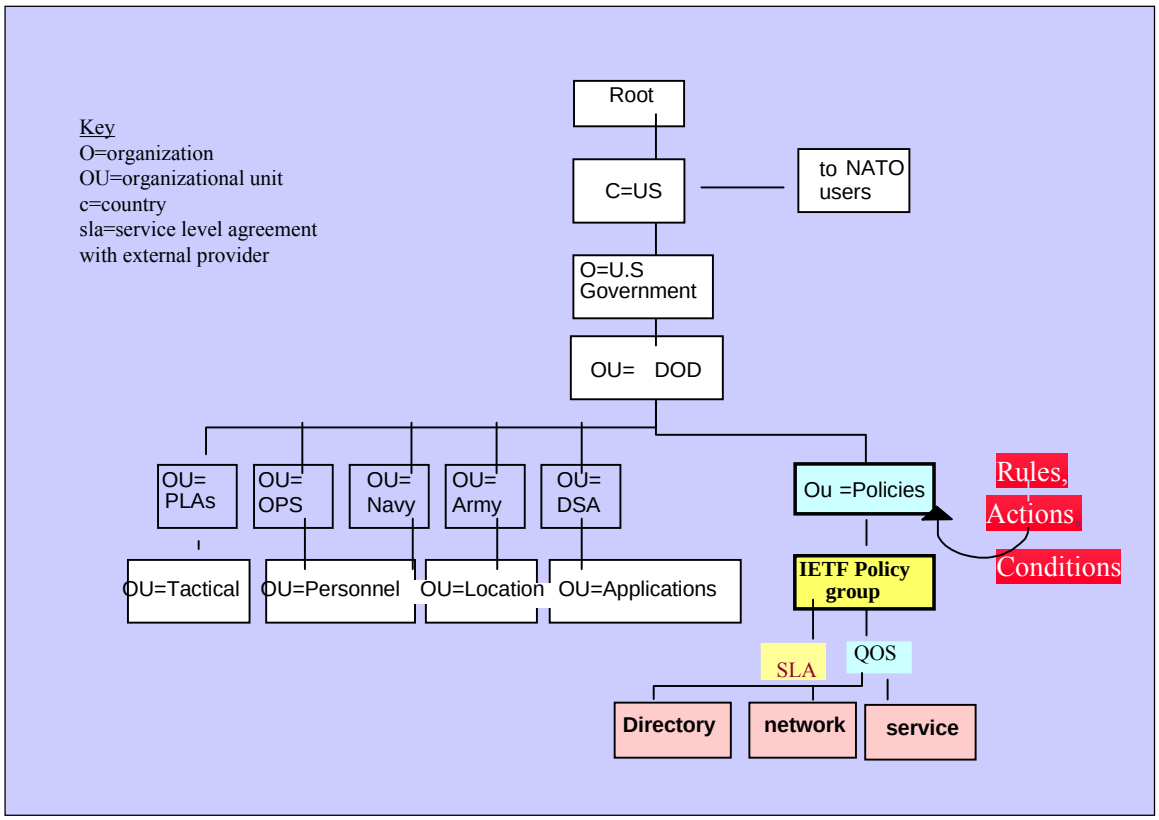

Figure 6. Near-term EB/EC Architecture Uses Directory Driven Approach to Interoperability

3.1.1 Mapping Component Interactions – (Data Conversion, Transmission and Adaptation)

The information dependencies (for data creation and update) between vertical domains must map to a set of component interactions, which hide any differences by converting between non-object, legacy data and added-value object meta data for a new mission or inter-domain EB capability. In practice, this can mean writing special validation/comparison routines using tools for data clean up like Model Reference Technology Architecture Repository (Marty). Even when new capabilities and outputs differ from legacy outputs, legacy products can have relevance to verifying that new adaptations have been represented as expected.

The set of component interactions developed for migration to the near-term GCSS-AF and EB should be adaptable for new external interfaces, as well as legacy proprietary technologies; and enable different kinds of transmission modes.[19] An example of a business conversion (adaptation) component is a payment gateway to convert currencies and bill handling for Internet use. An example of systems architecture transmission conversion is between X.12 and EDIFACT encoded EDI transactions and non-EDI formats. The architecture separates the business information from the particular delivery and transformation mechanism to enable greater flexibility for scaling and maintenance.

This GCSS-AF implementation plan proposes a focus on integrating multiple architectures into an EB/EC architecture to support the warfighter. The composite architecture must take into consideration the integration of PKI to ensure secure business transactions when conducting business within the Air Force and with external industry trading partners. The rationale follows:

- Legacy applications cannot simply be ported. It is more adaptive to port data for EB legacy integration through common directory information trees and extract common business rules for enterprise sharing. The directory tree provides the larger enterprise context that lets you drill down to share data a manageable amount of data across the enterprise.

- Component re-use opportunities must consider the criticality of specifying uniform interfaces although both high-level application program interfaces and low-level protocol/database interfaces are considered. The key for the GCSS-AF EB/EC architecture is to define an architecture model that has the top-level interfaces and dependencies for each vertical functional domain (logistics, medical, financial, contracting…) and across functional domains (MedLog, contracts-financial, etc.).

- The composite GCSS-AF approach will support shared business rules, uniform interfaces, and added new components as mobile agents. For example, mobile agents might be used for rate solicitation, financial portfolios

[19] Using COTS from the AF integration framework acquisition

for trading partners, transportation routing and rating, prime vendor Purchase Order (PO), back-order status tracking, traffic movement guarantees, and performance measurement, to name a few.

3.1.2 EB/EC Business Rules

In enterprise architecture, the focus is on managing dynamics (rules/events) for new EB components, as distinguished from a more traditional architecture focus, which views architecture as collections of processes and procedures.

Business Rules Approach (sample)
The methodology to achieve EB enterprise integration for GCSS-AF includes validation of legacy rules and outputs with new COTS components.[20] From an implementation perspective, the developer must ensure legacy business data (rules, constraints) will migrate as expected for batch reports and files, and for WWW and online access. In many cases, the developer must study the originating system to validate the target system's validity, not just the target exclusive of previous outcomes. There are two rule types:

1. A fixed context rule is a pre-condition and post-condition that may itself vary (by time, location, and vertical domain).
2. A situational rule is dynamic at run-time by interface, for on-the-fly decision-making, such as the state or status of the network, inventory levels, ability to meet daily operational tempo, etc.

Administration supports adding rules, compounding rules, implementing new formulas, and building new rule uses. Rules offer the following benefits:
1. Helps Preserve strategic components from legacy systems.
2. Preserved rules can be re-used (called by) COTS such as Enterprise Resource Planning (ERP) software.
3. Separation of concerns (a rules component) for the implementation enables quality:
   - Remove/relocate rules as the system stabilizes.
   - Discover costly rules or unfired rules as developers perform regression testing.

3.2 A Recommended GCSS-AF Architecture Approach: Use of Packages

A package is a single interface with all the data inheritance needed for implementing a given business process such as combat and mobility support. The package will be a

[20] From an implementation perspective, you need to ensure that the legacy business applications' data (rules, constraints) will migrate as expected for batch reports and files and online access. In many cases, you must look at the originating system and the target system's for validity, not just the target exclusive of previous outcomes.

composition of legacy and new business components. In the operational architecture, a package may aggregate knowledge across a domain as encompassing as Theater Missile Defense/National Missile Defense (TMD/NMD), Ground Moving Target Indications (GMTI), Air Moving Target Indications (AMTI), Agile Combat Support (ACS), Dynamic Aerospace Command, Integrated Space C2 (ISC2) or a combination of these. At a systems implementation level, it is more likely to span a pairwise (customer and service provider) agreement involving functions used by one of the above-mentioned domains. Figure 7 depicts the management interface inheritance activity to:

1. Provide a manager an overall view of the GCSS-AF horizontal integration supported by EB/EC;
2. Anticipate different interface requirements; [21] and
3. Organize cross-functional interfaces for products of supply chain management and products created from reengineering legacy for best business practice.

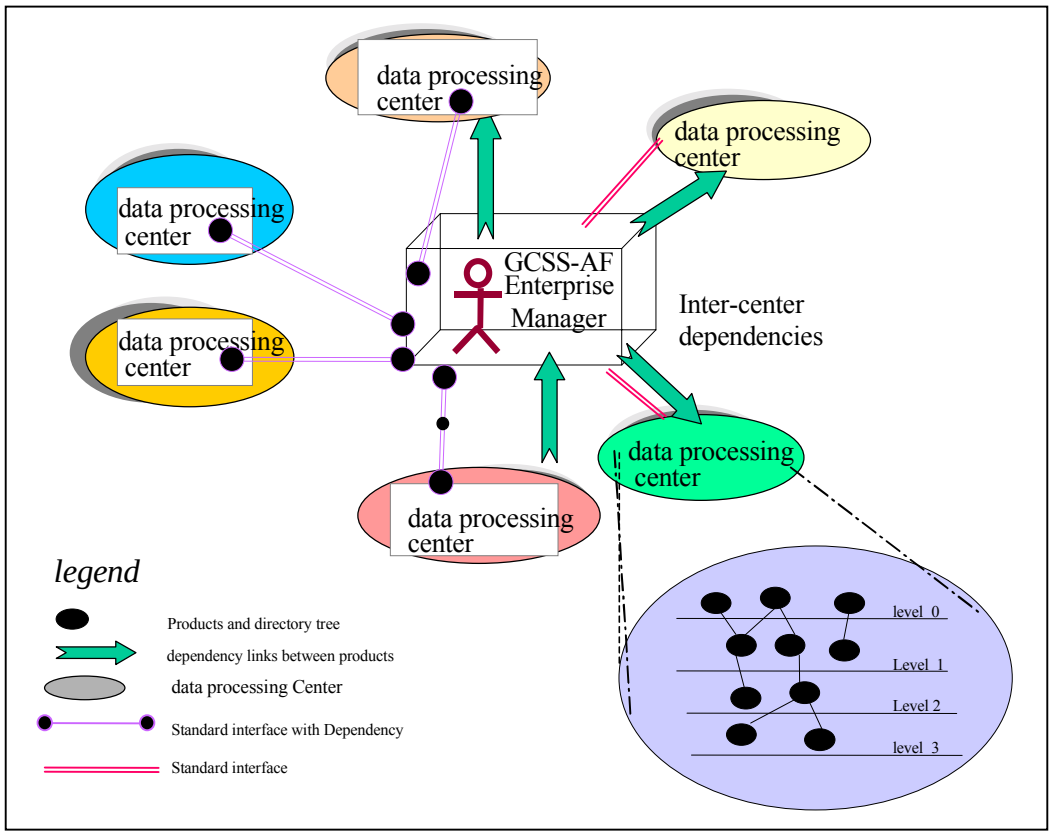

Figure 7. Near-Term GCSS-AF EB/EC Enterprise Architecture Levels.

[21] For development and support, implementer decides if need to transform data between each source and target, whether to adapt each source & target component to provide the message interface to a single structure used by the broker (HUB). AF Organizational unit is responsible for adapting to a standard implementation convention, testing through broker for direct, or point-to-point translation, etc.

Figure 7 shows the enterprise server with a manager application. The Enterprise Architecture levels are approximately equivalent to the chain of measurement points from Headquarters to Wing Level to Unit level, as needed, to execute the mission. In short, the Enterprise Architecture levels are domains for management of mission data. In an alternate enterprise design they could be domains for matching retail and wholesale transactions for an ordering interface. To reiterate, the concept is to organize knowledge access for the purpose of supporting an inter-domain guarantee that a product is from a specified interface group and set of origination points, e.g., using levels of data as one means to establish synchronization.

Single Interface/Business Package

A package, as used in the architecture approach, is a single interface for all the data structures at a given level. The cross-functional shared data may be at a single level interface (package) or may be an aggregate of levels or a pair between two IT/data centers or between a data center and some other different external source. Such combinations may consist of a download from a supplier or carrier using an X.12 transaction. Each center requires data "inheritance" or inference that must be accomplished in a very clean way through the levels.[22]

- Products (medical/logistic/financial inputs and outputs) within a data processing center at a depot, unit, headquarters or distributed theater site are categorized into levels.
- There are dependency relationships between levels. Let's say level x+1 is always dependent on level x data.
- The grand parent of all data is level 0 data, which may come from an external source as described earlier or may come from a joint DOD source like a CINC.
- The cross-functional viewpoint is concerned with the strong interface typing (packaging) and system decomposition into a set of levels that interact for decentralized interfaces to ensure synchronized management activity.[23]

Components can be packaged according to a set of generic rules. Thus, composition is a powerful modeling concept, since it permits a (sub-) system to be treated as a single higher-level object. The rule for compositional software architecture is to keep it simple, elegant and functional.

Multiple Levels of Information Management

Assume that for GCSS-AF level zero, business knowledge is shared for something as large as the Combat Support Domain, but the gross abstraction in the operational architecture has been decomposed into smaller packages for the systems architecture.

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[22] The concept of a package in component development is used for a single interface to containers of classes that are available as needed within the package. A package state diagram shows states for sequential and concurrent states and enables architects to illustrate business processes with concurrency and iterations.

[23] One alternative is to implement business components as mobile agents on top of JAVA – at the enterprise manager server - for advantages of machine independence and security. As a systems solution this is a match for application deployments over large-scale distributed networks. A client can develop a specialized call service such as for calculating air miles, suited to the given situation [23].

This approach provides guidance to break out that Air Force domain into dependent levels (1,2,3) for service delivery points; the model incorporates Integration Framework COTS, such as Message-Oriented Middleware (MOM), to integrate data residing in multiple databases throughout the enterprise[24].

As implementers make changes to data that flows as bundled data across the interface, one can measure the effects of change (using key performance parameters like service availability) at levels 0,1,2,3. The measurement approach involves:

1. Requesting data from any number of packages to compose a user community or enterprise viewpoint. For external interfaces, a package may be a pair-wise interface encompassing all agreements between an external provider like Boeing and the Air Force for logistics service. Viewpoints are flexible and dynamic.
2. A user may request any of the products, from any of the levels, from any of the data centers.
3. The system transparently ensures users access only the packaged level interface that is required, i.e. the named high level 0 interface and a separate interface for each of the tiered levels exist.
4. Provides a GCSS-AF commander an overall view of the enterprise and a means to validate information source. Requires development for enterprise management and semantic integration only for the directory tree itself, and for knowledge shared at each level in the directory tree, allowing applications to bypass unused levels.
5. Business rules and re-use components can be packaged at a single interface and invoked to interact with one another, according to a set of rules and a state machine for real-time processing.

Fit with the Operational and Systems Architecture

A component as used herein, is a self-contained software entity that can execute in an environment in which the Integration Framework services are available. The component can be customized and configured with other components that use the same framework and can be downloaded at run-time (as needed). It can be compiled on the fly; can be controlled by a scripting language; can be customized and configured by non-programmers; and, lastly, does not duplicate functionality available in the framework.[25] The approach presented is not the targeted GCSS-AF architecture. Rather, it is a means for composing requirements for such an architecture, and leveraging capabilities for electronic commerce technology. The approach concentrates on creating future cross-domain functionality by specifying external interfaces that meet commercial best practice business processes:

[24] Risk is may lack interoperability between message broker vendors and ad hoc capability…messages are explicitly defined and applications adapted to support message interface. Generally rely on Remote Procedure Calls (RPCs) or some variation of synchronous communications.

[25] Component architectures are characterized by the need for additional infrastructure in the form of frameworks e.g., for the development and deployment of reusable Java™ server-side components. At the same time, inspired by notions like reflection, and containers, new roles are possible, such as an application domain expert, who develops reusable Enterprise Beans and an application assembler who integrates Beans from multiple Bean assistants to compose a complete application, and to develop custom Beans when necessary.

1. Supports large systems - middleware carries shared EB components.
2. Rules separation - makes it simpler to deal with problems that arise in a vertical domain --e.g., if stock on hand or in-transit is calculated differently across GCSS-AF organizational units and MAJCOMs.
3. The Operational architecture specifies where different formulas and measurements exist to carry out summarization between levels of data - levels are mapped to data stewardship.
4. Variations for data collection and dissemination at the levels are specified in the systems architecture.
5. Client exit points from main code can follow a small set of design patterns. For example, when the functional client issues a query, a rule will fire an agent for payment rule component [23]. Here, a specialized client routine "calls for export" the generalized agent rules component, which forwards the algorithm and data needed by the client for processing on a local server.
6. In effect, this vignette demonstrates data mining where agents move between machines to look for information on behalf of their clients.
7. Interface management: Systems architectures will associate a level with a unique identifier called a relative distinguished name (RDN), in X.500 terms. For example, vertically one can track from level two in the medical domain to level three. Horizontally, one can track from level two in the medical domain to level two in the logistics domain, for a medical-logistics function.
8. Unfortunately, some vendors perpetuate the fiction that a silver bullet will create a complete safe and secure implementation. No substitution yet exists to replace the effort involved in data mapping, knowledge transfer, and quality assurance.

3.3 Methodology to support Component Architecture

Examples of components can be found in CORBA and JAVA and DCOM technologies. In fact, modern practitioners recognize that no one architecture style is enough! Any end-to-end implementation will be a hybrid of architecture styles. The methodology for contrasting existing GCSS-AF architectures with the envisioned interoperable architectures is described in Attachment D.

Method for Delivery of Components for the GCSS-AF Near-term Architecture
Figure 7 illustrates one aspect of the software process to develop and migrate components in keeping with the GCSS-AF Integration Framework and near-term architecture approach. The process shown is used to [34]:

1. Apply commercial enterprise component technology to a distributed system as an example of a domain engineering effort.
2. Populate enterprise components by connecting to legacy databases and message feeds.
3. Extend a commercial framework like Enterprise Java Beans or the CORBA business object model to support population activity.

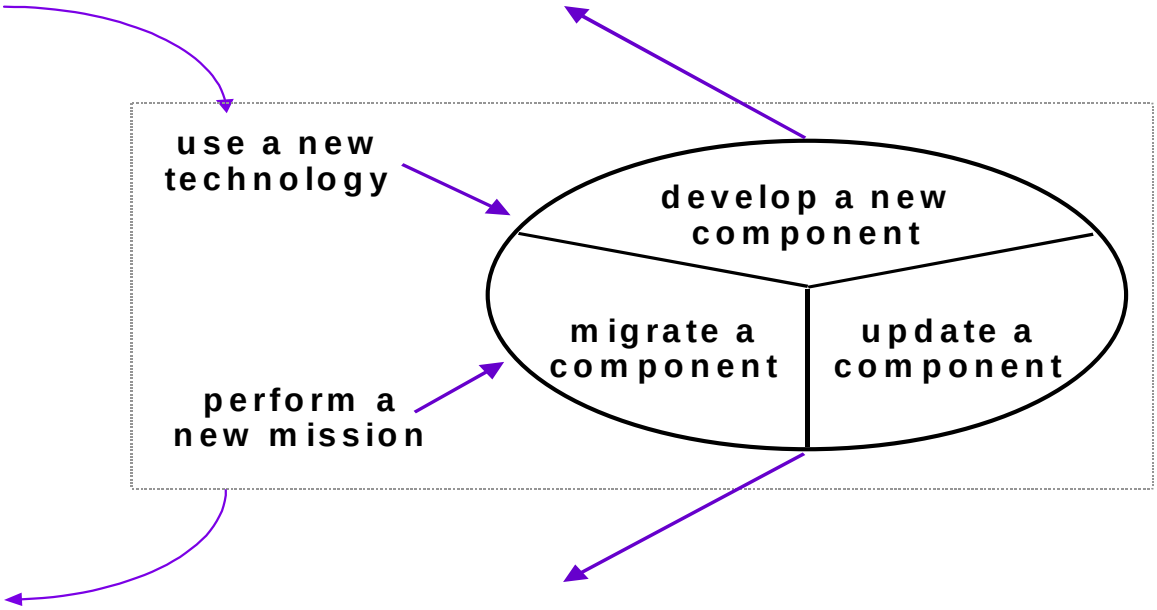


Figure 7. A Component-Based Software Process to develop and migrate

(Original Source: Eric Hughes, MITRE, and [34])

Connecting to legacy information sources leverages the population of enterprise components. Gains from run-time extensibility of component-based applications include ability to compose systems by plugging in components and better define modularity and interfaces, as well as increased use of commercial components. For instance, to migrate a component to legacy system, developers will use enterprise component frameworks like Enterprise Java Beans with or without CORBA and ODBMS.[26]

In a component-based development effort, different organizations perform different roles, as distinguished from traditional development. For instance, the analysis role requires a domain expert; a developer role gets split into a component assembler and a component deployer. The systems architect, or integrator, will have greater involvement in component development teams. Enterprise component output can be thought of as a product that evolves from each step of the development and migration process to become input to the next step, until a new component is implemented to add value to the existing software system. Air Force related efforts are adopting components both within the GCSS-AF and external systems.[27] Using a "to be" architecture as an example to integrate

[26] Key challenges for component architecture are fault isolation, component safety, performance and versioning. Others include: Component testing - Very large number of possible configurations, Vendor/Creator cannot test all interconnections; applicability of Software Engineering foundations. Note that in versioning for local changes, extensibility must be built into components; need iteration for thorough integration testing

[27] DII-AF C2STA (DAI): enterprise component technology proposed core funding for joint experiment DII COE Distributed Computing Working Group: current work with CORBA, DCOM, component technologies, NIMA USIGS: CORBA and component-based architecture, staffing for end of FY99, Blueprint: AFIWC and MITRE SANT effort to integrate systems using enterprise components has 4 staff-years for support, including joint Enterprise Java Bean experiment

a component that supports a new mission (Figure 7), a domain expert (logician, medical or contracts person) becomes involved in assembling applications from off-the-shelf software and salvaging legacy business rules. In fact, the Defense Message System (DMS) is prototyping a policy manager component based on the Figure 7 concept:

1. Definition by a domain expert of specialized requirements for policy-driven Directory Management is introduced where there is no industry standard.
2. A component assembler develops the policy rules, objects and their interfaces from allied interoperability requirements.
3. Interface development language specifications (IDL) are stored/compiled for use by an Object request Broker (ORB) in a CORBA test environment. Components in the simulated environment will be interfaced with existing DMS directory agents and the Directory Information Base (DIB).
4. Freeware, such as Netscape and JAVA JNDI API's are pulled into the experiment,[28] to simulate a distributed WEB interface that passes object names across a mix of domain naming services (DNS).
5. COTS, in this case, Orbix Web, and Java Development Toolkit, support the component development platform.

[28] Java Naming and Directory InterfaceTM (JNDI) is a standard extension to the JavaTM. 1. Source: http://java.sun.com/products/jndi/tutorial/ldap/models/v2.html.

4 Candidate Components for an Enterprise Architecture with Enabling EB

As mentioned in the TMIP legacy application reuse, architects are leveraging legacy functionality to "expand" into the vision use cases to provide re-use components that cut across Joint Services like the Composite Health Care System, to add new analytical reporting capability. Candidate components for an architecture approach are proposed, as follows:

1. *Electronic Signature and Notifier*
   The notification component to transmit a message upon failure of a data entry/authorization person to provide signature. This is a final electronic signature. Notifier will move a record forward. The module is being developed to sign-off a medical episode, where signature completes an outpatient record. The concept is re-useable for sign-off on freight departure and arrival, which is recorded as the event happens. The implementation concept calls for each node to transmit discrepancy signature reporting up a data level in the architecture, for example to an AF Logistics Systems Center (LSC) Discrepancy Reporting System [21,25]. Time measures for the event exists showing the chain of measurement points from Headquarters, to Command Post, to Unit level, as needed, to execute the mission.

2. *Data Quality of Service (QoS)*
   The QoS strategies institute validation and edit checks against all collected files and records to enable accuracy and comparability [26]. Status - two of the four data quality attributes, timeliness and completeness, support automatic notification by email to cognizant users when data falls outside-established measurement standards. Detailed edits to measure accuracy and comparability are in process, plus Web search capability is pending. The strategy:

   a) Provides rapid feedback to all organizational levels (i.e., MTFs, major commands, regions, and services) to recover missing data and resolve errors.
   b) Utilizes a hierarchy of organizational product line managers (PLMs) who are responsible and accountable for data quality, aided by automated components, to:
      – Ensure Air Force biometrics data is flowing;
      – Identify data errors and stimulate correction;
      – Provide rapid feedback to all levels for status and to enable assistance; and
      – Identify and correct poor transmission conditions.
   c) Institutes daily record collection and compares the inputs to outputs for an episode to determine if the information is complete and approximately correct. For example, kept appointments are compared with record encounters for standard ambulatory data records (SADR) and outpatient workload counts.
   d) Generic components could incorporate this Data QoS strategy for feedback and status at critical service delivery points across horizontal communities.

3. *Quantity Pattern*
   The quantity pattern component can resolve a situation where units of measure are mismatched, such as kilometers and miles. The pattern is flexible to convert quantities for many units of measure and conversion formulas without having to manipulate specific legacy code [18, 21]. See Attachment D sub-section, entitled Virtuoso Business Components.

5 Summary

In summary, this appendix explores how enterprise business components for EB will extend the GCSS-AF architecture in the near term by separating business information from a particular delivery and transformation mechanism, thereby enabling greater flexibility for scaling and maintenance.

Architects must focus on specifying uniform interfaces for passing shared knowledge. Although both high-level application program interfaces and low-level protocol/database interfaces are considered important, the key for the GCSS-AF EB/EC extensions is to define an architecture model that has top-level interfaces and dependencies for each vertical functional domain (logistics, medical, financial, contracting…) and across functional domains (MedLog, contracts-financial, etc.). The architecture development will select virtuoso components and rules for the packages to enable generalized use in the GCSS-AF community. The architecture implementation will ensure interoperability through use of GCSS-AF Integration Framework infrastructure services and technology. Both cross-functional and vertical domain architectures tend to emphasize requirements for high quality data/information. EB/EC can contribute to systems' data/information quality because EB/EC processes and information technologies eliminate manual processes, thus reducing opportunities for human data error. Therefore, data/information quality becomes both a precondition for and an enabler of EB/EC.

The Air Force has begun implementing EB/EC in disparate organizations using disparate techniques. The architecture proposed herein will provide the Air Force with a unifying infrastructure to orchestrate a systematic implementation of EB/EC across the GCSS-AF infrastructure.

Attachment A: Architecture List of Acronyms

	All Domains
AOR	Area of Responsibility
AIS	Automated Information System
C2	Command and Control
C4I	Command, Control, Communications, Computer, and Intelligence
C4S	Command, Control, Communications, Computer Systems
CCB	Configuration Control Board
CINC	Commander-in –Chief
COE	Common Operating Environment
CONUS	Continental United States
COTS	Commercial off-the-shelf
CRD	Capstone Requirements Document
DII	Defense Information Infrastructure
DISA	Defense Information Systems Agency
DISN	Defense Information Systems Network
DOD	Department of Defense
FY	Fiscal Year
GCCS	Global Command and Control System
GCSS	Global Combat Support System
GOTS	Government off-the-shelf
HQ	Headquarters
ITV	In-Transit Visibility
JECPO	Department of Defense Joint Electronic Commerce Program
JTA	Joint Technical Architecture
JTF	Joint Task Force
LAN	Local Area Network

OPLAN	Operations Plan
ORD	Operational Requirements Document
PMO	Program Management Office
VAN	Value Added Network for EDI
QC	Quality Control
WWW	Worldwide Web

	Logistics Domain
ACC	Air Combat Command
ADANS	AMC Deployment Analysis System
AFWA	Air Force Weather Agency
AMC	Air Mobility Command
AR	Air Refueling
ATS	Air Traffic Service
AUTODIN	Automatic Digital Network
CAMPS	Consolidated Air Mobility Planning System
CDB	Corporate Database
CMARP	Contingency Mating and Ranging Program
CMARPS	Combined Mating and Ranging Planning System
COINS	Commercial Operations Integrated System
CPX	Command Post Exercise
CRQS	Channel Requirements Quota System
DAFIF	Digital Aeronautical Flight Information File
DCO	Delivery Control Officer
EMARP	Employment Mating and Ranging Program
FS	Functional Specification
FTX	Field Training Exercise
GATES	Global Air Transportation Executive System
GTN	Global Transportation Network
JOPES	Joint Operation Planning and Executive System
JPRL	Job Performance Requirements List
MOG	Maximum On Ground

MROC	Multi-command Required Operational Capability
MS	Microsoft
NAF	Numbered Air Force
NIMA	National Images and Mapping Agency
OCD	Operational Concept Document
ORI	Operational Readiness Inspection
POE	Point Of Embarkation
POD	Point Of Debarkation
PRAMS	Passenger Reservation and Manifesting System
QCOA	Quick Course of Action
RDBMS	Relational Database Management System
RIPS	Receiver Integrated Planning System
ROMC	Required Operational Messaging Characteristics
SAAM	Special Assignment Airlift Mission
SIP	System Integration Plan
TIPS	Tanker Integrated Planning System
TMARP	Tanker Mating and Ranging Program
TPFDD	Time Phased Force Deployment Data
TSSAS	TPFDD Sizing, Sourcing, and Analysis System
USTRANSCOM	United States Transportation Command

	Health Care Systems Domain
AE	Aeromedical Evacuation
AECC	Aeromedical Evacuation Coordination Centers
AELT	Aeromedical Evacuation Liaison Teams
AES	Aeromedical Evacuation System
ATHCA	Air-Transportable Health Care Assemblages
CPT	Common Procedural Terminology
DMLSSM	Provides a medical catalog; assembly management; inventory management; electronic commerce order, receipt, and status processing; asset visibility; in-transit visibility (ITV); customer support; financial management; property management; quality assurance; patient movement item tracking; facilities management; biomedical equipment maintenance and technology management; and requisition processing for blood and optical products. (Reference DMLSS ORD Version 6.0.)

DNBI	Disease or Non Battle Injury
FMO	Functional Management Office
FOC	Full Operational Capability
HCD	Health Care Delivery
HIBC	Health Industry Business Communication Council
ICD	International Classification of Diseases
IEEE	Institute of Electrical and Electronics Engineers
IOC	Initial Operational Capability
ITDB	Interim Theater Database
KPP	Key Performance Parameter
MASF	Mobile Air Staging Facilities
MC4	Medical Communications for Combat Casualty Care
MedLog	Medical Logistics
MHS	Military Health Services
MILSTRIP	Military Standard Requisitioning and Issue Procedure
MTF	Medical Treatment Facility
NBC	Nuclear, Biological, and Chemical
OASD(HA)	Office of the Assistant Secretary of Defense for Health Affairs
TMIP	Theater Medical Information Program
TMIP FMO	TMIP Functional Management Office
TMIP PMO	TMIP Program Management Office

Attachment B: Architecture Glossary of Terms

Actor - An actor is anything outside the system to which the system interfaces; it could be a person, a group of persons, an organization, another system or a piece of equipment. Actors represent roles, which have specific sets of responsibilities. An individual person may interact with the system as different roles over a period of time. For instance, a DMS administrator may have policy roles for directory and schema administration.

Action – Interactions that show significant ways in which the system is to be used. When asking question 1 about process, a Use Case represents a structurally related sequence of interactions performed by an actor in a dialogue with the system to provide some measurable value to the actor.

Acquisition – domain that includes program management, engineering [writes RFP], cm, data management, contracting, manufacturing, logistics, test, financial management

Biometric Identification -- Typically used for security and access control applications, biometrics identification techniques digitally store some physiological trait as a means of personnel identification. In a fingerprint ID system, for example, a person gains access to a secured area after placing his or her finger on a reader that matches the fingerprint to one digitally stored in a database.

Contracting – writing the contract – an activity that is part of acquisition. Contract could be a service level agreement, procurement for engineering, development contract etc and any program might use all. Establishing formal relationship in AF lexicon. Procurement of services or selling commodities.

Commercial Catalog Contracts -- one of several tools developed by DLA to employ logistics practices similar to those used by the commercial sector. These catalogs enable DLA to eliminate in-house inventory, storage, and distribution operations. The commercial supplier offers timely direct vendor delivery and the commercial price structure reflects that the supplier is carrying the burden.

Commercial Technical Data Packages --A commercial technical data package is a technical description of an item that, first, provides a user with sufficient information to determine if an item will meet a particular need and, second, with the necessary information to buy it. Commercial technical data in the form of specifications and standards is a key element of DOD Acquisition reform.

Component – As used herein, a self-contained software entity that can execute in an environment in which the IF's services are available, can be customized and configured with other components that use the same framework.
Can be downloaded at run-time (as needed);can be compiled on the fly; can be controlled by a scripting language; can be customized and configured by non-programmers; does not duplicate functionality available in the framework

Document Technology – digital content creation, digital content repositories, digital content delivery

Electronic Business (EB) - "The application of EC techniques and solutions to the business processes of the DOD to include the entire range of the DOD functional areas" (DoD EB/EC G&P Memo, 11 Mar 99)

Electronic Commerce (EC) - "The interchange and processing of information via electronic techniques for accomplishing transactions based upon the application of commercial standards and practices" (DoD EB/EC G&P Memo, 11 Mar 99)

Electronic Data Interchange (EDI) - "The digital node-to-node information exchange of organizational communications" (1998 Price Waterhouse Technology Assessment)

External Interface – an entity that is NOT currently part of the system, yet provides resources required or affected by the system

Integrative Negotiation - the decision-making process of resolving a conflict involving two or more parties over multiple interdependent, but non-mutually exclusive goals [14]. Rather than a zero-sum game, where the seller always makes the profit, it is a win-win game based on finding the right match of product for the customer's need and then coming to a decision on fair market price.

Object Services – interfaces that provide the distributed infrastructure supporting (with the Necessary transparencies) the existence of, and interactions between, distributed objects: they are independent of the specific purpose of any application processing as defined by the enterprise specification.

Attachment C: Architecture EB/EC Services

By 2002, industry pundits expect electronic commerce will be greater than 1% of the global economic product (GEP) and mostly business-to-business. As e-commerce expands rapidly from an experiment to core business, implementers will need to deal with each other in a unified way, such as by enabling common EB/EC services.

1. Customer Care Support - communities for industry-specific Extranets that give all members of the trading community the chance to trade electronically. A service for consumers to electronically access the EB/EC services functions with little or no human operator assistance. Can be seen as a replacement of operator-based service call centers. This service category includes many special industry variations such as:
   a) Need identification stimulated through product information
   b) Product and service evaluation - post purchase stage customer service to evaluate overall buying experience (12)
   c) Community members participate in forums, share and capitalize on best business practices in their domain.
   d) Members simply log onto their community and connect with their business partners. Each community has its own web site; you can access them all from this page[29].
   e) Service for Web site creation
   f) Customer Relationship Management (CRM) - - new forms of multi-party relationships and transactions - fixed price/auction/negotiate

2. Directory services - e.g. White And Yellow Pages lookup

3. Electronic Acquisition - Authorized Government personnel use EDA for reviewing contract award documents and modifications with regards to deliverables and also for disbursing payments to Vendors for deliverables received (11). Future service engagement supporting voting and contractual agreements and policy-driven service level agreement (SLA) management. Enables customers to keep track of, which providers and suppliers are on contract for assets of interest to consumers connected to the E-Mall buyer and sellers models. E.g., new SLAs are negotiated driven by policy. Government contracts personnel can propagate changes to suppliers by invoking their contract change operation.

4. Electronic Banking - financial service performs basic accounting functions including a payments interface into the bank. The (consumer) portion of the market provides access to on-line bank statement showing account status. Example: bankcards/tellers on ships with charge-back to military personnel account for quality of life. It also allows access to payment processing services. Payment processing client may be a finance package such as Quicken (Intuit) or a DFAS system. The services described above to include payroll processing and the more complex invoice payments associated with the function (1).

[29] Source: HarbingerNet, http://www.harbinger.net/communities/index.html.

5. Electronic Claims Processing - Payment by e-bill can be cash, check, debit or credit.

6. Electronic Distribution (6)
   a) Route X12 EDI Transactions
   b) Convert EDI Transactions
   c) Convert Documents
   d) Transmit and Receive EDI Transactions

7. Electronic Data Access (6)
   a) Provide Index to Documents
   b) Authenticates Users
   c) Provides Access Control
   d) Accesses Documents
   e) Receive PDF Files and Indexes
   f) Stores and Retrieves Post-Award Documents for acquisition

8. Electronic Grants for R&D – electronic interchange with universities to allocate grants for the Air Force experimentation and research and development programs

9. Electronic Healthcare Claims Facility[30] - electronic interfaces for claims settlement. Support to administer and manage standardized electronic claims processing using established Healthcare Data formats.

10. Electronic Retailing - E-MALL:
    a) Search Services And Agencies Catalogs - Locate, Compare, Order And Track Order - service request (purchase order, purchase order acknowledgment, purchase order change request-buyer initiated)
    b) Travel - prompt travel cost reimbursement, and improved travel service[31]
    c) Consolidated service invoice/statement
    d) Payment order/remittance [32] - The payment types include (but are not limited to);
       · Credit Cards
       · Debit Cards
       · Electronic Cash
       · Micro-payments
    e) Pay Via IMPAC Card - purchase to payment process e.g., Planning: Forecast, Price/Sales Catalog, Request for Quote, Response to RFQ, Bar Code/NPI, Purchase: Order, Change Order, Delivery: Advance Ship Notice, Receipt Advice, Financial Invoice, Remittance Advice, Automated Disputes

[30] Electronic Commerce Domain Task Force, Electronic Healthcare Claims Facility, Request For Proposal 3 OMG Document: ec/97-06-01

[31] Initiate travel requests, which are approved by a supervisor. Subsequently, actual travel costs are recorded in a voucher and submitted for approval and payment. Travel records and history are maintained in the DTS Common User Interface (CUI). The CUI is the interface point to the DOD Electronic Commerce Infrastructure. Any interaction between the CUI and DOD Accounting and Disbursing systems occurs as Electronic Data Interchange (EDI) and is processed and routed by the Defense Electronic Business Exchange (DeBX).

[32] Purchase card provides a less costly and more efficient way for DOD organizations to buy goods and services directly from vendors instead of processing requests through government procurement offices.

11. Healthcare E-Mall – expansion of the medical logistics just-in-time inventory management program to allow customers to place orders via the E-mall (9)

12. Inventory and Supply Chain Management - In the collaboration space, extending collaboration to work hands-off. Activity is digitized for order promising across an extended supply chain environment, which allows organizational units to subscribe to supply chain events, they are concerned about. There is a focus on collaboration around document sharing, e.g., Commercial catalog contracts. Uses applications for enterprise resource planning (ERP) implementations and the "plus" includes CRM and supply chain management, procurement, and the like (integrated). The e-commerce equation requires that ERP systems are attached at the front-end to CRM solutions, in the middle to supply chain and electronic procurement systems, and at the back-end to analytical tools that can monitor the entire process (11).

13. Online Marketing And Advertising - Catalogue facilities provide a framework for portable data stores in which service and contracts can be passed between participants. Includes the support for the "advertising" or "distribution" of profiles (semantic data objects describing electronic commerce offerings). A recruiting interface meets requirements "discovery", i.e. requests for "searches" for content matching a certain criteria. In some distribution and discovery cases, requirements for anonymous transactions are identified (1).
    a) Disclosure Of The Availability Of A Domain Facility
    b) Disclosure Of Information Related To Business Processes
    c) Disclosure Of Role And Identity Related Information
    d) Disclosure Of Information Related To Business Agencies
    e) Disclosure Of Information Related To Commercial Services

14. Public Certificate Authorities (CAs) - A service for issuing and validating trusted certificates to support a variety of applications. CA service provider issues and distributes certificates to users of certificate-based Applications (1). During use of the certificates in business transactions, users may request certificate validation services from the CA. The revenue to the CA provider comes from "selling" the certificates and from validation transaction charges. The CA may be required to issue several types of certificates and to support many certificate distribution methods. Example: what levels of security are available on the JECPO network (ECPN) interwork and use versus the EPSS (GSA AF tagged on the GSA network)[33].

15. QoS shopping - comparison shopping, namely -- bandwidth, processing speed, and sustainable network connectivity[34].
    a) QoS monitoring for pre-ordering, and assets tracking using Standard QoS properties related to time, on per-order basis, group order, by country, destination,

[33] The portal handles all of the technology and security required to make the exchanges happen typical of business-to-business E-Commerce transactions.
[34] Source: "Agent mediated electronic commerce: an MIT Media Laboratory Perspective", Moukas, Guttman, Zacharia, Maes

etc. Timeout specifies a relative time after which the undelivered order should be given to another supplier.

16. General EB/EC management services
    a) Role registration
        - Product or service customization - A set of role oriented interfaces through which an instrument can be installed, invoked and removed.
        - A role model is used with the objective of abstracting out the generalized supply/demand relationships. Roles are available for policy adjudication, contracts management, credit checking, etc. Roles enable you to adapt "Infrastructure Ownership Approaches".
        - Subscribe and unsubscribe
    b) Directory white and yellow pages, routing management and supplementary search information concerning EDI messages and other useful related documents for your functional integration with EC, as well as catalogs from suppliers.
    c) Negotiation Facility - processes supporting collaborative negotiation, agreement and engagement for real-time personnel management- Publishing a Collaborative Process
    d) Community Management - Brokerage between customer and service provider and supplier domains to include Service Security, Accounting and Community Management (subscribe/unsubscribe for EB/EC services)
    e) Policy Management Service
        - Enter, negotiate and publish policy service - Clients have fine-grained control over which events are forwarded and which are discarded. Order policy can be configured as regards order event delivery based on priority, earliest expiration time, or FIFO.

Attachment D: Methodology

Approaches that need to be harmonized with others in the overall implementation for GCSS-AF IF are the:

1. Methodology for Contrasting Existing Air Force (AF) Architectures in GCSS-AF with vision architectures and
2. Method for Delivery of Components for the GCSS-AF Near-term Architecture.
3. Methodology for Contrasting Existing GCSS-AF Architectures with the Envisioned Architectures

The unification of modeling methods is becoming possible because experience has enabled us to differentiate between important concepts and unimportant concepts. Today, Unified Modeling Language (UML) creators insist particularly on the fact that the UML modeling language is designed to be used independent of the analysis and design method actually used. We use it herein as an object-oriented pattern for comparing AF use cases created today through different methods. Our purpose is to contrast, and perhaps extend; the AF architectures that exist today under the umbrella called Global Combat Support System-Air Force (GCSS-AF). Steps to document the implementation architecture scope are, as follows:

1. Select a high impact function from each of the architecture domains - medical, logistics, acquisition, financial, and contracting.

2. Use real use cases (human interaction, organization/systems interaction) to capture operational views of the current systems called the, "as is" architecture. For example, architects are concerned with the:
   a) Business Operations Environment
   b) Connections to stakeholders and customers
   c) Interfaces to complete transactions
   d) Management of reference data
   e) Management of transaction data
   f) Recording transactions

3. These same concerns are expressed in essential use cases to distill the abstract conceptual view called the, "to be" for an enterprise architecture. Meanwhile, architects are also concerned with ranking for decision-making what is:
   a) Evident to a user that it is performed
   b) Hidden, transparent to a user
   c) Frill - optional

   This is a means to capture customers, providers, and goals; and to note decisions and alternatives for a high-level architecture vision.

4. At a later phase, architects can "expand" some of the vision use cases to provide re-use components that cut across functions. A vision is achieved by contrasting and organizing the use cases as packages - groups of subsystems for high-level enterprise architecture.

UML is a proven approach owned by Object Management Group (OMG) as a standard for modeling throughout the software lifecycle and formally maintained to add UML stereotypes that enable analysis, design, development, and deployment. UML can be employed by methodologies like the Rational Unified Process and Catalysis. Depending on your architecture goal, one can use UML use cases to document:

a) Relationships between viewpoints "as is" and "to be" or
b) A conditional process for decision-making or
c) Extended behavior for a sub-function (for the implementation, a subsystem or procedural call), or
d) Shared use cases that perform an important re-use sequence of actions.

Benefits and Limits of UML

For the implementation architecture, tools like UML are able to encapsulate dynamic behavior that is typical of Internet environments: the outputs generated are objects and code that can be used in a simulation and exported to a run-time environment. Lockheed Martin used UML to capture requirements for the GCSS-AF IF.

The outputs can be integrated with existing and re-engineered applications, new business rules and COTS or GOTS components. In short, architects are turning to creating dynamic components rather than monolithic paper architectures to free themselves from slow, expensive analysis and design efforts, and to build up an adaptable architecture model.

The key for the GCSS-AF EB/EC architecture is to define an architecture model that has the top-level interfaces and dependencies for each vertical functional domain (logistics, medical, financial, contracting…) and across functional domains (MedLog, contracts-financial, etc.).

The tools that use UML import existing word documents. When existing architectures are available, listening to the voice of the customer is for validation, as opposed to starting over and then presenting business architecture as a huge narrative. As you will see, the diagrams herein, are simple to read, and therefore, easy to turn-around when government subject matter expertise is needed.

Today UML is non-semantic. The current OMG standards groups are working to extend UML for constraints in the Object Constraint Language (OCL) and provide an interface to XML [27].

GCSS-AF Integration Framework and Component Architecture

The integration framework (IF) acquisition provides implementation by Lockheed Martin Federal Systems, Inc. for a set of framework products.[35] To that end, the EJB and Tivoli Enterprise products selected both use component architectures: respectively, Java components reside in the Enterprise Java Beans framework and Tivoli Enterprise supports the Common Object Request Broker Architecture.

[35] COTS include IBM's MQSeries, Tivoli's systems enterprise management software, and Enterprise Java Beans.

Developing a new component, or assembling one from selected re-useable software, calls for rich interface specifications and mutual obligations among AF organizational domains. In Figure D1, output from each step becomes input to the next step. The approach is concerned with systematic practice for dynamic architecture simulation and enterprise component development[36]. Further, the approach is compatible with the GCSS-AF Integration Framework guidelines, as stated below [20]:

1. Define cross functional architecture;
2. Standardize, streamline data sharing and access;
3. Use Common services (security, data transfer, etc);
4. Support rules on how to access data and functionality; and
5. Build the application layer to integrate with the framework and represent a mission application.

Components are exemplified by CORBA, JAVA and DCOM technologies. The CORBA OMA and ORB and are one of a number of IF alternative choices for the implementation platform. Frameworks like Enterprise Java Beans, and Distributed Component Object Model (DCOM) describe how objects communicate among each other. In fact, we recognize that no one architecture style is enough! That is, any end-to-end implementation will be a hybrid of architecture styles.

Method for Delivery of Components for the GCSS-AF Near-term Architecture
Figure D1 illustrates one interpretation of implementation support to using the GCSS-AF Integration Framework and near-term architecture approach.

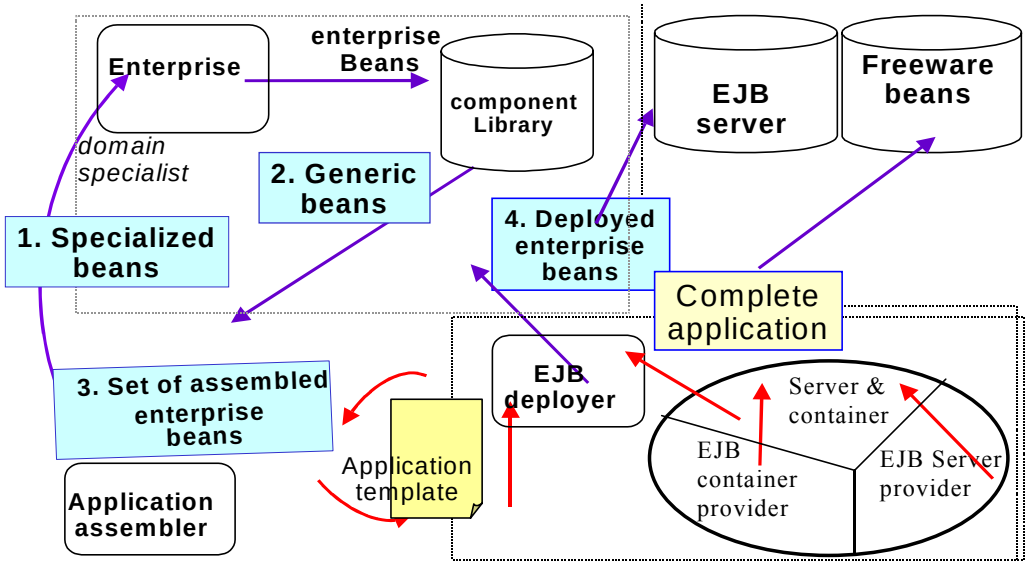


Figure D1. Component-Based Software Process for Interfaces.

(Original Source: Eric Hughes, MITRE)

[36] Architecture styles like Bulletin Board, Publish and Subscribe, and Message Q are very different from the component style. The systems architecture must resolve the mismatches. Also, the WWW uses low level technologies - the abstraction level of component software; so there must be middleware to implement cross-domain services.

Concept: You can think of Enterprise component output as a product evolves from each step of the development process to becomes input to the next step, until a new component is migrated, to add value to the software system. Related Efforts Are Adopting Components both within the AF and in external systems[37]:

Using a "to be" architecture as an example, to integrate a new component (on the left), a domain expert (logician, medical or contracts person) becomes involved in assembling applications from off-the-shelf software and salvaged legacy. The population of enterprise components is leveraged by connecting to legacy information sources. To migrate a component to legacy systems, one can use enterprise components (Enterprise JavaBeans with CORBA and ODBMS). To illustrate, the Defense Message system (DMS) is prototyping policy manager components based on the Figure D1 concept:

1. Definition by a domain expert of specialized requirements for policy-Driven Directory Management where there is no industry standard.

2. Component assembler develops the policy components and their interfaces from allied interoperability requirements with the objective of migrating the new capabilities to the deployed system.

3. Interface specifications (IDL) are stored/compiled for use by an Object request Broker (ORB) in a CORBA test environment. Components in a simulation environment are interfaced with existing DMS directory components to ensure interoperability. Freeware, such as Netscape and JAVA JNDI API's are pulled into the experiment[38], to create a distributed WEB interface - Source: http://java.sun.com/products/jndi/tutorial/ldap/models/v2.html.

4. The prototype will use actual links to remote DMS directories and local directory and messaging software.

5. COTS (in this case, Orbix Web, and Java Development Toolkit) provides the component development platform.

Object Management Architecture (OMA)
Now that we have discussed the component development methodology that supports the near-term GCSS-AF architecture, we take a closer look at the underlying commercial standards behind both the GCSS-AF IF and EB. Examples are:

[37] DII-AF C2STA (DAI): enterprise component technology
Proposed core funding for joint experiment
DII COE Distributed Computing Working Group: current work with CORBA, DCOM, component technologies, NIMA USIGS: CORBA and component-based architecture, staffing for end of FY99
TBMCS: interest for long term, Blueprint: AFIWC and MITRE SANT effort to integrate systems using enterprise components has 4 staff-years for support, including joint experiment
[38] Java Naming and Directory InterfaceTM (JNDI) is a standard extension to the JavaTM

1. *Business Standards*, like X.12, as the basis for EC business process. A key player is the Telecommunications Industry Forum (TCIF) Electronic Data Interchange Committee, and their interpretation of established American National Standards Committee (ANSI) products like standards for X.12 that enable Telecommunications Company (TELCO) pre-ordering, ordering and local access ordering processes.

2. *Technical Standards like Extensive Mark-up Language (XML)* are being used by industry to "streamline data sharing and access" in multiple domain contexts and ensure interoperability at the external interfaces. A new World Wide Web Consortium (W3C) standard Schema for Object Oriented XML (SOX) and a Common Business Library (CBL) in SOX[39] for core business functions that go into purchase orders, etc. are publicly re-useable for JAVA XML electronic business components.

3. *Object Management Architecture (OMA)* is the basis for a technical interface architecture and language neutral interfaces. The OMG's Object Management Architecture (OMA) is a commercial specialization of open distributed processing. All together, the OMG's consensus standards and the International Organization for Standards (ISO) Open Distributed Processing Reference Model (ODP-RM) referenced in the Joint Technical Architecture (JTA) form a useful set of standards capabilities for system architects and developers [reference http://www-jta.itsi.disa.mil/].

The architecture philosophy to use the GCSS-AF IF, follows commercial best practices/ standards, and promotes uniform middleware COTS [32]. Thus, development that will use the IF in a CORBA implementation would need to understand what the commercial architecture is about. Figure D2, which is taken from [OMA- 15], illustrates the overarching commercial architecture that influences message broker software.

[39] XML http://www.marketsite.net/xml/xdk has public domain software for SOX.

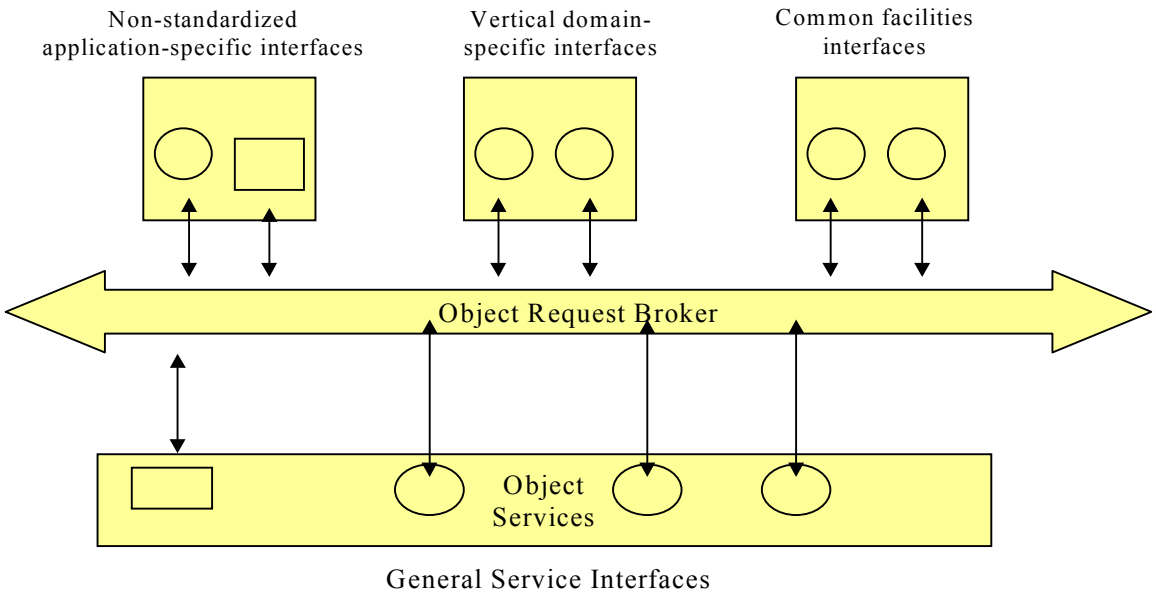


Figure D2 CORBA OMA architecture

Although object oriented techniques are used within OMA for describing an architecture, the resultant system need not be constructed exclusively with object oriented constructs. OMA provides a technical architecture that is vertically specific to major communities. First, Figure 2 "CORBA OMA Architecture" illustrates the general service interfaces as the basis for a CORBA platform (15)[40]. The following are standard CORBA specified technical (object) services: Naming, Event, Relationship, Persistence, Notification, Transactions, Externalization, and Security, among others.
Second, across the center in Figure D2, the double-headed arrow is the Object Request Broker (ORB) kernel for a language neutral interface.
Third, the common facilities are the implementation and interface repository including the class libraries used by the ORB implementation[41].
Fourth, the OMA supports vertical domain specific applications interfaces to functional domains:

a) Manufacturing - comprised of specifications that relate to the OMG-compliant interfaces for manufacturing systems. To date, the Distributed Simulation Systems (DSS) specification is available.

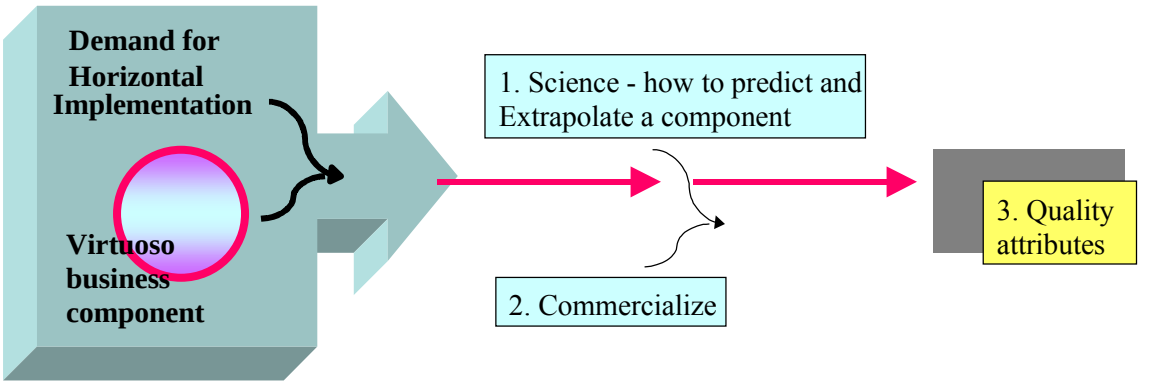
b) Electronic Commerce Domain - models support companies like Merrill Lynch, Morgan Stanley, and consumers for the banking and finance community. Finance is comprised of specifications that relate to the OMG-compliant interfaces for financial systems. To date, the Currency specification is available.

[40] Specifications for design and construction of commercial tools guide vendors like Netscape's Internet Interoperability Protocol (IIOP) browser interface.
[41] more and more, ORBS are becoming the "internals of products" such as with Message Broker Adapters (message oriented middleware) and object transaction monitors.

c) Medical – specification for the Person Identification Service (PIDS) and the Lexicon Query Service specifications are available; includes interfaces to develop patient identification access systems for functions like bio-molecular sequence analysis, and access to longitudinal patient records for different kinds of stakeholders (providers of care, patients, and government personnel/systems).

Virtuoso Business Components and the Quantity Pattern
Besides the earlier "Candidate Components for an Enterprise Architecture with Enabling EB" there are commercial components that have been proven through actual implementation and will further enable simplicity and commonality in cross-functional architectures.

A vision is achieved by contrasting and organizing components as groups. Alternatively, hybrid architecture is achieved by selecting a component for integration using the component methodology provided by the IF and exemplified by EJB. That is, generalized enterprise components may come from existing GCSS–AF, or successful patterns in the community. Good practice for re-use is dependent on quality attributes, as illustrated in Figure D3 [reference http://www.sei.cmu.edu/ata_init].



1. Rather than trial and error on re-use, need blueprint process for regular operations that are followed in combination, irrespective of domain.
2. Disciplined assessment to resolve conflicting interface requirements for EB/EC problems
   - Standard notation for recording and communication design focus
   - Procedures and standards that are published
   - Have a number of implemented unit operations

   e.g., road tested security component operates when breached situation
3. Principle ways to analyze candidates for re-application - specific attributes associated with a portion of the architecture like security, availability, modifiability and performance - frequency of input, event is sporadic, periodic, predictable

Figure D3. Quality Attributes for GCSS-AF Architecture Reuse Components.

The GCSS-AF architecture philosophy is to use an integration framework (IF) with compatible models that follow commercial best practices, architectural standards, and use of COTS [32].

Example Business Component: Quantity Pattern
Observations on patient information change daily. In contrast, the phenomena and phenomena- type are more static. Figure D4 depicts classes for qualitative categories and measurement of phenomena e.g., heart rate is a phenomena type and there are alternative measures to determine the rate[42]. That is, the Figure D4 class diagram, uses phenomena to model/capture rules and a structure for the measurement of categories of observation to generalize control for the medical domain.

In brief, observations from regular day to day data, in the form of episodes that update a patient record, might be uniformly raised to higher organizational commands in summary analysis and trending reports.

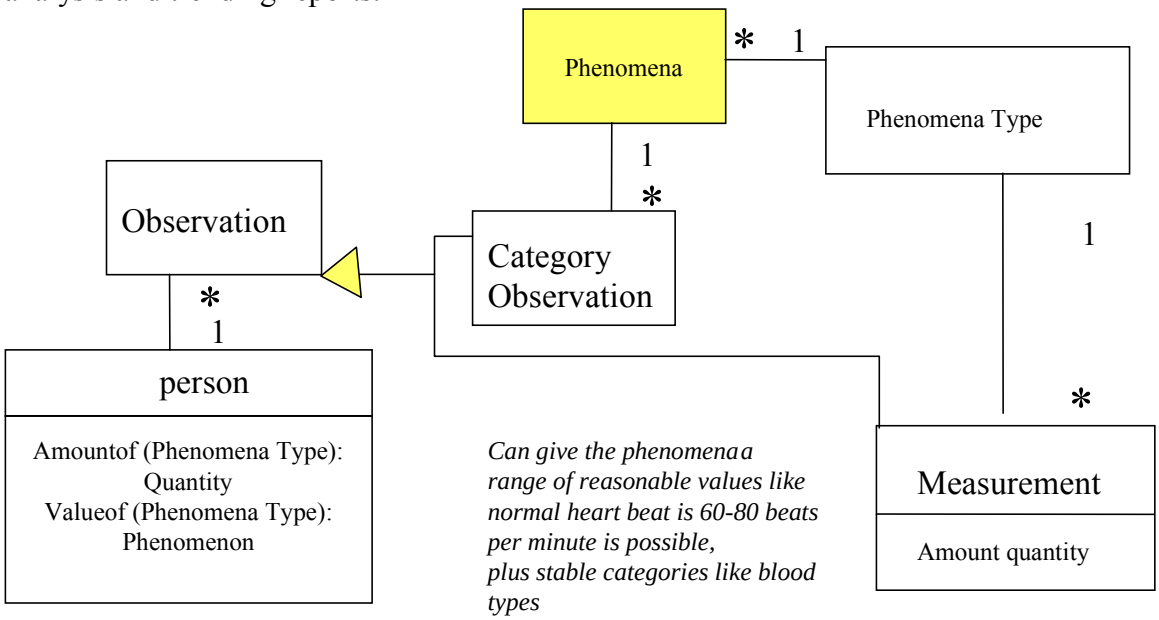


Figure D4. A Small View into A Large Model for the Medical Domain

[42] patterns apply to interfaces

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Attachment F: Joint GCSS AIS and Logistics Requirements Processes

The Joint Requirements Oversight Council (JROC) currently has oversight for prioritization of joint logistics/AIS requirements. The members are four star generals. Their purpose is to validate warrior requirements and provide assistance to requirements working groups.

Applicants:

1. Need to go through the requirements process chain;
2. Prepare for an acquisition;
3. Get approval for creating a new program;
4. Focus on war-fighter requirements.

CONOPS Experimentation

An Advanced Concept Technology Demonstration (ACTD) is one approach to starting a new program. All GCSS programs make similar programmatic decisions regarding available funding, updates to acquisition strategy, balancing requirements against funding and so on, for an implementation. They may also begin with an ACTD. J-9, the JCS for Joint Experimentation receives conceptual requirements essential to Joint War-fighting Processes (JWP) from JCS and Commanders-in-Chief (CINCs). Although, USACOM/J-9 has a Federated Battle Lab, the organization has difficulty capturing an enterprise joint warrior picture. One reason is that each Service/Agency today has its own laboratory.

Similar GCSS Architecture Goals across Services

Army goals for a Layered Approach (sample)

1. Wholesale-Retail Integration includes Prime Vendor - GOAL: Modernize Wholesale Inventory
   Operations/Systems to Support Focused Logistics...(i.e., Standard Depot System, Commodity Command Standard System)
2. Command Support Systems Data Sharing via GCSS-Army Support, and purchase a service not a system.
3. Support for JTF Commander - includes Inter-Service Support to GCSS-AF, GCSS-NAVY, etc., plus single-source data entry, and EDI Data Standardization

Navy Goals for Right Investment Balance between Support and Warfighting Capabilities (sample)

1. Support for new equipment - Reengineering Navy Supply
2. Quality of logistics support (reduce delay in receiving parts)
   - Actual figures show Reduced - Response Time by 25% (12 days) in 2 years
   - Goal: Down to 23 days by 2000
3. Virtual Customer Information Center- 24 hours a day / 7 days a week
   - Actual figures show 30% reduction in shipboard Procurement Management Systems (PMS)
4. Spares/repair parts program

- Increase Direct Vendor Delivery and EDI

Marine goals for Expeditionary Logistics (sample)
Situational Awareness, Status of Forces (Readiness, Sustainability), and Operational Picture - for Critical decisions, logistical feasibility and critical shortfalls. Key concepts for GCSS-Marines incorporate specific sustainment objectives for the operational architecture - see Table 3.

Table 3.Marines Key Concepts.

Key Concepts
• Expeditionary Logistics
• Task-Organized for Mission
• Accompanying Supplies
1. MEF – Marine Expeditionary Force - service to CINC 60 Days of Sustainment 90 Days of Aviation Sustainment
2. MEB- Marine Expeditionary Brigade - 13k - 18k – brigade level support; 30 Days of Sustainment
3. MEU- Marine Expeditionary Unit - 2k - reinforced battalion and squadron to service for day-to-day presence - 15 Days of Sustainment

Common Operation Picture (COP)
In the Joint arena, the Joint Task Force Commander has access to multiple data sources with Web access and an event browser from the Common Operational Picture. COP and the Combat Support Data Environment combined form a synonym for an infrastructure to query live databases using data mediator software. Currently, DOD is fielding COP V3.1 to be compatible with the Global Command and Control System (GCCS). Initially, the program demonstrated capabilities for Kosovo operations. COP will next support fielding of an operating capability for Theater Medical Information Program (TMIP), and logistics applications in the logistics readiness center e.g., accept personnel data coming in through the GCSS COP using Web PKI.

It is envisioned that GCSS-AF will pass information to GCSS COP to provide the War fighter and his supporting elements with "the appropriate level of security, needed for the Expeditionary Air Force (EAF) to execute the Air Force mission throughout the full spectrum of military operations"[20].

Attachment G: Sample USE CASES for the GCSS-AF Architectures

Vertical Functional domain: Health Care Systems ("As Is" and "To Be")

The Current Architecture: "As Is"

The "current architecture" is made up of stand-alone applications that were candidates for TMIP stovepipe integration; six applications are re-used from other AF agencies:

1. DBSS from Army - Defense Blood Standard System
2. REOHM - Radiation Exposure/Occupational Health Module
3. MRC - Medical Reference Component
4. PEM - Patient Encounter Module - Joint tool being modified for TMIP
5. MAT - Medical Analysis Tool
6. Composite Health Care System (CHCS) NT from Joint services.

A Use Case for the current system would show each of the above stovepipe applications as stand-alone components, often serving the same organizations and people, but lacking automated interfaces. In the concept for reuse, various organizational roles (patient, provider, and medical logistician) will share access via TMIP, as illustrated by Figure G1 referencing 18,19.

Figure G1 Illustrates some of the key classes of information in the TMIP business process model using a UML class diagram:

1. Commander: Commander may be a Medical Treatment Facility (MTF) commander, Joint Task Force commander (JTF) commander, or a medical unit commander. These commanders have normal command responsibilities plus medical operations and reporting responsibilities.
2. HQ Analytical Processing System: Headquarters Analytical Processing System contains the Interim Theater Database - Operational Data Store (ITDB-ODS) that is used to provide data to the Medical Surveillance System for report generating purposes.
3. Medical Plan: A Medical Plan is produced by the Medical Planner and contains information regarding medical regulating procedures that are to be performed during the deployment.

The icon in the Figure that annotates certain object classes and their attributes, like health service orders and status, is used to indicate a security stereotype (field requires security lock). Each rectangle gives a class name and class attributes. The class dependencies are indicated with lines and show the quantitative relation (zero to one, one too many - using an asterisk for many).

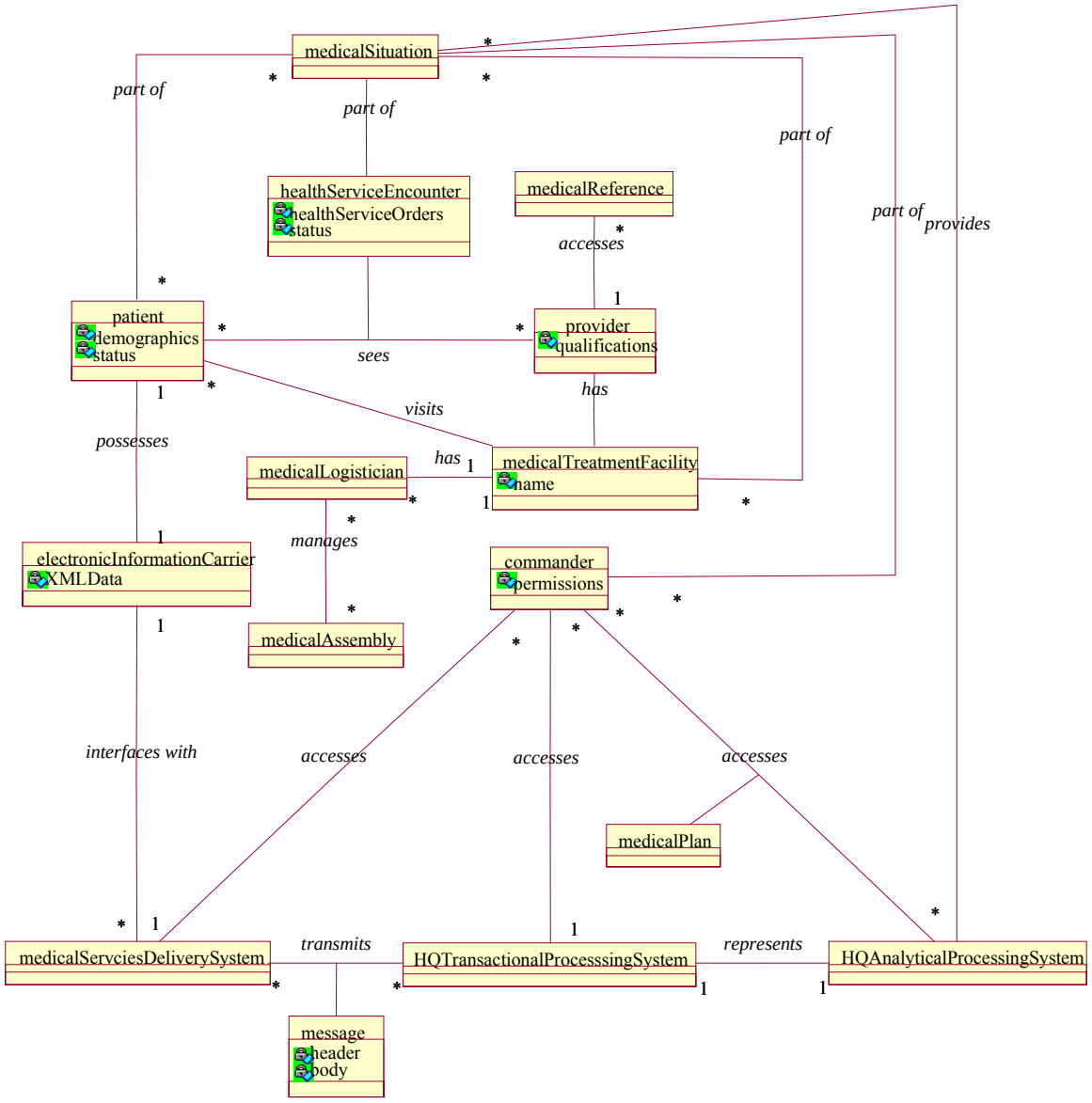

Figure G1. TMIP Concept Overview.

The fifteen TMIP classes relate to one another through the process of implementing the class hierarchy. In fact, the completed models can eventually show the behavior of each class (methods and data elements) and associate the higher level class diagram to messages so a development specification can be generated from the architecture. Architecture-driven specifications are a reality today for component development.

TMIP nodes can use the common network or, if saturated, can use removable media. In accordance with the Operational Requirements Document (ORD), TMIP nodes will use each Service-Agency infrastructure differently. The concept is for a "lighter, smaller hospital" footprint. In the future, the Area of Responsibility (AOR) CINC will have access to medical logistics components.

The Future TMIP Architecture: "To Be" (sample)
The "to be" TMIP architecture snapshots NEW developments from the TMIP architecture by selecting one mission essential function: describe electronic business. The four new components are Medical Surveys Component (MSC), Immunization Tracking System (ITS), Medical Surveillance System (MSS), which we highlight for patient tracking[43], and Lower Echelon Reporting and Surveillance Module (LERSM).

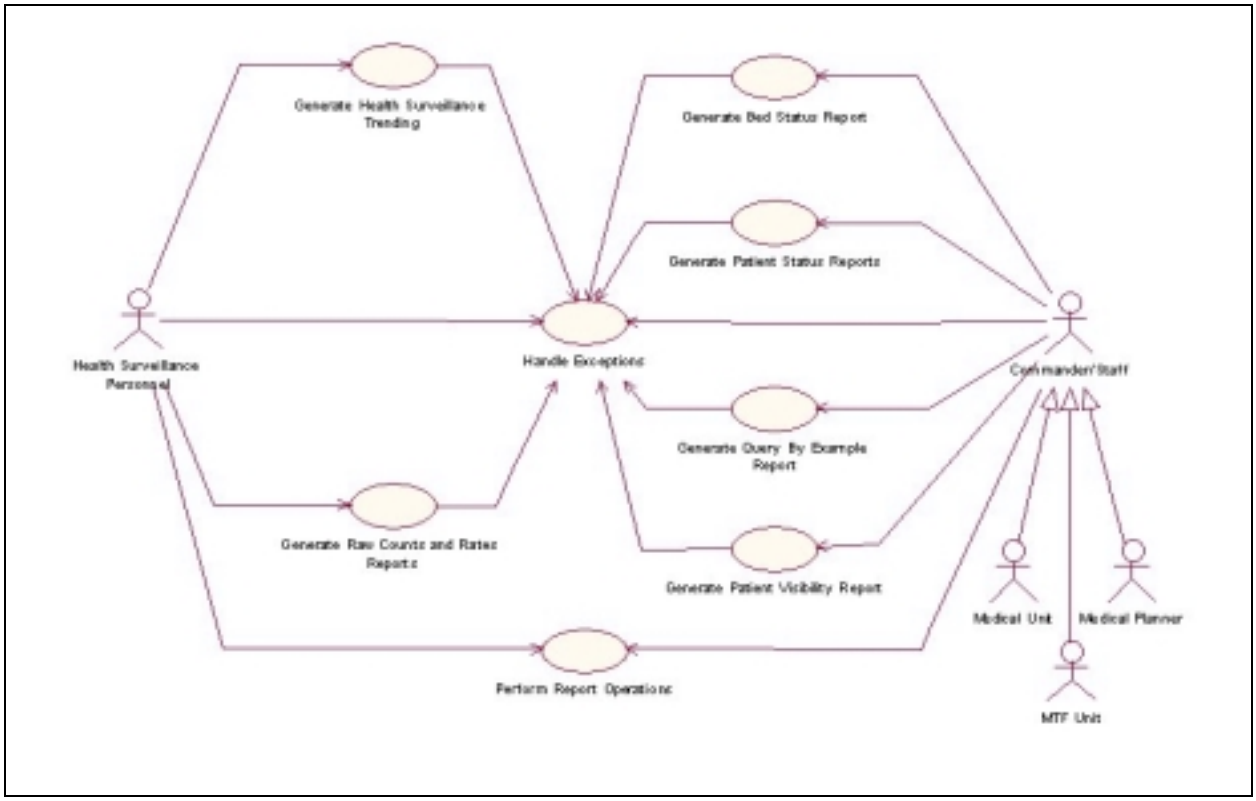

Figure G2. Use Case Diagram for the Medical Surveillance System.

Medical Surveillance System
Figure G2 presents the essential use-case diagram for the Medical Surveillance System (MSS). Actors (Roles) like medical unit can be constrained by the requirements for security, scalability, and interoperability, quality of service, and reliability.

[43] MSS is called the Lower Echelon Reporting and Surveillance Module (LERSM) at an MSDS. For the purposes of this SDD, MSS, and LERSM are covered by the same design artifacts.

Use Case	Generate Patient Visibility Report -
Actors	Medical Unit Commander, MTF Unit Commander, Medical Unit Staff, Unit MTF Staff
Purpose	To provide the commander and his/her staff the ability to view an airman's medical history information obtained during the current deployment.
Overview	The user has identified the airman of interest by the patient's social security number (SSN). The user enters this information into the Patient Visibility module and submits the query. The system would then display the listing of the patient's health service episodes (HSE) logged during the current deployment.
Type	Primary, Essential

Preconditions

1. User already logged into the system (i.e., MSS or LERSM).
2. User has the proper permissions to generate Patient Visibility reports.

Typical Course of Events

Actor Action	System Response
1. User chooses to search for a particular patient in theater.	2. The system prompts the user for various search parameters.
3. User enters the patient's complete name or service number (but not both simultaneously).	4. The system reads and validates the entered information.
8. User indicates that the entry is complete and that the report should be generated.	5. The system runs the Patient Visibility report sorting the records by episode date (most current episode first).
	6. The system displays the report containing the patient's complete deployed medical history captured in theater.
	7. Publish a notification that is to be logged indicating report generation succeeded.

Postconditions

1. A log entry has been made indicating that the report generation operation was successful.
2. A Patient Visibility report is displayed which contains a listing of the patient's health service episodes (HSE) logged during the current deployment.

Example: Integrated Architecture for Consolidated Air Mobility Planning System (CAMPS)

CAMPS provides Air Mobility Command (AMC) with a system for the planning and scheduling of AMC assets in support of peacetime, crisis, contingency, and wartime operations. CAMPS will incorporate the baseline functionality of two legacy AMC systems, which exchange a minimal amount of data and migrate them to an integrated architecture compatible with the Global Command and Control System (GCSS) Common Operating Environment (COE).

"As Is" Legacy System Integration

There are two legacy systems [29,31].

1. AMC Deployment Analysis System (ADANS) – ADANS provides support for aircraft allocation management through the Barrelmaster and Air Refueling (AR) components. Also, tanker units may use ADANS to enter, update, and retrieve information regarding air-refueling events. ADANS allows planned and scheduled missions developed during the planning process to be transmitted to AMC's Global Decision Support System (GDSS) for execution management, among other functions.
2. Combined Mating and Ranging Planning System (CMARPS) - plan and schedule aircraft missions for tanker support for deployment planning (Tanker Mating and Ranging Program (TMARP)), employment planning (Employment Mating and Ranging Program (EMARP)), quarterly training requirements (Horseblanket), and single-cell air refueling requirements (Contingency Mating and Ranging Program (CMARP)), among other functions.

Next, the functions for the two integrated legacy systems are illustrated in Figure G3 and briefly described using an essential UML Use Case and action specification.

Use Case	Air Refueling
Actors	Mission plan for air freight, air refueling planning system, air refueling station
Purpose	The Air Refueling Planner is responsible for planning tanker missions to fulfill requests for air refueling.
Overview	Interfaces may take the form of text message traffic between CAMPS and the external system, database coordination with the external system, or E-mail messages exchanged with the external system. Interfaces with other AMC systems will be through data replication or direct access of data generated by the other systems.
Type	Primary, Essential

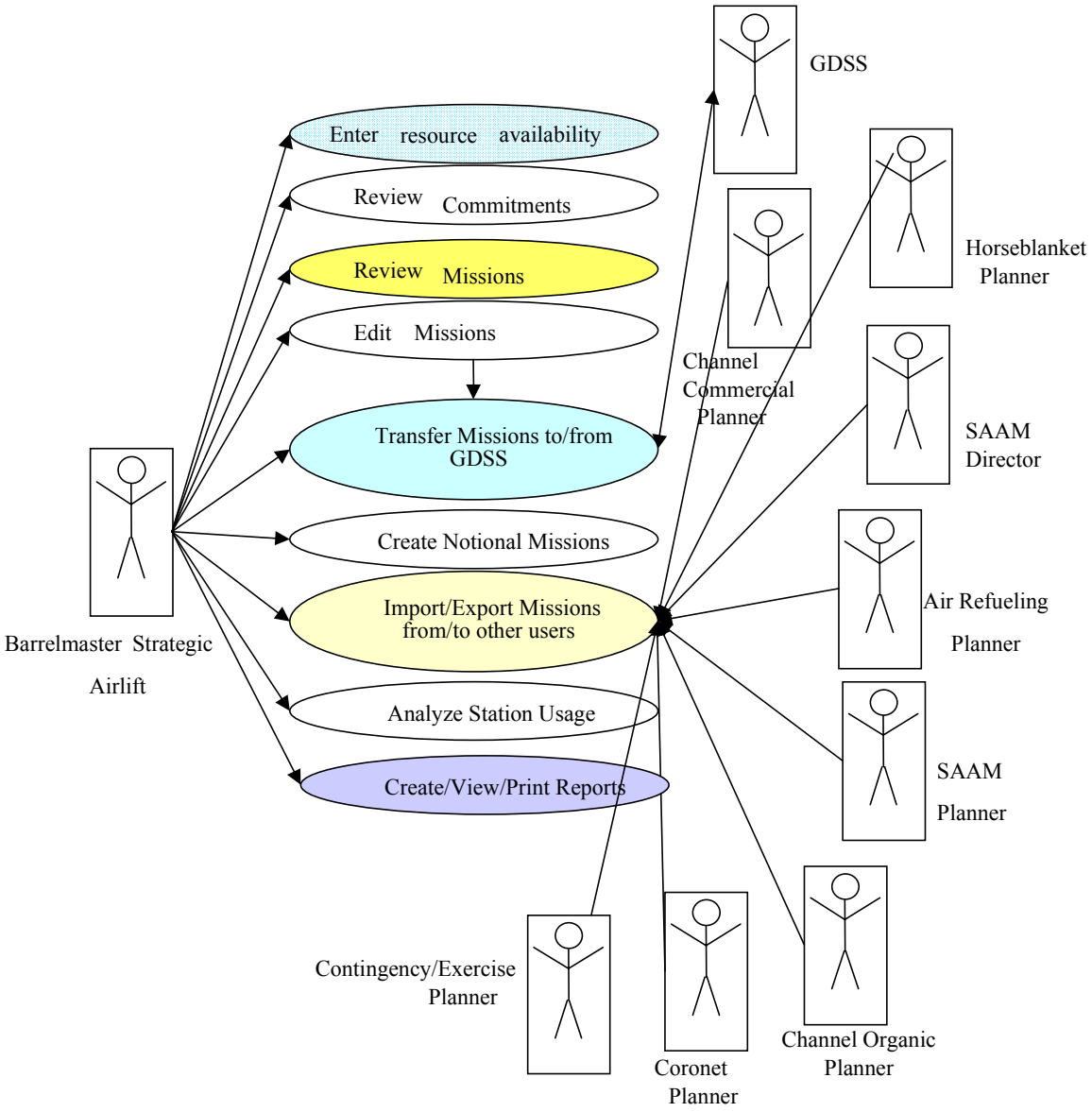

Figure G3. Legacy Integration for logistics transportation planning systems: CAMPS

Preconditions
Interface to Global Transportation Network (GTN)
"GTN provides automated support to the United States Transportation Command (USTRANSCOM) to accomplish its mission of Global Transportation Management for the Department of Defense. A GTN provides the information USTRANSCOM needs for transportation visibility, planning, command and control, intelligence and reporting. CAMPS provides and interfaces with GTN by sending updates to Special Assignment Airlift Mission (SAAM) missions" [29].

Typical Course of Events for Refueling (sample)
A planned route will always include one or more optional stops for refueling and during theater operations planned or emergency refueling may occur on a ship. The integrated

CAMPS will migrate from legacy systems to provide the planner with planning tools that present an integrated view of planning and scheduling for airlift and tanker resources.

Actor Action	System Response
Planner	Air refueling planning system - bullets
Action - Link/Unlink a tanker mission with a receiver mission (from Mission Processing)	
• Link a tanker mission to a receiver mission. The receiver mission's air refueling request is satisfied by the tanker mission. • Unlink a tanker mission to a receiver mission. The receiver mission's air refueling request is no longer satisfied by the tanker mission.	
Action - Display tankers for receiver requests (from Mission Processing)	
• Display a set of tanker missions that satisfy a specified receiver request(s).	
Action - Display receivers for tanker refueling (from Mission Processing)	
• Display a set of receiver missions that are to be refueled by a specified tanker mission.	
Action - Display refueling track usage (from Resource Processing)	
• Display the times a specified refueling track is in use. • Display the missions assigned to a specified refueling track.	
Action - Determine when air refueling allocation has been exceeded (from Mission Tasker)	
• Identify when air-refueling allocations for a plan have been exceeded. • Notify the user when air-refueling allocations for a plan have been exceeded.	
Action - Check mission times against aircraft and equipment availability (from Mission Processing)	
• Check mission times against aircraft and equipment availability for a plan by unit.	
Action - Check mission times against aircrew availability (from Mission Processing)	
• Check mission times against aircrew availability for a plan by unit.	
Action - Check mission times against airport operating hours (from Mission Processing)	
• Check mission times against airport operating hours.	
Action - Link missions for precedence (from Mission Processing)	
• Link mission to specify follow-on missions (i.e. recycle missions).	

Postconditions
GTN provides feedback on how scheduling requirements are being fulfilled.

Impacts for EB and EC
1. Create/View/Edit Resources to the World Wide Web (WWW) from Resource Processing
   Example: Display airport permissions and restrictions
2. Publish Monthly Bulletins to the WWW (from Report and Summary Processing)
   Example: Make the Channels Bulletin for a month available via the WWW. This provides visibility of the monthly schedule changes to the WWW users.

To summarize, integration of legacy systems for use of central planning and decentralized execution is just one aspect of the AMC concept that will flow into GCSS-AF. The larger goal is one-stop shopping for C2 information. AMC has established an electronic commerce relationship with commercial airlines for approximately 1400 aircraft, and envisioned a business relationship with commercial airlines called virtual airline, which is described next.

The Future AMC Architecture: "To Be" (sample)
Virtual Airlines C2 Project
As mentioned previously, legacy external interfaces to commercial carriers are being managed in a less than optimal manner. Scheduling and execution of air mobility transportation will be made more cost-effective using automated EB with broader categories of flights, planning rules and monitoring. The Virtual Airline C2 Project is sponsored jointly by Defense Advanced Research Project's Agency (DARPA) and AMC. The purpose of the project is to develop a prototype system; called the Virtual Airline Integration and Evaluation Tool (VALIENT), which would create a "Virtual Airline" from commercial air carriers. The primary users of the system would be operators from AMC and representatives from the commercial air carriers. Virtual Airline Project improves upon the existing process where the air carrier receives tasking without the context of the overall lift requirements or the knowledge of other carriers' participation [27,28,31].

Concepts of Operations
Carriers and the AF share many tools, but some tools are only used by the AF, as illustrated in Figure 9. Tools have a high impact for improved business process. For instance, one tool helps carriers identify excess capacity in their current schedules. Another, the Carrier Strength Assessment Tool assesses the strength of each commercial carrier. The strength of a carrier is determined by the number and type of assets that are located near a staging area and by its capability to meet the demand at that staging area. For example, American Airlines has a maintenance base, a crew base, and a major presence at all three New York airports (Kennedy, LaGuardia, and Newark). It also has large, transatlantic capable aircraft. This makes American Airlines a prime candidate for providing long haul airlift out of McGuire AFB, NJ. On the other hand, Southwest has maintenance and crew bases at BWI (Baltimore-Washington International Airport) but no transatlantic capable aircraft, making it a good airlift candidate if there is domestic airlift demand to be fulfilled from Andrews AFB, MD [27,28].

Use Case Diagram (sample)
The air operations specialist (AF Log planner) in the Tanker Airlift Control Center (TACC) and the commercial carriers work together using the Virtual Airline tools. All parties are informed of the requirements and are involved in the process of determining the tasking. Additional information can be found at the Virtual Airline web site http://www.metsci.com/va/virtual_airline.html. The use case depicts the Virtual Airline method of using commercial air.

Use Case	Virtual Airline
Actors	Air operations specialist, commercial carrier, CRAF carrier
Purpose	All parties are informed of the requirements and are involved in the process of determining the tasking.
Overview	Because carriers collaborate on a plan and its downstream execution, risk is reduced for other problems such as aircraft maintenance needs, ground services, and weather that can cause delays and propagate throughout the airlift schedule.
Type	Primary, Essential

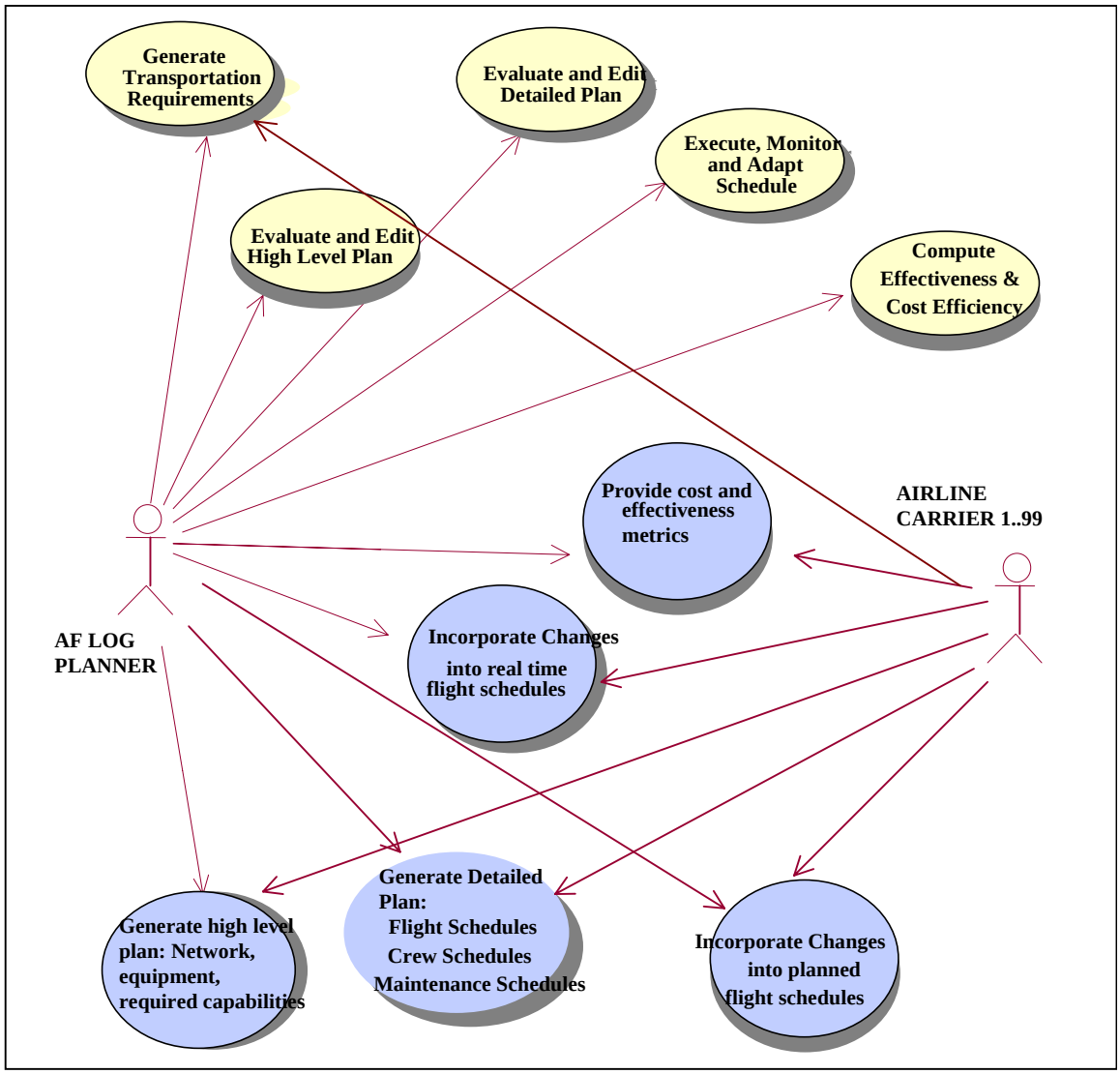

Figure G4. Process for Virtual Airline - From Transport Requirements through Detailed Planning.

Use Case Diagram (sample)
The air operations specialist (AF Log planner) in the Tanker Airlift Control Center (TACC) and the commercial carriers work together using the Virtual Airline tools. All parties are informed of the requirements and are involved in the process of determining the tasking. Additional information can be found at the Virtual Airline web site http://www.metsci.com/va/virtual_airline.html. The use case depicts the Virtual Airline method of using commercial air

Preconditions
1. An environment where missions can be repaired in real-time.
2. A movement requirement includes:
   a) Origin,
   b) Destination,

c) Earliest arrival date (EAD) at the destination, and
d) Latest arrival date at destination.

Typical Course of Events (sample)

Source of information: Stuart D. Draper, MITRE: Greg Godfrey, Metron Inc.

Actor Action	System Response
1. Air operations specialist or carrier - view the demand using Demand and Capacity Analysis Tool (DCAT) – requested as a chart or geographically	2. Commercial carriers inform AMC about the excess capacity in their current schedules type and amount of capacity that they can provide to fulfill various demand requirements [44]
3. Air operations specialist or carrier – analyze the availability	4. DCAT displays a graph plotting the raw demand and the available carrier capacity
5. Air operations specialist – If the capacity does not satisfy all the demand. Perform demand smoothing - attempts are made to shift the demand, within the arrival time constraints, to match the available capacity.	6. Display Demand Pattern after Smoothing - after smoothing (most, but not all, of the demand has been matched successfully to available capacity).
7. Air operations specialist - In order to satisfy the remaining demand, AMC would need to invoke Civil Reserve Air Fleet (CRAF) obligations for Level II.	8. DCAT communicates this information to the carriers. Carriers have the opportunity to volunteer additional aircraft for a short time rather than losing the aircraft to CRAF for an extended time
9. Airfield Manager (AFM) provides input at pre-planning phase	10. Maximum-on-Ground (MOG) information for those airfields used for the movement requirements.
11. Airfield Manager access Timeline View of Arrival Flights and Slots at end of planning phase	10.1. Information display to help the carriers assign arrival slot times for their flights at destination airfields.
12. the AFM continues to monitors arrival flights and slot availability during the execution phase,	10.2. Availability of parking spaces, equipment, fuel, and runways at the airfield

Postconditions

1. Missions at the staging areas must be flexible and easy to repair.
2. The Airfield Management module will be based on the Flight Status Monitor (FSM) system developed for the Federal Aviation Agency (FAA) and commercial air carriers. It will manage arrival slots in theater according to approach and landing, maximum number aircraft on the ground (MOG), refueling, and unloading capacity constraints.

[44] American Airlines has in its schedule six 747's that sit idle in San Juan every night. Had American been aware of the requirement to transport potable water, U.S. troops, and other supplies to Honduras in the wake of Hurricane Mitch, they could have provided airlift to the military overnight without disrupting their daily schedule.

Potential EB Benefits

Flexible business partnerships, based on negotiation and business algorithms

1. Software agents use business rules for evaluating candidate carriers and matching them with missions on the fly.
2. Integration of AMC's Global Decision Support System (GDSS), Command and Control Information Processing System (C2IPS), and Air Combat Command's (ACC) Theater Battle Management Core System (TBMCS), as funding becomes available.

Attachment H: Architecture Web Sites

1. Afmoa_sgoi.brooks.af.mil
   Used to monitor data quality metrics and enable patient information exchange, and collect data globally from the MSG MAGCOM and medical treatment facilities and as low as the clinics to (adolescent clinic at medical center) to see how well they submit data for outpatient record keeping.

   Thanks to Chief of Patient Administration Division – Michael Fitzwater

2. sg-www.satx.disa.mil
   Air Force Medical Service web site. Our goal is to use this forum to enhance information exchange throughout the Air Force Medical Service enterprise. Business tools to Access Medical Service Web Applications, Computer Based Training, Mailing List Subscriptions, AFMS Metrics

   Thanks to Frank W. Williams, LT. Col, USAF MSC, Chief Medical Systems Division

3. http://www.tricare.osd.mil/dmlss/
   DMLSS development has been guided by state-of-the-art technical systems engineering including Electronic Commerce/Electronic Data Interchange (EC/EDI), bar coding, and wireless technology.

   Thanks to Major Jeffery Owen

4. http://cba.ha.osd.mil/projects/other/dbss/dbss-main.htm

   Thanks to MITRE's Chris Marsh

   CHCS II: The Composite Health Care System II (CHCS II) is the basis for the Department of Defense (DoD) Computer-based Patient Record (CPR). CHCS II is a "system of systems" offering the same functionalities as over 60 clinical application information systems developed by the DoD and the Armed Services over the past 20 years. When deployed, CHCS II will provide the cost-effective, worldwide, standardized clinical application information system required to support the following needs: Health care delivery to armed service personnel, retirees, and beneficiaries; Medical readiness of military forces; and Quality managed care. CHCS II is being incrementally developed and deployed. Increment 1 underwent operational testing and evaluation in the first quarter of fiscal year (FY) 1999. Increment 2 is under development and will be deployed worldwide during FY 00.

5. http://www.C3I.osd.mil/org/cio/
   DoD Chief Information Officer (CIO) Guidance and Policy Memorandums (G&PMs). Architecture policy for CIOs per Implementation of Subdivision E of the Clinger-Cohen Act of 1996 (Public Law 104-106). CIO Links: DoD Electronic

Business/Electronic Commerce Strategic Plan Memorandum and DoD Electronic Business/Electronic Commerce Strategic Plan (May 1999)

Thanks to Marge Larson, CPI, Office of the Deputy Chief of Staff for Logistics and Terry Balven, HQ Information Program Planning Office

Thanks to Transportation Analyst, Joni Schaefer and Agnes Womble – Contacting Officer, Headquarters AMC Directorate.

Thanks to Col John H. Gunselman Jr.

6. http://www.supply-chain.org/
   The Supply-Chain Council (SCC) has developed and endorsed the Supply Chain Operations Reference-model (SCOR) as the cross-industry standard for supply-chain management. It uses business processes that may map to some artifacts (process and work flow) of an operational architecture for C4ISR and adds metrics like Delivery Performance to Commit Date, Perfect Order Fulfillment and cost measures.

7. Web sites where activity for EDI committee work for TELCO's is going on:
   - http://www.atis.org/atis/tcif/edi/sosc/5tc53r01.htm
   - http://www.atis.org/atis/tcif/barcode/5tc20hom.htm

8. Main web page with customer instructions, Computer Store: http: accway.acc.as.mil

   Thanks to Lt Col Paul Sievert

9. Use Cases and other materials that support the methodology can be found at "Writing Effective Use Cases", IBM Object Technology Practice,
   - http://members.aol.com/acockburn

10. AF Defense Information Infrastructure Division (DIIE)

    Thanks to Lt Col Glenn Murphy, chief of DIIE and Susan Sullivan, assistant engineering branch chief

Appendix E
Case Study for Secure EB/EC Data Exchange

This appendix contains a case study for secure EB/EC data exchange.

MITRE

10 November 1999
55410-L-60R
D440-L-1799

Mr. Spencer Cake
AFCIC Headquarters
1250 Air Force Pentagon
Washington, DC 20330-1250

Subject: *Electronic Commerce: Business Considerations and the Virtual Bank*

Dear Mr. Cake:

Attached please find the subject document prepared under the FY00 MITRE Air Force Communications and Information Center (AFCIC) Project Work Statement (PWS). As agreed in planning conversations with you, the document examines secure electronic commerce in the electronic banking industry. This document is planned for incorporation in the *Air Force EB/EC Implementation Plan*, currently under development by Logistics Management Institute.

Questions or comments concerning this deliverable may be addressed to either the document author, Mr. Gerald Eiden, at (719) 572-8239; or the Associate Project Leader, Ms. Patricia Dunn, (703) 883-6357.

Sincerely,

Gerald F. Eiden
Associate Engineer

Patricia A. Dunn
Associate Project Leader, 55410
Support to AFCIC/CC

Enclosure

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ENCLOSURE

Electronic Commerce: Business Considerations and the Virtual Bank

November 1999

Gerald F. Eiden

Air Force Project 03995541

MITRE

Table of Contents

Section 1

Introduction

"However brilliant a technology, its social effects are only felt when a critical mass of people adopt it. Before that uptake, the world's most powerful tool is only a gadget," (Siebel and House, p15) says Thomas M. Siebel, chairman and CEO of Siebel Systems. His is an accurate description of the current state of limbo in which Electronic Commerce exists today. Will this new form of commerce establish a firm foothold in global business, or collapse following public disregard or under technical scrutiny? Industry pundits recognize this era in Internet development as a veritable gold mine for entrepreneurs, and as a turning point, that will change the rules of global commerce. Electronic Commerce technologies and businesses hope to sustain a furious pace of innovation with demands for secure transactions, heightened customer authentication and privacy, and increased protection for supporting hardware and software applications. Many vendors meet the challenge by offering their commercial solutions. Corporate and government Intranets have initiated pilot programs that use state of the art encryption technologies and custom user services. DoD and Air Force implementation will prove an effective extension to enable Combat Support providers to connect vendors and suppliers. Yet, it is difficult to build the modern infrastructure that uses emerging Electronic Commerce technologies in a cost effective and interoperable manner. Early network development taught the costly lesson that security must grow in concert with the infrastructure, not as an afterthought. Now serious business, the Internet and its security requirements are no longer solely needed to provide information, entertainment, and advertising, but to provide a secure, virtual marketplace for the future.

The modern Internet has made way for Electronic Commerce by replacing the *Information Highway* of the early 1990's with new promise. "Going Digital" is the catch phrase of the day, yet it is difficult to gain customer confidence. Many users of the World Wide Web are still not convinced their digital identity and account data will remain secure online. Some Internet business leaders are proceeding cautiously, monitoring Electronic Commerce growth trends, and staying abreast of the associated technological advances. This has not stopped other online businesses from forging a new identity in the virtual marketplace by providing quick access and online cost savings. The promise of Electronic Commerce is measured on a grand scale. Growth predictions are driving entrepreneurs and established industries alike to maneuver quickly to establish their own storefronts in the virtual marketplace. However, the waters are treacherous and only a few have met their optimistic expectations. Industry examples of Electronic Commerce illustrate 1) a turning point for global business; 2) the need to assemble an infrastructure deftly and patiently; and 3) the ever-emergent requirement for security to play a pivotal role in development of the infrastructure.

Section 2

The Next Watershed

Heralded as the next watershed in computing development, Electronic Commerce is a hot topic. "The Internet is going to be the most ubiquitous, cost-effective, and timely mechanism for exchanging information in human history." (Siebel and House, p18) Catching the attention of political leaders and global businesses, Electronic Commerce provides the key to a future "paperless" business environment. Those hoping to succeed must approach this medium by breaking it into manageable pieces.

Electronic Commerce is composed of two distinct areas, Business-to-Business (B-to-B) commerce, and Business-to-Consumer (B-to-C) commerce. (Korper and Ellis, p6) B-to-B applications include Intranet/Extranet applications where corporations trade internally and externally between in-house departments, suppliers, manufacturers, etc. The latter, B-to-C, are familiar to users in the form of electronic stock traders, online retailers, virtual malls, manufacturing sites, etc. Figure 2-1 provides an overview of Electronic Commerce activity.

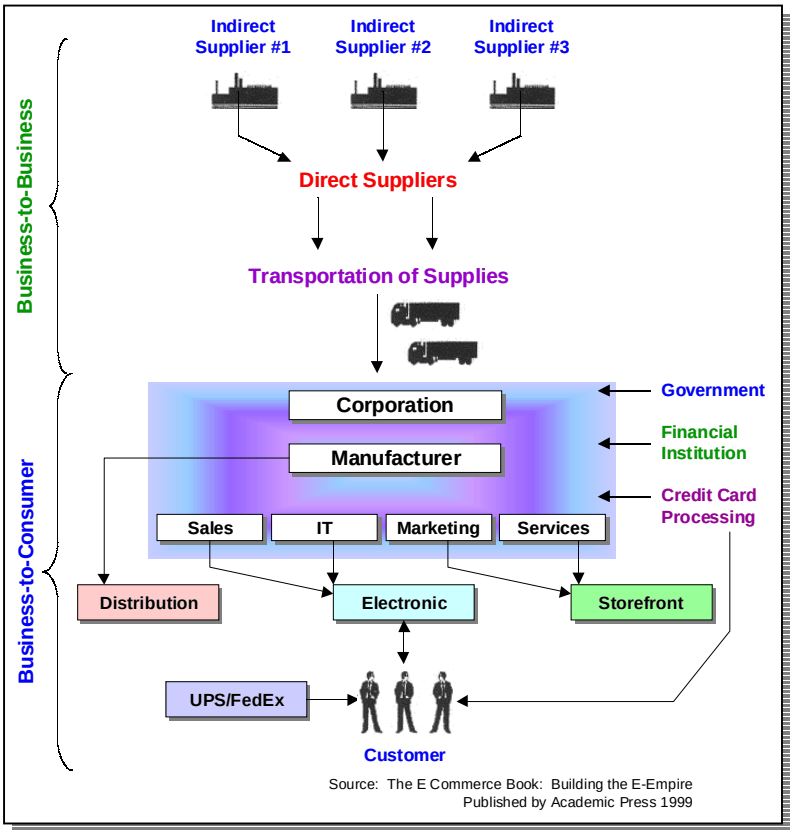

Figure 2-1. Electronic Commerce: Business-to-Business and Business-to-Consumer

Some success stories include the DELL corporation that has gained significant market share trading its wares with corporate and commercial buyers; E*Trade.com with its success as a virtual stock broker; and Amazon.com with its large selection of titles and high customer satisfaction rating. Estimated profits for B-to-B commerce are astounding:

> Forrester Research estimates that, in 1997, online transactions amounted to $9 billion; of that figure, the bulk -- $7.5 Billion -- was in business-to-business sales. One leader in this field, Cisco Systems, Inc., brought in online revenues of $3.2 billion. The Commerce Department projects $300 billion in business-to-business sales by the year 2002. (Siebel and House, p4)

Cost savings for B-to-B applications is also substantial as "a study by the National Association of Purchasing Management estimates that the average corporate purchase order costs $79 to process -- $38 of that in internal processing costs…the implication is clear: streamline purchasing, and a corporation can realize huge savings." (Knorr, Oct 1999)

B-to-C commerce is also experiencing widespread success, with similar growth predictions. However, most of this success is in specialty areas, booksellers, travel sales, and electronics, to name a few. Building an electronic storefront requires investment and patience. Many consumers still resist online purchasing and transactions, and perhaps a historical example of a changed business model can explain why.

Siebel offers the example of Automated Teller Machine (ATM) banking. When ATMs first arrived on the banking scene, consumers were wary. Some avoided them entirely, preferring a personally secure transaction with a living, breathing bank teller. Over time, ATM banking gained visibility as a resource to enable customer banking 24 hours a day, 7 days a week, and has evolved into a ubiquitous feature of society, available at many retail outlets and independent stands. ATM technology is now a fundamental part of international commerce, allowing customer access to accounts across the globe. Today, ATM machines are instantly recognizable to consumers and an integral part of banking operations. (Siebel and House, p15)

While ATM banking opened the door for Electronic Commerce in the banking industry, customers still demand expanded access to their accounts for information and transactions. Automated Teller services exist at many banking institutions with limited account inquiry and transaction capabilities by way of touch tone telephone. However, online banking is growing rapidly, fueled by the drive for increased Internet Electronic Commerce. Direct access and management of financial accounts via the Internet has evolved to a Virtual Banking model that may very well become the banking model of the future.

Section 3

The Virtual Bank

Banking options are growing with independent organizations and established banks offering online account processing, loan accounts, mortgage applications, etc. These online services use a Virtual Bank model, which replaces the brick and mortar of conventional banking. Figure 3-1 suggests such a model.

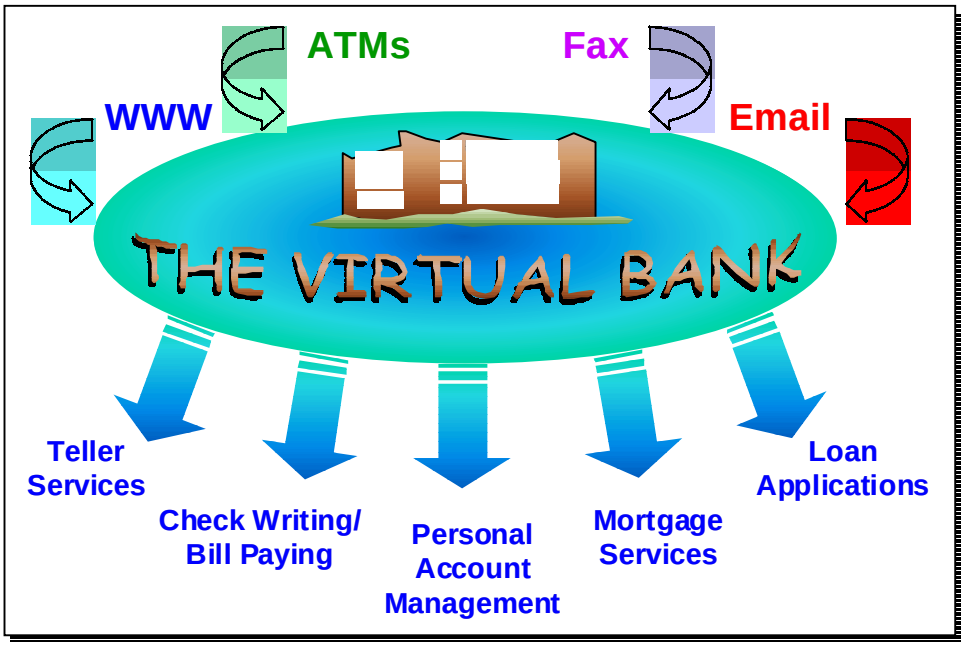

Figure 3-1. The Virtual Banking Model

While online trading companies like E*Bay.com have enjoyed fast growth on the Internet, the Virtual Bank may be evolving slowly, discovering its own identity in Electronic Commerce much like the ATM slowly found its niche in conventional banking. "Unlike electronic brokerages, which have quickly proliferated, Internet-only banks have appeared in a measured way over the last four years. Currently, federal regulators are overseeing fewer than a dozen of them, though there are hundreds of 'real' banks with Web sites where certain transactions can be performed electronically." (Skrzycki, October 1999) Some Internet-only banks are advertising great success in their approach to this new medium.

As an example, Telebank Financial Corporation initiated its purely online banking model in 1989 "through electronic delivery channels including the Internet, telephone, ATM, and fax to reduce operating costs and pass the savings back to customers." (Business Wire, October 1999) Telebank has grown significantly since 1989, boasting assets of more than $3.2 billion and 80,000 retail accounts. The Telebank Online website gives consumers WWW access to the expanded services they require: 24-hour, 7-day access; high interest return on checking and savings; and low fees. Telebank predicts electronic banking will reduce branch banking's market share to 41 percent by 2002. (Telebank, October 1999) If this kind of success is achieved, conventional banking operations will change substantially. Others considering online banking, however, are not as optimistic:

> "The interest in banks that offer online banking is a lot less than people ever imagined," said Richard M. Riccobono, deputy director of the Office of Thrift Supervision. "People thought it would explode." (Skrzycki, October 1999)

Independents like Telebank may be among the mavericks in this new banking culture as "regulators and analysts expect that the real growth in Internet banking will come from Internet divisions created by traditional banks. These operate as units of their parent banks under different trade names." (Skrzycki, October 1999) Some of these online banks are already recognizable: Wingspanbank, property of BankOne; USAccess Bank, created by Central Bank USA; and BankDirect, established by Texas Capital Bank.

The key to virtual banking success is its cost-saving services to the customer. "It costs a bank about a penny to execute a transaction online, compared with a dollar for a manual transaction in a branch bank." (Skrzycki, October 1999) In any form, Internet-only or Internet division, online banking has become a medium of substantial importance. "Despite doubters, Egg, an Internet bank set up a year ago by London's Prudential Assurance Co., now has $13 billion in deposits, attracting clientele that is young, computer savvy, and willing to click for the best rates -- wherever in cyberspace they might be." (Skrzycki, October 1999)

These important developments in banking commerce transform preconceived customer and business approaches to financial services. If online banking truly soars above branch operations in the future, as Telebank predicts, a true Internet watershed will occur. Building customer trust, however, will be an important issue. While the young are more apt to join the ranks of those banking and purchasing online, other consumers are not convinced their transaction record, privacy, and digital identity will remain secure. The success of Electronic Commerce depends on security it provides for both B-to-B as well as B-to-C infrastructures.

Section 4

Security Considerations

The Banking industry must protect the systems that manage client accounts using network security methods. Network security requires restricted physical access to hardware, protected electronic access to shared information, as well as encryption and firewall technologies to guard against external monitoring and attack. Security managers must establish Policies and Procedures for employees and maintain that security via training and audits. However, they should "keep in mind when developing a security strategy [to] balance the need for communication and information transfer between [the] company and customer vendors, suppliers and the public, with the potential for harm that this access creates" (Korper and Ellis, p188) As security defenses grow, hackers find new avenues of attack. Network Administrators must ensure that server ports are secure and would-be attackers are unable to compromise critical information or services. This means installing state of the art security technologies, and monitoring unauthorized attempts to gain access to the systems within the infrastructure. Figure 4-1 illustrates Network Security Architecture functions.

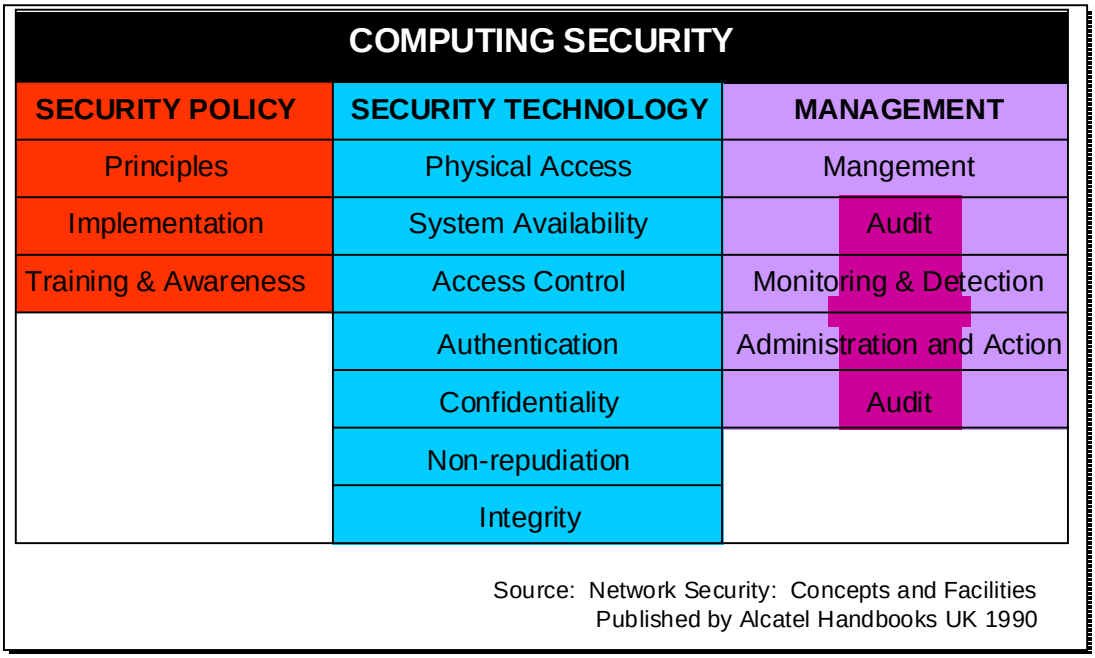

Figure 4-1. Security Architecture

Computing Security is big business, and is of great importance to the networked systems it supports. Technologies that attempt to protect the customer, ensure secure transactions, and safeguard surety of data are widespread. However, security standards on the Internet are in a general state of disarray. Security solutions for systems using username/password protection may be sufficient for Intranet/Extranet applications implementing their security strategy. However, the inherent lack of protection over the Internet is always a threat to network security. If a business expends too much of its time defining secure methods of exchanging data, and restricting use of resources already available on the Internet, development of a successful Electronic Commerce model will be impeded. Therefore, embracing current technologies and fielding these systems will keep online businesses in business.

Today, Internet businesses demand secure communication and transactions. The solution that best meets authenticity needs is Public Key Infrastructure (PKI), which "is the realization of digital certificate technology." (Alcatel, p48) Under PKI, Certificate Authorities (CAs) manage, distribute, and revoke Digital certificates. Public Key encryption enables *any-to-any encryption*, assuring both the sender and receiver that the intended communication is trusted and has not been modified. With this certification process, addressing problems with email spoofing and repudiation is possible. Benefits of PKI include "a much more thorough means of ensuring that customers are certain of the merchant identity…and [offers] proof of what the customer ordered in a much more rigorous way." (Mathews, 1999) Risks remain however, as PKI fails "to provide a common, interoperable implementation…PKI needs to present a common face to the e-commerce market if it is to achieve [its] benefits." (Mathews, 1999) PKI leaders are implementing services online to Internet businesses and DoD activities as well. These include VeriSign, Inc., Entrust Technologies, Inc., RSA, Netscape, CyberTrust, Baltimore Technologies, and GlobalSign.

DoD and Air Force implementation of PKI has traveled beyond pilot programs. Recently, the DoD announced that both VeriSign and Sun-Netscape Alliance would provide DoD PKI services. VeriSign will act as Interim External Certificate Authority (IECA) allowing "350,000 DoD trading partners…the option to obtain VeriSign digital certificates to secure their e-commerce transactions with the DoD." (PRNewswire, October 1999) Sun-Netscape Alliance will support the General Services Administration (GSA) with the iPlanet Certificate Management System that "enables the deployment of certificates to citizens, contractors and businesses so they can interact with the government agencies and the DoD electronically and securely." (Sun-Netscape Alliance, November 1999) In addition, the USAF ESC Chief Architect's Office (CAO) has suggested that "the DoD PKI must interoperate with a large number of other PKIs from NATO Allies, commercial partners and the rest of the federal government. These other PKIs may be based on different products,

certificate policies, and algorithms." (ESC CAO, July 1999) It is true that PKI is still in its infancy, but given the global reaction to this technology, it has become the prime choice for digital certificate services of the future.

Other solutions exist, notably SMART Cards and the Secure Electronic Transaction (SET) payment protocol. SMART Cards provide digital credits for electronic transactions and exist in specialized applications across the globe, including DoD utilization as a standard for electronic transactions. The SET protocol, developed by VISA/Master Card in 1997, is not as successful. SET uses public key encryption and digital envelopes to protect transactions between the customer and the service provider. It also acts to counter repudiation with digital certificate signatures. However, the protocol has not caught the attention of online businesses, perhaps due to its slow evolution and its sluggish promotion in the virtual marketplace. SET may very well "become a solution in search of a problem." (Siebel and House, p59)

As these technologies evolve, it is ultimately the responsibility of security managers and administrators to maintain the highest level of protection for their systems in consonance with the level of criticality of information they seek to protect. As noted earlier, security should not cripple the effort but fortify and monitor progress in all areas of an Electronic Commerce infrastructure. There has been significant advancement since the days when security was only an afterthought. The computing culture has been sufficiently shaken by hacker attacks, malicious code, and internal misuse to acknowledge the need for on-going security policy, procedures, and audits. Continuing these efforts will reinforce infrastructures against impending electronic threat.

Section 5

Conclusion

Electronic Commerce presents a turning point for global commerce. Its promise as a veritable gold mine is attracting entrepreneurs, established businesses and government organizations across the world. It is a new and exciting medium. Yet, some have experienced the dark side of the phenomenon by not properly preparing and securing their virtual storefront. Customer service is the goal. Giving customers what they want, empowering them in a way that Electronic Commerce will exceed conventional commerce, is required. Only when they can save time or money will the customer enter a virtual rather than a conventional market. These services must be swift and secure. Providing all of this functionality and providing it *now*, is the key.

In the Virtual Bank example, financial institutions must establish a presence that provides at least basic online services for their customers. Security plays a primary role. Organizational security infrastructure already exists for large corporate, government, and military enterprises, protected behind firewalls with established security policies and procedures. Applying Electronic Commerce technologies is a difficult and costly endeavor, but worth the effort. Each organization must identify 1) its needs; 2) how Electronic Commerce technology will enhance user/customer capabilities; and 3) how security is impacted. Moving quickly, such organizations have fielded pilot programs that employ the latest in encryption and electronic transaction technologies. Much like B-to-B and B-to-C applications, the Air Force infrastructure can use this technology to connect diverse operations and provide enhanced access to shared data. As well, system architects can tailor their applications to provide limited connectivity for external vendors, contractors, and other public users. Along the way, security administration must maintain vigilant watch, using the best tools at their disposal.

It is better to "Launch and Learn," Siebel recommends. Because "whatever you're using today will be practically obsolete in little more than a year. That puts a tremendous competitive pressure on the industry as a whole…The 'launch and learn' principle may not be conservative, but it's not reckless, either." (Siebel and House, p89) With learning as the main objective, the enterprise cannot help but improve. In the Virtual Bank example, customer satisfaction was the primary goal. Following the same objectives, Air Force implementation of Electronic Commerce technologies can only better its services while enriching the security that must support the infrastructure.

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Acronym List

ATM	Automated Teller Machine
B-to-B	Business-to-Business
B-to-C	Business-to-Consumer
CA	Certificate Authority
CAO	Chief Architect's Office
CEO	Chief Executive Officer
DoD	Department of Defense
ESC	Electronic Systems Center
GSA	General Services Administration
IECA	Interim External Certificate Authority
NATO	North American Treaty Organization
PKI	Public Key Infrastructure
SET	Secure Electronic Transaction
USAF	United States Air Force
WWW	World Wide Web

Appendix F
Memorandum—Smart Card Adoption and Implementation

Figure F-1. Memorandum—Smart Card Adoption and Implementation

DEPUTY SECRETARY OF DEFENSE

1010 DEFENSE PENTAGON
WASHINGTON, DC 20301-1010

NOV 1 0 1999

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
UNDER SECRETARIES OF DEFENSE
DIRECTOR, DEFENSE RESEARCH AND ENGINEERING
ASSISTANT SECRETARIES OF DEFENSE
GENERAL COUNSEL OF THE DEPARTMENT OF DEFENSE
INSPECTOR GENERAL OF THE DEPARTMENT OF DEFENSE
DIRECTOR, OPERATIONAL TEST AND EVALUATION
ASSISTANTS TO THE SECRETARY OF DEFENSE
DIRECTOR ADMINISTRATION AND MANAGEMENT
DIRECTORS OF THE DEFENSE AGENCIES
DIRECTORS OF THE DOD FIELD ACTIVITIES

SUBJECT: Smart Card Adoption and Implementation

The Department is committed to innovation through the reformation of business processes and exploitation of technology to achieve our goal of efficiency and improved effectiveness. One of the Department's major initiatives in this respect has been the evaluation of smart cards for use in various operational and business applications. Now is the time to adopt smart cards throughout the Department and realize the potential that this technology offers.

Consistent with the provisions of the Clinger-Cohen Act of 1996 (Divisions D and E of Public Law 104-106), the Department's Chief Information Officer (CIO) is assigned the overall responsibility for the development of the Department's smart card policy and oversight. I direct all DoD Components to take actions necessary to implement the use of a standard DoD smart card as specified herein.

The initial implementation of smart card technology shall be effected as a Department-wide common access card (CAC). The CAC shall be the standard ID card for active duty military personnel (to include the Selected Reserve), DoD civilian employees and eligible contractor personnel. It also will be the principal card used to enable physical access to buildings and controlled spaces and will be used to gain access to the Department's computer networks and systems. This card would accommodate an integrated circuit chip and would also contain such other relevant media as magnetic stripe and bar codes. This memorandum assumes that all relevant standards will be applied to the card as appropriate. To ensure full and consistent use of existing capabilities and gain efficiencies, the CAC shall be issued and maintained using the infrastructure provided by the Defense Enrollment Eligibility Reporting System and the Real-time Automated Personnel Identification System. The DoD CIO, with the assistance of the Under Secretary of Defense (Personnel and Readiness) (USD(P&R)), is assigned the responsibility to coordinate the physical design of this new CAC using the smart card technology.

In response to the increasing threat to our networks and computer systems, I previously mandated DoD-wide movement toward a ubiquitous public key infrastructure (PKI). Since co-

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Figure F-1. Memorandum—Smart Card Adoption and Implementation (Continued)

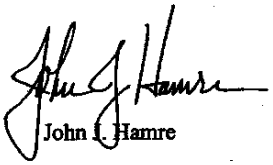
processor smart cards already are being used as authentication tokens for certificates and as private keys for digital signature and access authentication, the adoption of this technology within the Department--and placement on the CAC--will enable this card to serve as DoD's primary platform for the authentication token. I authorize the DoD CIO to modify previously issued PKI guidance, as appropriate, to incorporate and accommodate use of the CAC. I expect the DoD CIO to ensure an initial implementation of the smart card-based CAC at multiple locations no later than December 30, 2000. As a result of the recent Joint Requirements Oversight Council (JROC) briefing, and in support of the foregoing milestone, the Department of the Navy shall take the lead in preparing a smart card Operational Requirements Document (ORD), for submission to the JROC no later than January 31, 2000. In addition, the DoD CIO shall develop for my approval a CAC Execution Plan within 120 days of the date of this memorandum. That plan, at a minimum, shall address configuration management, a requirements planning methodology, and the use of functional community panels to ensure broad communication and cross-functional integration.

I hereby disestablish the Smart Card Senior Steering Group. In its place, the DoD CIO shall establish a Smart Card Configuration Management Control Board (SCCMCB). The SCCMCB shall assure the integration of cross-functional requirements and determine summary-level chip storage allocations, to include those for Component-specific use of the CAC. The SCCMCB will include representatives (Flag/SES minimum) from affected Principal Staff Assistants (PSAs) within the Office of the Secretary of Defense (OSD) and the DoD Components, and shall oversee the operation of a Smart Card Senior Coordinating Group (SCSCG).

An official (Flag/SES) designated by the Secretary of the Navy shall serve as the chairperson for the SCSCG. This body shall develop and implement Department-wide interoperability standards for use of Smart Card technology and a plan to exploit Smart Card technology as a means for enhancing readiness and improving business processes. This body shall accomplish these tasks by integrating smart card requirements in coordination with the DoD Components and the Public Key Infrastructure Program Management Office, and making recommendations to the DoD CIO through the SCCMCB. The SCSCG will receive technical and executive secretariat support from the Access Card Office, which currently is an element of the Defense Manpower Data Center.

The implementation of CAC applications shall be accomplished in conjunction with the OSD PSA, or designee, who is responsible for the mission or function to be supported by the CAC. Each PSA is encouraged to establish a community panel, composed of Component functional representatives, to support this role. In addition, the Military Departments and, as needed, other DoD Components, will designate organizations to serve as Component-wide smart card offices that promote and manage Component-unique smart card requirements within the chip storage allocations issued by the SCCMCB. The DoD CIO shall draft an appropriate DoD issuance to incorporate these policies and establish permanently the SCCMCB and the SCSCG.

I recognize and appreciate the efforts to date and solicit your support and cooperation as we undertake this significant effort.



John J. Hamre

Appendix G
Roles and Responsibilities

This appendix identifies the EB/EC roles and responsibilities for Air Force organizations.

OFFICE OF THE AIR FORCE CHIEF INFORMATION OFFICER

The Office of the Air Force Chief Information Officer has the following EB/EC roles and responsibilities:

- Be the Air Force EB/EC champion.
- Be briefed on EC-related issues routinely by the Director, GCSS-AF.
- Oversee development of GCSS-AF enterprise-wide architecture and ensure uniform implementation.
- Ensure coordination of functional area operational architectures by the GCSS-AF lead agency for building knowledge to facilitate an integrated information infrastructure.
- Ensure functional area infrastructure requirements and information assurance issues are identified, resourced, and coordinated before beginning system development.
- Ensure adequate funding to support insertion of EB/EC into GCSS-AF.
- Provide policy guidance, program advocacy, and oversight for the unclassified and classified GCSS-AF infrastructure.
- Ensure current business processes are examined and reengineered, where applicable, before inserting new information technologies into business processes.
- Ensure business cases are completed, reviewed, and approved before making expenditures on EB/EC technologies.
- Ensure return on investment metrics are collected, analyzed, and reported by all functional areas to the Air Force CIO.

- Keep fully apprised on the following:
  - ➤ DoD-mandated EB/EC directives and projects
  - ➤ Impact of DoD and JECPO mandates and projects.
  - ➤ Draft DoD and JECPO-related policy and architectural changes.
- Ensure Air Force EB/EC IT and security systems are in compliance with DoD and other government standards.
- Ensure Air Force EB/EC information technology and security systems are interoperable with other relevant information technology and national security systems of the Government and DoD.

GCSS-AF AND EB/EC DIRECTOR

The GCSS-AF Director has the following EB/EC roles and responsibilities:

- Facilitate BPR across functional domains.
- Manage GCSS-AF integration and EB/EC requirements prioritization process.
- Ensure EB/EC projects and prototypes are consistent with the GCSS-AF architecture.
- Control integration and allocation of funds for GCSS-AF and EB/EC requirements.
- Integrate top-down directives and functions as an advocate for coordination among the various domains.
- Provide status briefings to the Air Force CIO on GCSS-AF and EB/EC-related issues and projects.
- Be the primary EB/EC Office in the Air Force responsible for keeping the Air Force CIO apprised of on-going EB/EC activities, including paperless contracting and DRID #48-related activities. Feedback from functional areas to the Air Force CIO/GRID on EB/EC related project activities will be institutionalized by this plan. Functional areas may, at times, be required to interface with the Office of the Secretary of Defense, JECPO, commercial sector, other Military Services, and Defense Agencies, but not as the Air Force spokesperson for EB/EC and only as the functional performing work related to their specific areas of responsibility.
- Coordinate external mandates (e.g., Management Reform Memorandums, DRIDs, and other directed tasks) related to GCSS-AF or EB/EC.

- Coordinate internal Air Force EB/EC-related actions.
- Resolve EC-related issues raised by MAJCOMs, field operating agencies, direct reporting units, and the Air Staff.
- Advocate project funding (based on compelling business cases) to the Air Force CIO and JECPO.
- Update and maintain Air Force EB/EC strategic and implementation plans.
- Sponsor GCSS-AF Requirements Board.

AIR FORCE SECRETARIAT AND AIR STAFF FUNCTIONAL AREAS

All Secretariat and Air Staff functional areas have the following EB/EC roles and responsibilities:

- Reengineer inefficient and outdated business processes in accordance with the FY00–FY05 Annual Planning Programming Guidance.
- Ensure development and maintenance of appropriate documentation establishing a requirement or authorization for projects.
- Develop functional area operational architecture drawings showing business processes (how and with whom they conduct business). Provide copies of the architecture to the GRID to help the staff updating in EB/EC plans and architectures. Submit copies of GCSS-AF and EB/EC POM requirements to the GCSS AF Directorate.[1] Develop, maintain, and track performance metrics related to the use of EB/EC.
- Identify EB/EC and GCSS-AF prototype projects for incorporation into the GCSS-AF architecture and for funding consideration.
- Mentor prototype proposals by advocating funding for deserving requirements.
- Develop and forward "to be" operational architectures that incorporate EB/EC techniques and business process reengineering to the GCSS-AF Director for review and coordination.

[1] The Directorate will analyze all requirements to identify systems and projects related to the GCSS-AF and EB/EC. Projects will be reviewed and ranked by the GCSS-AF Requirements Review Board. Those identified as providing the best fit and greatest benefit to GCSS-AF and EB/EC will be sent to the Air Force CIO, who will support POM submissions to the Air Force Board. His support will further bolster programs submitted in POM submissions.

SAF/FM will be the baseline functional community for EC financial transactions in support of other functional areas and MAJCOMs.

SAF/GC will provide legal opinions and guidance on EB/EC-related issues.

AF/SC (AFCIC) will:

- Review functional area operational architectures to ensure they complement and comply with existing architecture policy guidance.
- Coordinate with the DoD C4ISR Architecture Working Group to ensure functional architectures comply with overall DoD architecture specifications.
- Provide PKI, digital signature, and encryption technology implementation guidance.
- Advise the GCSS-AF Director on infrastructure-related matters (e.g., capacity and capabilities, networking and routing, firewalls, security).
- Develop and coordinate information security policy recommendations.
- Participate in data quality and standardization initiatives.
- Advocate adequate communications infrastructure before functional system development and fielding.

AFCA will:

- Be the champion for EB/EC technical interface compliance to the Joint Technical Architecture (JTA), JTA-AF, and the DoD EB/EC architecture.
- Be the point of contact for and maintain the Air Force EB/EC Web site.
- Support DoD EC Day by coordinating Air Force booth demonstrations and Air Force award nominations.
- Provide support and guidance related to EB/EC technical and EDI standards support.
- Provide corporate awareness of EB/EC technical resources.
- Establish and maintain a repository of EB/EC information, frequently asked questions, activities, and initiatives.
- Provide information avenues related to the evaluation and analysis of the use of COTS and GOTS in support of EB/EC.

- Consolidate functional EB/EC metrics for the Air Force CIO as required.
- Support GRID by assessing EB/EC implementation progress.

AF/JA will actively support and participate in EB/EC policy development.

AF/IL will:

- Represent the GCSS-AF Director on DRID #48-related issues.
- Keep the GCSS-AF Director apprised on status of E-Mall and all DRID #48-related issues.

AFMIA will provide, when part of the manpower determination process, guidance and assistance to the GCSS-AF Director and all functional areas on performing business process reengineering.

AFIWC will provide security technologies (e.g., encryption) support to the GCSS-AF Director.

ESC will:

- Develop a checklist for functional areas to use when developing EB/EC initiatives for submittal into the requirements process.
- Provide EB/EC Web development assistance to other Air Force customers.
- Provide EB/EC technical expertise for rapid prototype development and EDI-related initiatives.
- Provide EDI mapping expertise for ANSI X12 prototype projects.
- Develop and maintain Air Force electronic gateway.
- Provide required technical support related to EB/EC.

Air Force MAJCOMs will:

- Identify, evaluate, and reengineer inefficient and outdated business processes.
- Prepare operational architecture drawings for review by GCSS-AF PMO and incorporation into GCSS-AF architecture.
- Identify prototype projects for incorporation into the GCSS-AF architecture and for central funding consideration.

The Air Education and Training Command will assist the GCSS-AF PMO and major command developers in identifying and analyzing EB/EC training requirements and update existing courseware.

CIVILIAN CAREER PROGRAM FUNCTIONAL CHIEFS/FUNCTIONAL CHIEF REPRESENTATIVES

Civilian Career Program Functional Chiefs/Functional Chief Representatives (FCs/FCRs) will—in coordination with the Office of the Assistant Secretary of the Air Force (Manpower, Reserve Affairs, Installations, and Environment), GCSS-AF Director, and EB/EC proponents—identify, analyze, and develop EB/EC training requirements for Air Force civilians at technical, managerial, and executive levels.

PROPONENTS OF EB/EC INITIATIVES

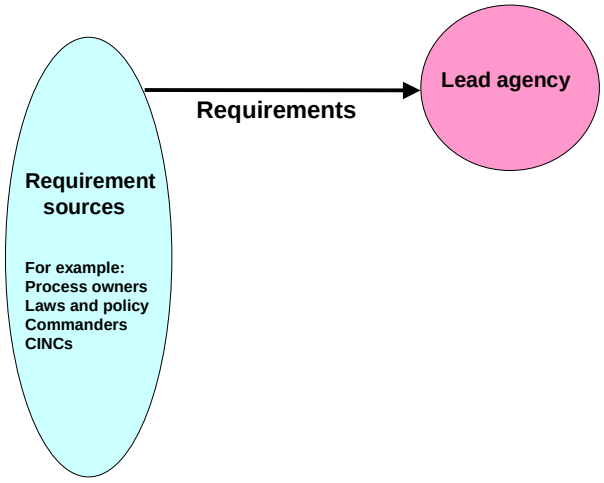
EB/EC proponents are program offices or organizations that are the process owners or key sponsors for developing EB/EC pilots programs, initiatives, or solutions. An EB/EC proponent is the primary point of contact for an EB/EC activity (pilot, initiative, or solution) and is responsible for funding the EB/EC activity. The EB/EC proponent is the end-user of an EB/EC solution and has a critical role in achieving the EB/EC vision. The EB/EC proponent may also represent the developer of an EB/EC solution if it also perform the system development effort. The EB/EC proponent will support the goals of the Air Force through the following:

- Implementing each EB/EC pilot or solution in accordance with functional requirements to the maximum extent practicable in all facets of developing, fielding, training, integrating, and testing of the EB/EC pilot or solution.
- Ensuring that actions involving implementation of EB/EC initiatives comply with the guiding principles in the *Air Force Electronic Commerce Strategic Plan* (1995), *DoD EB/EC Strategic Plan* (1999), *DoD EB/EC Implementation Plan* (1999), and this implementation plan.
- Coordinating with the GCSS-AF Office, FCs, and FCRs in identifying EB/EC training requirements for the proposed or fielded EB/EC pilot or solution.
- Providing the GCSS-AF Office entries to the EB/EC repository to maintain a central base of current EB/EC points of contact, initiatives, and concepts that can be promulgated throughout the Air Force.

Appendix H
Enterprise Requirements Generation and Integration Process

The lead agency will consolidate and manage GCSS-AF requirements for Air Force combat support, including EB/EC information capabilities. The agency will sponsor all GCSS-AF requirements throughout the PPBS cycle. During execution, it will serve as the *customer* for cross-domain or enterprise-wide requirements it develops. Figure H-1 illustrates the relationship among the lead agency and other organizations and the macro-level processes to meet responsibilities.

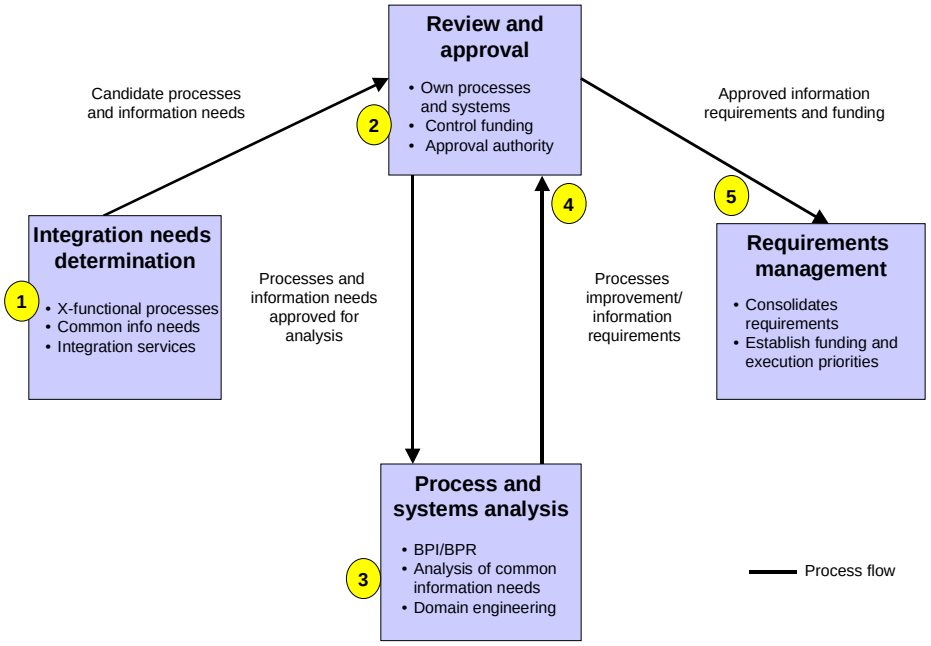
Figure H-1. GCSS-AF Requirements Process



Note: CINCs = commanders in chief.

As shown in Figure H-1, the lead agency will obtain requirements from several sources. They include requirements mandated for all information systems (enterprise), requirements across more than one domain's information systems (multi-domain), and discrete functional requirements. The lead agency will use its position to facilitate multi-domain or enterprise business process improvement (BPI) and BPR opportunities and broker competing BPI/BPR alternatives among functional areas. The lead agency will use the process in Figure H-2 to analyze requirements for BPI and BPR.

Figure H-2. GCSS-AF Requirements Process



The process will consist of the following steps:

- *Step 1. BPI/BPR determination.* The lead agency will use JEFX planning and M&S activities to analyze, develop, and propose business and warfighting process improvement opportunities.

- *Step 2. Broad review of BPI/BPR proposals.* This step is critical because resource support usually comes from functional areas. The board may be required to find ways to redirect resources and assign responsibility to support the cross-functional BPI/BPR and supporting requirements.

- *Step 3. Process analysis.* A group will be formed to analyze the identified need, perform necessary BPI/BPR, and determine IT support required to enact the changes. This step is made in close cooperation with the functional and warfighting process owners.

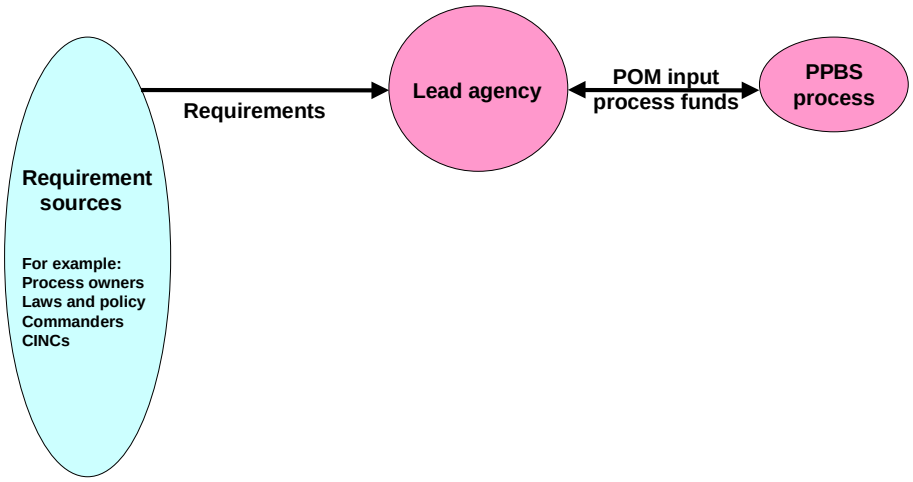
- *Step 4. Review board approval of the fully developed solution.* This step occurs when the analysts and process owners have identified and agreed on a plan for process improvement and developed an implementation plan, including requirements documents.

- *Step 5. Continuation of the requirements process.* This step continues the requirements process if no BPI/BPR opportunities can solve the requirements.

As shown Figure H-3, the lead agency will consolidate all GCSS-AF requirements and present a prioritized consolidated POM input to the corporate process.

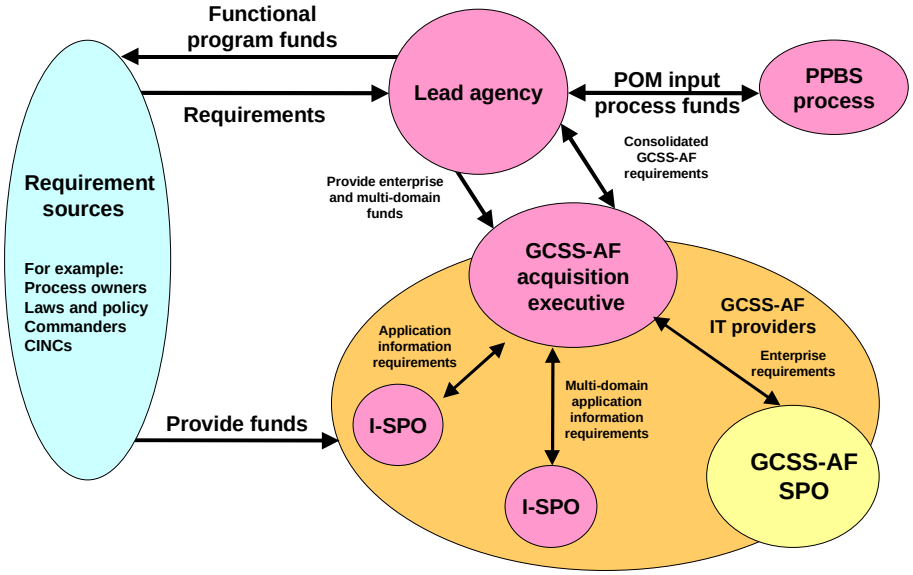
The lead agency will advocate funding requirements throughout the PPBS cycle. The functional and domain customers should partner with the lead agency to advocate the consolidated POM input throughout the PPBS process.

Figure H-3. GCSS-AF Requirements Funding Process



As shown in Figure H-4, the functional area will remain the customer for functional requirements, and the lead agency will be the customer for enterprise-wide and multi-domain requirements. Each will negotiate appropriate SLAs with the respective system program offices (SPOs). The lead agency will coordinate with the GCSS-AF acquisition executive to determine which SPO would best provide the needed capabilities.

Figure H-4. GCSS-AF Requirements Execution Process



Appendix I
Points of Contact

Table I-1. Points of Contact

Name	Organization	Phone
Ms. Griffiths	ACC/SCX	DSN 574-7142
Mr. Frank Helnzmann	AETC/SCXX	DSN 487-6954
Lieutenant Colonel Rubin Mendez	AF/DPF	(703) 614-2478
Mr. Luther Bebley	AF/DPF	(703) 693-4544
Mr. Steve Alsup	AF/ILX	(703) 697-8648
Major Mosley	AF/ILX	(703) 695-5590
Lieutenant Colonel Gary Gillespie	AF/RE	(703) 697-2085
Major Brian Jefferson	AF/SG	(202) 767-4530
Lieutenant Colonel Clara Nielsen	AF/SG	(202) 767-4521
Captain Frank	AF/XOR	(703) 697-1841
Colonel Rebecca Gentry	AF/XPI	(703) 697-0862
Lieutenant Colonel Joe Crilley	AF/XPM	(703) 693-4151
Major Kurt Russell	AF/XPX	(703) 697-4820
Major Haber	AFCA/CC	DSN 576-2571
Wing Commander Tony Boyle	AFCIC/ITA	(703) 588-8179
Ms. Essye Miller	AFCIC/ITS	(703) 588-6451
Mr. Bill Meskill	AFCIC/SYI	(703) 588-6174
Mr. Spencer Cake	AF-CIO/GRI	(703) 416-8484
Lieutenant Colonel Mike Sheridan	AF-CIO/GRI	(703) 416-8430
Mr. Gary Brooks	AFMC/SCD	DSN 787-4438
Mr. Glen Hendricks	AFMIA/CC	DSN 487-5150
Major Jeanne Cole	AFRC/SCY	DSN 497-1864
Captain William Pearce	AFSOC/CIO	(850) 884-5983
Lieutenant Colonel Jeter	AFSPC/CIO	DSN 692-3685
Lieutenant Colonel Mary Duncan	AMC/CIO	DSN 576-6756
Captain Mailley	AMC/SCX	DSN 576-6685
Colonel Mould	ANG/CF	(703) 607-2388
Ms. Carol Watkins	Defense Printing Office (DPO)	(202) 404 2364
Lieutenant Colonel Michael Gethers	HAF 2002	(703) 614-8593
Mr. Terry Balven	HIP-O	(703) 416-1360
Mr. Tony Bagnani	JECPO	(703) 767-0613

Table I-1. Points of Contact (Continued)

Name	Organization	Phone
Mr. Miles Holzman	JECPO	(703) 767-6916
First Lieutenant Lopez	PACAF/CIO	DSN 315-449-4667
Colonel Lyndl Balven	SAF/AQC	(703) 588-7227
Major Tim Murphy	SAF/AQR	(703) 588-7841
Major Gordon Weiss	SAF/AQX	(703) 588-7128
Major Matt Swanson	SAF/FMP	(703) 697-0292
Mr. Jake Baker	SAF/FMP	(703) 697-6465
First Lieutenant William Cobb	SSG Logistics SPO	DSN 334-416-1752
Lieutenant Colonel Glenn Murphy	SSG/DII	DSN 596-1095
Mr. Walt Dzialo	SSG/ILT (CMOS)	DSN 596-2069
Ms. Susan Kirkland	SSG/ILT (CMOS)	DSN 596-5578
Mr. Bill Stevensen	SSG/PM	DSN 596-4041
Major Ann Lee	USAFE/CIO	DSN 314-480-7335
Major Anne McPharlin	USAFE/SCX	DSN 314-480-7335

Appendix J
Incentives for Adoption of Electronic Business

The appendix presents work conducted by the DoD Incentives for Adoption of Electronic Business Working Group for assessing the implications of creating incentives for adopting EB. Table J-1 presents the incentive target model.

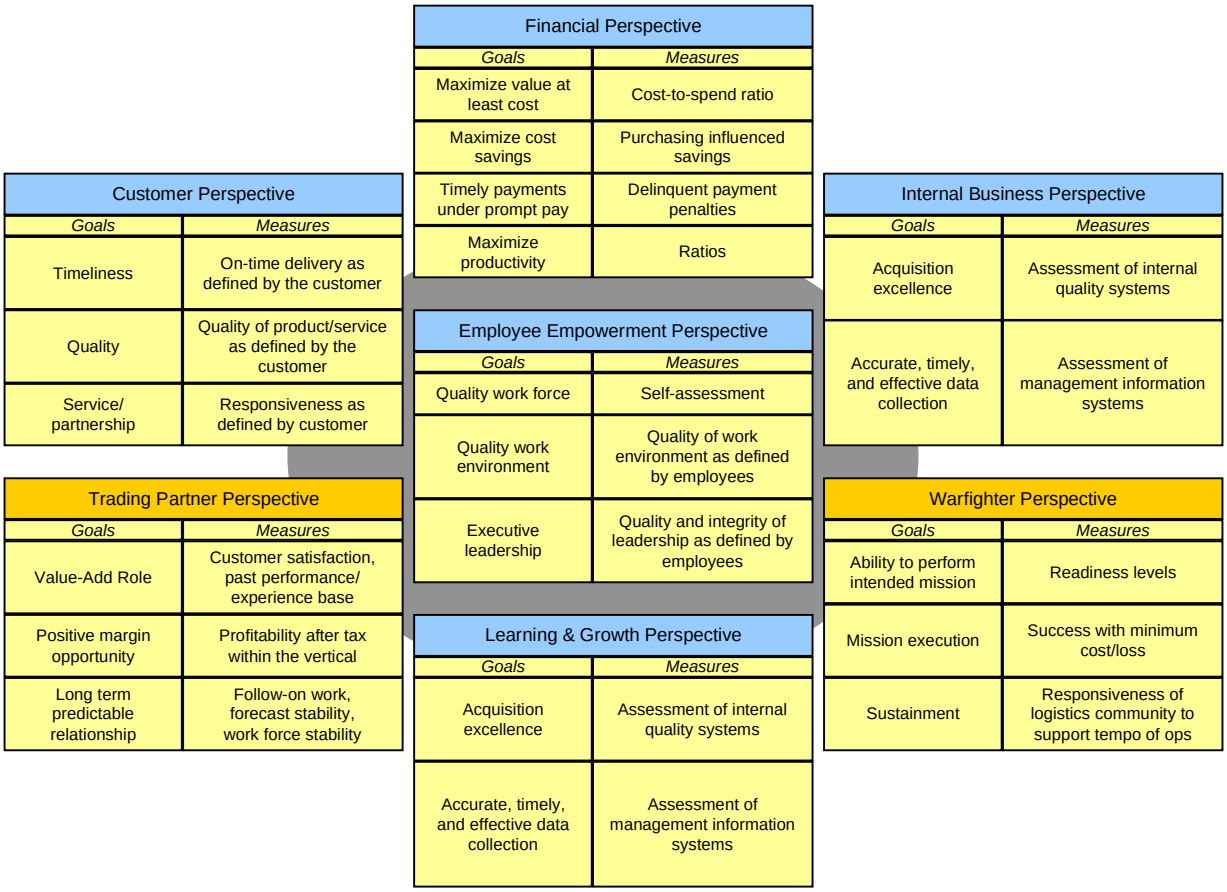
Table J-1. Incentives Target Model—Perspective and Success Requirements

Perspective	Success requirement
Financial	To succeed financially, how should we appear to our stakeholders (agencies, Military Services, Congress, and industry)?
Customer	To achieve our vision, how should we appear to our customers (allies, civilian, cross-agency)?
Warfighter	To achieve our vision, how should we appear to the warfighters (joint operations, Military Services)?
Trading partner	To achieve our vision, how should we appear to our trading partners (contractors, suppliers, allies)?
Internal business	To satisfy our stakeholders, customers, trading partners, and warfighters, in what business processes must we excel?
Employee empowerment	To achieve our vision, how should we appear to our employees?
Learning and growth	To achieve our vision, how will we sustain our ability to change and improve?

Note: Adapted from Kaplan & Norton, "The Balanced Scorecard—Measures That Drive Performance," *Harvard Business Review* (January–February 1992). Extended to reflect industry and DoD environments.

Figure J-1 depicts incentives for EB adoption.

Figure J-1. Incentives for Adoption of EB



Financial Perspective	
Goals	*Measures*
Maximize value at least cost	Cost-to-spend ratio
Maximize cost savings	Purchasing influenced savings
Timely payments under prompt pay	Delinquent payment penalties
Maximize productivity	Ratios

Customer Perspective	
Goals	*Measures*
Timeliness	On-time delivery as defined by the customer
Quality	Quality of product/service as defined by the customer
Service/ partnership	Responsiveness as defined by customer

Internal Business Perspective	
Goals	*Measures*
Acquisition excellence	Assessment of internal quality systems
Accurate, timely, and effective data collection	Assessment of management information systems

Employee Empowerment Perspective	
Goals	*Measures*
Quality work force	Self-assessment
Quality work environment	Quality of work environment as defined by employees
Executive leadership	Quality and integrity of leadership as defined by employees

Trading Partner Perspective	
Goals	*Measures*
Value-Add Role	Customer satisfaction, past performance/ experience base
Positive margin opportunity	Profitability after tax within the vertical
Long term predictable relationship	Follow-on work, forecast stability, work force stability

Warfighter Perspective	
Goals	*Measures*
Ability to perform intended mission	Readiness levels
Mission execution	Success with minimum cost/loss
Sustainment	Responsiveness of logistics community to support tempo of ops

Learning & Growth Perspective	
Goals	*Measures*
Acquisition excellence	Assessment of internal quality systems
Accurate, timely, and effective data collection	Assessment of management information systems

Appendix K
Abbreviations

ABSS	Automated Business Services System
AEF	Aerospace Expeditionary Force
AFCIC	Air Force Communication and Information Center
AFMC	Air Force Materiel Command
AFRC	Air Force Reserve Command
AIS	automated information system
ANSI	American National Standards Institute
APCS	Automated Purchase Card System
API	application program interface
APIMS	Aerospace Physiology Information Management System
ASIMS	Aeromedical Services Information Management System
BOD	Business Object Document
BPI	business process improvement
BPR	business process reengineering
BRM	Base Records Manager
C&I	Communication and Information
C4ISP	Command, Control, Communication, Computers, and Intelligence Support Plan
C4ISR	Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance
CA	certificate authority
CAD	computer-aided design

CAIM	Customer Area Inventory Management
CAM	computer-aided manufacturing
CAMPS	Consolidated Air Mobility Planning System
CAMS	Core Automated Maintenance System
CARE	Customer Automation and Reporting System
CCR	Central Contractor Registration
CGM	Computer Graphics Metafile
CINC	commander in chief
CIO	Chief Information Officer
CMOS	Cargo Movement Operations System
COE	Common Operating Environment
CORBA	common object request broker architecture
COTS	commercial off-the-shelf
CPDSS	Civilian Personnel Decision Support Software
CPU	central processing unit
CRL	Certificate Revocation List
DBMS	database management system
DCPDS	Defense Civilian Personnel Data System
DDS	Dental Data System
DEPSECDEF	Deputy Secretary of Defense
DFAS	Defense Finance and Accounting Service
DIAP	Defense-wide Information Assurance Program
DII	Defense Information Infrastructure
DIMHRS	Defense Integrated Military Human Resource System
DISA	Defense Information Systems Agency

DISN	Defense Information Systems Network
DLA	Defense Logistics Agency
DMLSS	Defense Medical Logistics Standard Support
DMS	Defense Message System
DNS	Domain Name Server
DoD	Department of Defense
DOTS	Document and Tasking System
DP	Personnel
DPS	Defense Protective System
DRID	Defense Reform Initiative Directive
DRIR	Defense Reform Initiative Report
DTS	Defense Travel System
E/MSS	Electronic/Member Self-Service
EB	electronic business
EBIS	Employee Benefits Information System
EBO	electronic business operations
EC	electronic commerce
ECA	external certificate authority
ECRC	Electronic Commerce Resource Center
EDA	Electronic Document Access
EDI	electronic data interchange
EDIFACT	EDI for Administration, Commerce, and Transportation
EDIINT	EDI Internet (standards)
EFT	electronic funds transfer
E-LES	Electronic Leave and Earnings Statement

EMall	Electronic Mall
EPS	Electronic Posting System
ERM	electronic records management
ERMS	electronic records management system
ERP	enterprise resource planning
ETMS	Education and Training Management System
ETS	Electronic Transaction System
FC	Functional Chief
FCR	Functional Chief Representative
FD	funding document
FEGLI	Federal employee group life insurance
FEHB	Federal employee health benefits
FIPS	Federal Information Processing Standards
FM	Financial Management
FTP	File Transfer Protocol
GCSS	Global Combat Support System
GCSS-AF	Global Combat Support System–Air Force
GIF	Graphics Interchange Format
GOTS	government off-the-shelf
GRID	GCSS-AF Requirements Integration Directorate
GRITT	GCSS-AF Requirements Integration Tiger Team
GTN	Global Transportation Network
HAF	Headquarters Air Force
HIP	Headquarters Information Project
HIP-O	Headquarters Information Project Office

HSE	health service episode
HSRS	Health Standard Resource System
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
IC	implementation convention
IER	information exchange requirement
IF	integration framework
IL	Installations and Logistics
IM	inventory management
IMPAC	International Merchant Purchase Authorization Card
IP	Internet Protocol
IRSS	Information and Resource Support System
ISAC	Information Security and Access Control
IT	information technology
IVRS	Interactive Voice Response System
JAMSS	Joint Ammunition Management Standard System
JECPO	Joint Electronic Commerce Program Office
JEDA	Joint Electronic Document Access
JITC	Joint Interoperability Test Command
JPEG	Joint Photographic Experts Group
JTA	Joint Technical Architecture
KBS	Knowledge-Based System
LAN	local area network
MADES	Menu Assisted Data Entry System
MAJCOM	major command

MIB	Management Information Base
MILMOD	Military Modernization
MIME	Multi-purpose Internet Mail Extension
MOM	message-oriented middleware
MRP	Manufacturing Resource Planning
MSS	Medical Surveillance System
MTF	medical treatment facility
NTIS	National Technical Information Service
OMG	Object Management Group
ORB	object request broker
PARIS	Personnel Automated Record Information System
PC	personal computer
PDML	Product Data Markup Language
PDS	Personnel Data System
PKI	public key infrastructure
PKIX	public key infrastructure exchange
PMO	Program Management Office
POM	program objective memorandum
PPAIS	Past Performance Automated Information System
PPBS	Planning, Programming, and Budgeting System
PPI	personnel process improvement
PR	purchase request
PSA	Principal Staff Assistant
RCPHA	Reserve Component Preventive Health Assessment
RDBMS	Relational Database Management System

RDDS	Reserve Dental Data System
RMA	Records Management Application
SBSS	Standard Base-Level Supply System
SC	Systems and Computers
SCPD	Standard Core Personnel Document
SDE	shared data environment
SDP	service delivery point
SG	Surgeon General
SGML	Standard Generalized Markup Language
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SPO	system program office
SPS	Standard Procurement System
SQL	Structured Query Language
SSL	secure socket layer
STEP	Standard for the Exchange of Product Model Data
T&E	test and evaluation
TDPMIS	Technical Data Package Material Information System
TeDS	Technical Data System
TLS	Transport Layer Security
TMIP	Theater Medical Information Program
TRAC^{2}ES	TRANSCOM Regulating and Command and Control Evacuation System
TRANSCOM	U.S. Transportation Command
TSP	thrift savings plan

ULPS	Unit-Level Planning and Scheduling
UML	Unified Modeling Language
UN	United Nations
UPS	uninterruptible power supply
URI	Universal Resource Identifier
URL	Uniform Resource Locator
USAF	United States Air Force
VIP	Virtual Interactive Personnel
WAN	wide area network
WAWF	Wide Area Workflow
WBITS	Web-Based Integrated Training System
WD	Workforce Directory
WInS	Web Invoicing System
XML	Extensible Markup Language