

## **Global Combat Support System – Air Force**

*Providing the warfighter and supporting elements with timely, accurate, and trusted Agile Combat Support information, with the appropriate level of security, needed for the Expeditionary Aerospace Force to execute the Air Force mission*

The concept behind Global Combat Support System – Air Force (GCSS-AF) is a simple one – seamlessly integrate all combat support Automated Information Systems to provide enhanced warfighter support. Implementation of this concept however, is not simple.

Integrating the disparate Air Force combat support systems requires bringing together a variety of skill sets, resources, legacy data and legacy code. It involves cutting across functional AIS stovepipes, making all data corporate and integrated, improving data management and presenting data in a manner that will assist the warfighter. It requires integrating services from a variety of vendors with a diverse set of application models and standards. Tight budgets and the push for shorter development cycles has developers searching for tools to help them spend more time coding for new business value, and less time and effort recoding existing business logic or rebuilding underlying infrastructure. With the impetus on continuously adding value, there is no time or budget to re-invent.

Terrific technology is not enough to unify a heterogeneous environment. Lacking a well-designed and open architecture, good technology quickly becomes obsolete resulting in unstable and fragmented systems. Open architectures that embrace a set of technical standards around which information systems are built and that allow them to talk to each other, have emerged as the key to integrating islands of automation.

The use of software componentization is now sufficiently mature to permit an enterprise solution to be created. Additionally, the highly successful use of open standards based on the work done by the Internet Engineering Task Force (IETF) (<http://www.ietf.org/>) and the World Wide Web consortium (W3C) (<http://www.w3.org/>) are actively embraced. Implementing best industry standards helps ensure that our solution can be upgraded as commercial technologies advance.

The Air Force recognized that we needed an enterprise solution that would scale to the needs of the entire United States Air Force. The GCSS-AF enterprise architecture was developed to be the guiding strategy to implement the vision. This architecture provides the structure, conventions, policies, and mechanisms for building integrated and interoperable combat support automated information systems. It provides the basis for Air Force wide coordination of combat support system activities, and a set of standards and common technical services that will foster interoperability and information sharing, while lowering total cost of ownership.

This architecture has been designed to promote seamless access to information sources for all authorized users and consistency in how data is shared and appears in user applications. It is a flexible platform to meet changing requirements and enable the effective integration of new information technology. The architecture is evolutionary, designed to be progressive to support the varied needs of the Air Force over time.

The GCSS-AF enterprise architecture is an n-tier componentized system of systems architecture which consists of two major layers, or frameworks : the Application

Framework Layer and the Integration Framework Layer. The Application Framework layer contains the business/functional capabilities while the Integration Framework layer contains the “plumbing” or common services used by all business functions. This component-based, open-standards architecture allows the Air Force to encapsulate the elements of existing or new systems so that all of the ingredients of their enterprise systems plug together seamlessly and can be upgraded and expanded more easily.

GCSS-AF supports an object oriented building block approach for application software in which the technology-centered software services and making new technology accessible is centralized in the Integration Framework, while information systems developers provide software building blocks and business-centered services for the enterprise and organize these components into business applications.

### **The Integration Framework :**

The Integration Framework (IF) is the cornerstone of the implementation of the GCSS-AF architecture. It is an application support framework that provides a well-designed and thought out infrastructure implementing the services and functionality that are repeatedly built in all systems. It provides the common services such as security, messaging, and distributed transaction support so software developers don't have to start from scratch each time they write an application. By separating the services that are common to all applications, significant software redevelopment costs can be avoided.

For example, by implementing distributed transaction services in the Integration Framework, the application developer benefits by not needing to code support for the entire distributed transaction processing problem. Rather, the developer employs well-defined interfaces to the various transaction services, which then provide the necessary calls to the other components involved in a distributed transaction.

The IF is not a “paper” framework. It is instantiated in hardware and software and centrally fielded as an Air Force enterprise resource to provide these common services, in real time, at run time. The services of the IF are implemented using a painstakingly configured suite of commercial-off-the-shelf (COTS) products.

The IF is based on open commercial standards to enabling cooperative computing and reducing the complexity of interoperation between applications and support structures. To the extent possible, the IF COTS products have been configured to only utilize open-standards based interfaces, and any proprietary interfaces in this software suite have been turned off or removed.

New applications can be implemented using small components without making large investments in software infrastructure. The IF has been architected and designed to enable new technology to be

The IF will support three separate object models based on CORBA (<http://www.corba.org/>), Java 2 Enterprise Edition (J2EE) (<http://java.sun.com/j2ee/>), and the Microsoft COM/DCOM (<http://www.microsoft.com/com/>).

J2EE/EJB is emerging as the GCSS-AF preferred technology solution.

added or substituted with minimal impact on the other pieces in the framework. As the GCSS-AF IF evolves, the COTS product base will be continually updated with “best of breed” solutions.

The runtime domain includes software that makes the computing system services available to application through standard interfaces. The IF defines the functions and services needed for interoperability among the application components, regardless of geographic location. It provides an environment that allows best-in class tools to be integrated such that developers can easily leverage the operational runtime services and specified application programming interfaces (APIs) to create business applications.

Technologically, the IF provides the flexibility to choose the appropriate implementation for an application, be they objects, procedures, or message driven applications.

### **The Application Framework**

The Application Framework is populated by components built by application developers to implement the business logic and user interface. The role of the functional business applications components in the GCSS-AF architecture is to provide specific business functions, while reusing the generic business logic, information and underlying services and technologies provided by the Integration Framework.

By leveraging the services of the Integration Framework, functional application developers can concentrate their efforts on solving business problems, and it enables them to be more responsive to changing customer requirements.

The number of point-to-point interfaces between Air Force combat support systems today is staggering. In many systems the amount of code built and maintained to support these interfaces is larger than the code supporting the functional business logic. System modernizations are hamstrung by the need to support or use unique or proprietary mechanisms to exchange data. This must change. Once an AIS has been integrated into GCSS-AF, it will be able to access the data or functionality of all the other integrated AISs.

The Open Applications Group is the standards leveraged to deploy Business Components across the AF Enterprise.  
<http://www.openapplications.org/>

In the GCSS-AF architecture interoperability is achieved through the common data transfer methods provided by the Integration Framework, the support for and use of commercial standard message formats and the concept of Data Stewardship. By providing common data transfer methods based on open commercial standards (message oriented middleware, CORBA, etc.) all combat support systems can be connected through a common “pipe”. Commercial standard message formats such as Business Object Documents and X.12 and the use of self describing markup languages such as XML to express these formats can eliminate much of the complexity of interface agreements.

Data Stewardship is not a technology, but a process by which the enterprise data is identified and documented for use by the enterprise. The one tenet of Data Stewardship is that each piece of information has one and only one trusted source. They are the steward. A trusted source may be the steward over multiple pieces of information, but it is the only source for those items. If a system accesses information from a source other than that information steward, it is risking using outdated or otherwise incorrect information. The steward is responsible for the integrity, accuracy, quality etc. of the data and making the data available to authorized components throughout the enterprise.

The GCSS-AF architecture promotes system development by breaking up large software systems into smaller more manageable pieces. This modular approach and the services provided by the Integration Framework to integrate components and achieve interoperability simplifies and expedites system development.

Simplifying application development has a ripple effect throughout the entire enterprise. Operations are streamlined, thereby reducing development and maintenance costs. Application solutions that allow for easier development are usually much simpler and more straightforward to manage and support. In addition, working with simplified application solutions will reduce the time and resources it takes to train developers.

## **Summary**

GCSS-AF has the potential for a magnitude of benefits for the application developers, the program offices that manage our information systems, and the Air Force. Developers must abide by the overarching GCSS-AF architecture, but now have the capability to build more powerful and extensible capabilities in a shorter time and the opportunity to work with the latest proven technology. Program offices can focus on their core competencies, enjoy reduced life cycle costs, and reduced process costs as they can leverage the Integration Framework life cycle documentation (C&A, C4ISP etc.).

The customer, the users across the Air Force benefit the most. GCSS-AF provides a consistent security model and reduced administration with better information assurance. Information interoperability using industry standards means one stop shopping for the data they need.

The process of developing and deploying enterprise-class application systems remains one of the most difficult and complex tasks in any enterprise. Defining the GCSS-AF enterprise architecture was the first step. Implementing the GCSS-AF Integration Framework is the next step. The rest is up to you.

A system and information management environment based on the GCSS AF architecture has considerable benefits:

- Universal access to corporate and global information sources to all authorized users.
- Efficient and effective management and decision support.
- A flexible platform to meet changing requirements.
- Investment planning and cost effectiveness in information technology spending.
- Consistency in how data is shared and appears in user application.
- Effective integration of new information technology