The Enterprise Integrator
Improving Mission Effectiveness in a Fiscally Constrained Environment
Through Mission Integration

by
Greg Wenzel
Thomas Pfeifer
Steve Soules
Bill Ott
Jimmy Pham

Booz | Allen | Hamilton
delivering results that endure
The Enterprise Integrator
Improving Mission Effectiveness in a Fiscally Constrained Environment Through Mission Integration

US federal departments and agencies are plagued by inefficiencies. The Government Accountability Office (GAO) reports that overlapping and duplicative government activities generate billions of dollars in unnecessary spending each year. Many government inefficiencies can be traced to the siloed nature of government organizations, processes, and systems. Although government missions often cross organizational boundaries, each department and agency is organizationally structured around siloed functions without regard for how processes and systems interrelate to meet higher-level mission needs. Siloed organizations create siloed systems that hinder information sharing, slow operational processes, and undermine opportunities for exploiting shared data and collaborating on shared mission responsibilities. Consequently, siloed systems not only drive up costs, but they also diminish mission capabilities.

Senior leaders have attempted to reduce inefficiencies through initiatives such as Better Buying Power 2.0, the Joint Information Environment, and the Intelligence Community Information Technology Enterprise. These efforts aim to break down silos by promoting shared standards and infrastructures, open architectures, and other policies to improve interoperability among information systems. These new policies and initiatives are necessary but too conceptual and leave too much room for varying interpretations among organizations building new systems.

The critical missing element is an “enterprise blueprint” that clearly details critical inter-system interfaces and dictates the design specifics for each systems developer within the enterprise. When designing and implementing systems, organizations will need to think (and act) in terms of an “enterprise” that is comprised of multiple systems that interoperate seamlessly as a system-of-systems (SoS). US Navy Vice Admiral David Dunaway, Commander of Naval Air Systems Command, recently wrote: “The government must take control of the critical inter-system interfaces and dictate the design specifics, similar to how the smartphone business controls its interoperability. This involves standardizing critical interface requirements, implementing government-defined and -controlled interface reference designs, and directing industry to build them to open-architecture standards.” In an era of increased mission sharing and collaboration, an enterprise SoS approach standardizes interfaces, breaks down silos, and integrates processes and systems to drive out inefficiencies and enable true mission integration.

Causes of Inefficiencies Across the Federal Government
In the government’s traditional approach to system acquisition, program managers define high-level requirements for individual systems. The program managers then provide the requirements (and funding) to various industry systems developers for implementation. Exhibit 1, illustrates five separate, stove-piped system implementation efforts; Exhibit 2, depicts the technology “stack” for the five systems developed (see next page). Systems developers focus primarily on developing their individual systems; therefore, system integration into the SoS environment typically does not occur until after the systems are fielded, which is often too late and costly.

In addition, because each system is developed in relative isolation, each system has its own unique infrastructure, operating system software, software services (e.g., security, reporting), data, and custom mission-specific software. Thus, costs are driven up by the duplicate investment to develop the same

---

**Exhibit 1** | Systems Development Efforts Today Lack Enterprise Coordination

**Exhibit 2** | Stove-Piped Systems with Duplicate and Non-Standard Technology Components

**Exhibit 3** | An Enterprise SoS Approach to Increase Mission Effectiveness in a Fiscally Constrained Environment

**Exhibit 4** | Modular, Open, and Government-Owned SoS with Common Software, Data, and Infrastructure

Source: Booz Allen Hamilton
technology component, service, and/or application in multiple systems—often in closed, proprietary (or industry-owned) architectures. The end result: unmet mission needs resulting from poor integration and significant cost inefficiencies due to investing in the same components multiple times.

Mission Integration Through a System-of-Systems Approach

The objective is to meet cross-organizational mission needs through an SoS that is based on standards, open architecture, and government-owned designs defined in an enterprise blueprint. Based on Booz Allen Hamilton’s experience in supporting federal clients, we have developed a modern approach, illustrated in Exhibit 3, that takes an enterprise perspective with three primary roles—program managers, enterprise integrators, and systems developers—to meet cross-organizational mission needs and eliminate inefficiencies.

The program managers continue to analyze missions and doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) to define high-level SoS requirements. They provide those requirements to the enterprise integrator for further functional decomposition. The enterprise integrator then designs the enterprise SoS blueprint, which is critical to ensure SoS interoperability that meets cross-organizational mission needs.

The enterprise integrator analyzes the requirements and then divides them into a set of implementation packages based on the enterprise SoS blueprint. Systems developers then receive these requirement packages, as part of their contract, for implementation. The program managers, supported by the enterprise integrator, manage the mission and requirements decomposition, as well as the SoS architecture, while systems developers perform component design and development according to the blueprint. This separation of SoS architecture and component design and development is the key to building adaptable systems that are born interoperable.

The government can significantly reduce acquisition costs by eliminating the complex and costly post-fielding investment required to integrate unique, proprietary solutions. Once developed, the enterprise integrator conducts testing and evaluation on the systems to ensure the systems developers implemented the systems in accordance with the integration design standards and specifications underlying the SoS environment. Lastly, the enterprise integrator works with the program managers to perform communications “campaigns” and outreach to ensure all stakeholders are involved and updated throughout the process.

Exhibit 4 illustrates the technology stack for the SoS environment. Common infrastructure, operating software, data, and software services are the foundation upon which mission specific applications and data are developed and integrated.

Benefits of the Enterprise Integrator Role

The enterprise integrator serves as the government’s agent to ensure that the SoS architecture is an open architecture that maximizes interoperability and the ability to acquire system functionality from multiple technology providers. The government maintains ownership over the enterprise integrator’s design artifacts to eliminate technology dependence and vendor lock-in. The acquisition cost of the overall SoS is significantly reduced by eliminating the complex and costly post-fielding investment required to integrate unique, proprietary solutions. In addition, the government avoids duplicate technology investment—freeing up resources to develop new capabilities. Table 1, on the following page, provides a more complete list of the features and benefits that the enterprise integrator brings to the government.
Barriers to Overcome
To meet cross-organizational mission needs through integrated SoS, government agencies and departments must break down barriers in three areas: technical architecture; system acquisition; and organizational culture. Adapting a mission integration approach will require agencies to shift from:

- **Proprietary Solutions to Government-Owned, Open Architectures.** The government needs to move away from proprietary, closed, contractor-owned systems to an enterprise SoS architecture that is standards-based, open, and government-owned to ensure system interoperability and data integration. This approach calls for the government to develop SoS blueprints with detailed designs for intersystem interfaces and specifications for a modular, open, government-owned architecture. In addition, as part of their procurement packages, contractors will be required to deliver individual systems that integrate into the overall SoS environment.

- **Big Bang, Stove-Piped Acquisitions to Agile, Incremental Delivery of SoS Capabilities.** Agencies will need to move away from the big-bang acquisition approach in which a single system is delivered all at once, often after years of development, by a single contractor team comprised of a primary contractor and a handful of subcontractors. Instead, they should adopt an enterprise approach designed to acquire modular systems, delivered incrementally by the full industry base and injecting new innovations into the SoS as soon as they are invented. This new acquisition approach will yield an agile, evolutionary capability that leverages a large contractor supply base that can bring new innovations quickly into the SoS environment.

### Table 1 | Enterprise Integrator Features and Benefits

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>FEATURE</th>
<th>BENEFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Requirements</td>
<td>• Top-down functional decomposition of operational requirements early in the process</td>
<td><strong>Better mission alignment:</strong> Ensure that technology investments and capabilities are and remain aligned with mission needs.</td>
</tr>
<tr>
<td>SoS Technical Direction</td>
<td>• Bottom-up analysis of existing systems for capability evolution into an SoS environment</td>
<td><strong>Increased adaptability:</strong> The creation of interoperability designs delivers technology independence and enables easier addition of new technologies, replacement of existing technologies, and refresh of aging technologies.</td>
</tr>
<tr>
<td>Program Management</td>
<td>• A strategic plan and roadmap that establishes the delivery of integrated capabilities over time including the transition of existing systems functionality</td>
<td><strong>Greater government control:</strong> The government retains ownership of all service requirements and system-of-systems designs. Therefore, the government maintains control over the construction and evolution of the systems.</td>
</tr>
<tr>
<td>SoS Design and Specifications</td>
<td>• End-to-end traceability among operational and system architecture artifacts</td>
<td><strong>Enhanced interoperability:</strong> Focus on the SoS design that is critical to achieving an integrated environment. These designs give the government the means to monitor component development for SoS interoperability compliance.</td>
</tr>
<tr>
<td></td>
<td>• Platform-independent, open industry standards-based service interface specifications as the foundation for interoperability</td>
<td><strong>Leverage existing systems:</strong> Architecture and design principles center on re-use and leverage (i.e., leverage what has been built and build what can be leveraged). Proper leverage of existing systems will minimize cost, accelerate delivery, and reduce risk.</td>
</tr>
<tr>
<td></td>
<td>• SoS design using open, standards-based principles that organizes required system functionality into well-defined services that align with mission needs</td>
<td><strong>Leverage existing systems:</strong> Architecture and design principles center on re-use and leverage (i.e., leverage what has been built and build what can be leveraged). Proper leverage of existing systems will minimize cost, accelerate delivery, and reduce risk.</td>
</tr>
<tr>
<td>SoS Integration</td>
<td>• Independent Testing &amp; Evaluation (T&amp;E) and integration efforts</td>
<td><strong>Decrease time to capability:</strong> Well-defined service components with clearly articulated interoperability design allow the government to distribute the system's construction effort across multiple vendors, thereby gaining scalability as well as capitalizing on vendor specialization.</td>
</tr>
</tbody>
</table>

*Source: Booz Allen Hamilton*
• **A Functionally Oriented to an Enterprise-Oriented Culture.** Leaders must think not solely from a functional perspective, but also from an enterprise perspective that moves them from siloed systems to SoS decisions. An enterprise approach calls for much greater stakeholder collaboration both horizontally (e.g., across Army, Air Force, and Navy) and vertically (e.g., across strategic, operational, and tactical levels) to prioritize requirements and ensure that cross-organizational mission needs are met. Enterprise leaders embody connectedness, interdependency, diversity, and adaptability, and serve as role models. To change mindsets and enable leaders to execute against increasingly complex environments, enterprise leadership programs and other traditional and nontraditional learning approaches will provide opportunities to obtain a broader worldview that spans traditional boundaries and problem-solving approaches.

---

**Booz Allen’s Mission Integration Methodology**

Booz Allen has significant experience working with clients and systems developers to provide SoS blueprints, roadmaps, and integrations. From this experience, we have adopted three core tenets that underlie our mission integration approach to deliver SoS:

- **Mission-Driven.** Because missions cross organizations, it is critical to provide full traceability and visibility of systems, activities, and requirements to mission needs. This is the foundation for optimizing capabilities and mission readiness. In addition, changes must be quantifiable via clear mission impact.

- **Enterprise Perspective.** Leaders need to understand capability/system gaps and redundancies across organizational boundaries, so they can make more informed decisions on intelligent technology.
injection and/or convergence, and deliver integrated SoS that meets mission needs. From the enterprise perspective, the government should take an ABCD approach when it comes to technology: Adopt first, Buy second, Create third, and Decommission fourth.

- **Open, Modular Architecture.** The government needs to own the architecture, the system, and the data, thus reducing vendor lock-in and helping eliminate inefficiencies. In addition, the government needs to create modular architecture with open, interoperable, and well-defined interfaces to plug in new technologies when they become available, fostering innovation and reuse across the enterprise.

Based on these tenets, Booz Allen developed a methodology called Mission Integration (MI), illustrated in Exhibit 5 on the previous page. The MI methodology is iterative and consists of six disciplines that use visually rich artifacts to deliver integrated views of missions, stakeholders, processes, systems, and technologies that deliver enhanced SoS solutions. Following the MI methodology, program managers, enterprise integrators, and systems developers can ensure that the systems developed will be adaptable, interoperable, and, most importantly, increase mission effectiveness in a fiscally constrained environment.

**Conclusion**

The federal government cannot afford the growing costs—in terms of dollars spent and mission capabilities lost—resulting from inefficient IT environments in which information systems and processes are not effectively integrated. The chief problem is the siloed development of information systems, which typically are retrofitted with costly and sometimes ineffective interfaces after they are built. Consequently, the government must abandon its hands-off approach that places the responsibility on systems developers to produce interoperable systems. Instead, the government should adopt an enterprise perspective that engages an enterprise integrator to develop the blueprints that dictate to developers the system specifications to ensure interoperability within an SoS environment. Booz Allen’s MI methodology, supported by a key role, the enterprise integrator, enables the government to drive out inefficiencies and, more important, meet its cross-organizational mission needs.
About the Authors

Greg Wenzel is a Booz Allen Hamilton Senior Vice President in the firm’s Strategic Innovations Group, providing leadership in Advanced Enterprise Integration. He leads the C2ISR Mission Systems solutions for clients across the Department of Defense (DoD). Wenzel’s experience includes intelligence community systems, tactical warfighting systems, commercial web-based systems, and advanced distributed simulation. He is currently focused on the continued net-centric transformation of IT systems, helping DoD clients achieve enterprise efficiency through reuse and integration.

Thomas Pfeifer is a Booz Allen Hamilton Senior Vice President in the firm’s US Air Force (USAF) and National Aeronautics and Space Administration (NASA) IT business. He directs senior IT professionals focused on enterprise information management, net-centricity, cybersecurity, and IT infrastructure design and development. He is the officer in charge of the AF NETCENTS and NETCENTS-2 IDIQs and regularly leverages these vehicles to address and resolve some of the Air Force’s most challenging infrastructure and systems applications transformations.

Steve Soules is a Booz Allen Hamilton Senior Vice President and leads the Advanced Analytics services in support of DoD markets. He designs automated tools that assist in conducting architecture analysis of integrated systems and capabilities-based portfolios. He provides operational, technical, programmatic, and performance analyses of integrated architectures and systems. His past experience includes senior operations research and analysis positions supporting the Chairman of the Joint Chiefs of Staff and the Office of the Assistant Secretary of Defense for Command, Control, Communications and Intelligence Systems.

Bill Ott is a Booz Allen Hamilton Vice President in the firm’s Strategic Innovation Group, and currently leads initiatives for clients across the DoD, helping them to increase mission effectiveness through integrated IT system-of-systems. He is a recognized leader in agile software development; data strategy, services, and solutions; and software system integration. He also leads internal investment activities to develop new and innovative solutions for the firm’s Mission Integration capability.

Also contributing to this article was Jimmy Pham, Booz Allen Hamilton Senior Associate (pham_jimmy@bah.com).

Contact Information:

Greg Wenzel  
Senior Vice President  
wenzel_gregory@bah.com  
703-917-2739

Thomas Pfeifer  
Senior Vice President  
pfeifer_tom_j@bah.com  
719-387-3710

Steve Soules  
Senior Vice President  
soules_stephen@bah.com  
703-902-5266

Bill Ott  
Vice President  
ott_william@bah.com  
703-377-0157
About Booz Allen

Booz Allen Hamilton has been at the forefront of strategy and technology consulting for nearly a century. Today, Booz Allen is a leading provider of management consulting, technology, and engineering services to the US government in defense, intelligence, and civil markets, and to major corporations, institutions, and not-for-profit organizations. In the commercial sector, the firm focuses on leveraging its existing expertise for clients in the financial services, healthcare, and energy markets, and to international clients in the Middle East. Booz Allen offers clients deep functional knowledge spanning consulting, mission operations, technology, and engineering—which it combines with specialized expertise in clients’ mission and domain areas to help solve their toughest problems.

The firm’s management consulting heritage is the basis for its unique collaborative culture and operating model, enabling Booz Allen to anticipate needs and opportunities, rapidly deploy talent and resources, and deliver enduring results. By combining a consultant’s problem-solving orientation with deep technical knowledge and strong execution, Booz Allen helps clients achieve success in their most critical missions—as evidenced by the firm’s many client relationships that span decades. Booz Allen helps shape thinking and prepare for future developments in areas of national importance, including cybersecurity, homeland security, healthcare, and information technology.

Booz Allen is headquartered in McLean, Virginia, employs more than 23,000 people, and had revenue of $5.76 billion for the 12 months ended March 31, 2013. For over a decade, Booz Allen’s high standing as a business and an employer has been recognized by dozens of organizations and publications, including Fortune, Working Mother, G.I. Jobs, and DiversityInc. More information is available at www.boozallen.com. (NYSE: BAH)

To learn more about the firm and to download digital versions of this article and other Booz Allen Hamilton publications, visit www.boozallen.com.
### Principal Offices

<table>
<thead>
<tr>
<th>Principal Offices</th>
<th>Principal Offices</th>
<th>Principal Offices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huntsville, Alabama</td>
<td>Leavenworth, Kansas</td>
<td>Philadelphia, Pennsylvania</td>
</tr>
<tr>
<td>Montgomery, Alabama</td>
<td>Radcliff, Kentucky</td>
<td>Charleston, South Carolina</td>
</tr>
<tr>
<td>Sierra Vista, Arizona</td>
<td>Aberdeen, Maryland</td>
<td>Houston, South Carolina</td>
</tr>
<tr>
<td>Los Angeles, California</td>
<td>Annapolis Junction, Maryland</td>
<td>San Antonio, Texas</td>
</tr>
<tr>
<td>San Diego, California</td>
<td>Lexington Park, Maryland</td>
<td>Abu Dhabi, United Arab Emirates</td>
</tr>
<tr>
<td>San Francisco, California</td>
<td>Linthicum, Maryland</td>
<td>Alexandria, Virginia</td>
</tr>
<tr>
<td>Colorado Springs, Colorado</td>
<td>Rockville, Maryland</td>
<td>Arlington, Virginia</td>
</tr>
<tr>
<td>Denver, Colorado</td>
<td>Troy, Michigan</td>
<td>Chantilly, Virginia</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>Kansas City, Missouri</td>
<td>Charlottesville, Virginia</td>
</tr>
<tr>
<td>Pensacola, Florida</td>
<td>Omaha, Nebraska</td>
<td>Falls Church, Virginia</td>
</tr>
<tr>
<td>Sarasota, Florida</td>
<td>Red Bank, New Jersey</td>
<td>Herndon, Virginia</td>
</tr>
<tr>
<td>Tampa, Florida</td>
<td>New York, New York</td>
<td>McLean, Virginia</td>
</tr>
<tr>
<td>Atlanta, Georgia</td>
<td>Rome, New York</td>
<td>Norfolk, Virginia</td>
</tr>
<tr>
<td>Honolulu, Hawaii</td>
<td>Fayetteville, North Carolina</td>
<td>Stafford, Virginia</td>
</tr>
<tr>
<td>O’Fallon, Illinois</td>
<td>Cleveland, Ohio</td>
<td>Seattle, Washington</td>
</tr>
<tr>
<td>Indianapolis, Indiana</td>
<td>Dayton, Ohio</td>
<td></td>
</tr>
</tbody>
</table>

The most complete, recent list of offices and their addresses and telephone numbers can be found on www.boozallen.com

---

©2013 Booz Allen Hamilton Inc.

Use of the Department of Defense image does not constitute or imply endorsement.