STAYING AHEAD OF CHANGE WITH OPEN FRAMEWORKS
One of the growing challenges for defense organizations is making sure their networks and systems keep pace with today’s rapidly changing missions. Open frameworks are emerging as a powerful solution. They make adding, upgrading and swapping components easier, giving organizations the speed-to-delivery and agility to keep pace with change. And they make it possible to take advantage of the latest commercial technologies to achieve that speed and agility.

With open frameworks, defense organizations can quickly replace or reuse services, data, infrastructure — and even user experiences — across the entire enterprise. Such flexibility enables organizations to expand and strengthen their current mission applications — and create powerful new ones — as the mission requires.

The Architectural Principles of “Open”

To understand the potential of open frameworks, we first have to look at their underlying architectural principles. The terms “frameworks” and “architectures” are often used interchangeably, but it’s helpful to differentiate the two. Open architectures provide the overarching concepts, or principles, of “open.” Open frameworks are the implementation of those principles for any number of missions across multiple domains — such as air, space and cyberspace.

Three key principles of open architecture are: modularity, open application programming interfaces (APIs) and a horizontal, enterprise view. Taken together they enable the services and other components of the framework to be abstracted. The components can then be employed in a “plug-and-play” fashion to achieve the mission in new and innovative ways.
Modularity

In an open framework the services that support the mission applications — such as security, health and status and monitoring and control — are modular and loosely coupled. This makes it easy to extend or enhance existing services, or to add new ones. At the same time, the underlying technologies are abstracted from the services, making it possible to easily and rapidly remove unnecessary components and replace them with new and more relevant ones.

Open frameworks are able to achieve this by using approaches that promote loose coupling and modularization, such as containers and microservices. Such frameworks also leverage the most advanced open source software (OSS), as well as best-of-breed commercial and government off-the-shelf products (COTS and GOTS). This gives defense organizations the ability to quickly and cost-effectively adapt to changing mission and user needs.

Open APIs

Open APIs — the second principle of open architecture — are also critical. Among the barriers to speed-to-delivery and agility are interfaces that are proprietary, or which have been highly customized. These limitations make it more difficult for defense organizations to bring in new technologies, or to reuse capabilities across different mission areas. Open APIs, on the other hand, enable organizations to bring in any technology or application — including those that are proprietary. Open frameworks can host any number of applications that are “black boxes,” as long as they can connect with the frameworks, and with one another.

Horizontal Enterprise View

A third principle of open architecture is the horizontal, enterprise-wide view. Instead of being limited to a vertical approach — supporting only the program of record — open frameworks enable organizations to orchestrate mission workflows across the entire enterprise. This can be achieved because in open frameworks, the system’s concept of operations (CONOPS), business logic and data models are not hardwired in. Rather, they are abstracted from the framework so that they can be easily extended with new mission threads and applications. With an open framework, as the mission evolves, the framework evolves with it.

The enterprise-wide approach also emphasizes reuse, and building for reuse, so that frameworks can scale on demand. The potential of this approach can be seen in the commercial world, in the way that web-based mapping services have expanded on their initial role of helping people get from one place to another. Mapping services are now embedded in a host of apps — from Uber, Airbnb and Yelp to Snapchat and Instagram — that have transformed how we organize and execute daily tasks. With open platforms defense organizations can just as powerfully transform how they organize and execute their missions.

Ultimately, by adopting the key principles of open architecture — including modularity, open APIs and the horizontal, enterprise-wide approach — organizations can abstract services, data, infrastructure and user experience. This ability enables organizations to build open frameworks that keep pace with fast-changing missions and technologies.

Leveraging Advanced Approaches — and the Right Expertise

Even when frameworks are designed from the outset to be extensible and adaptable they still may not be truly open. To create open frameworks in mission-critical systems organizations need to bring in best practices from across the defense community in modern software development methods, including
With an open framework, as the mission evolves, the framework evolves with it.
rapid prototyping and agile development. And because the open frameworks need to operate in highly classified environments, they require the latest and most sophisticated cybersecurity approaches, such as automation and orchestration (A&O) and anomaly detection with advanced analytics.

And yet, while all these steps are essential, they’re still not sufficient. Creating true open frameworks requires yet another, equally crucial step — one that is often overlooked. The technologies and the processes can only be brought together with the right combination of mission expertise, software expertise, and user input.

The path to achieving this is not always clear. Some organizations contend that although mission expertise is certainly important in developing applications, the framework itself should be built by software architects. Other organizations take the opposite view — that software architects aren’t needed for frameworks at all. They argue that the mission experts who build the applications, such as electrical or aerospace engineers, can handle the frameworks as well.

Booz Allen Hamilton’s experience in this field has shown that both mission and software experts must play an equal part in developing open frameworks. Mission expertise is needed to make sure that the framework provides the necessary capabilities to support all mission application and user needs. There are untold details that cannot be captured in requirements specifications — and that only mission domain experts will understand.

At the same time, software architects and engineers are best suited to design the open framework as they have the knowledge and experience to take advantage of the latest technologies and design patterns. Without that software expertise, so-called “open” frameworks tend to remain tightly closed.

User input is just as critical. If the open frameworks don’t meet their needs — if, for example, the user interfaces are too confusing — the frameworks will be used improperly or not at all. The most effective approach is to get regular user feedback as the framework is being developed and implemented and incorporate that feedback in frequent iterations. One of the great strengths of open frameworks is that they make this user-centered approach possible — organizations can easily switch components in and out as needed to respond to user feedback.

Getting the right combination of mission experts, software architects and users is both an art and a science. All three groups not only have to be on board, they have to collaborate closely with one another, almost as one mind. It’s important that they work shoulder-to-shoulder throughout the entire process of building and implementing open frameworks, from creating a common vision to the continuous prototyping to extend and add mission capabilities. As the three groups learn from one another and build trust, they integrate their perspectives and expertise. They take a shared approach to a shared vision. This collaboration paves the way for them to bring in the third-party application developers. All work toward a common purpose.
OUR EXPERTS

Ki Lee
Vice President
Lee_Ki@bah.com

Wes Haga
Distinguished Engineer
Haga_Mark@bah.com
About Booz Allen

For more than 100 years, business, government, and military leaders have turned to Booz Allen Hamilton to solve their most complex problems. They trust us to bring together the right minds: those who devote themselves to the challenge at hand, who speak with relentless candor, and who act with courage and character. They expect original solutions where there are no roadmaps. They rely on us because they know that — together — we will find the answers and change the world. To learn more, visit BoozAllen.com.