Network-Centric Warfare Brings Increased Combat Power

The theme for this month's CrossTalk is "Network-Centric Architecture." The concept of network-centric warfare has been center stage since the Joint Chiefs of Staff's "Joint Vision 2010" paper was released in July 1996. Since that time, the direction has been reinforced by Joint Vision 2020, and by the Department of Defense's top leadership. Air Force Chief of Staff Gen. John Jumper has been very vocal concerning the need to integrate manned, unmanned, and space systems. "It is through such integration that we achieve the greatest return on our investment in our war-fighting capabilities" says Jumper. "These integration efforts include fully integrating combat, mobility, and space forces into a Joint Synthetic Battlespace …"

The aim of this month's CrossTalk is to explore various aspects of how to achieve this integration of software intensive systems. In the first article, *Designing Highly Available Web-Based Software Systems*, Michael Acton of Lockheed Martin Mission Systems describes the basics of achieving highly available systems. Approaches such as horizontal scaling and cloning are described for producing maintainable, highly available Web applications for hosting on the Global Combat Support System-Air Force (GCSS-AF).

Next, Dr. Malcolm Morrison, Dr. Joel Sherrill, and Ron O'Guin of OAR Corporation, and Deborah A. Butler of the U.S. Army Aviation and Missile Command provide examples of how to achieve mission adaptability in *A Fire Control Architecture for Future Combat Systems*. They describe the need to encapsulate functionality in well-defined software components, to isolate hardware characteristics in personality modules, and to use software architecture to classify components within domains. This work is the foundation for the systems that will support the Army's Future Combat System.

Enterprise Engineering: U.S. Air Force Combat Support Integration by Eric Z. Maass of Lockheed Martin Mission Systems explores the fundamental considerations of developing to an enterprise engineering vision, as well as enterprise application development techniques used on the GCSS-AF. An infrastructure for development, known as the Integration Framework, provides a common set of services and components for applications that join the enterprise. The framework reduces the cost of software development by avoiding reintroduction of common services (e.g., security, messaging, etc.). Success will allow stand-alone combat support systems to integrate in an efficient and secure manner, vastly improving the value of information while reducing the cost of sustainment.

Next, Bradley C. Logan of The Boeing Company, in *Technical Reference Model for Network-Centric Operations*, provides some background on why the shift toward network-centric warfare is needed, and fundamental definitions. He then describes the Strategic Architecture Reference Model (SARM), a technical reference model for network-centric warfare, and how it enables systems-of-systems interoperability. The SARM is a multi-layered model with lower level communications and information layers based on open systems, and higher levels where contractors compete based on their domain expertise. The reference model addresses the need for a guiding framework and products that will allow platforms and systems to become nodes on the Global Information Grid.

With the introduction of network-centric warfare comes increased complexity and the challenge of developing efficient test methods. In *New Spreadsheet Tool Helps Determine Minimal Set of Test Parameter Combinations*, Gregory T. Daich of the Software Technology Support Center, describes a new tool to systematically identify a minimal set of test cases. The approach answers the question: "What is the most effective, smallest set of test configurations that will find the majority of serious parameter interaction defects?"

Network-centric warfare brings increased combat power. Many years ago, it took 1,000 bombs to destroy a target; now that same target can be destroyed by one bomb. What's the difference between those 1,000 bombs and this one bomb? It's the information content of that one bomb. During Operation Enduring Freedom and Operation Iraqi Freedom, we observed how advances in both space-based and unmanned platform technologies allowed persistence over the battlefield, and how advanced sensors provide more precise information. These new capabilities put networks with their ability to quickly disseminate information at the center of military strategy. Our ability to exploit these technologies depends on software professionals like you. We hope this issue will help you in contributing to the design of adaptable, secure, highly available systems.

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