



'Net' gains

Boeing-designed system is communications backbone for U.S. Navy missile destroyers By Paula Shawa

Surging through seas at speeds topping 30 knots (35 miles per hour, or 55 kilometers per hour), a U.S. Navy missile destroyer is an imposing presence. More than 500 feet (150 meters) long, bursting with an arsenal of offensive and defensive weapons and a crew of more than 270 men and women, it is one of the most powerful military surface ships, ably equipped to protect and defend.

Coursing through the destroyer, unseen but critical to its operation, is the Boeing-designed Data Multiplex System (DMS)—the communications backbone for this class of vessel.

DMS was conceived as a network solution for the Navy when today's Internet was still in its infancy. Its roots date back to the 1970s, when fax machines were hot new technology.

"We were creating a pre-Internet network," said Scott Meier, chief engineer for the DMS program. With a degree in electrical

engineering, Meier landed in balmy Southern California for his job interview in 1979 after shoveling snow from his driveway in Michigan earlier the same day. He never looked back, joining a team that has worked for many years to nurture DMS from its earliest stages into an operational system that can readily accommodate new technologies.

For more than 35 years, the DMS network has served the fleet of 60 U.S. Navy destroyers around the globe, providing near 100 percent reliability over countless hours of operation. Earlier this year, the Navy signaled its continued confidence in DMS by sustaining Boeing's role as the design agent for the network, and awarding the company a production contract for the latest order of DMS shipsets.

"It's mission critical and it's never been a reason for a ship not to sail," said DMS Program Manager Jay Nieto.

Also a program veteran, Nieto has cumulatively spent several years at sea helping develop DMS. Exhaustive testing on land and at sea paved the way for the Data Multiplex System to be formally incorporated into the contract design in the early 1980s for today's class of U.S. Navy missile destroyer, the *Arleigh Burke*, designated in Navy parlance as DDG 51. It was the first time a Navy ship contract design package included a digital, shipwide data network.

The impetus for DMS was simple: Replace miles of bulky, hard-wired, point-to-point cabling in legacy ship designs. The system works by multiplexing signals over a common coaxial cable infrastructure. IOUs—input/output units—are located throughout the ship to serve as the user interface with the network. The benefit to this design philosophy, as the DMS engineers like to describe it, is that it can be reconfigured without changing the basic footprint.

The network allows data transfer for basic shipboard systems, including navigation, steering, combat systems, weapon systems, damage control, and ship and machinery control systems. Simply put, DMS is fundamental to a ship's operation.

To date, there have been three versions of the DMS system, all still in use. U.S. Navy destroyers DDG 51-78 are outfitted with the first generation, the original copper-cable circuit-switching system presently managing approximately 4,700 signals across the network.

In the mid-1990s fiber optics replaced the copper coaxial cabling. The Fiber Optic DMS iteration simplified network hardware, reduced costs and enhanced backbone capacity from 2.4 MB per second to 100 MB per second and managing 14,000 signals.

The most current configuration is the Gigabit Ethernet DMS, which is being installed on DDGs 111 and 112, currently under construction. It offers even faster data transfer rates (1,000 MB per second) and can support multimedia services such as voice, video and data. It will aid the Navy's efforts to streamline personnel requirements by further supporting remote monitoring and control of machinery, increased

automation of routine operations and automated logging of critical system functions.

At shipyards in Bath, Maine, and Pascagoula, Miss., the Boeing face of the DMS program is its three field service representatives. Here, where the Navy destroyers are built and retrofitted, Rick Prevost, Bruce Matznick and Donnie Thompson work side by side with the shipbuilding contractors and Navy personnel during the installation and checkout of the DMS.

"Our job is to make sure the customer is getting what they're paying for," Matznick explained.

Boeing service reps also go to sea with ships to "prove out" the DMS and work directly with system operators.

At program management headquarters in Huntington Beach, Calif., the DMS lab is outfitted to replicate each evolution of the DMS network. Lab personnel can troubleshoot and resolve issues quickly and validate the small but ongoing changes made to the system.

Richard Kahn, a civilian, began as a project engineer at the program's inception and is now the Navy's DMS program manager.

"One of the keys of this program is being able to keep up with the needs of the user systems, and this program has always done that," he said. "We have constantly kept it up to date to perform those new functions."

The DMS team is exploring new capabilities that will further enhance the system. Sales to international customers also will continue. Three of the Gigabit Ethernet DMS shipsets recently contracted will be delivered to foreign militaries—as will application of DMS to other U.S. Navy ships. ■

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PHOTOS: (LEFT) U.S. Navy Sonar Tech 1st Class Steven Duncan stands watch in the Combat Information Center aboard a missile destroyer fitted with Boeing's Data Multiplex System.

(RIGHT) U.S. Navy missile destroyers in the DDG-51 *Arleigh Burke* class rely on the Boeing Data Multiplex System as a communications backbone. U.S. NAVY

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