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case study

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A Case of the Navy's Communication WOW Factor

Company: UNITED STATES NAVY

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Tracing its roots back to the Revolutionary War, the U.S. Navy came into being in 1775 and was established officially in the U.S. Constitution in 1787. The U.S. Navy functions as the maritime branch of the U.S. military, operating 287 ships and roughly 3,700 aircraft. Apart from 330,000 active-duty officers and enlisted men, the Navy also employs about 120,000 reserve sailors and nearly 200,000 civilians.

www.navy.mil

BUSINESS CHALLENGE

Ships at sea rely on satellite communication for internet access, as the obvious considerations of distance and mobility make any other kind of connectivity impossible. However, satellite communication is extremely expensive, relatively slow, and unreliable, having a marked effect on ship-to-ship communications. For instance, a carrier strike group can carry nuclear weapons, but it does not have enough bandwidth to hold a live videoconference between the captains of its constituent ships. With the increasing use of computers in naval operations, a reliable, fast network between ships became an increasingly attractive option for the Navy.

VENDOR OF CHOICE: INTELLICHECK MOBILISA

Intellicheck Mobilisa is a wireless technology and security company based in Port Townsend, Wash. Mobilisa has made government ID cards, including the student ID cards for the Air Force Academy, and has provided scanning and identification services for the Transportation Security Administration. Mobilisa had been working on technologies called Wireless Over Water (WOW) and Floating Area Network (FAN) that allow ships at sea to be networked wirelessly when Congress earmarked money for Mobilisa to adapt the technology to the Navy.

www.icmobil.com

THE PROBLEM IN DEPTH

Because of the remoteness and extreme mobility of naval vessels, the only way to get the internet at sea is by satellite. As technology advances and the military features more and more computer networks, fast, reliable, and cheap ship-to-ship communications become more and more important.

The Navy is becoming so computer-conscious that in fall 2009, the 10th Fleet was reactivated without any ships or plans to operate any ships. Instead, the 10th Fleet will serve as Fleet Cyber Command. With current technology, if someone on an aircraft carrier wants to email someone on a destroyer in the same battle group, the email has to go up to a satellite, be processed, and come back down again. Putting a communications satellite in orbit is extremely expensive, and the added distance the signal has to travel slows the flow of information.

With such reliance on remotes, GPS, and interoperability, satellites simply were no longer up to the task. "We've for a long time had the capability to use satellite connections," says Navy project manager Lance Flitter. "We wanted to be able to increase the bandwidth without using satellite, which is very costly." An over-water wireless network, by contrast, would allow ships to share information quickly and cheaply.

THE SOLUTION

The Navy turned to the FAN technology with an eye toward installing it on carrier strike groups, but there are other applications as well. While Mobilisa and the Navy both hope to install FAN technology on the most advanced warships, the first successful installation of WOW technology involved somewhat less-imposing ships.

"The genesis was about 7 years ago," Mobilisa CEO Nelson Ludlow says, "which was to move Wi-Fi out of coffee shops and onto North America's ferry systems." Washington State Department of Transportation pioneered WOW technology on its

'The 10th Fleet will serve as Fleet Cyber Command.'

The Littoral Sensor Grid buoys transmit video and environmental data over a floating area network.

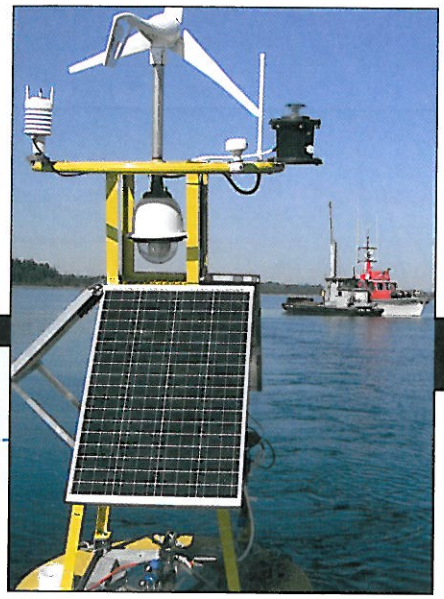
ferry system. In the Seattle area, ferries make up a vital portion of the area's commuter public transit system, with 23 million riders annually. In 2005, a Mobilisa-designed FAN brought Wi-Fi to all 22 vessels of the Washington State Ferries (WSF).

At present, the WSF network, currently operated by Boingo, is accessed daily by an average of 600 users. Most of these users are on the two busiest routes: the 35-minute ride from Bainbridge to Seattle and the 50-minute ride from Bremerton to Seattle.

"A lot of our commute ridership is walk on, because both of them come in to Seattle, and people then walk to their destination downtown," WSF communication manager Joy Goldenberg says.

Essentially, the WSF system allows commuters to stay online, if they choose, for the duration of their trip. "One of the things that the service provides is the ability to move from that coffee shop-type experience," says WSF IT director Steven Vandor. "They can connect from the network in the terminal … and get on the boat, and they can connect on the boat as well." Flitter currently oversees a program that is not very far, either geographically or technologically, from the ferry system.

'A network of buoys such as the one currently floating near Seattle could revolutionize port security.'



In order to power the buoys' cameras and transmitters, an array of wind, battery, and solar power supplies are installed to minimize maintenance.

The Navy, in conjunction with the University of Washington's applied physics department, is operating a Littoral Sensor Grid in Puget Sound that uses a FAN to transmit environmental data from buoys in the area.

For data buoys, the FAN represents a tremendous advance in data storage and transmission. "This is kind of a new deal, because in the past they'd have certain data centers on buoys, but they weren't really wireless, … all they had was a cell phone—they didn't have the ability to move large amounts of data," Ludlow says.

A FAN, however, can transmit all kinds of data in real time, up to and including video. Flitter says the buoys are currently deployed with cameras, infrared cameras, and sensors that measure oil, pH, and salinity. All environmental data is transmitted back to the data center in real time. In fact, that data is available at http://buoy.icmobil.com/Weather.aspx.

A FAN is what Flitter calls a "mesh network." In a network like this, there is no centralized hub—as long as any point in the network is connected to the internet, the entire network is. In a combat situation, the ability to readjust or, in the worst case, to lose any point in the network and continue to operate is essential. The different points in a FAN, Ludlow says, can be positioned up to 20 miles apart and still be connected, though in practice, 12–15 miles is more realistic. The signal is passed wirelessly and is only limited by interference from the water and the curvature of the Earth.

There are challenges. Ludlow says choosing a frequency that is not affected either by precipitation or the water is difficult, and the antennas must be mounted as high as possible to increase range.

For the buoys, particularly those equipped with cameras, Flitter noted another issue: "Stability," Flitter says. "When you're out there on a buoy, it's bouncing out there on the waves, which, for something like video, is not exactly the most desired conditions." While this is a major problem with 10'-high buoys, keeping a 100,000-ton aircraft carrier stable is somewhat less of an issue.

THE OUTCOME

Currently, the buoy project in Seattle may have applications other than ship-to-ship communications. Ludlow thinks that a network of buoys such as the one currently floating near Seattle could revolutionize port security.

With a FAN, sensor buoys could be placed very far apart and still create a network to scan incoming ships for hazardous materials. "We believe we can put the buoys almost a mile apart and still be able to adequately sense ships with dirty bombs," Ludlow says. "This idea is doable. We really didn't know when we were doing the R&D whether it was a tractable idea."

Being able to set up fewer buoys farther apart allows more and larger ships to pass through the network and be scanned. The more sensitive radiological sensors (Ludlow says these buoys are 1,000 times more sensitive than previous tests) allow a net to be deployed without littering a major port with buoys.

"Where we really need to go is to go into commercial ports," Ludlow says. "Those places get a lot of traffic, and this is not a very expensive system."

Flitter is more cautious in projecting the future. "We're just beginning to look at the use of radiological sensors," Flitter says, and while purpose-built buoys are in the works, no plans for a sensor net have progressed beyond the experimental phase.

A FAN does not obviate the need for satellite communications for a fleet of ships, as the fleet will still need to communicate with other ships outside the network. But according to Ludlow, 85% of a carrier strike group's bandwidth is expended on ship-to-ship communications. By replacing satellites with a FAN, the cost of ship-to-ship communication is effectively nothing after the hardware is installed. In a 21st-century battlefield, having a network like this can make an enormous impact.

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