



United States Coast Guard Keeps Five East Coast Ports Secure with Motorola's Point-to-Point Wireless Solutions

Boston, Portsmouth, Charleston, Miami and Key West



Miami Harbor

To increase Maritime Domain Awareness (MDA) among watchstanders in command centers within U.S. ports and waterways, the United States Coast Guard embarked on an initiative called Project Hawkeye, which can monitor the waters 20 miles (32 km) from the coast. The Hawkeye system consists of long-range optical cameras, RADAR, a Geographic Information System, a vessel identification system and a web portal for sharing information with port partners. When it came time to interconnect Hawkeye's surveillance equipment, the Coast Guard found it difficult to obtain a backhaul system that could meet their technical requirements while functioning reliably in the marine environment and weather conditions. After evaluating several alternatives, they finally selected a point-to-point system from Motorola that met and exceeded their expectations.

Customer

The United States Coast Guard (USCG) is a military, multi-mission, maritime service and one of the nation's five Armed Services. Its mission is to protect the public, the environment, and U.S. economic interests in the nation's ports and waterways, along the coast, on international waters, or in any maritime region as required to support national security, enforce the law or protect the safety of lives.

Project Hawkeye gives the Coast Guard the ability, via a system of sensors and cameras, to identify and track vessels in harbor and coastal waters, giving Watch Officers the ability to make operational decisions based on real-time information. Hawkeye's sensors and long-range cameras with infrared capabilities act as eyes on the coast to prevent any threats by sea in support of the U.S. Department of Homeland Security.

Situation and Challenge

The USCG needed to interconnect Hawkeye's various sensors, cameras, RADAR and other surveillance equipment that are strategically distributed across several East Coast seaports. One of the most critical elements of the project was implementing a system to backhaul the traffic from the remote sites to the command centers.

The individual links within the backhaul system would vary from site to site and be exposed to extreme conditions. As examples, the links in Key West would have to function in salty, hot, tropical conditions, while the links in Boston would encounter extreme winters and icy conditions. Most of the Boston links would be located in dense, high-interference urban areas and would have to transmit and receive information over water where shipping traffic continuously blocks the communications path. In some cases, the links would have to operate in complete non-line-of-sight (NLOS) conditions.

The links, which mostly included over-water paths, had to be extremely reliable in highly-congested areas and during unpredictable weather. Furthermore, all links required that the radios operate in a coastal, marine environment. Because Hawkeye was responsible for protecting the seaports from threats via the sea, security was also of utmost importance.

Technical Requirements

The Project Hawkeye team began the process of replacing all of their 802.11 links with the Motorola PTP 400 Series links in seaports from Key West to Boston. The links had to feed streaming video, camera control, RADAR information, shipboard Automatic Information System (AIS) information, tracking data, LAN traffic and remote control of ancillary devices to the command centers without experiencing latency or dropouts. Specific requirements were:

- Data rates of at least 10 Mbps each way
- Latency of no more than 12 ms
- Stability in obstructed, high interference and over-water paths
- Durability in seaport conditions, including sustainability in salt water
- 128-bit FIPS-197 compliant AES encryption
- Small physical footprint

“We were in need of a solution that could provide us with high-bandwidth without compromising reliability. For Hawkeye to be successful, our system needed to maintain Maritime Domain Awareness at all times via real-time live data. We are now able to maintain a watchful eye on the Port of Miami because of the reliability and security that Motorola's PTP 400 gives us, even in extremely high-interference paths.”

— Lieutenant Rhett Rothberg, United States Coast Guard

“Other products will promise you all the bandwidth in the world. However, what good is it if you can’t rely on it? Motorola’s PTP solutions consistently deliver where others cannot. They’re the complete package for anyone who needs to get the data through without problems.”

— Les Dawson, Vice President of Alioth Technical Services

Deployment Detail and Weather

The first system the USCG tested was an 802.11 wireless system, but the radios were not suited for the environment or application. For example, video feeds became pixilated, camera control was sluggish and links randomly dropped connectivity – sometimes dropping off-line for extended periods of time. These anomalies were caused by the polarization shifts and signal bending as communications traveled over the water. Hawkeye could not experience any downtime, or the entire network could be compromised and leave the seaport vulnerable.

The Coast Guard considered establishing private circuits via T1 lines. When evaluated, this option was too costly and did not provide adequate bandwidth for the application. Subsequently, the USCG deployed 802.11 wireless solutions, but eventually learned that 802.11 technology was neither flexible enough to mitigate RF interference, nor reliable enough for their over-water paths.

Finally, the USCG found a unique point-to-point solution from Motorola that claimed to deliver the high performance, reliability and security that they had been seeking. After testing the system in a controlled environment, the USCG replaced a failing 16-mile (26-km) over-the-water 802.11 link in Portsmouth, Virginia with its first Motorola PTP 400 Series link. Shortly thereafter, several other 802.11 links were replaced in and around the busy Miami seaport. The Motorola PTP 400 Series Wireless Ethernet Bridges, which were deployed in Portsmouth and over 23 miles (37 km) of the South Florida coastline, were immediately successful. Then systems were deployed in Key West, Florida, Boston, Massachusetts and Charleston, South Carolina.

Each of the PTP 400 bridges was equipped with an optional 128-bit FIPS-197 compliant AES encryption to meet the security requirements of the USCG. To minimize signal fading in these highly-congested areas that contained considerable path obstructions and atmospheric disturbances, Motorola’s unique Multiple-Input Multiple-Output (MIMO) technology was employed to achieve high system gain and sustain reliable connections. For longer-range over-water paths, including the 16-mile (26-km) path in Portsmouth, the PTP 400 bridges were deployed with spatially diverse antennas – an inexpensive and effective option utilizing Motorola’s MIMO technology. Since space was a premium in certain sites, several radios had to be mounted within inches of each other. Motorola’s narrow operating channel and small physical footprint with integrated antennas made the difference in these locations.

All the PTP 400 Series links were deployed quickly and easily using Motorola’s user-friendly support tools. The PTP Link Estimator and, most currently the PTP LINKPlanner, helped installers evaluate and optimize links prior to deployment, providing accurate path calculations based on geography, distance and other factors specific to each path. With the PTP 400’s User Manual and built-in audio alignment feature, aligning the radios was effortless. In addition, the PTP 400 GUI interface made fine tuning and trouble-shooting just as easy.

Results

The PTP 400 Series radios now interconnect five of Hawkeye's networks (comprised of sensors, cameras, RADAR and vessel identification equipment) to USCG command centers as well as other ancillary port watch locations. The unique system configuration includes several PTP 400 Series Integrated bridges with built-in antennas and several PTP 400 Series Connectorized bridges with external antennas to boost performance in extremely adverse environments.

The PTP 400 links exceeded the USCG's throughput requirement with a maximum capacity of 35-43 Mbps, depending on the path. The bridge's narrow spectral footprint (needs only 12 MHz) and the internal spectrum management capabilities offer extremely efficient channel planning and management. As a result, the PTP 400 solution helps to ensure that Maritime Domain Awareness is maintained at all times through reliable connections that are not compromised by high-interference, severe weather conditions or water motion.

Another primary concern of the USCG was adhering to security standards from the Department of Homeland Security, and this requirement was met through 128-bit FIPS-197 AES encryption. Furthermore, Motorola understood that downtime could make the system vulnerable and leave the door open for an attack on these five busy seaports. Now the PTP 400 systems deliver the level of dependability the USCG needs, even amidst a high amount of interference. As a result, real-time live data is seen immediately to help keep all five East Coast seaports safe.

Why Motorola Point-to-Point?

- Broadband wireless connections were not possible with other products because they could not maintain a connection across long-range paths and over water
- Motorola cost-effectively provided highly reliable connections (35-43 Mbps) in high-interference areas
- 128-bit FIPS-197 AES encryption is employed so security is not compromised
- Even when space was limited, the PTP 400 Series solution was deployed in such a way that enabled it to meet high-bandwidth requirements

The Motorola Wireless Broadband Portfolio

The Point-to-Point Wireless Ethernet Bridges – PTP 400 Series – are part of Motorola's comprehensive end-to-end portfolio of Wireless Broadband solutions and services that extend indoors and out. These solutions provide high speed connectivity that helps to enable greater situational awareness, improved response and seamless connectivity to critical voice, data, and video applications. The Wireless Broadband portfolio provides outdoor solutions, including PTP, PTMP and MOTOMESH™; indoor solutions such as Broadband-over-Powerline and WLAN; and end-to-end management solutions.

Our solutions help create, complement and complete broadband coverage with high performance networks that are secure, fast, scalable, and easy to deploy. These solutions allow our customers to help improve decision making, transform operations and increase efficiency.

More Information

For more information about other Motorola Federal solutions, visit www.motorola.com/federal.



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