La Spezia Container Terminal Improves Operations Performance with Cisco IoT

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The Italian-based terminal chose Cisco® Ultra-Reliable Wireless Backhaul to improve operations.

Executive Summary	
Customer Name: Contship Italia Group **Industry:** Shipping/ports **Location:** Italy	
Challenges	• Stacks of cargo containers in the port cause wireless coverage "obstructions" • Need reliable wireless network so equipment can exchange data in real time • Need strong network uptime, consistent wireless coverage for terminal productivity
Solutions	• Cisco Ultra-Reliable Wireless Backhaul • Cisco IW3702 Access Points
Results	• Strong wireless coverage despite usual connectivity • More reliable connectivity for "on-the-move" assets • Low-latency roaming wireless backbone

A terminal evolves

La Spezia Container Terminal (LSCT), on the northern Mediterranean coast of Italy, is one of the major port facilities in Europe. Part of the Contship Italia Group, the terminal can support 1.4 million TEUs (Twenty Foot Equivalent units) per year, providing fully integrated logistics services and intermodal connections.

The Italian-based terminal has been working hard to increase productivity and reduce downtime. At the heart of the action is the Terminal Operating System, also known as TOS, which allows the terminal to centrally coordinate the handling and storage of containers. For the TOS to function optimally, a reliable wireless network is required so that all yard and quay equipment can exchange data in real time. The reliability of the wireless connection impacts the orders that are sent to and received by the operators, so network uptime and consistent coverage are critical for terminal productivity.

La Spezia Container Terminal deployed an 802.11 Wi-Fi system for TOS Connectivity in 2008 and had worked through numerous upgrades and tuning sessions over the years to maximize its performance. The network was composed of 76 access points for coverage and supported nearly 200 pieces of equipment.

But the terminal layout presents challenges for wireless propagation because of how cargo containers are stacked up within the port. Up to five metal containers can be stacked on top of each other at any given time, which can cause interferences of communications coming in from ships, radars, and the nearby city of La Spezia. In addition to the layout, the size of the terminal is smaller than a traditional terminal, further creating challenges around cargo density.

"When you have multiple cargo containers stacked on top of one another, you're essentially creating interferences in the Wi-Fi coverage," said Stefano Lorenzini, Technical Department of La Spezia Container Terminal. "The terminal needed a reliable wireless solution that could accommodate for stacks of metal containers being constantly transported in and out of the port, something that typically obstructs Wi-Fi connectivity."

Although the Wi-Fi system at LSCT was fairly stable, coverage had been an issue leading to minutes of equipment downtime every day. This impacted the terminal's drivers and crane operators, who then needed to find areas where Wi-Fi coverage was more reliable.

Moreover, LSCT has been on a path to continue to adopt advanced automation solutions to increase its productivity and safety at the terminal. The limits of 802.11 Wi-Fi for OT applications had been a concern to the port's management, resulting in the hunt for alternative solutions. Issues such as packet loss during roaming, high latency to vehicles, and jitter are severe challenges in automation applications involving video or control. To mitigate these challenges, La Spezia Container Terminal deployed Cisco Ultra-Reliable Wireless Backhaul.

Connecting assets

After a careful analysis of wireless solutions available including LTE and Wi-Fi, La Spezia Container Terminal decided to upgrade its wireless OT network by adding Cisco Ultra Reliable Wireless Backhaul (formerly Fluidmesh) and Cisco IW3702 Access Points to serve as the backbone for the wireless backhaul. The Cisco IoT network works in parallel with the port's existing Wi-Fi system. Cisco Wireless Backhaul will be used to connect all "on-the-move" assets such as Ship-to-Shore cranes (STSs), Rubber-Tyred Gantry cranes (RTGs), stacking cranes, reach stackers, and terminal tractors creating a low-latency roaming wireless backbone. The existing Wi-Fi system will be left in place in areas where connectivity to hand-held devices such as tablets and laptops is required.

By using Cisco Wireless Backhaul technology, LSCT was able to address its wireless coverage issues as well as drastically reduce the number of access radios needed for coverage. In fact, only twenty Cisco Wireless Backhaul base stations were deployed, showing a 70 percent reduction in density in comparison to the 802.11 Wi-Fi. Cisco's wireless OT network will run on 5 GHz, leaving the 2.4 GHz spectrum for Wi-Fi applications. Moreover, the twenty Cisco Wireless Backhaul base stations will use its Machine Learning algorithm to optimize channel access and vehicle connectivity. This makes LSCT one of the first terminals in the world to adopt artificial intelligence to increase the performance of its wireless OT network.

On the vehicle side, each piece of lifting equipment is being fitted with one to two Cisco Wireless Backhaul radios and dual-polarity antennas for a total of nearly 200 Cisco Wireless Backhaul radios. The onboard Cisco Wireless Backhaul radio provides connectivity to a tablet used for onboard TOS display and control. Thanks to Cisco Ultra-Reliable Wireless Backhaul technology, the vehicles will be able to roam with a 0ms

hand-off time and support up to 5 Mbps of usable bandwidth each. This will allow LSCT to roll out video and control application in the future without any major network upgrade.

Simple and scalable

Thanks to Cisco Wireless Backhaul, LSCT was able to radically improve its wireless network without the need to go through a full network replacement. The network, which is already deployed in parts of the terminal, has demonstrated its ability to fully address the coverage issues and network downtime that LSCT was experiencing in the past.

"Cisco Ultra-Reliable Wireless Backhaul has redefined our perception of what can be done with wireless. It is the first time that our operators have been able to drive around the terminal without dropping a single ping," said Lorenzini. "We believe this solution to be a no-brainer for any terminal looking to solve TOS connectivity or any terminal looking to roll out an automation-capable OT network. Uptime for us is king and Cisco Wireless Backhaul has over-delivered on its promises."

-Stefano Lorenzini, Technical Department of La Spezia Container Terminal