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CASE STUDY

A series about Canopy wireless broadband in the marketplace.

THE LARGEST RAILROAD IN THE U.S. USES WIRELESS BROADBAND TO INCREASE SWITCHING YARD PRODUCTIVITY:

UNION PACIFIC RAILROAD IS TURNING TO MOTOROLA'S CANOPY™ WIRELESS BROADBAND PLATFORM TO HELP ENHANCE ITS YARD OPERATIONS IN 23 STATES

CANOPY™
Motorola Wireless Broadband Platform

SYNOPSIS

In our fast-paced, high-tech business environment, the railroad industry sometimes suffers from an outdated, low-tech image. In reality, the facts are much different, as the industry is turning to today's most sophisticated new technology to streamline virtually every aspect of its business.

Union Pacific Railroad, with extensive operations in almost every state west of the Mississippi River, is an acknowledged industry leader in the design and deployment of advanced technological solutions to increase efficiency and cost-effectiveness.

One crucial focal point for UP's high-tech initiatives is switch yard operations. These yards, now generally termed "classification" yards, are the heart of the railroad's operations and present some substantial communications challenges. One of the most important challenges is their sheer size. A rail yard may be many miles in length, and have hundreds of miles of track.

As the company strives to enhance its yard operations, it is crucial for both efficiency and safety to have effective, reliable and secure communications capabilities. The company plans on using the Canopy system in about 70 of its more than 180 yards.

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RAIL TRAFFIC CONTROL

Think of today's classification yards as control centers that function somewhat like air traffic control facilities at airports. In a 24-hour period, a typical yard will handle thousands of rail cars hauling everything from grain to chemicals to automobiles and countless other types of freight. Cars are received, repaired when necessary, sorted and assembled into trains departing for numerous destinations throughout the U.S., Mexico and Canada. To deal with this combination of size and complexity more efficiently, UP is using the Canopy platform in a number of highly critical applications.

ABOUT THE COMPANY

Union Pacific Corporation owns one of America's leading transportation companies. Its principal operating company, Union Pacific Railroad, is the largest railroad in North America, covering 23 states across the western two-thirds of the United States. A strong focus on quality and a strategically advantageous route structure enable the company to serve customers in critical and fast-growing markets. It is a leading carrier of low-sulfur coal used in electrical power generation and has broad coverage of the large chemical-producing areas along the Gulf Coast. With competitive long-haul routes between all major West Coast ports and eastern gateways, and as the only railroad to serve all six major gateways to Mexico, Union Pacific has the premier rail franchise in North America.

ROLLING TECHNOLOGY PLATFORMS

Nowhere is the technology revolution in the railroad industry more evident than in that familiar symbol of railroading, the locomotive. "Today's locomotives have become rolling technology platforms," says Ed Hollingsworth, Union Pacific's senior director of wireless engineering, "and most people don't realize that." Inside a majority of today's locomotives is an Ethernet-based LAN consisting of 10 to 12 different computers that control virtually every aspect of operations from speed regulation to fuel consumption to brake utilization and more.

THE REMOTE CONTROL LOCOMOTIVE (RCL)

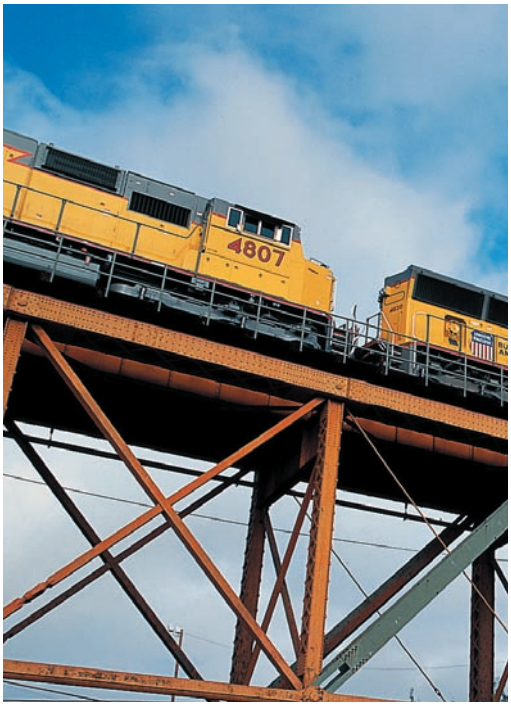
One relatively new development in yard operations is the recent approval by the Federal Railroad Administration (FRA) of what has become known as the remote control locomotive, or RCL. In use in Canada for more than ten years, RCL won FRA approval in the United States in 2003. "At Union Pacific, we are implementing RCL technology with a vengeance," says Hollingsworth.

The safety record of RCL is impressive. In May, 2004, the FRA published a preliminary report "strongly indicating that the deployment of remote control locomotives in and around rail yards has resulted in significant safety benefits." The report notes that "for the period covering May 1, 2003 through November 30, 2003, the RCL train accident rate was found to be 13.5 percent lower than the rate for conventional switching operations over the same period, and the employee injury rate was 57.1 percent lower."

How does RCL work? In the freight yard, workhorse "switch engines" move railcars from one track to another to create specific trains by destination. Until recently, these switching operations were manned by three-person crews; one person inside the engine operating it, the others on the ground uncoupling cars and ensuring the cars were placed on the correct track. With Remote Control Locomotive technology, the same productivity can now be delivered by two people on the ground with no one in the locomotive.

UP FREIGHT CARS DELIVER NORTH AMERICA'S AUTOMOBILES

Union Pacific is the largest automotive carrier west of the Mississippi River. The railroad serves seven U.S. vehicle assembly plants and distributes imported vehicles from six West Coast ports as well as from the port of Houston on the Gulf Coast. In addition, the railroad supports more than 40 vehicle distribution centers serving virtually all major western U.S. markets. These centers focus on "railcar-to-truck haulaway operations for major domestic and international automotive manufacturers." All in all, Union Pacific delivers more than 80 percent of the vehicles sold west of the Mississippi. In addition to hauling assembled vehicles, UP also handles movement of automotive parts and materials in containers and boxcars to local auto assembly plants from numerous locations in the U.S., Canada and Mexico.



RCL allows the ground personnel, communicating via a high-tech "radio control" to control critical locomotive functions such as speed, braking, direction of travel and more, all without the necessity of having anyone inside the locomotive itself. The result is hundreds of man-hours saved, allowing personnel to be assigned to other tasks.

THE CANOPY SYSTEM'S ENHANCED WIRELESS SECURITY OPTIONS

Motorola's Canopy platform provides built-in security with powerful, over-the-air DES (Data Encryption Standard) encryption. For special applications in which extra security precautions are prudent, the system is also available with AES (Advanced Encryption Standard) capabilities, which provide 128-bit encryption to ensure totally secure data delivery and exceptional reliability. With AES, it would take approximately 149 trillion years — that's older than the earth itself — to crack a code.

To help enhance RCL operations, Union Pacific is using Canopy point-to-point backhaul technology. UP's RCL system uses one or more 220 MHz intelligent repeaters in each yard to extend the range of signals, transmitting them to locomotives at much higher power. The repeaters require connection to the UP network, which is often best accomplished using Canopy backhaul. This permits ground personnel to work longer distances from the RCL locomotives, allowing them to operate over a much larger area of the yard.

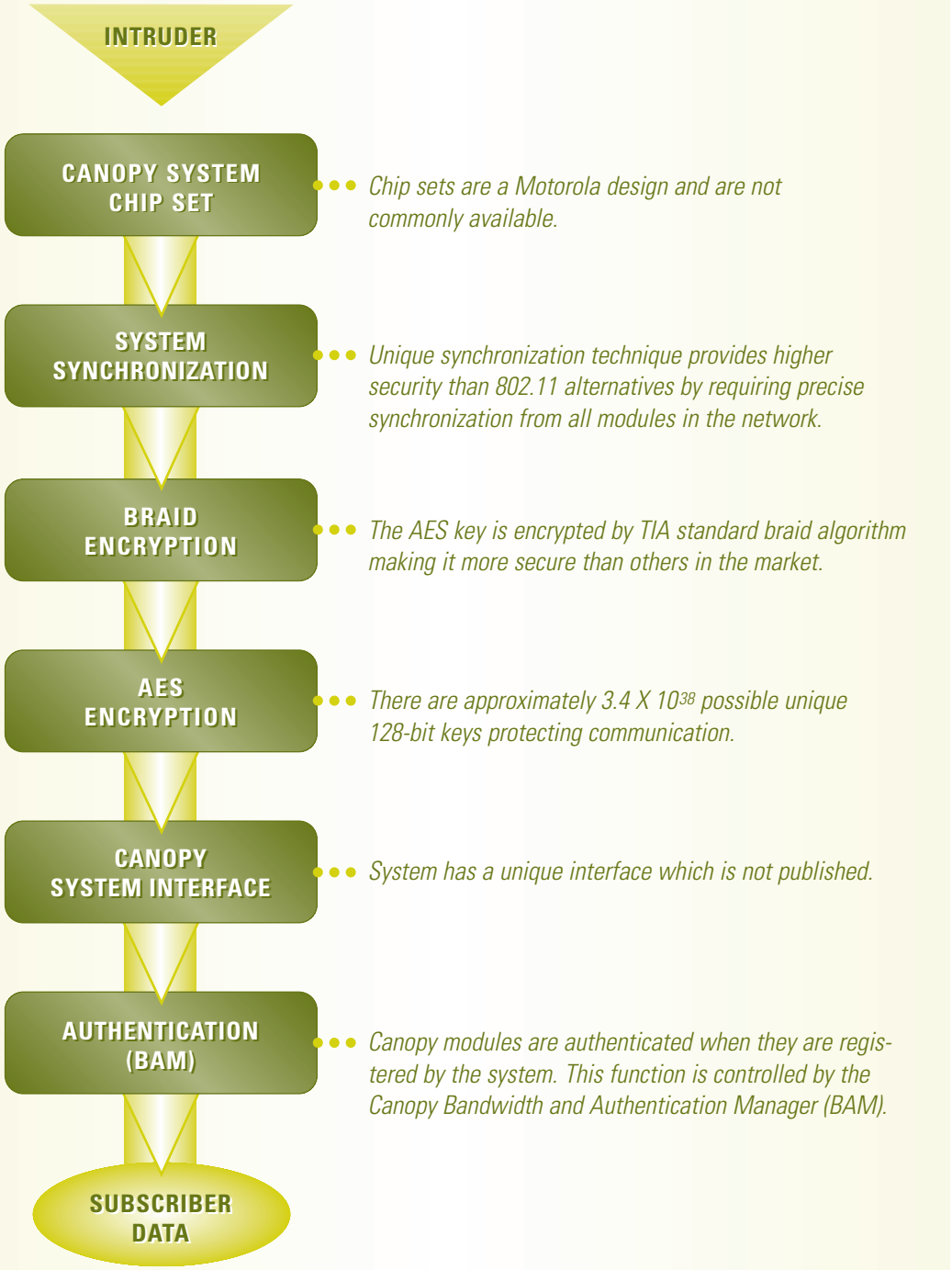
The railroad is also using the Canopy system to help increase safety. When an RCL locomotive must cross a road in the yards, there is now no one inside the cab to visually monitor the crossing for activity. UP solves this by placing cameras at each crossing. Then, again using Canopy backhaul, the visual data is sent to a yard control center where managers, who are in constant communication with ground personnel, continually monitor each crossing for traffic.

HIGH BANDWIDTH LINK

The Canopy platform supports wireless LAN. Canopy backhaul to repeater sites provides a wide bandwidth link between access points at the repeaters and the railroad's external network, facilitating a number of functionalities. These include wireless high-speed software upgrades for locomotives, which are normally carried out every few months. The Canopy high bandwidth connection also enables UP to backhaul data collected by the repeaters to the network, efficiently enabling a wide range of critical network diagnostic applications, including congestion management, statistics analysis and more.

CANOPY SYSTEM SECURITY ARCHITECTURE:
A POWERFUL BOND FOR PROTECTING THE CANOPY SYSTEM FROM INTRUDERS

The Canopy system is secured through successive layers of hardware, software, interfaces, encryption, signal synchronization and user authentication.



BLACK BOX DOWNLOADS

Many people also don't realize that locomotives, like airplanes, carry an on-board event recorder, or "black box." The information collected by the recorder — such as speed changes, horn utilization, brake usage and more — is important both for everyday operations review and, whenever necessary, for accident investigation. Until recently, getting this crucial data into the railroad's network required a person to climb inside each locomotive and download the information into a laptop computer. Today, UP is able to perform these tasks wirelessly, using the Canopy platform.

THE CANOPY SYSTEM AND SECURITY

"We needed a network that couldn't be penetrated," Hollingsworth says, "so point-to-point links came under increased security scrutiny especially after 9/11." The Canopy platform, with its robust built-in authentication technology, successfully meets the railroad's increased security requirements.

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>
> ED HOLLINGSWORTH, SENIOR DIRECTOR OF WIRELESS ENGINEERING, UNION PACIFIC

For more information about Motorola and wireless broadband and how the Canopy system can extend your network and services, increase your customer base, improve customer satisfaction, provide competitive advantage and deliver outstanding ROI, call 1-866-515-5825 / 800-795-1530 or visit us at www.motorola.com/canopy.com