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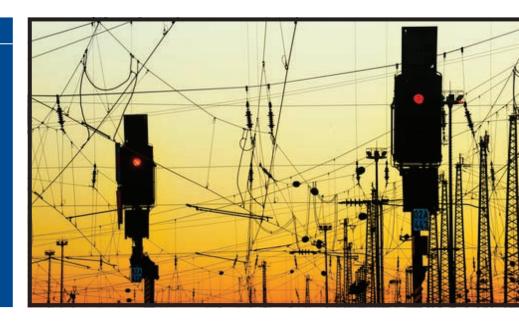
AN00016

Remote monitoring and management of rail vehicle energy usage

Belden's ruggedized Wireless LTE solution provides reliable communications enabling remote vehicle monitoring and management.

The OWL LTE M12 is a single box cellular router with a rich set of features that provide wireless connectivity, internet and remote access solutions for transport installations using high-speed cellular technologies and embedded GPS functionality.

Project Overview

For a rail operator that carries, on average, 1.25M passengers per day and over 50M tons of freight per year across 3200km of fully electrified rail track, energy usage is one of the most critical costs to be managed. The operator buys electricity through a service contract which has pre-defined average and peak demand rates built into it; the higher the electricity usage during a particular period, the higher the cost and if the peak figure is exceeded then the operator incurs additional (premium) energy charges from their supplier.

To average out the energy usage and hence manage the cost, this particular operator deployed a system which forecasts and remotely manages energy usage in the majority of their rail vehicles. For example if a freight train is known to be starting in a particular area, the passenger trains in the same area can be commanded to temporarily reduce their passenger heating or cooling systems to ensure the peak power budget is not exceeded.

Two key elements of the system are firstly, reliable connectivity between the train vehicles and the ground system and secondly, knowing the location of every vehicle.

The Challenge

The train operator required reliable connectivity to its entire rolling stock fleet to facilitate the remote monitoring and management of the onboard electrical systems and also to know the location of all of the rolling stock.

System Requirements

- High-speed wireless connectivity through LTE, UMTS/HSPA+ and GSM/GPRS/EDGE technologies
- 2 LAN ports (10/100BASE-TX), an RS232 interface
- Embedded GPS and optional dead-reckoning function for innovative navigation and location tracking
- GSM calls via Session Initiation Protocol (SIP)
- Onboard Rail Vehicle standards

Be certain.
Belden.

Why Belden?

The customer selected the OWL LTE M12 Industrial Cellular Router which was developed to enable reliable communication coverage for rail vehicles.

The customer found several characteristics of the OWL LTE M12 Industrial Cellular Router convincing. Firstly the small physical footprint combined with the IP40 metal housing means that the device can be mounted almost anywhere on a rail vehicle – a distinct advantage when dealing with multiple train classes, helping to reduce installation design effort and thus costs. The device also has a temperature range from -40°C to +70°C and is fitted with M12 connectors.

The functionality provided for the initial roll out was important, in particular:

- High-speed wireless connectivity through LTE, UMTS/HSPA+ and GSM/GPRS/EDGE
- Two LAN ports (10/100BASE-TX) and an RS232 interface
- Embedded GPS and optional dead-reckoning functionalities for innovative navigation and location tracking purposes
- Rail transportation standards
  - EN 50155
  - EN 50121-4
  - EN 45545-2 HL3, E8

Future expansion of the functionality is envisaged by the Customer and the following standard features were important to enable this without re-configuration.

- Voice GSM calls via session initiation protocol (SIP)
- A configurable web interface with customizable functionalities through scripting and application specific software modules (open LINUX)
- Multiple interfaces are offered, in addition to the two LAN ports (10/100BASE-TX), and RS232 interface, the OWL LTE M12 has
  - a USB interface
  - two digital inputs
  - two digital outputs
  - an SD Card slot

The Belden Solution

Belden delivered a cost effective LTE Wireless solution designed for the challenges of being installed onboard rail vehicles.

- Strong success record with multiple rolling stock manufacturers and operators around the globe
- Superior designed Wireless device OWL LTE M12 fulfills challenging environments of rail vehicle usage
- Excellent roaming and bandwidth capabilities for uninterrupted communication
- Location functionality assured with the latest GPS and optional dead-reckoning functionality

Multiple electric locos and electrical equipment

Be Certain with Belden

The OWL LTE M12 builds on the same great features as the original OWL LTE, but in a more robust configuration, meeting the challenging rail environment standards defined by EN 50155 and EN45545-2 HL3.

To guarantee the highest network availability, redundancy is provided through dual SIM cards and two Ethernet ports. Best-in-class integrated firewall protection also addresses growing security concerns.

Inside of an engine room on a diesel train

OWL LTE M12 Cellular Router

Product Details

To achieve secure, flexible and uninterrupted communication, the following Belden products are ideally suited to this onboard rail vehicle application.

OWL LTE M12 Cellular Router

The OWL LTE M12 Cellular Router provides wireless connectivity, internet and remote access solutions to transportation settings using high-speed cellular technologies and embedded GPS functionality.

- Fast wireless connectivity and reliable remote access – provide the best wireless experience and manage networks remotely through fast and reliable wireless cellular technologies, including LTE, UMTS/HSPA+ and GSM/GPRS/EDGE technologies.
- Optimal performance – achieve high network availability in harsh environmental settings with this ruggedly-designed, feature-rich cellular router.
- Easy to configure and customize – install and adjust this device with minimal product knowledge. Its open LINUX platform also allows for advanced customization.

RailTuff Ethernet cable and M12 Connectors

RailTuff Ethernet Cable and Lumberg Automation M12 Connectors

Belden offers a range of RailTuff Ethernet Data Cables, for reliable communications and enhanced system performance in railway, transportation and city transit systems. The cables are available for 100 Mbps, 1000 Mbps and 10 Gbps, depending on the application.

- Best in class flex life with sustained data transmission due to highly stranded copper conductors
- Fully compliant with EN 50155 Class TX giving a superior temperature rating

Lumberg Automation Shielded M12 Connectors and Patch Cables are compliant with the highest fire protection class EN45545-2 HL3.

- Fast and inexpensive installation due to molded and field-attachable connector types (D, A and X coded)
- Industrial protection class IP67
- Ready to install pre terminated M12 Patch Cables

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Belden Competence Center

As the complexity of communication and connectivity solutions has increased, so have the requirements for design, implementation and maintenance of these solutions. For users, acquiring and verifying the latest expert knowledge plays a decisive role in this. As a reliable partner for end-to-end solutions, Belden offers expert consulting, design, technical support, as well as technology and product training courses, from a single source: Belden Competence Center. In addition, we offer you the right qualification for every area of expertise through the world's first certification program for industrial networks. Up-to-date manufacturer's expertise, an international service network and access to external specialists guarantee you the best possible support for products.

Irrespective of the technology you use, you can rely on our full support – from implementation to optimization of every aspect of daily operations.

Always Stay Ahead with Belden

In a highly competitive environment, it is crucial to have reliable partners who add value to your business. When it comes to signal transmissions, Belden is the No. 1 solutions provider. We know your business and want to understand your specific challenges and goals to show how effective signal transmission solutions can push you ahead of the competition. By combining the strengths of our five leading brands, Belden, GarrettCom, Hirschmann, Lumberg Automation and Tofino Security, we are able to offer the integrated solution you need. Today, it may be a single cable, switch or connector, to solve a specific issue; tomorrow, it can be a complex range of integrated applications, systems and solutions. With the rise in smart, connected devices brought on by the Industrial Internet of Things (IIoT), together, we can make sure your infrastructure is ready to handle and make sense of the influx of data. Transform your business now with instant access to information, and make your vision a reality. Visit **info.belden.com/iiot** to learn more.

About Belden

Belden Inc., a global leader in high quality, end-to-end signal transmission solutions, delivers a comprehensive product portfolio designed to meet the mission-critical network infrastructure needs of industrial, enterprise and broadcast markets. With innovative solutions targeted at reliable and secure transmission of rapidly growing amounts of data, audio and video needed for today's applications, Belden is at the center of the global transformation to a connected world. Founded in 1902, the company is headquartered in St. Louis, USA, and has manufacturing capabilities in North and South America, Europe and Asia.

For more information, visit us at **www.belden.com** and follow us on Twitter **@BeldenIND**.