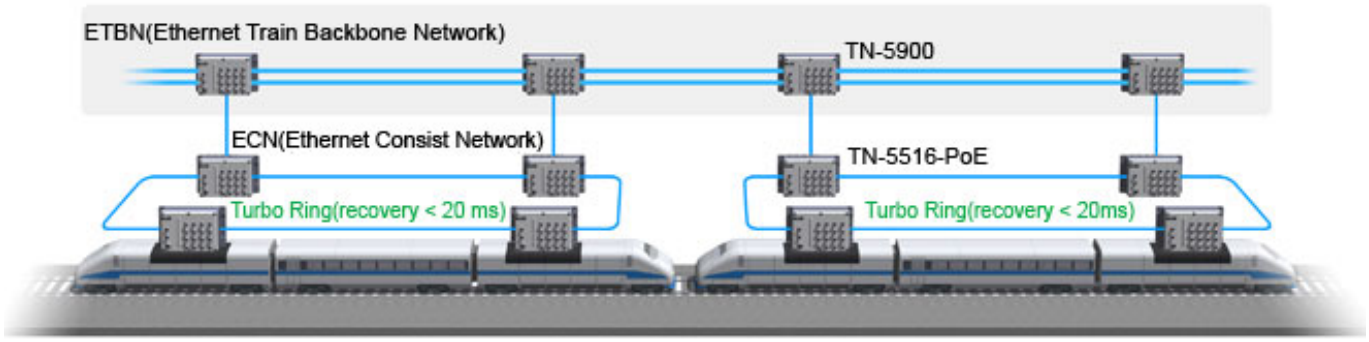
Train Communication Network

Maximizing the Value of Ethernet Technology in Multimedia Train Backbone



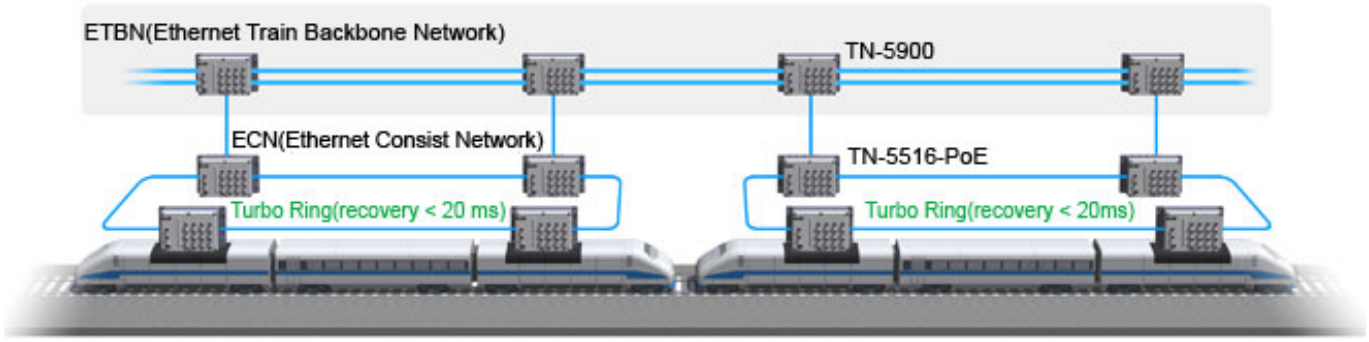
Behind the advanced technology, sophisticated instrumentation, and rich audio/visual connectivity of a modern train control system, there is a solid and dependable network. As train control systems have advanced, the requirements of train control networks have also kept pace. Networks need to deliver a high level of bandwidth and availability in order to support CCTV, PA, alarm, and control systems all on the same network, while still maintaining a reasonable total cost of ownership that does not overwhelm the operator with maintenance or operational burdens.

Railway operators have achieved the network performance and flexibility they need by combining Ethernet Train Backbones (ETB) with Ethernet Consist Networks (ECN). The complete train control network must be able to manage traffic within consists and also between consists while avoiding IP address conflicts, and also deliver data from the on-board network to trackside control centers. What´s more, the network must be able to perform in an unstable moving platform, which also physically changes when train consists are rearranged.

Moxa Rail Solutions

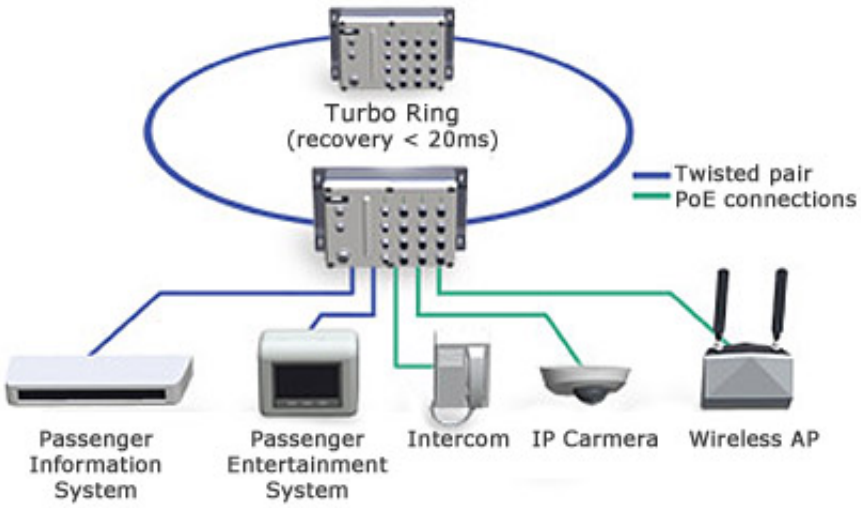
Layer 3 Advanced Network Management:

The TN-5816 and 5818 support layer 3 switching functionality, which simplifies the integration of multiple subnets. Each carriage consist can now be mass-configured with identical device IP without causing IP address conflicts. The layer 3 switches divide each consist into a subnet and allow data and information to flow between them.



Future-Proof Gigabit Transmission

It takes a lot of bandwidth to deliver the advanced technology, rich audio, and video data used in an onboard CCTV system; availability needs to be high as well to maintain uptime. Moxa?sEN 50155 managed Ethernet switches create future-proof Turbo Ring networks that can deliver large amounts of video data. These solutions meet increasing demands, have backup links that quickly respond to link failures, and also improve surveillance functionality without imposing additional operation costs.

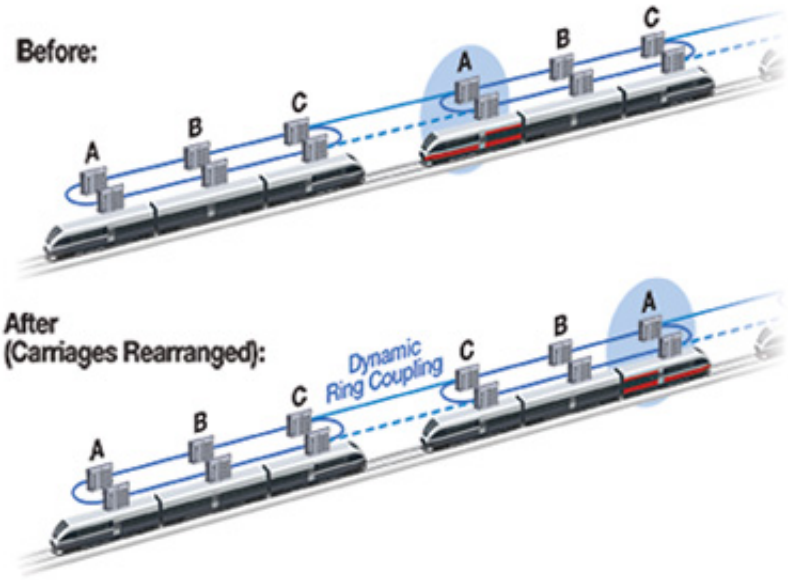


Efficient Dynamic Ring Coupling Technology

In addition to network availability, high reliability and efficiency are also key factors in onboard CCTV systems. Moxa?s EN 50155 managed Ethernet switches feature Dynamic Ring Coupling technology that excels in inter-consist network redundancy. When train carriages are reordered, Dynamic Ring Coupling detects and automatically reconfigures the network. This technology reduces configuration time

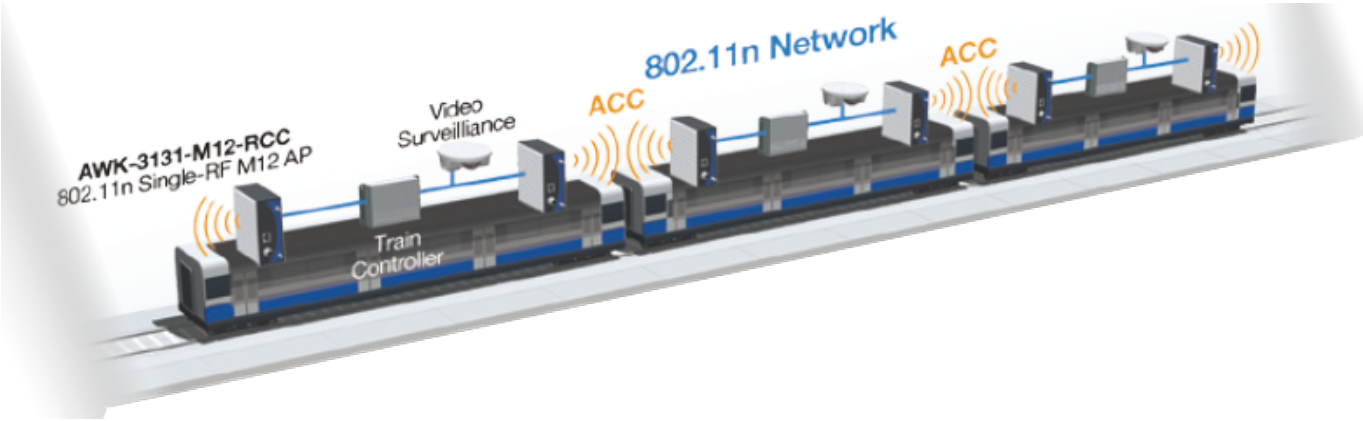
and potential human error, so the system is both highly reliable and efficient to operate day-to-day.

Note: Dynamic Ring Coupling is available for custom projects



802.11n Auto Inter-Carriage Connections

p>For carriages that are connected wirelessly, Moxa?s Auto Carriage Connection (ACC) will automatically form 802.11n wireless bridges between adjacent wireless APs. ACC is available in the 802.11n AWK-RCC series, which supplies up to 300 Mbps of bandwidth to comfortably support media-on demand services.



<u>Success Stories</u>

Advertising, Voice and Passenger Information System

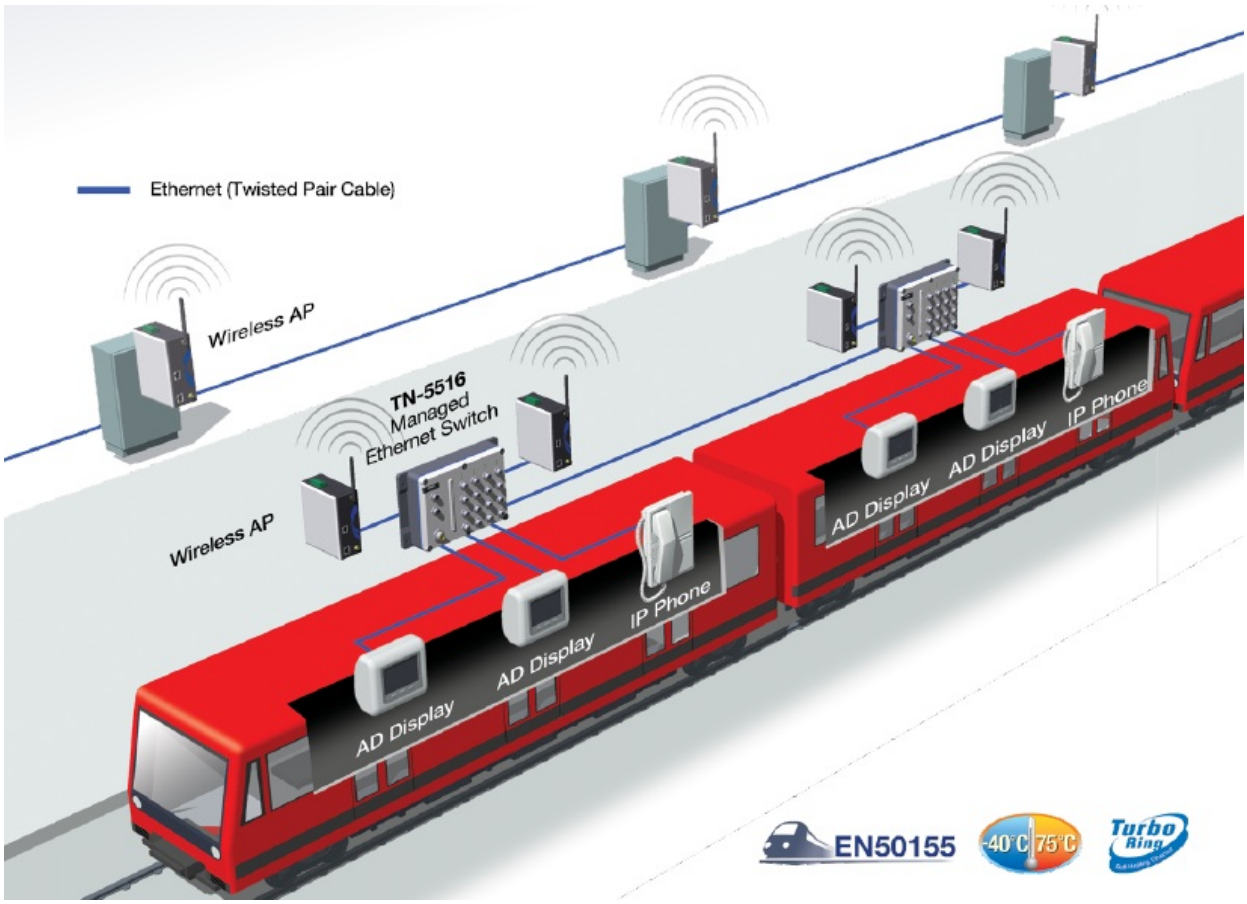
Location: Finland

Application Requirement

- Real-time transmission of advertising and entertainment content to metro passengers
- Seamless wireless connection from the track to the subway cars
- Rugged industrial networking products with IP54 housing protection or higher reliability and rail certification
- Rail approved EN 50155 Ethernet switches that offer VLAN capability and redundancy inside the train
- Products that are easy to integrate with legacy devices
- High number of ports to connect all equipment in each car to a single Ethernet switch Passenger

Moxa?s Advantages

- Moxa was able to provide a train approved switch solution with VLAN support and enough ports to cover all devices in the network
- TN-5516 managed Ethernet switches provide a stable, reliable, easy to deploy solution for redundant networks using Moxa?s redundant Turbo Ring structure
- Moxa?s products have an extended operating temperature range of -40 to 75°C and are ideal for rugged environments
- Three rotary switches on the TN switch allows the maintenance engineer to quickly set the last 3 digits of the IP address without using any software at all.
- The two independent power inputs, 24 VDC and 72 VDC, perfectly matched the available power system in the cars



Industrial Ethernet Backbone for Railway Operations

Location: Norway

Application Requirement

- A fast network with minimal boot up time. The train network must be up and available before the embedded
- computers in the train come online
- Reliable, feature-rich, and railway-certified switches
- Enough ports to connect all devices to the network
- Comprehensive service and support, and high cost-effectiveness

Moxa?s Advantages

- Moxa?s Ethernet switches take only 5 to 6 seconds to boot, beating other manufacturer´s products

- The TN-5516 has a built-in DC/AC power converter. This eliminates the need for an additional external converter, saving space, time, and money
- Moxa?s sophisticated products cover the different power inputs onboard a train: 12/24/36/48 VDC, 72/96/110 VDC, or 110/220 VDC/VAC dual, isolated redundant power supply increases the reliability of the communications
- Moxa´s railway Ethernet switches support PoE, which enables customers to add devices to their existing network infrastructure without purchasing more power cables or reorganizing the original network design.
- Moxa?s service package and high cost-effectiveness convinced the customers

