

# Modernizing Communications for the Rail Network

with Ribbon's Optimized Packet and Optical Transport Solution



## Evolving to Support the Digital Railway

Rail services have always been vital for a country's economic prosperity. They are essential for efficient bulk transfer of people to main employment centers, and for freight to reach primary distribution hubs. As passenger and freight numbers continue to grow rapidly, rail networks face acute capacity problems, which if not addressed, will impede this growth. The digital railway offers a solution to this capacity shortfall, making the existing rail infrastructure considerably more productive. It addresses the increased needs for capacity by introducing more flexibility in the handling of rolling stock, while maintaining strict safety and reliability standards. The digital railway uses traffic management systems like the European Railway Traffic Management System (ERTMS) and in-train signaling (e.g. ETCS), to allow trains to run much closer together. The telecoms network is key to this evolution; it provides a risk-free migration to a highly secure, always-up packet platform, providing support for all communication systems used by rail operators.

### Risk-Free Transition

with tailor made evolution for legacy services

### Secure Packet

guarantees mission critical services

### High Availability

provided by advanced operations software

### Multiservice

to enable the Intelligent Transport System

## Drivers Of Modernization

### Evolution to a Digital Railway

In-train signaling (European Train Control System) and traffic management systems are required to optimize rail capacity.

### Increased Regulation

Rail is a critical National infrastructure we see ever-increasing regulation to reduce carbon emission and improve punctuality.



### Better User Experience

From on-station to on-train, users expect a seamless digital experience.

### Security and Safety

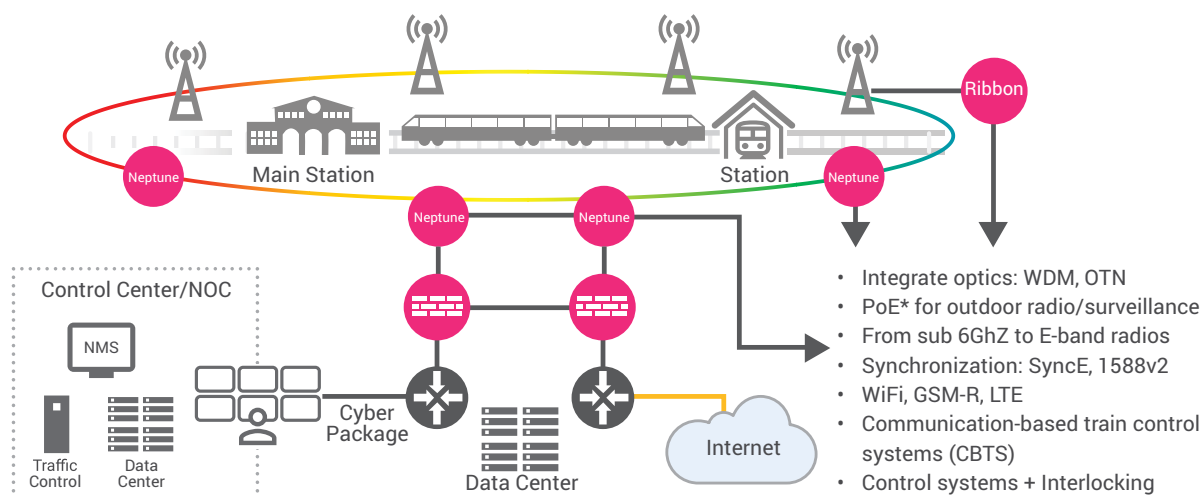
Signaling and control must be 'always-up'. Networks must be fully secured against cyber attacks. Must be able to detect and react to physical track anomalies.

### Cost-Effective and Risk-Free Transition to Packet

Ribbons packet solutions are optimized for the rail communications network. We have used them to provide many rail operators around the world with a risk-free evolution to packet based communications infrastructure.

When it makes sense for the network operator, legacy services and low-rate mission-critical services like SCADA, signaling, and traffic control are migrated to the packet layer. Our Elastic MPLS packet technology has been designed with mission critical networks in mind, it provides IP/MPLS to support IT networks and MPLS-TP (deterministic MPLS) which is industry accepted as the technology to support mission critical OT services which require low deterministic latency, high latency and extensive OAM. With extensive Circuit emulation (CES) capabilities the correct packet transport technology can be selected to meet the service needs on a service by service basis. Ribbon's field proven processes ensure this migration process is risk free.

- **Capacity is added when needed** with unique in-service expansion units and in-service upgradeable packet fabrics (e.g. 10G to 60G, 100G to 200/320G, 1T to 2T)
- **Technology is introduced when required** with unique in-service expansion units to scale connectivity and elasticity (Eth, Optical, PCM, CES); and with integrated WDM, OTN, and bidirectional SFPs to simplify optical connectivity.



Ribbon has extensive experience in transitioning networks and developed field-hardened, proven processes for this migration.

### Holistic Security Suite

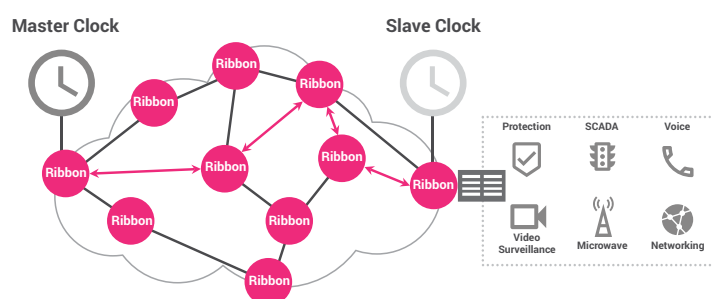
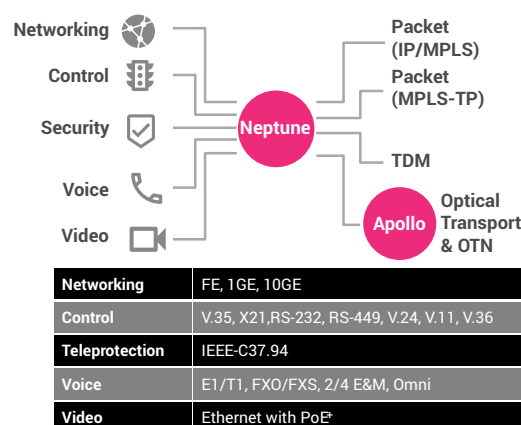
Critical industries are a prime target for cyber-attacks. Data security is a particularly complex matter. It must protect both IT and OT assets and be able to identify tangible threats from amongst the multitude of reported events.

Our solution provides physical layer security, encryption, firewalls, and intrusion detection. It provides the capabilities to identify and tackle potential attacks in several ways:

- **Preventing attacks where they occur** with distributed attack mitigation.
- **Provides Distributed SCADA Anomaly Detection and DPI Deep Packet Inspection**, addressing zero-days, advanced cyber-attacks, and delivers the key to identify and isolate such threats.
- **Guards the integrity** of the SCADA and OT network. The system maintains a complete OT network map and continuously monitors all transactions for abnormal behavior, providing early warnings of any tampering.
- **Identifies real threats** with advanced correlation and analysis for a clear view of tangible threats.

## Multiservice Platform

With Ribbons packet and optical portfolio you have a complete multiservice platform for supporting OT and IT services over the most appropriate transport technology. Mission-critical OT, like teleprotection and SCADA, requires the static, deterministic behavior that TDM and MPLS-TP provide; whereas, IP/MPLS provides optimized support for IT services like voice, video, and non-missioncritical networking. The solution seamlessly integrates the packet and optical layers to enable cost-efficient transport of the high-capacity data generated by video and other (IT) applications. Video technology adds specific challenges; thousands of trackside cameras generate vast quantities of HD video content. This must be backhauled to a few control locations to allow real-time analysis, required for hazard identification of the trackside environment. The solution provides a multicast architecture with end-to-end QoS monitoring to ensure the quality of the video network. Cost-effective bulk transport of the video traffic is provided by optical transport and Power over Ethernet (PoE) interfaces. These are available to power the trackside cameras and other outdoor monitoring devices. The solution provides an open, future-proof way to add new services and applications.



Traditionally, TDM provides the tools to derive and distribute the accurate timing that is fundamental to the operation of railway services. As networks evolve to packet, the timing architecture must remain robust. The solution allows an approach similar to that used in TDM. A built-in GPS receiver or an external timing source provides the master clock. 1588v2 precision timing protocol (PTP) distributes timing across the network and MPLS-TP reduces packet delay variation by using deterministic, bidirectional traffic paths.

Muse provides an intuitive GUI, this simplifies operations with rapid get-it-right-the-first-time network provisioning and rapid fault isolation. Advanced operations software provided by Muse™ is able to analyze the network data to ensure the network is operating at maximum availability, utilization, and efficiency. This functionality can be further extended to non-Ribbon transport devices by using Ribbon's 3rd party integration solution.

For rail networks wishing to use their unique geographical footprint to generate extra revenues as a Utelco, the multiservice capabilities of the solution provide the managed L2 and L3 VPNs required for business services, residential services, mobile backhaul, and future IoT applications.

## Optimized for High Availability

Railway operators require communications networks that provide 'five-9s availability' or better, Ribbons solution for railways provides this with:

- **Fully-redundant hardened design of the Network Elements** With 1+1 and 1:1 protection of key units and extended temperature range for use in railway applications (-25°C to +70°C).
- **Fast protection against single and multiple network failures:** MPLS-TP supports sub-50ms protection switching for single failures. Used in conjunction with pseudowire redundancy, protection is provided for multiple failures.
- **Remote disaster recovery** Allows network and management restoration from geographically dispersed sites in the event of catastrophic failure.
- **Potential network failure protection:** Muse provides advanced operations software to monitor network performance in real time and helps identify trends over time.

## Risk-Free Transition to Packet

Your Challenges	Our Solutions
<b>Need risk-free evolution to the digital railway</b>	Ribbons rail solution provides the scalable, elastic multiservice platform required for migrating mission-critical services, as networks move to provide the Intelligent Transport System that supports the digital railway: <ul style="list-style-type: none"><li>• Legacy services operate on this platform - by using circuit emulation</li><li>• MPLS-TP is used to provide the deterministic transport and advanced OAM required for mission-critical services</li><li>• Service assurance is guaranteed with advanced operations software provided by Muse™</li></ul>
<b>Need enhanced security</b>	Tailored, holistic security suite providing comprehensive protection for the communications infrastructure: <ul style="list-style-type: none"><li>• Integrated SCADA protection, secured connectivity, and secured services</li><li>• L1 to L3 encryption with L1 optical intrusion detection</li></ul>

## Intelligent High Availability Multiservice

Your Challenges	Our Solutions
<b>Need a multiservice network to support all the services associated with the digital railway</b>	Extensive multiservice capabilities provide support of OT services, IT services, and advanced consumer services from a single platform: <ul style="list-style-type: none"><li>• Mission-critical services like SCADA and teleprotection and supported by MPLS-TP</li><li>• IP/MPLS is used to support L2 and L3 services</li><li>• Pay-as-you-grow design, with unique in-service expansion units, scalable crossconnects and in-service upgradable packet fabrics</li><li>• Easy extension of the services with intuitive, get-it-right-the-first-time introduction of new resources enabled by Muse</li><li>• Proven SDN capabilities can be introduced as they are required by the rail network</li><li>• Supports business services, residential services, mobile backhaul, and future IoT applications, allowing rail operators to evolve as a Utelco.</li></ul>
<b>Need highly available telecoms network for mission-critical services</b>	Provides the intelligent, highly-available network required for mission-critical services with: <ul style="list-style-type: none"><li>• Hardened network elements and optimized architectures provided by Neptune and Apollo</li><li>• Intuitive operations and rapid fault isolation provided by Muse</li><li>• Advanced software provided by Muse ensures the network is operating at maximum availability, utilization, and efficiency</li><li>• Third-party device management integrated into Ribbon's end-to-end management</li></ul>

## About Ribbon

Ribbon Communications (Nasdaq: RBBN) delivers communications software, IP and optical networking solutions to service providers, enterprises and critical infrastructure sectors globally. We engage deeply with our customers, helping them modernize their networks for improved competitive positioning and business outcomes in today's smart, always-on and data-hungry world. Our innovative, end-to-end solutions portfolio delivers unparalleled scale, performance, and agility, including core to edge software-centric solutions, cloud-native offers, leading-edge security and analytics tools, along with IP and optical networking solutions for 5G. We maintain a keen focus on our commitments to Environmental, Social and Governance (ESG) matters, offering an annual Sustainability Report to our stakeholders. To learn more about Ribbon visit [rbbn.com](https://rbbn.com).

[Contact Us](#)

Contact us to learn more about Ribbon solutions.