

# Risk-Free Future-Proof Transition

for Critical Infrastructure Network Operators



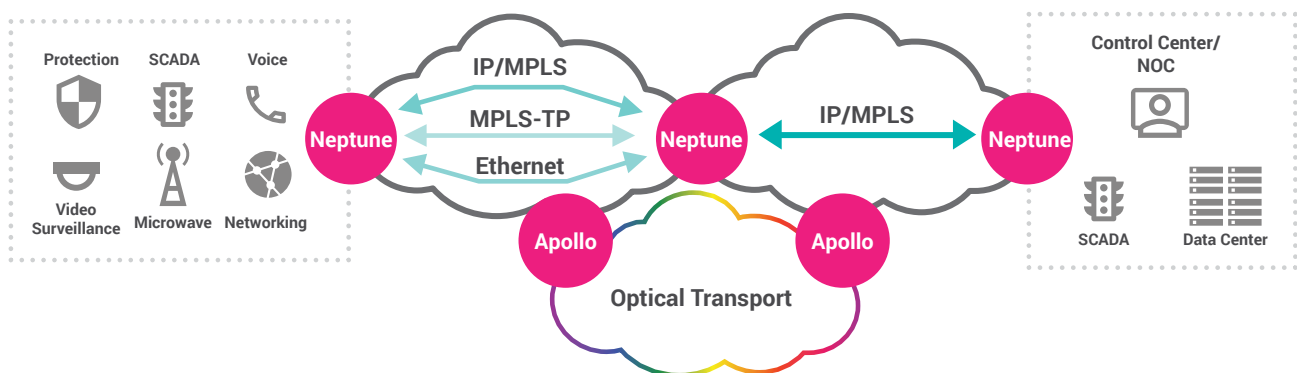
Critical Infrastructure (CI) Network Operators are under increasing pressure to support new services, reduce carbon emission, improve security, provide automation, and increase safety. Achieving this requires transition to a modernized, secure communications network that supports both packet and optical transport seamlessly.

Ribbon offers a seamless integrated packet and optical transport solution providing a highly reliable, secure, future proof communications solution optimized for critical industries. Ribbon's unique Elastic MPLS functionality provides integrated support for MPLS-TP, the proven best choice packet transport for OT services, and IP/MPLS, the preferred packet transport for IT services. In addition, Ribbon's holistic security suite incorporates state-of-the-art OT protection measures, giving operators confidence in the security of their network. Also, field hardened, proven processes allow easy and safe migration of legacy services and interfaces to Ribbon's future-proof packet platform.

**Risk-Free Modernization**  
tailored, hardened,  
field-proven, and future-proof

**Secure OT**  
with state-of-the-art OT  
security options

**Optimized for CI**  
compact, hardened, regulation-  
compliant solution



### Modernizing Critical Infrastructure Networks

For over five decades, Ribbon has been providing communications solutions for hundreds of CI networks, including power utilities, railways, highways, airports, oil, gas, water, government, and defense infrastructures. These solutions leverage the experience accumulated over many years from these critical infrastructure customers. The acquired expertise has helped us optimize our industry-leading Elastic Services Platform to offer an optimal solution that meets the unique needs of critical infrastructure network operators.

The critical industries sector spans many strategic industries and operations, including:

- **Energy:** Distribution and transmission businesses
- **Transportation:** Highways, railways, and airports
- **Utilities:** Oil, gas, and water
- **Public sector:** Government and defense institutions, and more recently, smart cities and smart municipalities.

While the specific needs of each critical industry in each country are unique, there are a number of drivers for modernization that are common to all:

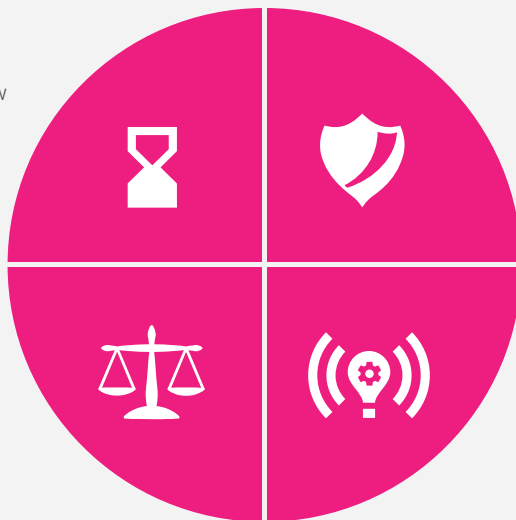
#### Critical Industries Must Transition to Packet-Based Networks

##### Aging Networks

- End-of-life SDH/TDM/ATM vs network expansion, population growth, and new services
- High maintenance costs
- Need for convergence

##### Regulation

- Compliance to standards
- Carbon emission reduction
- Improved service availability and customer satisfaction



##### Security and Safety

- Control automation
- Safety recommendation
- Video surveillance
- Cyber and physical security

##### Internet of Things

- Always-connected sensors
- SCADA
- Automation and control
- Smart devices

### Ribbon's Elastic Solution: Main Benefits

#### Risk-free modernization

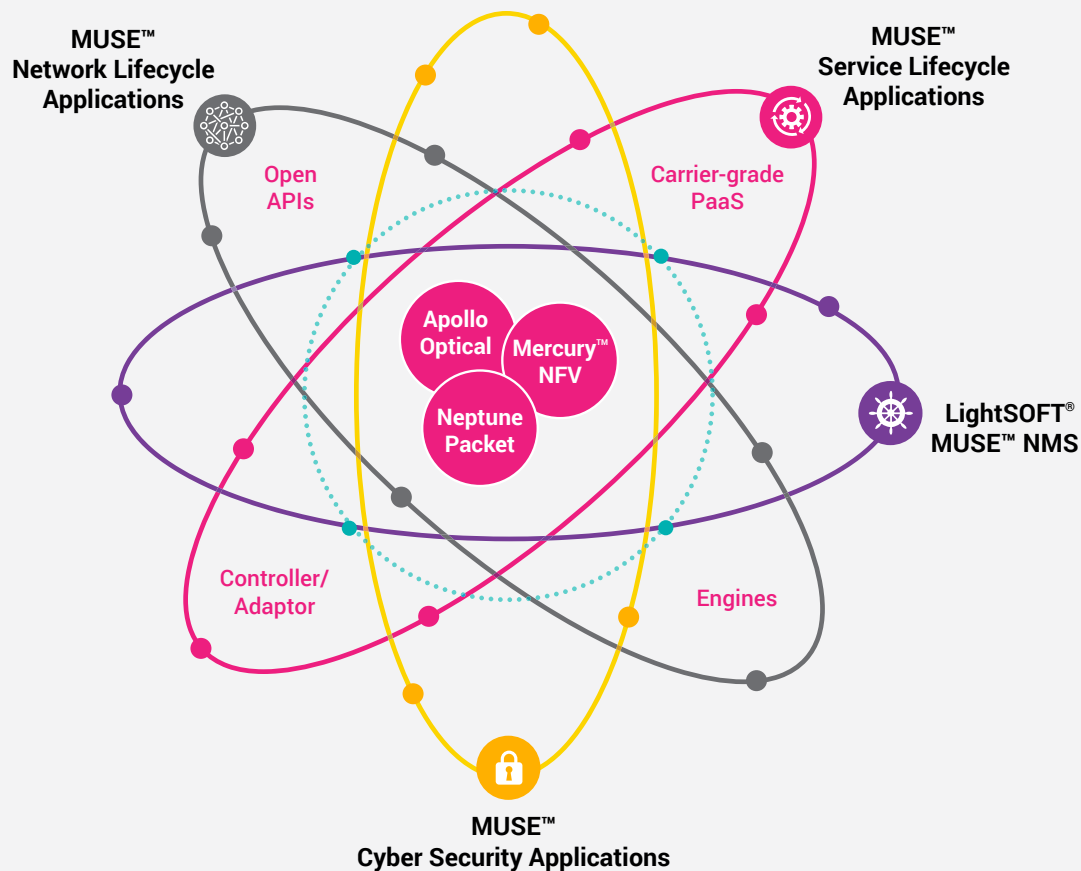
- Field hardened, proven migration processes build on 50+ years experience in CI projects
- Elastic MPLS provides seamless multilayer support across Packet, Optical, Carrier Ethernet and TDM
- Fully-integrated packet and optical transport
- Deterministic performance for packet
- Flexible SCADA support for legacy and new generation systems.
- Advanced software applications for automation, analytics, assurance, planning, maintenance, and monitoring
- End-to-end management with third-party device integration

#### Secure solution optimized for OT

- Holistic cyber security suite with state-of-the-art SCADA and OT security functions
- Flexible packet and optical encryption
- Secure hardware and software
- Compliance with CI-specific regulations and standards
- Environmentally-hardened platforms and compliance with environmental regulations
- Compact form factor with pay-as-you-grow modular architecture
- One-stop-shop for Critical Infrastructures projects

### ELASTIC Services Platform

Ribbon's ELASTIC Services Platform is a set of interworking hardware and software solutions. Network hardware platforms are controlled and supported by Ribbon's Muse software suite.



### Ribbon's ELASTIC Services Platform for CI

#### Neptune

##### Powered by Elastic MPLS for Risk-Free Transition to Packet

The Neptune product family offers cost-optimized packet transport. It provides support for modern packet services as well as for legacy TDM/SDH services and low-rate mission-critical services like SCADA. When it makes sense, the legacy services are migrated to the packet layer using Neptune's circuit emulation capabilities. Elastic MPLS is at the heart of the ELASTIC Services Platform solution and allows Neptune to provide a complete multiservice platform to support the Operational Technology (OT) and Information Technology (IT) services over the most appropriate transport technology. Mission-critical OT, like SCADA, requires the static, deterministic behavior that MPLS-TP provides. Whereas, IP/MPLS and segment routing provide optimized support for IT services, like voice, video, and non-mission-critical networking. Both IT and OT traffic can be supported on the same platform or on different platforms if air-gap security is required. The key benefits that Neptune provides for CI network operators are:

- MPLS-TP for mission-critical OT services
- Mission-critical service availability with advanced redundancy and protection schemes
- Support of legacy TDM/SDH interfaces
- Flexible SCADA support (TDM and Packet)
- Layer2 and Layer 3 encryption
- NFVi for best-of-breed point-of-access security applications
- Unrivaled multiservice support ready for future business evolution

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#### Apollo

##### Optimized Optical Transport for Critical Industries

The Apollo product line provides state-of-the-art transparent and flexible DWDM transport with integrated OTN and packet switching capabilities. Apollo's modular architecture enables solutions that extend from the access network to the metro core to regional longhaul spans in point-to-point, ring, and mesh architectures. Apollo combines high-performance, low-latency OTN transport and OTN switching with software-configurable optical routing for maximum efficiency. Apollo has unique integrated intelligence features to make network administration and maintenance simple and insightful. The key benefits that Apollo provides for CI network operators are:

- Flexible optical infrastructure including ADMs, ROADMs, muxponders, and amplifiers
- Seamless integration with the packet layer
- Optical encryption per service
- LightPULSE™ provides integrated OSNR reporting and OTDR capabilities for the fiber network, allowing easy detection of network degradation or failure and rapid repair
- Ready-for-future business evolution with WDM, scalable from 10 Gbps to 1 Tbps.

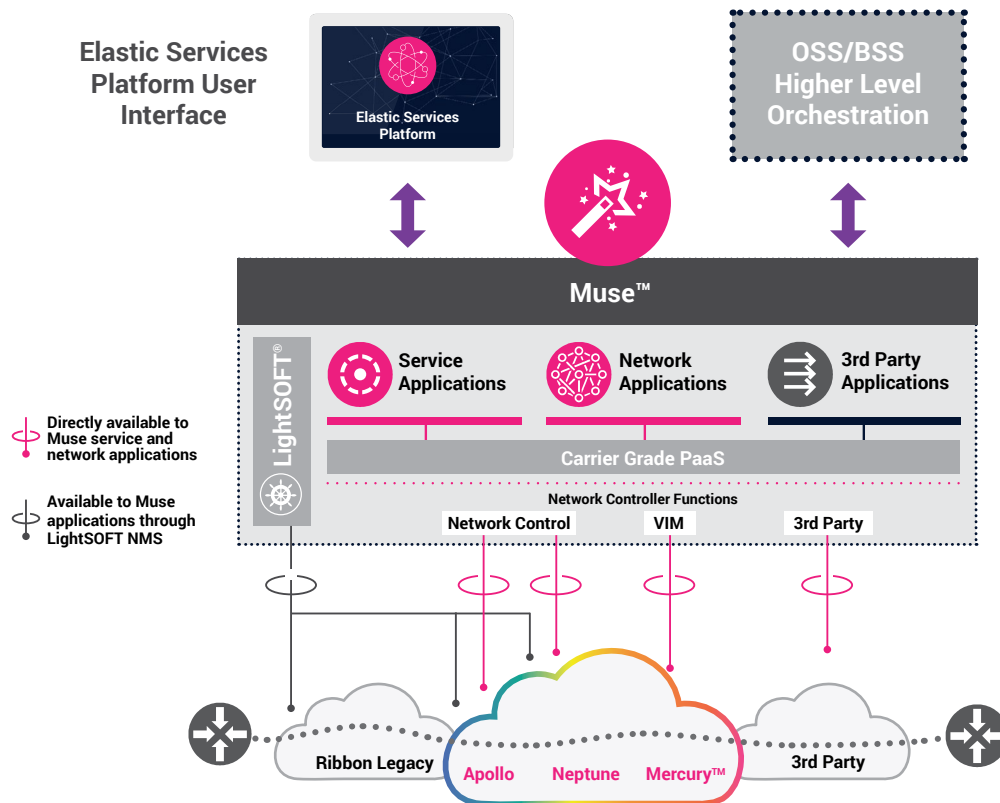
### Muse™ Software Suite

#### Advanced Operations Software

The Muse suite is Ribbon's holistic software offering, leveraging the best of industry-leading management systems and applications. Muse delivers real-time control over a secure network infrastructure and automates the service and network operation lifecycles.

The key benefits Muse provides for CI network operators are:

- **Service lifecycle applications** – that use intelligence and automation to enhance the management of services over their complete lifecycle.
- **Network lifecycle applications** – that ensure the network infrastructure is in place, optimized, and running smoothly.
- **LightPULSE™** – uses OTDR and OSNR to detect and locate fiber degradation and failure
- **LightSOFT®** – provides multilayer, intuitive network management, allowing CI network operators to manage their networks in real time.
- **LightINSIGHT™** – a LightSOFT™ application that ensures the network is operating at maximum availability, utilization, and efficiency.
- **Muse 3rd-party NE Controller** – provides management of third-party network elements
- **Standard interfaces** – facilitate integration into wider ecosystems.

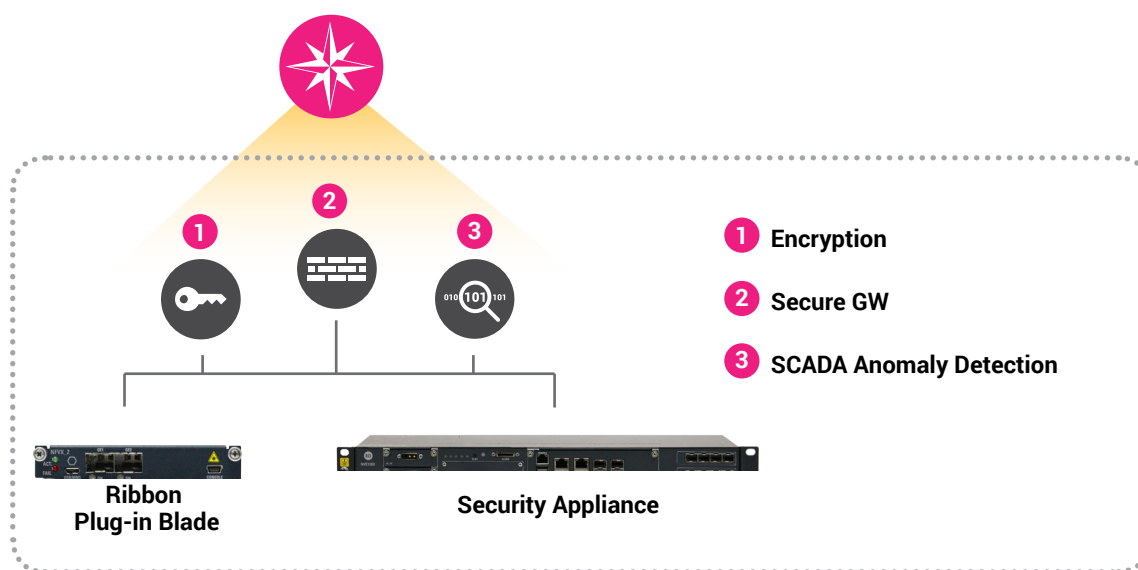


### Muse™ Cyber Security Platform

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.

Neptune™ uses the Mercury™ NFV platform to host virtual network functions (VNFs) which provide advanced security capabilities. These include physical layer security with encryption, firewalls, and intrusion detection. It provides the capabilities to identify and tackle potential attacks in several ways:

- **Prevents 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 and ranks them by severity.



## Risk-Free Modernization

Your Challenges	Our Solutions
To modernize and digitize the network, while assuring mission-critical SLAs (Service Level Agreements)	<b>Ribbon provides a risk-free evolution path that gives Critical Infrastructure network operators confidence for modernizing their networks, including:</b> <ul style="list-style-type: none"> <li>Field-hardened, proven migration processes</li> <li>Elastic MPLS, allowing legacy, current, and future transport mechanisms to be supported from a single platform</li> <li>Seamless integration of packet and optical transport</li> <li>MPLS-TP to provide the deterministic packet transport and advanced OAM required for mission-critical (OT) services, such as teleprotection and SCADA</li> <li>IP/MPLS to support non-mission-critical and IT services</li> <li>Optical transport with OTN for high-bandwidth services, like HD video and DCI</li> <li>Multiple field-proven migration paths for legacy TDM and SDH networks</li> <li>Advanced software tools for lifecycle management with automation, analytics, assurance, planning, maintenance, and monitoring.</li> </ul>
A platform with extended lifetime in the network	<b>Designed to have a 15-year deployment lifetime as standard:</b> <ul style="list-style-type: none"> <li>Elastic MPLS supports seamless introduction of new technologies, such as segment routing as they become viable for CIs</li> <li>Utelco-ready mobile and IoT backhaul, business services, and Carrier-of-Carrier services</li> <li>Future-proof SDN (Software Defined Networks) already available</li> <li>New functionality easily added with Mercury NFV (Network Function Virtualization).</li> </ul>

## Secure Operations Technology (OT)

Your Challenges	Our Solutions
Meet security regulations and standards as they evolve	<b>Provides tailored, holistic security:</b> <ul style="list-style-type: none"> <li>Muse Cyber Security Suite is designed to comply with security regulations and standards (NERC-CIP, BSI, ENISA, and more).</li> </ul>
Point of access security for OT	Muse Cyber Security Suite uses the Mercury NFVi capability, embedded on Neptune™, to provide comprehensive protection for OT at the point of access with secure gateway functionality, including SCADA-aware firewall and other tools.
Zero-day attacks	Distributed SCADA Anomaly Detection and DPI (Deep Packet Inspection)
Protection from man-in-the-middle attacks	<b>Neptune provides packet transport protection with:</b> <ul style="list-style-type: none"> <li>MACSEC support fully compliant with IEEE802.1AE, IEEE 802.1AEbn-2011, IEEE 802.1AEbw-2013, IEEE 802.1X-2010 (MKA protocol)</li> <li>IPSEC</li> </ul>

## Solutions Optimized for Critical Industries

Your Challenges	Our Solutions
Platforms optimized for the CI environment	<b>Extensive multiservice capabilities that support OT services, IT services, and advanced consumer services from a single platform:</b> <ul style="list-style-type: none"> <li>Pay-as-you-grow architecture with unique in-service expansion units, scalable cross-connects, and in-service upgradable packet fabrics</li> <li>Compact form factor with high density and low power consumption</li> <li>Environmentally hardened</li> <li>Power over Ethernet interfaces to power external devices</li> <li>Support of utility-grade mission-critical services</li> <li>Compliance to strict regulations and standards (e.g. IEC 61850, IEEE 1613, EN 50121)</li> </ul>
Single solution across the entire network	<b>One-stop-shop for the entire communications network:</b> <ul style="list-style-type: none"> <li>Ribbon provides end-to-end project management and utility-grade end-to-end network management</li> <li>Muse 3rd-party NE Controller for third-party device 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.