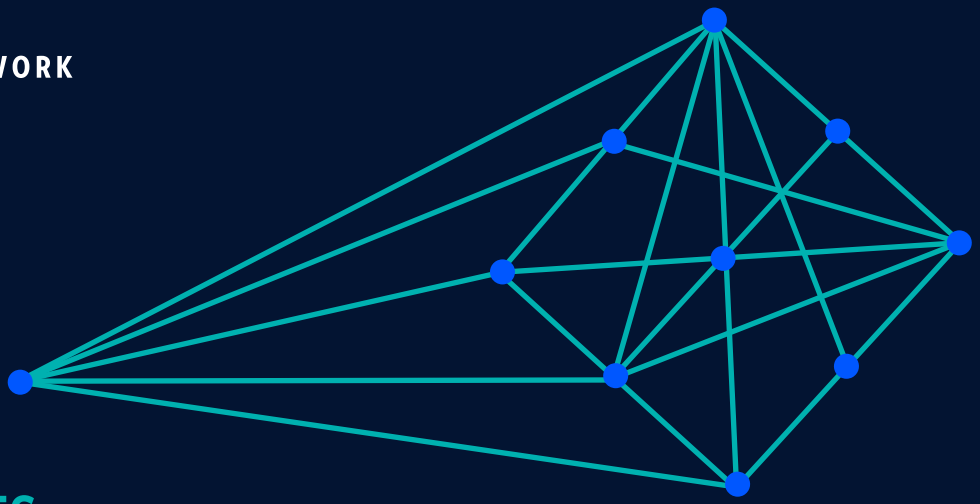
ECI THE ELASTIC NETWORK

NEPTUNE
FOR CRITICAL INFRASTRUCTURES



Critical Infrastructures (CI) are under increasing pressure to improve their services, reduce carbon emission, and increase safety. To achieve this, vast amounts of smart IoT devices are being introduced to achieve better control of network resources. High-resolution video from CCTV cameras is used to increase security, improve safety, and provide better customer services. All the data from these devices must be analyzed in real-time and this requires a modernized, secure IP communication network. The Neptune product family, powered by ECI's unique Elastic MPLS technology and supported by its Muse™ software gives ritical infrastructures a risk-free, future-proof transition path to this new digitized network. At the same time, it provides optimized support for legacy, mission-critical applications like SCADA, teleprotection, and emergency communications.

Risk-Free Transition
for tailored network evolution

Secure Packet
for mission-critical services

High Availability
by advanced network architecture

Multiservice
for seamless evolution to IP

DRIVERS OF MODERNIZATION

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

INTERNET OF THINGS
- Always-connected sensors
- SCADA
- Automation and control
- Smart devices

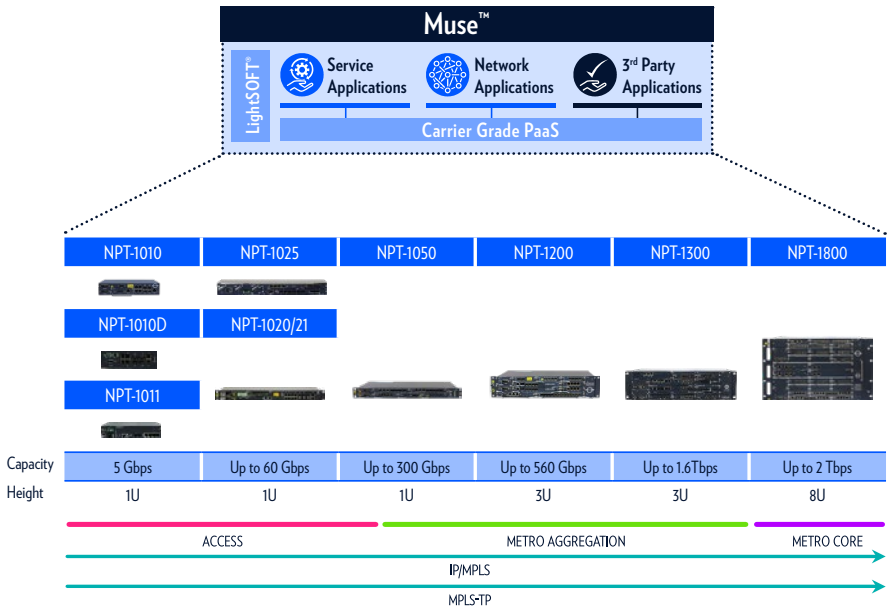
REGULATION
- Compliance to standards
- Carbon emission reduction
- Improved service availabilityand customer satisfaction

SECURITY AND SAFETY
- Control automation
- Safety recommendation
- Video surveillance
- Cyber and physical security

COST-EFFECTIVE AND RISK-FREE TRANSITION TO PACKET

The Neptune product family provides cost-effectiveness to a packet-based network. This comprehensive portfolio ensures the right-sized platform that is always available, with unique, in-service, pay-as-you grow capabilities, allowing easy capacity and technology expansion, as follows:

- **Capacity is added when needed** with 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.

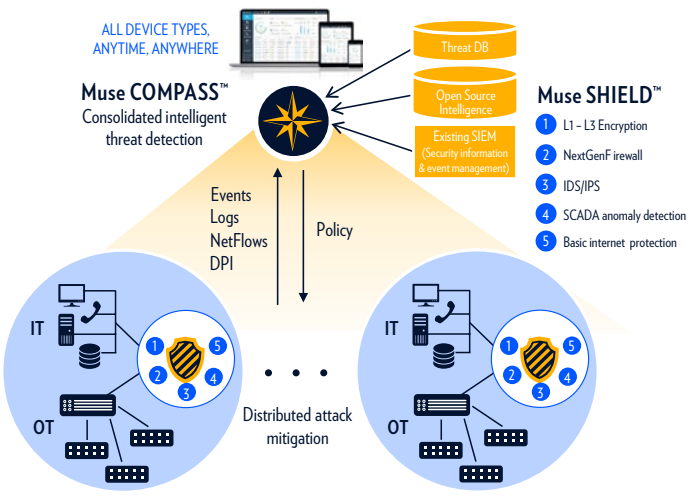


HOLISTIC SECURITY SUITE

Critical infrastructures are a prime target for cyber-attacks. Data security is a particularly complex matter. It must protect both Information Technologies (IT) and Operational Technologies (OT) and be able to identify tangible threats from the multitude of reported events.

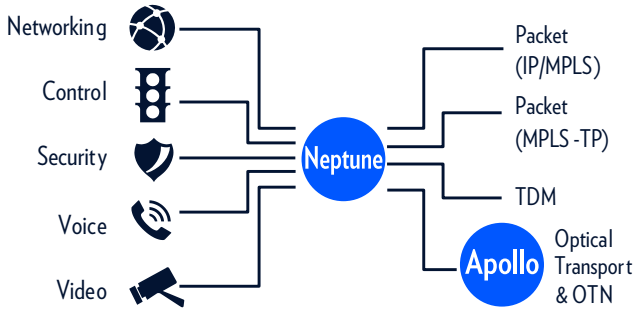
Neptune uses the Mercury™ NFV platform to host the Muse Cyber Security SHIELD. This provides physical layer security with encryption, firewalls, and intrusion detection. It provides the capabilities to identify and deal with potential attacks in several ways:

- **Prevents attacks where they occur** with distributed attack mitigation.
- **Guards the integrity of the SCADA and OT network.** The system maintains a complete OT network map and monitors all transactions for abnormal behavior continuously, 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.



MULTISERVICE PLATFORM

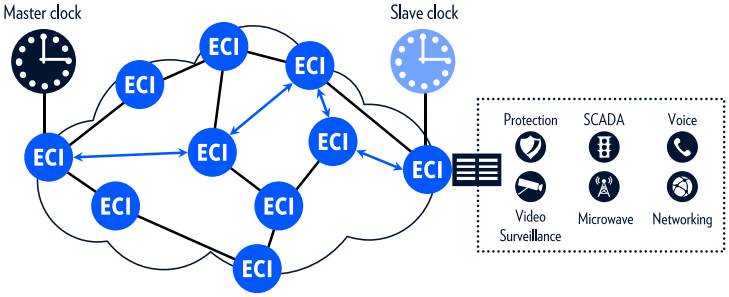
Neptune uses elastic MPLS to provide a complete multiservice platform for critical infrastructures, with OT and IT services supported over the most appropriate transport technology. Mission-critical OT, like SCADA, requires the static, deterministic behavior that TDM and MPLS-TP provide. On the other hand, 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. Configuring and maintaining the SLAs and QoS on a service-by-service basis supports this without compromising security. Neptune can be integrated seamlessly into an optical transport layer, providing cost-efficient transport of the high-capacity data generated by video and other IT applications.



Networking	FE, 1GE, 10GE
Control	V.35, X21, RS-232, RS-449, V.24, V.11, V.36
Teleprotection	IEEE-C37.94
Voice	E1/T1, FXO/FXS, 2/4 E&M, Omni
Video	Ethernet with PoE+

As networks evolve to packet, the deterministic, bidirectional traffic paths used by MPLS-TP ensure that robust timing is maintained. For critical infrastructures wishing to use their unique geographical footprint to generate extra revenues as a Utelco, the multiservice capabilities of Neptune provide the managed L2 and L3 VPNs required for business services, residential services, mobile backhaul, and future IoT applications.

LightSOFT® provides network management for all ECI products. It provides right-first-time network provisioning, rapid fault isolation, and automation of routine tasks for easier and smooth day-to-day operation. Muse software applications take this a step further, providing advanced operation software to analyze network data, ensuring the network is operating at maximum availability, utilization, and efficiency.



COST-EFFECTIVE AND RISK-FREE TRANSITION TO PACKET

Critical infrastructures require communication networks that provide 'five-9s availability' or better. Neptune achieves 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 energy 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 a catastrophic failure
- **Network data collection and analysis:** LightINSIGHT™ provides advanced network data analysis to help identify trends over time.

TECHNICAL SPECIFICATIONS

RISK-FREE SCALABLE TRANSISTION	RISK-FREE TRANSITION • **Legacy Interface support:** SNMPv2/v3, CLI • **Transport technologies:** Elastic MPLS supports IP/MPLS. MPLS-TP and segment routing • **Traditional management systems:** Muse Software Suite, LightSOFT, LightINSIGHT, Muse Cyber Security Suite, EMS-NPT, LCT • **Future proof:** Muse Software Suite, OpenFlow, NETCONF/YANG, PCEP, BCP-LS (Fut)
	IN-SERVICE SCALABILITY • **Elastic Modularity:** Expansion unit provides 3 slots for in-service capacity and technology expansion • **Switching fabric expansion:** Adding extra switch cards increases the switch matrix capacity
SECURE PACKET	TAILORED, HOLISTIC SECURITY WITH THE MUSE CYBER SECURITY SUITE • **OT security:** Integrated SCADA protection, secured connectivity, and secured services • **IT Security:** L2 and L3 VPNs: for secure business services with guaranteed SLAs and QoS, L1 to L3 encryption with L1 optical intrusion detection from LightPULSE™
MULTISERVICE	ELASTIC MPLS (PACKET) • **Services:** MEF CE2.0 (E-Line, E-LAN, E-Tree, E-Access), Ethernet, L2/L3 VPNs, MPLS-TP, IP/MPLS, Segment Routing • **Service Interfaces:** FE, 1GE, 10GE, 100GE
	TDM • **Services:** Native TDM, CES (SAToP, CESoP and CEP) • **Service interfaces:** n x 64Kbps (FXO, FXS, 2/4W E&M, V24, V35, V36, V11, RS422, RS449, C37.94, OMNI, G.703 64K), E1/T1, E3/DS3, STM-1/OC-3, STM-4/OC-12, STM-16/64
	OTN • **Capacity**: 3 x 40G • **Services**: Ethernet, Storage, Video, SDH/ SONET • **Service interfaces**: 10GE, FC-1/2/4/8/10, SDI, HD-SDI, DVB-ASI, STM-16/64, OC-12/48 • **Transport interfaces**: OTU-1, OTU-2, OTU-2e
	WDM • CWDM, DWDM, Muxponder, Amplifiers
	FLEXIBILITY • **Switching platforms**: Packet +TDM, Packet only • **Topologies**: Mesh, multi-ring, ring, star, linear • **Protocol conversion**: IP/MPLS and MPLS-TP stitching, pseudo-wire headend termination
HIGH AVAILABILITY	PROTECTION AND RESTORATION HW redundancy for common units, I/O Hardware protection (IOP), G.8032 Ethernet Ring Protection (ERP), MPLS-TP FRR, Dual FRR, 1:1 Linear protection, PW Redundancy, Virtual Router Redundancy Protocol (VRRP), MS-PW, IEEE 802.3ad Ethernet Link Aggregation (LAG), Multi-chassis LAG Transport interfaces: OTU-1, OTU-2, OUT-2e
	TIMING AND SYNCHRONIZATION SyncE, 1588v2, External timing 1PPS and TOD, Internal Stratum 3 clock (holdover state), Primary and secondary sources (supports SSM bits), ACR, DCR, loop timing on SAToP, BITs (2MHz/2Mbit)
	OPERATIONS, ADMINISTRATION, AND MAINTENANCE (OAM) Ethernet OAM (IEEE 802.1ag and ITU-T Y.1731 PM), IP/MPLS OAM (LSP Ping, LSP Trace-route), MPLS-TP OAM (CC/AIS/RDI/LB/LT/DM), Bidirectional Forwarding Detection (BFD), RFC 2544 generator, Y.1564
	TRAFFIC MANAGEMENT AND SECURITY **Traffic Management:** Traffic Classification (based on Port, VLAN, Port+VLAN, IEEE 802.1p, IPv4/IPv6 TOS and DSCP), Network-wide Call Admission Control (CAC), 8 Classes of Service (CoS) • **Security:** Access Control List (ACL), Radius, IEEE802.1x, SSH, SSA, Encrypted OSPF (HMAC-SHA256)

Specifications subject to change without notice

Contact us to find out how our ELASTIC networks can help you grow

ABOUT ECI

ECI is a global provider of ELASTIC network solutions to CSPs, utilities as well as data center operators. Along with its long-standing, industry-proven packet-optical transport, ECI offers a variety of SDN/NFV applications, end-to-end network management, a comprehensive cyber security solution, and a range of professional services. ECI's ELASTIC solutions ensure open, future-proof, and secure communications. With ECI, customers have the luxury of choosing a network that can be tailor-made to their needs today – while being flexible enough to evolve with the changing needs of tomorrow. For more information, visit us at www.ecitele.com