Carrier Ethernet Technical Standard Compliance Register: Industrial Ethernet Switch Ring Topology Recovery Protocols (ERPS G.8032)

PLATFORM ROLE IN ISP

The Industrial Ethernet Switch Ring Topology Recovery Protocols (ERPS G.8032) platform is a carrier-grade Ethernet switching solution engineered for service provider and industrial networks requiring deterministic sub-50ms ring protection. This document serves as the official technical standard compliance register, detailing the hardware architecture, protocol conformance, and deployment capabilities of the ERPS G.8032 switching platform. It is intended for network architects, ISP infrastructure planners, and industrial automation engineers designing resilient ring-based topologies.

The platform integrates ITU-T G.8032 Ethernet Ring Protection Switching (ERPS) with a non-blocking switching fabric, hardware-assisted fault detection, and carrier-class OAM, delivering a turnkey solution for access, aggregation, and industrial ring networks.



NON-BLOCKING FORWARDING ARCHITECTURE

The Industrial Ethernet Switch Ring Topology Recovery Protocols (ERPS G.8032) platform employs a non-blocking, store-and-forward architecture with a high-performance switching ASIC that supports line-rate forwarding across all ports. The internal fabric is designed to sustain full-duplex traffic on all interfaces simultaneously, eliminating head-of-line blocking and ensuring deterministic latency for ring protection messages.

Key architectural elements include:

- ERPS State Machine Hardware Offload: Dedicated logic for Ring Automatic Protection Switching (R-APS) message processing, enabling sub-50ms recovery independent of CPU load.

- Multi-Ring Support: Concurrent operation of multiple ERPS rings with independent or interconnected protection domains.
- Ring Interconnection: Support for multi-ring/ladder topologies with defined interconnection nodes and virtual channel handling.
- Fault Detection: Hardware-assisted link fault detection and remote defect indication via Ethernet OAM (IEEE 802.1ag, ITU-T Y.1731).
- Load Balancing: Optional ERP instance mapping to VLANs for traffic engineering across rings.

TRAFFIC SHAPING QOS

The platform provides comprehensive QoS capabilities to ensure that R-APS protocol messages receive strict priority treatment, while ring traffic is shaped according to service-level agreements. The QoS subsystem includes:

- Eight hardware queues per port with strict priority and weighted round-robin scheduling.
- IEEE 802.1p/DSCP trust and mapping, with configurable per-queue shaping.
- Dedicated queue for control-plane protocols (ERPS, STP, LLDP, OAM) ensuring uninterrupted ring protection signaling.
- Policing and marking for ring-bound traffic to prevent congestion from impacting recovery times.

- Multicast and broadcast storm suppression to maintain ring stability.

PERFORMANCE PARAMETERS

The following performance parameters define the operational envelope of the ERPS G.8032 platform:

- Ring Recovery Time: < 50 ms per ITU-T G.8032 recommendation, independent of ring size up to maximum supported nodes.
- Maximum Ring Nodes: Up to 255 nodes per ring (hardware dependent).
- Maximum Rings per Device: Up to 16 concurrent ERPS rings.
- MAC Address Table Size: 32K entries per device.
- VLAN Support: 4K VLANs (IEEE 802.1Q), with 1:1 and 1:N VLAN mapping for ERP instances.
- Jumbo Frame Support: Up to 9,600 bytes.
- Switching Capacity: 128 Gbps to 598 Gbps depending on model.
- Forwarding Rate: 95.2 Mpps to 446.4 Mpps.

Parameter	**Specification**
Form Factor	1RU to 4RU rack-mountable, modular options
Switching Capacity	128 Gbps to 598 Gbps

Forwarding Rate	95.2 Mpps to 446.4 Mpps
MAC Address Table	32K entries
VLAN Support	4K VLANs (IEEE 802.1Q)
ERPS Rings	Up to 16 concurrent rings
Ring Nodes	Up to 255 nodes per ring
Ring Recovery Time	< 50 ms (ITU-T G.8032)
Jumbo Frames	Up to 9,600 bytes
Power Supply	Dual hot-swappable redundant AC/DC
Cooling	Redundant fan trays, front-to-back or back-to-front airflow
Management	Console, USB, RJ45, out-of-band Ethernet
Operating Temperature	-40°C to +75°C (industrial variants)
MTBF	> 300,000 hours
Compliance	ITU-T G.8032, MEF, IEC 61850-3, IEEE 1613, EN 50121-4

MEF STANDARDS

The Industrial Ethernet Switch Ring Topology Recovery Protocols (ERPS G.8032) platform complies with the following MEF and carrier Ethernet standards:

- MEF 2: Requirements and Framework for Ethernet Service Protection.

- MEF 6.2: Ethernet Services Definitions Phase 2.

- MEF 10.3: Ethernet Services Attributes Phase 3.

- MEF 17: Service OAM Requirements and Framework.

- MEF 26.1: External Network Network Interface (ENNI) Phase 2.

- MEF 30.1: Service OAM Fault Management Implementation Agreement.

Additionally, the platform supports ITU-T G.8032/Y.1344 (Ethernet Ring Protection Switching) versions 1 and 2, including:

- Revertive and non-revertive operation.

- Signal fail (SF) and signal degrade (SD) triggers.

- Manual switch, forced switch, and clear commands.

- Multi-ring/ladder topology support.

- Interconnection node and virtual channel handling.

- R-APS message authentication and priority handling.

ARCHITECTURE DIAGRAM



DEPLOYMENT HIGHLIGHTS

- Sub-50ms ring recovery for mission-critical industrial and carrier networks.
- Seamless integration with existing ring topologies and mixed-vendor environments.
- Comprehensive OAM for proactive fault detection and performance monitoring.
- Redundant hardware design with hot-swappable power supplies and fans.
- Carrier-grade reliability with MTBF exceeding 300,000 hours.

STRUCTURAL CHASSIS OVERVIEW

- Form Factor: 1RU to 4RU rack-mountable, depending on port density and modularity.

- Port Configurations: 8 to 48 Gigabit Ethernet ports, 4 to 24 10 Gigabit Ethernet ports, and optional 40/100 Gigabit uplinks.
- Redundancy: Dual hot-swappable AC/DC power supplies, redundant fan trays.
- Cooling: Front-to-back or back-to-front airflow options.
- Management: Console, USB, RJ45 management port, and out-of-band Ethernet management.

SUPPORTED TRANSCEIVER INTERFACES

- SFP/SFP+: 100/1000 Mbps and 10 Gbps optical/copper transceivers.
- QSFP+/QSFP28: 40/100 Gbps optical transceivers.
- RJ45: 10/100/1000 Mbps copper ports.
- Console: RJ45 and USB-C.

PERFORMANCE SPECS

[TABLE_1]

CARRIER ACCREDITATIONS

- CE, FCC, RoHS, WEEE.
- IEC 61850-3 and IEEE 1613 for substation automation.

- EN 50121-4 for railway applications.

- NEMA TS-2 for traffic control systems.

- ITU-T G.8032 compliance certified.

TOPOLOGY SCHEMATIC

[IMAGE_2]