Carrier-Grade Routing Solution Brief: Deploying ruggedized ethernet switch cost

# CARRIER-GRADE ROUTING SOLUTION BRIEF: DEPLOYING RUGGEDIZED ETHERNET SWITCH COST

## 1. TARGET NETWORK POSITIONING

The ruggedized ethernet switch portfolio is purpose-engineered for deployment in mission-critical, environmentally harsh network segments where commercial-grade equipment presents unacceptable failure rates. Typical installation domains include: wayside railway communications, offshore energy platforms, intelligent traffic systems (ITS), military field-deployable networks, and heavy industrial IoT backbones. This solution brief addresses total cost of ownership (TCO) amortization across a 15-year service life, factoring both capital expenditure (CAPEX) for the hardened hardware and operational expenditure (OPEX) savings from reduced field replacement cycles.



2. HARDWARE-LEVEL FAILOVER REDUNDANCY

The ruggedized switching platform eliminates single points of failure through dual-redundant, hot-swappable power supplies (rated -48V DC or 110/240V AC auto-sensing) and a modular fanless thermal dissipation system. Key redundancy metrics:

- Mean Time Between Failures (MTBF): >500,000 hours @ 85°C ambient (Telcordia SR-332).

- Redundancy Protocol: ITU-T G.8032 Ethernet Ring Protection Switching (ERPS) with sub-50ms failover.

- Dual image boot support with automatic rollback on corrupted firmware detection.

3. PROTOCOL SUPPORT MATRIX

Layer 2 switching and Layer 3 routing capabilities are fully deterministic even

under full line-rate load. Supported protocol suite includes:

- Layer 2: IEEE 802.1Q VLAN (4K active VLANs), QinQ (double tagging), MSTP/RSTP, Link Aggregation (LACP 802.3ad).

- Layer 3: Static routing, OSPFv2/v3, BGP-4, VRRP, Policy-Based Routing (PBR).

- Management: SNMPv3, CLI (full RS-232 console), RESTCONF, RADIUS/TACACS+ integration.

4. CORE PARAMETERS

- Packet forwarding: Non-blocking store-and-forward architecture with 64-byte packet line-rate performance on all ports.

- Frame size: Jumbo frame support up to 12,288 bytes.

- MAC table: 32K entries.

- IPv4/IPv6 route table: 16K routes (shared).

| **Parameter** | **Specification** |
|---|---|
| Form Factor | 1RU Ruggedized Steel Chassis (IP40 ingress protection) |
| Switching Capacity | 128 Gbps (non-blocking, full duplex) |
| Power Supply | Dual Hot-Swappable Redundant: 48V DC (18-75V) or AC 100-240V auto-sensing |
| Operating Temperature | -40°C to +85°C (no fan, convection |

| | |
|---|---|
| | cooled) |
| Shock & Vibration | IEC 61373 (railway), MIL-STD-810G Method 514.7 |
| Port Density | Up to 24x Gigabit RJ45 + 6x 10G SFP+ (factory configurable) |
| Forwarding Rate | 95.2 Mpps (64-byte packets) |

5. LIFECYCLE ASSURANCE (MTBF)

Our ruggedized portfolio undergoes HALT (Highly Accelerated Life Testing) beyond standard IEC 60068-2 specifications. The cost model reflects a 0.5% annualized failure rate (AFR) across the first 10 years, compared to 8-12% AFR for non-ruggedized alternatives in similar thermal/vibration profiles. Each unit ships with a 5-year advanced replacement warranty, extendable to 10 years via service SKU.

6. TARGET BACKBONE TOPOLOGIES

- IP surveillance rings (up to 30 nodes, automatic ring healing).
- Redundant star-of-rings for substation automation (IEC 61850-3 compliance).
- Linear daisy-chain with ERPS protection for roadside toll collection.



DEPLOYMENT COST SUMMARY

- Entry-tier (8x Gigabit RJ45, 2x SFP): Optimized for edge aggregation, low port density.

- Mid-tier (16x Gigabit combo, 4x 1G/10G SFP+): For distribution layer with PoE+ (90W/port).

- Carrier-tier (24x Gigabit, 6x 10G SFP+, 2x 40G uplink): Full L3 routing, industrial temperature (-40°C to +85°C).

Contact your regional systems engineer for a TCO modeling worksheet customized to your environmental class and deployment scale.