Carrier Ethernet Protection Options

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Predictable Resilience Options

**G.8032**
- OpEx friendly (E-Line, E-LAN, and E-Tree services)
- Low CapEx
- Sub 50ms protection
- Standardized in ITU-T SG15/Q9 G.8032

**PBB-TE**
- IEEE standard 802.1Qay
- Sub 50ms protection
- Traffic engineering, Static Provisioning

**MPLS**
- Protection via FRR or BFD mechanisms
- Dynamic control plane

**MPLS-TP**
- Sub 50ms protection
- Static provisioning model (or dynamic control plane)
G.8032 Ethernet Rings
Major Rings, Sub-Rings & Operator Commands

Ethernet Ring Values
- Efficient connectivity (P2P, multipoint, multicast)
- Rapid service restoration (<50 msecs)
- Technology agnostic (runs over Ethernet, OTN, Sonet etc...)
- Fully standardized (in ITU-T SG15/Q9 G.8032) → Feb’08
- Scales to a large number of nodes and high bandwidth links (GE, 10G, 40G, 100G)

→ Standalone rings
→ Single and dual homed ring
→ Ring ladders
→ Sub-ring homing on multiple parent rings

Plus
- Services crossing multiple metro rings
- Efficient hierarchical aggregation
- Multiple metro ring topologies
- Single and dual homing configurations
- CESD & transport portfolio interoperability
- Transport-like operator commands
  • Force switch and clear
G.8032 Failure/Restoration Walk-thru

1. a) Normal configuration

2. b) Ring span failure occurs

3. c) LOS detected
d) Port blocking applied
e) APS message issued

4. f) R-APS causes forwarding database flush
g) Ring block removed
G.8032 Sub-rings: How it Works

A sub-ring is a G.8032 ring that:

• On its own, does NOT form a closed loop.
• Is connected to other G.8032 ring via a pair of interconnection nodes

Traffic between the interconnection nodes is controlled by the major G.8032 ring(s) via an interconnection link.

**Major Ring**

- Data traffic is prevented from ingressing/egressing the port
- Control traffic (R-APS messages) not forwarded across the node
  - R-APS messages are still handed to SW for processing locally
  - Local SW generated R-APS messages are still allowed out the port
  - A failure of the Interconnection link causes protection switching of the major ring ONLY.

**Sub-Ring**

- Sub-Ring’s RPL channel block only block client traffic, not R-APS messages
- Sub-Ring’s implicitly block R-APS messages at their interconnection node termination ports.
G.8032 Ethernet Ring Protection with Sub-Rings

- Services across multiple ring topologies
- Sub-ring Protection Switching
- Transport Like – “Operator Commands”
Example G.8032 Network Applications

Wireless Backhaul

Business Services - Private Build

Business Services - Access

Business Services - DSL Aggregation
**MPLS-TP LSP Protection**

- **Legend**
  - VS: MPLS Virtual Switch
  - MPS to PBB-TE
  - Ethernet to MPLS
  - Ethernet to PBB-TE

- **Key Features**
  - Deterministic traffic engineering & resilience
  - End to end protection, facility backup (1:1 and 1:n protection)
  - OAM toolset for service assurance
Real differentiation:

- Over 16K Carrier Ethernet enabled cell towers (to date)
- Microwave/mmwave access (95%) with fibre aggregation
- Carrier grade networking and OAM
- Automated provisioning
MNO Case Study
What was required/deployed?

- **Carrier Ethernet Backhaul from cell site to mobile switching center**
  - IP/MPLS (with dynamic control plane) deemed too expensive
- **Radio+Fiber Transport** – lowest cost nationwide solution
- **Transports both 3G & 4G Traffic** (30-100 Mbps per cell tower today)
- **Robust resiliency and architectural stability**
  - High service availability via tiered resiliency and diverse path tunnels
- **Fast deployment and time to revenue**
  - simple, fast tunnel & service provisioning (avg. turn up time per tower = 5 min)
- **Network optimization with low latency handovers & restoration**
- **Enhanced scalability** (1000+ sites per Metro / millions of services)
- **QoS and SLA guarantees** (via CIR/EIR per service and per tunnel)
- **Advanced OAM service monitoring**
  - via 802.1ag, Y.1731, per service loop-backs, etc

“This is how networks will be built” - CTO
Thank You