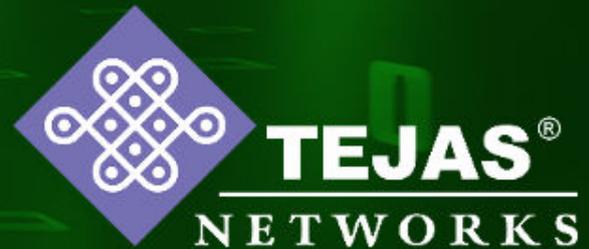


Ethernet Ring Protection Scheme



Future Ready. Today



Introduction

A Hierarchy of Rings is the most common topology for telecom aggregation networks today. Rings offer two points from any client to the POP location, thus protecting against single failures in the network.

Traditionally SDH networks have been built as rings and SDH offers several ways to protect the traffic. SNCP and MS-SP-RING are two ways in which SDH offers 50ms protection on ring traffic. However as transport networks slowly migrate to pure packet, these mechanisms are no longer available. Packet networks need to evolve in order to provide the same 50ms resilience to the network. With this in mind, ITU-T standardized the Ethernet Ring Protection Scheme into the G.8032 standard.

Ethernet Ring Protection Scheme or ERPS is a way of building these 50ms protected shared packet rings over Ethernet. ERPS not only provides 50ms protection, but enables the service provider to build scalable layer 2 aggregation networks. Tejas implementation of ERPS not only provides these shared 50ms protected rings, but offers many additional features which are important from a practical perspective. These features include support for ringlets, multi-ring topologies, dual ring and dual node interconnect and open ring extensions. The key benefits of ERPS are discussed below.

50ms Protection on Packet Rings: This was the prime motivator for developing ERPS and continues to remain the most important benefit. Many applications have been built with the assumption that 50ms protection will be provided by the transport layer. This was always true when the underlying layer was SDH, but with pure packet networks, it became available only when ERPS was developed. In addition, even the applications which do not strictly require 50ms protection would benefit greatly if it was available.

For eg, if the downtime was more than 200ms, TCP will reduce it's window size and slow down the rate at which it is pumping traffic, thinking that there is congestion in the network. Even though the full bandwidth is restored after 200ms, the applications will experience slow connections, for next several seconds or minutes, until TCP restores it's window size. These have implications on Gaming, jitter in Voice and Video traffic and Frame Relay and ATM might reroute traffic.

If the downtime exceeds 2 seconds, TCP timeouts will happen and routing protocols will get affected. In case of more than 10 seconds, all sessions get terminated and routing table reconvergence happens.

RSTP/MSTP vs ERPS: Spanning Tree Protocols are perhaps the most common method of protecting Ethernet meshed networks, is to use RSTP. RSTP suffers from several limitations, some of which include high convergence times (2s to 10s), limitation on network size (maximum of 7 hops).

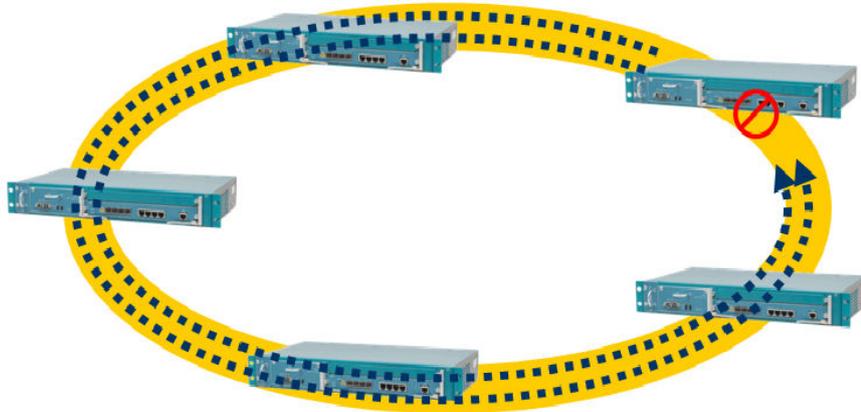
Comparison	RSTP/MSTP	ERPS
Convergence Time	2s to 10s	50ms
Ring Size	Max of 7	No limit
Fault Localization	No (Traffic on entire RSTP domain gets affected)	Yes (Traffic only on the failed ring gets affected)

In order to overcome these limitations, the service providers who deployed Ethernet in the Aggregation Networks, used to keep them small and segregated them using Routers. However this is no longer necessary and complete end-to-end Ethernet Networks can be built, primarily due to ERPS.

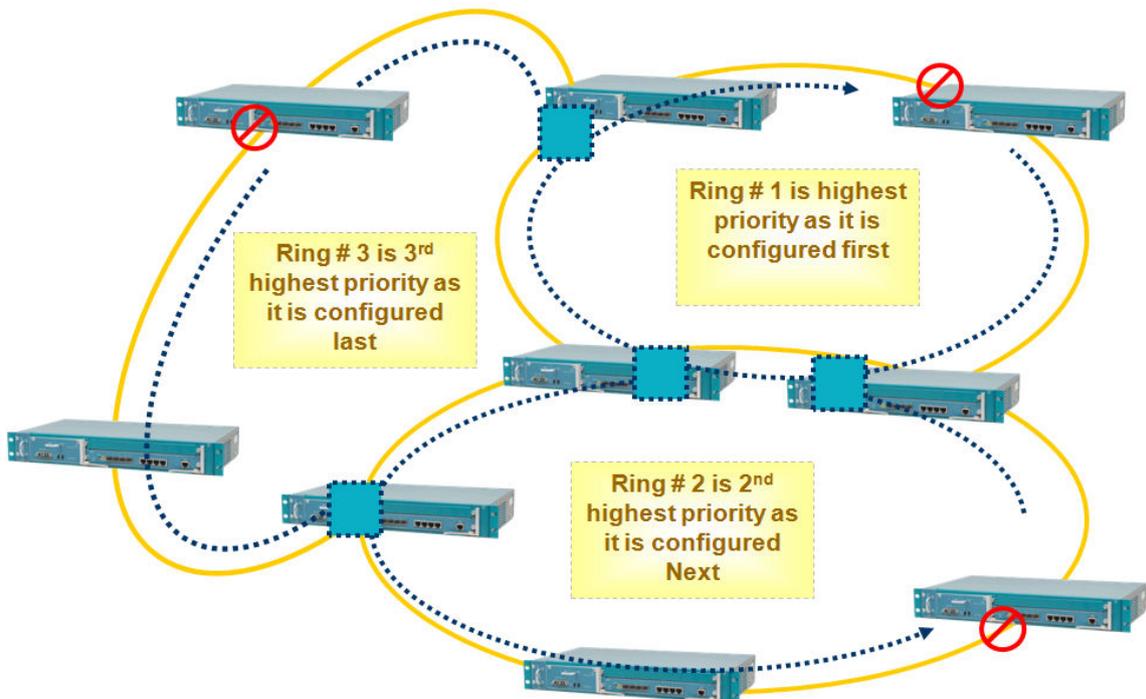
Ringlets for Effective Bandwidth Utilization: Tejas supports segregation of the physical ring into multiple logical rings or ringlets. This enables protected and unprotected traffic to co-exist on the network. Also different scheduling and QoS policies can be applied to different ringlets. A Ringlet is a logical ring into which different VLAN IDs or groups of VLAN IDs can be added and the entire bundle is treated as one logical ring. One key advantage of having ringlets is that different ringlets can block different spans of the ring for loop avoidance. So although one ringlet will use only one side of the ring, but with many ringlets, both sides of the ring get fully utilized. [This leads to doubling of the bandwidth available on the packet ring.](#)

..... Ringlet#1 consists of VLAN #10-25

- A ringlet within a ring is a collection of xVLAN associated to a RingID and is associated with a RingletID.
- Each ringlet is also associated with one control xVLAN for R-APS control messages.



Multi Ring Support: Rings are seldom built as standalone entities. Most networks consist of a hierarchy of interconnected rings. Some of these might share two nodes in common (Dual Node), or might have a single node subtending two rings. The protection requirements of these differ slightly and need to be supported by ERPS. Tejas implementation supports all of these scenarios and handles the corner cases cleanly.



Open Ring Extensions: Mostly the gateway or aggregation router is configured in a redundant topology. The traffic from the aggregation network can reach both the active and standby router, and in case of a failure, all the traffic needs to be switching to the standby router. Tejas supports these use cases through it's open ring extensions to ERPS.

To summarize, ERPS enables 50ms protection, bandwidth efficiency, scalability of the Layer 2 network and more operator control over the network. Thus, ERPS support is a must have for any Carrier Class Layer 2 Networks.