RESILIENT PACKET RING (RPR)

Resilient packet ring technology has been developed for packet based transport for ring topology offers high degree of resilience, optimised data traffic and efficient packet networking. It has extensive performance monitoring, proactive network restoration and flexible deployment capabilities. RPR network are therefore capable of carrying multiple services, including jitter and latency sensitive traffic such as voice and video traffic. RPR combines the best feature of legacy SDH and Ethernet technology into one layer to provide carrier class services.

Over few years demand for Internet protocol is growing at a fast pace while voice demand is remaining more or less stable. Circuit switched voice traffic has to be converted into packet switched data traffic. This does not match with the present SDH technology. Protocols like Frame relay, ATM &PPP are inefficient, costly and complex to scale the increasing demand for data services.

Conventional SDH has implemented improvements, such as VCAT and LCAS, to suite data application. However, SDH transport creates point to point circuits that are not particularly suited for data applications. SDH also reserves bandwidth for every source on the ring and prevents nodes from claiming unused bandwidth

One of major advantages of RPR is that it protects existing investments in fibre and other transmission infrastructure. Most of the metro area fibre is ring based; therefore RPR will best utilising existing fibre facilities. Moreover, apart from dark fibre, RPR can also operate over SDH or DWDM equipment, allowing smooth and efficient migration.

RPR is a layer 2, ring based protocol that combines intelligence of IP routing and statistical multiplexing with the bandwidth efficiencies and resiliency of optical rings. RPR network consist of two counter rotating fibre rings that are fully utilized for transport at all times for superior fibre utilisation instead of keeping a fibre for protection. These fibres are also used to carry control messages such as topology updates, protection, and bandwidth control). Control messages flows in opposite direction to the traffic. The assumption that packet rings made is a packet sent on ring shall eventually reach to the destination node irrespective of the path it take around the ring. This assumption therefore, simplifies the packet handling by the node that is now node has to receive, transmit or forward the packet. RPR permits more efficient use of bandwidth using statistical multiplexing. It also eliminates the need for manual provisioning, because the architecture lends itself to the implementation of automated provisioning. Moreover, there is no need for channel provisioning as each ring member can communicate with every other member based on element's MAC address. RPR also provides two priority queues at the transmission level, which allow the delivery of delay and jitter sensitive application, such as voice and video.

Data can be carried over SDH or over Ethernet physical layer. Packet over SDH physical layer offers robust error and performance monitoring. RPR can be encapsulated with Synchronous payload Envelope using HDLC / GFP encapsulation. The robust SDH physical layer error and performance monitoring mechanism provide information for use of RPR protection mechanism. RPR networks therefore retain many of the performance characteristics, such as protection, low latency and low jitter on SDH. RPR can also be carried over Ethernet physical networks.

RPR architecture is highly scalable, very reliable and easy to manage in comparison to legacy point to point topologies. RPR supports auto discovery of other RPR network elements on the ring. New RPR nodes announce themselves to their direct neighbours with control messages and distribute changes in their settings or topologies. RPR achieves a loop free topology across the rings with rapid recovery mechanism on single span ring break (failure of node or fibre). On failure of ring protection messages are quickly dispatched. It has two protection mechanisms

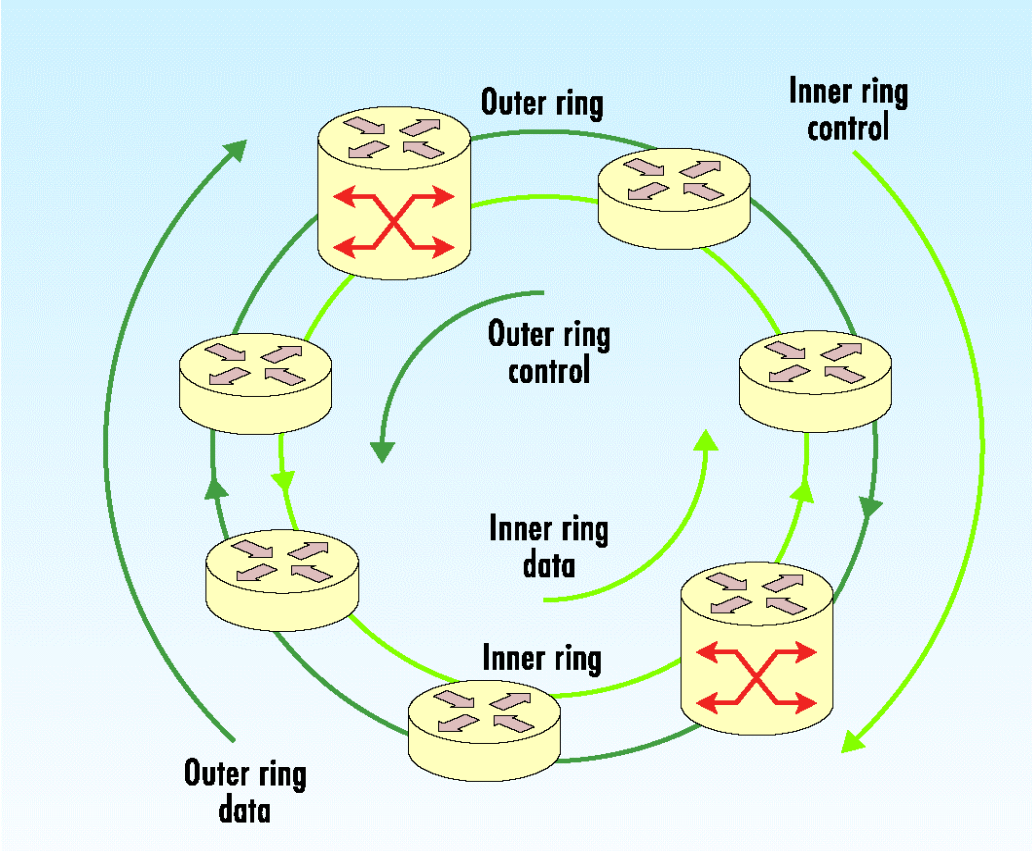

Fig.1 Resilient Packet Ring

1 Wrapping

The nodes which is neighbour to the failed spans, directs the packet away from the failed span by wrapping the traffic around to the other fibre.

2 Steering

In this protection mechanism the information of failed span is notified to all the nodes as against the neighbour nodes only in “wrapping mechanism”. All nodes on the ring then adjust network topology maps to avoid failed span.

The RPR is a new standard of Ethernet transport. It is emerging as solution for metros data transport applications. The goal of RPR is to increase the manageability and resiliency of Ethernet services while providing maximum capacity and usage over an established SDH ring. It has following features:

1. Services: RPR supports latency and jitter sensitive services such as voice and video.
2. Resilience: It provides proactive and automatic span failure protection with in 50 ms recovery time from fibre cut.
3. Efficiency: This technology provides usage of bandwidth in multiple spans that is unlike in SDH where bandwidth is used between source and destination nodes, in RPR the bandwidth is available downstream nodes in ring for use after the packets are received by the destination node.
4. Scalability: RPR support topology for more than 100 nodes in a ring with automatic topology discovery.

5. Utilisation of existing infrastructure: RPR technology provides means for utilisation of existing SDH or DWDM transport for the purpose providing data based services including Jitter and latency services such as voice and video.

RPR effectively transforms a chain of point-to-point SDH paths between nodes to a single virtual shared medium. The shared transport ring created by RPR can then be used over multiple SDH nodes to carry connection-oriented transport services, and enable optimal and fair use of bandwidth for busty services through highly efficient statistical multiplexing.