TEC
TELECOMMUNICATION ENGINEERING CENTRE

NEWSLETTER
टी ई सी संचारिका

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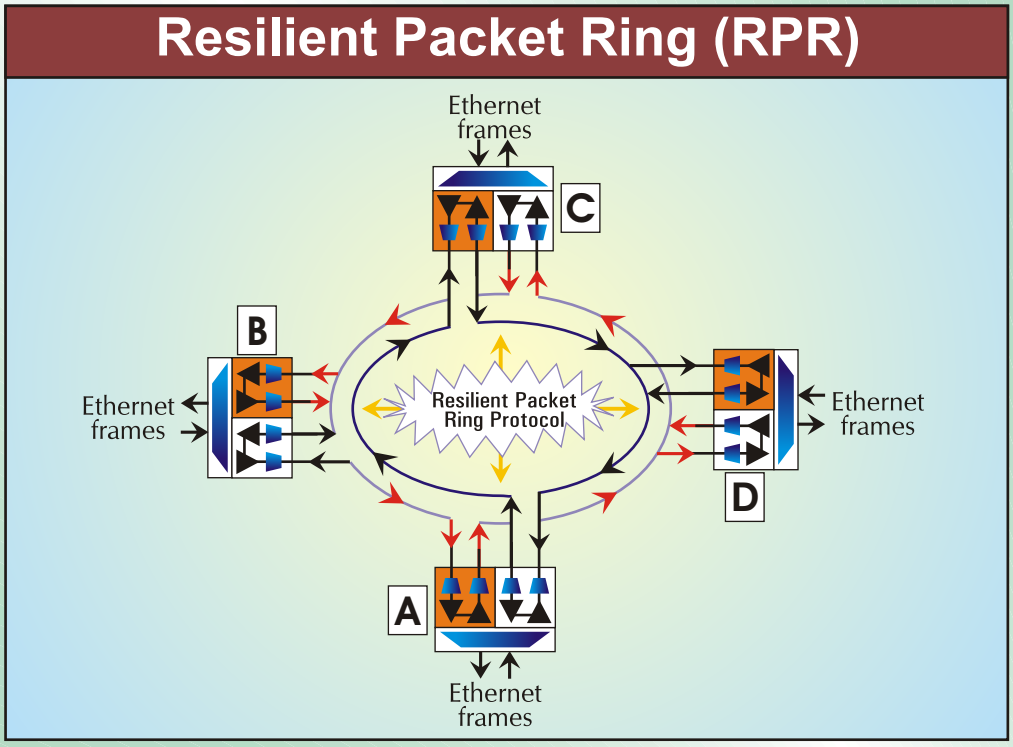
Resilient Packet Ring (RPR)



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Resilient Packet Ring (RPR)

Resilient packet ring (RPR) is a technology defined by the IEEE 802.17 Group for packet-based transport for ring topology offering high degree of resilience, optimised data traffic and efficient packet networking. This technology incorporates extensive performance monitoring, proactive network restoration and flexible deployment capabilities. RPR networks have the ability to carry multiple services, including jitter and latency sensitive traffic such as voice and video. RPR combines the best features of legacy Synchronous Optical Network (SONET)/ Synchronous Digital Hierarchy (SDH) and Ethernet into one layer to maximise profitability while delivering carrier-class service. RPR provides "SONET/SDH" performance at Ethernet economics.

Service providers and enterprise customers are deploying RPR solutions to deliver multiple data, voice, and video services, instead of delivering them over separate parallel networks. RPR has the unique advantage of delivering efficient data transport with the resiliency and performance required by the most demanding applications.

New services such as IP VPN (Virtual Private Network), VoIP (Voice over IP) and digital video are no longer confined within the corporate Local-Area Network (LAN). These applications are placing new requirements on Metropolitan Area Network (MAN) and Wide Area Network (WAN) transport. RPR technology is uniquely positioned to fulfil the bandwidth and feature requirements as networks transition from circuit dominated to packet-optimised infrastructures.

Key Features of Resilient Packet Ring Technology

Resilience: RPR provides proactive span protection and automatically avoids failed spans within 50 ms.

Services: RPR supports latency and jitter sensitive services such as voice and video and Committed Information Rate (CIR) services.

Efficiency: Unlike SONET/SDH, bandwidth is consumed only between the source and destination nodes. Packets are removed at their destination, leaving this bandwidth available to downstream nodes on the ring.

Scalable: RPR supports topologies of more than 100 nodes per ring. Automatic topology discovery mechanism is possible.

Multicast: A RPR multicast packet can be transmitted around the ring and can be received by multiple nodes. Mesh topologies require multicast packets to be replicated over all possible paths, wasting bandwidth.

Spatial Reuse: RPR unicast packets are stripped at their destination. Unlike SONET/SDH networks, where circuits consume bandwidth around the whole ring, RPR allows bandwidth to be used on multiple spans.

Optimisation of Protocols: Packet Ring protocols are exceptionally alluring. They bring the best of SONET-ring optimisation in a protocol with Ethernet data compatibility and bandwidth, making a powerful means of leveraging an existing SONET or DWDM transport infrastructure.

Multi Gigabit Ethernet Transport: RPR can carry 10/100 Mbps Ethernet, 1Gbps and 10Gbps Ethernet.

Classification of Services: RPR provides three level, class based traffic schemes:

Class A Traffic: Low latency and low jitter (Real time voice and video)

Class B traffic: Predictable latency and jitter (streaming voice or streaming video)

Class C Traffic: Best effort transport traffic

(contd… on page 4)

TEC LAUCHES ITS WEB SITE www.tec.gov.in

VISION

TEC shall leverage its status as a "Centre of Excellence"
in Telecom to position India as a
"Lead Telecom Knowledge and Manufacturing Hub"
of Asia-Pacific Nations by
driving Telecom Standards, Manufacturing Support and Network Building Skillsets in the interests of this region and market

MISSION

- To take initiative in NGN and set up world class NGN test-bed.
- Outsource routine interface approval testing of network equipment and CPEs, to cut delays.
- Coordinate "National Technology Think-Tank" to address the development of the entire Telecom eco-system in India.
- Give thrust of Wi-Max and PON technologies to ensure fast-track rollout of broadband in the country, especially in rural areas.
- Evolve Technical standards for National Disaster Relief and Security Control for Telecom networks.
- Fund and encourage R&D in Telecom in public and Private sectors as well as Educational Institutions to make India R&D hub in this region.
- Provide Certification for driving indigenisation and manufacturing take - off India.
- Vigorously participate in professional bodies such as ITU - T, WiMax Forum, TM Forum, Enum Working Group , IETF , IEEE etc. and partner with multilateral organisation like APT , CTO etc. to protect country `s interests.
- Setting up Asia Telecom Standards Institute in New Delhi and Telecom consultancy to S.E. Asia and SAARC countries.
- Actively co-operate with C-DOT to develop Telecom Technologies aimed specifically for local manufacture.

Class A is divided into classes Ao and A_1. Class B is divided into B-CIR (Committed Information Rate) and B-EIR (Excessive information Rate). B-EIR class of traffic is a fairness eligible traffic. In order to fulfil the service guarantee for Ao, A1 and B-CIR classes, traffic bandwidth needed for these classes of services is pre-allocated. For Ao traffic class, bandwidth is reserved and can only be used by the status holding the reservation. Bandwidth pre-allocated for A1 and B-CIR classes is called 'reclaimable' and 'reserved'. Bandwidth not used and not pre-multicasted can be used for FE (Fast Ethernet) traffic. Class C traffic is best effort traffic and not associated with an explicit service guarantee.

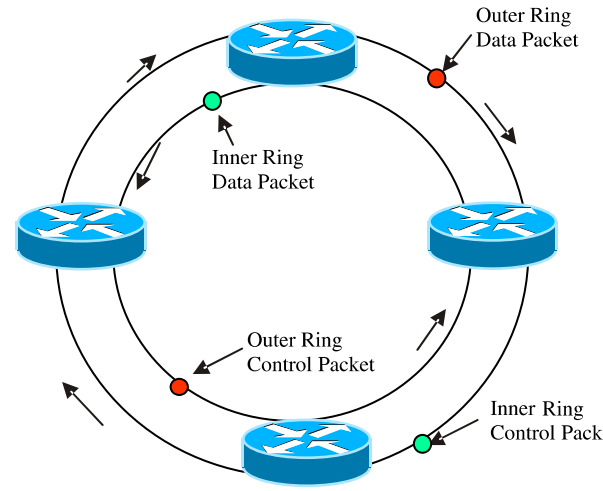
Bandwidth Fairness: For any given link on the ring, every source receives an equal proportion of fairness eligible bandwidth. If all sources have equal weights, then all sources have equal access to the available bandwidth of all links. This mechanism ensures that different ingress traffic streams have fair access to the available ring resources.

How RPR Technology Works?

RPR technology uses a dual counter rotating fibre ring topology. Both rings (inner and outer) are used to transport working traffic between nodes. By utilizing both fibres, instead of keeping a spare fibre for protection, RPR utilises the total available ring bandwidth. These fibres or ringlets are also used to carry control messages (e.g. topology updates, protection, and bandwidth control). Control messages flow in the opposite direction of the traffic. For instance, outer-ring traffic-control information is carried on the inner ring to upstream nodes.

Packet Rings work on the assumptions that a packet sent on the ring will eventually reach its destination node regardless of the path it has taken around the ring. The assumption that the nodes are on a ring, allows many optimisations.

Since the nodes "know" they are on a ring, only three basic packet handling actions, namely **insertion** (adding a packet into the ring), **forwarding** (sending the packet onward), and **stripping** (taking the packet off the ring) are needed. This reduces the amount of work that individual nodes have to do to communicate with each other, especially as compared with mesh networking where each node has to make a forwarding decision about which port to be used for each packet. The "ring assumption" allows better resiliency, multicasting, and bandwidth sharing as compared to traditional Ethernet.

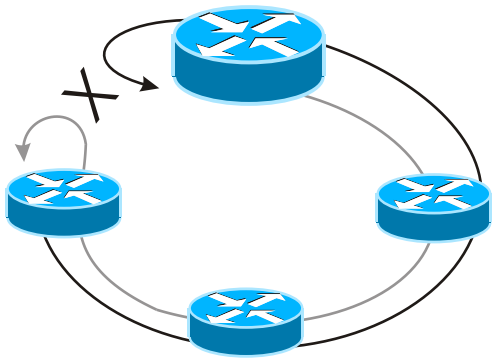


The RPR, being a Layer-2 network protocol, the MAC layer contains much of the functionality for the RPR network. The RPR MAC is responsible for providing access to the fibre media. The RPR MAC can receive, transit and transmit packets.

RPR has the ability to protect the network from single span (node or fibre) failures. When a failure occurs, protection messages are quickly dispatched. RPR has two protection mechanisms Wrapping and Steering:

Wrapping – Nodes neighbouring the failed span will direct packets away from the failed span by wrapping traffic around to the other fibre (ringlet). This mechanism requires that only two nodes participate in the protection event. Other nodes on the ring can send traffic as normal.

Steering – The protection mechanism notifies all nodes on the ring of the failed span. Every node on the ring will adjust network topology maps to avoid this span.



Regardless of the protection mechanism used, the ring will be protected within 50 ms.

Physical Layer

RPR packets can be transported over both SONET and Ethernet physical layers. The SONET/SDH physical layer offers robust error and performance monitoring. RPR packets can be encapsulated within the Synchronous Payload Envelope (SPE) using a High-Level Data-Link Control (HDLC) or Generic Framing Protocol (GFP) encapsulation. A robust Layer-1 protocol like SONET/SDH provides information such as loss of signal and signal degrade for use by the RPR protection mechanism. When using a SONET/SDH physical layer, RPR can be carried over SONET/SDH TDM transport or dark fibre.

Ethernet provides an economical physical layer for RPR networks. RPR packets are transmitted with the required Inter Packet Gap (IPG).

RPR Systems using the SONET physical layer will not interoperate with Ethernet physical-layer-based systems on the same ring.

ISP (Internet Service Provider) Networks

Without barriers of traditional SONET/SDH infrastructure, RPR solutions are helping ISPs to deliver reliable Internet services (such as IP, VoIP and video) and address the growing bandwidth service requirements for the next-generation intra Point Of Presence (POP), exchange point, and server farm/storage applications.

Comparing RPR to Other Solutions	
Legacy TDM	•Statistically provisioned circuits •SONET/SDH limit of 16 nodes •Multiple layers of equipment for IP services
Meshed Ethernet	•Spanning tree protocol (STP) limits protection response to minutes •Limited number of nodes •QoS applied at every hop
Ethernet Rings	•Limited and proprietary protection schemes •Limited number of nodes •Packets are processed at each hop •No high-priority transit path

Regional or Metro Networks

A regional transport ring typically connects cities and urban concentration within a large Metropolitan area. RPR regional metro solutions are available for transport over dark fibre, Wavelength Division Multiplexing (WDM) and over SONET/SDH, cable and enterprise/campus MANs.

RPR enables metro access solutions for service providers looking to deliver Internet Services (such as IP, VoIP, and VPN) to metro access networks with direct Ethernet connectivity for multi-tenant/multi-dwelling customers and edge programmability.

The Future of RPR

RPRs provide a reliable, efficient, and service-aware transport for both enterprise and service-provider networks. Combining the best features of legacy SONET/SDH and Ethernet into one layer, RPR maximises profitability while delivering carrier-class service. RPR will enable the convergence of voice, video and data services transport.

IMPORTANT ACTIVITIES OF TEC DURING AUGUST 2006 TO JANUARY 2007

New GRs/IRs

Following GRs/IRs and Technical documents were issued:

- Personalized Ring Back Tone (PRBT) for PSTN
- Intrusion Prevention System
- Ethernet to E1 Converter
- Ethernet Media Converter
- Ethernet Traffic Analyzer for Ethernet Transport Service Testing

Revised GRs/IRs

- Web Cache Engine
- Digital Cable Fault Locator for Copper Cable
- Power Supply to CLIP Phone
- Self supporting PVC Drop Wire with Fibre Glass Roving as strength member
- 40 Chl DWDM equipment Channel rate upto 10Gb/s for core network Application
- DCME with 5:1 and 10:1 gain
- IR for Systems Employing Computer Telephony Integration
- Local Multipoint Distribution System in 10.5 GHz, 26 GHz and 28GHz frequency band
- RF Power meter and Frequency counter (upto 40 GHz)
- Base Station Antennas and Feeder cable for (890-960 MHz, 1710-1880 MHz and 1920-2170 MHz) frequency bands)

Tests and Field trials

- QoS of Softswitch of M/s UT STARCOM
- Location based Application & Services
- Intelligent Network System of M/s Ericsson for South Zone
- FLPP Service
- Multimedia Messaging Service (MMS) of BSNL GSM Project IV

Other Activities

- **Manufacturers' Forum conducted for**

- 60/80 Meter Tubular Triangle Hybrid (TTH) Towers
- Softswitch for Transit Application & Signalling Gateway
- Fibre Distribution Management System
- Optical Spectrum Analyser
- Broadband Wireless Access System (WiMax) Based on IEEE 802.16e
- Standard on call completion to Busy Subscriber (CCBS)

- TEC Website www.tec.gov.in launched by Member(T), Telecom Commision
- Solution provided for field problems raised in the workshop of EWSD switching system, held in ALTCC Ghaziabad

Approvals issued by TEC during the period August 2006 to January 2007

Interface Approvals.....	40
Service Test Certificate.....	183
Total	**223**

Approvals issued by TEC upto 31.01.2007

Interface Approvals.....	4302
Service Test Certificate.....	2060
Total	**6362**

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मार्च 2007
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