Protection Requirements in RPR Interconnection

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July 10, 2001
Portland, OR

# Problem Statement (1)

- "RPR Protection switching shall be complete in less than 50ms for a single failure."

    - RPR Objective Motion #23, May 2001
    - Covers only a single ring

- Need to provide similar levels of protection for interconnected RPR networks as well.

    - Multiple hierarchical ring interconnection and/or multi-ring stacking is required for greater geographical coverage and network capacity.

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IEEE 802.17 July 2001 (bjl_inter_02.pdf)

Problem Statement (2)
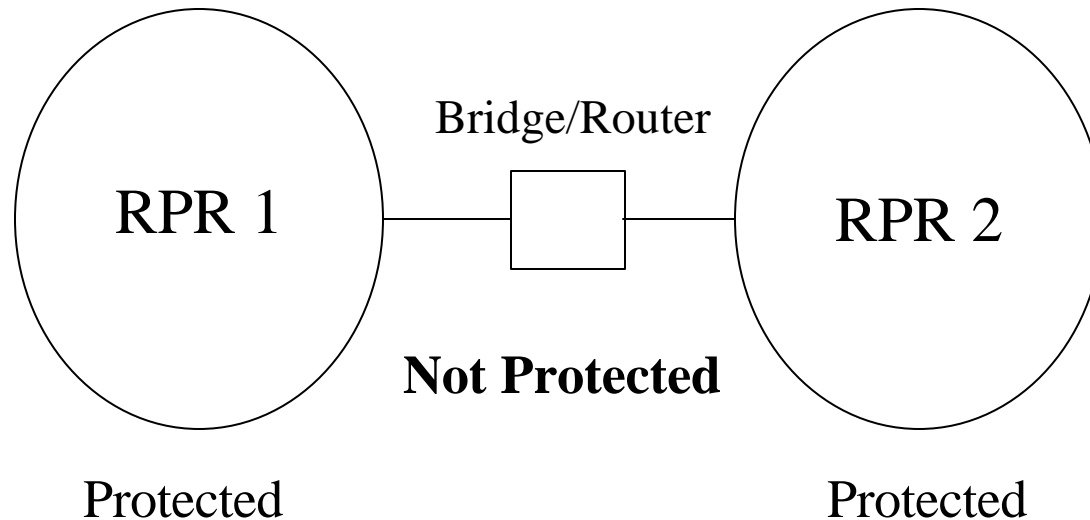
- Single attachment becomes a single point of failure

Problem Statement (3)

Bridge/Router

RPR 1   RPR 2

**Protected with
long convergence**

Protected   Protected
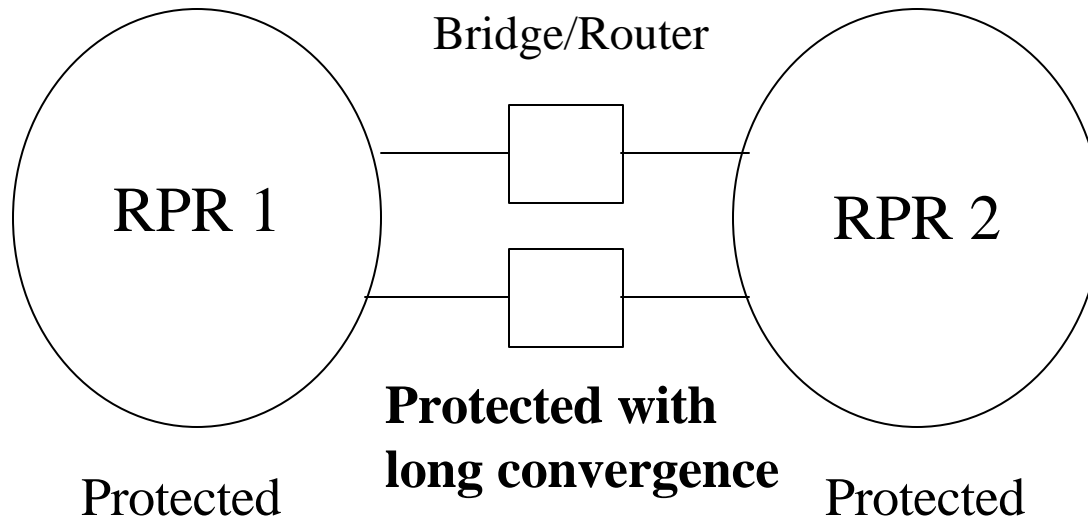
- Dual attached interconnection using L2 bridging or routing relies on STP or L3 routing protocol convergence times, which may typically incur an order of seconds.

Customer Requirements

- Bell Nexxia (May Interim, 2001)

  - "Multiple rings can be expected in a large metro area."

  - Shown RPR ring interconnection via dual LAN switches

- Evolution Networks (May Interim, 2001)

  - "Dual attachment points on different rings."

- Excite@Home (May Interim, 2001)

  - "Real world network design."

- Alcatel (March Plenary, 2001)

  - "Dual node interconnection is recommended."

- SBC (March Plenary, 2001)

  - "Robust protection mechanisms equivalent to SONET, DWDM layer protocol performance."

Application Example

R1

A   B

C

R2

D

R3

G

E

F

R4   R5
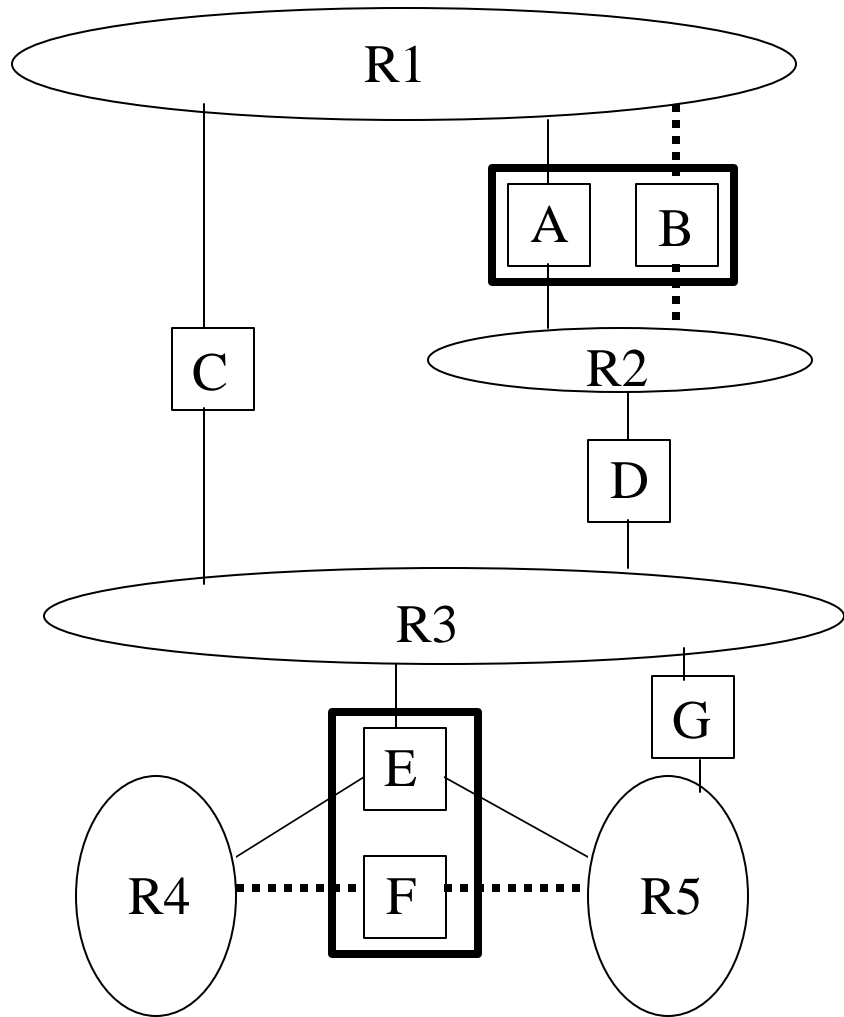
- Fast doubly protected rings:
  - R1 and R2, R4 and R5
- All other rings are also provided with redundant paths with both link and node disjointness, but fast protection is not guaranteed.

Legend:

⬭ RPR ring

☐ Internetworking Device

SONET UPSR/BLSR Protection in Ring Interconnection

- Protection requirement for interconnected rings is also specified for SONET, where the interconnection is realized through double attachment devices.

  - GR-1230-Core (BLSR)

  - GR-1400-Core (UPSR)

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Potential Solution Approaches

- Mechanism to emulate multiple interconnection devices as a single virtual entity.

  - L2: Extension of 802.3ad link aggregation across multiple nodes

  - L3: Extension of VRRP (RFC 2338) or HSRP (RFC 2281)

  - Issues to be addressed:

    - Interaction with L2 (e.g., STP) or L3 routing protocols

    - Load balancing capability

802.17 Requirements

- Fault indication signaling

  – Also required for the single ring protection operation

- New control message type?

- Any others?

Possible Approaches within 802.17

- ## Punt:
  - This belongs to higher layer issues.

    Q: *Aren't we failing to deliver something important?*

- ## Partial Adoption:
  - Investigate as a work item to ensure the big picture, and possibly provide Informative Annexes that describe/enumerate higher level mechanisms.

- ## Full Adoption:
  - Define control messages and protocols, specifically for dual attached RPR ring interconnections.

Concluding Remarks

- We believe that 802.17 should provide, at the minimum, Informative Annexes for dual attached RPR interconnections.

  - There exist other areas of work items which are beyond the scope of "traditional" IEEE 802 mandate, but are considered essential.

- Quotes from "Plans to reorganize Sub-IP technologies in IETF (dr_subip_01.pdf)," Dan Romascanu, et al., July 9, 2001

  - "802.17 – RPR targets availability, user separation and QoS capabilities that are new in the 802 space."

  - "The new functional and OAM&P requirements challenge the current standards model, and seem to hint that 802 activity needs to develop awareness for 'over-L2 'aspects."

- It is also noted that such "redundancy" requirement for inter-ring networking is recognized as a gap in current list of passed objectives.

  - Harry Peng's "Architectural Analysis (hp_arch_01.pdf)," July 9, 2001