

Optimizing Time-to-Market for RPR

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Agenda

- User needs
- Vendor perspectives
- 802.17 challenges
- Historical trends
- Proposed solution

User Needs

- Packet rings with sub-50 ms protection performance
- Differentiated and guaranteed services
 - Packet loss, BW, delay and jitter
- Flexibility to design metro networks with RPR and Ethernet with ease and simplicity
 - Services over single RPR
 - Services between RPR, connected by RPR rings
 - Service between RPR, connected by POS or Ethernet meshes
- Choice of implementing transport applications using layer 2, MPLS and IP-based solutions

System Vendor Perspective

- Hedge bets between 10 GE and 10G RPR
- Differentiate products based on system functions (types of interfaces and QoS)
 - Difficult if box is based on proprietary RPR solutions from the “big boys”
- Leverage industry
 - Existing silicon
 - Existing ideas
 - Test equipment
- Reduce apprehension of user acceptance

Component & Test Perspective

- Avoid “one-offs” for RPR and 10 GE
 - SERDES, MAC and PHY
- Target large installed base of system vendor customers
- Enable differentiation based on higher-layer functions
 - Traffic shaping, support for MPLS & IP

Challenges to 802.17

- Not much time !
 - Proposal cutoff in November 2001
- Lots to do !!
 - Frame format, fairness, topo discovery, protection switching mechanisms ...
- Must deliver to schedule or lose credibility !!
 - You snooze, you lose and go into “hibernation”
- Ensure broad, rapid adoption of RPR standard with early demonstration of interoperability

Meeting Timeline

- Leverage existing work where possible
- Stay focused on defining what is new & unique
 - Forwarding rules between East and West
 - Topology discovery and protection switching
- Get off the QoS debate – it is a black hole !!
 - Put in hooks for both Class & Flow based BW management schemes and move on !

Keep RPR Competitive

- Ensure a timely solution
 - Think of implementation
- Reduce risk for RPR solution vendors and suppliers
- Make 802.17 flexible for Router and Transport solution (layer 2) vendors
- Be pragmatic: metro network architectures will use both Ethernet and RPR

Historical Trends

- 802.1p & 802.1Q built on existing standards
 - Preserved prior investment
 - New additions were introduced through length/PID field changes
- Network enhancements can happen in stages as needed
 - Systems that do not support a PID can ignore frames

The Proposal

RPR should adopt the Ethernet frame and define a shim layer for RPR.

Details

- Adopt the Ethernet frame format and use a new Type value to indicate the presence of a shim layer for additional RPR header fields.
- Use a New Tag ID value in 802.1 to indicate RPR frame encapsulation
- Provide optional Label in the protected RPR header

Value of Ethernet Frame Structure

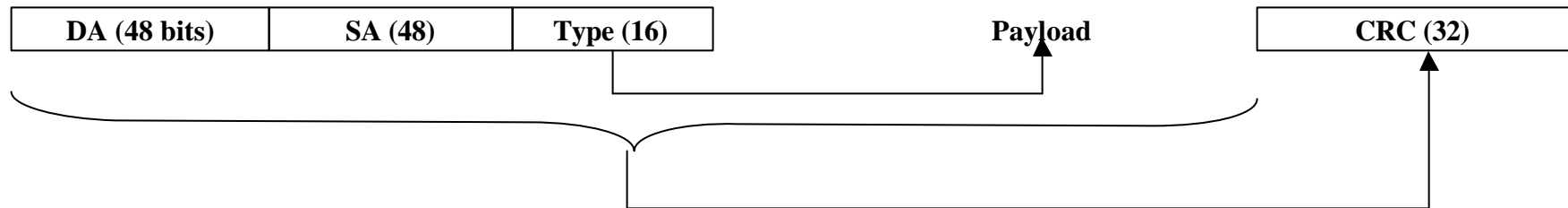
- Leverage silicon from 10 GE
 - Silicon vendors can hedge their bets better.
- Test equipment vendors can make simple enhancements to 10 GE test gear for RPR
- Vendors can build boxes with dual personality: 10 G Ethernet or RPR switch
 - Same gear deployed into rings or meshes

Ethernet Values (cont'd)

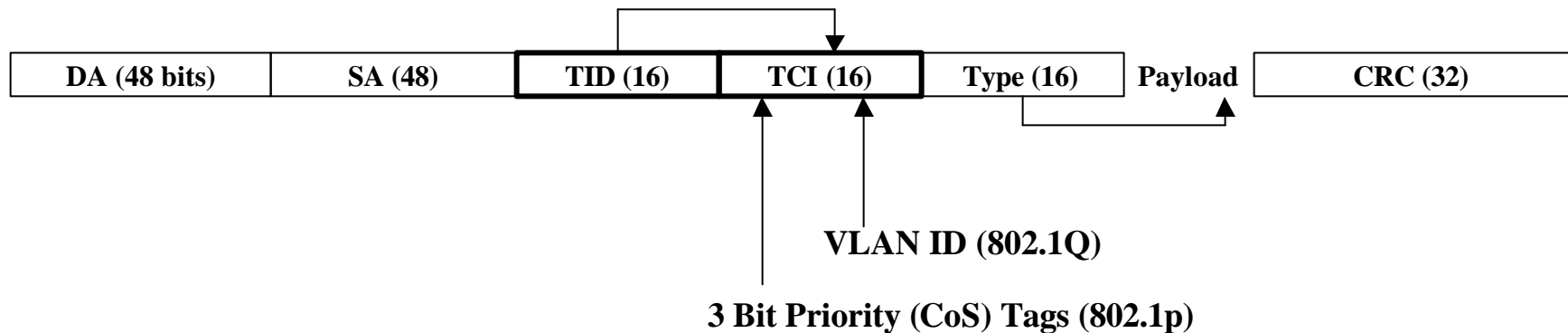
- RPR frames can travel unmodified through Ethernet switches
 - Makes metro network architecture design easier for carriers
 - Makes possible end-to-end QoS for Layer 2, MPLS or IP-based transport networks
- Leverage Ethernet/PHY work:
 - Schemes defined for transporting Ethernet frames over SONET and dark fiber

Tutorial - Ethernet Frame Formats

Untagged Ethernet Frame Format



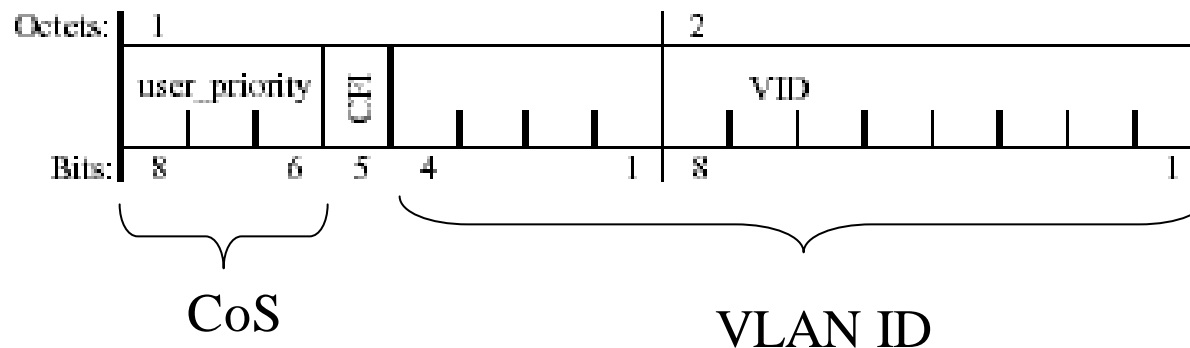
Tagged Ethernet Frame Format



Tutorial - TID and TCI Formats

- TAG ID for Ethernet is 0x8100 or 0xAA-AA-03 for SNAP encapsulation

TCI Format



Tutorial - 802.1 VLAN ID Semantics

- If VLAN ID = 00 then VLAN is not used only CoS bits are relevant
- VLAN ID = FFF is reserved
- $0 < \text{VLAN ID} < \text{FFF}$ then VLAN ID is used

Types of RPR Frames

- Control Frames
- Data Frames
 - Data frames with no label requirement
 - Data frames with a protected label for customer, service, or flow separation

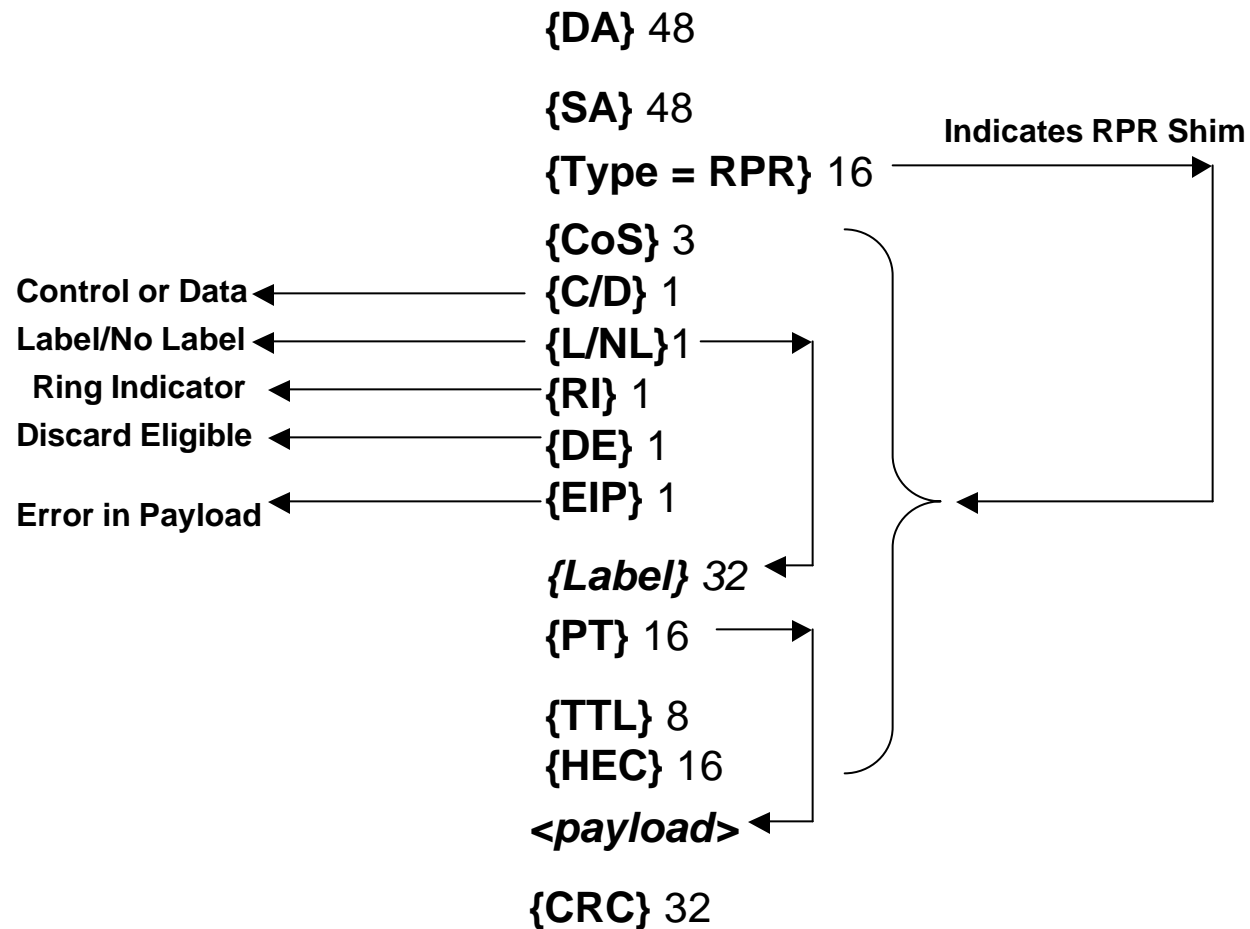
RPR Shim Requirements

- Need Time-To-Live (TTL) field
- Need a bit to distinguish between data and control frame type (C/D)
- Ring Indicator (RI)
- Priority bits (CoS)
- Payload Protocol Type (PT)
- Error In Payload (EIP)
- Packet Discard Eligibility (DE)

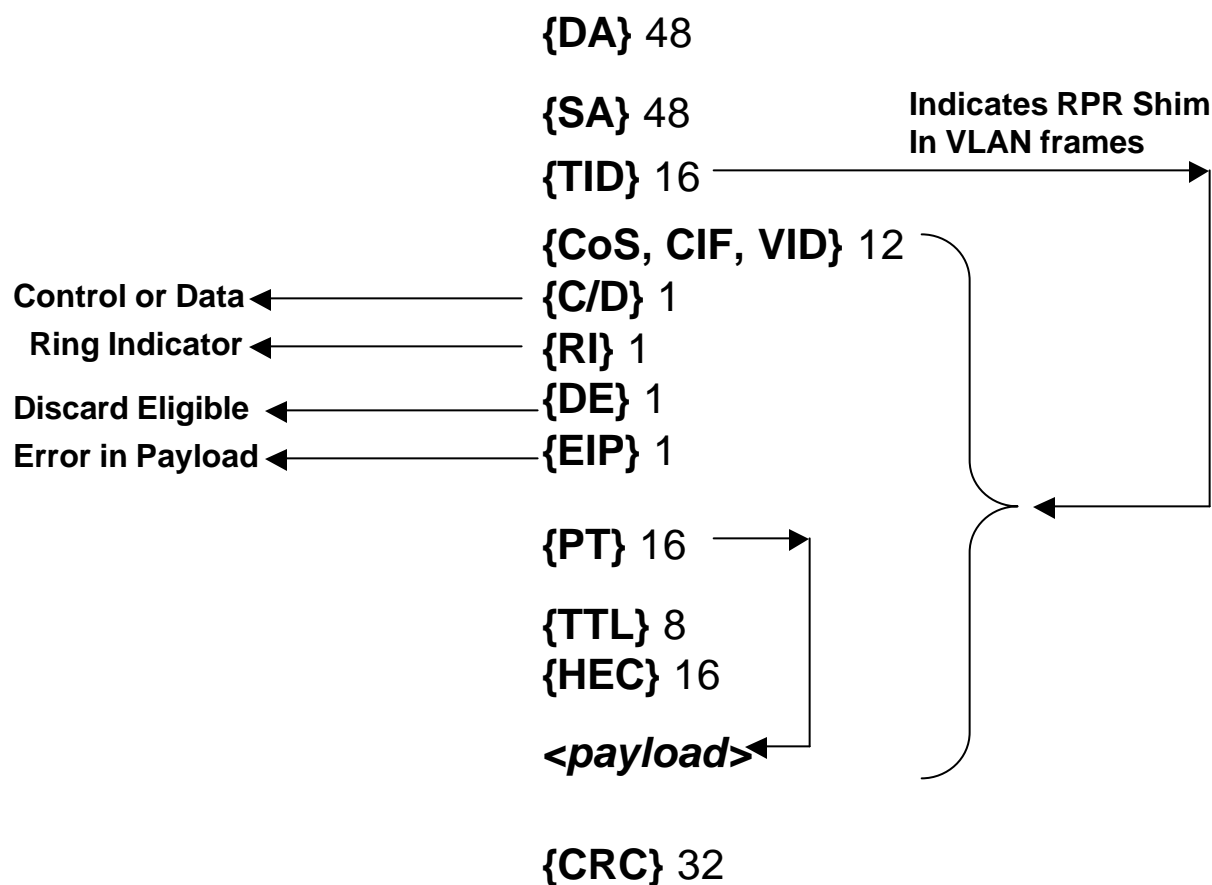
RPR Frame Requirements (cont'd)

- Optional requirements: A protected user-specific field for de-multiplexing to port, service/customer separation, or MPLS labels
- Need header protection (HEC)
 - Some services require persistent delivery of data (corrupted or uncorrupted)

RPR Frames in Ethernet



RPR in Ethernet VLAN frames



Error Detection

- Header checksum protects the header
- Ethernet CRC protects the entire frame
- On Receive at an RPR node:
 - If Bad HEC = Corrupted Header -> drop packet
 - If Good CRC = Good Frame -> pass to TX
 - If Bad CRC & Good HEC = Corrupted Payload, good header -> set EIP and pass to TX
- Before Tx at an RPR node
 - Compute HEC and then compute CRC on entire frame

RPR & Ethernet

- Layer 2 Forwarding: A RPR frame can go through Ethernet switches unmodified
 - Can Support transparent or VLAN-based bridging
 - Router connected to RPR can be a neighbor to a router connected to Ethernet
 - Can support MPLS tunneled traffic engineering
 - No need for a new MPLS shim definition for RPR
 - MPLS shim layer can be protected
- Layer 2 QoS support: Class, VLAN or Label based priority schemes can be engineered to provide end-to-end QoS
 - CoS bits can have the same meaning in both RPR and Ethernet
 - 802.1p and RPR shim have CoS bits in same location

Issues to Address

- Question for Bridging Gurus
 - Will an RPR/Ethernet bridge pick the direction on the destination RPR ring?
 - May need a Destination Ring ID bit
- Single Ethernet/RPR MAC silicon vendor question:
 - Can we have 2 CRC modes?
 - CRC on RPR payload only
 - CRC on entire frame (like Ethernet)

Proposed Motions

- RPR shall have a frame format using the Ethernet frame with positions and semantics for DA, SA, Type and CRC fields, as defined for Ethernet frames
- RPR shall have a shim layer following Ethernet header for additional fields relevant to RPR
- RPR shall use new 802.1 TIDs to recognize RPR shim layer in tagged VLAN frames
- RPR shall have a HEC to cover entire RPR header
- RPR shim layer shall support an option for a generic label in the RPR header included under the HEC