

RPR QoS Requirements

Understanding the issues of QoS related motions

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Jeanne De Jaegher -Alcatel

Operator requirements and Trade-off's



- ❖ RPR should support new revenue-generating services.
- ❖ Fiber in the Metro is expensive! Operators want a high bandwidth utilization.
 - ▮ QoS is always difficult to combine with high bandwidth utilization.
- ❖ The needs of the Metro Networks are very diverse! Operators want flexibility.
- ❖ Operators want a cheap and easy-to-manage solution
 - ▮ RPR needs to find a balance between flexibility and simplicity

What is the Service Level Agreement a packet-based Metropolitan Network should support ?

- ◆ Delay & jitter guaranteed services
 - ◆ Bandwidth guaranteed services
 - ◆ Packet loss guaranteed services
 - ◆ Protection guaranteed services
- ⇒ Operators make money from guaranteed services!

How does this translate at the RPR MAC layer?

- ❖ The RPR MAC layer supports QoS by mapping the traffic in different priority classes.
- ❖ The RPR MAC layer supports delay, bandwidth, and packet loss guaranteed services, by ensuring a *fair* access of the traffic to the ring.
- ❖ Bandwidth reservation and policing shall be done at the ingress of the ring. Reservation signalling should be recognized by the Standard RPR MAC.

How does this translate at the RPR MAC layer?

- ❖ The RPR MAC layer supports Protection guaranteed services by
 - ◆ Layer 2 fast protection switching and rerouting (50 ms)
 - ◆ class-based protection levels
 - ◆ sharing of protection bandwidth: in case of bandwidth shortage, some classes of traffic may be dropped
- ⇒ **Requirement:** The Standard RPR MAC shall support class-based protection.

Multiple classes of service and *fair* access to the ring

- ❖ For real-time traffic,
 - ▶ privileged access to the ring
 - ▶ minimizing the impact on end-to-end delay & jitter of the position in the ring
- ❖ For bandwidth guaranteed traffic and for best-effort traffic,
 - ▶ a fair (equal or weighted) access to the available bandwidth for all the nodes of the ring

CONCLUSION: The Standard RPR MAC must support multiple classes of service.

- ▶ Following the vendor's choice or the operator's market, classes can be used to support actual QoS.
- ▶ Some classes may be merged, but the Standard RPR MAC shall allow for support of flexible combinations of the different guaranteed services (protection, delay & jitter, bandwidth and packet loss)

Scheduling

- ❖ The scheduling can be based on cut-through, on store and forward, or on any combination of both depending on the classes.
- ❖ The actual scheduling solution for the different classes is an implementation choice, and should never become a requirement for the Standard RPR MAC.
 - ◆ Withdraw implementation oriented motions:
 - ▶ 43: The RPR MAC will support a cut-through transit buffer on the ring
 - ▶ 51: The fairness mechanism shall prevent upstream and downstream advantage or disadvantage in terms of bandwidth and delay allocation.

Congestion control at the MAC layer

- ❖ To guarantee at the same time high bandwidth utilization and fairness for best-effort traffic, one needs congestion control at the MAC layer:

- ◆ Efficient bandwidth utilization means source 1 will take all the available bandwidth

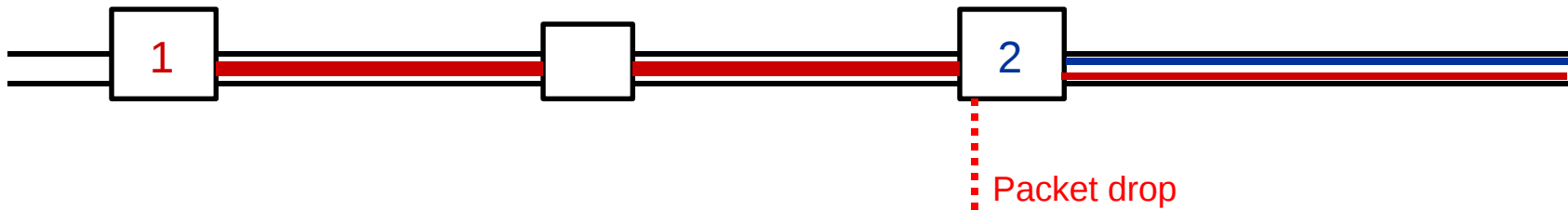


- ◆ If source 2 also wants to send, it has to throttle source 1.

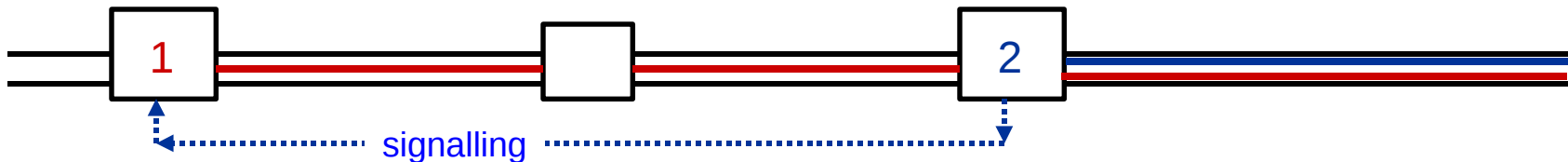
Congestion control at the MAC layer

❖ At the MAC layer, there are two ways to control the flow of source 1:

▶ Packet drop in the congested node



▶ Throttling of other nodes on the ring by internode signalling



Congestion control at the MAC layer

- ❖ The actual mechanism for congestion control is an implementation choice and should never become a requirement for the Standard RPR MAC.
 - ◆ Withdraw implementation-oriented motions:
 - ▶ 12: minimal packet loss **on the ring** except during protection events
 - ▶ 13: No packet loss **on ring** except during protection events
 - ▶ 44: The RPR MAC will provide for better than 90% link utilization for any span **on the ring**
 - ⇒ **on the ring** features: give no indications about the MAC behavior

Conclusions

- ❖ The RPR MAC layer supports QoS by mapping the traffic in different priority classes
 - ⇒ **Motion:** The Standard RPR MAC shall have multiple classes of service such as to be able to support delay & jitter, bandwidth and packet loss guarantees. The Standard shall not associate these guarantees with the different classes.
 - ⇒ **Motion:** The Standard RPR MAC shall support class-based protection

Conclusions

- ❖ The actual scheduling for the different classes is an implementation choice, and should never become a requirement for the Standard RPR MAC.

⇒ **Motion:** withdraw motions: 43, 51

- ❖ The actual mechanism for congestion control is an implementation choice and should never become a requirement for the Standard RPR MAC.

⇒ **Motion:** withdraw motions 12, 13, 44