Transit path and fairness behavior

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Introduction

Introduction

- All the current proposals to IEEE 802.17 WG for an RPR standard are defining an RPR implementation rather than a behavior
- Standard bodies usually work on behavior definitions
  - Implementation issues are out of the scope of any standard work
- IEEE 802.17 shall focus on defining the behavior that any RPR MAC shall present rather than its own internal implementation
  - Internal implementation are difficult (if not impossible) to test

Scope of the presentation

- Define a behavior description of the RPR MAC data path and fairness algorithm

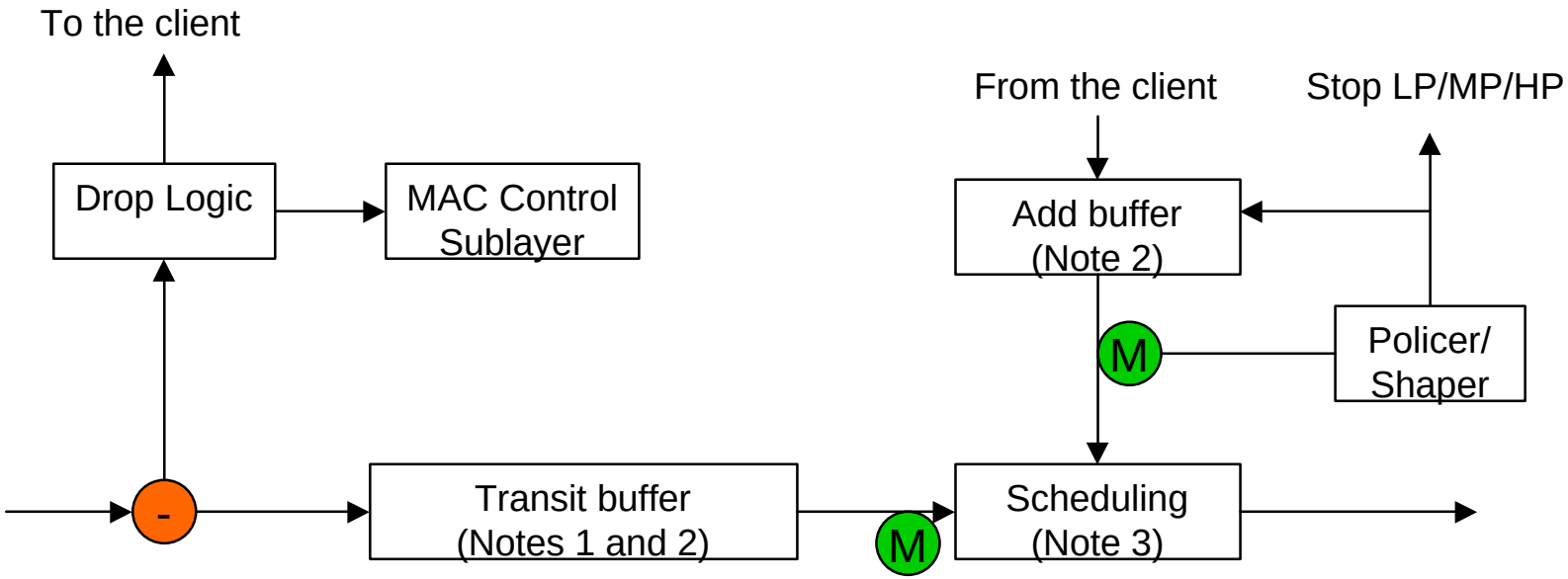
- The behavior description shall allow:
  - Vendors to define different implementations, such that it will allow vendor differentiation in the marketplace
  - New and better implementations to be developed in the future
  - Multi-vendor interworking such that different implementations can co-exist on the same ring

RPR Service Definition

- 802.17 shall support three classes of service (as proposed in Darwin)
  - High Priority (HP) traffic with bounded end-to-end delay and jitter with negligible end-to-end frame loss
  - Medium Priority (MP) traffic with no bounds on end-to-end delay and jitter but with commitments to deliver the in-profile traffic (i.e. the cMP traffic below the CIR) without any service guarantee on the excess traffic (i.e. the eMP traffic).
  - Low Priority (LP) traffic with no service guarantees (Best effort)
- During normal conditions both HP and cMP will get their CIR
- The eMP and LP traffic may be delivered according to network resource sharing the available bandwidth on the ring in a fair way
  - The fairness allocation shall be a per-station weighted fairness

MAC Data Path Behavior

MAC Data path Behavior



- Note 1 – HP frames should never be delayed more than 3 MTU times
- Note 2 – The structure is implementation dependent (packet loss optionally allowed)
- Note 3 – The algorithm is implementation dependent
- M – rate monitor

Transit buffer

- The HP transit traffic should never be delayed more than 3 MTU times
  - At least 1 MTU buffer is required for contention resolution
- The cMP transit traffic should never be lost
- There are no requirements for eMP and LP traffics
- The structure of the transit buffer is implementation dependent and not part of the standard
  - Both single buffer and dual buffer implementations in Darwin, Alladin and DVJ can be standard compliant
  - Other implementations may be standard compliant

Add buffer

- All the traffic from the client has to be buffered for arbitrating its access to the ring
- The structure of the add buffer is implementation dependent and not part of the standard
  - A single queue implementation (e.g. 1 MTU) that moves to the upper layer all the complex queuing and scheduling can be standard compliant
  - The three queues implementation in Darwin can be standard compliant
  - Other implementations may be standard compliant

Scheduling

- The scheduling selects the packet to be transmitted
  - It should ensure commitments on the HP and cMP transit and add traffic
  - It should ensure a fair access between LP and eMP transit and add traffic

    A per station weighted fairness allocation is defined
  - The eMP and LP add traffic should not exceed the allowed_rate parameter defined by the fairness protocol
- The scheduling algorithm is implementation dependent and not part of the standard
  - The scheduling implementations proposed in Darwin, Alladin and DVJ can be standard compliant
  - Other implementations may be standard compliant

Fairness Protocol

Fairness Protocol – 1

- As described in Darwin the RPR-fa determines
  - Congestion detection
  - Advertised rate
  - Station allowed_rate

- Congestion detection is implementation dependent because it is strictly linked to the actual internal implementation
  - Darwin defines congestion conditions for single buffer and dual buffer implementations
  - When more than two transit buffers are implemented, the congestion detection conditions may be different (they depend on the queuing and scheduler implementations) and are not part of the standard

Fairness Protocol – 2

- The computation of the advertised rate is implementation dependent and not part of the standard
  - The draft Darwin describes some implementation examples
  - The drafts Alladin and DVJ describe other implementation examples
- Upon receiving a fairness message the RPR MAC should reduce its allowed rate to the value derived from the received message (see Darwin)
- Fairness messages are sent out periodically as described in Darwin
  - An all-1s codes is used to signal a null rate
- Following these rules different implementations can inter-work on the same ring
  - IEEE 802.17 WG shall try to identify and find any inter-working issue

Considerations on Packet Loss

Considerations on packet loss

- RPR has no requirements to avoid packet loss on the ring
  - IEEE 802.17 WG already rejected a motion to have such a requirement
- Packet loss is not an issue for multi-vendor interworking
  - Lossy and loss-less MACs can co-exist without any problem
- In any case, the 802.17 MAC does not provide a reliable data transport
  - Loss events on the ring can always happen (e.g. corrupted HEC frames)
- Avoiding packet loss on the ring only moves the problem of packet loss at the ingress points

This can cause HP frames to be lost before entering the ring in favor of LP frames already on the ring

Conclusions

Conclusion

- IEEE 802.17 Standard shall specify a data path behavior !
- IEEE 802.17 Standard shall not specify one implementation nor a set of implementations !
  - The implementations described in Darwin, Alladin and DVJ can be valid standard implementation so their description can be moved into Annex K
  - Other implementations are not precluded
- This presentation proposes a behavior description
- More work is needed to improve the description if required

The main goal is INTEROPERABILITY !

- Any issue impacting interoperability should be solved before releasing the standard – anyone who likes to provide inputs is more than welcome