A Behavioral Description of the 802.17 MAC

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Motivation

- The current draft describes 2 implementations and how they interwork
  - Refers to the output of the Rate Ad-hoc
- Instead, we need a behavioral description
  - Hides the internal architecture details
  - Defines externally observable behavior
- In order to make several implementations compliant, we will need to relax some of the constraints
  - It is also possible to make the constraints so tight that only one kind of architecture can comply
- This presentation takes a shot at a behavioral description
- Most of the numbers in this presentation are examples
  - Please don't kill me if you don't like them!

Services Classes

- Class A
  - Guaranteed Bandwidth
    - Provisioned bandwidth is non-reclaimable
    - If an implementation can provide this service with the bandwidth being reclaimable, it is a value add!
  - Bounded jitter
- Class B
  - Committed Bandwidth
  - Additional variable bandwidth depending on available bandwidth and local station weight
  - Jitter bound is looser than for Class A for traffic within committed rate; no guarantee for excess traffic
- Class C
  - No committed Bandwidth
  - Variable bandwidth depending on available bandwidth and local station weight

Requirements for Class A Traffic

- Transit path
  - No more than 1 MTU worth of delay at a node
- Insert path
  - Packet must be guaranteed insertion within 1 msec for a ring of 200 Km diameter
    - 1 msec is the RTT of a ring of this size
  - Vendor must specify whether bandwidth is reclaimable or not and whether it must be reserved all around the ring in order to guarantee this behavior
- No reordering is permitted within this class

Requirements for Class B Traffic

- Transit Path
  - No more than 1 msec worth of delay at a node (or come up with something else that makes sense)
  - This will constrain the buffering that can be done at the node
- Insert Path
  - Packet must be inserted on the ring within 5 msec for a 200 Km ring
- No reordering is permitted within this class

Requirements for Class C Traffic

- Transit Path
  - Same requirements as Class B
- Insert Path
  - Packet must be inserted on the ring within 10 msec for a 200 Km ring
- No reordering is permitted within this class

Congestion Detection

- A node must declare it is congested if:
  - Access delay of Class A exceeds 0.5 msec; or
  - Access delay of Class B exceeds 2 msec; or
  - Access delay of Class C exceeds 4 msec
- There are other possibilities for congestion detection that a node may employ in order to meet the earlier requirements
  - Those are beyond the scope of the standard
- When congested, a node must send fairness messages that contain information which causes other nodes to reduce their insert rates

Do We Really Need NxMTU Jitter?

- The NxMTU argument gets less and less interesting as speeds get higher
  - At OC-192, we can afford to have 10NxMTU jitter (assuming we could live with NxMTU at the 1 Gbps)
- It's important for the standard to come up with a realistic number that meets the requirements
  - For a ring diameter of *x* Km, and *y* number of stations, the jitter is *z* milliseconds

Conclusions

- This presentation provides a starting point for a behavioral description of the RPR MAC
  - Performance parameters are specified in the context of ring size and number of nodes
  - Allows different architectures to claim compliance
- Depending on the internal architecture tighter bounds and better utilization are possible
  - But they are not required by the standard
- For Class A traffic, the transit bounds specified are as tight as they can possibly be
  - The MAC end-to-end delay for Class A traffic from a node is not affected by what other nodes do
  - This is all that matters for an implementation to maintain its jitter performance on a heterogeneous ring