Transit Path Design and Inter-Operability

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Agenda

- Introduction
- Requirements
- Simulation Results
- Conclusion

Introduction

- Some architectures have 1 transit buffer
- Some architectures have 2 transit buffers
- Buffers operating in store-and-forward or cut-through mode
- Each architecture has a unique congestion control and fairness algorithm with:
  - Unique messaging infrastructure
  - Unique control parameters
- Transit path design is critical for performance

Introduction

- Questions:
  - Can different architectures live in the same ring?
  - If yes, can we get the same or similar performance in a heterogeneous ring compared to a homogenous ring?
- Answers:
  - Yes!
  - And yes!

Requirements

- The mass of the problem revolves around congestion control
- Need to make sure no one is favored based on a particular architecture or location on the ring
- How?
  - Need to investigate on a case-by-case basis
  - Who wants to talk to whom?
- A single control message format needs to be defined

Toy Scenario

- Simple Single Transit Buffer (SSTB)
  - One transit buffer (cut-through)
  - XON/XOFF to stop low priority traffic
- SRP
  - Two transit buffers (store-and-forward)
  - Usage messages
- Traffic pattern:
  - All traffic destined from the nodes to the hub
  - ~%30 high priority, ~%70 low priority
- Homogeneous ring performance comparison presented in May 2001

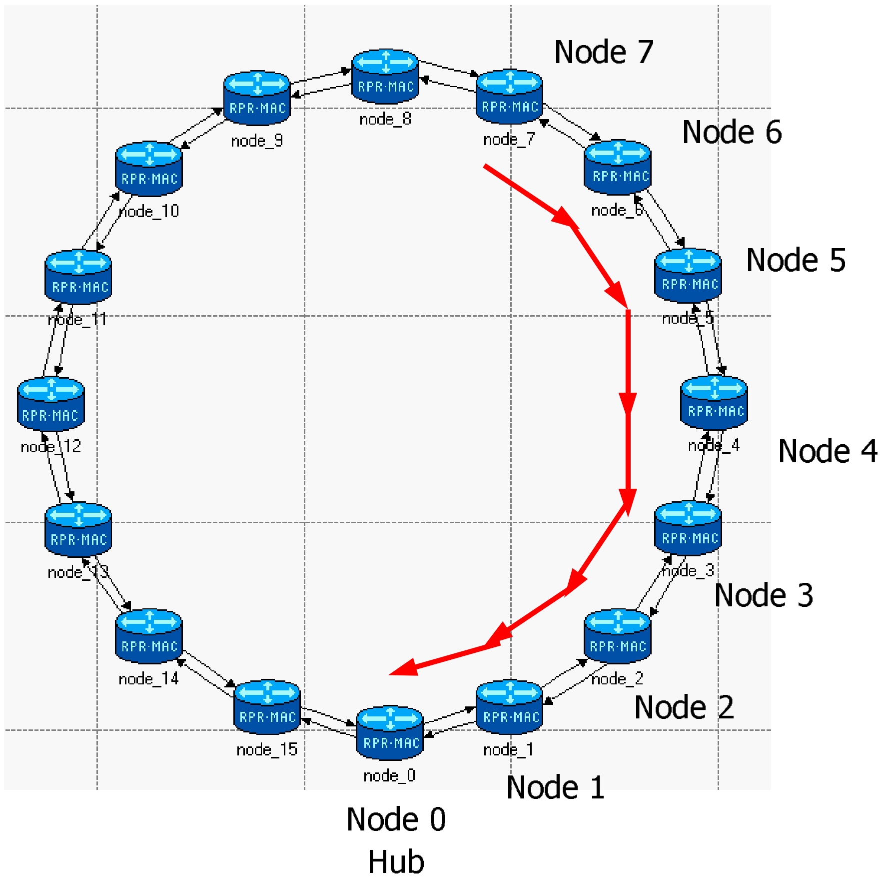
  http://www.ieee802.org/17/documents/presentations/may2001/nu_ctvst_02.pdf

Interaction

- Relay control messages originated from other type of nodes upstream
- Simple Single Transit Buffer (SSTB)
  - If (value==NULL_USAGE) then XON; else XOFF
  - Token bucket for rate shaping of low priority TX
- SRP
  - Cut allowed usage by a % when XOFF (used 50%)
  - Limiting data rate on the ring to a percentage of the link rate (used 95%)
  - Token bucket for rate shaping of low priority TX

Different combinations

	Single Tb	Dual Tb
Mix 1	7,5,3,1	6,4,2,0
Mix 2	6,4,2,0	7,5,3,1
Mix 3	7,6,5,4	3,2,1,0
Mix 4	3,2,1,0	7,6,5,4
Mix 5	7,4,3,0	6,5,2,1
Mix 6	6,5,2,1	7,4,3,0



Scenarios

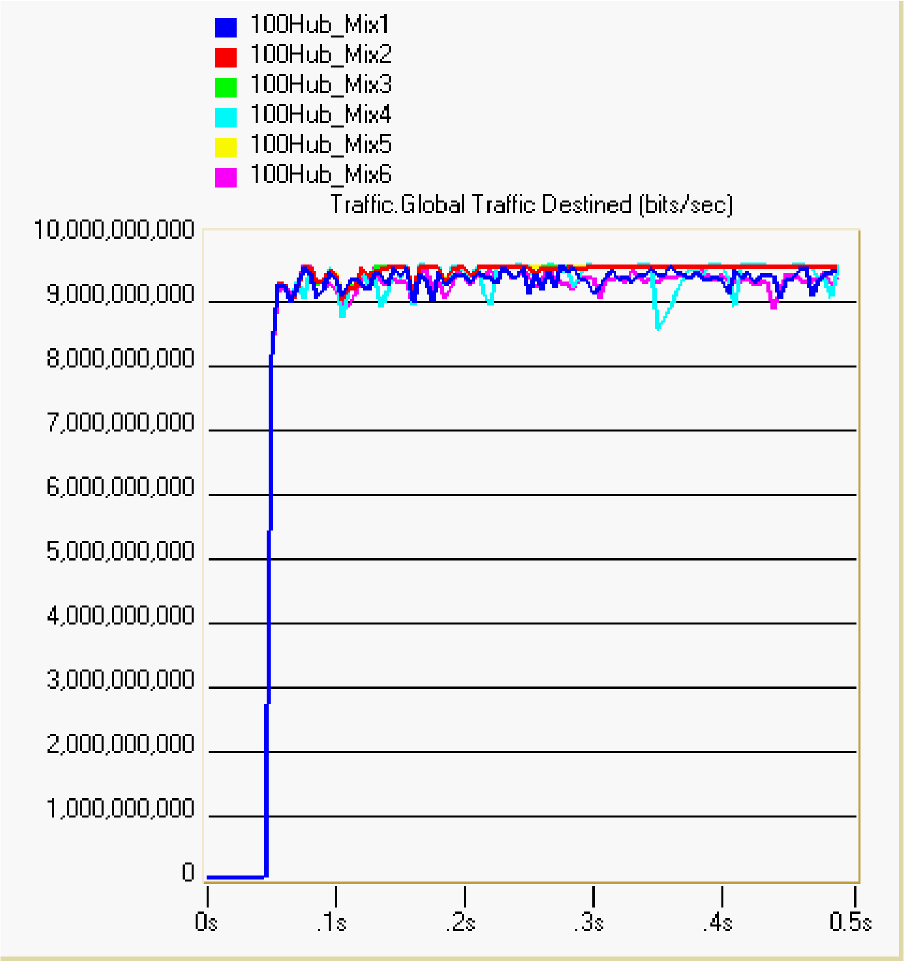
- CT: all single TB nodes
  - CT_rt: single TB with rate shaper for Low Priority
- SF: all dual TB nodes
  - SF_rt: dual TB with rate shaper for Low Priority
- Mix#: single and dual TB nodes, each with rate shaper for Low Priority

Details

- High Priority TX CAR = 420 Mbps
  - (CT nodes only)
- Low Priority TX shaping rate = 930 Mbps
  - (CT and SF nodes)
- SF nodes limited to %95 of link rate
  - (no limit for CT nodes)

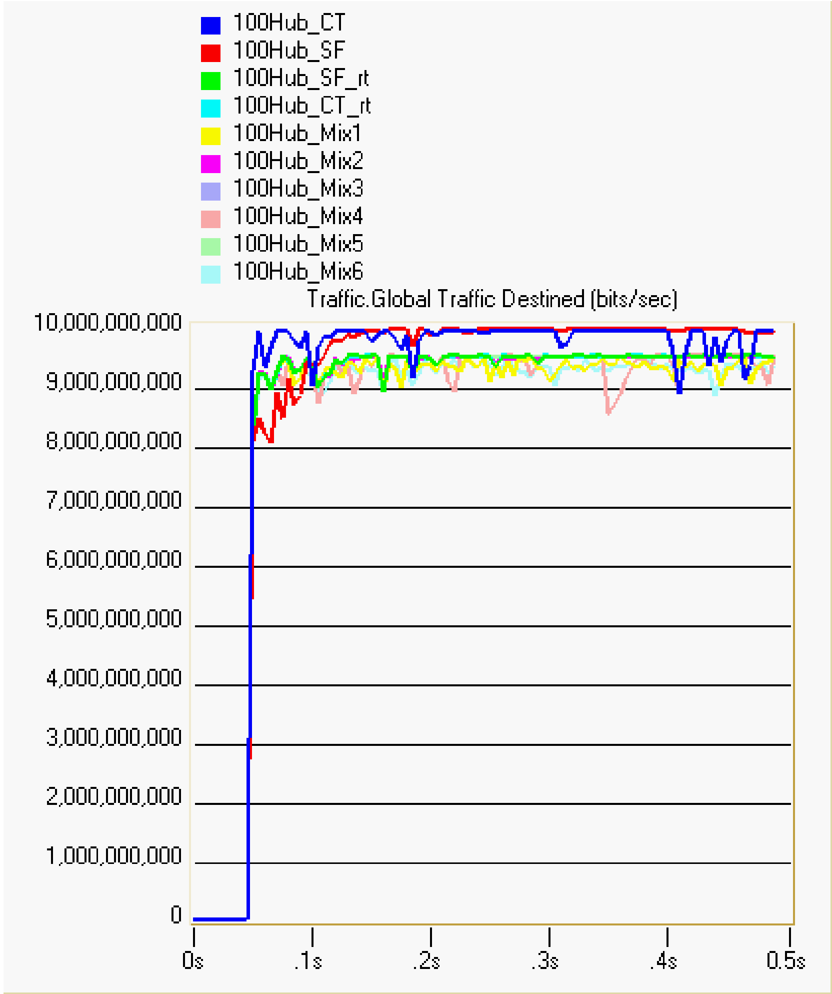
Throughput (1), Hetereogenous Rings

Traffic Destined (bps)



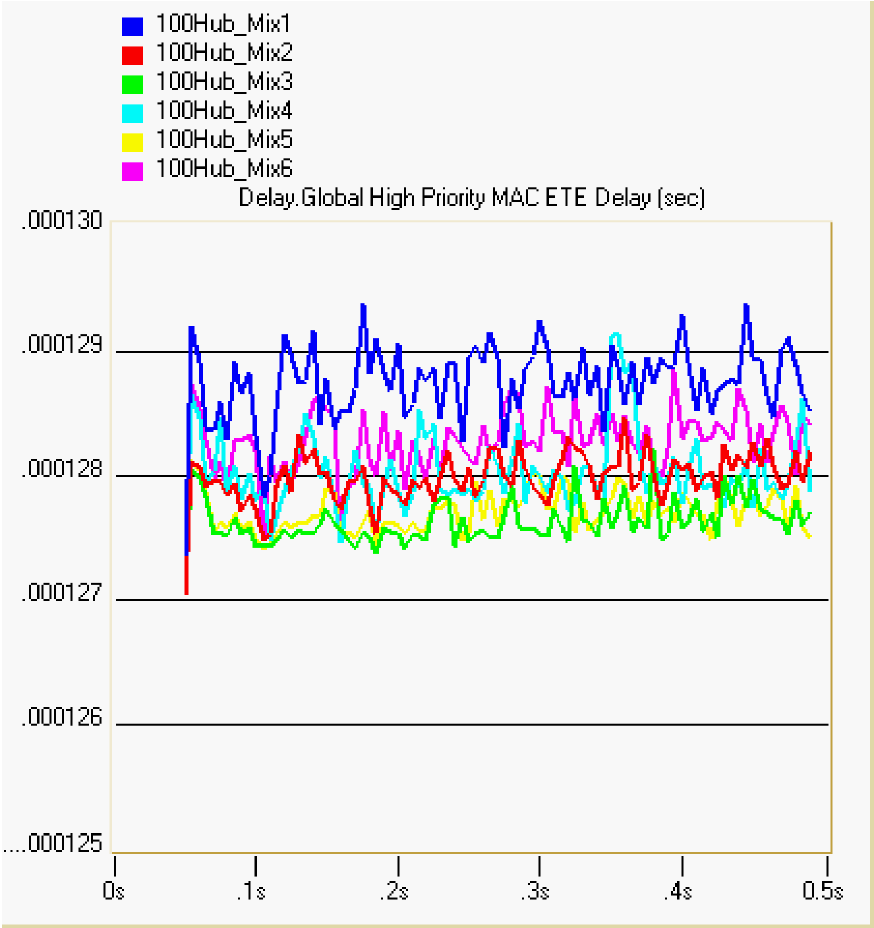
Throughput (2)
. Hetereogenous Rings compare with Homogenous Rings

Traffic Destined (bps)



Delay (1), Hetereogenous Rings

High Priority MAC ETE Delay (sec)



Delay (2), Hetereogenous Rings

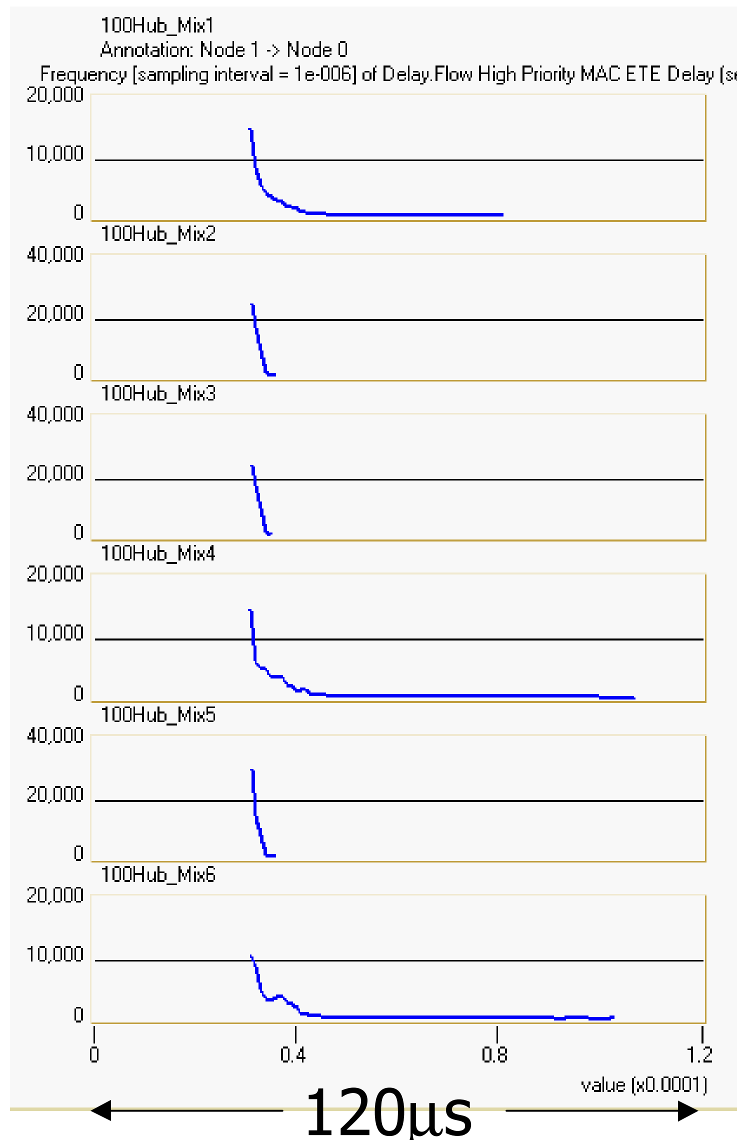
High Priority

MAC ETE Delay (sec)

Histogram

Max Jitter observed:

72 µsec



Conclusion

- Inter-operability is possible!
- Need cooperation of all nodes involved in a heterogeneous ring
- Need to agree on common control messaging format and parameters