Performance Analysis of Darwin: Transient State

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Agenda

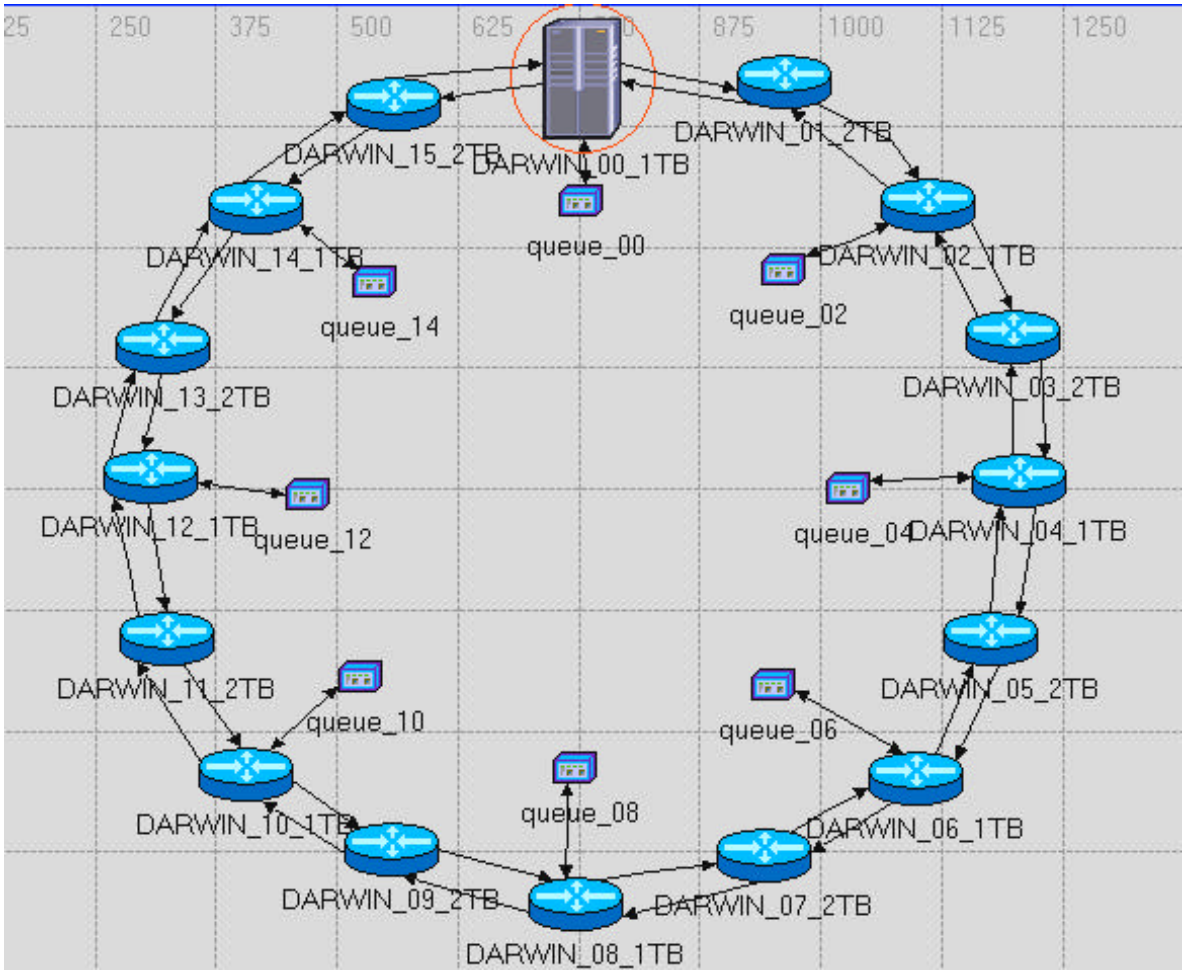
- Objectives
- Darwin Scenarios and Simulation Settings
- Transient Simulation Results
- Conclusions

Objectives

- Examine the performance of Darwin
  - Mixed topology with Mono-queue nodes and Dual-queue architecture
  - Hub Scenario
    - Even load sourcing, equal weight
    - Step traffic increase
  - Capture Transient Response of
    - Mono-queue (1TB) as the congested station
    - Dual-queue (2TB) as the congested station

Scenario T2TB-HL:
Congestion detected by 2TB station

- Darwin_00_1TB is the Hub
- Stations 01 to 15 send traffic counter clockwise on inner ring
- At t=0s, ring is 50% loaded with **High Priority**
- At t=0.05s, ring is 100% loaded with **Low Priority**



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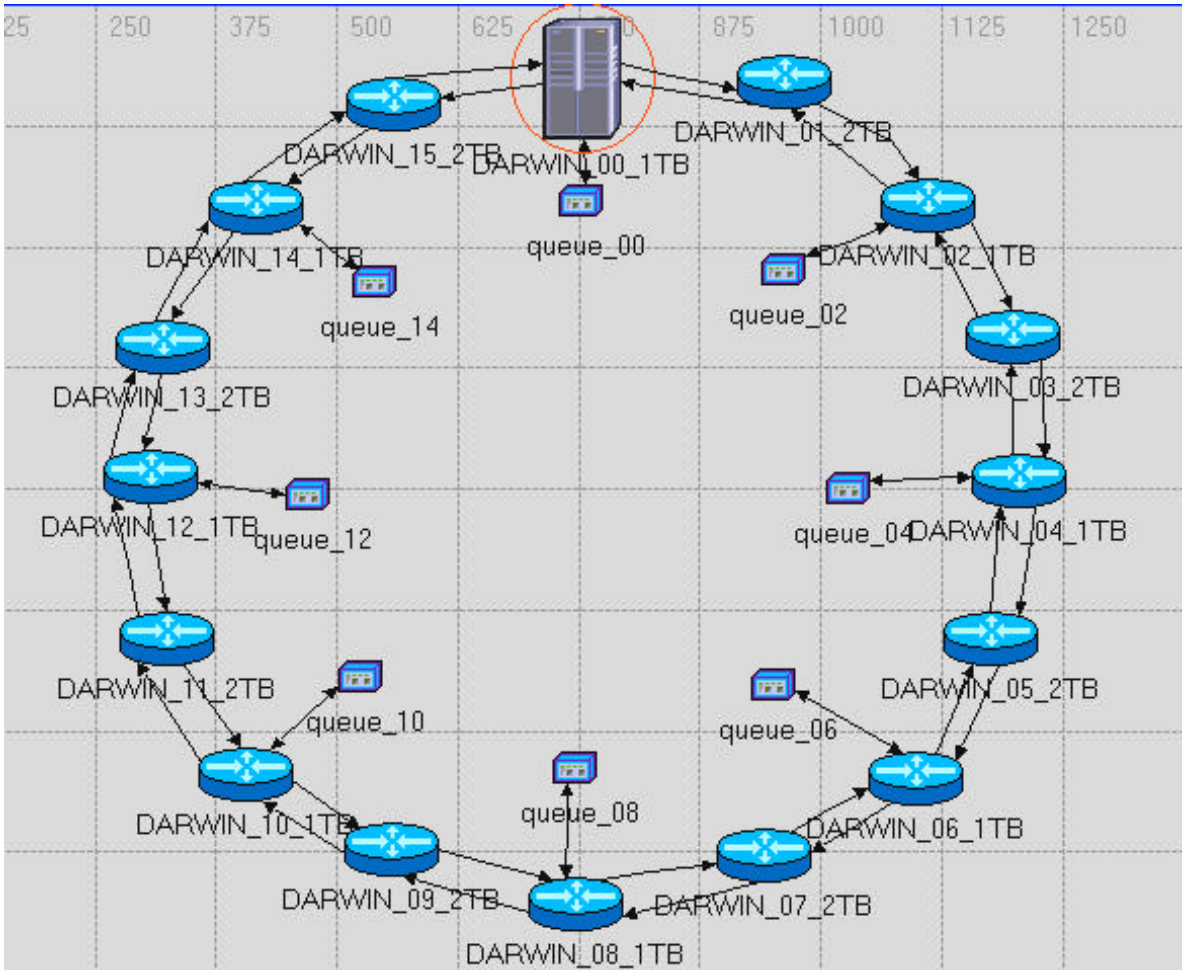

Scenario T1TB-HL :
Congestion detected by 1TB station

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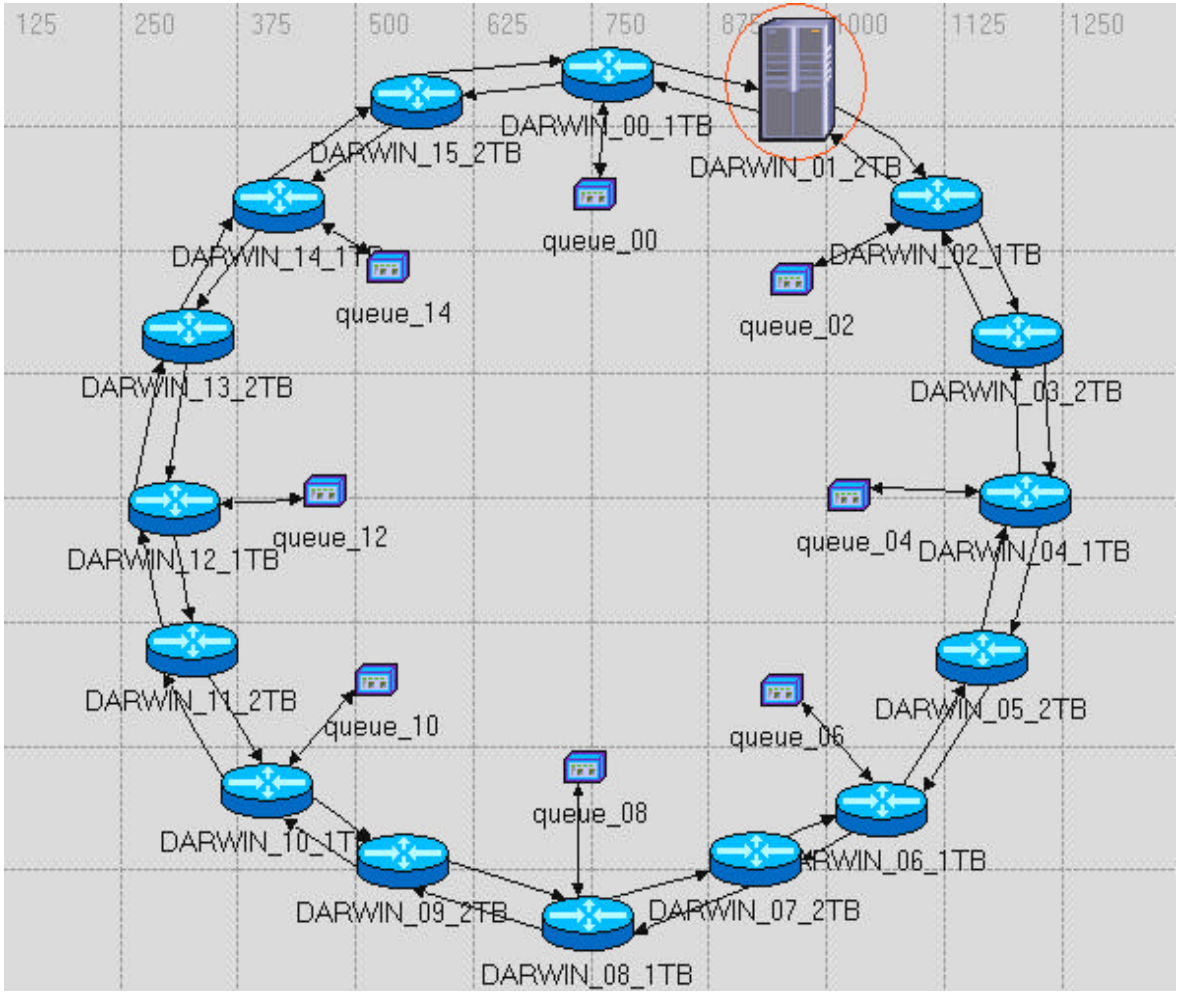
- At 0.05s, ring is 100% loaded with **Low Priority**



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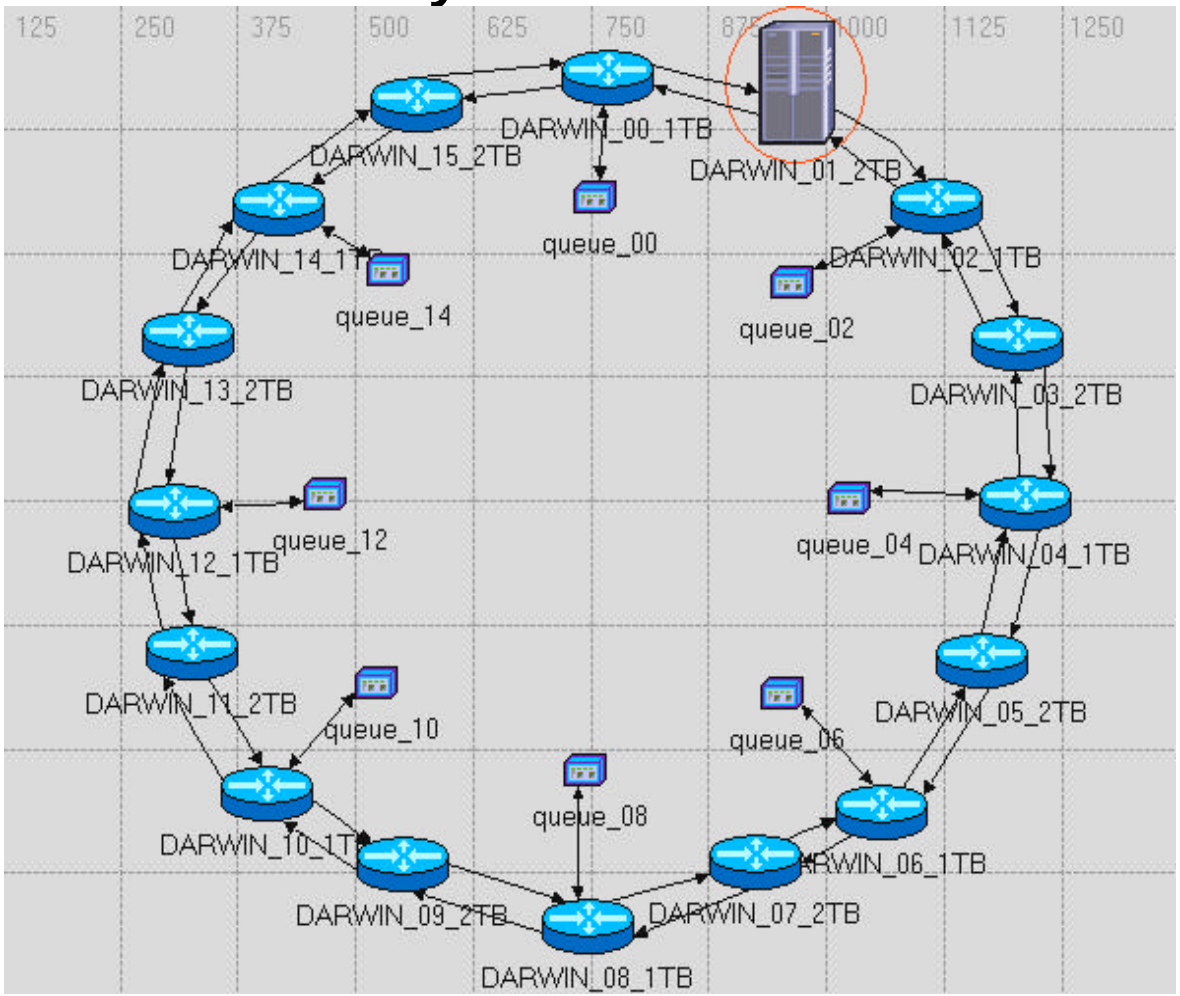


Scenario Summary

Scenarios	Congested station	t= 0s	t= 0.05s
		Traffic profile	Traffic add
T2TB-HL	2TB	50% high	100% low
T2TB-LH	2TB	100% Low	50% high
T1TB-HL	1TB	50% high	100% low
T1TB-LH	1TB	100% Low	50% high

MTU time = 1.2 us; Burst size ~ 15 us; RTT time 2 ms

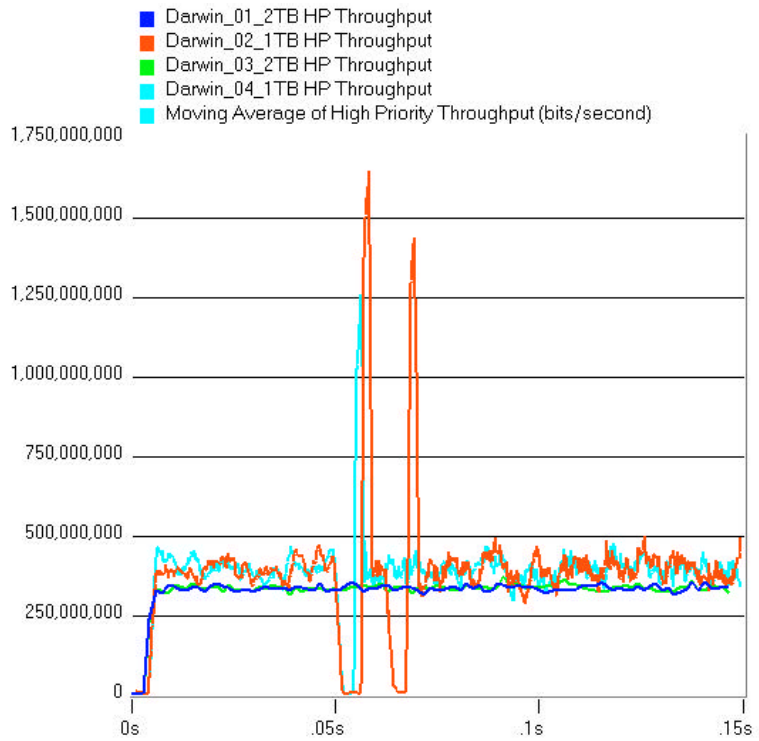
Traffic Settings

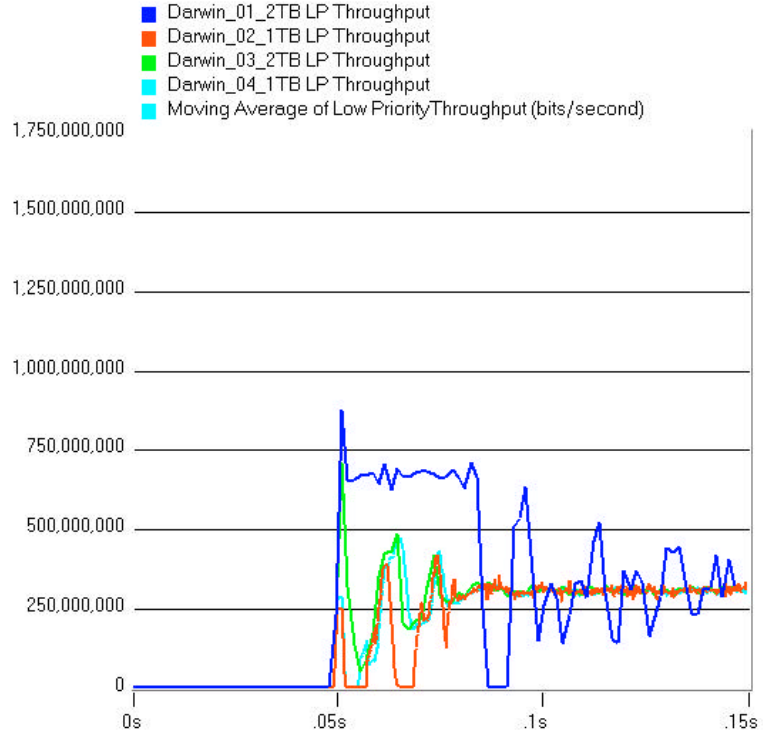
- Low Priority and High Priority traffic is generated with Poisson Distribution
- Packet size is tri-modal
  - (60% 64B, 20% 512B, 20% 1518B)
  - MTU time = 1.2 us
- Mean packet size is 444.4B
- RTT ~ 2ms

Simulation Parameters

- Simulation Settings: 1TB Nodes
  - Ring Access Delay Threshold: 1ms
  - Tsample: 200us
  - Token Size: 1,000 bits
  - Leaky Bucket Size: 150,000 bits
    - Burst time ~ 15 us
- Simulation Settings: 2TB Nodes
  - Decay Interval: 100us
  - Low Transit Buffer Size: 4MB
    - Low threshold 900MB
    - High threshold 3.75MB
  - Low Transmit Buffer Size: 1MB
  - Leaky Bucket Size: 80,000 bits
    - Burst time ~ 8 us
  - Trigger Threshold for advertisement: 450KB
- Common Settings
  - Target Utilization: 95%
  - Link Delay: 70us (15km)
  - Link Rate: 9.953 Gbps (OC-192)

Scenario T2TB-HL
Transient throughput

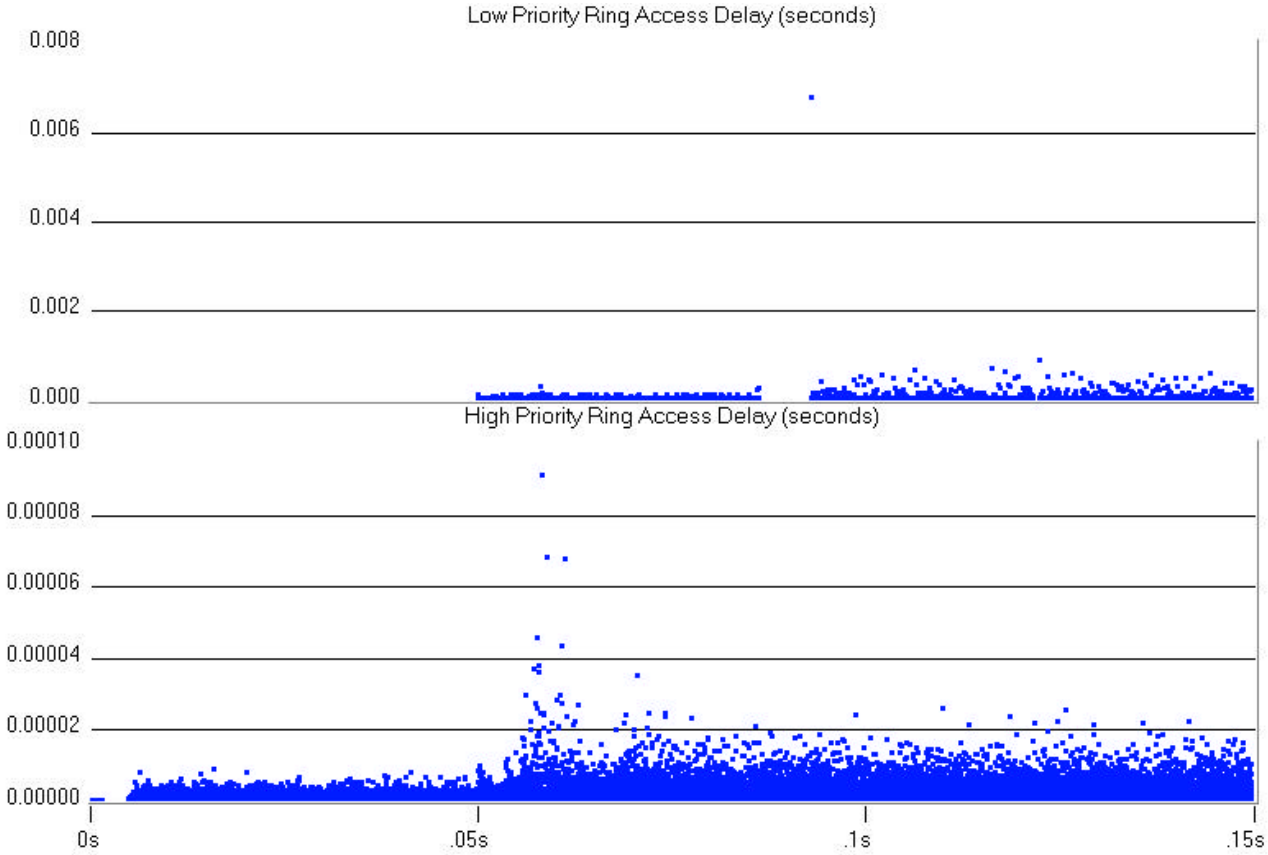




Class A1, B 80 ms transient Class C

Scenario T2TB-HL

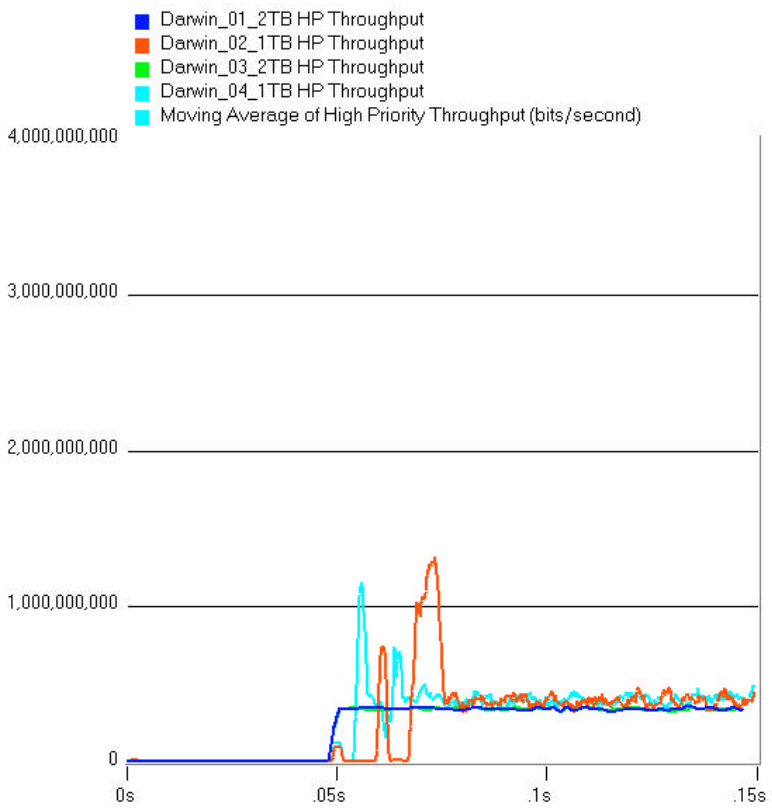
Ring Access Delay at congested station

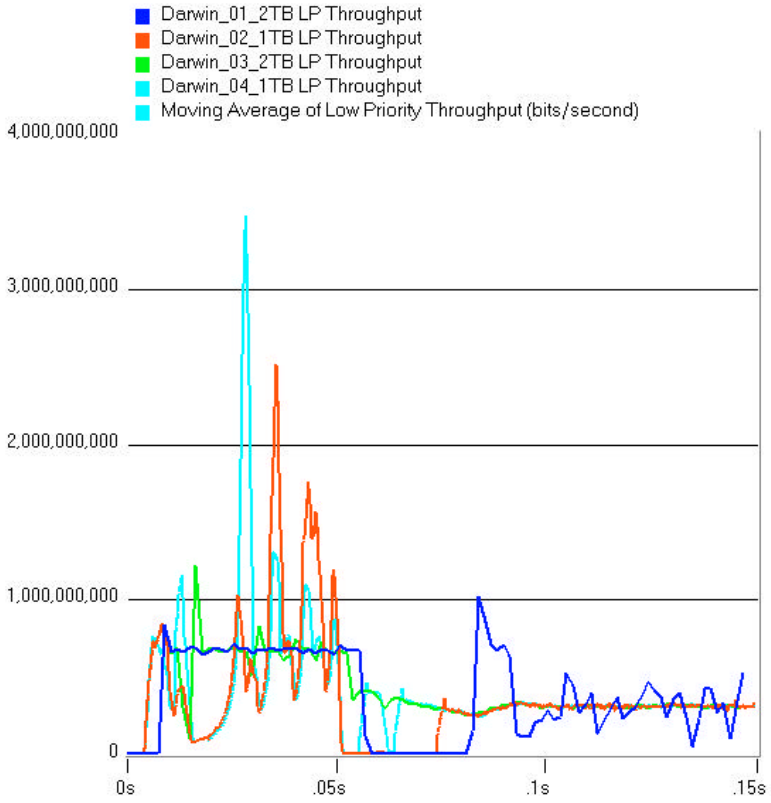


Class B, C
Max 6000 us

Class A1
Max 90 us

Scenario T2TB-LH
Transient Throughput

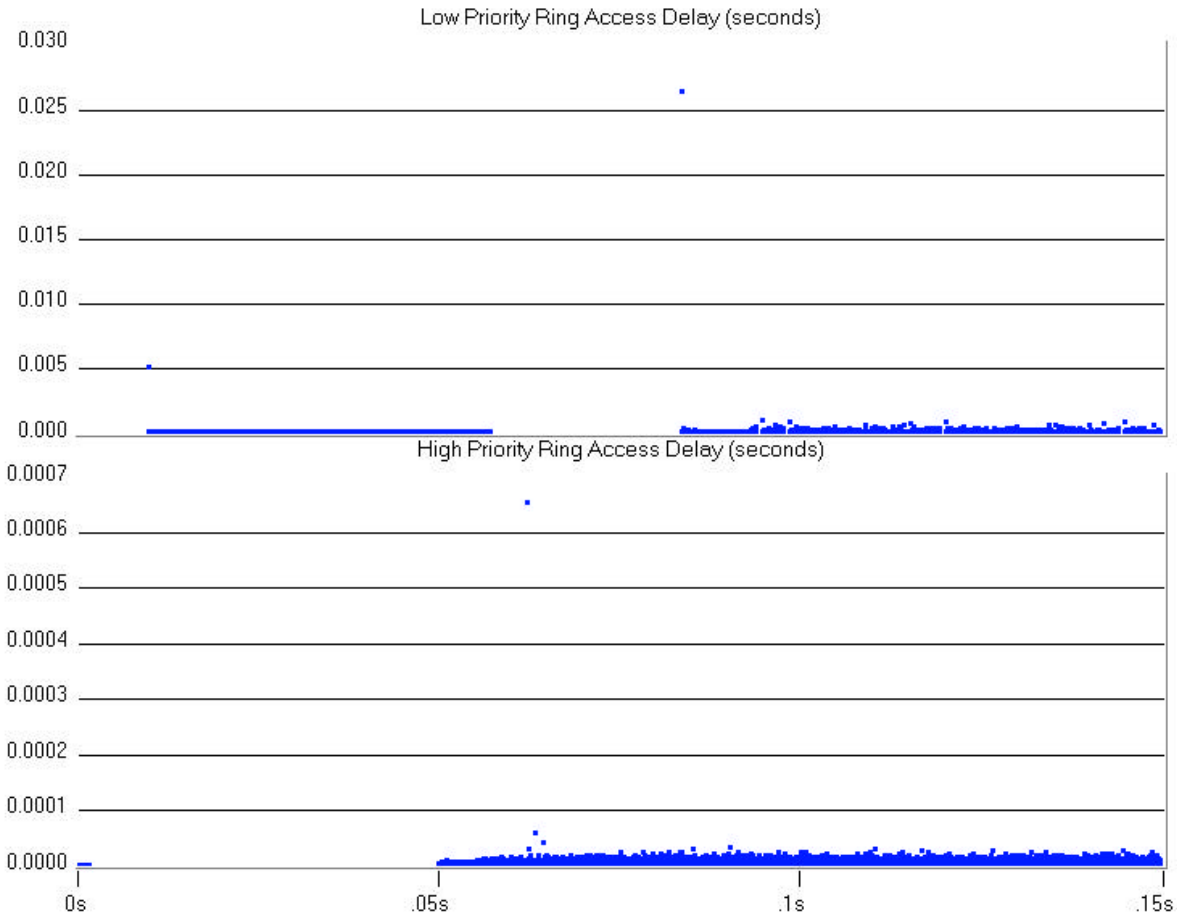




Class A1, B **80 ms transient** **Class C**

Scenario T2TB-LH

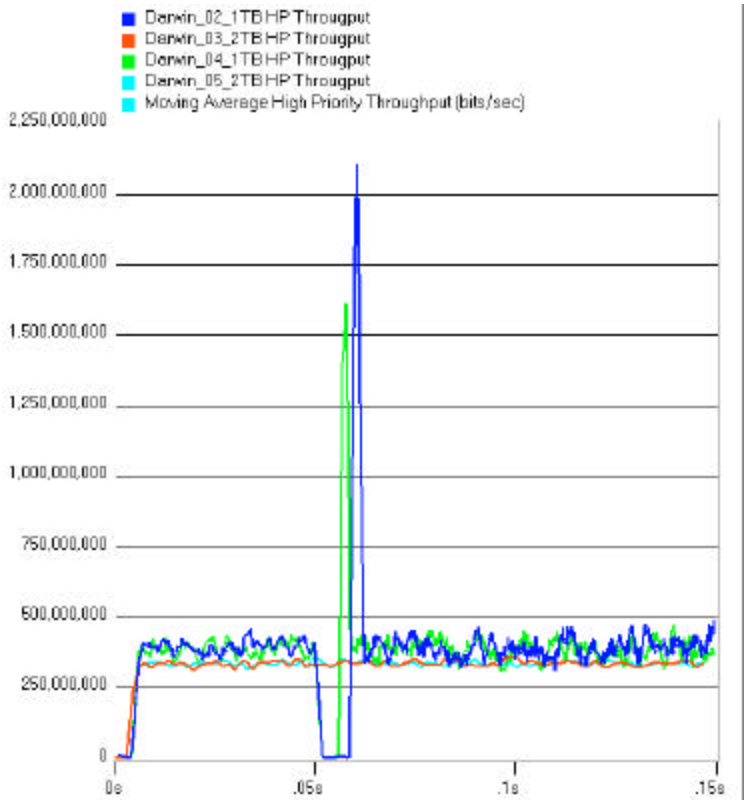
Ring Access Delay at congested station

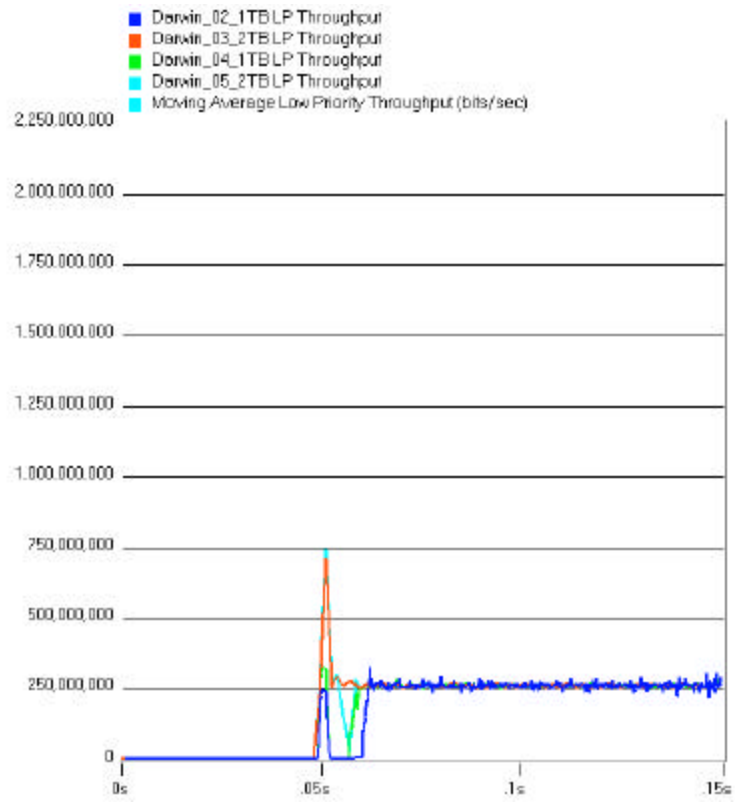


Class B,C
Max 25000 us

Class A1
Max 650 us

Scenario T1TB-HL
Transient Throughput

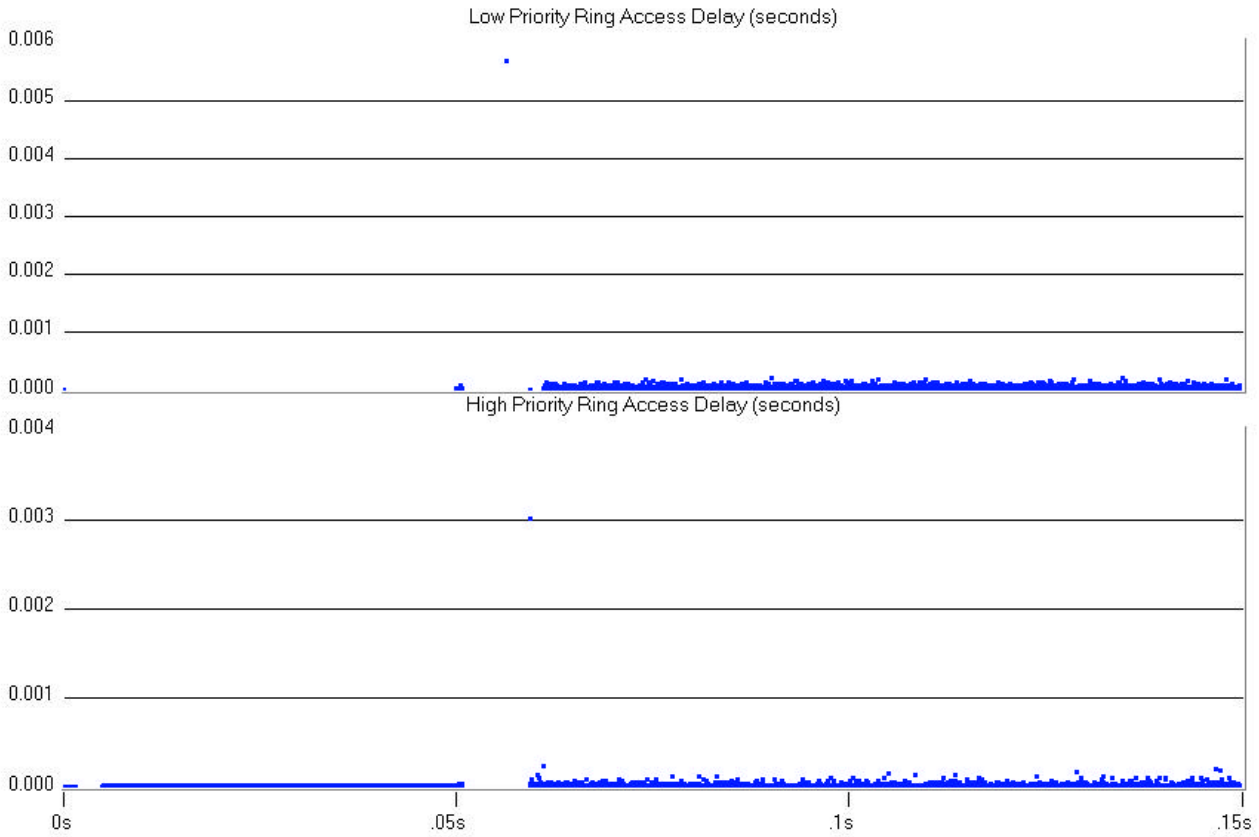




Class A1, B **70 ms transient** **Class C**

Scenario T1TB-HL

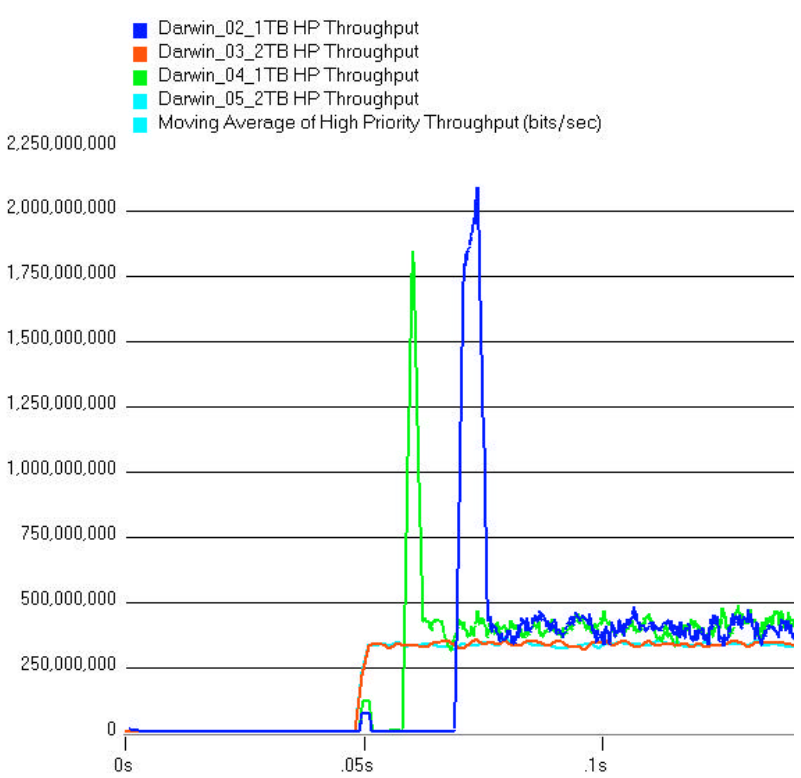
Ring Access Delay at congested station

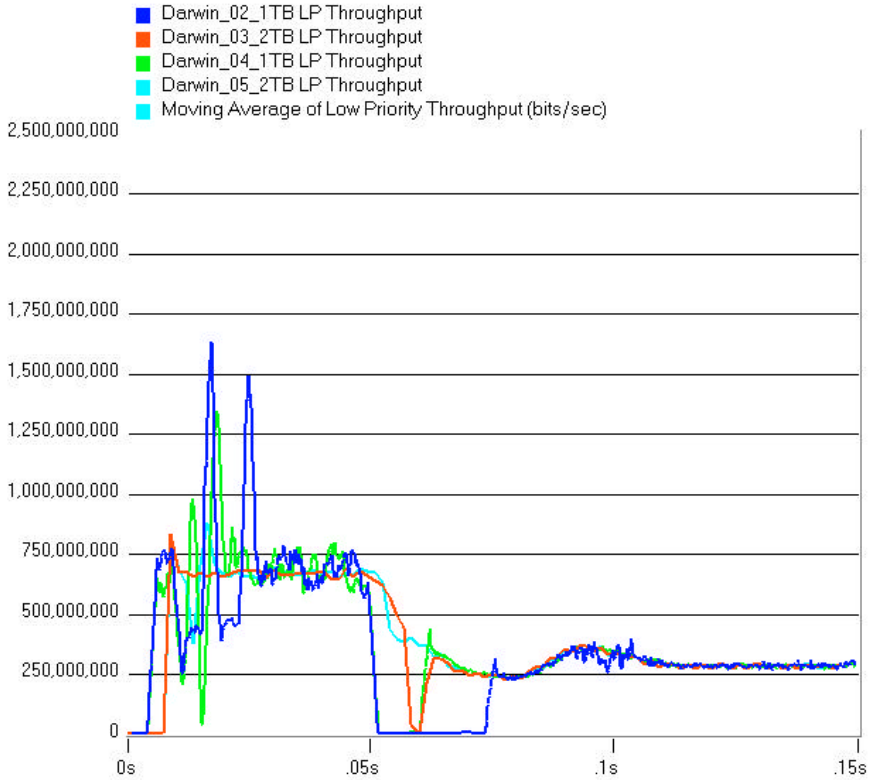


Class C
Max ~6000 us

Class B
Max 3000 us

Scenario T1TB-LH
Transient Throughput

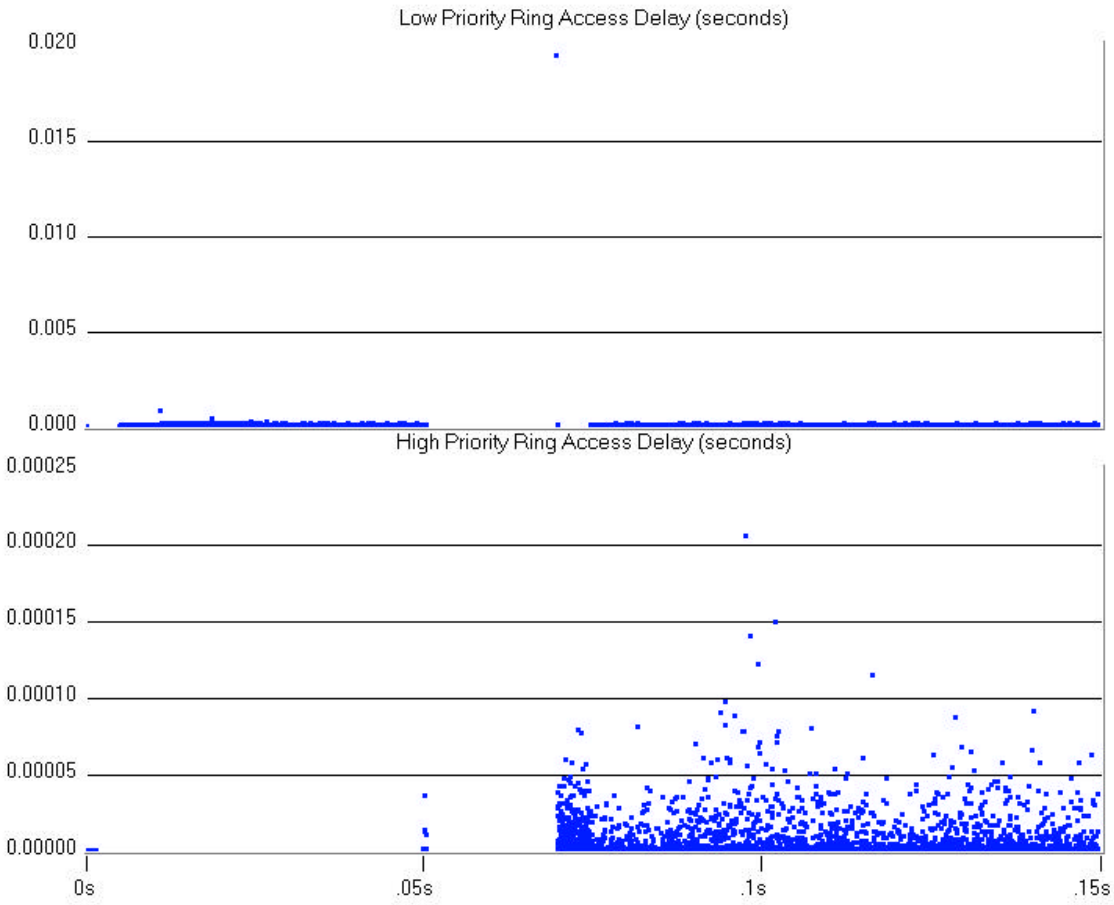




Class A1, B **80 ms transient** **Class C**

Scenario T1TB-LH

Ring Access Delay at the congested station



Class C
Max 20,000 us

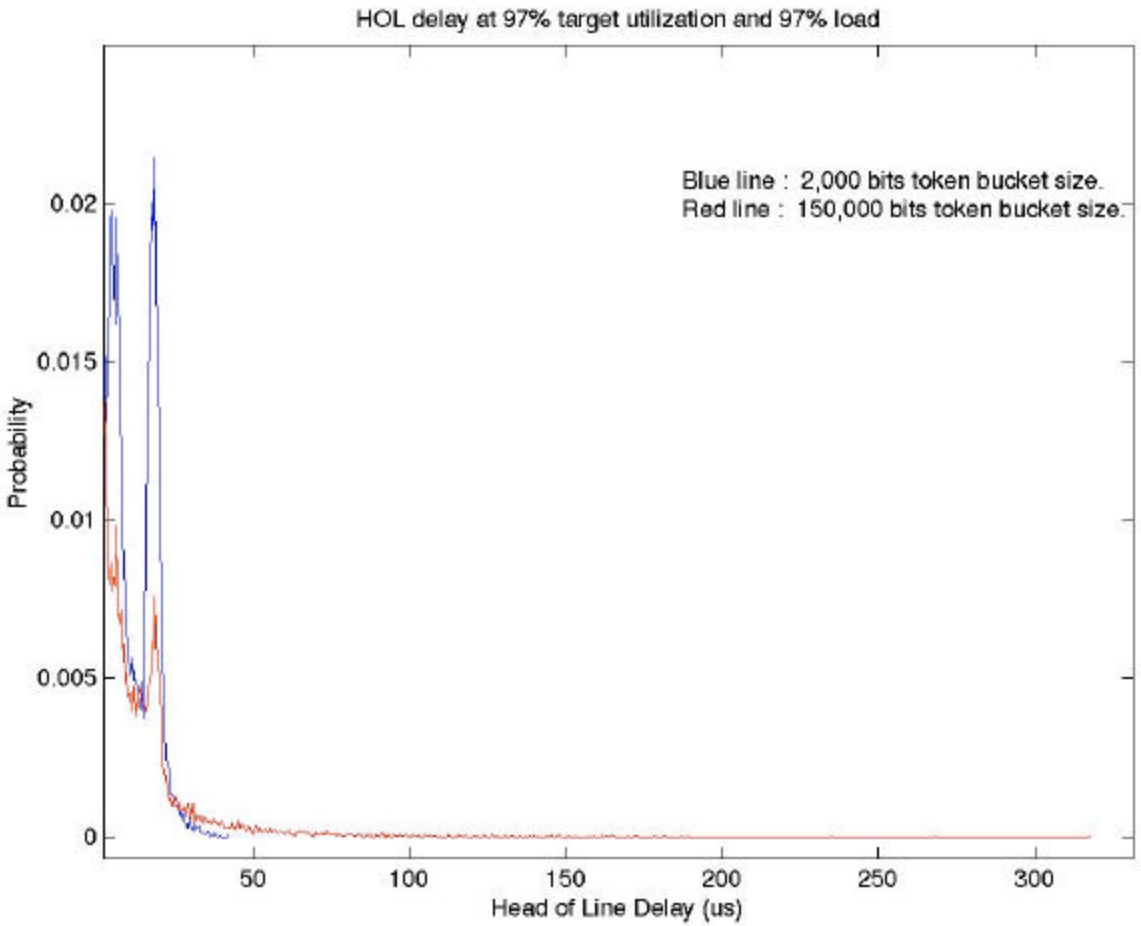
Class B
Max 200 us

Conclusions

- Mono-queue and dual-queue based on Darwin model interwork
  - Simulation result for High (reclaimable) and low priority traffic
- Transient state results:
  - Converges to steady states very fast (NxRTT)
  - Achieves expected bounded MAC access delay and jitter
    - 1TB High reclaimable/low < 2RTT
    - 2TB High <RTT; low >RTT

Backup Slides

Ring Access Delay vs. Bucket Size



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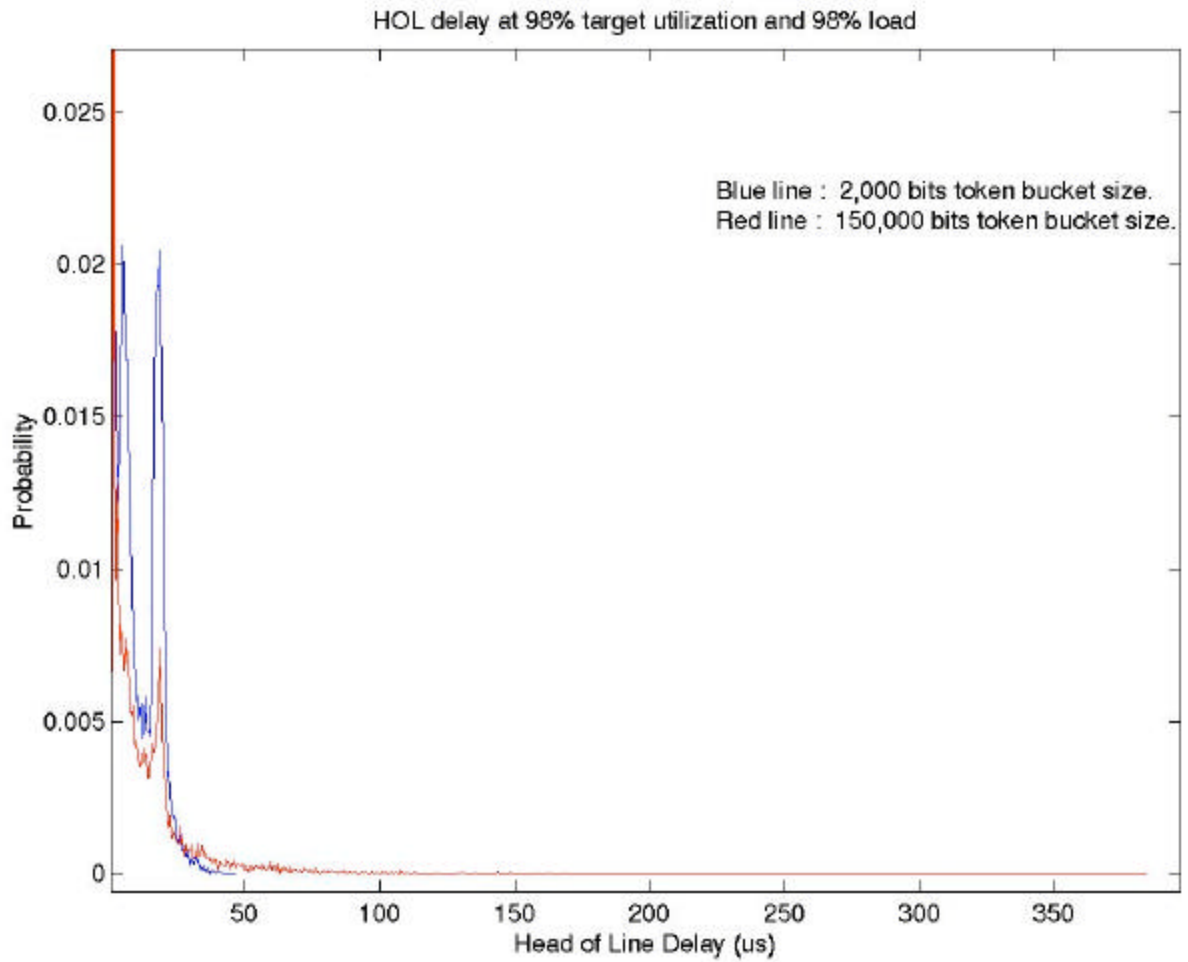

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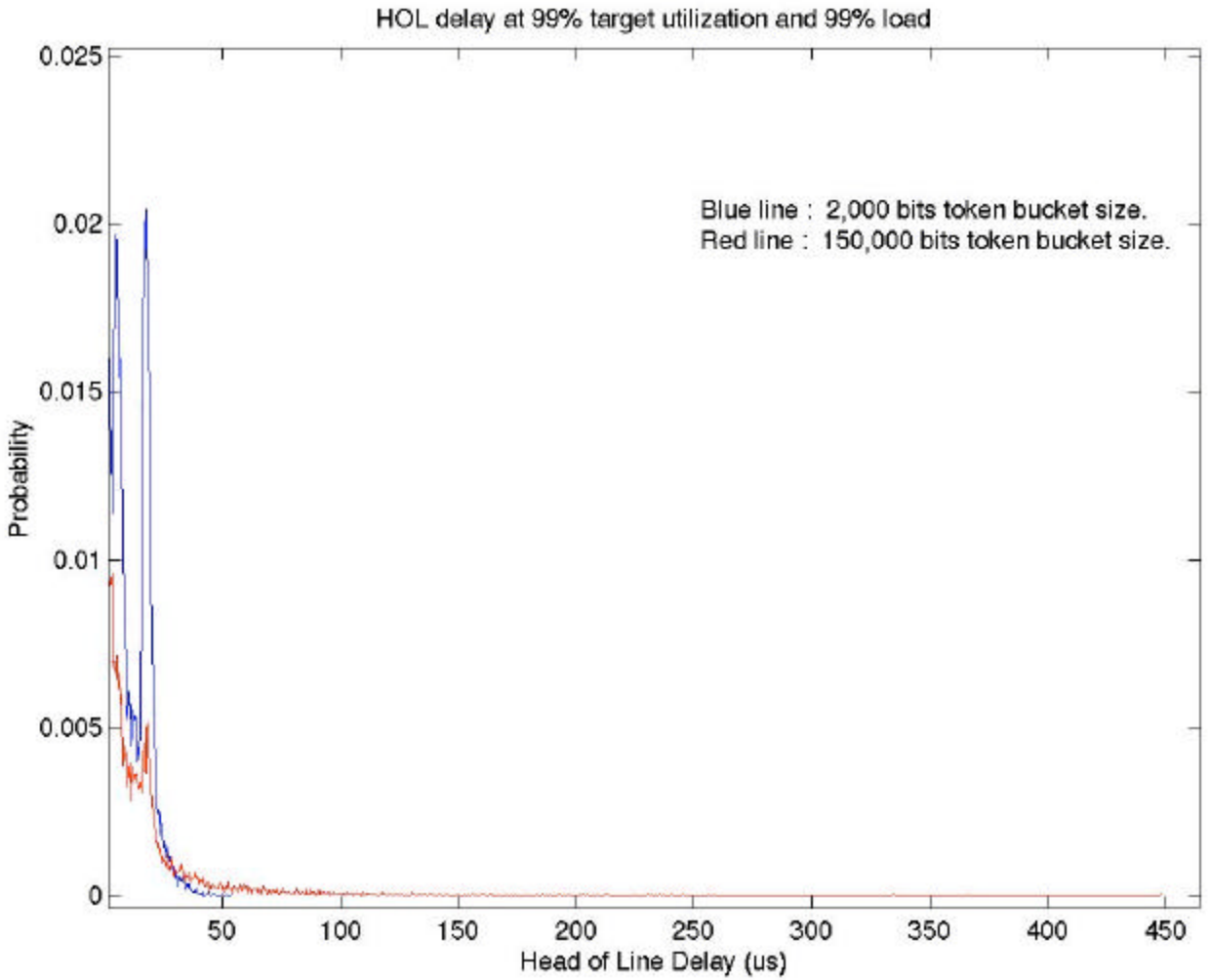

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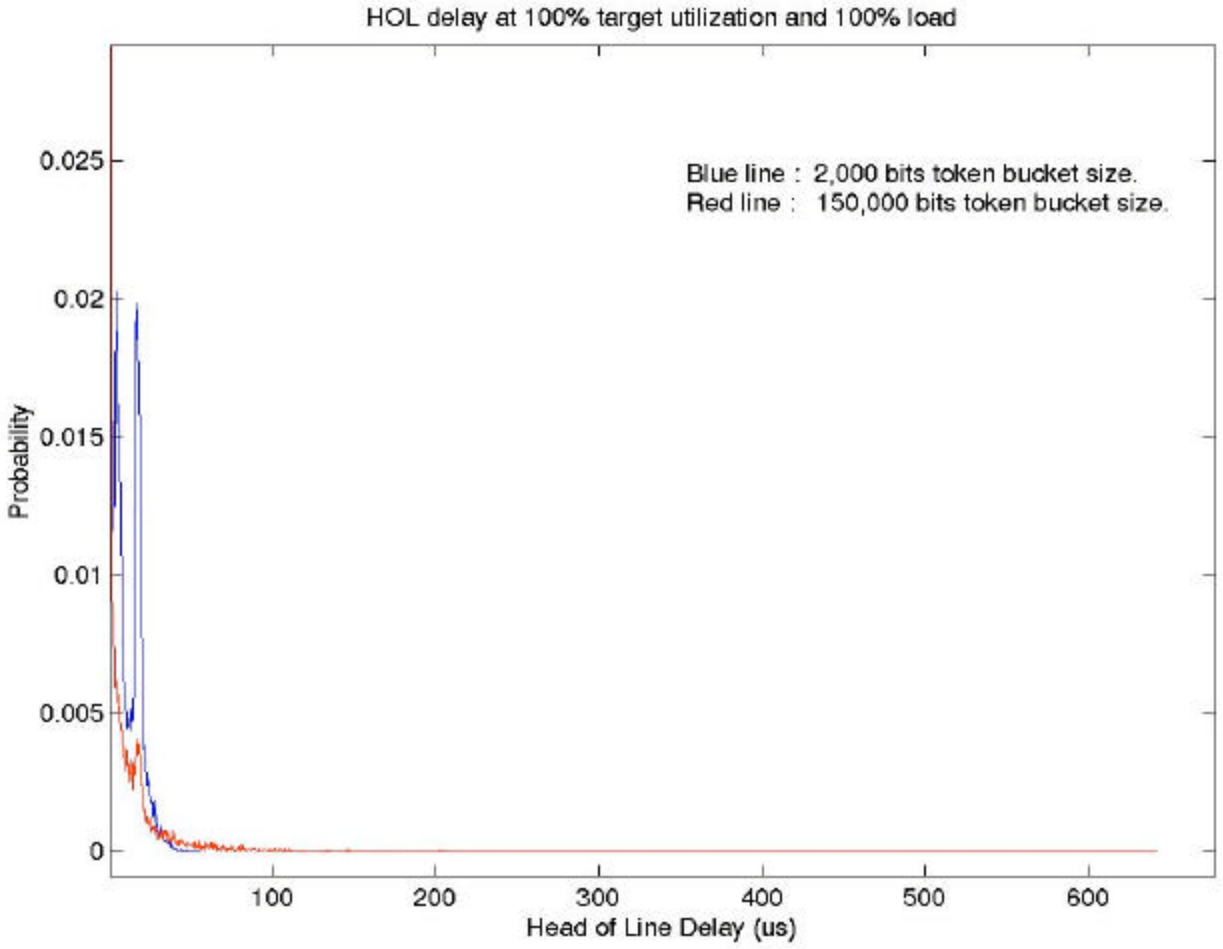

Ring Access Delay vs. Bucket Size 8-Node Senario