



Performance Analysis of Darwin: Steady state

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Agenda

- Objectives
- Darwin Scenarios and Simulation Settings
- Steady State Simulation Results¹
- Conclusions

¹ Transient response simulation is in a separate presentation

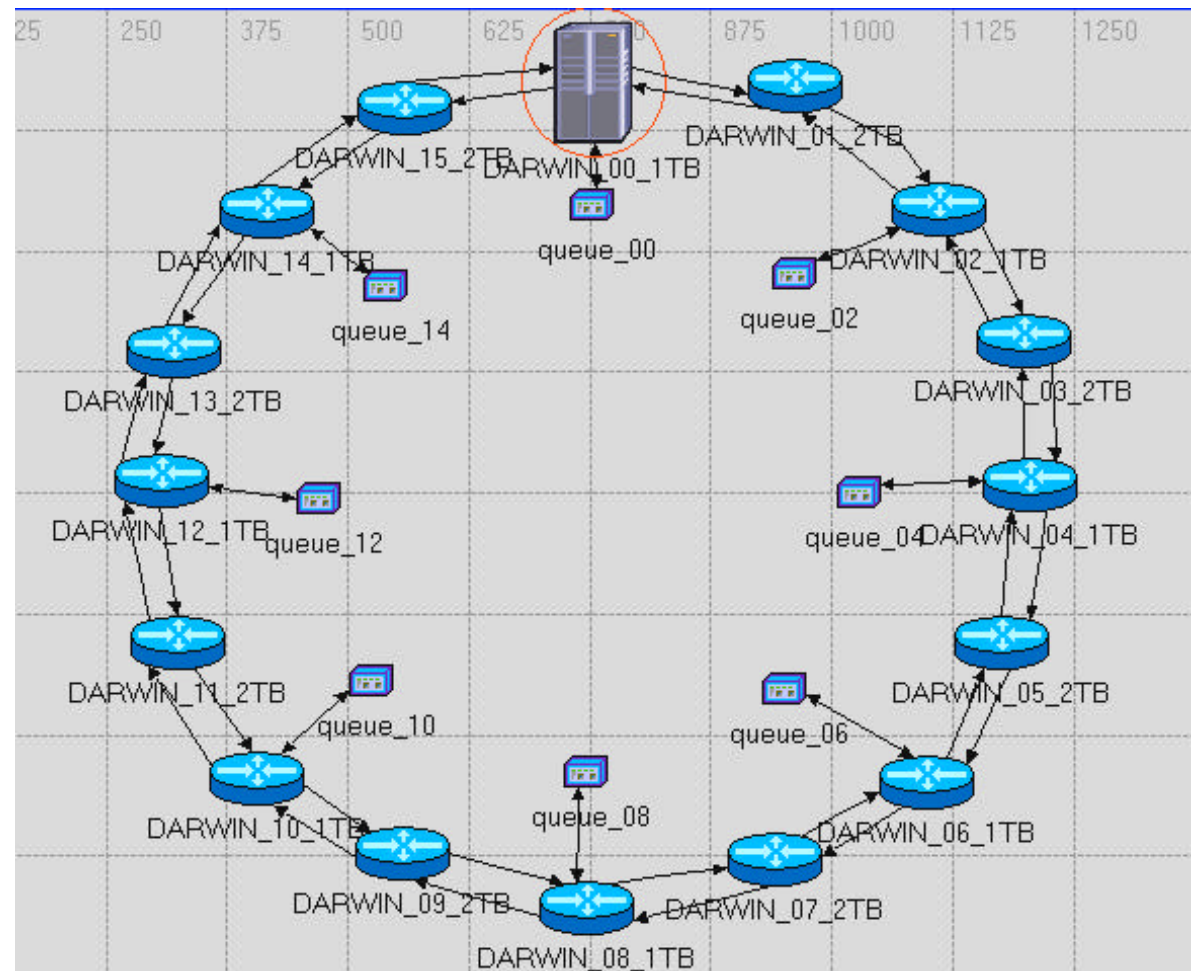
Objectives

- 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
 - Analysis of interworking
 - Mono-queue (1TB) as the congested station
 - Dual-queue (2TB) as the congested station
 - CDF: **Ring Access Delay**
 - 2 types of traffic: High(reclaimable) and low priority

Scenario S2TB-HL:

Congestion detected by 2TB station

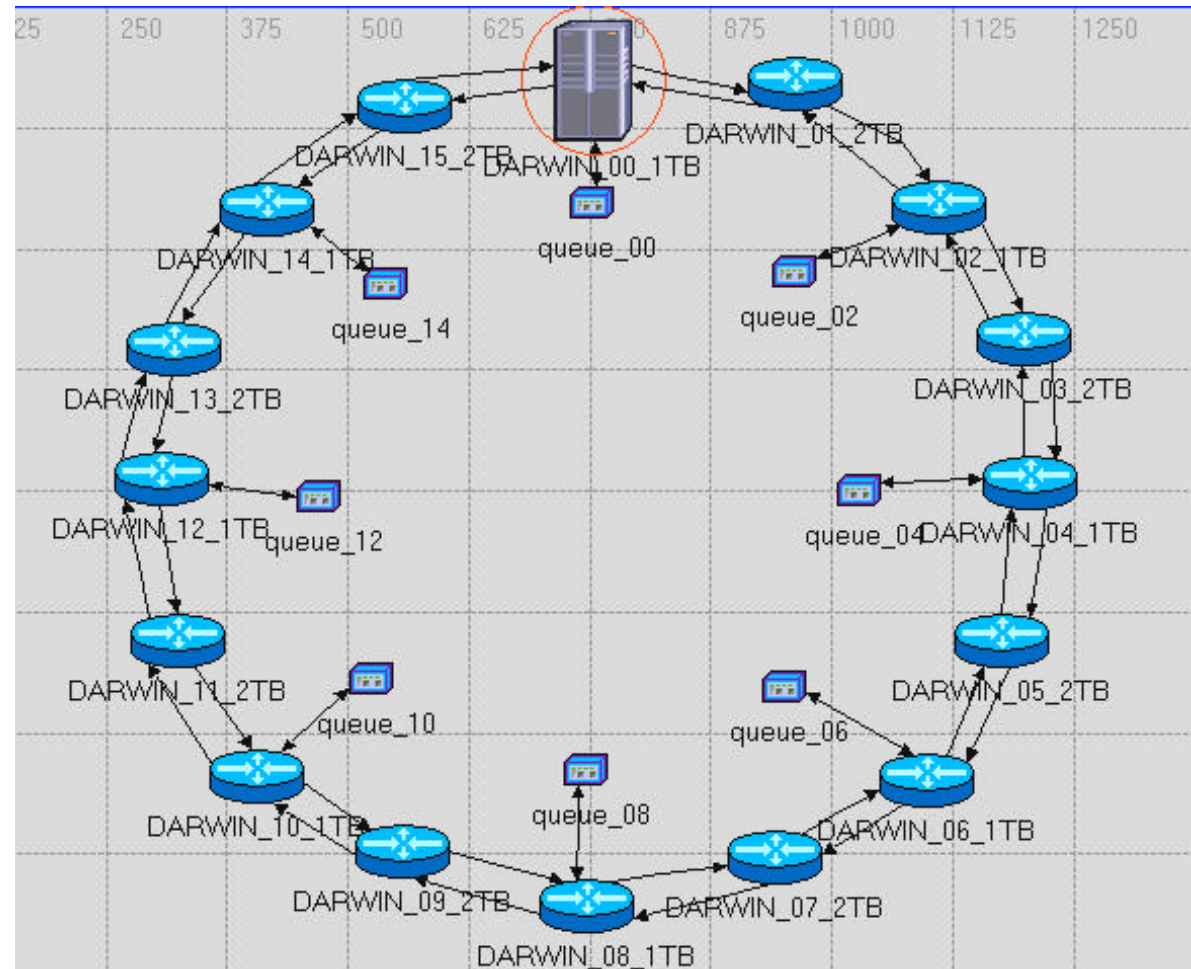
- Darwin_00_1TB is the Hub
- Stations 01 to 15 send traffic counter clockwise on inner ring
- At $t=0s$, ring is 50% loaded with **High Priority**
- At $t=0.05s$, ring is 100% loaded with **Low Priority**



Scenario S2TB-LH:

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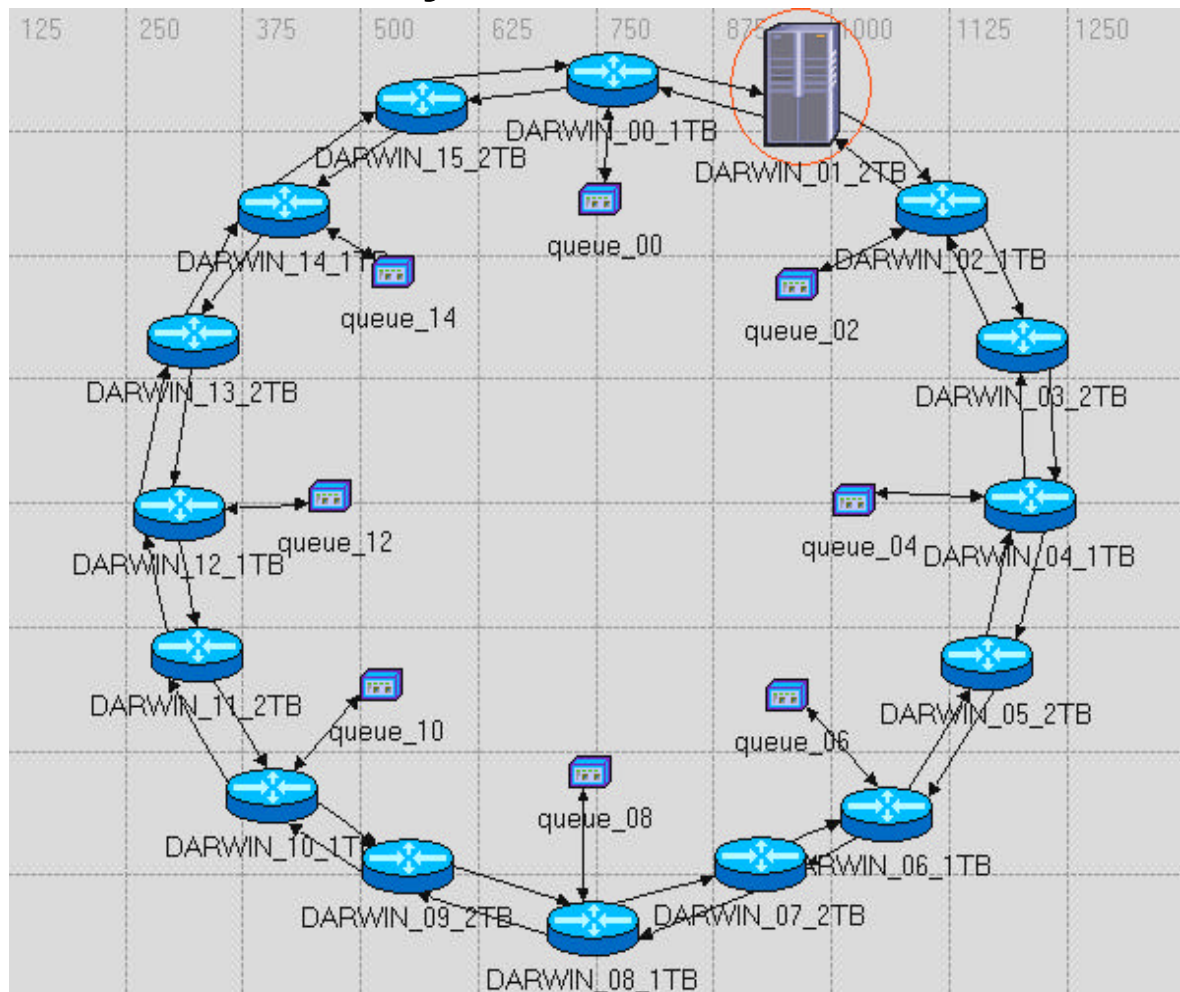
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Scenario S1TB-HL:

Congestion detected by 1TB station

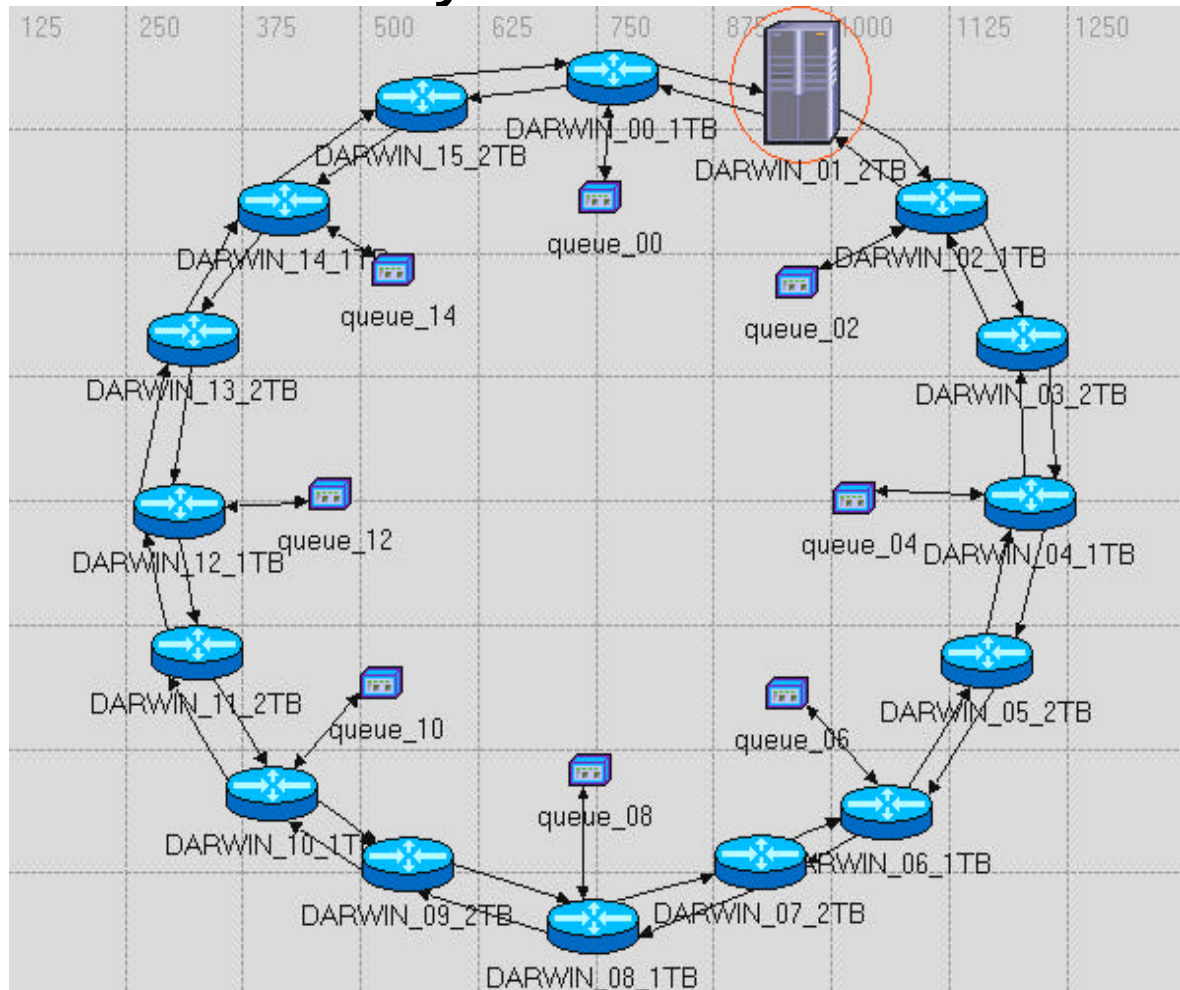
- Darwin_01_2TB is the Hub
- Stations 02 to 00 send traffic counter clockwise on inner ring
- At 0s, ring is 50% loaded with **High Priority**
- At 0.05s, ring is 100% loaded with **Low Priority**



Scenario S1TB-LH:

Congestion detected by 1TB station

- Darwin_01_2TB is the Hub
- Stations 02 to 00 send traffic counter clockwise on inner ring
- At 0s, ring is 100% loaded with **Low Priority**
- At 0.05s, ring is 50% loaded with **High Priority**



Scenario Summary

Scenarios	Congested station	t= 0s	t= 0.05s
	Target utilization 95%	Traffic profile	Traffic add:
S2TB-HL	2TB	50% high	100% low
S2TB-LH	2TB	100% Low	50% high
S1TB-HL	1TB	50% high	100% low
S1TB-LH	1TB	100% Low	50% high



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

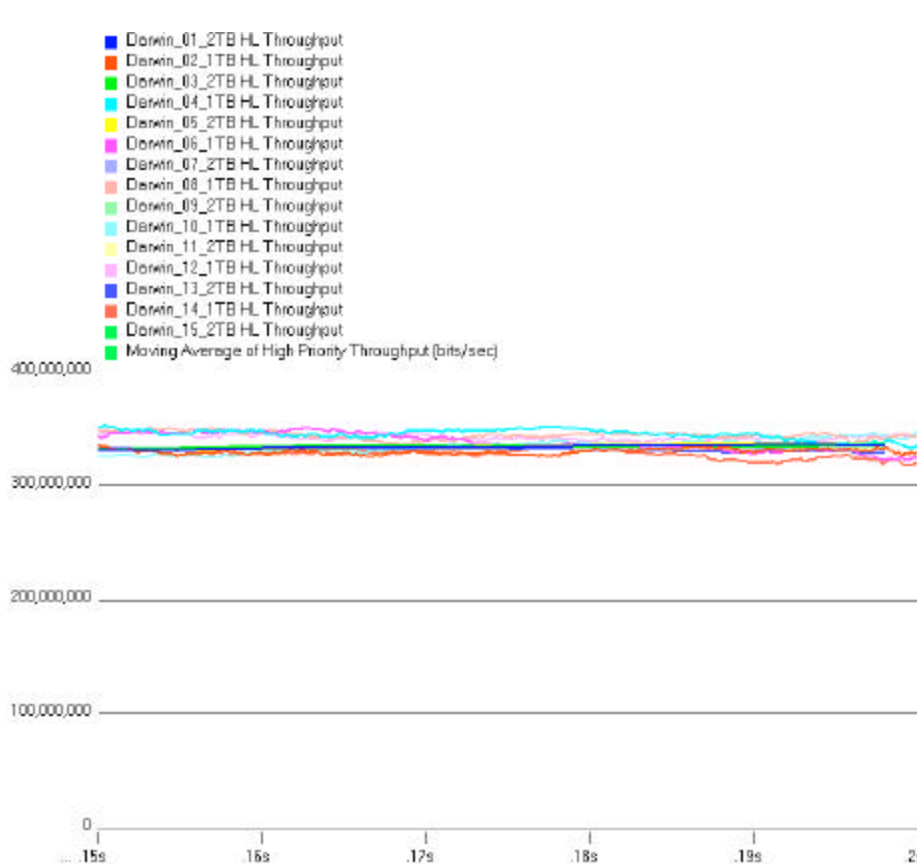


Simulation Parameters

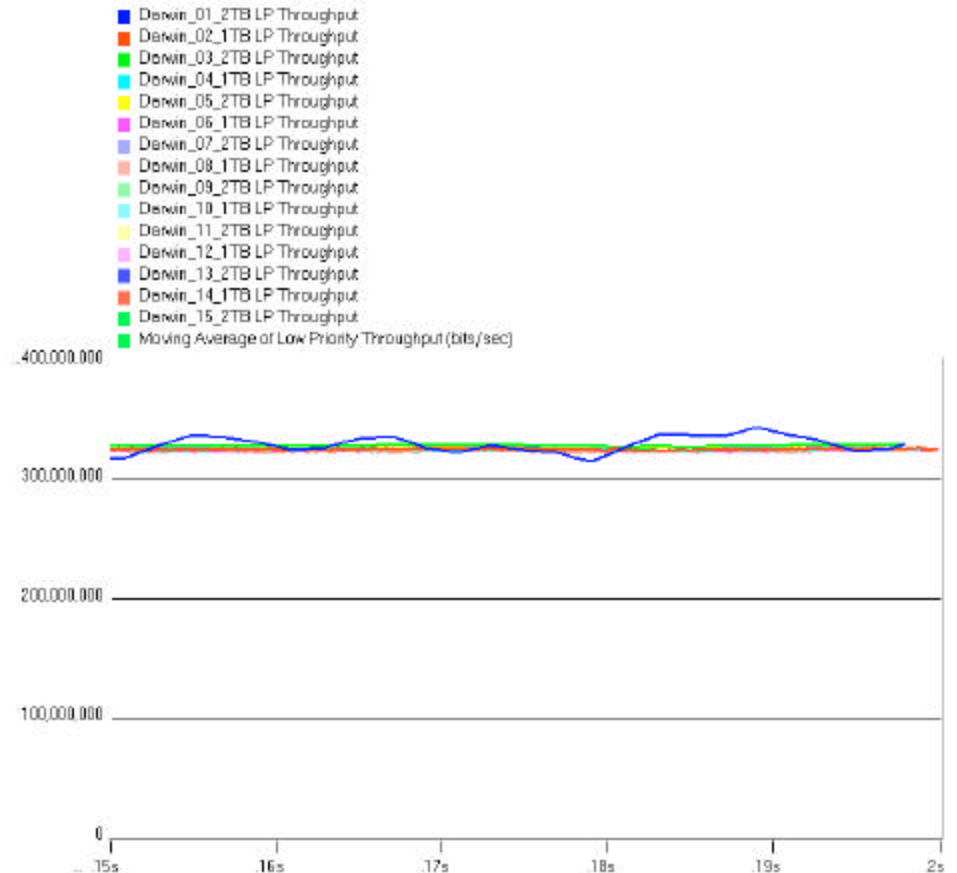
- Simulation Settings: 1TB Nodes
 - Ring Access Delay Threshold: 1ms
 - Tsample: 200us
 - Token Size: 1,000 bits
 - Leaky Bucket Size: 150,000 bits (12 MTU)
 - Burst time: 15us
- Simulation Settings: 2TB Nodes
 - Decay Interval: 100us
 - Low Transit Buffer Size: 4MB
 - Low threshold: 900KB
 - Low Transmit Buffer Size: 1MB
 - Leaky bucket size: 80,000 bits
 - Burst time: 8us
 - Trigger Threshold: 450KB
- Common Settings
 - Target Utilization: 95%
 - Link Delay: 70us (15km)
 - Link Rate: 9.953 Gbps (OC-192)

Scenario S2TB-HL

Achieves Stable and Fair Throughput



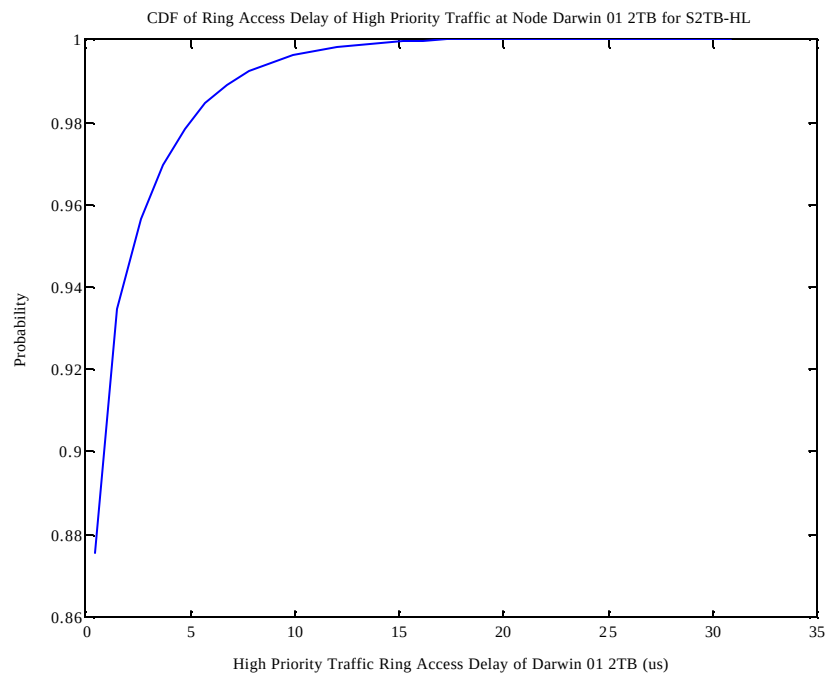
Class A1,B priority throughput



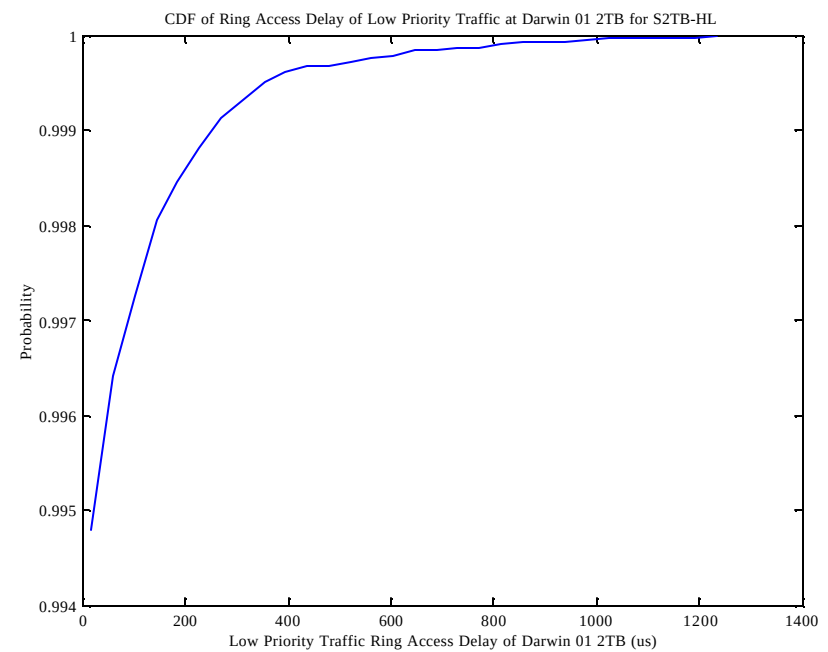
Class C priority throughput

Scenario S2TB-HL

Bounded Ring Access Delay: CDF



Class A1 priority: Bounded 30 us



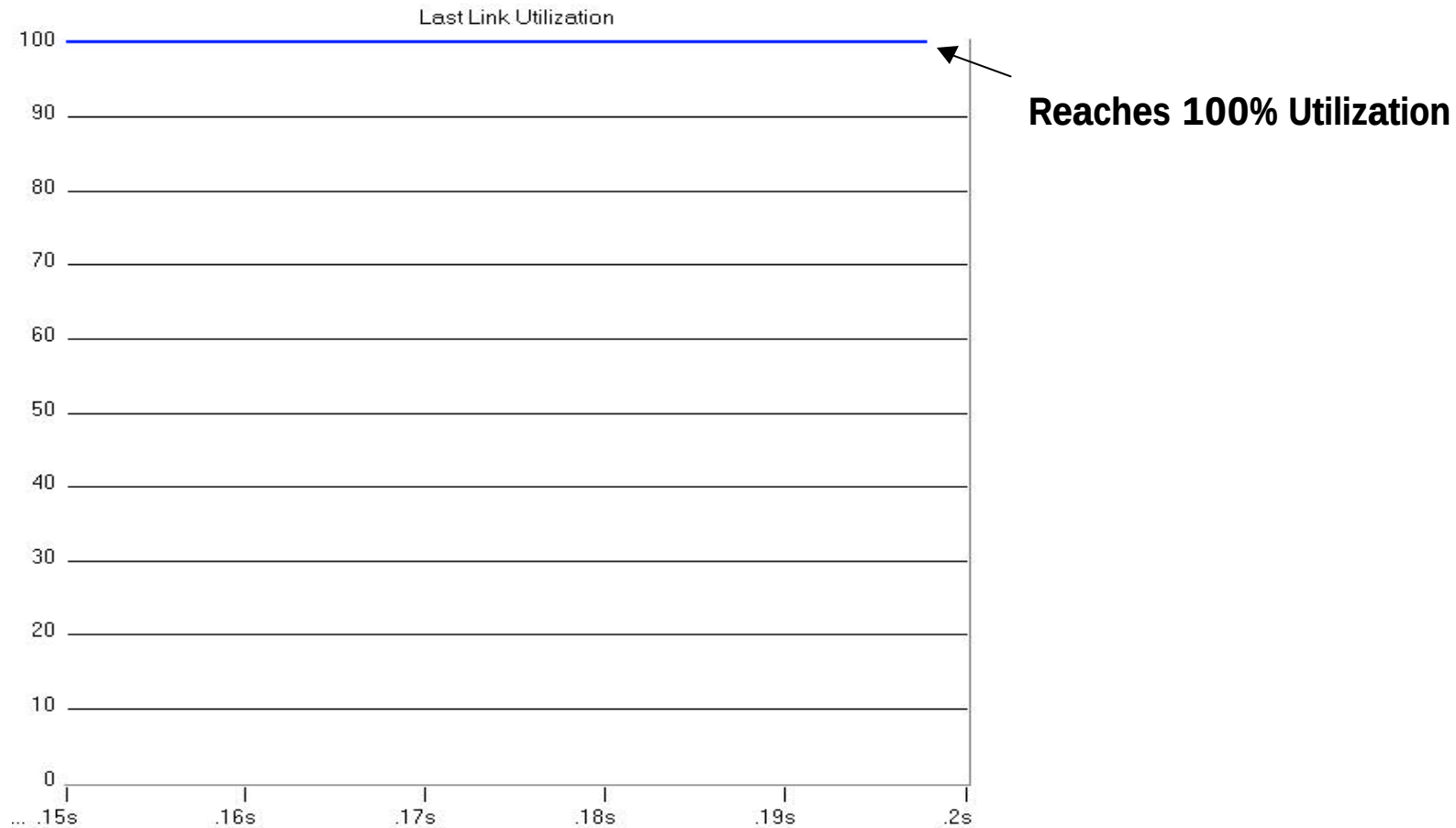
Class B,C priority: Bounded 1200 us

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



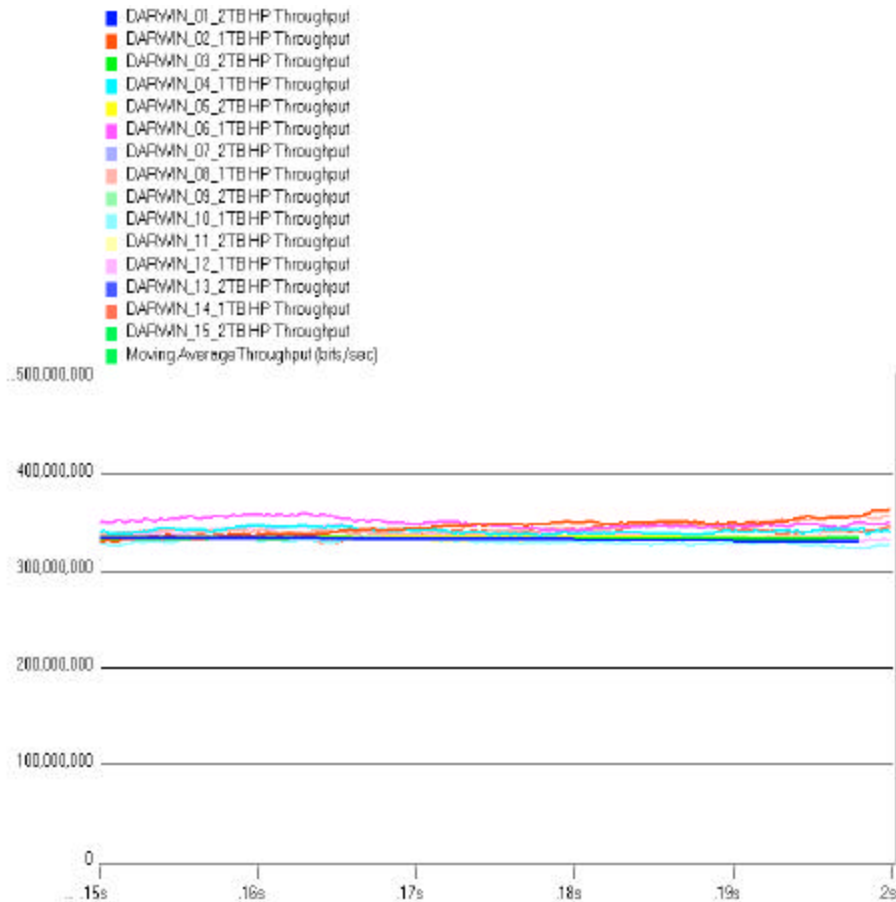
Scenario S2TB-HL

Achieves target Utilization, last link

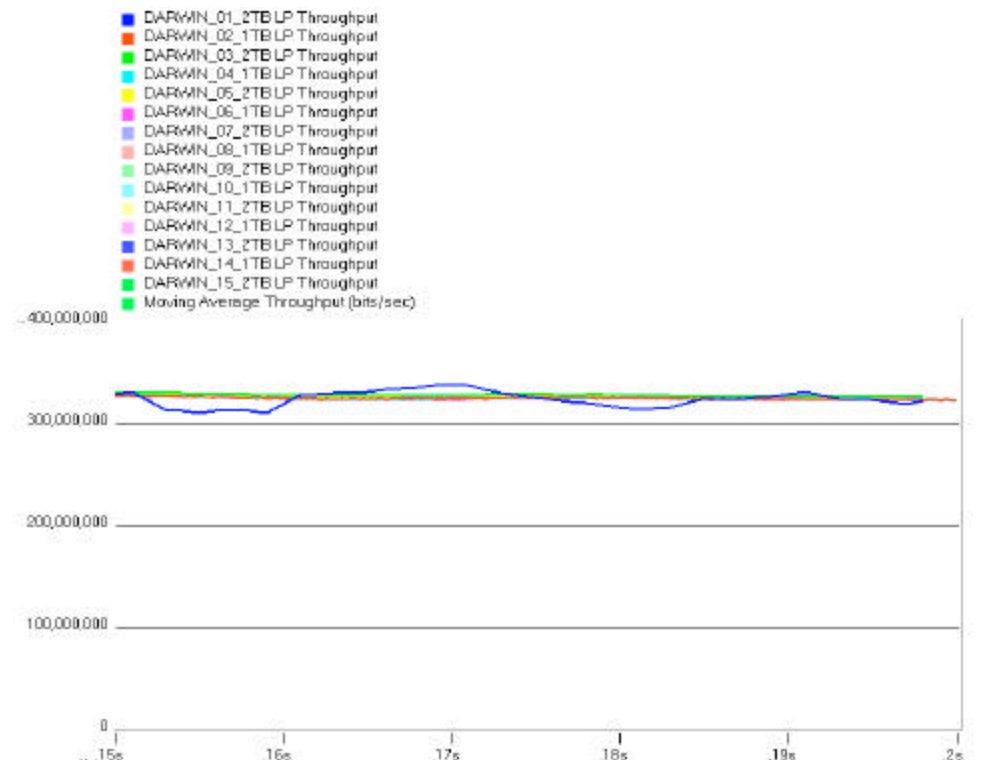


Scenario S2TB-LH

Achieves Stable and Fair Throughput



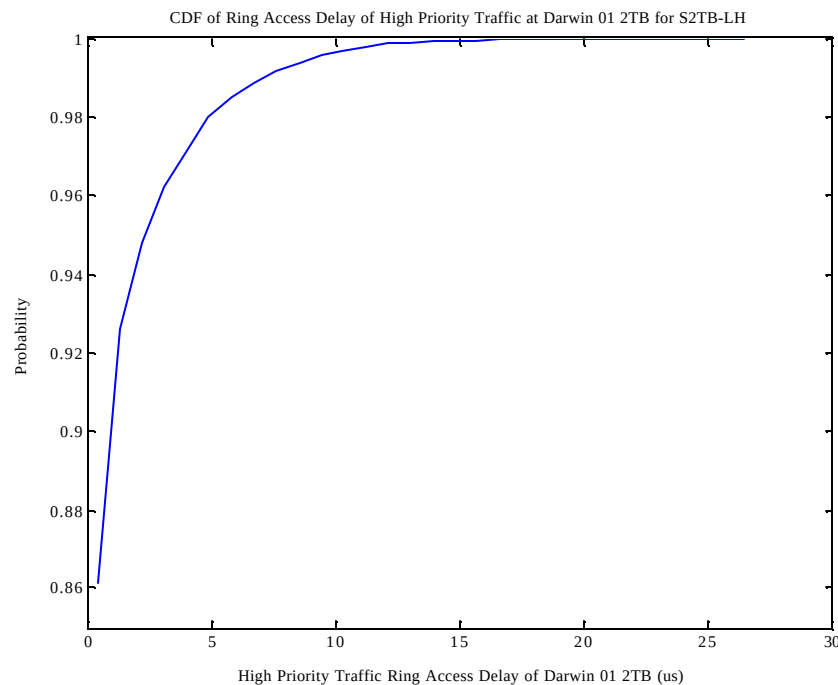
Class A1,B priority throughput



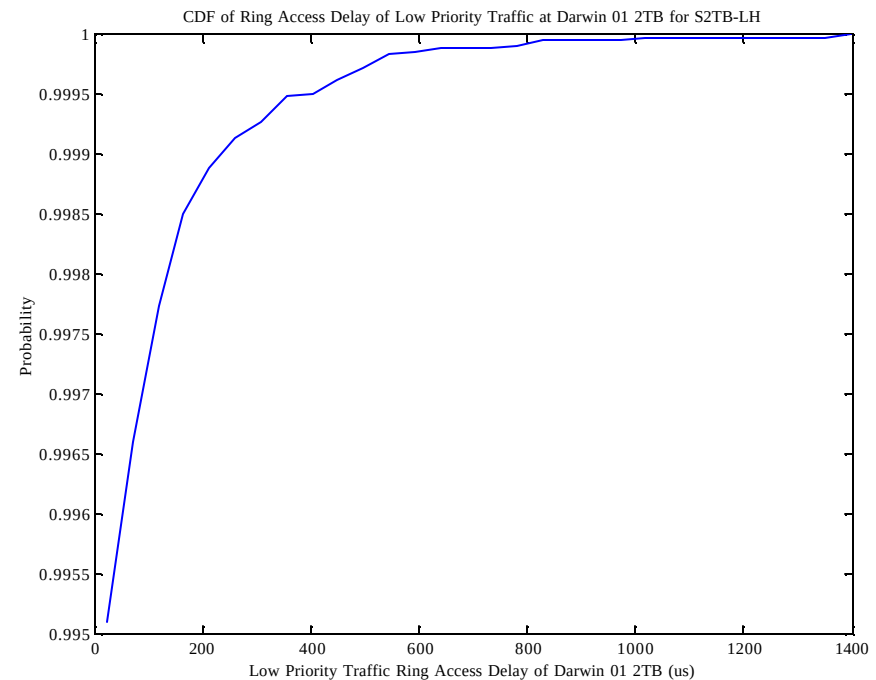
Class C priority throughput

Scenario S2TB-LH

Bounded Ring Access Delay:CDF



Class A1: Bounded 27 us

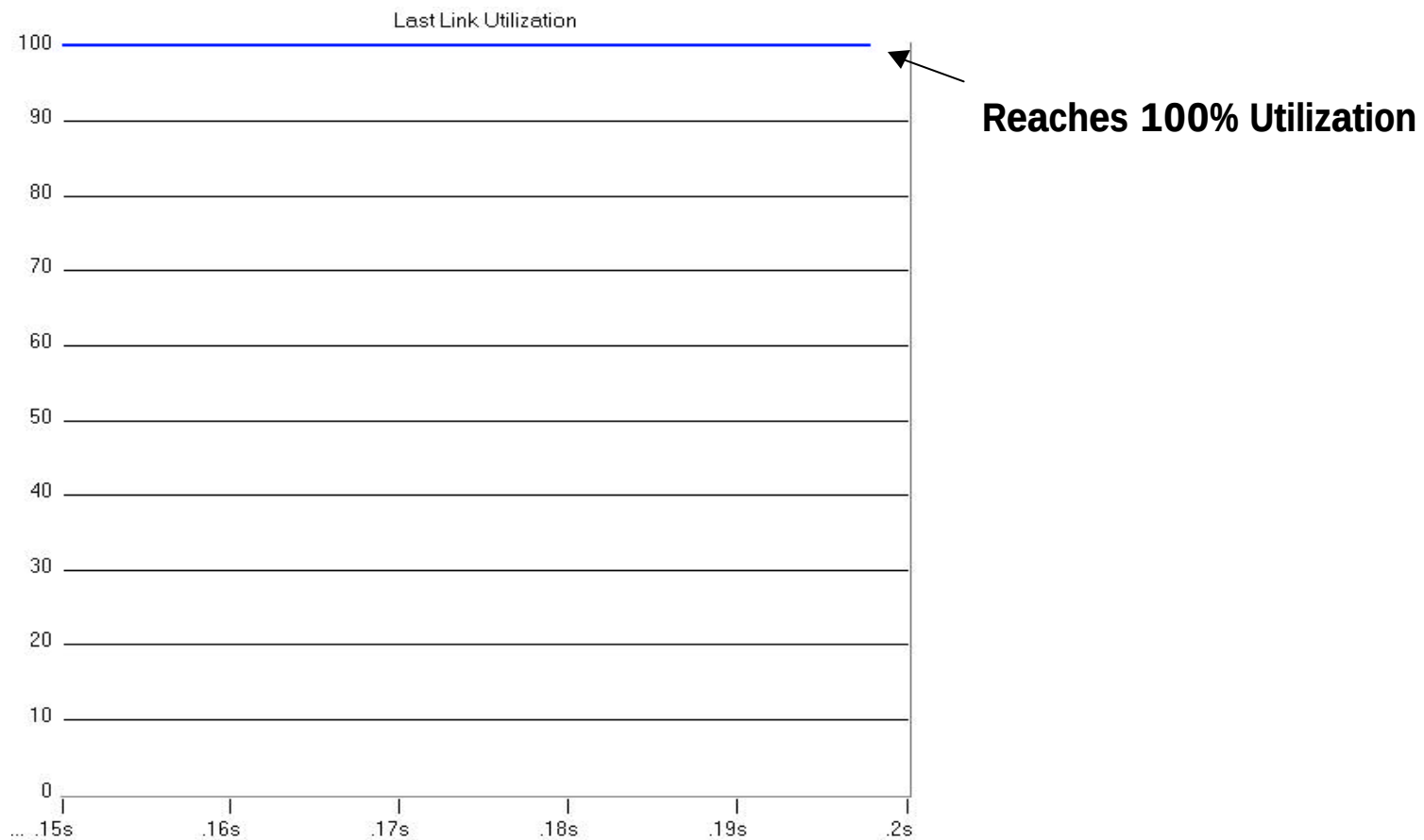


Class B,C priority: Bounded 1400 us



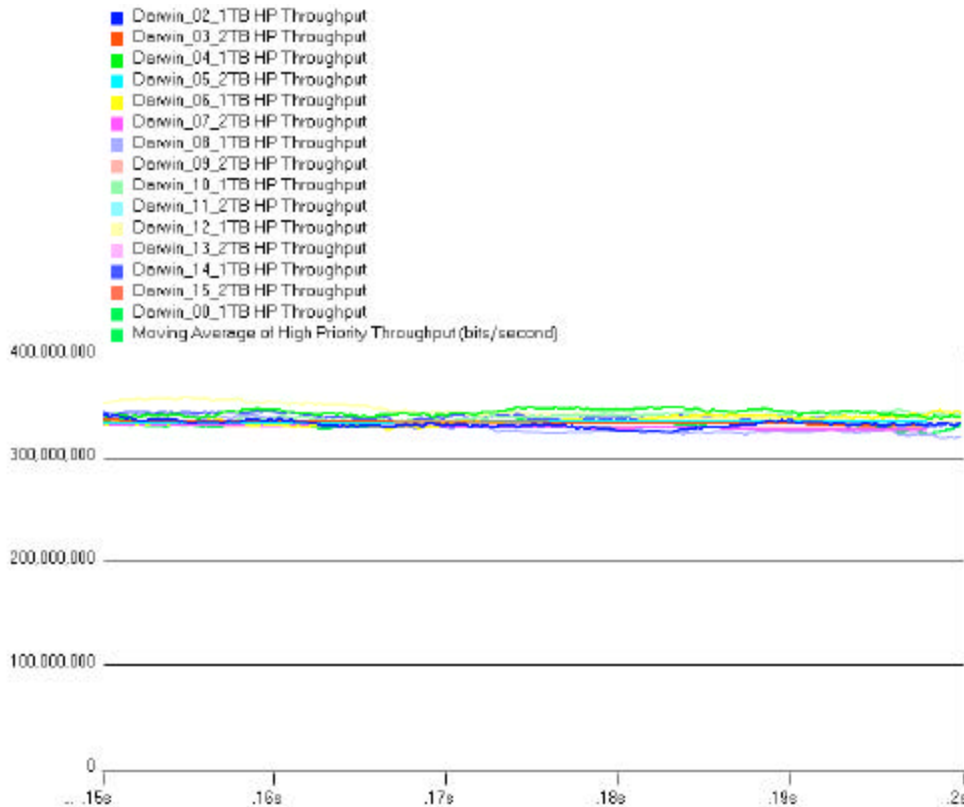
Scenario S2TB-LH

Achieves target Utilization, last link

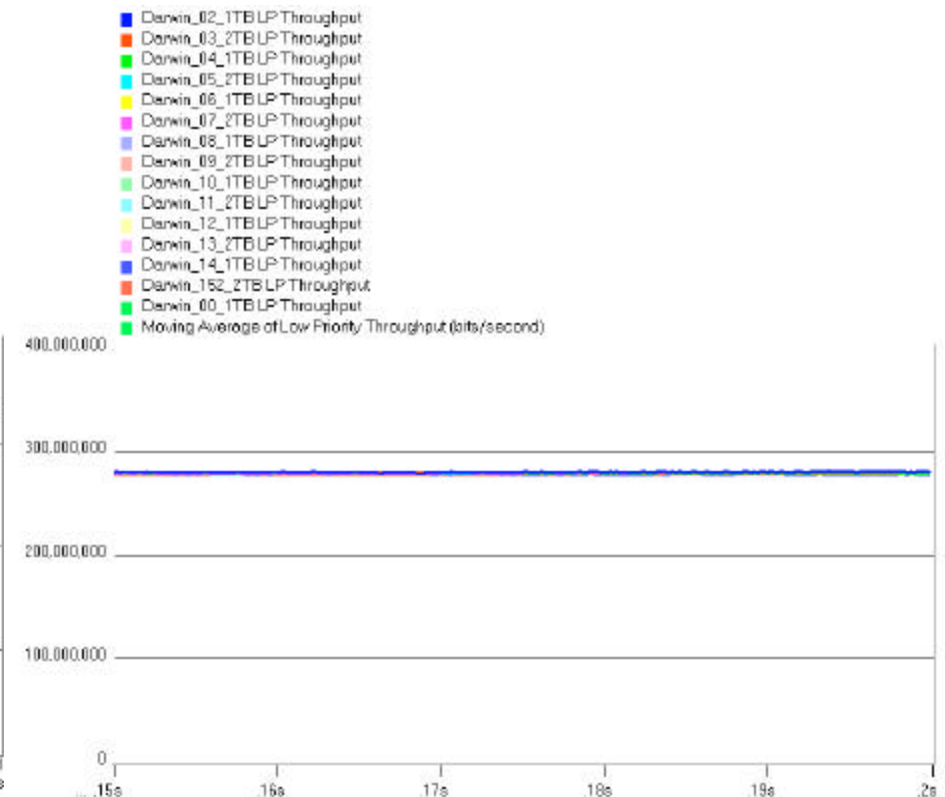


Scenario S1TB-HL

Achieves stable and Fair Throughput



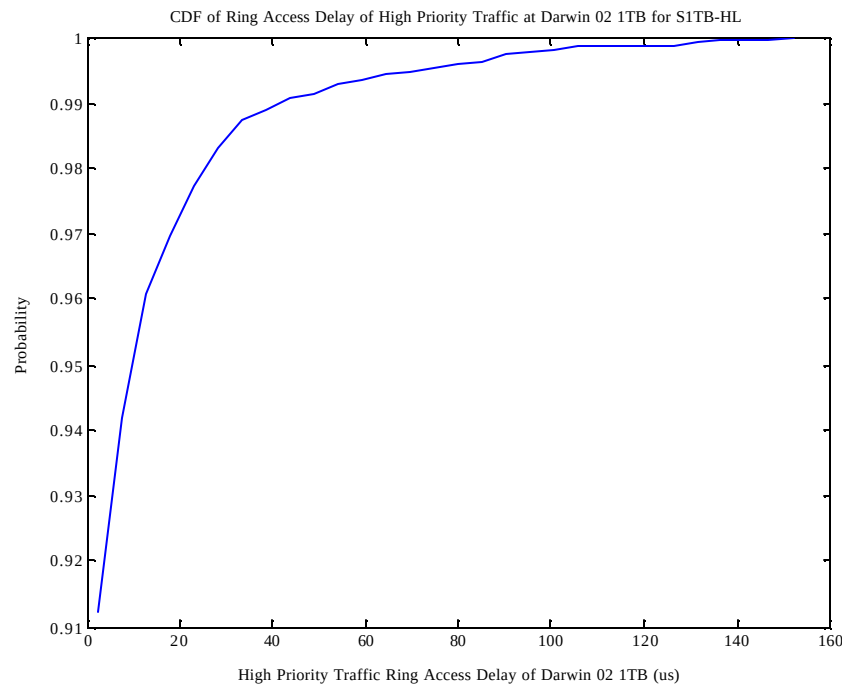
Class A1,B priority throughput



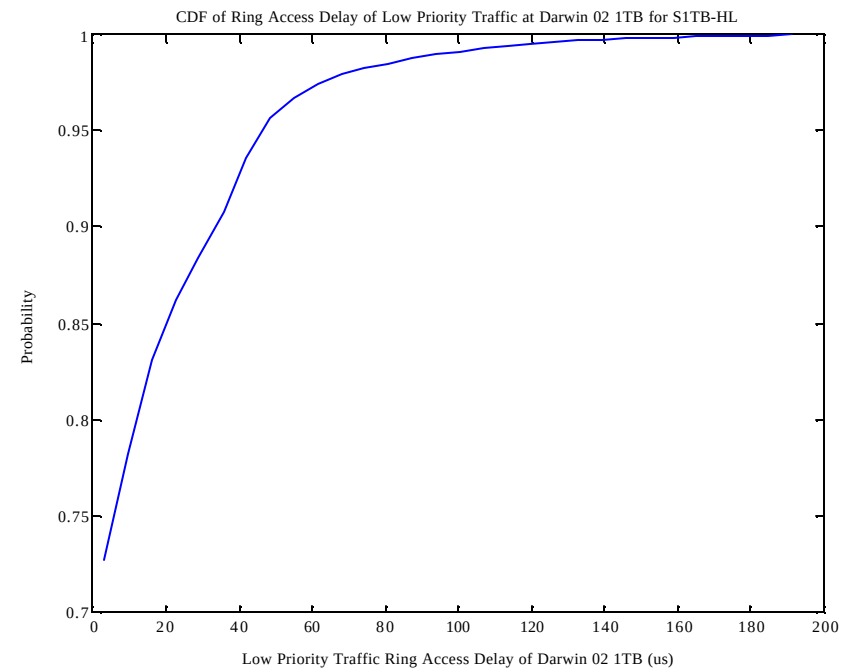
Class C priority throughput

Scenario S1TB-HL

Bounded Ring Access Delay: CDF



Class B: Bounded 150 us

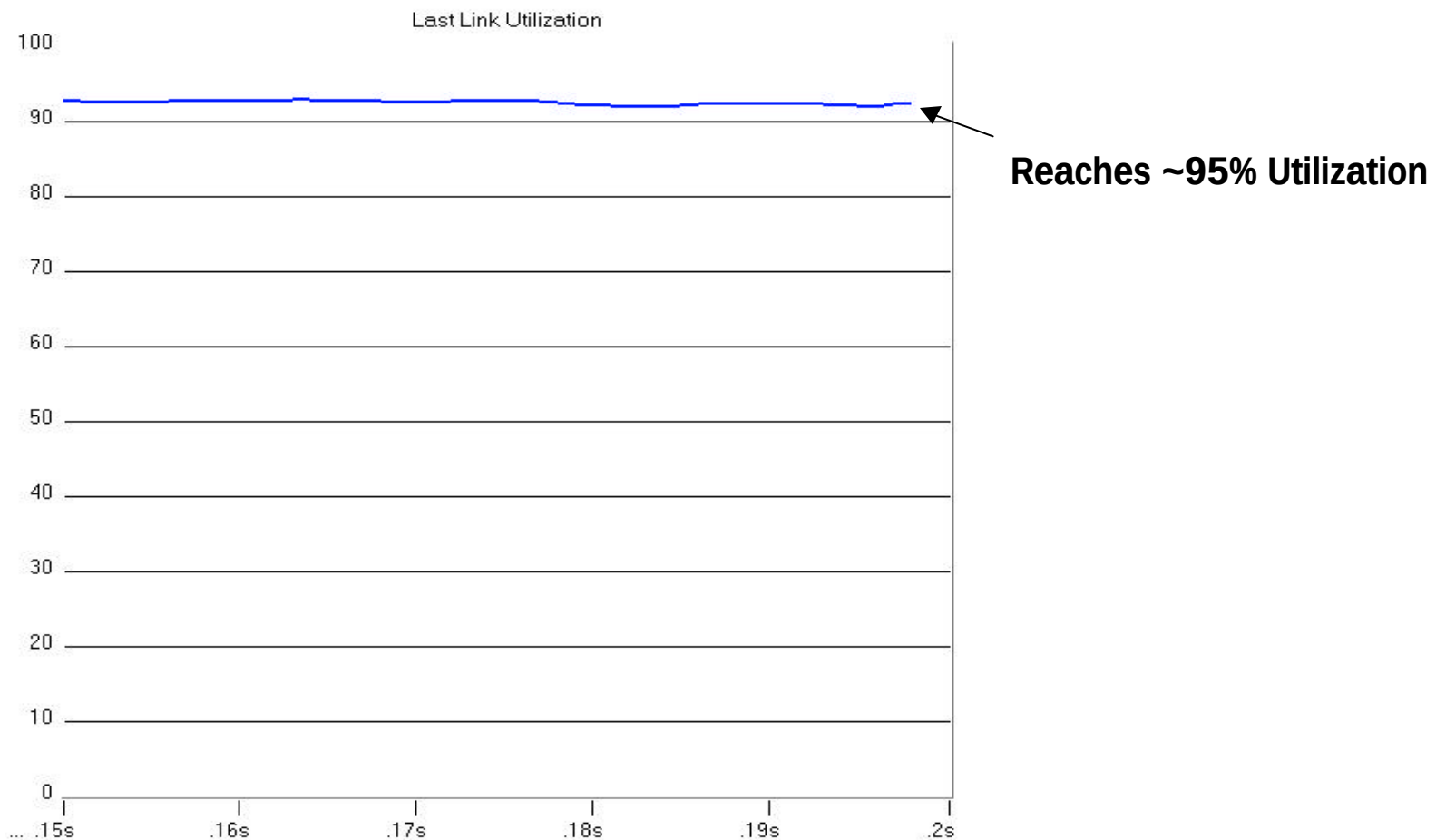


Class C: Bounded 190 us



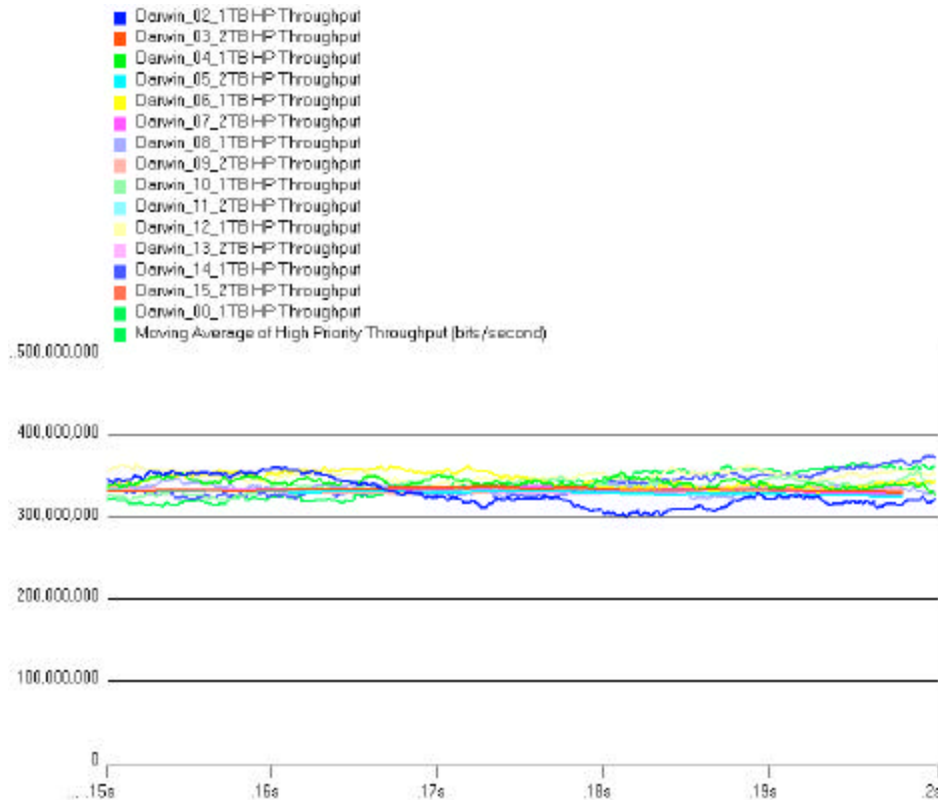
Scenario S1TB-HL

Achieves Target Utilization

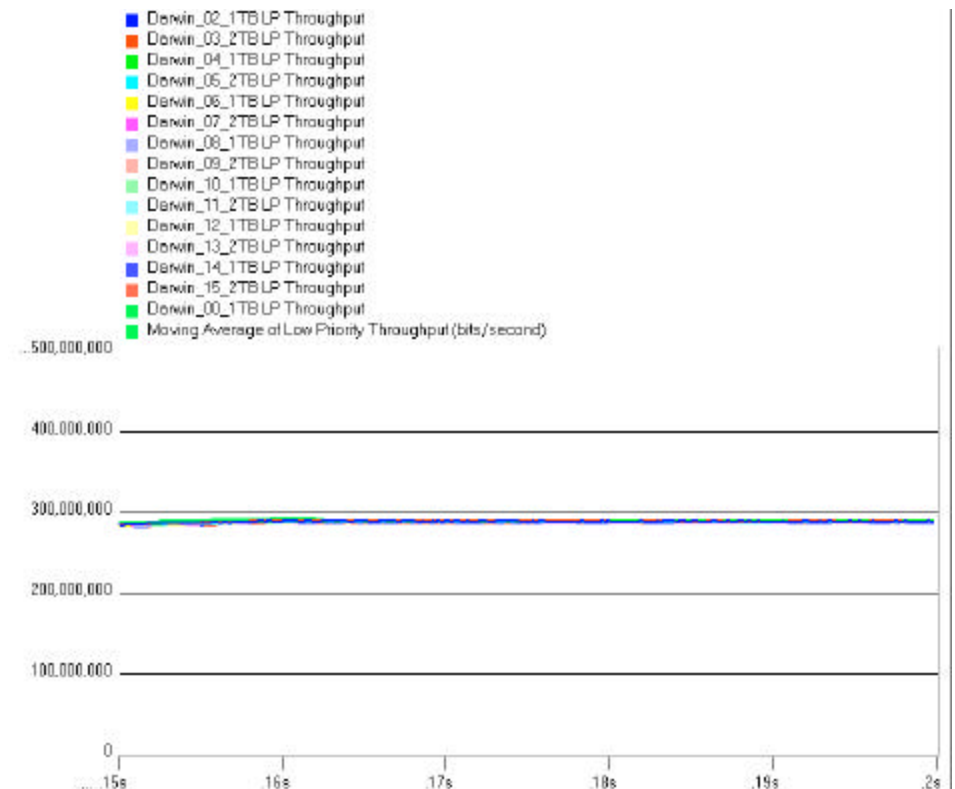


Scenario S1TB-LH

Achieves Stable and Fair Throughput



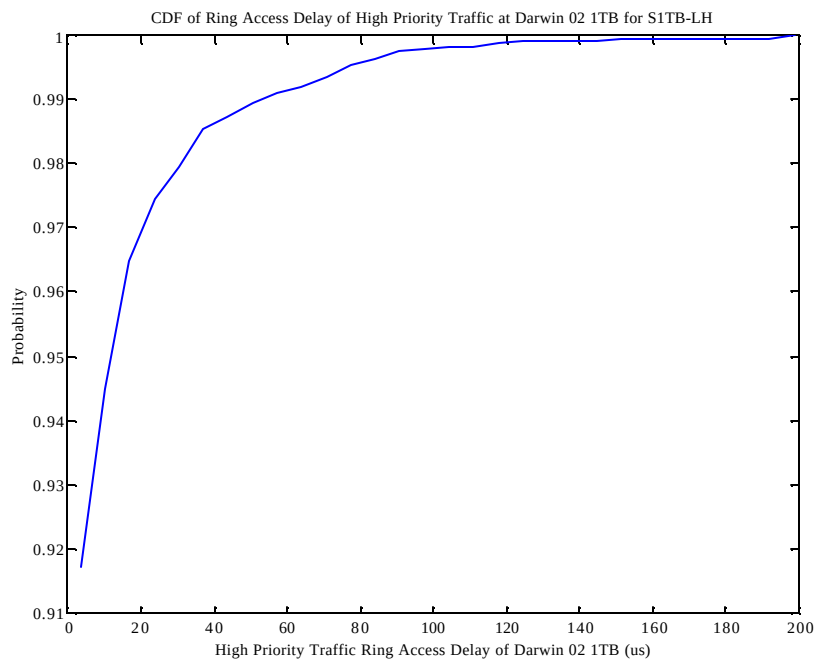
Class A1, B priority throughput



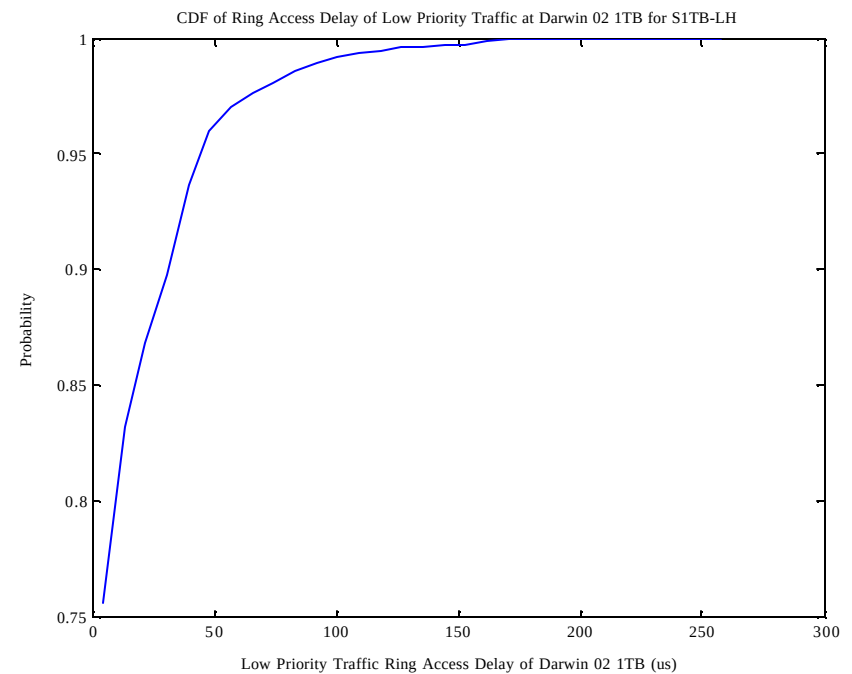
Class C priority throughput

Scenario S1TB-LH

Bounded Ring Access Delay: CDF



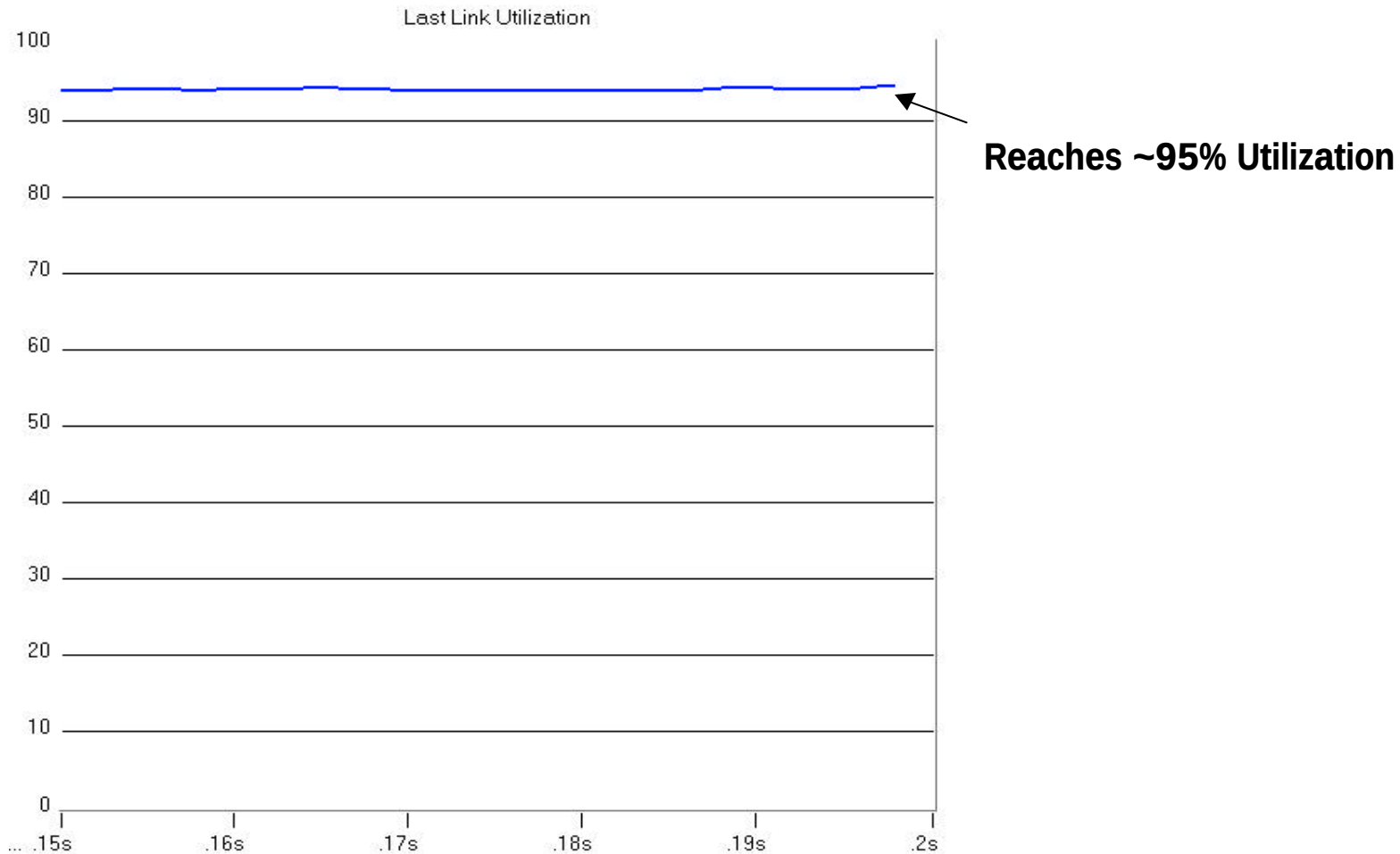
Class B: Bounded 200 us



Class C: Bounded 250 us

Scenario S1TB-LH

Achieves Target Utilization



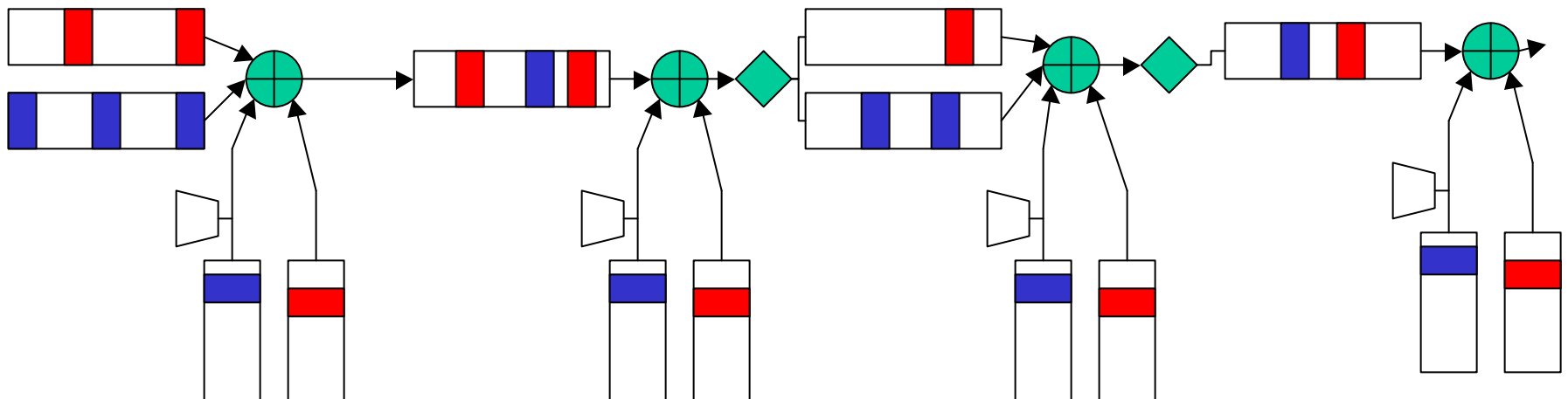
Conclusions

- Mono-queue and dual-queue based on Darwin model interworks
 - Simulation result for High (reclaimable) and low priority traffic
- Steady state results:
 - Achieves target utilization with fair and stable throughput
 - Achieves expected bounded MAC access delay and jitter
 - 1TB High reclaimable/low < RTT
 - 2TB High <RTT; low >RTT



Backup

Simulation comment:



- Draft 0.1
 - PTQ – A0 and A1
 - STQ – B and C
- For Mono-Q the max advertised BW should be LR-high not what is in the table