QCN: First Benchmark Simulation

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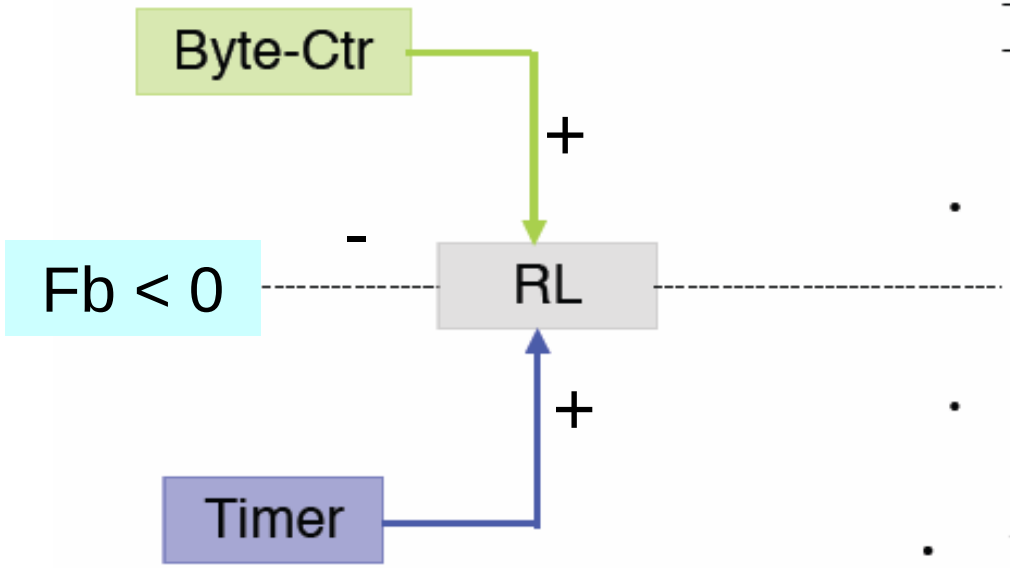
QCN (A Brief Review)



- Byte-Counter
  - 5 cycles of FR (150KB per cycle)
  - AI cycles afterwards (75KB per cycle)
  - Fb < 0 sends timer to FR
- RL
  - In FR if ***both*** byte-ctr and timer in FR
  - In AI if ***only one of*** byte-ctr or timer in AI
  - In HAI if ***both*** byte-ctr and timer in AI
- Note: RL goes to HAI only after 500 pkts have been sent
- Timer
  - 5 cycles of FR (T msec per cycle)
  - AI cycles afterwards (T/2 msec/cycle)
  - Fb < 0 sends timer to FR

Two counters: byte-counter and timer cycle through independently;
Both reset by Fb < 0 signal

Rate Decreases

- Upon a Fb < 0 signal
  - TR = CR
    - TR is decreased implicitly
  - CR = CR * (1 – Gd*|Fb|)

Rate Increases

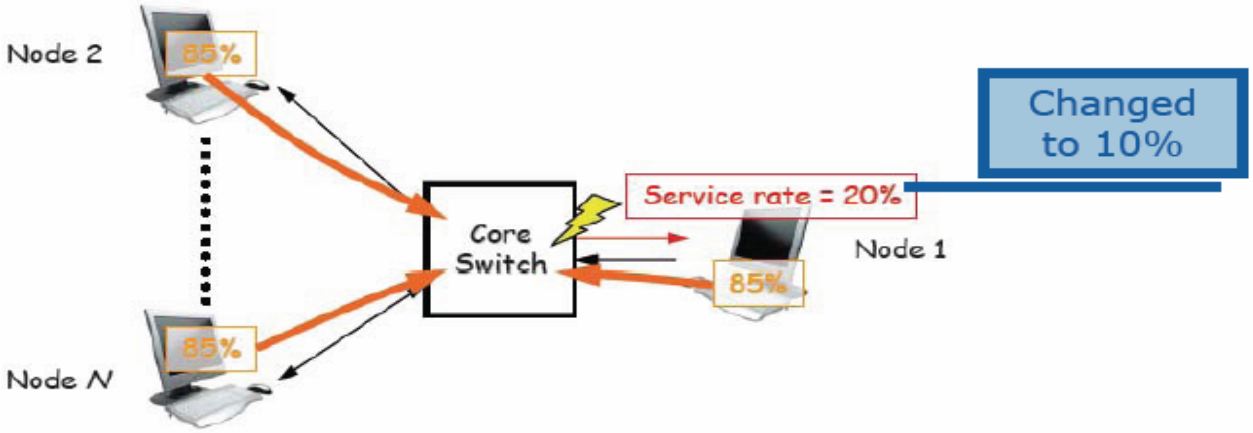
When RL is in FR
- Upon completion of a byte-counter or timer cycle: CR = (CR+TR)/2
- EFR and Target rate reduction enabled during first cycle of byte-counter

When RL is in AI
- Upon completion of a byte-counter or timer cycle: TR = TR+R_AI; CR = (CR+TR)/2

When RL is in HAI (at least 500 pkts have been transmitted since last ding)
- Events = completion of byte-counter or timer cycles
- Event numbered i = 1, 2, …
- At the end of event number i:
  TR = TR + (i*R_HAI); CR = (CR+TR)/2

Baseline #1

1. Output Generated Hot Spot Single Hop



Workload:

- All Nodes (10) : Uniform Distribution, load = 8.5Gbps
- Node 1 Service Rate = 1Gbps
- One Congestion Point
  - Hotspot:
    - Degree: 9, Severity = 8.5:1,
    - Duration: 80 mS from ti=10 to 90 mS

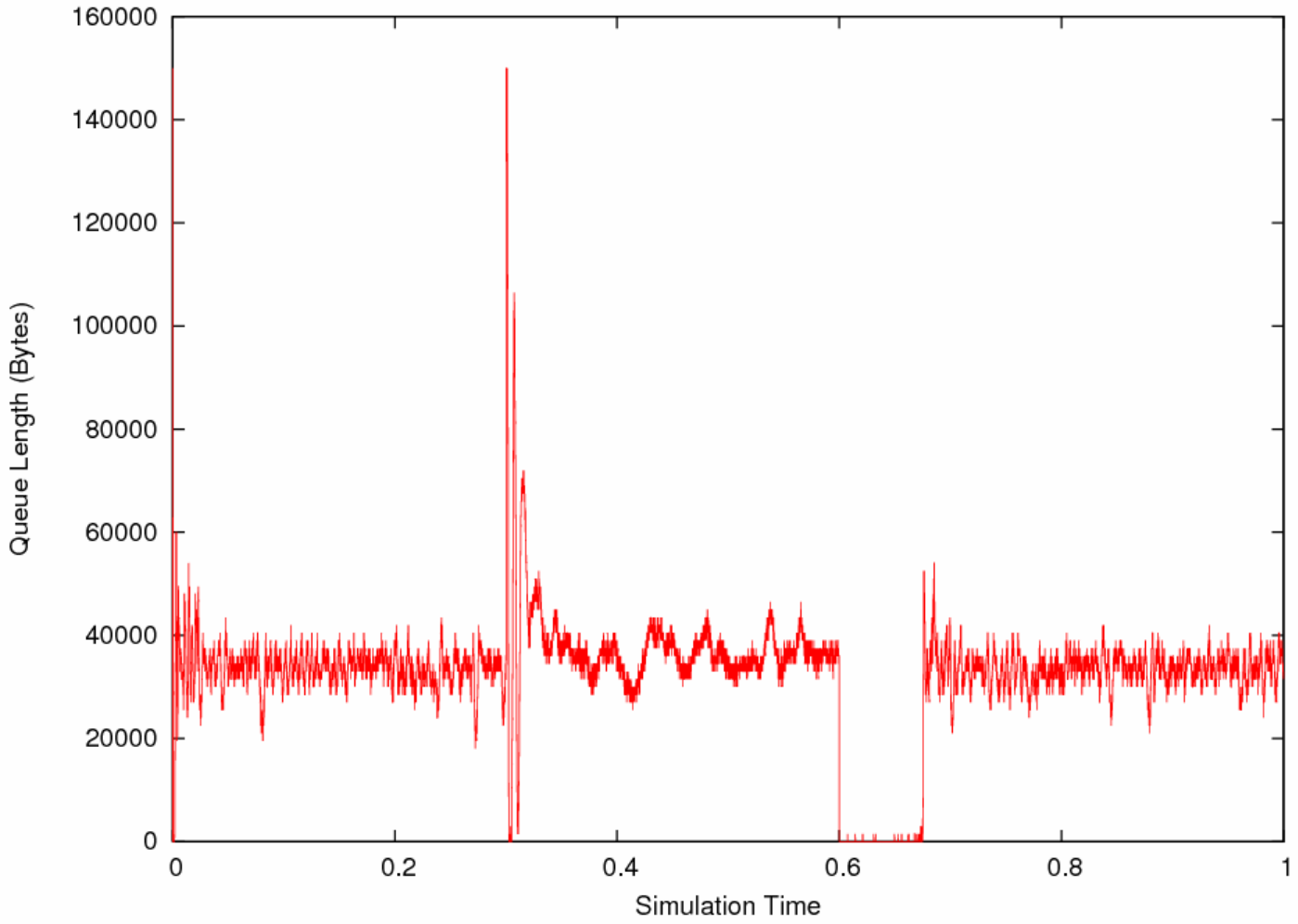
- Scenarios: 2Gbps, 1Gbps, 0.5Gbps OG service rates

Required

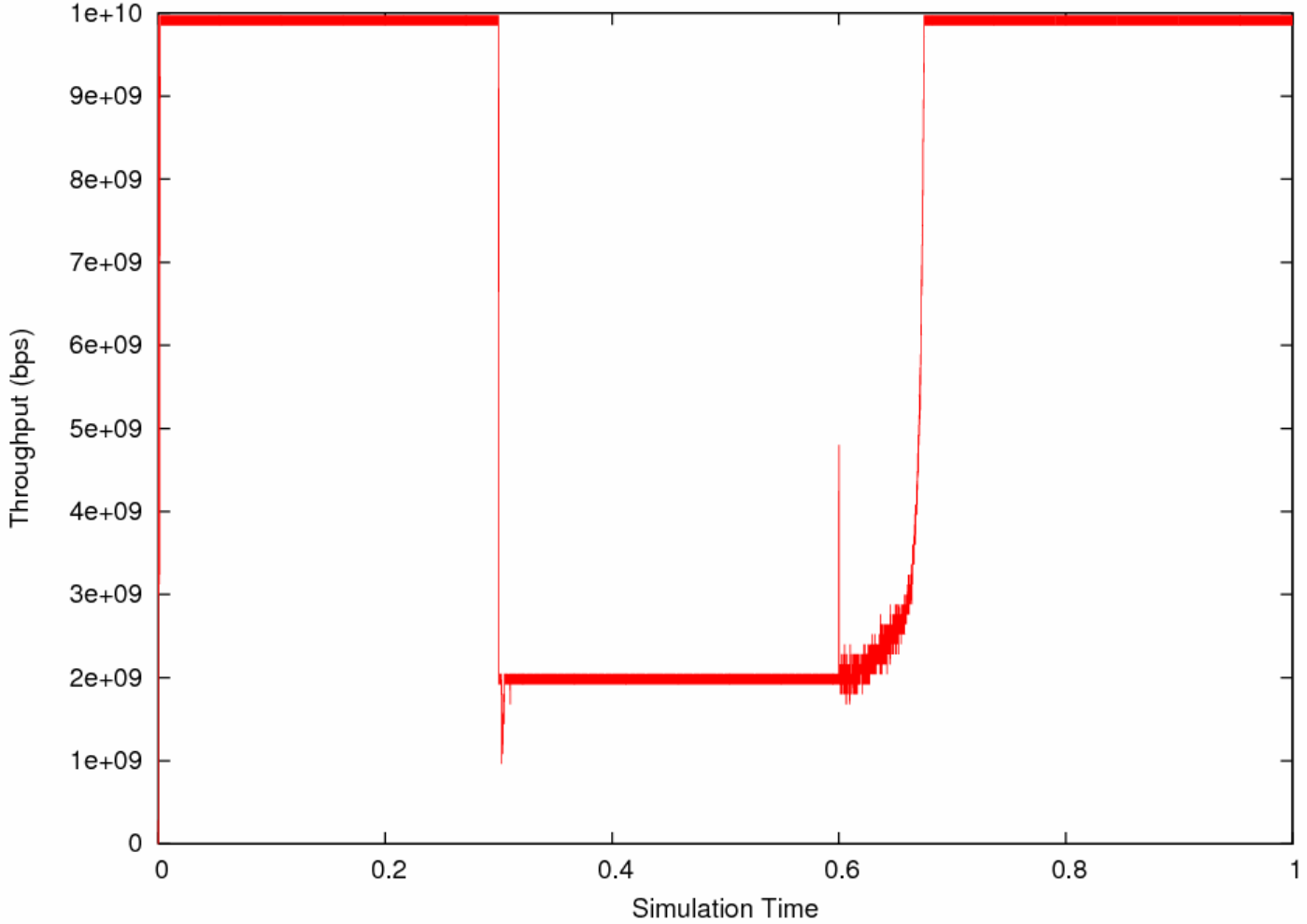
Simulation Parameters

- Traffic
  - I.i.d. Bernoulli arrivals
  - Uniform destination distribution (to all nodes except self)
  - Fixed frame size = 1500 B
- Switch
  - VOQ with 2.4MB shared mem
  - Partitioned memory per input, shared among all outputs
  - No limit on per-output memory usage
- Adapter
  - RLT: VOQ and single; RR service
  - One rate limiter per destination
  - Egress buffer size = 1500 KB,
  - Ingress buffer size = Unlimited
- QCN
  - W = 2.0
  - Q_EQ = 33 KB
  - GD = 0.0078125
  - Base P_{sample} = 1% (on average 1 sample every 150 KB)
  - PROB_SCALE = 9%/64
  - R_{unit} = 1 Mb/s
  - MIN_RATE = 10 Mb/s
  - TIMER_PERIOD = 15 ms
  - Extra Fast Recovery enabled
  - R_AI = 5 Mbps
  - R_HAI = 50Mbps
  - FAST_RECOVERY_TH = 5

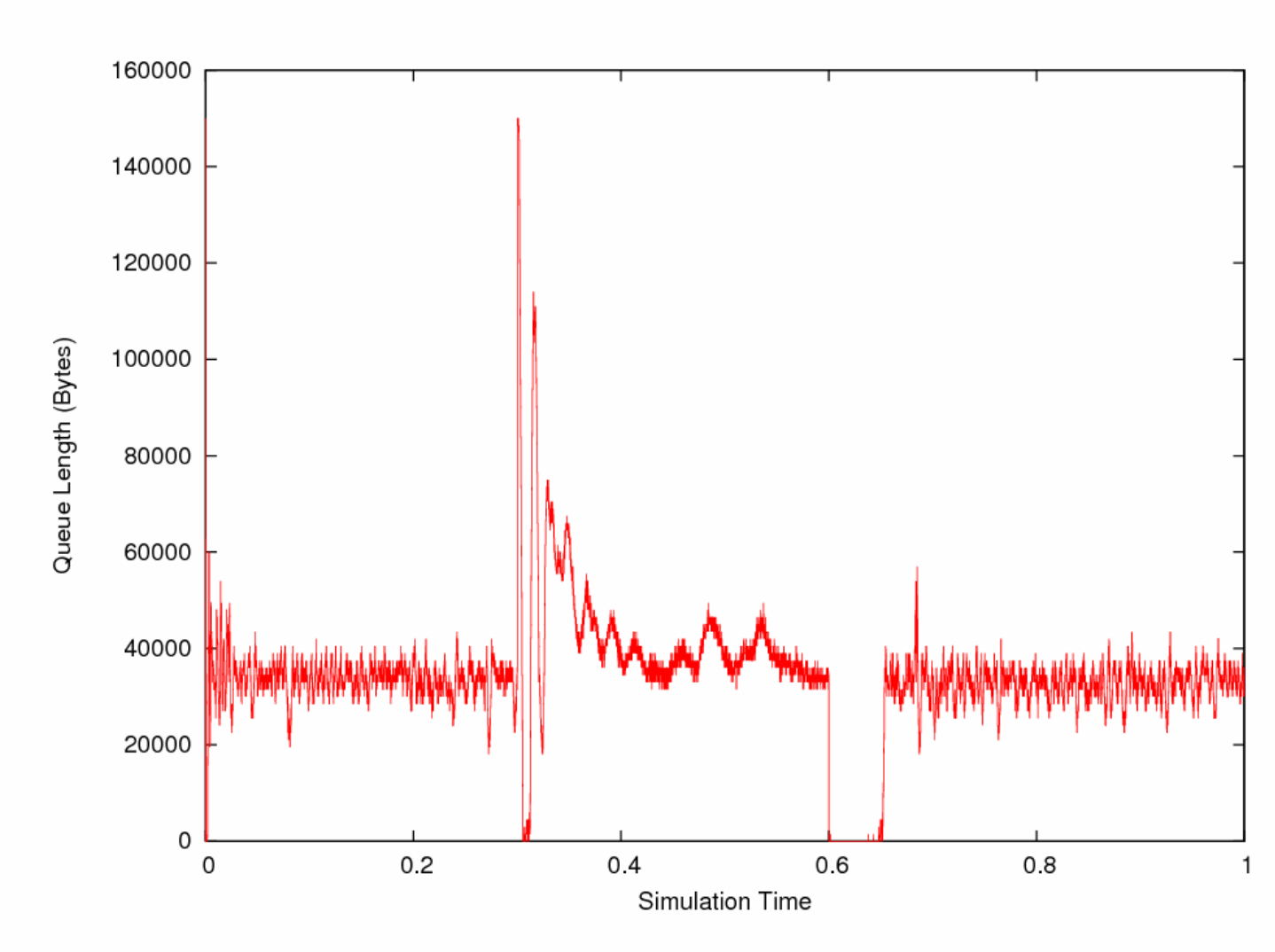
Service Rate: 2.0Gbps
- Queue Size



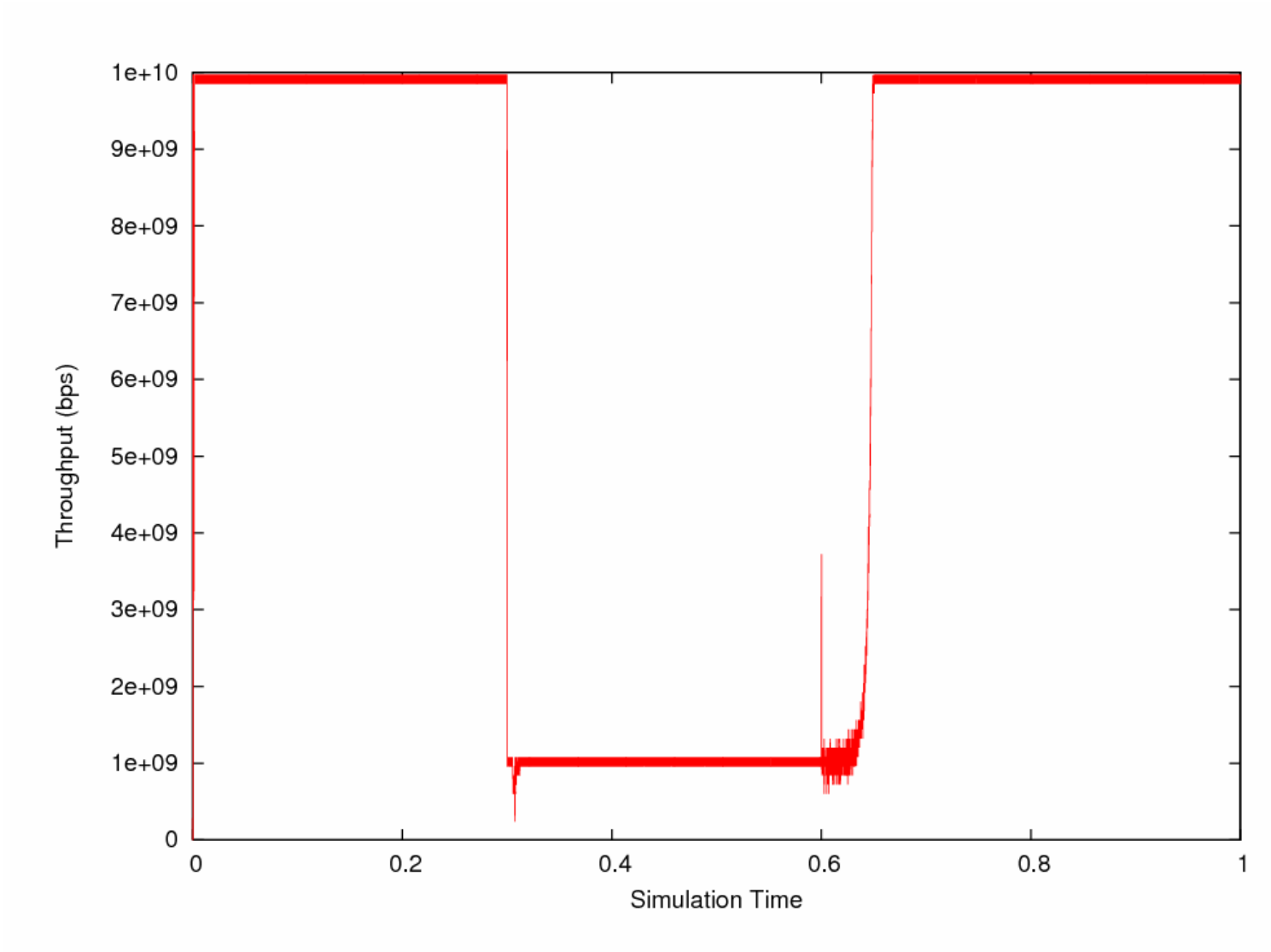
Service Rate: 2.0Gbps - Throughput



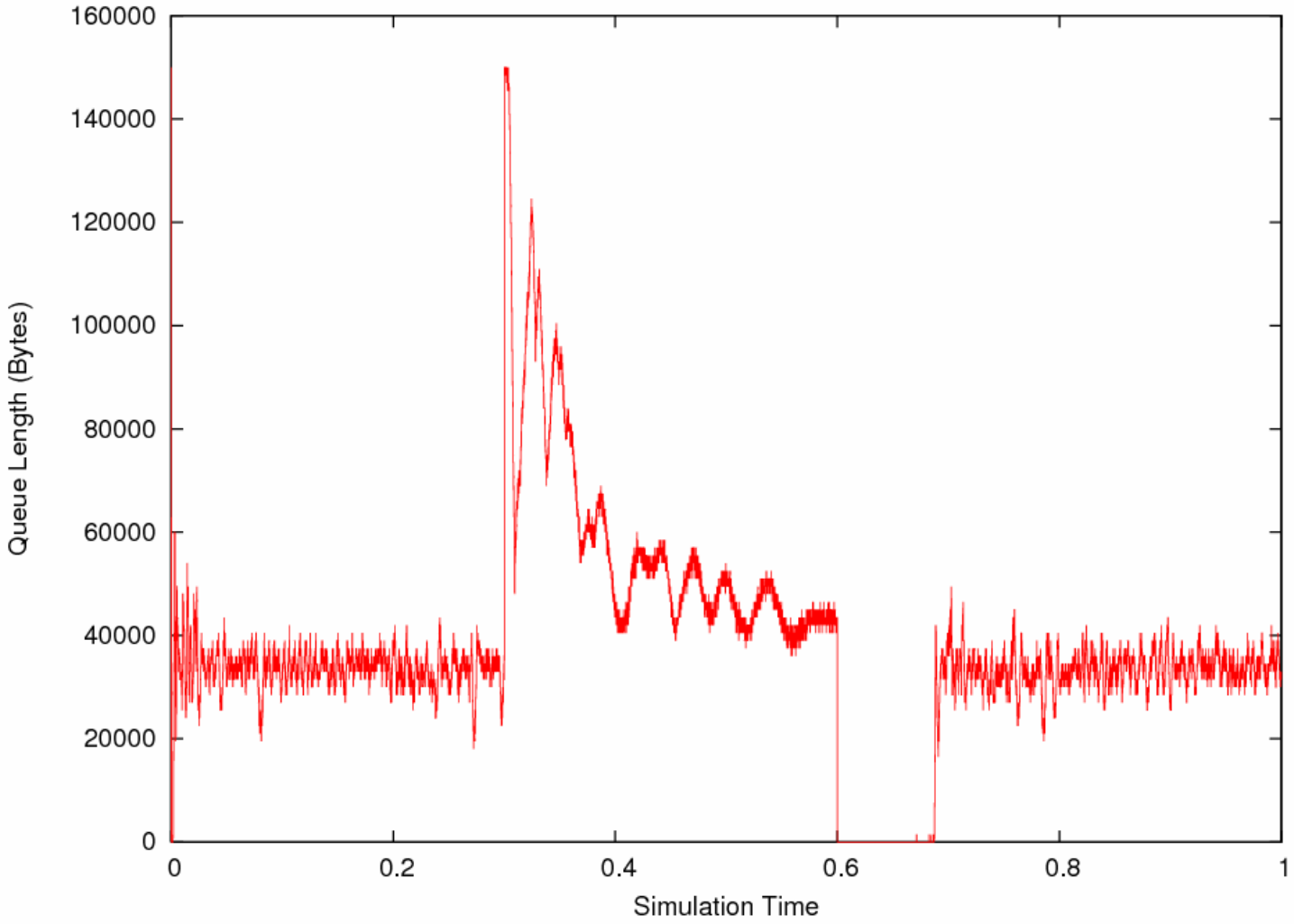
Service Rate: 1.0Gbps - Queue Size



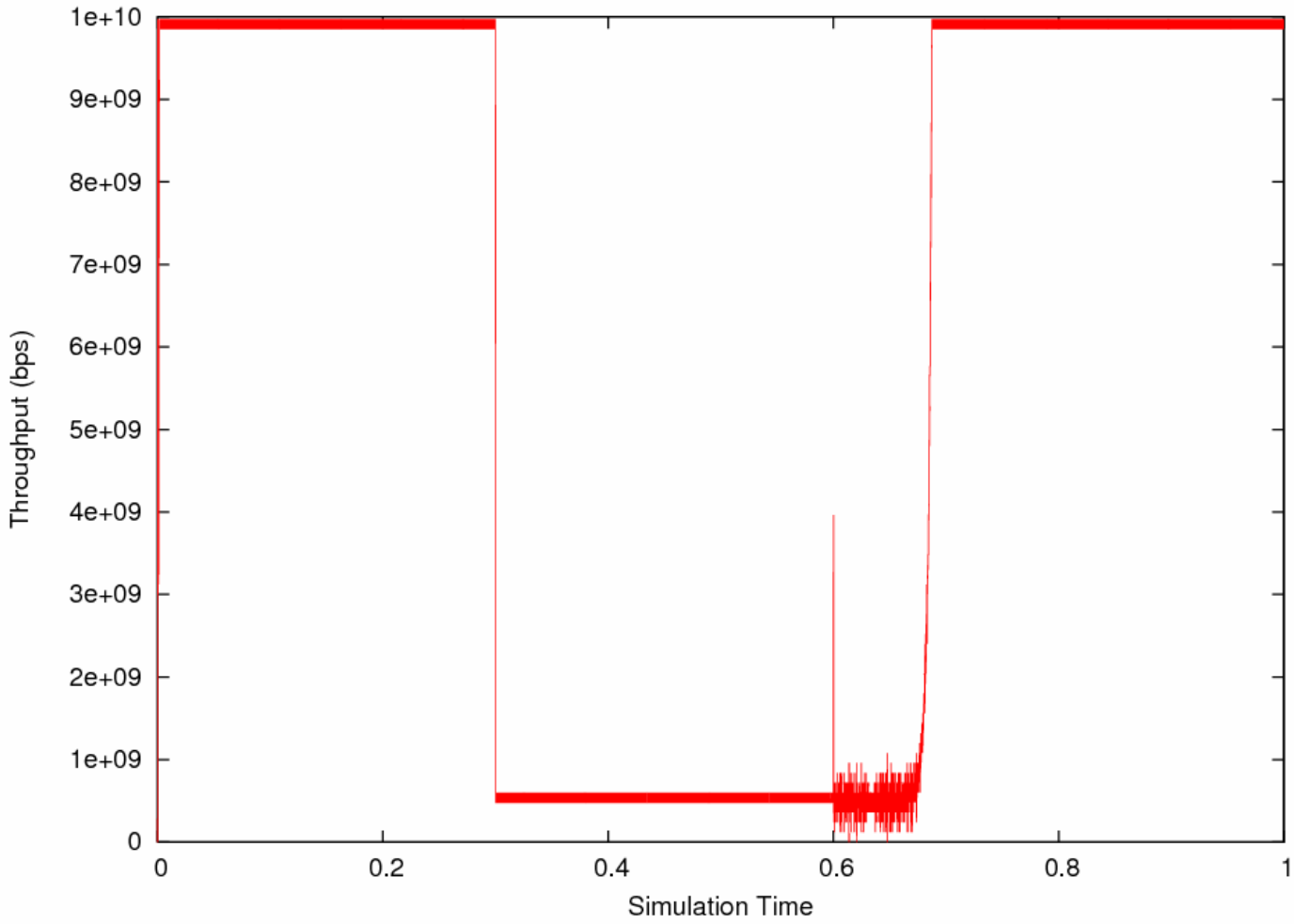
Service Rate: 1.0Gbps - Throughput



Service Rate: 0.5Gbps - Queue Size



Service Rate: 0.5Gbps - Throughput



Summary

- Basic benchmark simulation under Omnet environment
  - QCN-HAI behaves as expected
  - More simulations need to be finished

Happy Holidays !