QCN: An Update of Benchmark Simulations

Berk Atikoglu, Abdul Kabbani, Rong Pan, Balaji Prabhakar
Simulation Parameters

- **Traffic**
  - i.i.d. Bernoulli arrivals
  - Uniform destination distribution (to all nodes except self)
  - Fixed frame size = 1500 B

- **QCN**
  - \( W = 2.0 \)
  - \( Q_{\text{EQ}} = 33 \text{ KB} \)
  - \( GD = 0.0078125 \)
  - Base marking: once every 150 KB
  - Margin of randomness: 30%
  - \( R_{\text{unit}} = 1 \text{ Mb/s} \)
  - \( \text{MIN\_RATE} = 10 \text{ Mb/s} \)
  - \( \text{BC\_LIMIT} = 150 \text{ KB} \)
  - \( \text{TIMER\_PERIOD} = 15 \text{ ms} \)
  - \( R_{\text{AI}} = 5 \text{ Mbps} \)
  - \( R_{\text{HAI}} = 50 \text{Mbps} \)
  - \( \text{FAST\_RECOVERY\_TH} = 5 \)
  - Quantized Fb: 6 bits
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
Service Rate: 2.0Gbps
- Queue Size

# of drops: 346
Service Rate: 2.0Gbps
- Throughput
Service Rate: 1.0 Gbps
- Queue Size

# of drops: 368
Service Rate: 1.0Gbps
- Throughput
Service Rate: 0.5Gbps
- Throughput
Baseline #2

2. OG HS Multi-Hop

Workload:
- All: Uniform distribution traffic (background traffic)
- Nodes 1-6: 25% (2.5Gbps), Nodes 7-10: 40% (4 Gbps)
- Primary Hotspot:
  - Node 7 service rate = 5% (Rx only)
  - If saturation tree spreads => 5 congestion points total

- Scenarios:
  - PAUSE: Enabled/Disabled
Without Pause
- Congested Queue Size (0.5Gbps)

# of drops: 698
Benchmark 2 – Bottleneck Throughput
Without Pause
- Uncongested Queue Size (0.5Gbps)
Benchmark 2
– Individual Flows’ Throughput
With Pause
- Bottleneck Queue Size
Benchmark 2 – With Pause
- Bottleneck Link Throughput (bps)
Benchmark 2 – With Pause
- Uncongested Queue Size
Benchmark 2 – With Pause
- Individual Flow Throughput (bps)
Scenario 2: 80ms Hot Spot Duration
Without Pause
(80ms Hot Spot Duration)
- Congested Queue Size (0.5Gbps)

# of drops: 698
Benchmark 2
(80ms Hot Spot Duration) – Bottleneck Throughput
With Pause
(80ms Hot Spot Duration)
- Congested Queue Size (0.5Gbps)
Benchmark 2
(80ms Hot Spot Duration)
– Bottleneck Throughput
Workload:
- Four culprit flows of 2 Gb/s each from nodes 1, 4, 8, 9 to node 7 (hotspot)
- Three victim flows of 7 Gb/s each: node 2 to 9, node 5 to 3, node 10 to 6
- Node 7 service rate = 20%
- Five congestion points, All switches and all flows affected
- Fair allocation provides 0.5 Gb/s to all culprits and 7 Gb/s to all victim
Without Pause
- Bottleneck Queue Size (2Gbps)

# of drops: 228
Without Pause
- Bottleneck Throughput

![Graph showing simulation time vs throughput](image-url)
Culpit Flows - Throughput (0.5Gbps)
Victim Flows - Throughput (7Gbps)
Wit Pause
- Bottleneck Queue Size (2Gbps)
Culpit Flows - Throughput (0.5Gbps)
Victim Flows - Throughput (7Gbps)
Scenario 3: 80ms Hot Spot Duration
Without Pause
(80ms Hot Spot Duration)
- Congested Queue Size (2Gbps)

# of drops: 212
Benchmark 3
(80ms Hot Spot Duration)
– Bottleneck Throughput
With Pause
(80ms Hot Spot Duration)
- Congested Queue Size (2 Gbps)
Benchmark 3
(80ms Hot Spot Duration)
– Bottleneck Throughput