CN-SIM: A Baseline Simulation Scenario

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Ver. 4
Motivation

- So far we have defined a set of common
  - Topologies
  - Traffic Patterns
  - Metrics
  - Bridge Model
- To ensure comparability of results, we also need to make sure our models and simulation tools are properly calibrated
- The baseline simulation scenario should allow us to achieve a reasonable alignment quickly and easily
Topology & Traffic Pattern

![Diagram showing network topology with congestion at point CP]
Topology & Traffic Pattern
**Configuration, Parameters & Workload**

- **Short Range, High-Speed Datacenter-like Network**
  - Link Capacity (C) = 10 Gbps
  - Buffer Size (B) = 150 KB (both CP and RP)
  - Switch latency = 1 μs
  - Link Length = 100 m (.5 μs propagation delay)
  - Station processing time = 2 μs
  - Loop Latency = 8 μs

- **BCN Control Loop Parameters**
  - $Q_{eq} = 375 \text{ 64-byte pages (or 16 1500-byte frames or approx 24 KB )}$
  - $S = 150 \text{ KB (frames are sampled on average every 150 KB received)}$
  - $W = 2$
  - $G_i = 5.3 \times 10^{-1}$ (Max rate increase: $C/10$ when $Max \ Fb^+ = (1 + 2 \times W) \times Q_{eq}$ is received)
  - $G_d = 2.6 \times 10^4$ (Max rate decrease: $1/2$ when $Max \ Fb^- = (1 + 2 \times W) \times Q_{eq}$ is received)
  - $R_u = 1 \text{ Mbps}$

- **Workload: 100% UDP (or Raw Ethernet) Traffic**
  - S1-S4: fixed-length (1500 bytes) frames, Bernoulli temporal distribution with parameter $\rho = 0.5$
    (i.e., offered load = 50%)
Simulation Run & Results

- Simulation
  - Runs: 10
  - Duration: 100 ms
  - Initial Transient @ t = 5 ms (all sources start)
  - Final Transient @ t = 80 ms (2 sources stop)

- Results
  - Throughput on congested downlink:
    - 10 Gbps (100%, measured during congestion)
  - Throughput and fairness on uplinks:
    - Average 2.5 Gbps (25%, measured between 78 and 80 ms)
    - See table on slide 7
  - Buffer utilization @ congested link:
    - See diagram on slide 8 and 9
Throughput & Fairness

- **Target Rate = 2.5 Gbps**

- **Normalized deviation from Target**

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<th>Max</th>
<th>Min</th>
<th>Mean</th>
<th>FI</th>
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Max Dev = 0.30  Avg Max = 0.18  Avg FI = 0.98
Buffer Utilization (Run 27434)
Buffer Utilization (Run 26645)