CN-SIM: A Multi-Hop, Output-Generated Hotspot Simulation Scenario

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V1.0

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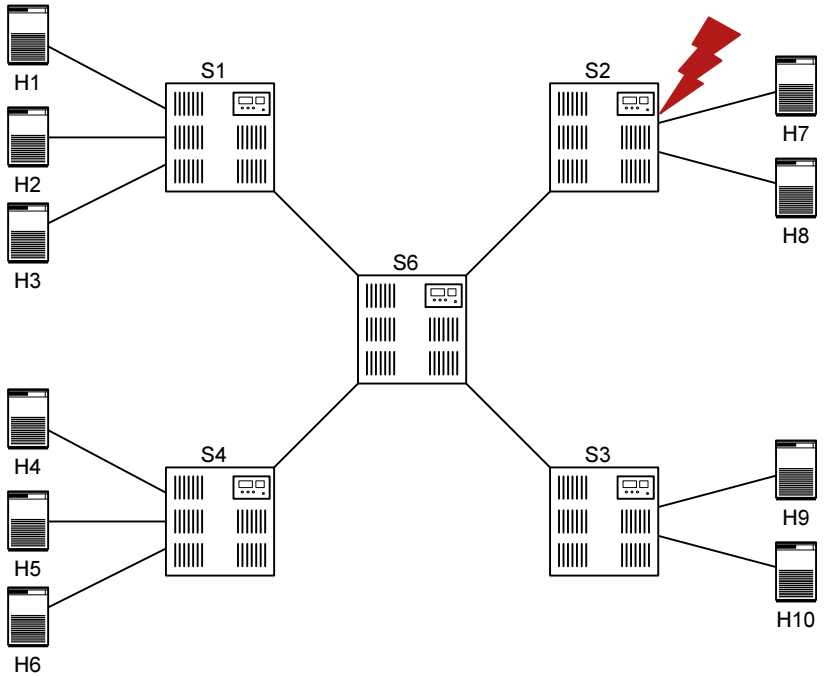
Simulation Environment

- Topology & Workload as per Mitch and Cyriel's proposal (http://www.ieee802.org/1/files/public/docs2006/au-sim-Zurich-Hotspot-Benchmark-OG-MS-r2.pdf)



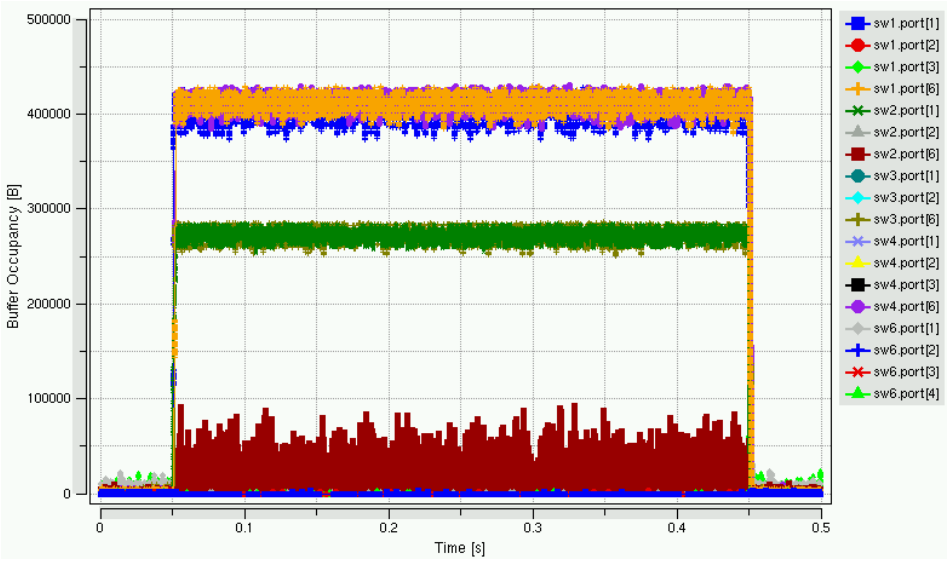
Temporary reduction in service rate from 10 to 0.5 Gbps

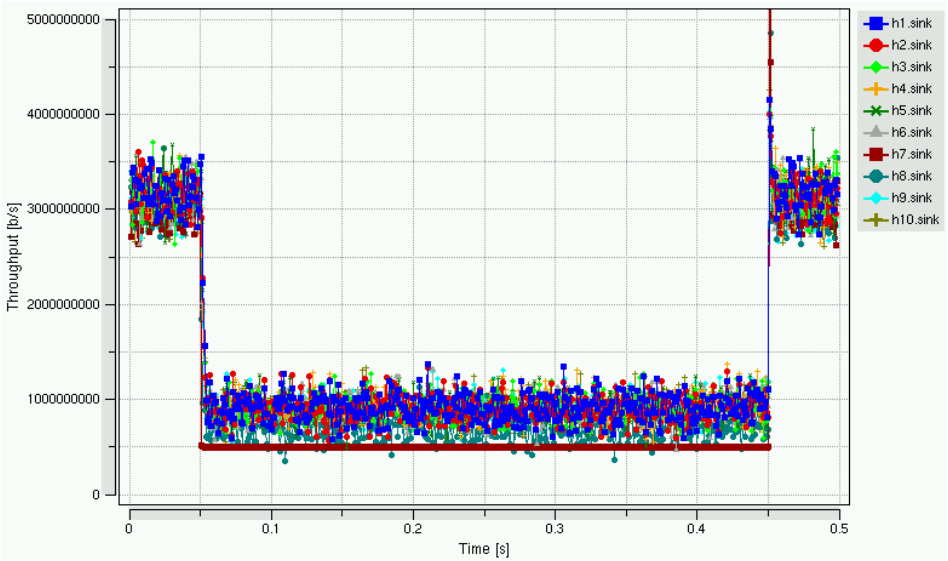
- Traffic pattern
  - Uniform (except self)
  - Load: H1-6: 25% H7-10: 40%
- Hotspot
  - Duration: 400 ms, from t_i = 50 to t_f = 450 ms
  - HS degree = 2
  - HS severity = 7.2 : 1

Simulation Environment (cont)

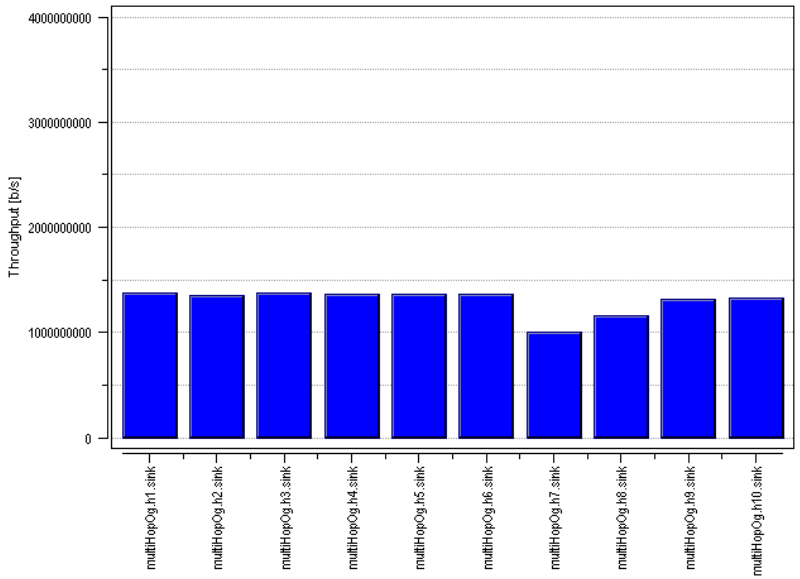
- Switch output buffer partitioned per input port
  - 150 KB of space for each input ➔ 2.4 MB for 16 ports
- Selective Pause enabled on each partition
  - Assert threshold 140 KB
  - De-assert threshold 130 KB
- BCN parameters as per Baseline Scenario
  - W = 2
  - Qeq = 375 64-byte pages (24 KB)
  - Gi = 5.3333 x 10-1
  - Gd = 2.6667 x 10-4
  - No BCN-Max or BCN(0,0)
  - No Oversampling
- Simulation duration 500 ms
- Metrics
  - Buffer utilization (qualitative)
  - Individual Throughput (qualitative)
  - Average Individual and Aggregate Throughput (quantitative)

BCN Disabled

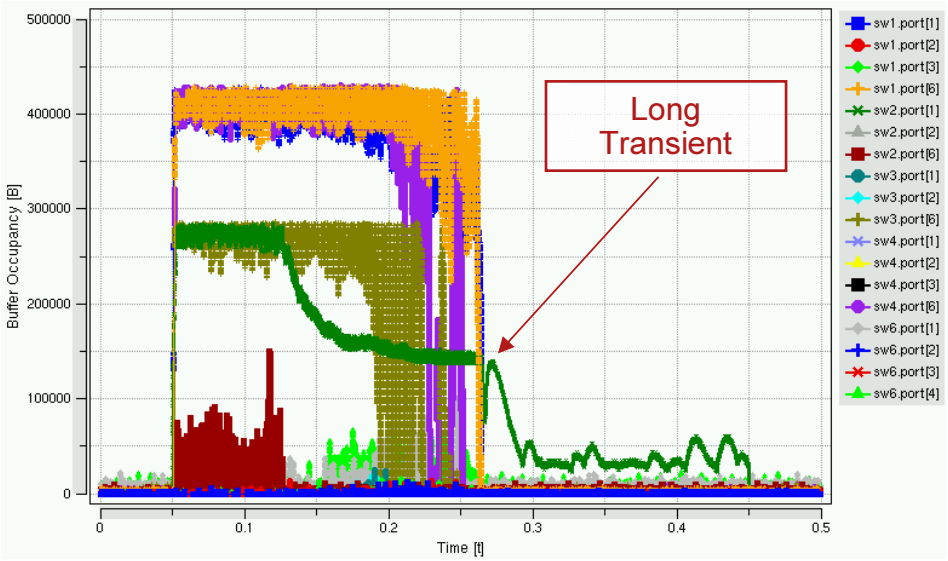


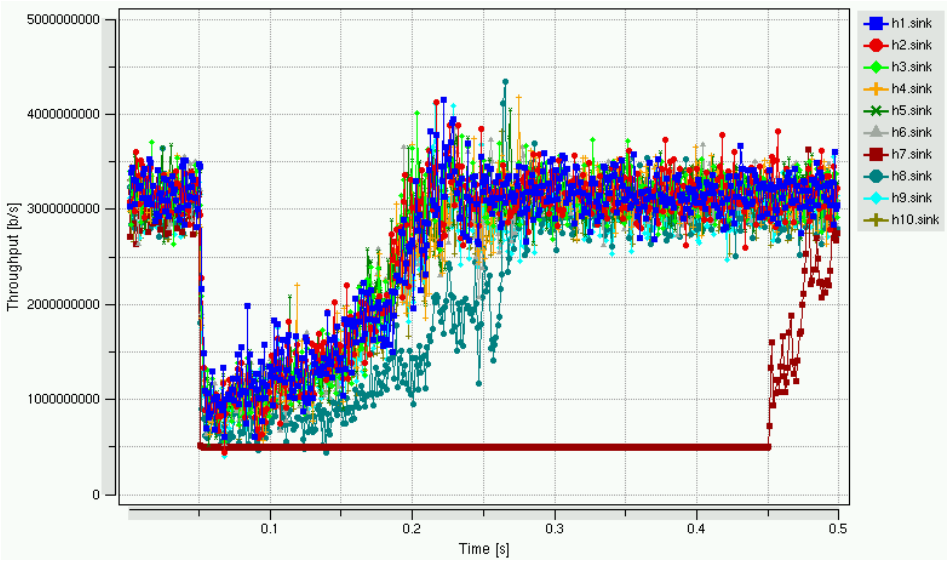


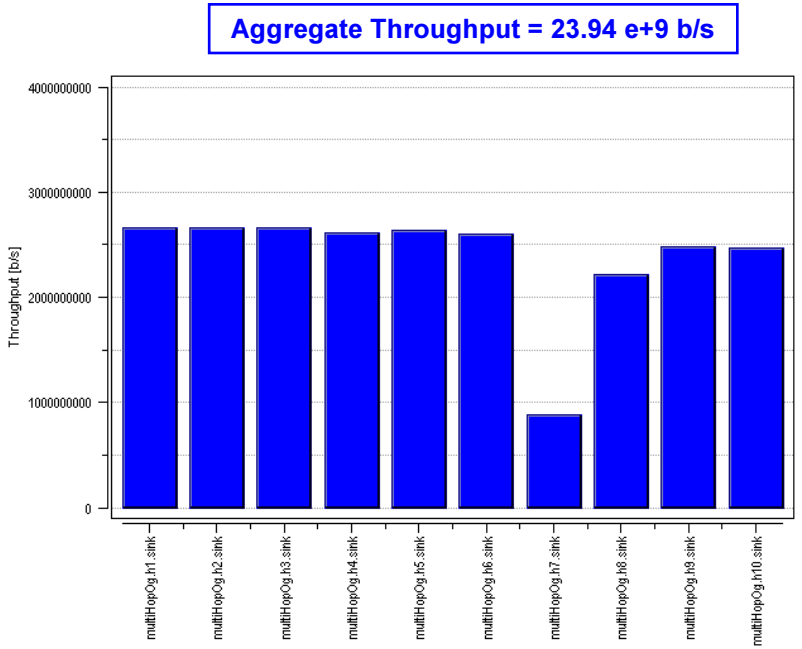
Aggregate Throughput = 13.06 e+9 b/s



BCN Enabled

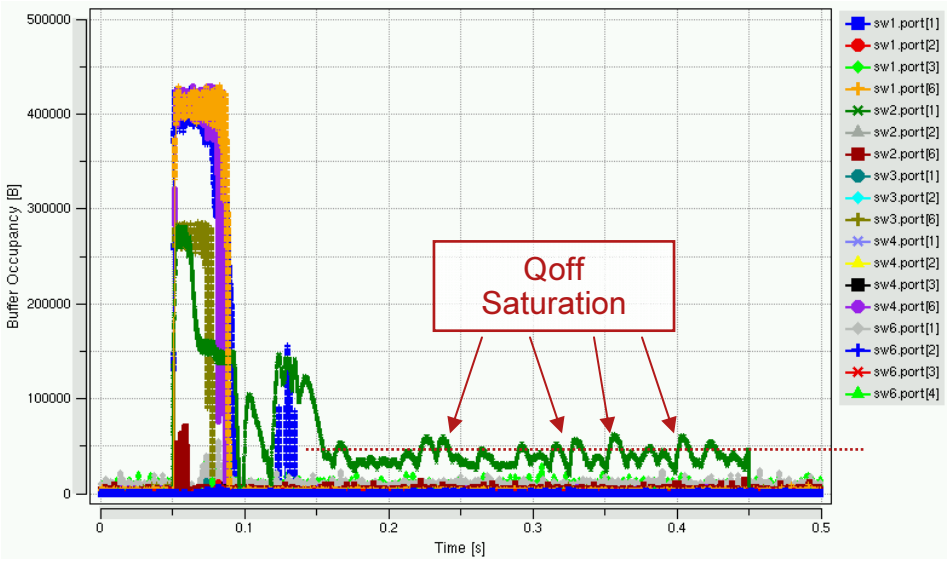


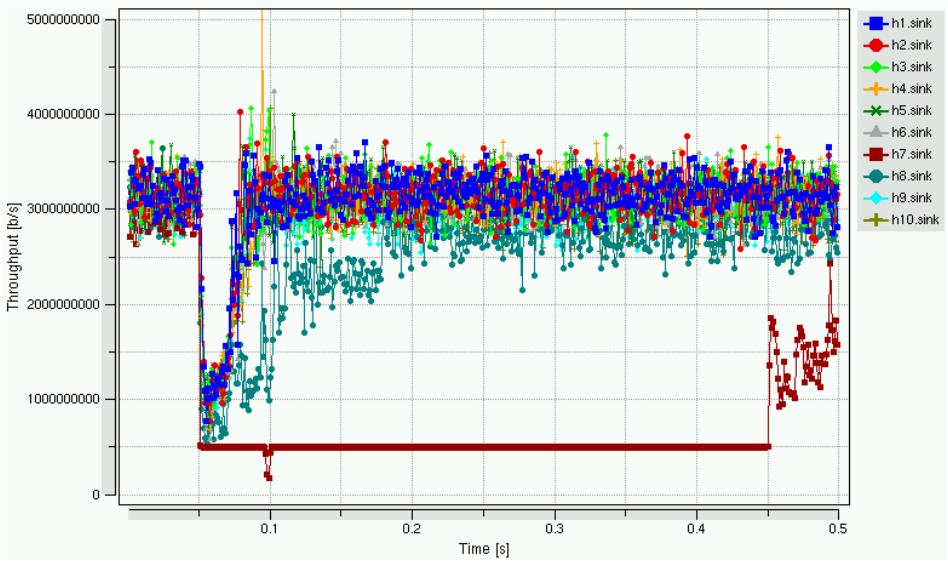




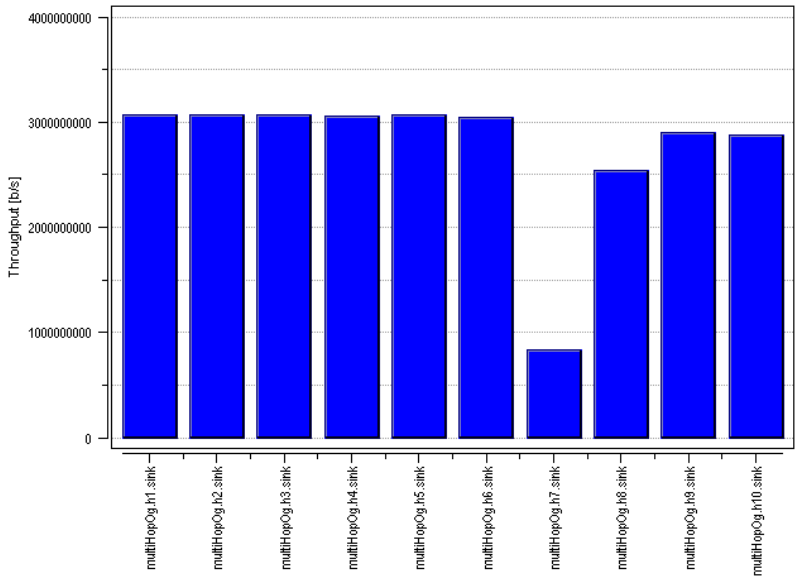
- Next Step: Shorten Initial Transient
  - Enable BCN-Max
  - Threshold = 4 * Qeq = 1500

BCN Enabled + BCN-Max



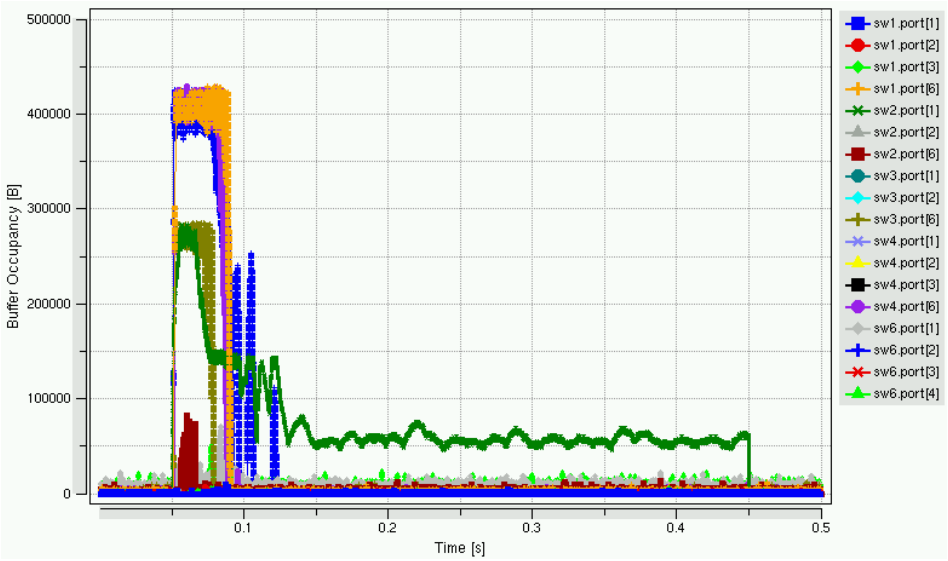


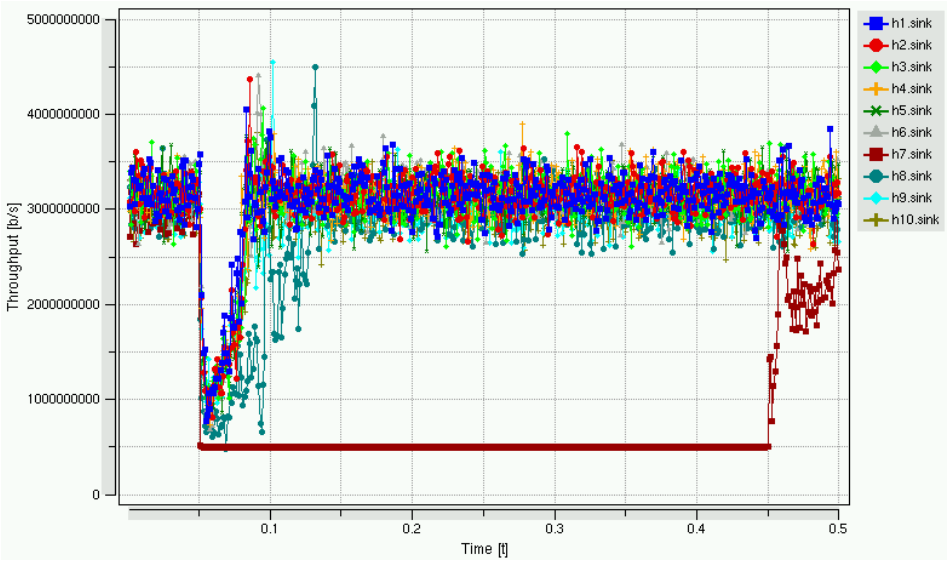
Aggregate Throughput = 27.59 e+9 b/s



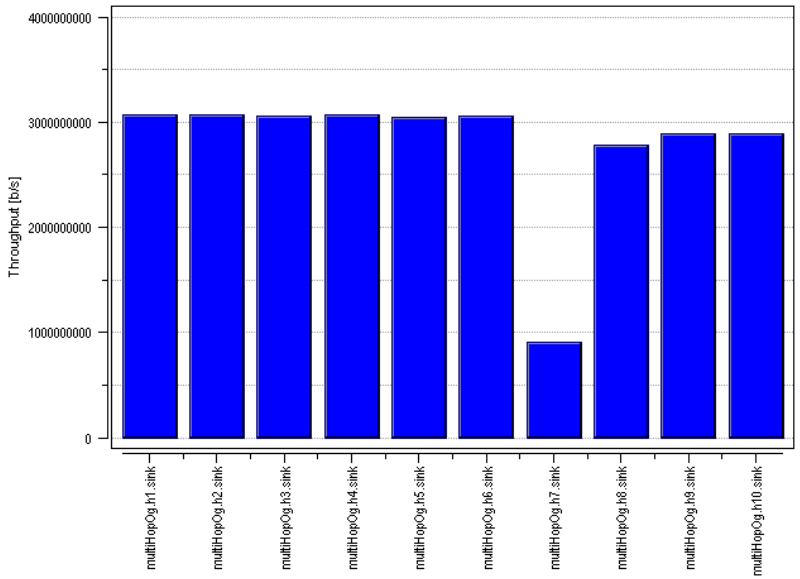
- Next Step: Reduce Qoff Saturation
  - Double Qeq (750)
  - Gi = 2.6667e-1
  - Gd = 1.3333e-4

BCN Enabled + BCN-Max + 2*Qeq



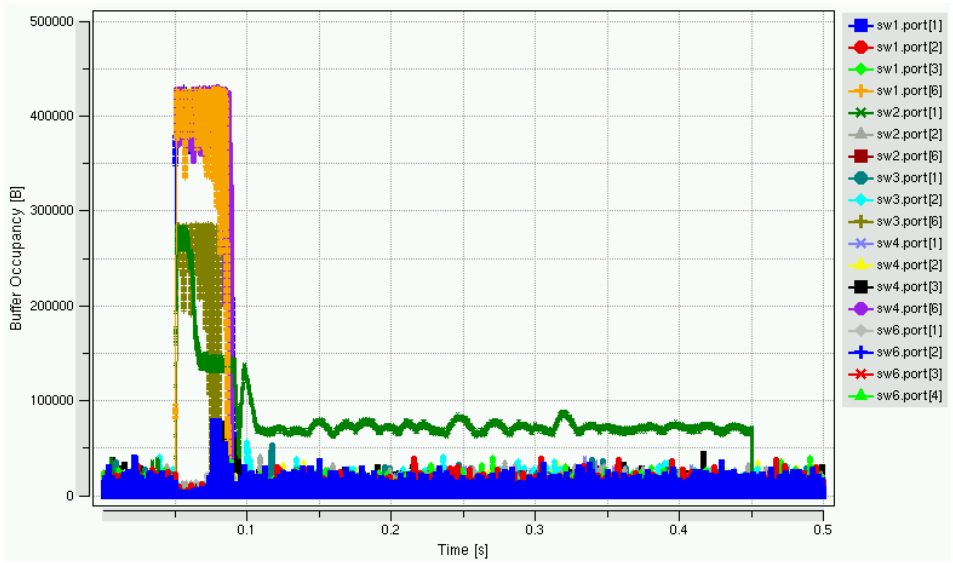


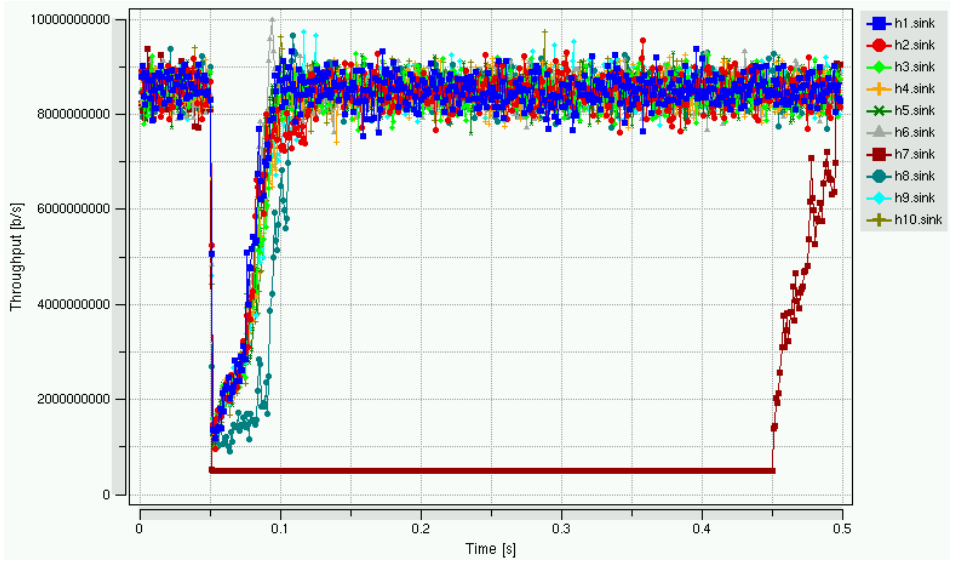
Aggregate Throughput = 27.89 e+9 b/s

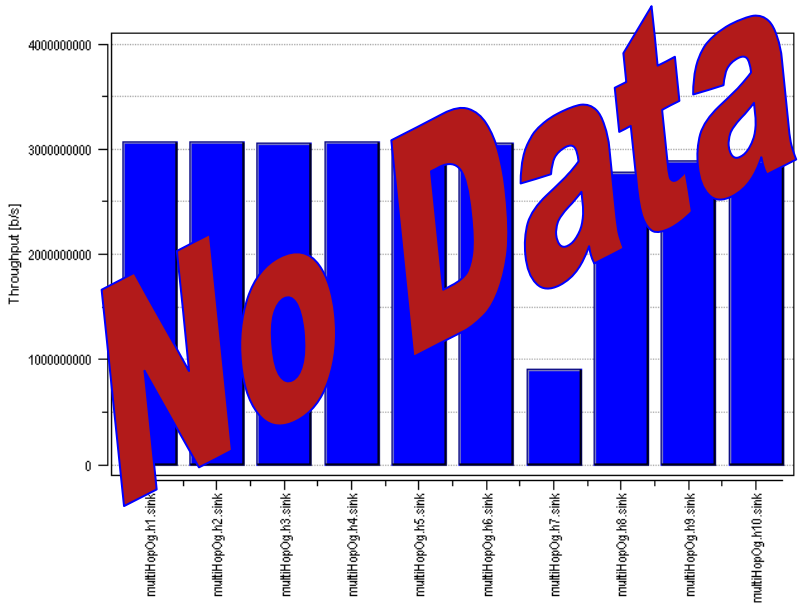


- Increase HS severity by:
  - Increasing ISLs capacity to 30 Gb/s
  - Increase offered load to 85%
  - New HSS = 17:1

BCN Enabled + BCN-Max + 2*Qeq + HHSS







Conclusions

- Baseline parameters worked unexpectedly well in this stress-test scenario
- Apparently, BCN seems quite resilient with respect to dramatic changes (20x) in the bottleneck capacity *C*
- Next step: add more congesting flows (*N*) to assess BCN resilience to such network condition