Pantheon Report

Tested in mahimahi: mm-delay 10 mm-link 12mbps.trace 0.12mbps.trace
Repeated the test of 21 congestion control schemes 3 times.
Each test lasted for 30 seconds running 1 flow.

System info:
Linux 4.15.0-1028-gcp
net.core.default_qdisc = fq
net.core.rmem_default = 16777216
net.core.rmem_max = 536870912
net.core.wmem_default = 16777216
net.core.wmem_max = 536870912
net.ipv4.tcp_rmem = 4096 16777216 536870912
net.ipv4.tcp_wmem = 4096 16777216 536870912

Git summary:
branch: muses @ 7a686f7c2ed0a333082c0bab1fa5c921ab47e6ee
third_party/fillp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/fillp-sheep @ 0e5bb722943babcd2b09042c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbfe58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b17eaab4a906ce6bb7cf3cf
third_party/muses @ 5ce721187ad823da20955377730c746486ca4966
third_party/pantheon-tunnel @ f866d3f58d27af942717625ee3a354cc2e802bd
third_party/pcc @ 1af9958fa0d66d18b623c091a55fecn872b4981e1
  M receiver/src/buffer.h
  M receiver/src/core.cpp
  M sender/src/buffer.h
  M sender/src/core.cpp
third_party/pcc-experimental @ cd43e343e3f5f5613e8acd08fab92c4eb24f974ab
third_party/proto-quic @ 77961f1a827733a86b42f1bc8143ebc978f3cffe2
third_party/scream-reproduce @ f099118d1421aa3131bf11ff1964974e1da3bdbb2
  M src/ScreamClient
  M src/ScreamServer
third_party/sprout @ 366e35c6178b01e31d4a46ad18c74f9415f19a26
  M src/examples/cellsim.cc
  M src/examples/sproutbt2.cc
  M src/network/sproutconn.cc
third_party/verus @ d4b447ea74c6c60a261149af2629562939f9a494
  M src/verus.hpp
  M tools/plot.py
third_party/vivace @ 2baf86211435ae071a32f96b7d8c504587f5d7f4
third_party/webrtc @ 3f0cc2a9061a41b6f9dfe4735770d143a1fa2851
local test in mahimahi, 3 runs of 30s each per scheme
(mean of all runs by scheme)

Average throughput (Mbit/s)

95th percentile one-way delay (ms)

local test in mahimahi, 3 runs of 30s each per scheme
(mean of all runs by scheme)
<table>
<thead>
<tr>
<th>scheme</th>
<th># runs</th>
<th>mean avg tput (Mbit/s) flow 1</th>
<th>mean 95th-%ile delay (ms) flow 1</th>
<th>mean loss rate (%) flow 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP BBR</td>
<td>3</td>
<td>2.66</td>
<td>13.41</td>
<td>0.03</td>
</tr>
<tr>
<td>Copa</td>
<td>3</td>
<td>1.76</td>
<td>12.98</td>
<td>0.10</td>
</tr>
<tr>
<td>TCP Cubic</td>
<td>3</td>
<td>5.25</td>
<td>13.13</td>
<td>0.05</td>
</tr>
<tr>
<td>FillP</td>
<td>3</td>
<td>11.53</td>
<td>69.53</td>
<td>0.14</td>
</tr>
<tr>
<td>FillP-Sheep</td>
<td>3</td>
<td>10.24</td>
<td>41.61</td>
<td>0.10</td>
</tr>
<tr>
<td>Indigo</td>
<td>3</td>
<td>1.26</td>
<td>21.49</td>
<td>0.10</td>
</tr>
<tr>
<td>Indigo-MusesC3</td>
<td>3</td>
<td>2.75</td>
<td>36.67</td>
<td>0.37</td>
</tr>
<tr>
<td>Indigo-MusesC5</td>
<td>3</td>
<td>3.05</td>
<td>35.29</td>
<td>0.13</td>
</tr>
<tr>
<td>Indigo-MusesD</td>
<td>3</td>
<td>2.97</td>
<td>19.63</td>
<td>0.10</td>
</tr>
<tr>
<td>Indigo-MusesT</td>
<td>3</td>
<td>2.96</td>
<td>34.99</td>
<td>0.17</td>
</tr>
<tr>
<td>LEDBAT</td>
<td>3</td>
<td>2.38</td>
<td>30.62</td>
<td>0.11</td>
</tr>
<tr>
<td>PCC-Allegro</td>
<td>3</td>
<td>7.01</td>
<td>158.07</td>
<td>0.04</td>
</tr>
<tr>
<td>PCC-Expr</td>
<td>3</td>
<td>5.66</td>
<td>12.86</td>
<td>0.04</td>
</tr>
<tr>
<td>QUIC Cubic</td>
<td>3</td>
<td>3.13</td>
<td>12.23</td>
<td>0.05</td>
</tr>
<tr>
<td>SCReAM</td>
<td>3</td>
<td>0.22</td>
<td>11.73</td>
<td>0.04</td>
</tr>
<tr>
<td>Sprout</td>
<td>3</td>
<td>8.57</td>
<td>76.73</td>
<td>0.26</td>
</tr>
<tr>
<td>TaoVA-100x</td>
<td>3</td>
<td>1.88</td>
<td>13.07</td>
<td>0.06</td>
</tr>
<tr>
<td>TCP Vegas</td>
<td>3</td>
<td>3.49</td>
<td>13.14</td>
<td>0.04</td>
</tr>
<tr>
<td>Verus</td>
<td>3</td>
<td>1.50</td>
<td>24.09</td>
<td>0.08</td>
</tr>
<tr>
<td>PCC-Vivace</td>
<td>3</td>
<td>1.44</td>
<td>12.19</td>
<td>0.04</td>
</tr>
<tr>
<td>WebRTC media</td>
<td>3</td>
<td>0.05</td>
<td>19.18</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Run 1: Statistics of TCP BBR

Start at: 2019-03-18 22:05:14
End at: 2019-03-18 22:05:44

# Below is generated by plot.py at 2019-03-18 22:37:02
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.59 Mbit/s (21.6% utilization)
95th percentile per-packet one-way delay: 13.413 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 2.59 Mbit/s
95th percentile per-packet one-way delay: 13.413 ms
Loss rate: 0.03%
Run 1: Report of TCP BBR — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 2.59 Mbit/s)  Flow 1 egress (mean 2.59 Mbit/s)

Per Packet Delivery Delay (ms)

Flow 1 (95th percentile 13.41 ms)
Run 2: Statistics of TCP BBR

Start at: 2019-03-18 22:17:30
End at: 2019-03-18 22:18:00

# Below is generated by plot.py at 2019-03-18 22:37:03
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.77 Mbit/s (23.1% utilization)
95th percentile per-packet one-way delay: 13.420 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 2.77 Mbit/s
95th percentile per-packet one-way delay: 13.420 ms
Loss rate: 0.03%
Run 2: Report of TCP BBR — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 2.77 Mbit/s)  Flow 1 egress (mean 2.77 Mbit/s)

Per-packet one-way delay (ms)

Time (s)

Flow 1 (95th percentile 13.42 ms)
Run 3: Statistics of TCP BBR

End at: 2019-03-18 22:30:18

# Below is generated by plot.py at 2019-03-18 22:37:03
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.62 Mbit/s (21.8% utilization)
95th percentile per-packet one-way delay: 13.408 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 2.62 Mbit/s
95th percentile per-packet one-way delay: 13.408 ms
Loss rate: 0.03%
Run 3: Report of TCP BBR — Data Link

Average capacity 12.00 Mbit/s (shaded region)

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Throughput (Mbit/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.00</td>
</tr>
<tr>
<td>5</td>
<td>4.00</td>
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<tr>
<td>10</td>
<td>6.00</td>
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<tr>
<td>15</td>
<td>8.00</td>
</tr>
<tr>
<td>20</td>
<td>10.00</td>
</tr>
<tr>
<td>25</td>
<td>12.00</td>
</tr>
<tr>
<td>30</td>
<td>14.00</td>
</tr>
<tr>
<td>35</td>
<td>16.00</td>
</tr>
</tbody>
</table>

Flow 1 ingress (mean 2.62 Mbit/s)  Flow 1 egress (mean 2.62 Mbit/s)

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Packet delivery delay (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10.00</td>
</tr>
<tr>
<td>5</td>
<td>12.00</td>
</tr>
<tr>
<td>10</td>
<td>14.00</td>
</tr>
<tr>
<td>15</td>
<td>16.00</td>
</tr>
<tr>
<td>20</td>
<td>18.00</td>
</tr>
<tr>
<td>25</td>
<td>20.00</td>
</tr>
<tr>
<td>30</td>
<td>22.00</td>
</tr>
<tr>
<td>35</td>
<td>24.00</td>
</tr>
</tbody>
</table>

Flow 1 (95th percentile 13.41 ms)
Run 1: Statistics of Copa

Start at: 2019-03-18 22:00:33
End at: 2019-03-18 22:01:03

# Below is generated by plot.py at 2019-03-18 22:37:06
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.68 Mbit/s (14.0% utilization)
95th percentile per-packet one-way delay: 13.004 ms
Loss rate: 0.10%
-- Flow 1:
Average throughput: 1.68 Mbit/s
95th percentile per-packet one-way delay: 13.004 ms
Loss rate: 0.10%
Run 1: Report of Copa — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mb/s)

Time (s)

Flow 1 ingress (mean 1.68 Mbit/s)  Flow 1 egress (mean 1.68 Mbit/s)

Per packet one-way delay (ms)

Time (s)

Flow 1 (95th percentile 13.00 ms)
Run 2: Statistics of Copa

Start at: 2019-03-18 22:12:49

# Below is generated by plot.py at 2019-03-18 22:37:06
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.83 Mbit/s (15.2% utilization)
95th percentile per-packet one-way delay: 12.977 ms
Loss rate: 0.09%
-- Flow 1:
Average throughput: 1.83 Mbit/s
95th percentile per-packet one-way delay: 12.977 ms
Loss rate: 0.09%
Run 2: Report of Copa — Data Link

![Graph]

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 1.83 Mbit/s)  Flow 1 egress (mean 1.83 Mbit/s)

![Graph]

Packet delivery delay (ms)

Flow 1 (95th percentile 12.98 ms)
Run 3: Statistics of Copa

End at: 2019-03-18 22:25:37

# Below is generated by plot.py at 2019-03-18 22:37:06
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 1.76 Mbit/s (14.6% utilization)
  95th percentile per-packet one-way delay: 12.960 ms
  Loss rate: 0.10%
-- Flow 1:
  Average throughput: 1.76 Mbit/s
  95th percentile per-packet one-way delay: 12.960 ms
  Loss rate: 0.10%
Run 3: Report of Copa — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbps)

0 2 4 6 8 10 12

Time (s)

Flow 1 ingress (mean 1.76 Mbit/s)  Flow 1 egress (mean 1.76 Mbit/s)

Per packet one-way delay (ms)

10 12 14 16 18 20 22 24

Time (s)

Flow 1 (95th percentile 12.96 ms)
Run 1: Statistics of TCP Cubic

Start at: 2019-03-18 22:06:24
End at: 2019-03-18 22:06:54

# Below is generated by plot.py at 2019-03-18 22:37:08
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 5.25 Mbit/s (43.8% utilization)
95th percentile per-packet one-way delay: 13.071 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 5.25 Mbit/s
95th percentile per-packet one-way delay: 13.071 ms
Loss rate: 0.05%
Run 1: Report of TCP Cubic — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 5.25 Mbit/s)  Flow 1 egress (mean 5.25 Mbit/s)

Per-packet one-way delay (ms)

Time (s)

Flow 1 (95th percentile 13.07 ms)
Run 2: Statistics of TCP Cubic

Start at: 2019-03-18 22:18:40
End at: 2019-03-18 22:19:11

# Below is generated by plot.py at 2019-03-18 22:37:08
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 5.25 Mbit/s (43.8% utilization)
  95th percentile per-packet one-way delay: 13.206 ms
  Loss rate: 0.05%
-- Flow 1:
  Average throughput: 5.25 Mbit/s
  95th percentile per-packet one-way delay: 13.206 ms
  Loss rate: 0.05%
Run 2: Report of TCP Cubic — Data Link

![Image of throughput over time](image1)

![Image of packet inter-arrival delay over time](image2)
Run 3: Statistics of TCP Cubic

Start at: 2019-03-18 22:30:58

# Below is generated by plot.py at 2019-03-18 22:37:15
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 5.25 Mbit/s (43.8% utilization)
95th percentile per-packet one-way delay: 13.109 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 5.25 Mbit/s
95th percentile per-packet one-way delay: 13.109 ms
Loss rate: 0.05%
Run 3: Report of TCP Cubic — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 5.25 Mbit/s)  Flow 1 egress (mean 5.25 Mbit/s)

Flow 1 (95th percentile 13.11 ms)
Run 1: Statistics of FillP

Start at: 2019-03-18 22:02:18
End at: 2019-03-18 22:02:48

# Below is generated by plot.py at 2019-03-18 22:37:29
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 11.56 Mbit/s (96.3% utilization)
95th percentile per-packet one-way delay: 66.648 ms
Loss rate: 0.13%
-- Flow 1:
Average throughput: 11.56 Mbit/s
95th percentile per-packet one-way delay: 66.648 ms
Loss rate: 0.13%
Run 1: Report of FillP — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Time (s)

Throughput (Mbit/s)

Flow 1 ingress (mean 11.57 Mbit/s)  Flow 1 egress (mean 11.56 Mbit/s)

Per packet one way delay (ms)

Time (s)

Flow 1 (95th percentile 66.65 ms)
Run 2: Statistics of FillP

End at: 2019-03-18 22:15:05

# Below is generated by plot.py at 2019-03-18 22:37:29
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 11.45 Mbit/s (95.4% utilization)
  95th percentile per-packet one-way delay: 73.590 ms
  Loss rate: 0.06%
-- Flow 1:
  Average throughput: 11.45 Mbit/s
  95th percentile per-packet one-way delay: 73.590 ms
  Loss rate: 0.06%
Run 2: Report of FillP — Data Link

![Graph showing network throughput and packet transfer delay]

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 11.46 Mbit/s)  Flow 1 egress (mean 11.45 Mbit/s)

Per Packet one way delay (ms)

Time (s)

Flow 1 (95th percentile 73.59 ms)
Run 3: Statistics of FillP

Start at: 2019-03-18 22:26:52

# Below is generated by plot.py at 2019-03-18 22:37:31
# Datalink statistics
-- Total of 1 flow:
   Average capacity: 12.00 Mbit/s
   Average throughput: 11.57 Mbit/s (96.4% utilization)
   95th percentile per-packet one-way delay: 68.355 ms
   Loss rate: 0.22%
-- Flow 1:
   Average throughput: 11.57 Mbit/s
   95th percentile per-packet one-way delay: 68.355 ms
   Loss rate: 0.22%
Run 3: Report of FillP — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 11.60 Mbit/s)  Flow 1 egress (mean 11.57 Mbit/s)

Packet loss rate (miss)

Time (s)

Flow 1 (95th percentile 68.36 ms)
Run 1: Statistics of FillP-Sheep

Start at: 2019-03-18 22:02:53
End at: 2019-03-18 22:03:23

# Below is generated by plot.py at 2019-03-18 22:37:31
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 10.22 Mbit/s (85.2% utilization)
  95th percentile per-packet one-way delay: 42.040 ms
  Loss rate: 0.10%
-- Flow 1:
  Average throughput: 10.22 Mbit/s
  95th percentile per-packet one-way delay: 42.040 ms
  Loss rate: 0.10%
Run 1: Report of FillP-Sheep — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbps)

Time (s)

Flow 1 ingress (mean 10.23 Mbit/s)  Flow 1 egress (mean 10.22 Mbit/s)

Per Packet one way delay (ms)

Time (s)

Flow 1 (95th percentile 42.04 ms)
Run 2: Statistics of FillP-Sheep

Start at: 2019-03-18 22:15:10
End at: 2019-03-18 22:15:40

# Below is generated by plot.py at 2019-03-18 22:37:31
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 10.22 Mbit/s (85.2% utilization)
95th percentile per-packet one-way delay: 41.272 ms
Loss rate: 0.09%
-- Flow 1:
Average throughput: 10.22 Mbit/s
95th percentile per-packet one-way delay: 41.272 ms
Loss rate: 0.09%
Run 2: Report of FillP-Sheep — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 10.23 Mbit/s)  Flow 1 egress (mean 10.22 Mbit/s)

Per packet one way delay (ms)

Time (s)

Flow 1 (95th percentile 41.27 ms)
Run 3: Statistics of FillP-Sheep


# Below is generated by plot.py at 2019-03-18 22:37:31
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 10.27 Mbit/s (85.6% utilization)
95th percentile per-packet one-way delay: 41.515 ms
Loss rate: 0.10%
-- Flow 1:
Average throughput: 10.27 Mbit/s
95th percentile per-packet one-way delay: 41.515 ms
Loss rate: 0.10%
Run 3: Report of FillP-Sheep — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbps)

Time (s)

Flow 1 ingress (mean 10.27 Mbit/s)  Flow 1 egress (mean 10.27 Mbit/s)

Packet delay (ms)

Time (s)

Flow 1 (95th percentile 41.52 ms)
Run 1: Statistics of Indigo

Start at: 2019-03-18 22:06:59
End at: 2019-03-18 22:07:29

# Below is generated by plot.py at 2019-03-18 22:37:31
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 1.25 Mbit/s (10.5% utilization)
  95th percentile per-packet one-way delay: 21.575 ms
  Loss rate: 0.29%
-- Flow 1:
  Average throughput: 1.25 Mbit/s
  95th percentile per-packet one-way delay: 21.575 ms
  Loss rate: 0.29%
Run 1: Report of Indigo — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

0 2 4 6 8 10 12

Time (s)

0 5 10 15 20 25 30 35

Flow 1 ingress (mean 1.26 Mbit/s)  Flow 1 egress (mean 1.25 Mbit/s)

Per-packet one-way delay (ms)

0 5 10 15 20 25 30 35

Time (s)

0 5 10 15 20 25 30

Flow 1 (95th percentile 21.57 ms)
Run 2: Statistics of Indigo

Start at: 2019-03-18 22:19:16
End at: 2019-03-18 22:19:46

# Below is generated by plot.py at 2019-03-18 22:37:31
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.26 Mbit/s (10.5% utilization)
95th percentile per-packet one-way delay: 21.417 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 1.26 Mbit/s
95th percentile per-packet one-way delay: 21.417 ms
Loss rate: 0.00%
Run 2: Report of Indigo — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

0 5 10 15 20 25 30 35

Flow 1 ingress (mean 1.26 Mbit/s)  Flow 1 egress (mean 1.26 Mbit/s)

Per-packet one-way delay (ms)

Time (s)

0 5 10 15 20 25 30

Flow 1 (95th percentile 21.42 ms)
Run 3: Statistics of Indigo

End at: 2019-03-18 22:32:03

# Below is generated by plot.py at 2019-03-18 22:37:31
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.26 Mbit/s (10.5% utilization)
95th percentile per-packet one-way delay: 21.486 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 1.26 Mbit/s
95th percentile per-packet one-way delay: 21.486 ms
Loss rate: 0.00%
Run 3: Report of Indigo — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 1.26 Mbit/s)  Flow 1 egress (mean 1.26 Mbit/s)

Per-packet one-way delay (ms)

Time (s)

Flow 1 (95th percentile 21.49 ms)
Run 1: Statistics of Indigo-MusesC3

Start at: 2019-03-18 22:09:54
End at: 2019-03-18 22:10:24

# Below is generated by plot.py at 2019-03-18 22:37:33
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.75 Mbit/s (22.9% utilization)
95th percentile per-packet one-way delay: 36.244 ms
Loss rate: 0.56%
-- Flow 1:
Average throughput: 2.75 Mbit/s
95th percentile per-packet one-way delay: 36.244 ms
Loss rate: 0.56%
Run 1: Report of Indigo-MusesC3 — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

0 1 2 3 4 5 6 7 8 9 10 11 12

0 5 10 15 20 25 30 35

Time (s)

Flow 1 ingress (mean 2.76 Mbit/s)  Flow 1 egress (mean 2.75 Mbit/s)

Per-packet one-way delay (ms)

0 10 20 30 40 50 60

0 5 10 15 20 25 30 35 40

Time (s)

Flow 1 (95th percentile 36.24 ms)
Run 2: Statistics of Indigo-MusesC3


# Below is generated by plot.py at 2019-03-18 22:37:35
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.75 Mbit/s (22.9% utilization)
95th percentile per-packet one-way delay: 36.025 ms
Loss rate: 0.53%
-- Flow 1:
Average throughput: 2.75 Mbit/s
95th percentile per-packet one-way delay: 36.025 ms
Loss rate: 0.53%
Run 2: Report of Indigo-MusesC3 — Data Link

Average capacity 12.00 Mbit/s (shaded region)

- **Flow 1 ingress (mean 2.76 Mbit/s)**
- **Flow 1 egress (mean 2.75 Mbit/s)**
Run 3: Statistics of Indigo-MusesC3

Start at: 2019-03-18 22:34:29
End at: 2019-03-18 22:34:59

# Below is generated by plot.py at 2019-03-18 22:37:38
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.75 Mbit/s (22.9% utilization)
95th percentile per-packet one-way delay: 37.746 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 2.75 Mbit/s
95th percentile per-packet one-way delay: 37.746 ms
Loss rate: 0.01%
Run 3: Report of Indigo-MusesC3 — Data Link

Average capacity 12.00 Mb/s (shaded region)

Flow 1 ingress (mean 2.75 Mb/s)  Flow 1 egress (mean 2.75 Mb/s)

Per-packet end-to-end delay (ms)

Flow 1 (95th percentile 37.75 ms)
Run 1: Statistics of Indigo-MusesC5

Start at: 2019-03-18 22:01:08
End at: 2019-03-18 22:01:38

# Below is generated by plot.py at 2019-03-18 22:37:40
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 3.07 Mbit/s (25.6% utilization)
95th percentile per-packet one-way delay: 35.113 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 3.07 Mbit/s
95th percentile per-packet one-way delay: 35.113 ms
Loss rate: 0.03%
Run 1: Report of Indigo-MusesC5 — Data Link
Run 2: Statistics of Indigo-MusesC5

End at: 2019-03-18 22:13:54

# Below is generated by plot.py at 2019-03-18 22:37:42
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 3.05 Mbit/s (25.4% utilization)
  95th percentile per-packet one-way delay: 35.463 ms
  Loss rate: 0.35%
-- Flow 1:
  Average throughput: 3.05 Mbit/s
  95th percentile per-packet one-way delay: 35.463 ms
  Loss rate: 0.35%
Run 2: Report of Indigo-MusesC5 — Data Link

Average capacity 12.00 Mbps (shaded region)

Throughput (Mbps)

Time (s)

Flow 1 ingress (mean 3.06 Mbps)  Flow 1 egress (mean 3.05 Mbps)

Per-packet end-to-end delay (ms)

Time (s)

Flow 1 (95th percentile 35.46 ms)
Run 3: Statistics of Indigo-MusesC5

Start at: 2019-03-18 22:25:42
End at: 2019-03-18 22:26:12

# Below is generated by plot.py at 2019-03-18 22:37:42
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 3.04 Mbit/s (25.4% utilization)
  95th percentile per-packet one-way delay: 35.283 ms
  Loss rate: 0.01%
-- Flow 1:
  Average throughput: 3.04 Mbit/s
  95th percentile per-packet one-way delay: 35.283 ms
  Loss rate: 0.01%
Run 3: Report of Indigo-MusesC5 — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 3.04 Mbit/s)  Flow 1 egress (mean 3.04 Mbit/s)

Per-packet one-way delay (ms)

Flow 1 (95th percentile 35.28 ms)
Run 1: Statistics of Indigo-MusesD

Start at: 2019-03-18 22:07:34
End at: 2019-03-18 22:08:04

# Below is generated by plot.py at 2019-03-18 22:37:43
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 2.98 Mbit/s (24.8% utilization)
  95th percentile per-packet one-way delay: 19.499 ms
  Loss rate: 0.03%
-- Flow 1:
  Average throughput: 2.98 Mbit/s
  95th percentile per-packet one-way delay: 19.499 ms
  Loss rate: 0.03%
Run 1: Report of Indigo-MusesD — Data Link

Average capacity 12.00 Mbit/s (shaded region)

- Flow 1 ingress (mean 2.97 Mbit/s)
- Flow 1 egress (mean 2.98 Mbit/s)

Per packet one-way delay (ms)
- Flow 1 (95th percentile 19.50 ms)
Run 2: Statistics of Indigo-MusesD

Start at: 2019-03-18 22:19:51
End at: 2019-03-18 22:20:21

# Below is generated by plot.py at 2019-03-18 22:37:43
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 2.98 Mbit/s (24.9% utilization)
  95th percentile per-packet one-way delay: 19.964 ms
  Loss rate: 0.25%
-- Flow 1:
  Average throughput: 2.98 Mbit/s
  95th percentile per-packet one-way delay: 19.964 ms
  Loss rate: 0.25%
Run 2: Report of Indigo-MusesD — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Flow 1 ingress (mean 2.99 Mbit/s)  Flow 1 egress (mean 2.98 Mbit/s)

Packet delivery delay (ms)

Flow 1 (95th percentile 19.96 ms)
Run 3: Statistics of Indigo-MusesD

Start at: 2019-03-18 22:32:08
End at: 2019-03-18 22:32:38

# Below is generated by plot.py at 2019-03-18 22:37:46
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 2.96 Mbit/s (24.7% utilization)
  95th percentile per-packet one-way delay: 19.422 ms
  Loss rate: 0.01%
-- Flow 1:
  Average throughput: 2.96 Mbit/s
  95th percentile per-packet one-way delay: 19.422 ms
  Loss rate: 0.01%
Run 3: Report of Indigo-MusesD — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

- Flow 1 ingress (mean 2.96 Mbit/s)
- Flow 1 egress (mean 2.96 Mbit/s)

Packet delay (ms)

Time (s)

- Flow 1 (95th percentile 19.42 ms)
Run 1: Statistics of Indigo-MusesT

End at: 2019-03-18 22:00:28

# Below is generated by plot.py at 2019-03-18 22:37:47
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 2.96 Mbit/s (24.7% utilization)
  95th percentile per-packet one-way delay: 34.912 ms
  Loss rate: 0.50%
-- Flow 1:
  Average throughput: 2.96 Mbit/s
  95th percentile per-packet one-way delay: 34.912 ms
  Loss rate: 0.50%
Run 1: Report of Indigo-MusesT — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

0 10 20 30 35
Time (s)

Flow 1 ingress (mean 2.97 Mbit/s)  Flow 1 egress (mean 2.96 Mbit/s)

Per-packet one-way delay (ms)

0 5 10 15 20 25 30
Time (s)

Flow 1 (95th percentile 34.91 ms)
Run 2: Statistics of Indigo-MusesT

Start at: 2019-03-18 22:12:14
End at: 2019-03-18 22:12:44

# Below is generated by plot.py at 2019-03-18 22:37:50
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 2.97 Mbit/s (24.7% utilization)
  95th percentile per-packet one-way delay: 35.134 ms
  Loss rate: 0.01%
-- Flow 1:
  Average throughput: 2.97 Mbit/s
  95th percentile per-packet one-way delay: 35.134 ms
  Loss rate: 0.01%
Run 2: Report of Indigo-MusesT — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 2.97 Mbit/s)  Flow 1 egress (mean 2.97 Mbit/s)

Per-packet end-to-end delay (ms)

Flow 1 (95th percentile 35.13 ms)
Run 3: Statistics of Indigo-MusesT

Start at: 2019-03-18 22:24:31
End at: 2019-03-18 22:25:01

# Below is generated by plot.py at 2019-03-18 22:37:52
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.95 Mbit/s (24.6% utilization)
95th percentile per-packet one-way delay: 34.924 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 2.95 Mbit/s
95th percentile per-packet one-way delay: 34.924 ms
Loss rate: 0.01%
Run 3: Report of Indigo-MusesT — Data Link

**Average capacity 12.00 Mbit/s (shaded region)**

Time (s)

Throughput (Mbit/s)

- **Flow 1 ingress (mean 2.95 Mbit/s)**
- **Flow 1 egress (mean 2.95 Mbit/s)**

**Per-packet end-to-end delay (ms)**

- **Flow 1 (95th percentile 34.92 ms)**
Run 1: Statistics of LEDBAT

Start at: 2019-03-18 22:04:39
End at: 2019-03-18 22:05:09

# Below is generated by plot.py at 2019-03-18 22:37:54
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.34 Mbit/s (19.5% utilization)
95th percentile per-packet one-way delay: 30.129 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 2.34 Mbit/s
95th percentile per-packet one-way delay: 30.129 ms
Loss rate: 0.00%
Run 1: Report of LEDBAT — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 2.34 Mbit/s)  Flow 1 egress (mean 2.34 Mbit/s)

Per-packet one-way delay (ms)

Flow 1 (95th percentile 30.13 ms)
Run 2: Statistics of LEDBAT

End at: 2019-03-18 22:17:25

# Below is generated by plot.py at 2019-03-18 22:37:54
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.35 Mbit/s (19.6% utilization)
95th percentile per-packet one-way delay: 30.281 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 2.35 Mbit/s
95th percentile per-packet one-way delay: 30.281 ms
Loss rate: 0.00%
Run 2: Report of LEDBAT — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbps)

Time (s)

Flow 1 ingress (mean 2.36 Mbit/s)  Flow 1 egress (mean 2.35 Mbit/s)

Per-packet one-way delay (ms)

Time (s)

Flow 1 (95th percentile 30.28 ms)
Run 3: Statistics of LEDBAT

End at: 2019-03-18 22:29:43

# Below is generated by plot.py at 2019-03-18 22:37:54
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 2.44 Mbit/s (20.3% utilization)
  95th percentile per-packet one-way delay: 31.441 ms
  Loss rate: 0.34%
-- Flow 1:
  Average throughput: 2.44 Mbit/s
  95th percentile per-packet one-way delay: 31.441 ms
  Loss rate: 0.34%
Run 3: Report of LEDBAT — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 2.44 Mbit/s)  Flow 1 egress (mean 2.44 Mbit/s)

Number of packets per second delay (ms)

Flow 1 (95th percentile 31.44 ms)
Run 1: Statistics of PCC-Allegro

Start at: 2019-03-18 22:08:44
End at: 2019-03-18 22:09:14

# Below is generated by plot.py at 2019-03-18 22:37:57
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 4.31 Mbit/s (35.9% utilization)
  95th percentile per-packet one-way delay: 12.311 ms
  Loss rate: 0.05%
-- Flow 1:
  Average throughput: 4.31 Mbit/s
  95th percentile per-packet one-way delay: 12.311 ms
  Loss rate: 0.05%
Run 1: Report of PCC-Allegro — Data Link

![Graph 1: Average capacity 12.00 Mbit/s (shaded region)]

- Flow 1 ingress (mean 4.31 Mbit/s)
- Flow 1 egress (mean 4.31 Mbit/s)

![Graph 2: Per-packet one-way delay (ms) with 95th percentile 12.31 ms]

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Run 2: Statistics of PCC-Allegro

Start at: 2019-03-18 22:21:01

# Below is generated by plot.py at 2019-03-18 22:38:05
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 8.23 Mbit/s (68.6% utilization)
  95th percentile per-packet one-way delay: 261.554 ms
  Loss rate: 0.04%
-- Flow 1:
  Average throughput: 8.23 Mbit/s
  95th percentile per-packet one-way delay: 261.554 ms
  Loss rate: 0.04%
Run 2: Report of PCC-Allegro — Data Link

![Graph showing throughput and packet delay over time]

- **Average capacity**: 12.00 Mbit/s (shaded region)
- **Throughput** (Mbit/s)
- **Time (s)**
- **Flow 1 ingress (mean 8.23 Mbit/s)**
- **Flow 1 egress (mean 8.23 Mbit/s)**

![Graph showing packet delay over time]

- **Per packet one-way delay (ms)**
- **Time (s)**
- **Flow 1 (95th percentile 261.55 ms)**
Run 3: Statistics of PCC-Allegro

Start at: 2019-03-18 22:33:18
End at: 2019-03-18 22:33:48

# Below is generated by plot.py at 2019-03-18 22:38:08
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 8.48 Mbit/s (70.6% utilization)
95th percentile per-packet one-way delay: 200.344 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 8.48 Mbit/s
95th percentile per-packet one-way delay: 200.344 ms
Loss rate: 0.04%
Run 3: Report of PCC-Allegro — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

0.0  2.5  5.0  7.5  10.0  12.5  15.0  17.5

Time (s)

0  5  10  15  20  25  30  35

Flow 1 ingress (mean 8.48 Mbit/s)  Flow 1 egress (mean 8.48 Mbit/s)

Per packet one-way delay (ms)

0  100  200  300  400  500

Time (s)

0  5  10  15  20  25  30

Flow 1 (95th percentile 200.34 ms)
Run 1: Statistics of PCC-Expr

Start at: 2019-03-18 22:01:43
End at: 2019-03-18 22:02:13

# Below is generated by plot.py at 2019-03-18 22:38:13
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 5.55 Mbit/s (46.2% utilization)
95th percentile per-packet one-way delay: 12.969 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 5.55 Mbit/s
95th percentile per-packet one-way delay: 12.969 ms
Loss rate: 0.05%
Run 1: Report of PCC-Expr — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

- Flow 1 ingress (mean 5.55 Mbit/s)
- Flow 1 egress (mean 5.55 Mbit/s)

Per-packet end-to-end delay (ms)

- Flow 1 (95th percentile 12.97 ms)
Run 2: Statistics of PCC-Expr

End at: 2019-03-18 22:14:29

# Below is generated by plot.py at 2019-03-18 22:38:16
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 5.88 Mbit/s (49.0% utilization)
95th percentile per-packet one-way delay: 12.592 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 5.88 Mbit/s
95th percentile per-packet one-way delay: 12.592 ms
Loss rate: 0.04%
Run 2: Report of PCC-Expr — Data Link

![Graph 1: Throughput (Mbps) vs Time (s)]

- Average capacity 12.00 Mbps (shaded region)
- Flow 1 ingress (mean 5.88 Mbps)
- Flow 1 egress (mean 5.88 Mbps)

![Graph 2: Packet per second vs Time (s)]

- Flow 1 (95th percentile 12.59 ms)
Run 3: Statistics of PCC-Expr

Start at: 2019-03-18 22:26:17
End at: 2019-03-18 22:26:47

# Below is generated by plot.py at 2019-03-18 22:38:16
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 5.55 Mbit/s (46.2% utilization)
95th percentile per-packet one-way delay: 13.015 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 5.55 Mbit/s
95th percentile per-packet one-way delay: 13.015 ms
Loss rate: 0.04%
Run 3: Report of PCC-Expr — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 5.55 Mbit/s)  Flow 1 egress (mean 5.55 Mbit/s)

Per-packet one-way delay (ms)

Flow 1 (95th percentile 13.52 ms)
Run 1: Statistics of QUIC Cubic

Start at: 2019-03-18 22:08:09
End at: 2019-03-18 22:08:39

# Below is generated by plot.py at 2019-03-18 22:38:16
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 3.13 Mbit/s (26.1% utilization)
  95th percentile per-packet one-way delay: 12.218 ms
  Loss rate: 0.05%
-- Flow 1:
  Average throughput: 3.13 Mbit/s
  95th percentile per-packet one-way delay: 12.218 ms
  Loss rate: 0.05%
Run 1: Report of QUIC Cubic — Data Link
Run 2: Statistics of QUIC Cubic

Start at: 2019-03-18 22:20:26
End at: 2019-03-18 22:20:56

# Below is generated by plot.py at 2019-03-18 22:38:16
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 3.12 Mbit/s (26.0% utilization)
  95th percentile per-packet one-way delay: 12.251 ms
  Loss rate: 0.05%
-- Flow 1:
  Average throughput: 3.12 Mbit/s
  95th percentile per-packet one-way delay: 12.251 ms
  Loss rate: 0.05%
Run 2: Report of QUIC Cubic — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 3.12 Mbit/s)  Flow 1 egress (mean 3.12 Mbit/s)

Packet one-way delay (ms)

Time (s)

Flow 1 (95th percentile 12.25 ms)
Run 3: Statistics of QUIC Cubic

Start at: 2019-03-18 22:32:43

# Below is generated by plot.py at 2019-03-18 22:38:16
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 3.14 Mbit/s (26.1% utilization)
95th percentile per-packet one-way delay: 12.215 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 3.14 Mbit/s
95th percentile per-packet one-way delay: 12.215 ms
Loss rate: 0.05%
Run 3: Report of QUIC Cubic — Data Link
Run 1: Statistics of SCReAM

Start at: 2019-03-18 22:03:29
End at: 2019-03-18 22:03:59

# Below is generated by plot.py at 2019-03-18 22:38:16
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 0.22 Mbit/s (1.8% utilization)
  95th percentile per-packet one-way delay: 11.788 ms
  Loss rate: 0.13%
-- Flow 1:
  Average throughput: 0.22 Mbit/s
  95th percentile per-packet one-way delay: 11.788 ms
  Loss rate: 0.13%
Run 1: Report of SCReAM — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Time (s)

Throughput (Mbit/s)

Flow 1 ingress (mean 0.22 Mbit/s)  Flow 1 egress (mean 0.22 Mbit/s)

Flow 1 (95th percentile 11.79 ms)
Run 2: Statistics of SCReAM

Start at: 2019-03-18 22:15:45
End at: 2019-03-18 22:16:15

# Below is generated by plot.py at 2019-03-18 22:38:16
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 0.22 Mbit/s (1.8% utilization)
  95th percentile per-packet one-way delay: 11.702 ms
  Loss rate: 0.00%
-- Flow 1:
  Average throughput: 0.22 Mbit/s
  95th percentile per-packet one-way delay: 11.702 ms
  Loss rate: 0.00%
Run 2: Report of SCReAM — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 0.22 Mbit/s)  Flow 1 egress (mean 0.22 Mbit/s)

Per packet on-way delay (ms)

Time (s)

Flow 1 (95th percentile 11.70 ms)
Run 3: Statistics of SCReAM

Start at: 2019-03-18 22:28:03
End at: 2019-03-18 22:28:33

# Below is generated by plot.py at 2019-03-18 22:38:16
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.21 Mbit/s (1.8% utilization)
95th percentile per-packet one-way delay: 11.707 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 11.707 ms
Loss rate: 0.00%
Run 3: Report of SCReAM — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 0.21 Mbit/s)  Flow 1 egress (mean 0.21 Mbit/s)

Per packet one-way delay (ms)

Time (s)

Flow 1 (95th percentile 11.71 ms)
Run 1: Statistics of Sprout

Start at: 2019-03-18 22:09:19
End at: 2019-03-18 22:09:49

# Below is generated by plot.py at 2019-03-18 22:38:26
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 6.62 Mbit/s (55.1% utilization)
95th percentile per-packet one-way delay: 76.446 ms
Loss rate: 0.35%
-- Flow 1:
Average throughput: 6.62 Mbit/s
95th percentile per-packet one-way delay: 76.446 ms
Loss rate: 0.35%
Run 1: Report of Sprout — Data Link
Run 2: Statistics of Sprout


# Below is generated by plot.py at 2019-03-18 22:38:32
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 10.65 Mbit/s (88.7% utilization)
95th percentile per-packet one-way delay: 77.067 ms
Loss rate: 0.12%
-- Flow 1:
Average throughput: 10.65 Mbit/s
95th percentile per-packet one-way delay: 77.067 ms
Loss rate: 0.12%
Run 2: Report of Sprout — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 10.66 Mbit/s)  Flow 1 egress (mean 10.65 Mbit/s)

Per-packet one way delay (ms)

Time (s)

Flow 1 (95th percentile 73.07 ms)
Run 3: Statistics of Sprout

Start at: 2019-03-18 22:33:54
End at: 2019-03-18 22:34:24

# Below is generated by plot.py at 2019-03-18 22:38:32
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 8.43 Mbit/s (70.3% utilization)
  95th percentile per-packet one-way delay: 76.679 ms
  Loss rate: 0.31%
-- Flow 1:
  Average throughput: 8.43 Mbit/s
  95th percentile per-packet one-way delay: 76.679 ms
  Loss rate: 0.31%
Run 3: Report of Sprout — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 8.46 Mbit/s)  Flow 1 egress (mean 8.43 Mbit/s)

Per packet one-way delay (ms)

Flow 1 (95th percentile 76.68 ms)
Run 1: Statistics of TaoVA-100x

Start at: 2019-03-18 22:04:04
End at: 2019-03-18 22:04:34

# Below is generated by plot.py at 2019-03-18 22:38:32
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.88 Mbit/s (15.6% utilization)
95th percentile per-packet one-way delay: 13.091 ms
Loss rate: 0.04%

-- Flow 1:
Average throughput: 1.88 Mbit/s
95th percentile per-packet one-way delay: 13.091 ms
Loss rate: 0.04%
Run 1: Report of TaoVA-100x — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 1.88 Mbit/s)  Flow 1 egress (mean 1.88 Mbit/s)

Per packet one-way delay (ms)

Flow 1 (95th percentile 13.09 ms)
Run 2: Statistics of TaoVA-100x

End at: 2019-03-18 22:16:50

# Below is generated by plot.py at 2019-03-18 22:38:32
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 1.88 Mbit/s (15.6% utilization)
  95th percentile per-packet one-way delay: 13.069 ms
  Loss rate: 0.04%
-- Flow 1:
  Average throughput: 1.88 Mbit/s
  95th percentile per-packet one-way delay: 13.069 ms
  Loss rate: 0.04%
Run 2: Report of TaoVA-100x — Data Link

![Graph 1: Average capacity 12.00 Mbit/s (shaded region)]

![Graph 2: Flow 1 ingress (mean 1.88 Mbit/s) and Flow 1 egress (mean 1.88 Mbit/s)]

![Graph 3: Per-packet one-way delay (ms)]

Flow 1 (95th percentile 13.07 ms)
Run 3: Statistics of TaoVA-100x

End at: 2019-03-18 22:29:08

# Below is generated by plot.py at 2019-03-18 22:38:32
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.88 Mbit/s (15.6% utilization)
95th percentile per-packet one-way delay: 13.061 ms
Loss rate: 0.09%
-- Flow 1:
Average throughput: 1.88 Mbit/s
95th percentile per-packet one-way delay: 13.061 ms
Loss rate: 0.09%
Run 3: Report of TaoVA-100x — Data Link
Run 1: Statistics of TCP Vegas

Start at: 2019-03-18 22:10:29
End at: 2019-03-18 22:10:59

# Below is generated by plot.py at 2019-03-18 22:38:32
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 2.91 Mbit/s (24.3% utilization)
95th percentile per-packet one-way delay: 13.109 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 2.91 Mbit/s
95th percentile per-packet one-way delay: 13.109 ms
Loss rate: 0.03%
Run 1: Report of TCP Vegas — Data Link
Run 2: Statistics of TCP Vegas

End at: 2019-03-18 22:23:16

# Below is generated by plot.py at 2019-03-18 22:38:32
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 3.84 Mbit/s (32.0% utilization)
95th percentile per-packet one-way delay: 13.135 ms
Loss rate: 0.08%
-- Flow 1:
Average throughput: 3.84 Mbit/s
95th percentile per-packet one-way delay: 13.135 ms
Loss rate: 0.08%
Run 2: Report of TCP Vegas — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

- Flow 1 ingress (mean 3.84 Mbit/s)
- Flow 1 egress (mean 3.84 Mbit/s)

Per-packet one-way delay (ms)

Time (s)

- Flow 1 (95th percentile 13.13 ms)
Run 3: Statistics of TCP Vegas

Start at: 2019-03-18 22:35:04
End at: 2019-03-18 22:35:34

# Below is generated by plot.py at 2019-03-18 22:38:40
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 3.73 Mbit/s (31.1% utilization)
  95th percentile per-packet one-way delay: 13.162 ms
  Loss rate: 0.02%
-- Flow 1:
  Average throughput: 3.73 Mbit/s
  95th percentile per-packet one-way delay: 13.162 ms
  Loss rate: 0.02%
Run 3: Report of TCP Vegas — Data Link

**Average capacity 12.00 Mb/s (shaded region)**

![Graph showing throughput over time with shaded region indicating average capacity of 12.00 Mb/s.]

**Flow 1 ingress (mean 3.73 Mb/s)  Flow 1 egress (mean 3.73 Mb/s)**

**Per-packet one-way delays (ms)**

![Graph showing per-packet one-way delays with flow 1 (95th percentile 13.16 ms).]
Run 1: Statistics of Verus

Start at: 2019-03-18 22:05:49
End at: 2019-03-18 22:06:19

# Below is generated by plot.py at 2019-03-18 22:38:40
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 1.37 Mbit/s (11.4% utilization)
  95th percentile per-packet one-way delay: 23.520 ms
  Loss rate: 0.00%
-- Flow 1:
  Average throughput: 1.37 Mbit/s
  95th percentile per-packet one-way delay: 23.520 ms
  Loss rate: 0.00%
Run 1: Report of Verus — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 1.37 Mbit/s)  Flow 1 egress (mean 1.37 Mbit/s)

Packet on-way delay (ms)

Time (s)

Flow 1 (95th percentile 23.52 ms)
Run 2: Statistics of Verus

Start at: 2019-03-18 22:18:05
End at: 2019-03-18 22:18:35

# Below is generated by plot.py at 2019-03-18 22:38:40
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 1.39 Mbit/s (11.6% utilization)
  95th percentile per-packet one-way delay: 23.922 ms
  Loss rate: 0.03%
-- Flow 1:
  Average throughput: 1.39 Mbit/s
  95th percentile per-packet one-way delay: 23.922 ms
  Loss rate: 0.03%
Run 2: Report of Verus — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

- Flow 1 ingress (mean 1.39 Mbit/s)
- Flow 1 egress (mean 1.39 Mbit/s)

Per packet egress delay (ms)

Time (s)

Flow 1 (95th percentile 23.92 ms)

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Run 3: Statistics of Verus

Start at: 2019-03-18 22:30:23
End at: 2019-03-18 22:30:53

# Below is generated by plot.py at 2019-03-18 22:38:40
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.73 Mbit/s (14.4% utilization)
95th percentile per-packet one-way delay: 24.822 ms
Loss rate: 0.21%
-- Flow 1:
Average throughput: 1.73 Mbit/s
95th percentile per-packet one-way delay: 24.822 ms
Loss rate: 0.21%
Run 3: Report of Verus — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 1.73 Mbit/s)  Flow 1 egress (mean 1.73 Mbit/s)

Per packet one-way delay (ms)

Flow 1 (95th percentile 24.52 ms)
Run 1: Statistics of PCC-Vivace

Start at: 2019-03-18 22:11:04
End at: 2019-03-18 22:11:34

# Below is generated by plot.py at 2019-03-18 22:38:40
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.44 Mbit/s (12.0% utilization)
95th percentile per-packet one-way delay: 12.168 ms
Loss rate: 0.05%
-- Flow 1:
Average throughput: 1.44 Mbit/s
95th percentile per-packet one-way delay: 12.168 ms
Loss rate: 0.05%
Run 1: Report of PCC-Vivace — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

0 2 4 6 8 10 12

Time (s)

0 5 10 15 20 25 30 35

Flow 1 ingress (mean 1.44 Mbit/s)  Flow 1 egress (mean 1.44 Mbit/s)

Per-packet one-way delay (ms)

10 12 14 16 18 20

Time (s)

0 5 10 15 20 25 30

Flow 1 (95th percentile 12.17 ms)
Run 2: Statistics of PCC-Vivace

End at: 2019-03-18 22:23:52

# Below is generated by plot.py at 2019-03-18 22:38:40
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 1.45 Mbit/s (12.1% utilization)
95th percentile per-packet one-way delay: 12.194 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 1.45 Mbit/s
95th percentile per-packet one-way delay: 12.194 ms
Loss rate: 0.03%
Run 2: Report of PCC-Vivace — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

0 5 10 15 20 25 30 35

Flow 1 ingress (mean 1.45 Mbit/s)  Flow 1 egress (mean 1.45 Mbit/s)

Per-packet end-to-end delay (ms)

Time (s)

0 5 10 15 20 25 30

Flow 1 (95th percentile 12.19 ms)
Run 3: Statistics of PCC-Vivace

Start at: 2019-03-18 22:35:39
End at: 2019-03-18 22:36:09

# Below is generated by plot.py at 2019-03-18 22:38:43
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 1.42 Mbit/s (11.8% utilization)
  95th percentile per-packet one-way delay: 12.215 ms
  Loss rate: 0.03%
-- Flow 1:
  Average throughput: 1.42 Mbit/s
  95th percentile per-packet one-way delay: 12.215 ms
  Loss rate: 0.03%
Run 3: Report of PCC-Vivace — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Flow 1 ingress (mean 1.42 Mbit/s)  Flow 1 egress (mean 1.42 Mbit/s)

Per packet one-way delay (ms)

Flow 1 (95th percentile 12.21 ms)
Run 1: Statistics of WebRTC media

Start at: 2019-03-18 22:11:39
End at: 2019-03-18 22:12:09

# Below is generated by plot.py at 2019-03-18 22:38:43
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 0.05 Mbit/s (0.4% utilization)
  95th percentile per-packet one-way delay: 19.265 ms
  Loss rate: 0.00%
-- Flow 1:
  Average throughput: 0.05 Mbit/s
  95th percentile per-packet one-way delay: 19.265 ms
  Loss rate: 0.00%
Run 1: Report of WebRTC media — Data Link
Run 2: Statistics of WebRTC media

End at: 2019-03-18 22:24:27

# Below is generated by plot.py at 2019-03-18 22:38:43
# Datalink statistics
-- Total of 1 flow:
  Average capacity: 12.00 Mbit/s
  Average throughput: 0.05 Mbit/s (0.4% utilization)
  95th percentile per-packet one-way delay: 18.644 ms
  Loss rate: 0.00%
-- Flow 1:
  Average throughput: 0.05 Mbit/s
  95th percentile per-packet one-way delay: 18.644 ms
  Loss rate: 0.00%
Run 2: Report of WebRTC media — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (Mbit/s)

Time (s)

Flow 1 ingress (mean 0.05 Mbit/s)  Flow 1 egress (mean 0.05 Mbit/s)

Per-Packet one-way delay (ms)

Flow 1 (95th percentile 18.64 ms)
Run 3: Statistics of WebRTC media

Start at: 2019-03-18 22:36:14
End at: 2019-03-18 22:36:44

# Below is generated by plot.py at 2019-03-18 22:38:43
# Datalink statistics
-- Total of 1 flow:
Average capacity: 12.00 Mbit/s
Average throughput: 0.05 Mbit/s (0.4% utilization)
95th percentile per-packet one-way delay: 19.620 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 19.620 ms
Loss rate: 0.00%
Run 3: Report of WebRTC media — Data Link

Average capacity 12.00 Mbit/s (shaded region)

Throughput (MBit/s)

0 2 4 6 8 10 12

Time (s)

0 5 10 15 20 25 30

Flow 1 ingress (mean 0.05 Mbit/s)  Flow 1 egress (mean 0.05 Mbit/s)

26 24 22 20 18 16 14 12 10

Per packet one way delay (ms)

0 5 10 15 20 25 30

Flow 1 (95th percentile 19.62 ms)