

Pantheon Report

Generated at 2018-09-05 03:46:58 (UTC).

Data path: Brazil on **p4p1** (*remote*) → AWS Brazil 1 on **ens5** (*local*).

Repeated the test of 4 congestion control schemes 3 times.

Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.

NTP offsets were measured against **gps.ntp.br** and have been applied to correct the timestamps in logs.

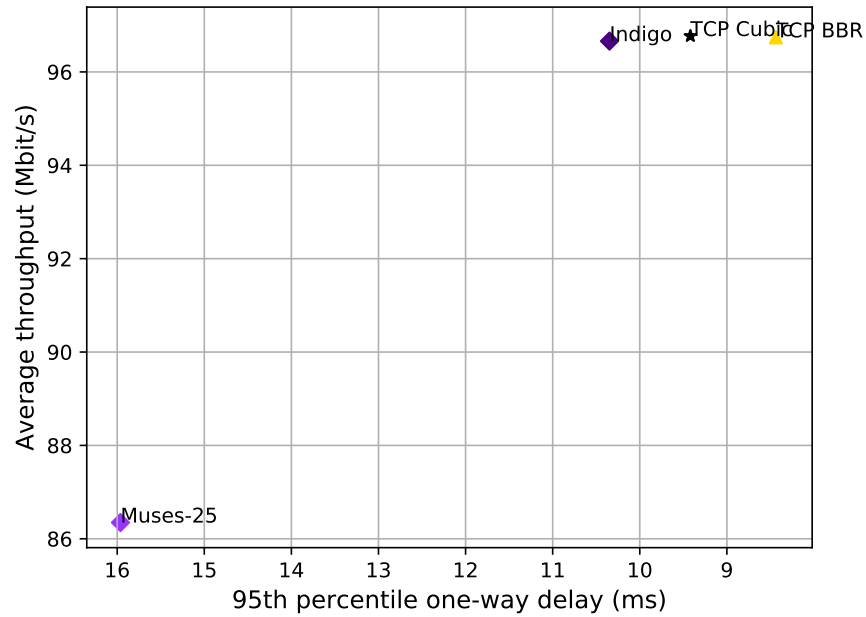
System info:

```
Linux 4.15.0-1020-aws
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
net.ipv4.tcp_mem = 536870912 536870912 536870912
```

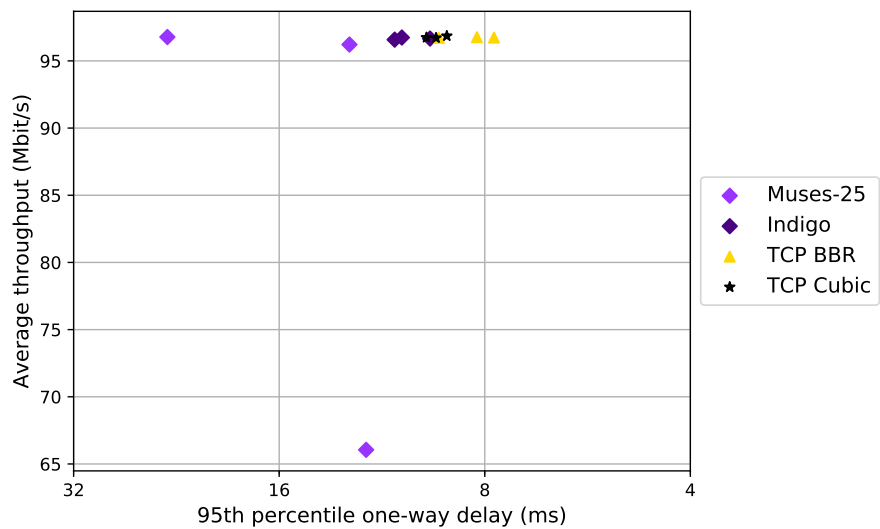
Git summary:

```
branch: muses @ 71e71e9a55b945431a7dea72180c1c9381097db9
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ 96fbc95fb38373d71fbc80c5a105e62e7636623b
third_party/pantheon-tunnel @ cbfce6db5ff5740dafa1771f813cd646339e1952
third_party/pcc @ 1afc958fa0d66d18b623c091a55fec872b4981e1
M receiver/src/buffer.h
M receiver/src/core.cpp
M sender/src/buffer.h
M sender/src/core.cpp
third_party/pcc-experimental @ cd43e34e3f5f5613e8acd08fab92c4eb24f974ab
third_party/proto-quick @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream-reproduce @ f099118d1421aa3131bf11ff1964974e1da3bdb2
M src/ScreamClient
M src/ScreamServer
third_party/sprout @ 366e35c6178b01e31d4a46ad18c74f9415f19a26
third_party/verus @ d4b447ea74c6c60a261149af2629562939f9a494
M src/verus.hpp
M tools/plot.py
third_party/vivace @ 2baf86211435ae071a32f96b7d8c504587f5d7f4
third_party/webrtc @ 3f0cc2a9061a41b6f9dde4735770d143a1fa2851
```

test from Brazil to AWS Brazil 1, 3 runs of 30s each per scheme
 3 flows with 10s interval between flows (mean of all runs by scheme)



test from Brazil to AWS Brazil 1, 3 runs of 30s each per scheme
 3 flows with 10s interval between flows



| scheme | # runs | mean avg tput (Mbit/s) | | | mean 95th-%ile delay (ms) | | | mean loss rate (%) | | |
|-----------|--------|------------------------|--------|--------|---------------------------|--------|--------|--------------------|--------|--------|
| | | flow 1 | flow 2 | flow 3 | flow 1 | flow 2 | flow 3 | flow 1 | flow 2 | flow 3 |
| TCP BBR | 3 | 58.86 | 40.61 | 32.61 | 8.50 | 7.51 | 8.29 | 0.10 | 0.03 | 0.26 |
| TCP Cubic | 3 | 59.19 | 40.34 | 32.26 | 9.43 | 9.25 | 9.58 | 0.10 | 0.16 | 0.30 |
| Indigo | 3 | 59.21 | 40.37 | 32.20 | 9.98 | 10.50 | 8.96 | 0.26 | 1.52 | 0.24 |
| Muses-25 | 3 | 51.81 | 37.16 | 29.59 | 8.70 | 22.37 | 36.47 | 0.01 | 0.32 | 0.57 |

Run 1: Statistics of TCP BBR

Start at: 2018-09-05 03:33:58

End at: 2018-09-05 03:34:28

Local clock offset: 9.614 ms

Remote clock offset: 0.423 ms

Below is generated by plot.py at 2018-09-05 03:46:23

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.72 Mbit/s

95th percentile per-packet one-way delay: 9.340 ms

Loss rate: 0.24%

-- Flow 1:

Average throughput: 58.80 Mbit/s

95th percentile per-packet one-way delay: 9.363 ms

Loss rate: 0.25%

-- Flow 2:

Average throughput: 40.67 Mbit/s

95th percentile per-packet one-way delay: 8.250 ms

Loss rate: 0.04%

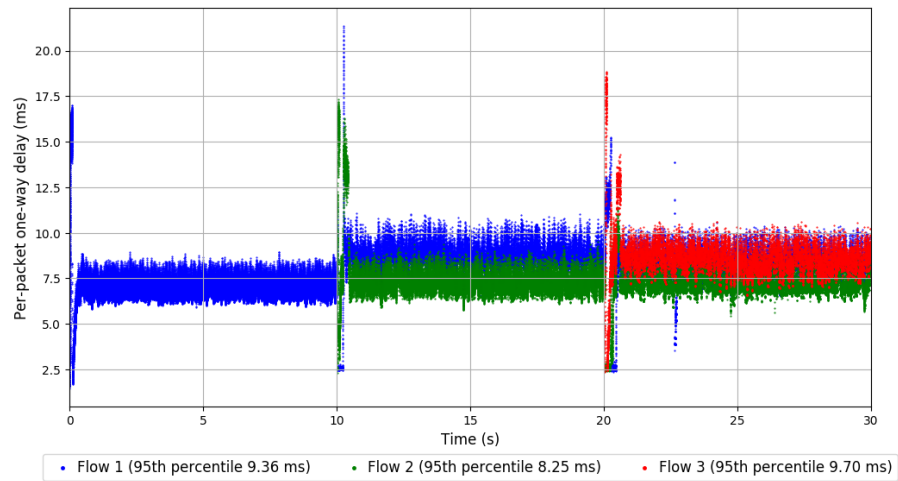
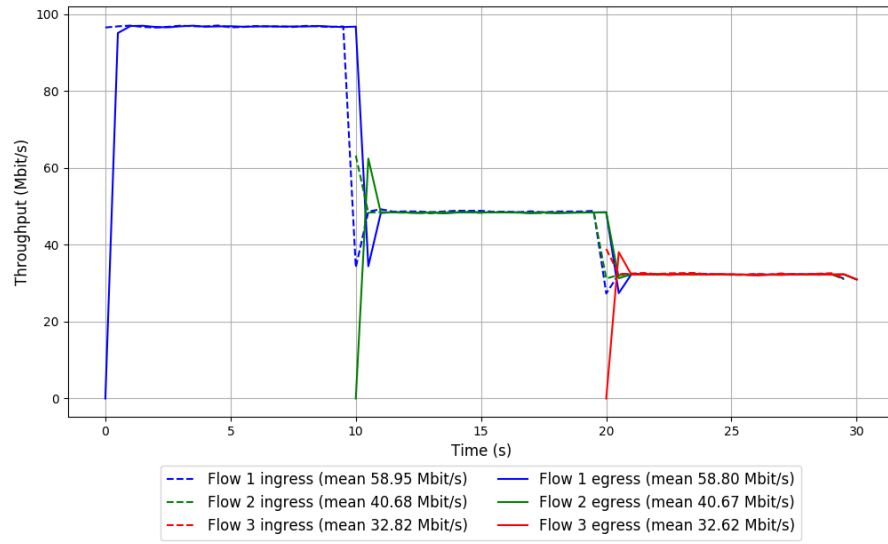
-- Flow 3:

Average throughput: 32.62 Mbit/s

95th percentile per-packet one-way delay: 9.702 ms

Loss rate: 0.66%

Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2018-09-05 03:38:35

End at: 2018-09-05 03:39:05

Local clock offset: 10.119 ms

Remote clock offset: 0.449 ms

Below is generated by plot.py at 2018-09-05 03:46:25

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.76 Mbit/s

95th percentile per-packet one-way delay: 8.215 ms

Loss rate: 0.04%

-- Flow 1:

Average throughput: 58.89 Mbit/s

95th percentile per-packet one-way delay: 8.396 ms

Loss rate: 0.04%

-- Flow 2:

Average throughput: 40.60 Mbit/s

95th percentile per-packet one-way delay: 6.739 ms

Loss rate: 0.02%

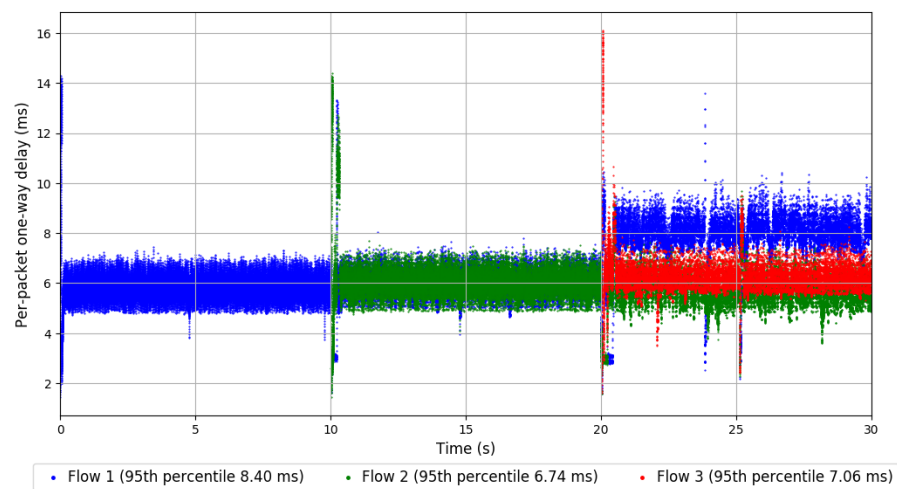
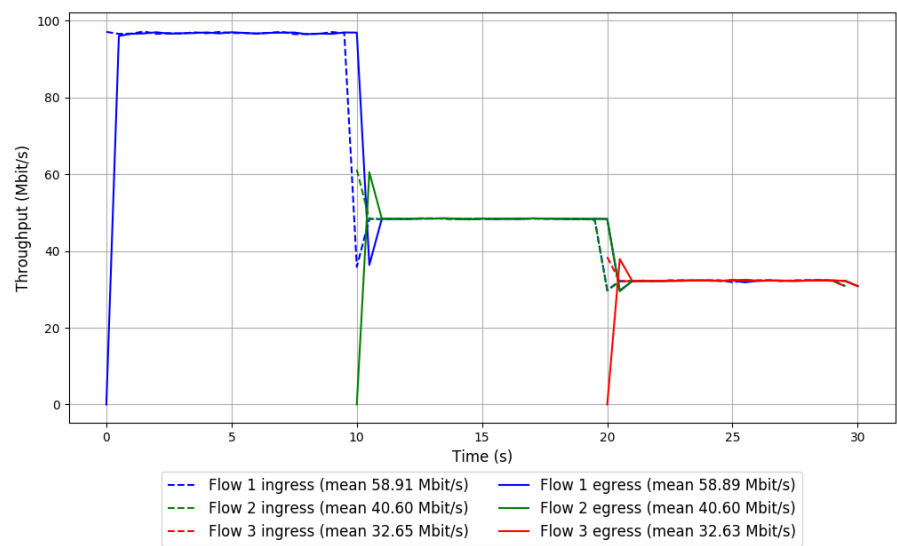
-- Flow 3:

Average throughput: 32.63 Mbit/s

95th percentile per-packet one-way delay: 7.064 ms

Loss rate: 0.06%

Run 2: Report of TCP BBR — Data Link



Run 3: Statistics of TCP BBR

Start at: 2018-09-05 03:43:13

End at: 2018-09-05 03:43:43

Local clock offset: 10.664 ms

Remote clock offset: 0.481 ms

Below is generated by plot.py at 2018-09-05 03:46:25

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.74 Mbit/s

95th percentile per-packet one-way delay: 7.755 ms

Loss rate: 0.03%

-- Flow 1:

Average throughput: 58.90 Mbit/s

95th percentile per-packet one-way delay: 7.739 ms

Loss rate: 0.01%

-- Flow 2:

Average throughput: 40.57 Mbit/s

95th percentile per-packet one-way delay: 7.527 ms

Loss rate: 0.03%

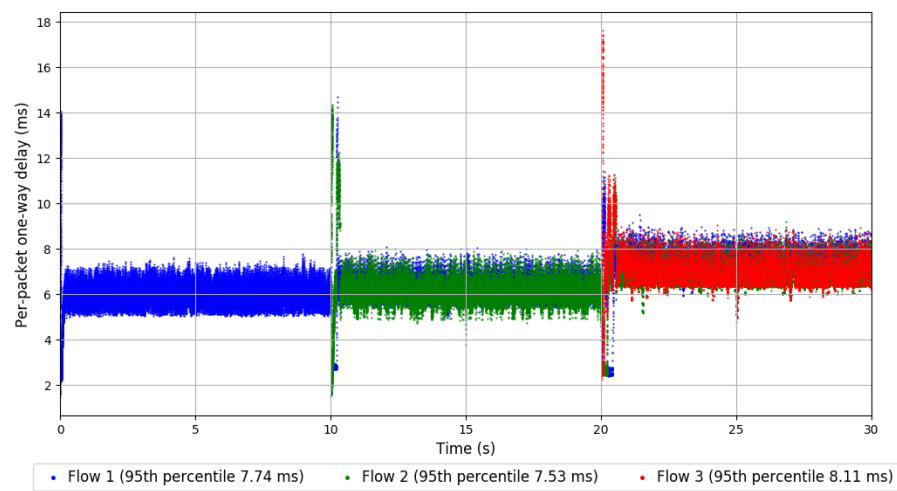
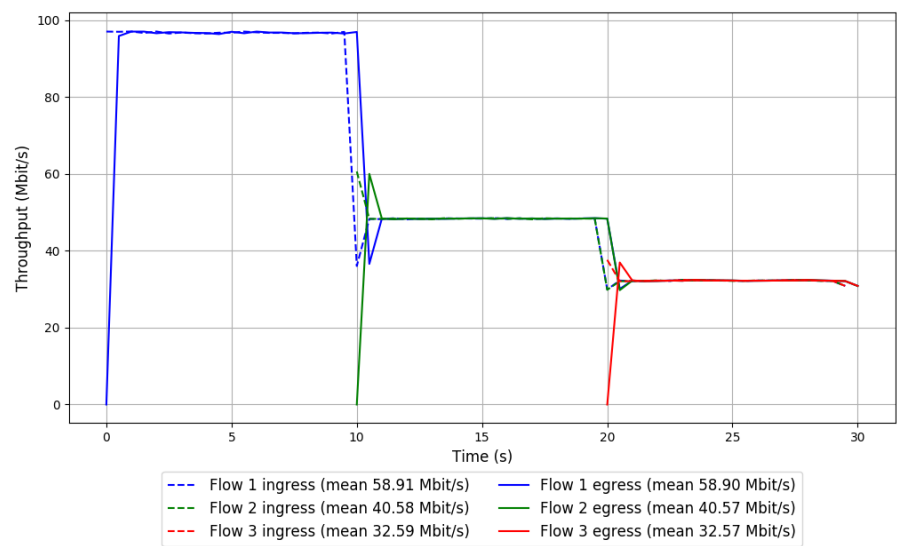
-- Flow 3:

Average throughput: 32.57 Mbit/s

95th percentile per-packet one-way delay: 8.106 ms

Loss rate: 0.07%

Run 3: Report of TCP BBR — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2018-09-05 03:35:08

End at: 2018-09-05 03:35:38

Local clock offset: 8.956 ms

Remote clock offset: 0.357 ms

Below is generated by plot.py at 2018-09-05 03:46:25

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.71 Mbit/s

95th percentile per-packet one-way delay: 9.428 ms

Loss rate: 0.14%

-- Flow 1:

Average throughput: 59.16 Mbit/s

95th percentile per-packet one-way delay: 9.534 ms

Loss rate: 0.10%

-- Flow 2:

Average throughput: 40.32 Mbit/s

95th percentile per-packet one-way delay: 9.070 ms

Loss rate: 0.15%

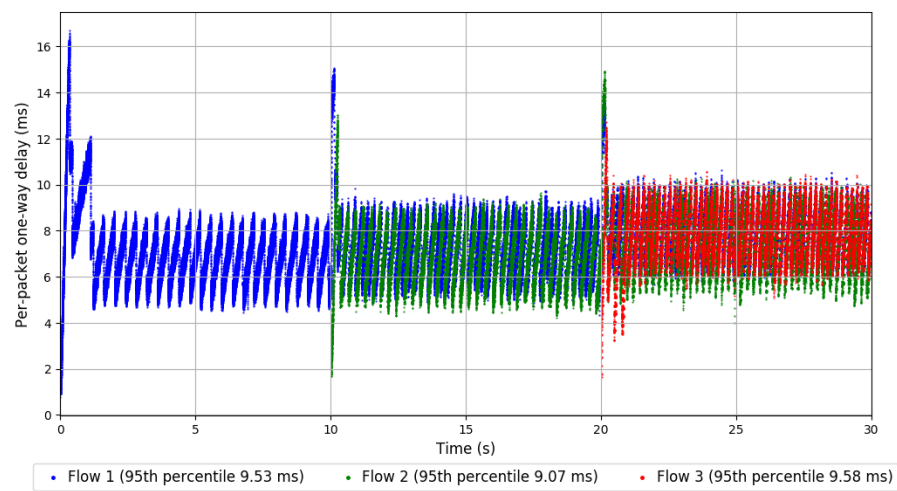
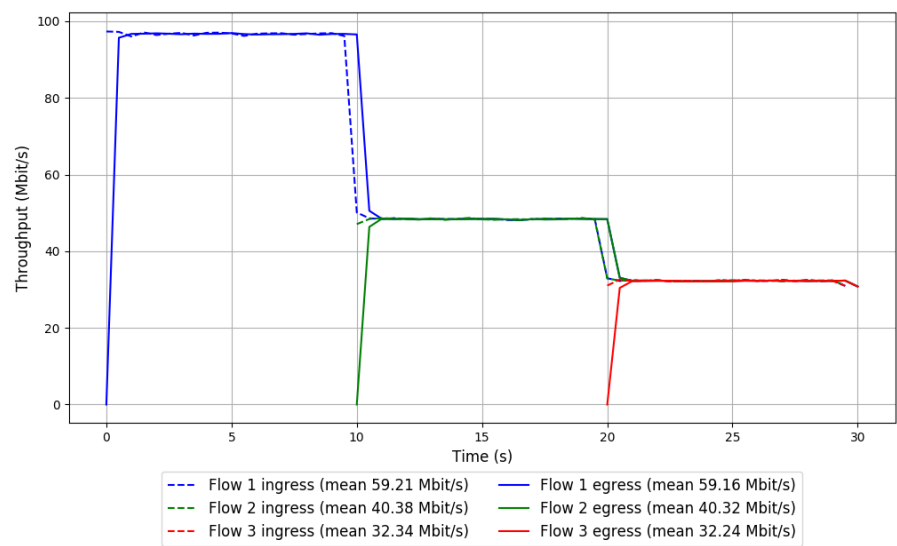
-- Flow 3:

Average throughput: 32.24 Mbit/s

95th percentile per-packet one-way delay: 9.578 ms

Loss rate: 0.31%

Run 1: Report of TCP Cubic — Data Link



Run 2: Statistics of TCP Cubic

Start at: 2018-09-05 03:39:44

End at: 2018-09-05 03:40:14

Local clock offset: 9.466 ms

Remote clock offset: 0.398 ms

Below is generated by plot.py at 2018-09-05 03:46:25

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.86 Mbit/s

95th percentile per-packet one-way delay: 9.093 ms

Loss rate: 0.13%

-- Flow 1:

Average throughput: 59.23 Mbit/s

95th percentile per-packet one-way delay: 9.033 ms

Loss rate: 0.10%

-- Flow 2:

Average throughput: 40.38 Mbit/s

95th percentile per-packet one-way delay: 9.038 ms

Loss rate: 0.15%

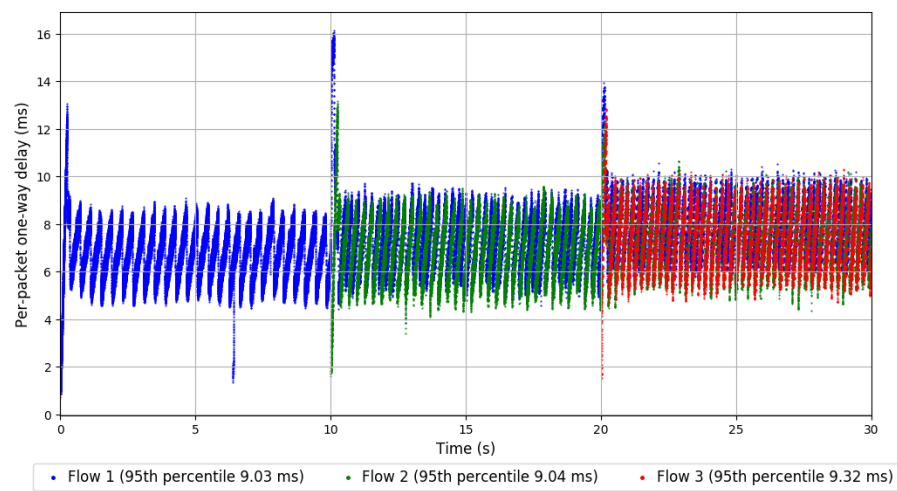
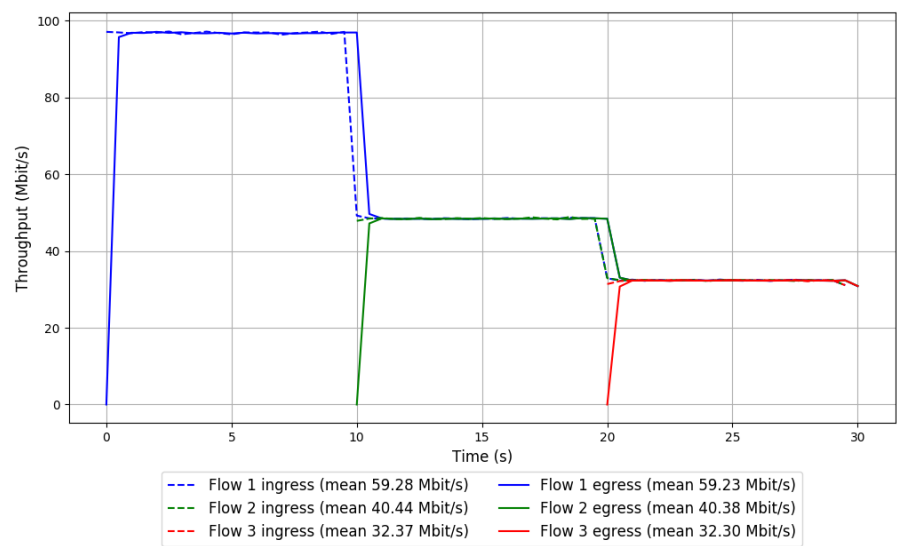
-- Flow 3:

Average throughput: 32.30 Mbit/s

95th percentile per-packet one-way delay: 9.325 ms

Loss rate: 0.25%

Run 2: Report of TCP Cubic — Data Link



Run 3: Statistics of TCP Cubic

Start at: 2018-09-05 03:44:22

End at: 2018-09-05 03:44:52

Local clock offset: 9.962 ms

Remote clock offset: 0.496 ms

Below is generated by plot.py at 2018-09-05 03:46:25

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.74 Mbit/s

95th percentile per-packet one-way delay: 9.737 ms

Loss rate: 0.15%

-- Flow 1:

Average throughput: 59.17 Mbit/s

95th percentile per-packet one-way delay: 9.717 ms

Loss rate: 0.10%

-- Flow 2:

Average throughput: 40.32 Mbit/s

95th percentile per-packet one-way delay: 9.639 ms

Loss rate: 0.18%

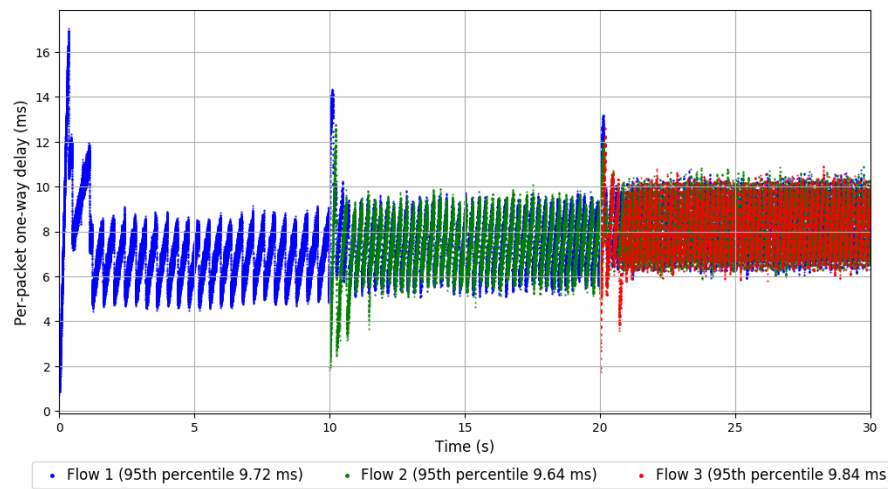
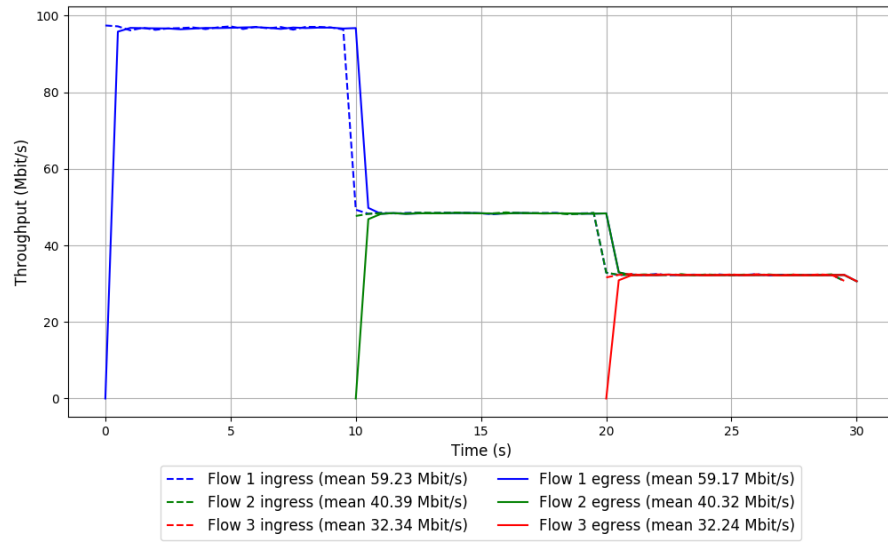
-- Flow 3:

Average throughput: 32.24 Mbit/s

95th percentile per-packet one-way delay: 9.840 ms

Loss rate: 0.33%

Run 3: Report of TCP Cubic — Data Link

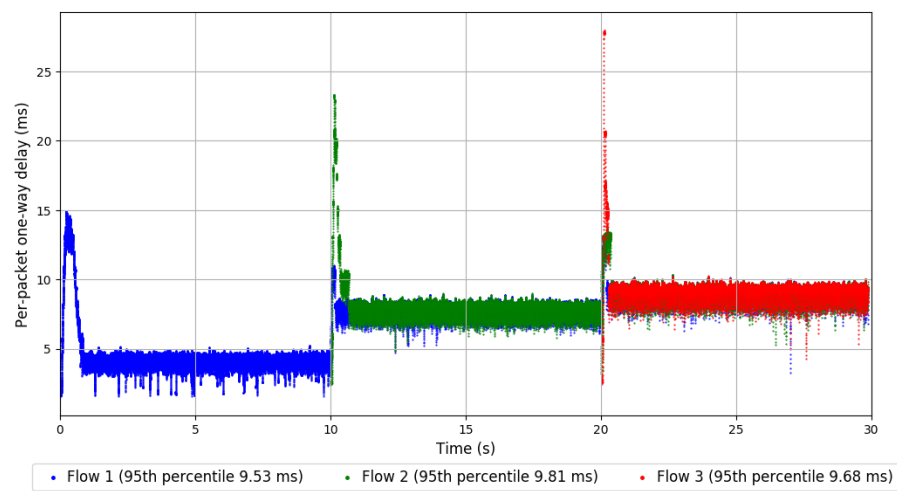
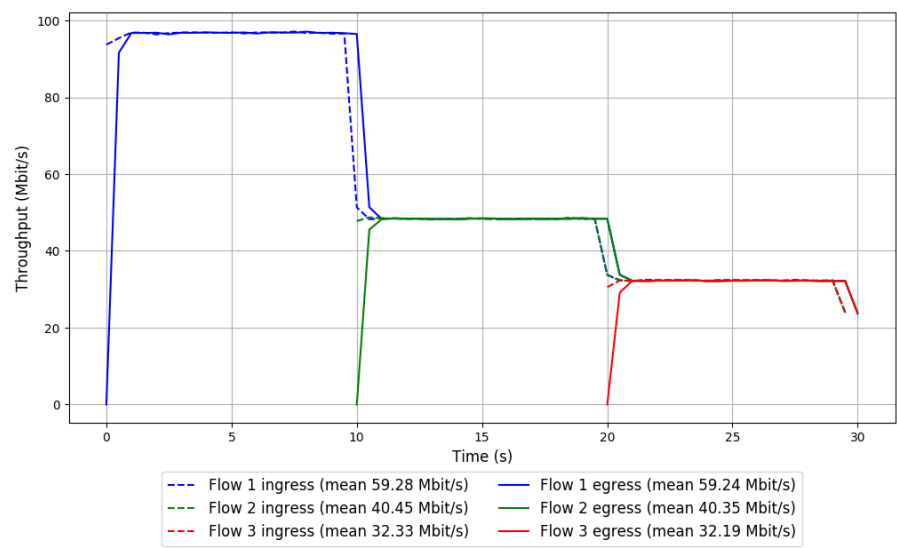


```
Run 1: Statistics of Indigo

Start at: 2018-09-05 03:32:48
End at: 2018-09-05 03:33:18
Local clock offset: 9.504 ms
Remote clock offset: 0.42 ms

# Below is generated by plot.py at 2018-09-05 03:46:26
# Datalink statistics
-- Total of 3 flows:
Average throughput: 96.66 Mbit/s
95th percentile per-packet one-way delay: 9.622 ms
Loss rate: 0.17%
-- Flow 1:
Average throughput: 59.24 Mbit/s
95th percentile per-packet one-way delay: 9.531 ms
Loss rate: 0.08%
-- Flow 2:
Average throughput: 40.35 Mbit/s
95th percentile per-packet one-way delay: 9.813 ms
Loss rate: 0.26%
-- Flow 3:
Average throughput: 32.19 Mbit/s
95th percentile per-packet one-way delay: 9.679 ms
Loss rate: 0.48%
```


Run 1: Report of Indigo — Data Link



Run 2: Statistics of Indigo

Start at: 2018-09-05 03:37:25

End at: 2018-09-05 03:37:55

Local clock offset: 9.992 ms

Remote clock offset: 0.384 ms

Below is generated by plot.py at 2018-09-05 03:46:26

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.58 Mbit/s

95th percentile per-packet one-way delay: 10.840 ms

Loss rate: 1.04%

-- Flow 1:

Average throughput: 59.14 Mbit/s

95th percentile per-packet one-way delay: 10.866 ms

Loss rate: 0.62%

-- Flow 2:

Average throughput: 40.36 Mbit/s

95th percentile per-packet one-way delay: 10.856 ms

Loss rate: 2.32%

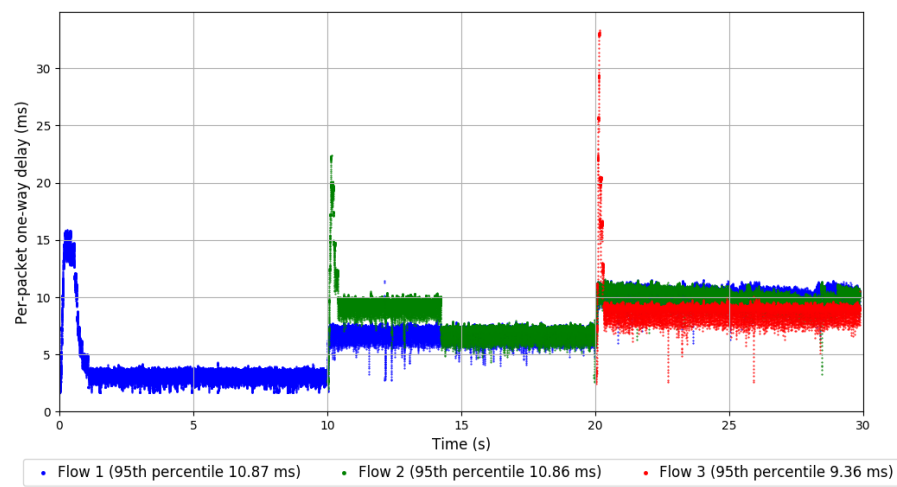
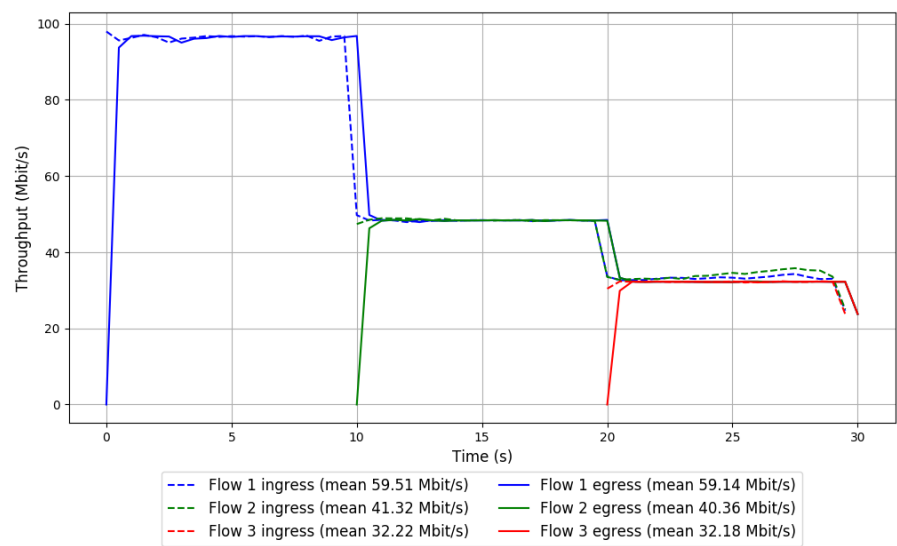
-- Flow 3:

Average throughput: 32.18 Mbit/s

95th percentile per-packet one-way delay: 9.362 ms

Loss rate: 0.13%

Run 2: Report of Indigo — Data Link



Run 3: Statistics of Indigo

Start at: 2018-09-05 03:42:02

End at: 2018-09-05 03:42:32

Local clock offset: 10.503 ms

Remote clock offset: 0.421 ms

Below is generated by plot.py at 2018-09-05 03:46:55

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.74 Mbit/s

95th percentile per-packet one-way delay: 10.581 ms

Loss rate: 0.61%

-- Flow 1:

Average throughput: 59.25 Mbit/s

95th percentile per-packet one-way delay: 9.547 ms

Loss rate: 0.08%

-- Flow 2:

Average throughput: 40.40 Mbit/s

95th percentile per-packet one-way delay: 10.828 ms

Loss rate: 1.97%

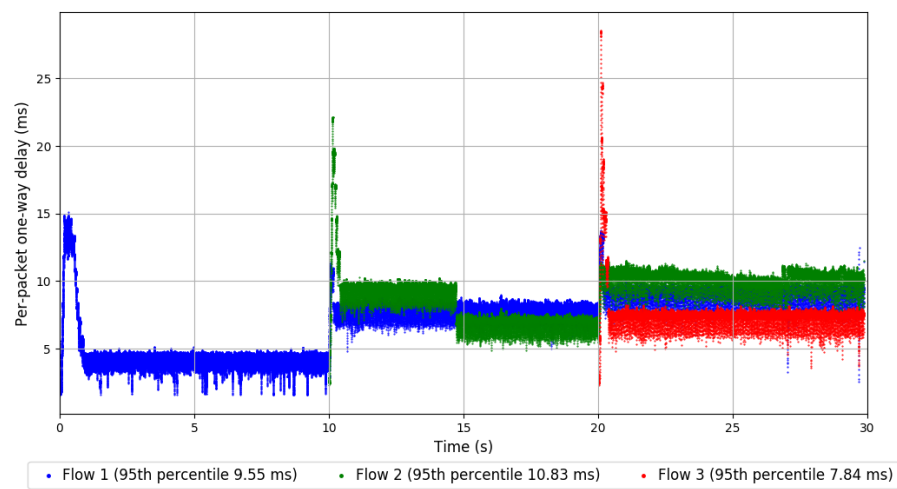
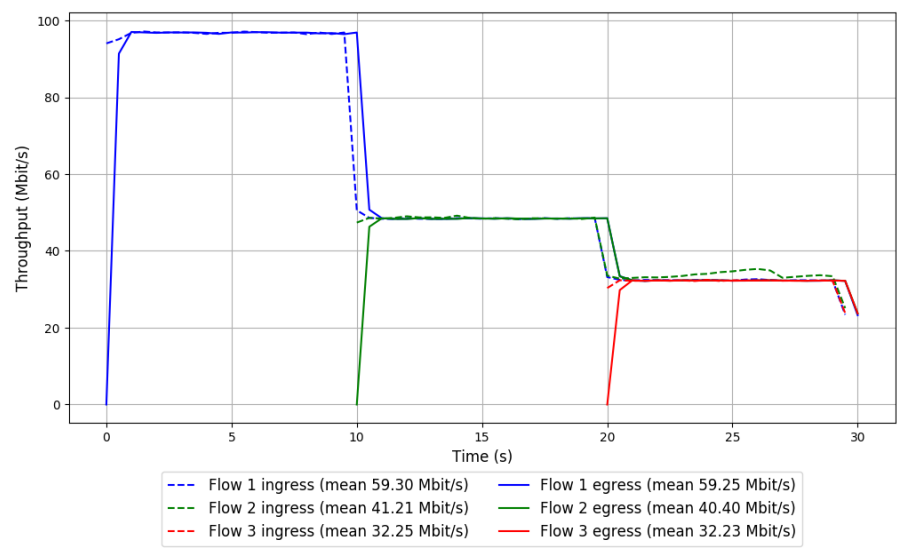
-- Flow 3:

Average throughput: 32.23 Mbit/s

95th percentile per-packet one-way delay: 7.843 ms

Loss rate: 0.10%

Run 3: Report of Indigo — Data Link



Run 1: Statistics of Muses-25

Start at: 2018-09-05 03:31:39

End at: 2018-09-05 03:32:09

Local clock offset: 9.31 ms

Remote clock offset: 0.432 ms

Below is generated by plot.py at 2018-09-05 03:46:56

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.22 Mbit/s

95th percentile per-packet one-way delay: 12.625 ms

Loss rate: 0.03%

-- Flow 1:

Average throughput: 70.76 Mbit/s

95th percentile per-packet one-way delay: 11.546 ms

Loss rate: 0.01%

-- Flow 2:

Average throughput: 24.62 Mbit/s

95th percentile per-packet one-way delay: 31.737 ms

Loss rate: 0.10%

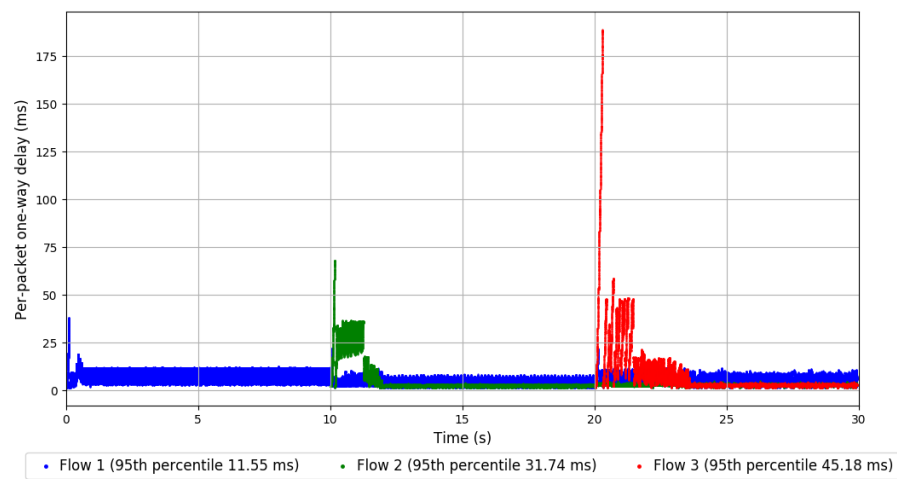
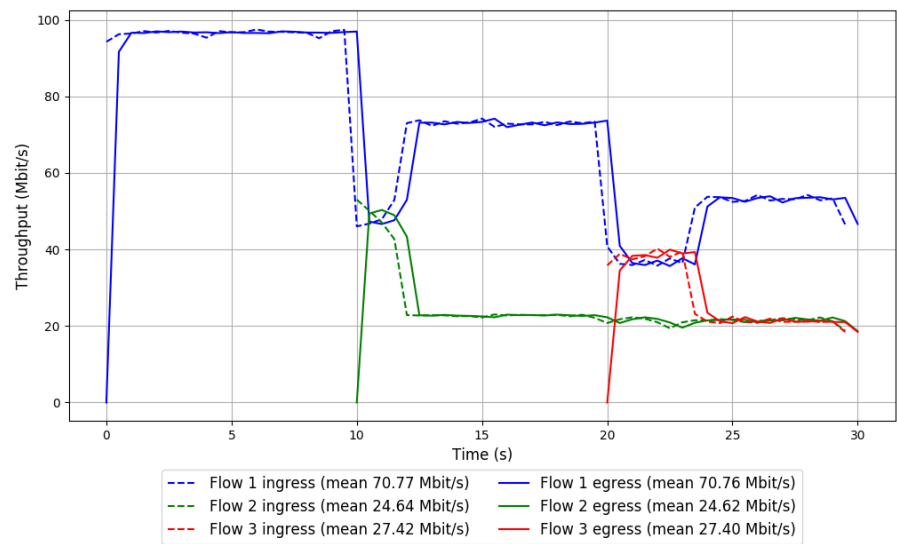
-- Flow 3:

Average throughput: 27.40 Mbit/s

95th percentile per-packet one-way delay: 45.183 ms

Loss rate: 0.09%

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

Start at: 2018-09-05 03:36:17

End at: 2018-09-05 03:36:47

Local clock offset: 9.86 ms

Remote clock offset: 0.465 ms

Below is generated by plot.py at 2018-09-05 03:46:56

Datalink statistics

-- Total of 3 flows:

Average throughput: 66.05 Mbit/s

95th percentile per-packet one-way delay: 11.935 ms

Loss rate: 0.02%

-- Flow 1:

Average throughput: 25.90 Mbit/s

95th percentile per-packet one-way delay: 2.881 ms

Loss rate: 0.01%

-- Flow 2:

Average throughput: 46.54 Mbit/s

95th percentile per-packet one-way delay: 11.961 ms

Loss rate: 0.01%

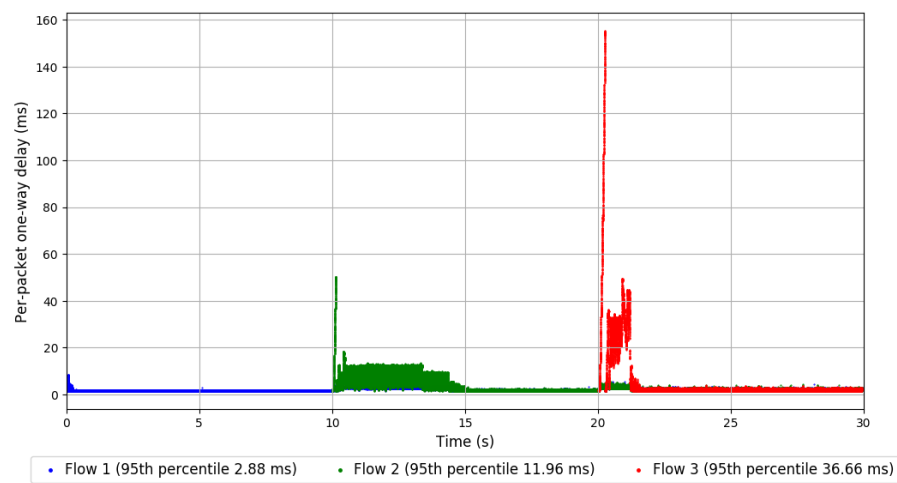
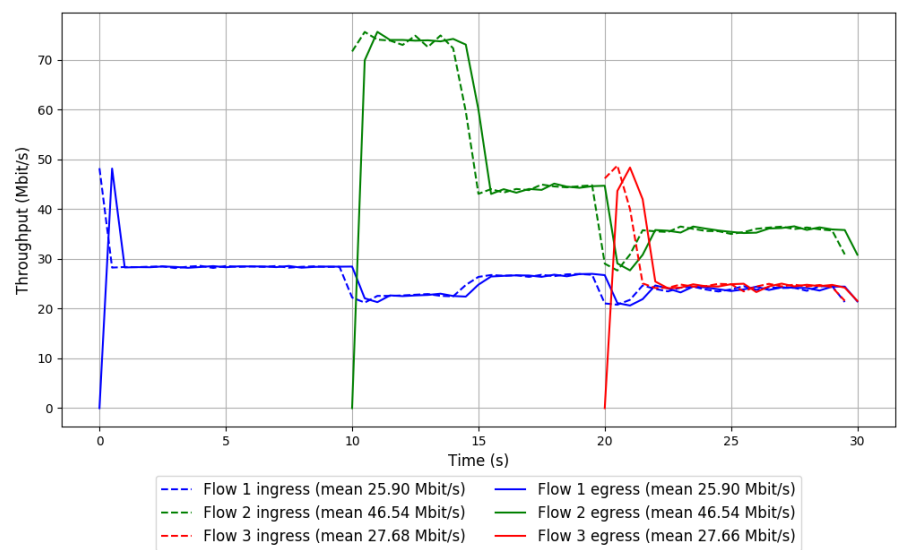
-- Flow 3:

Average throughput: 27.66 Mbit/s

95th percentile per-packet one-way delay: 36.663 ms

Loss rate: 0.11%

Run 2: Report of Muses-25 — Data Link



Run 3: Statistics of Muses-25

Start at: 2018-09-05 03:40:53

End at: 2018-09-05 03:41:23

Local clock offset: 10.367 ms

Remote clock offset: 0.459 ms

Below is generated by plot.py at 2018-09-05 03:46:57

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.78 Mbit/s

95th percentile per-packet one-way delay: 23.327 ms

Loss rate: 0.42%

-- Flow 1:

Average throughput: 58.78 Mbit/s

95th percentile per-packet one-way delay: 11.679 ms

Loss rate: 0.02%

-- Flow 2:

Average throughput: 40.31 Mbit/s

95th percentile per-packet one-way delay: 23.404 ms

Loss rate: 0.86%

-- Flow 3:

Average throughput: 33.70 Mbit/s

95th percentile per-packet one-way delay: 27.577 ms

Loss rate: 1.50%

Run 3: Report of Muses-25 — Data Link

