

Pantheon Report

Generated at 2018-08-28 10:23:13 (UTC).

Data path: Mexico on **em1** (*remote*) → AWS California 2 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 **time.stanford.edu** and have been applied to correct the timestamps in logs.

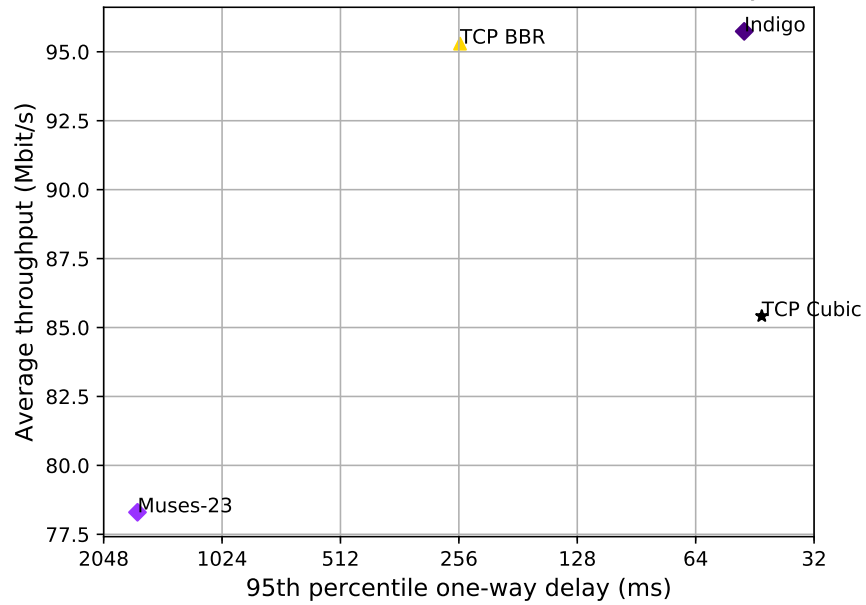
System info:

```
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
```

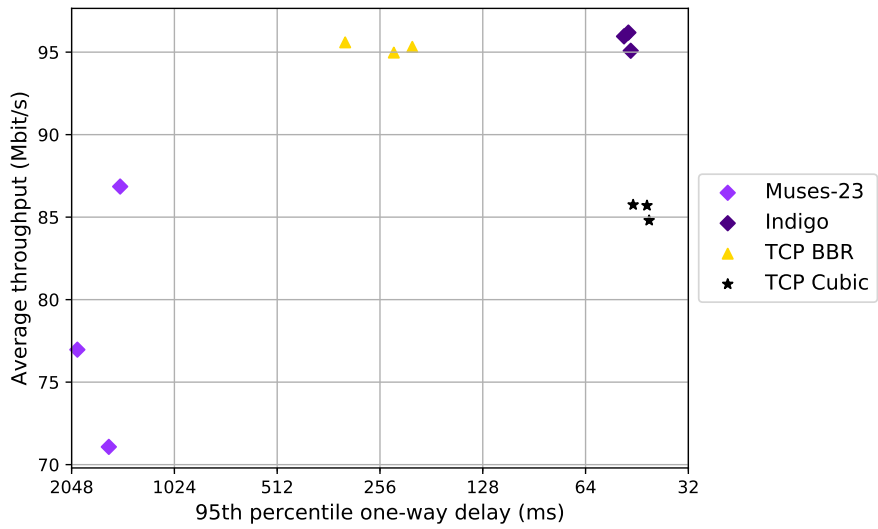
Git summary:

```
branch: muses-23 @ 88af05c5b0b7531637ca401951507a2fde628df6
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecd9c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b261c9e99c63be452bc16f94ce0caa99a4c9d39a
third_party/pantheon-tunnel @ cbfce6db5ff5740d4fe1771f813cd646339e1952
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-quic @ 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 Mexico to AWS California 2, 3 runs of 30s each per scheme
 3 flows with 10s interval between flows (mean of all runs by scheme)



test from Mexico to AWS California 2, 3 runs of 30s each per scheme
 3 flows with 10s interval between flows



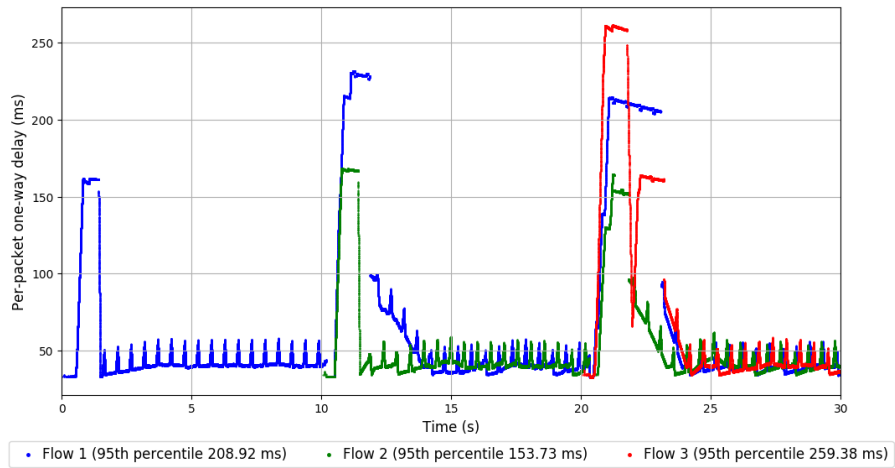
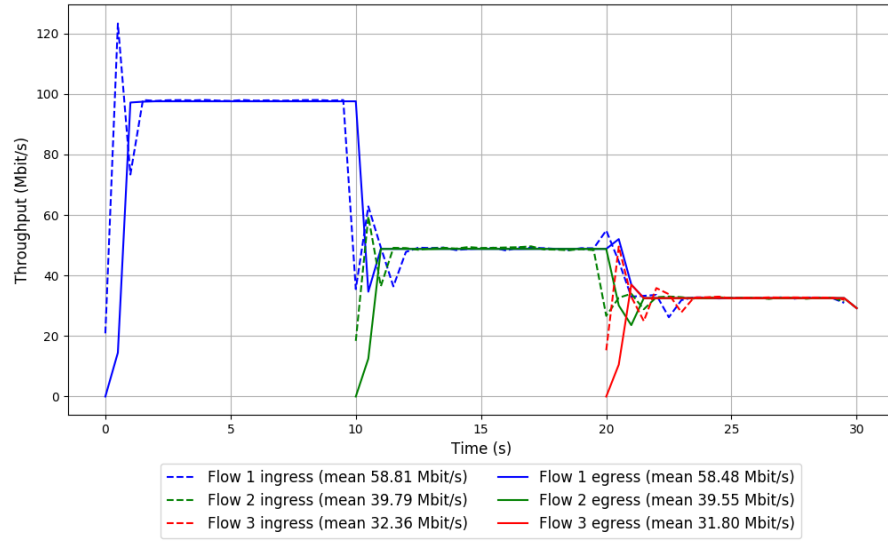
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	58.99	40.92	27.43	193.67	177.37	522.94	0.76	0.96	4.84
TCP Cubic	3	48.43	38.17	34.97	47.73	40.87	42.73	0.21	0.30	0.67
Indigo	3	57.95	38.68	36.90	48.00	47.81	50.04	0.20	0.38	0.76
Muses-23	3	44.74	35.52	30.13	1624.45	1278.43	1928.80	3.79	22.59	31.03

Run 1: Statistics of TCP BBR

Start at: 2018-08-28 10:08:23
End at: 2018-08-28 10:08:53
Local clock offset: -17.464 ms
Remote clock offset: 3.546 ms

Below is generated by plot.py at 2018-08-28 10:22:35
Datalink statistics
-- Total of 3 flows:
Average throughput: 95.32 Mbit/s
95th percentile per-packet one-way delay: 205.887 ms
Loss rate: 0.99%
-- Flow 1:
Average throughput: 58.48 Mbit/s
95th percentile per-packet one-way delay: 208.922 ms
Loss rate: 0.76%
-- Flow 2:
Average throughput: 39.55 Mbit/s
95th percentile per-packet one-way delay: 153.726 ms
Loss rate: 0.93%
-- Flow 3:
Average throughput: 31.80 Mbit/s
95th percentile per-packet one-way delay: 259.382 ms
Loss rate: 2.37%

Run 1: Report of TCP BBR — Data Link

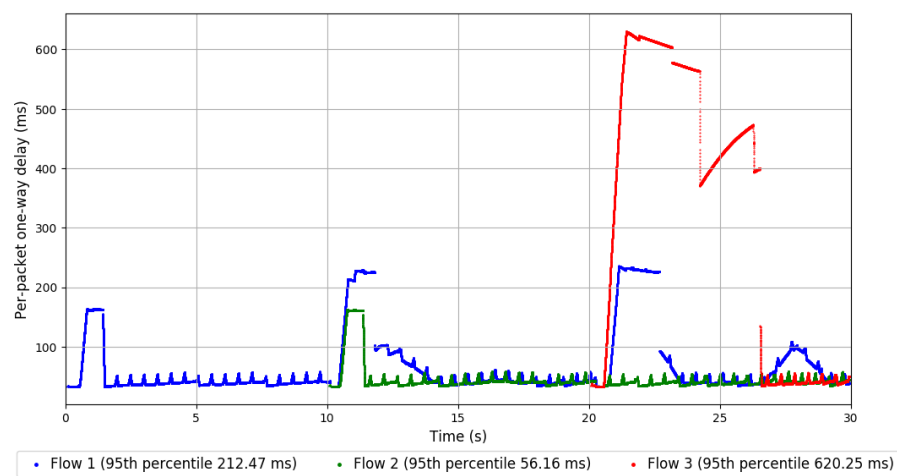
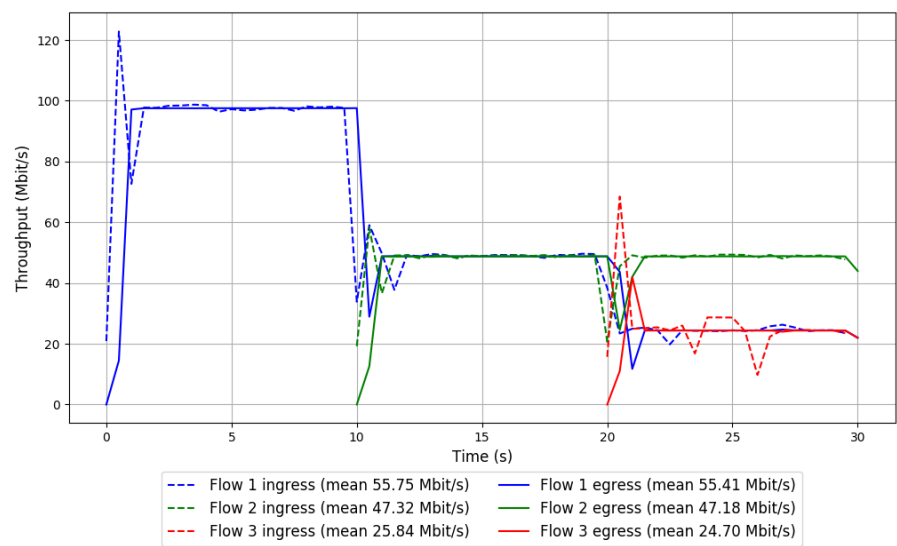


Run 2: Statistics of TCP BBR

Start at: 2018-08-28 10:13:49
End at: 2018-08-28 10:14:19
Local clock offset: -11.491 ms
Remote clock offset: 3.297 ms

Below is generated by plot.py at 2018-08-28 10:22:36
Datalink statistics
-- Total of 3 flows:
Average throughput: 94.97 Mbit/s
95th percentile per-packet one-way delay: 233.190 ms
Loss rate: 1.14%
-- Flow 1:
Average throughput: 55.41 Mbit/s
95th percentile per-packet one-way delay: 212.467 ms
Loss rate: 0.83%
-- Flow 2:
Average throughput: 47.18 Mbit/s
95th percentile per-packet one-way delay: 56.159 ms
Loss rate: 0.63%
-- Flow 3:
Average throughput: 24.70 Mbit/s
95th percentile per-packet one-way delay: 620.246 ms
Loss rate: 5.02%

Run 2: Report of TCP BBR — Data Link



Run 3: Statistics of TCP BBR

Start at: 2018-08-28 10:19:13

End at: 2018-08-28 10:19:43

Local clock offset: -9.091 ms

Remote clock offset: 3.194 ms

Below is generated by plot.py at 2018-08-28 10:22:37

Datalink statistics

-- Total of 3 flows:

Average throughput: 95.59 Mbit/s

95th percentile per-packet one-way delay: 323.733 ms

Loss rate: 1.45%

-- Flow 1:

Average throughput: 63.07 Mbit/s

95th percentile per-packet one-way delay: 159.619 ms

Loss rate: 0.68%

-- Flow 2:

Average throughput: 36.03 Mbit/s

95th percentile per-packet one-way delay: 322.219 ms

Loss rate: 1.32%

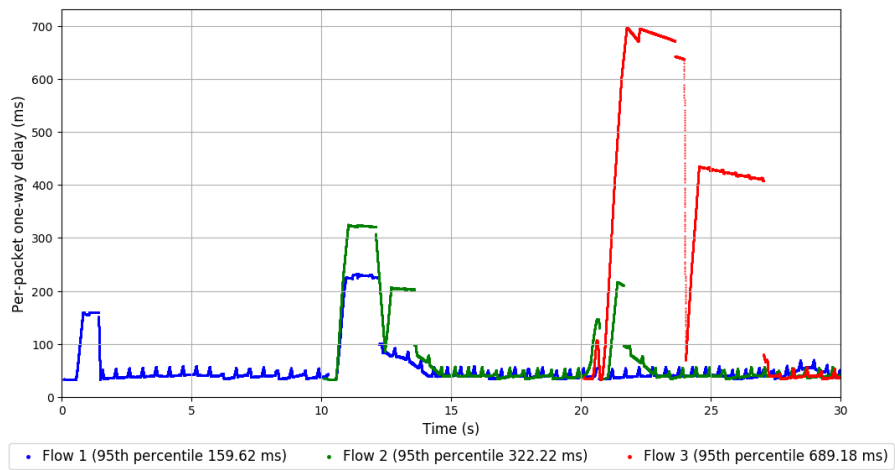
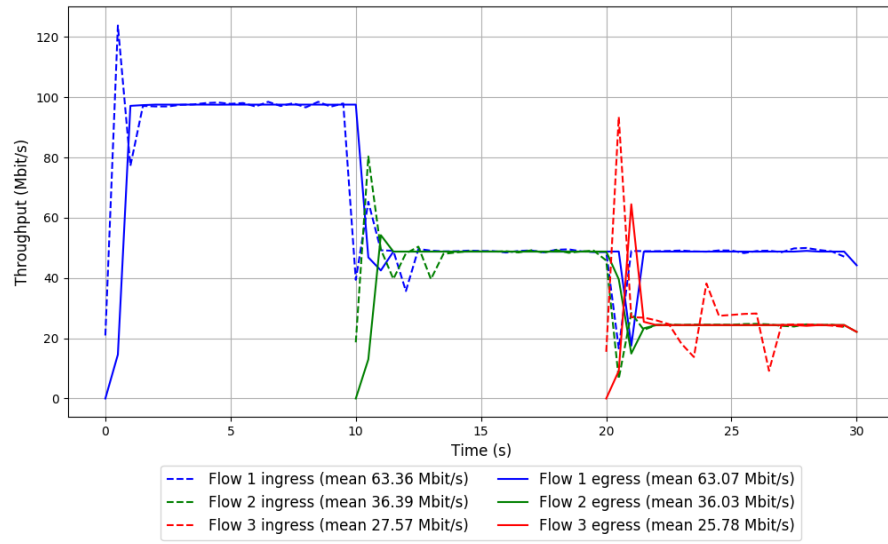
-- Flow 3:

Average throughput: 25.78 Mbit/s

95th percentile per-packet one-way delay: 689.182 ms

Loss rate: 7.14%

Run 3: Report of TCP BBR — Data Link

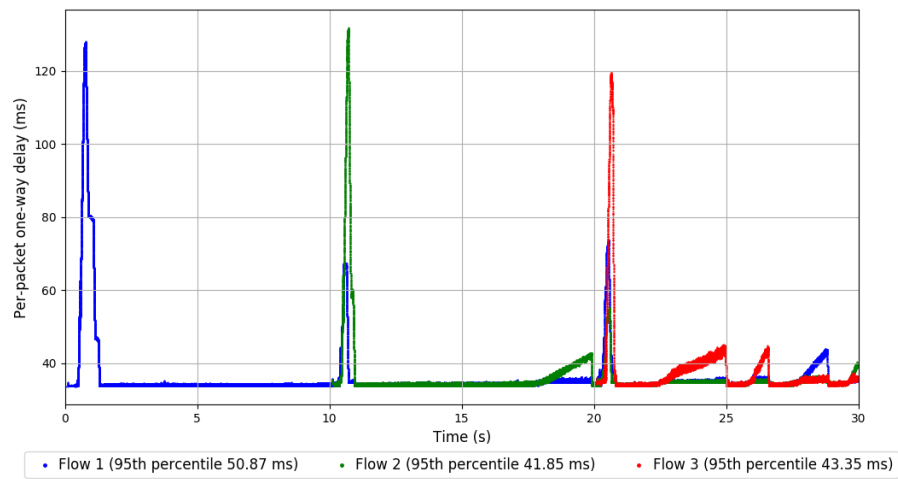
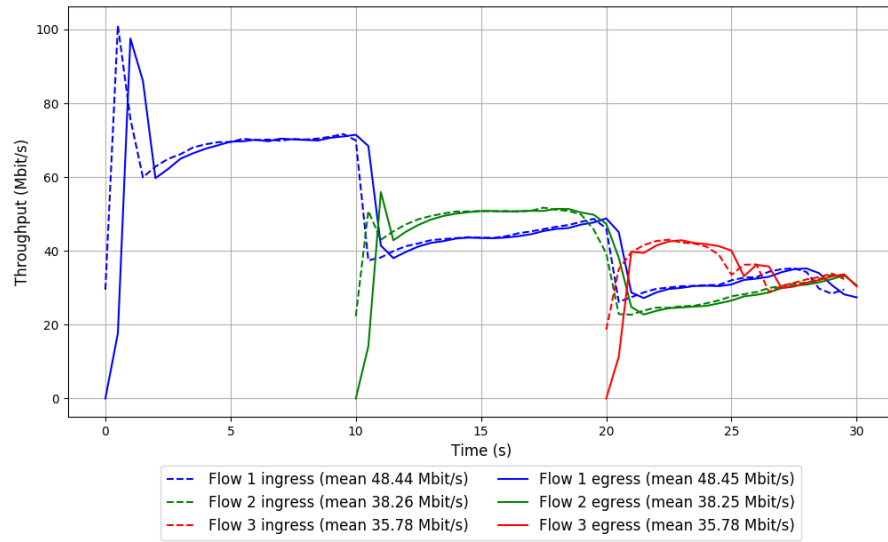


Run 1: Statistics of TCP Cubic

Start at: 2018-08-28 10:07:02
End at: 2018-08-28 10:07:32
Local clock offset: -16.863 ms
Remote clock offset: 3.594 ms

Below is generated by plot.py at 2018-08-28 10:22:37
Datalink statistics
-- Total of 3 flows:
Average throughput: 85.75 Mbit/s
95th percentile per-packet one-way delay: 46.431 ms
Loss rate: 0.29%
-- Flow 1:
Average throughput: 48.45 Mbit/s
95th percentile per-packet one-way delay: 50.874 ms
Loss rate: 0.20%
-- Flow 2:
Average throughput: 38.25 Mbit/s
95th percentile per-packet one-way delay: 41.850 ms
Loss rate: 0.33%
-- Flow 3:
Average throughput: 35.78 Mbit/s
95th percentile per-packet one-way delay: 43.350 ms
Loss rate: 0.63%

Run 1: Report of TCP Cubic — Data Link

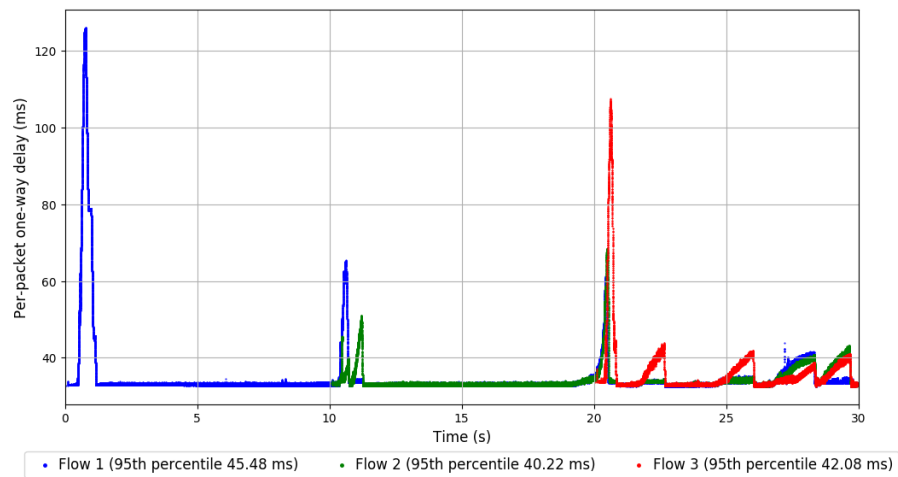
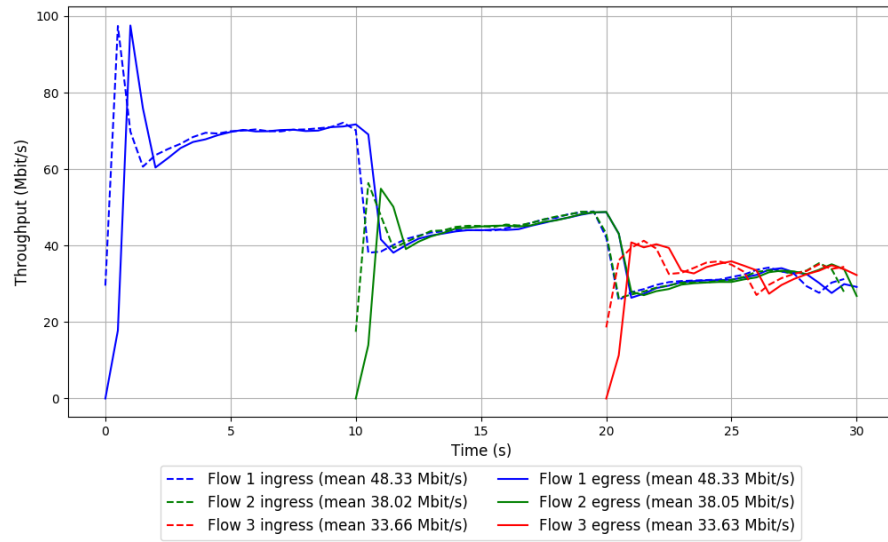


Run 2: Statistics of TCP Cubic

Start at: 2018-08-28 10:12:29
End at: 2018-08-28 10:12:59
Local clock offset: -12.792 ms
Remote clock offset: 3.36 ms

Below is generated by plot.py at 2018-08-28 10:22:37
Datalink statistics
-- Total of 3 flows:
Average throughput: 84.80 Mbit/s
95th percentile per-packet one-way delay: 41.679 ms
Loss rate: 0.30%
-- Flow 1:
Average throughput: 48.33 Mbit/s
95th percentile per-packet one-way delay: 45.477 ms
Loss rate: 0.22%
-- Flow 2:
Average throughput: 38.05 Mbit/s
95th percentile per-packet one-way delay: 40.221 ms
Loss rate: 0.25%
-- Flow 3:
Average throughput: 33.63 Mbit/s
95th percentile per-packet one-way delay: 42.079 ms
Loss rate: 0.74%

Run 2: Report of TCP Cubic — Data Link



Run 3: Statistics of TCP Cubic

Start at: 2018-08-28 10:17:53

End at: 2018-08-28 10:18:23

Local clock offset: -9.471 ms

Remote clock offset: 2.991 ms

Below is generated by plot.py at 2018-08-28 10:22:37

Datalink statistics

-- Total of 3 flows:

Average throughput: 85.70 Mbit/s

95th percentile per-packet one-way delay: 42.293 ms

Loss rate: 0.29%

-- Flow 1:

Average throughput: 48.51 Mbit/s

95th percentile per-packet one-way delay: 46.826 ms

Loss rate: 0.20%

-- Flow 2:

Average throughput: 38.21 Mbit/s

95th percentile per-packet one-way delay: 40.540 ms

Loss rate: 0.32%

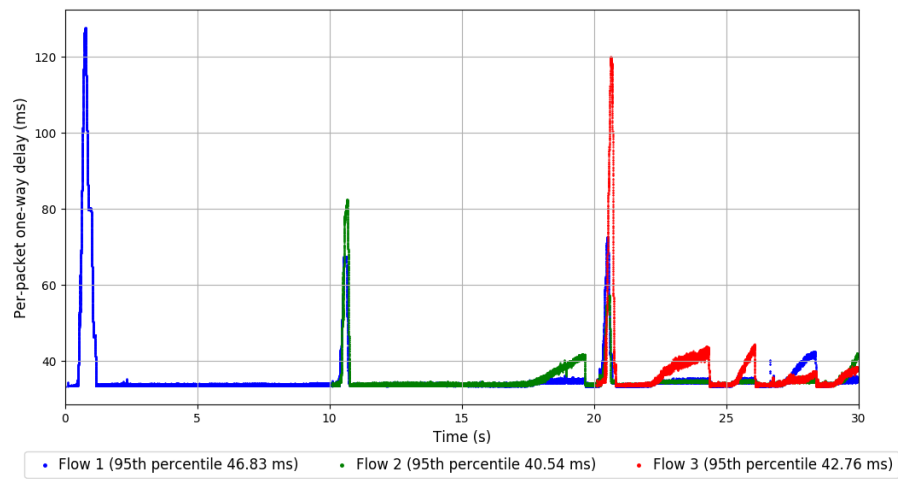
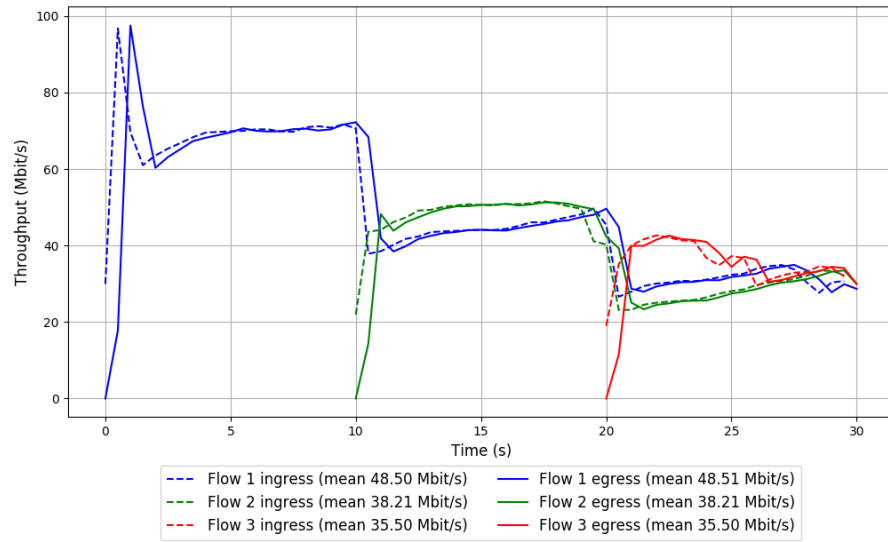
-- Flow 3:

Average throughput: 35.50 Mbit/s

95th percentile per-packet one-way delay: 42.762 ms

Loss rate: 0.64%

Run 3: Report of TCP Cubic — Data Link

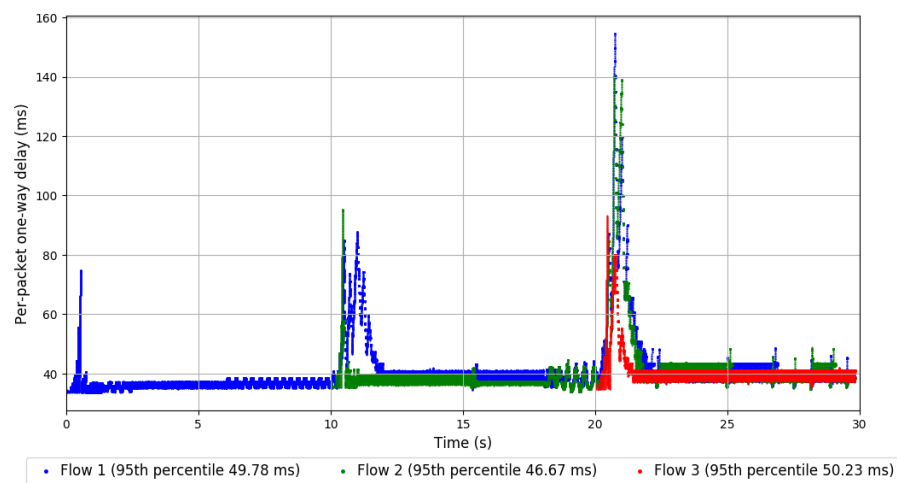
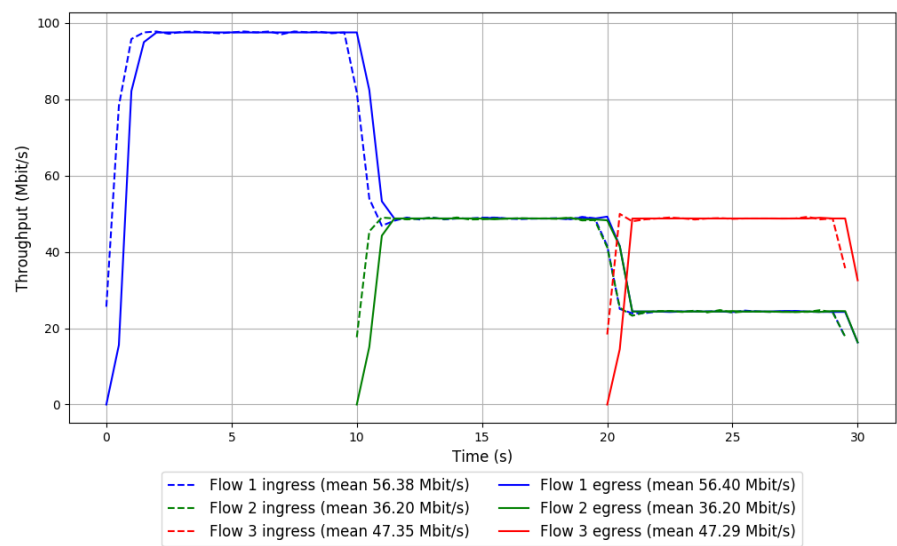


```
Run 1: Statistics of Indigo

Start at: 2018-08-28 10:05:40
End at: 2018-08-28 10:06:10
Local clock offset: -16.292 ms
Remote clock offset: 3.61 ms

# Below is generated by plot.py at 2018-08-28 10:22:38
# Datalink statistics
-- Total of 3 flows:
Average throughput: 95.95 Mbit/s
95th percentile per-packet one-way delay: 49.378 ms
Loss rate: 0.31%
-- Flow 1:
Average throughput: 56.40 Mbit/s
95th percentile per-packet one-way delay: 49.777 ms
Loss rate: 0.18%
-- Flow 2:
Average throughput: 36.20 Mbit/s
95th percentile per-packet one-way delay: 46.669 ms
Loss rate: 0.31%
-- Flow 3:
Average throughput: 47.29 Mbit/s
95th percentile per-packet one-way delay: 50.228 ms
Loss rate: 0.78%
```

Run 1: Report of Indigo — Data Link

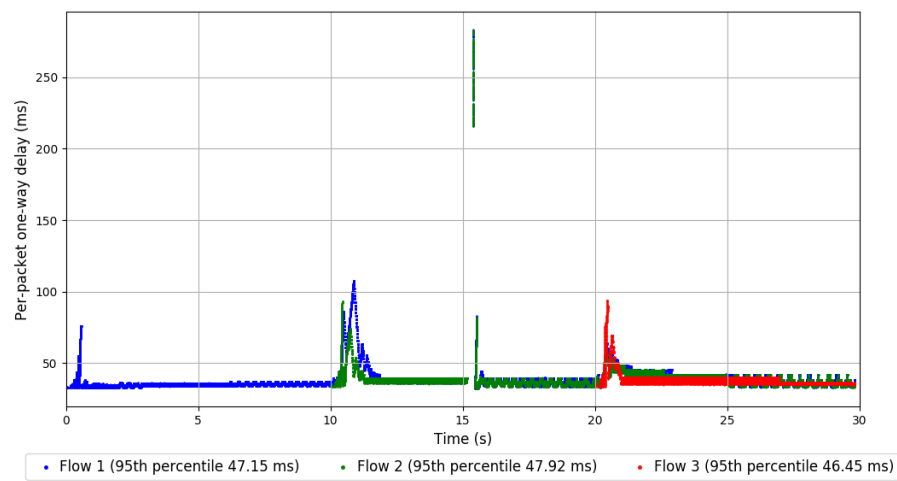
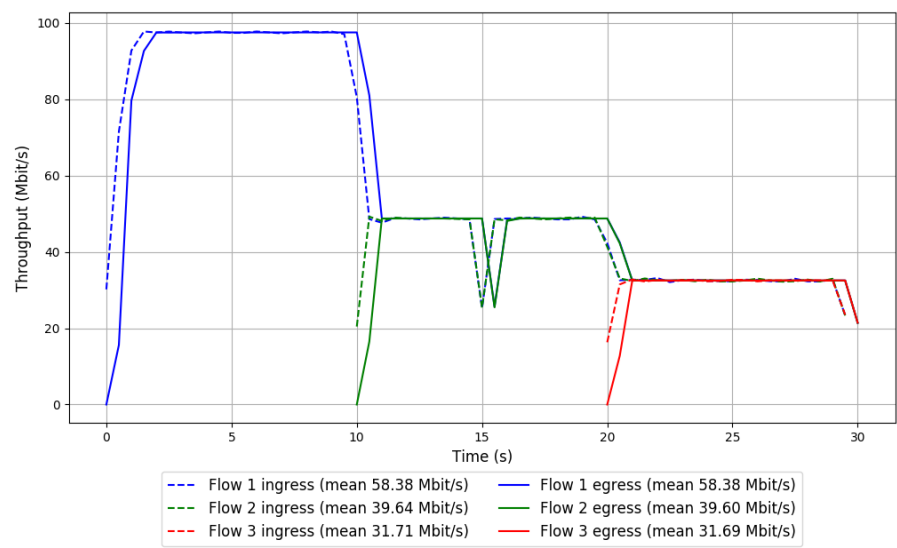


Run 2: Statistics of Indigo

Start at: 2018-08-28 10:11:07
End at: 2018-08-28 10:11:37
Local clock offset: -14.251 ms
Remote clock offset: 3.577 ms

Below is generated by plot.py at 2018-08-28 10:22:38
Datalink statistics
-- Total of 3 flows:
Average throughput: 95.08 Mbit/s
95th percentile per-packet one-way delay: 47.200 ms
Loss rate: 0.32%
-- Flow 1:
Average throughput: 58.38 Mbit/s
95th percentile per-packet one-way delay: 47.148 ms
Loss rate: 0.21%
-- Flow 2:
Average throughput: 39.60 Mbit/s
95th percentile per-packet one-way delay: 47.925 ms
Loss rate: 0.39%
-- Flow 3:
Average throughput: 31.69 Mbit/s
95th percentile per-packet one-way delay: 46.452 ms
Loss rate: 0.74%

Run 2: Report of Indigo — Data Link



Run 3: Statistics of Indigo

Start at: 2018-08-28 10:16:31

End at: 2018-08-28 10:17:01

Local clock offset: -9.964 ms

Remote clock offset: 3.267 ms

Below is generated by plot.py at 2018-08-28 10:23:04

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.19 Mbit/s

95th percentile per-packet one-way delay: 47.942 ms

Loss rate: 0.34%

-- Flow 1:

Average throughput: 59.06 Mbit/s

95th percentile per-packet one-way delay: 47.061 ms

Loss rate: 0.22%

-- Flow 2:

Average throughput: 40.24 Mbit/s

95th percentile per-packet one-way delay: 48.828 ms

Loss rate: 0.44%

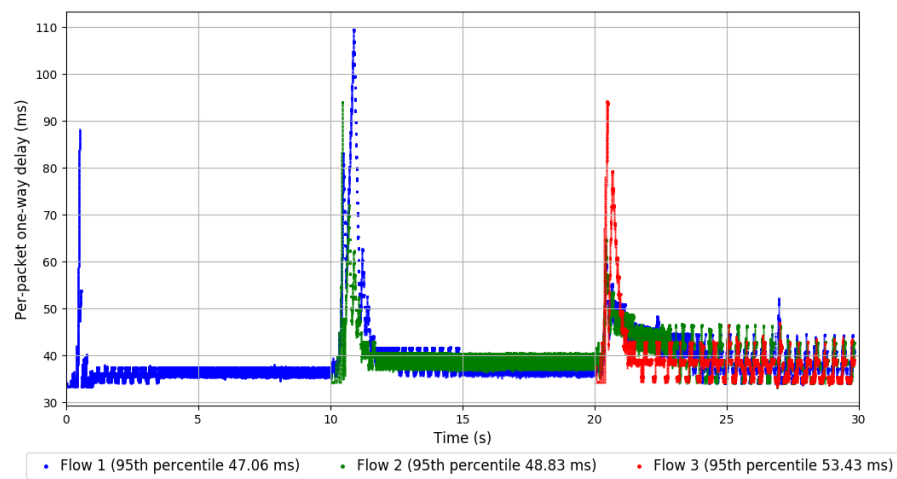
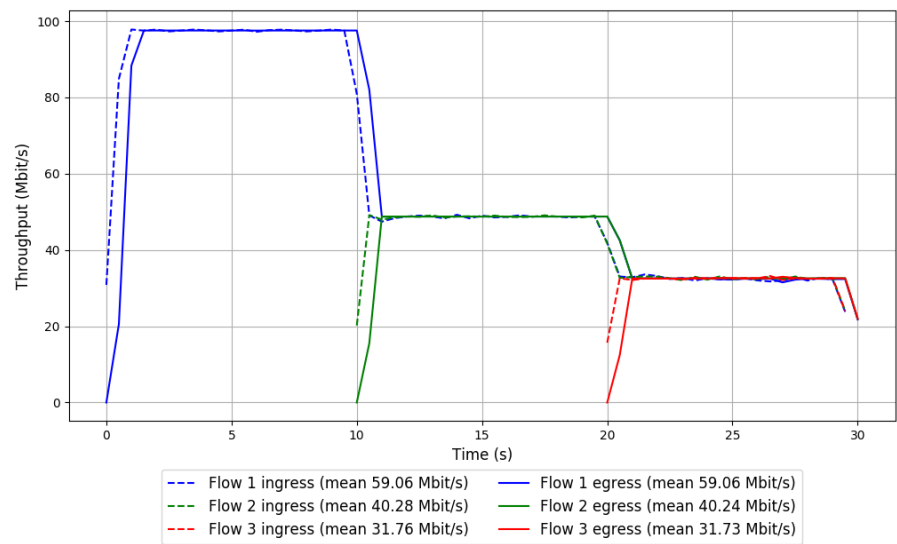
-- Flow 3:

Average throughput: 31.73 Mbit/s

95th percentile per-packet one-way delay: 53.430 ms

Loss rate: 0.75%

Run 3: Report of Indigo — Data Link



Run 1: Statistics of Muses-23

Start at: 2018-08-28 10:09:44

End at: 2018-08-28 10:10:14

Local clock offset: -15.89 ms

Remote clock offset: 3.28 ms

Below is generated by plot.py at 2018-08-28 10:23:12

Datalink statistics

-- Total of 3 flows:

Average throughput: 86.85 Mbit/s

95th percentile per-packet one-way delay: 1476.247 ms

Loss rate: 42.26%

-- Flow 1:

Average throughput: 54.53 Mbit/s

95th percentile per-packet one-way delay: 1474.874 ms

Loss rate: 3.21%

-- Flow 2:

Average throughput: 34.59 Mbit/s

95th percentile per-packet one-way delay: 1501.905 ms

Loss rate: 59.58%

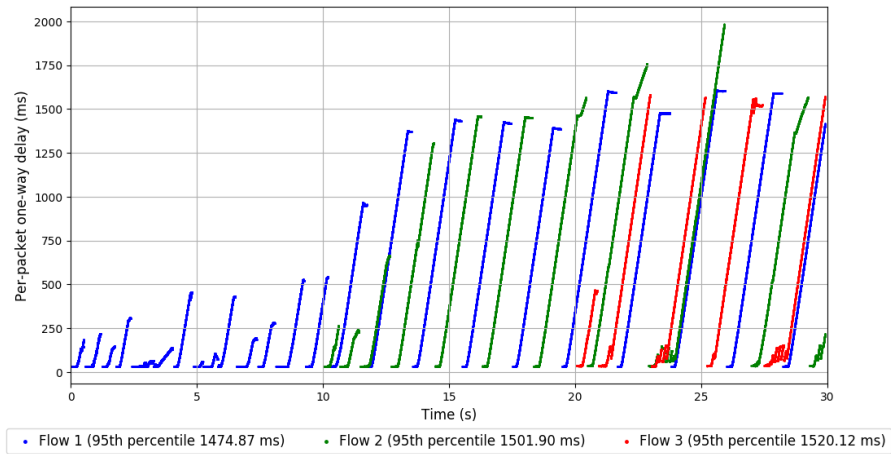
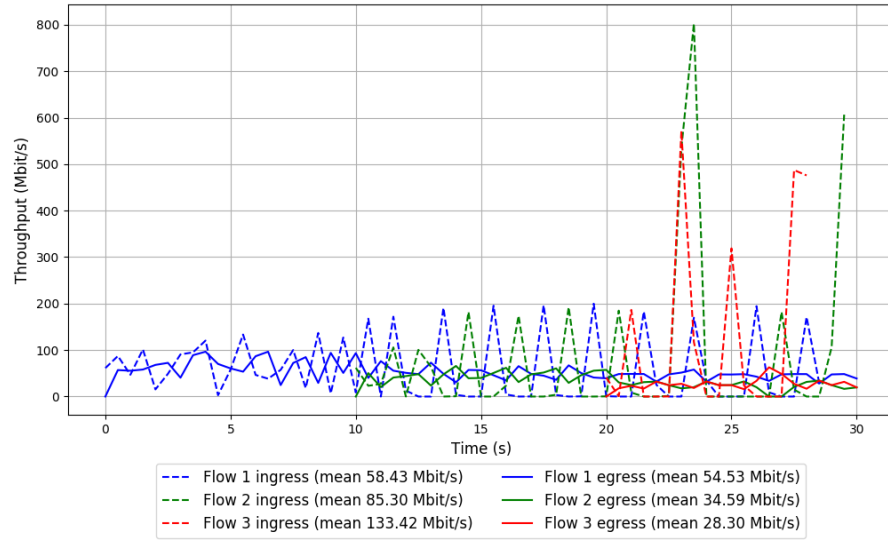
-- Flow 3:

Average throughput: 28.30 Mbit/s

95th percentile per-packet one-way delay: 1520.117 ms

Loss rate: 74.91%

Run 1: Report of Muses-23 — Data Link



Run 2: Statistics of Muses-23

Start at: 2018-08-28 10:15:11

End at: 2018-08-28 10:15:41

Local clock offset: -10.71 ms

Remote clock offset: 3.276 ms

Below is generated by plot.py at 2018-08-28 10:23:12

Datalink statistics

-- Total of 3 flows:

Average throughput: 71.08 Mbit/s

95th percentile per-packet one-way delay: 1593.538 ms

Loss rate: 2.99%

-- Flow 1:

Average throughput: 40.12 Mbit/s

95th percentile per-packet one-way delay: 1511.287 ms

Loss rate: 3.70%

-- Flow 2:

Average throughput: 31.85 Mbit/s

95th percentile per-packet one-way delay: 258.733 ms

Loss rate: 1.13%

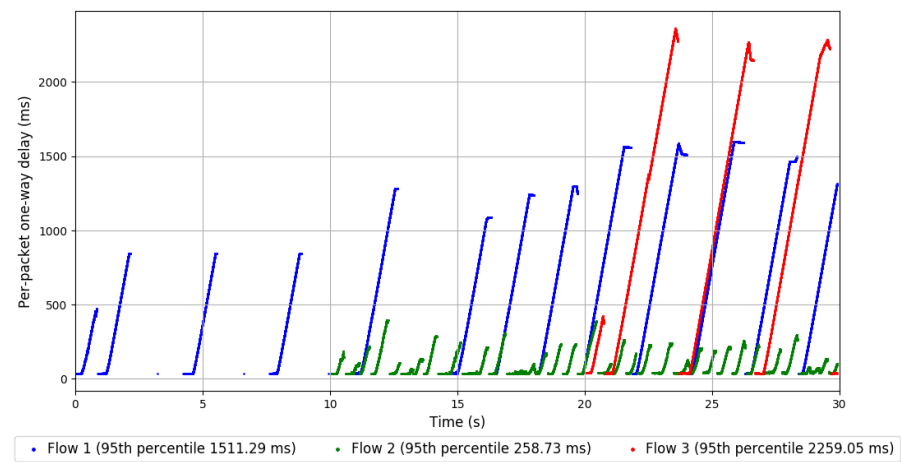
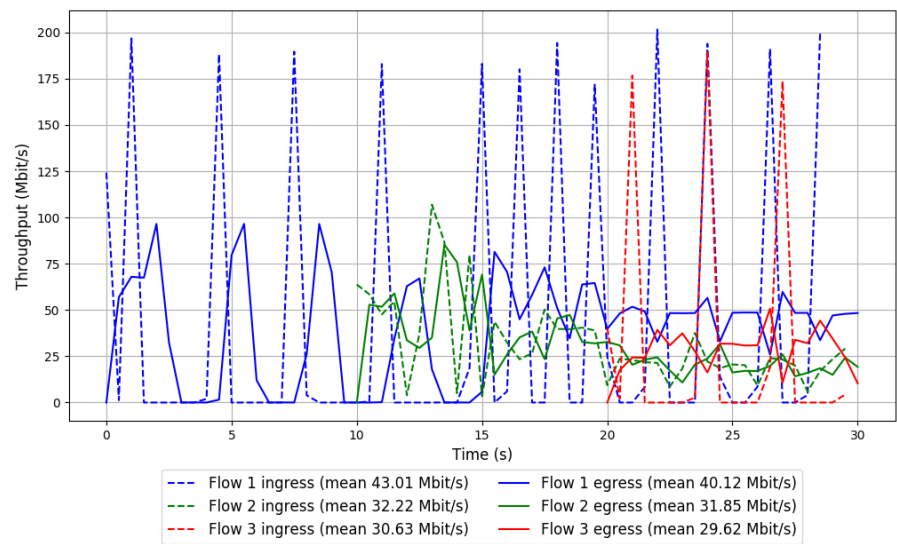
-- Flow 3:

Average throughput: 29.62 Mbit/s

95th percentile per-packet one-way delay: 2259.050 ms

Loss rate: 3.96%

Run 2: Report of Muses-23 — Data Link



Run 3: Statistics of Muses-23

Start at: 2018-08-28 10:20:35

End at: 2018-08-28 10:21:05

Local clock offset: -8.915 ms

Remote clock offset: 3.033 ms

Below is generated by plot.py at 2018-08-28 10:23:12

Datalink statistics

-- Total of 3 flows:

Average throughput: 76.97 Mbit/s

95th percentile per-packet one-way delay: 1970.279 ms

Loss rate: 6.84%

-- Flow 1:

Average throughput: 39.57 Mbit/s

95th percentile per-packet one-way delay: 1887.186 ms

Loss rate: 4.47%

-- Flow 2:

Average throughput: 40.11 Mbit/s

95th percentile per-packet one-way delay: 2074.639 ms

Loss rate: 7.05%

-- Flow 3:

Average throughput: 32.48 Mbit/s

95th percentile per-packet one-way delay: 2007.218 ms

Loss rate: 14.21%

Run 3: Report of Muses-23 — Data Link

