

Pantheon Report

Generated at 2018-08-28 10:20:29 (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.

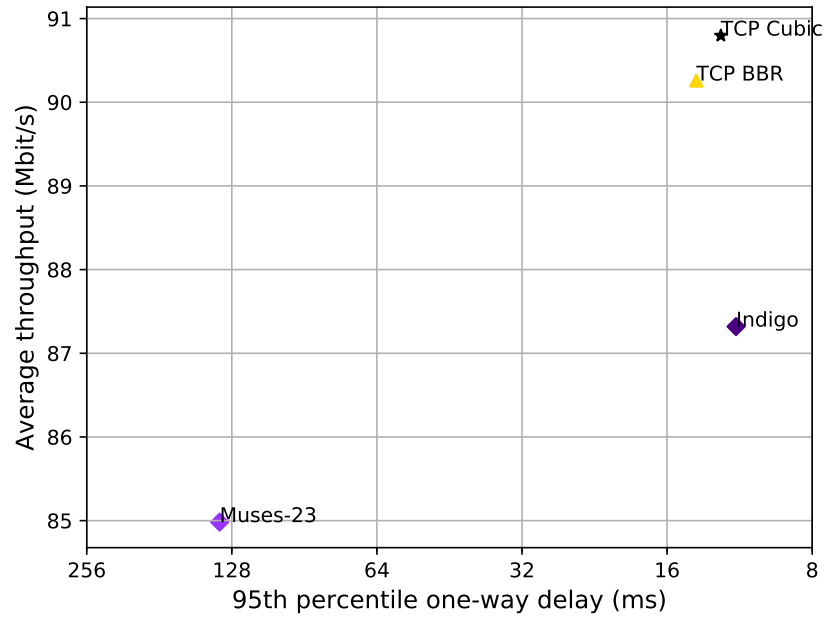
System info:

```
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
```

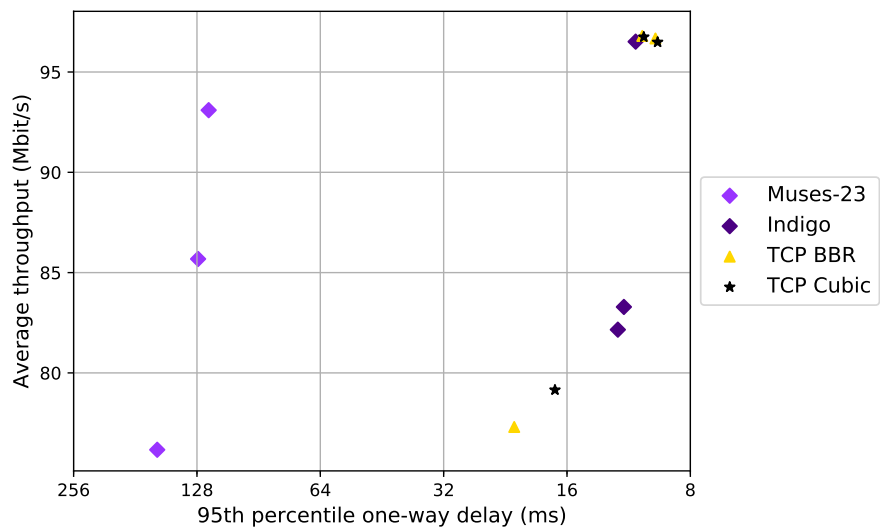
Git summary:

```
branch: muses-23 @ 88af05c5b0b7531637ca401951507a2fde628df6
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecd90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b261c9e99c63be452bc16f94ce0caa99a4c9d39a
third_party/pantheon-tunnel @ cbfce6db5ff5740d4afe1771f813cd646339e1952
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 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	54.91	37.82	30.62	13.30	14.17	16.11	0.41	0.61	1.48
TCP Cubic	3	55.33	38.00	30.60	12.57	12.14	11.86	0.08	0.16	0.26
Indigo	3	53.44	36.38	29.41	10.69	12.48	11.51	0.05	0.10	0.13
Muses-23	3	51.31	36.21	28.90	100.93	149.73	245.24	0.16	0.38	0.60

Run 1: Statistics of TCP BBR

Start at: 2018-08-28 10:07:45

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

Local clock offset: -7.108 ms

Remote clock offset: 0.181 ms

Below is generated by plot.py at 2018-08-28 10:19:39

Datalink statistics

-- Total of 3 flows:

Average throughput: 77.31 Mbit/s

95th percentile per-packet one-way delay: 21.525 ms

Loss rate: 1.15%

-- Flow 1:

Average throughput: 46.99 Mbit/s

95th percentile per-packet one-way delay: 21.839 ms

Loss rate: 1.01%

-- Flow 2:

Average throughput: 32.32 Mbit/s

95th percentile per-packet one-way delay: 20.512 ms

Loss rate: 1.04%

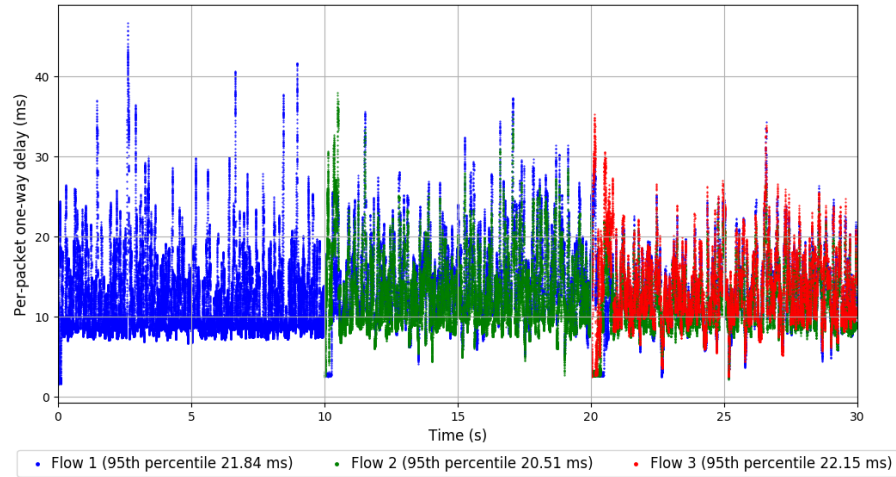
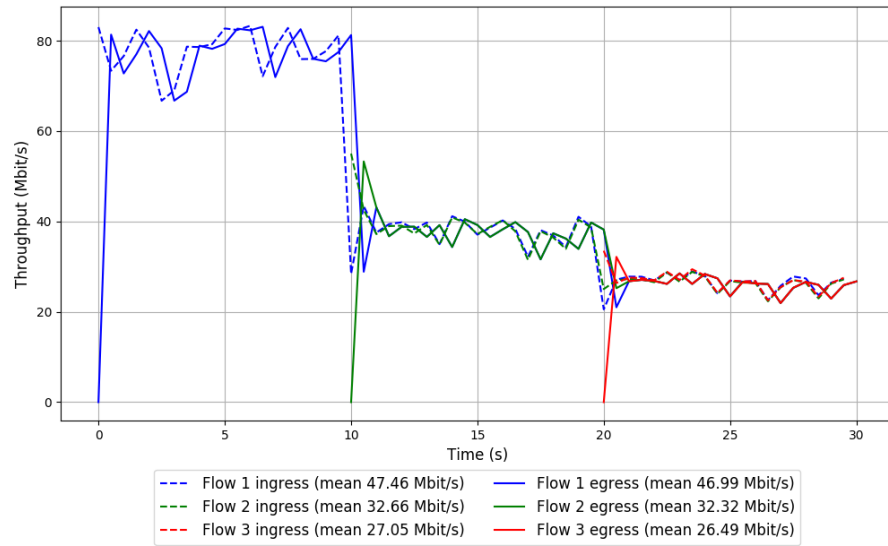
-- Flow 3:

Average throughput: 26.49 Mbit/s

95th percentile per-packet one-way delay: 22.152 ms

Loss rate: 2.14%

Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2018-08-28 10:12:15

End at: 2018-08-28 10:12:45

Local clock offset: -6.485 ms

Remote clock offset: 0.188 ms

Below is generated by plot.py at 2018-08-28 10:19:54

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.67 Mbit/s

95th percentile per-packet one-way delay: 9.733 ms

Loss rate: 0.24%

-- Flow 1:

Average throughput: 58.85 Mbit/s

95th percentile per-packet one-way delay: 7.940 ms

Loss rate: 0.02%

-- Flow 2:

Average throughput: 40.51 Mbit/s

95th percentile per-packet one-way delay: 10.944 ms

Loss rate: 0.28%

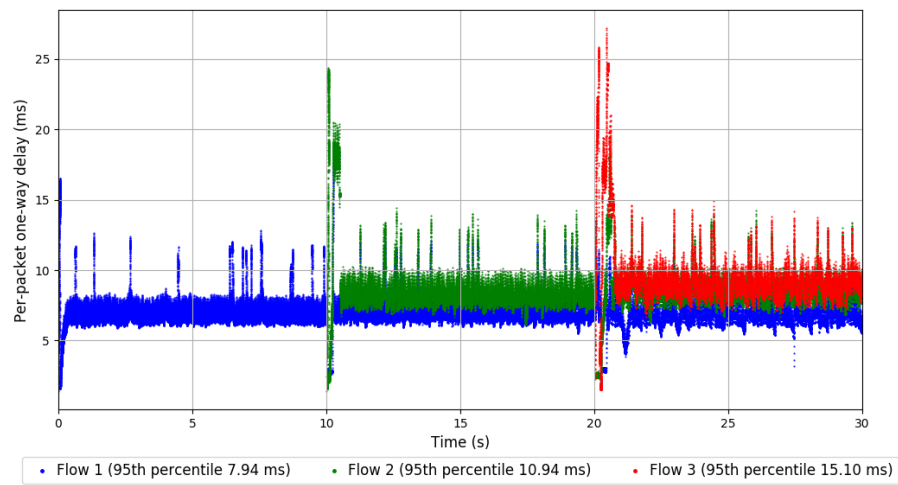
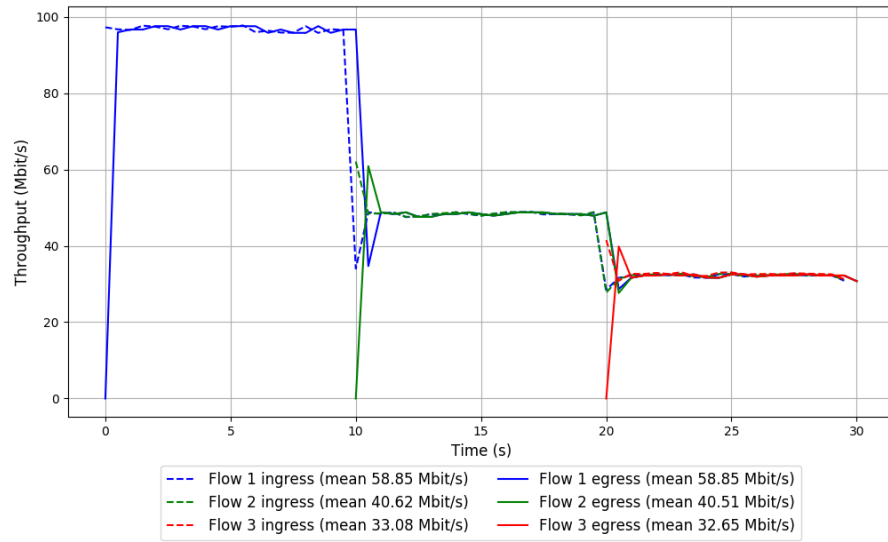
-- Flow 3:

Average throughput: 32.65 Mbit/s

95th percentile per-packet one-way delay: 15.101 ms

Loss rate: 1.34%

Run 2: Report of TCP BBR — Data Link



Run 3: Statistics of TCP BBR

Start at: 2018-08-28 10:16:47

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

Local clock offset: -5.158 ms

Remote clock offset: 0.269 ms

Below is generated by plot.py at 2018-08-28 10:19:54

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.80 Mbit/s

95th percentile per-packet one-way delay: 10.481 ms

Loss rate: 0.37%

-- Flow 1:

Average throughput: 58.88 Mbit/s

95th percentile per-packet one-way delay: 10.124 ms

Loss rate: 0.20%

-- Flow 2:

Average throughput: 40.63 Mbit/s

95th percentile per-packet one-way delay: 11.045 ms

Loss rate: 0.50%

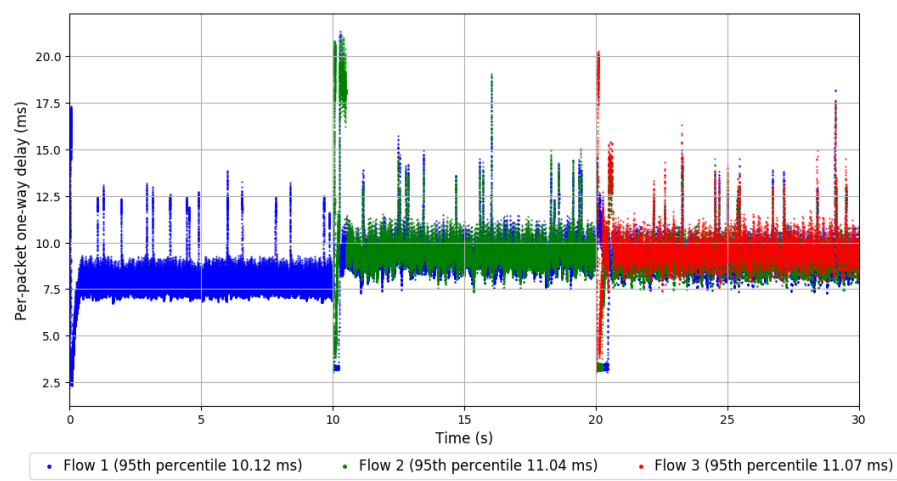
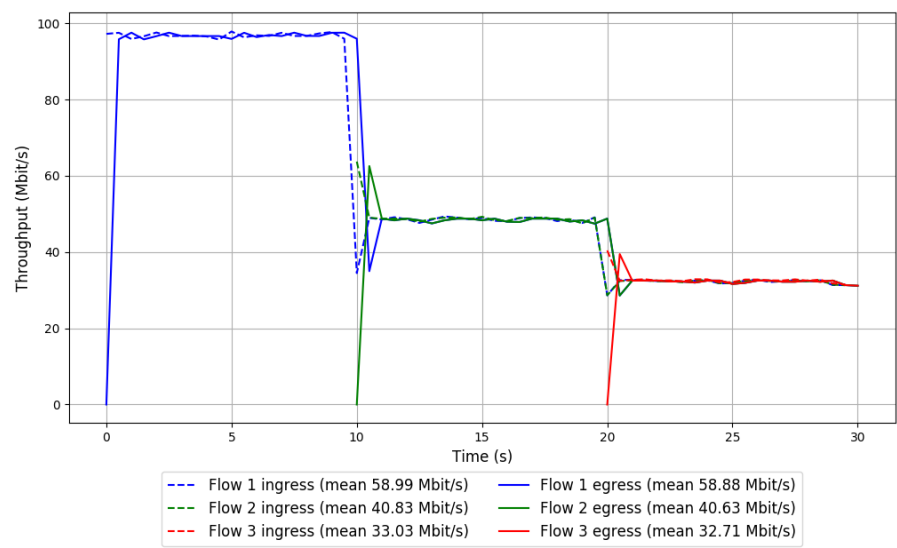
-- Flow 3:

Average throughput: 32.71 Mbit/s

95th percentile per-packet one-way delay: 11.066 ms

Loss rate: 0.97%

Run 3: Report of TCP BBR — Data Link



Run 1: Statistics of TCP Cubic

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

End at: 2018-08-28 10:09:23

Local clock offset: -6.325 ms

Remote clock offset: 0.177 ms

Below is generated by plot.py at 2018-08-28 10:19:54

Datalink statistics

-- Total of 3 flows:

Average throughput: 79.15 Mbit/s

95th percentile per-packet one-way delay: 17.120 ms

Loss rate: 0.13%

-- Flow 1:

Average throughput: 47.80 Mbit/s

95th percentile per-packet one-way delay: 18.147 ms

Loss rate: 0.09%

-- Flow 2:

Average throughput: 33.42 Mbit/s

95th percentile per-packet one-way delay: 16.198 ms

Loss rate: 0.16%

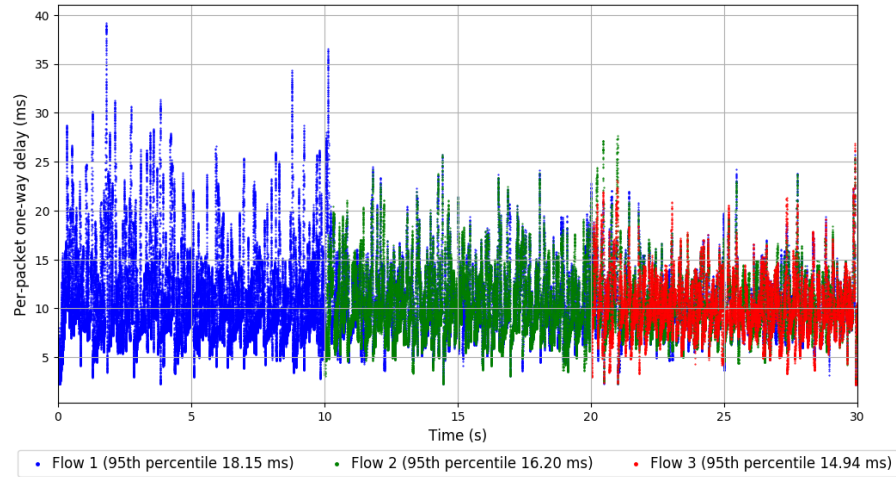
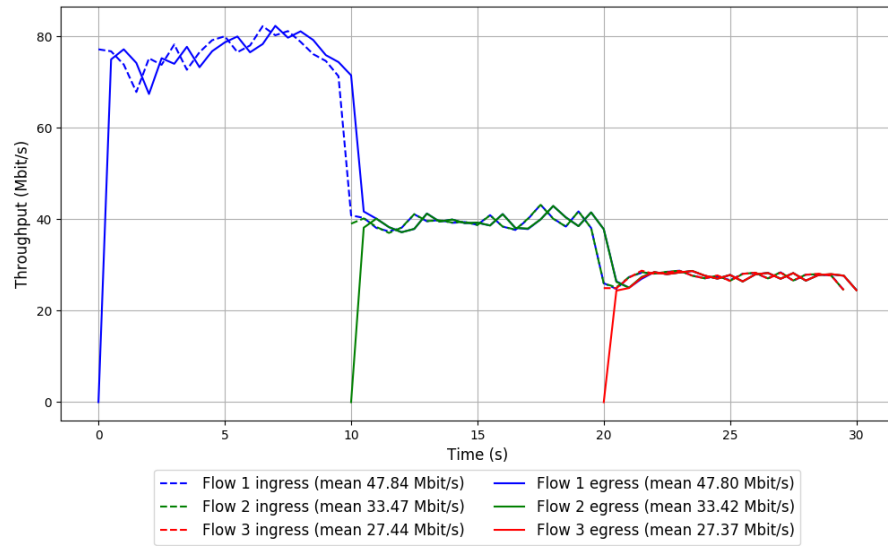
-- Flow 3:

Average throughput: 27.37 Mbit/s

95th percentile per-packet one-way delay: 14.936 ms

Loss rate: 0.27%

Run 1: Report of TCP Cubic — Data Link



Run 2: Statistics of TCP Cubic

Start at: 2018-08-28 10:13:23

End at: 2018-08-28 10:13:53

Local clock offset: -6.339 ms

Remote clock offset: 0.236 ms

Below is generated by plot.py at 2018-08-28 10:19:54

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.49 Mbit/s

95th percentile per-packet one-way delay: 9.617 ms

Loss rate: 0.11%

-- Flow 1:

Average throughput: 59.03 Mbit/s

95th percentile per-packet one-way delay: 9.348 ms

Loss rate: 0.08%

-- Flow 2:

Average throughput: 40.22 Mbit/s

95th percentile per-packet one-way delay: 9.625 ms

Loss rate: 0.14%

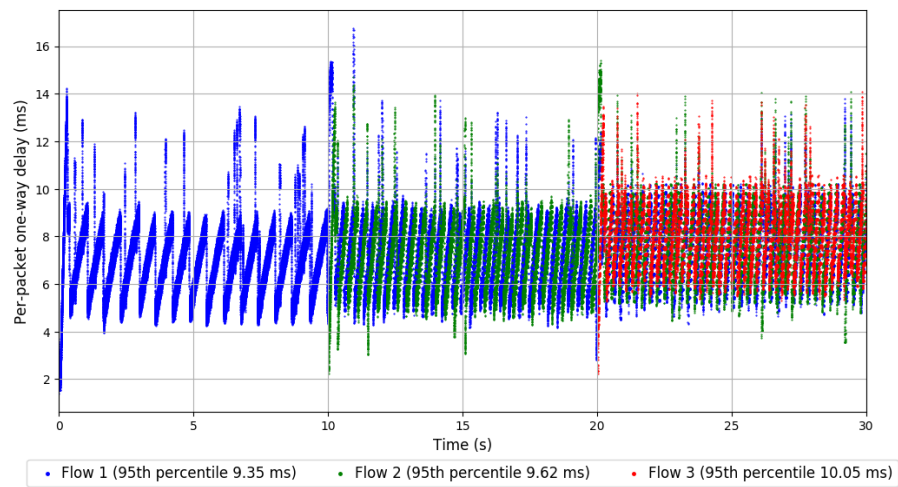
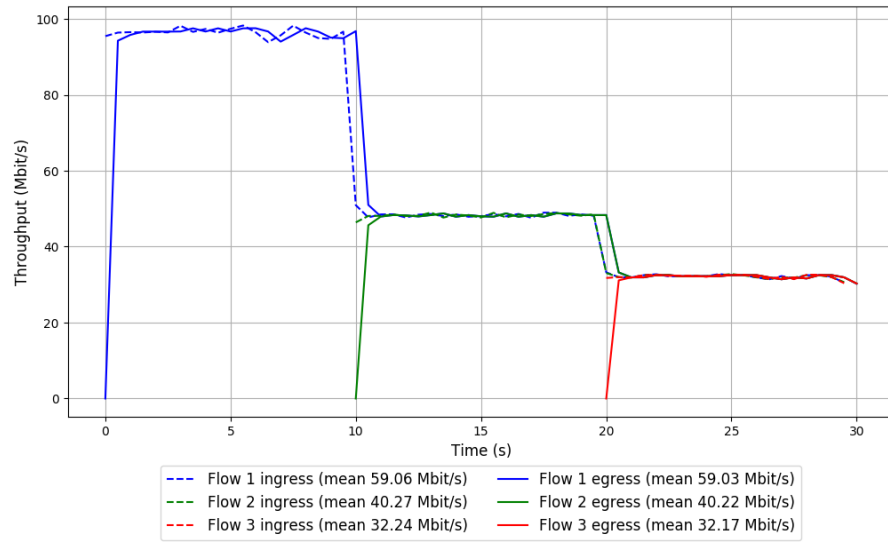
-- Flow 3:

Average throughput: 32.17 Mbit/s

95th percentile per-packet one-way delay: 10.053 ms

Loss rate: 0.25%

Run 2: Report of TCP Cubic — Data Link



Run 3: Statistics of TCP Cubic

Start at: 2018-08-28 10:17:55

End at: 2018-08-28 10:18:25

Local clock offset: -5.086 ms

Remote clock offset: 0.182 ms

Below is generated by plot.py at 2018-08-28 10:19:54

Datalink statistics

-- Total of 3 flows:

Average throughput: 96.75 Mbit/s

95th percentile per-packet one-way delay: 10.393 ms

Loss rate: 0.13%

-- Flow 1:

Average throughput: 59.15 Mbit/s

95th percentile per-packet one-way delay: 10.228 ms

Loss rate: 0.07%

-- Flow 2:

Average throughput: 40.36 Mbit/s

95th percentile per-packet one-way delay: 10.588 ms

Loss rate: 0.19%

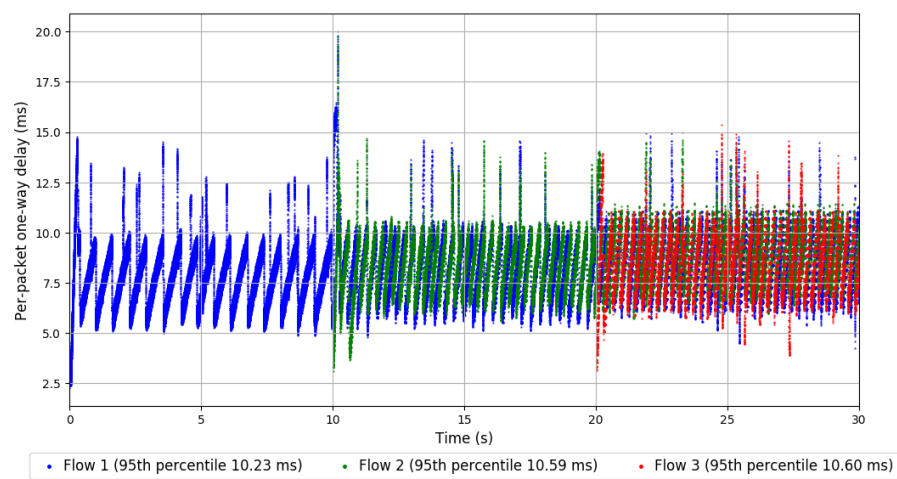
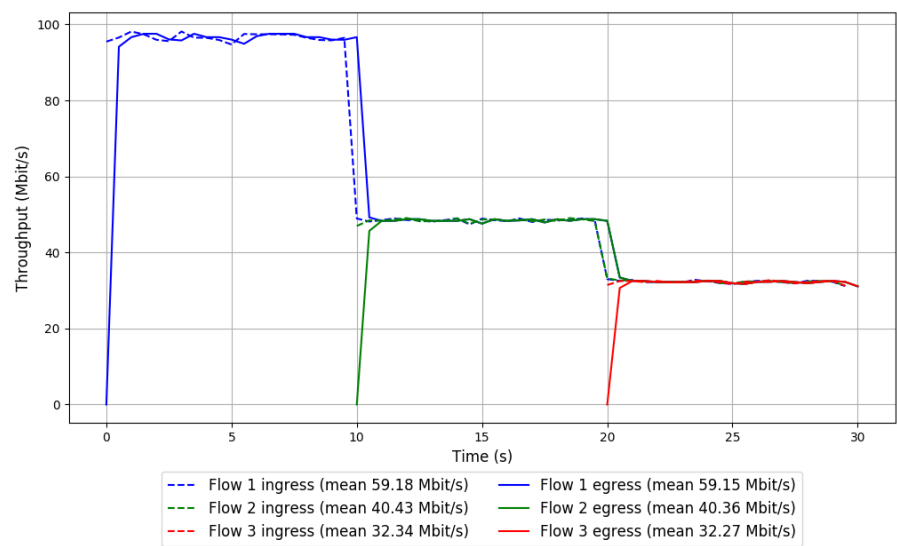
-- Flow 3:

Average throughput: 32.27 Mbit/s

95th percentile per-packet one-way delay: 10.601 ms

Loss rate: 0.26%

Run 3: Report of TCP Cubic — Data Link

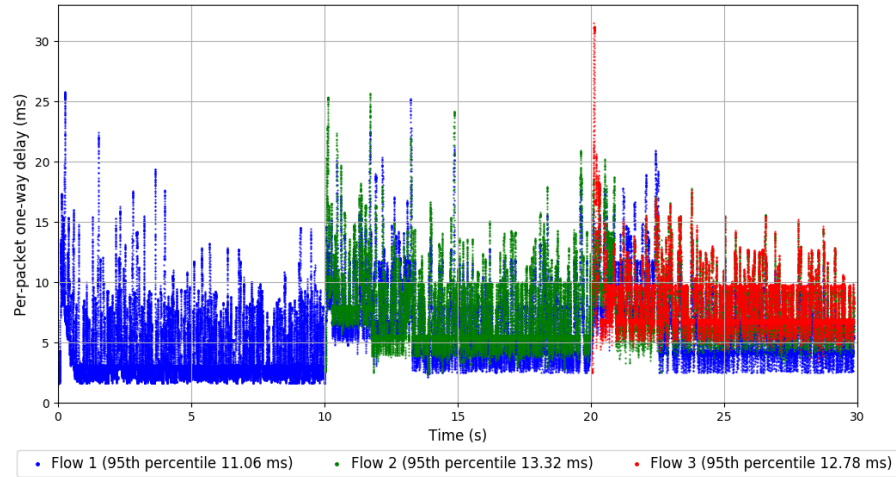
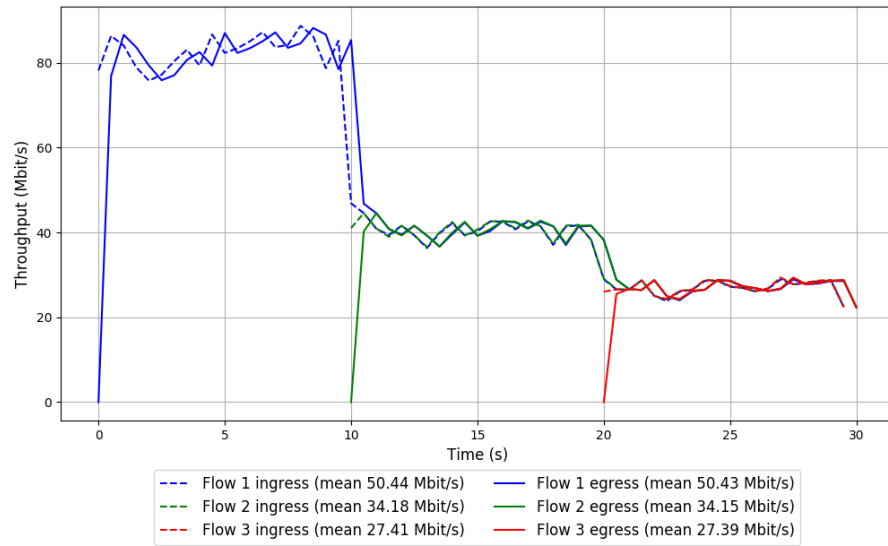


```
Run 1: Statistics of Indigo

Start at: 2018-08-28 10:05:30
End at: 2018-08-28 10:06:00
Local clock offset: -7.083 ms
Remote clock offset: 0.18 ms

# Below is generated by plot.py at 2018-08-28 10:19:54
# Datalink statistics
-- Total of 3 flows:
Average throughput: 82.15 Mbit/s
95th percentile per-packet one-way delay: 12.024 ms
Loss rate: 0.06%
-- Flow 1:
Average throughput: 50.43 Mbit/s
95th percentile per-packet one-way delay: 11.056 ms
Loss rate: 0.04%
-- Flow 2:
Average throughput: 34.15 Mbit/s
95th percentile per-packet one-way delay: 13.316 ms
Loss rate: 0.09%
-- Flow 3:
Average throughput: 27.39 Mbit/s
95th percentile per-packet one-way delay: 12.783 ms
Loss rate: 0.12%
```


Run 1: Report of Indigo — Data Link



Run 2: Statistics of Indigo

Start at: 2018-08-28 10:10:00

End at: 2018-08-28 10:10:30

Local clock offset: -6.944 ms

Remote clock offset: 0.241 ms

Below is generated by plot.py at 2018-08-28 10:19:54

Datalink statistics

-- Total of 3 flows:

Average throughput: 83.29 Mbit/s

95th percentile per-packet one-way delay: 11.622 ms

Loss rate: 0.04%

-- Flow 1:

Average throughput: 50.80 Mbit/s

95th percentile per-packet one-way delay: 10.902 ms

Loss rate: 0.02%

-- Flow 2:

Average throughput: 34.61 Mbit/s

95th percentile per-packet one-way delay: 12.776 ms

Loss rate: 0.05%

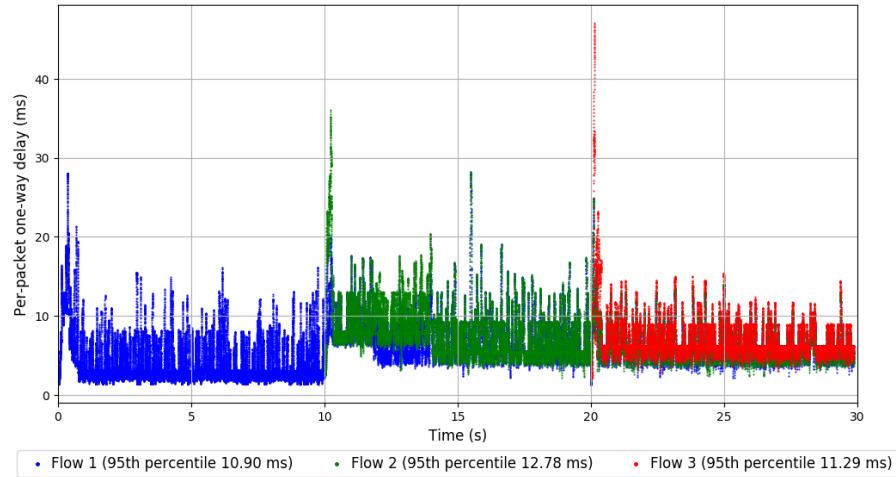
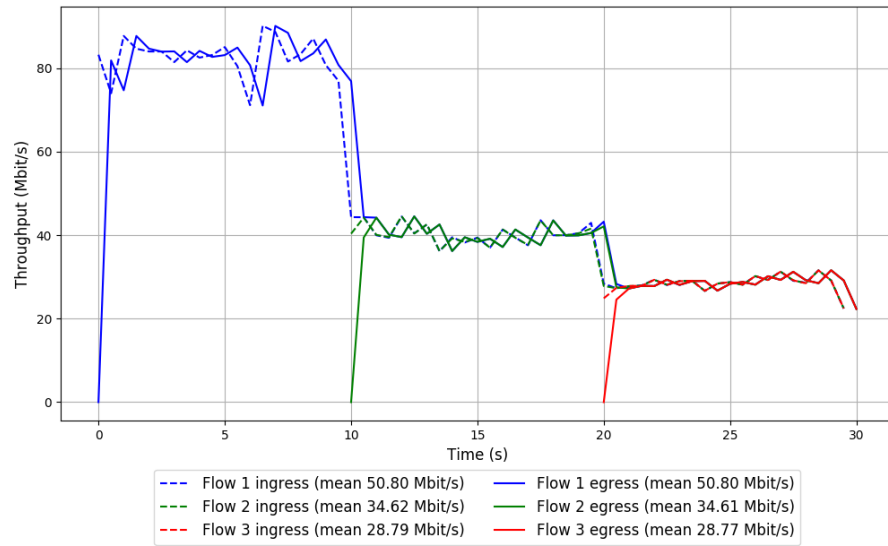
-- Flow 3:

Average throughput: 28.77 Mbit/s

95th percentile per-packet one-way delay: 11.294 ms

Loss rate: 0.09%

Run 2: Report of Indigo — Data Link

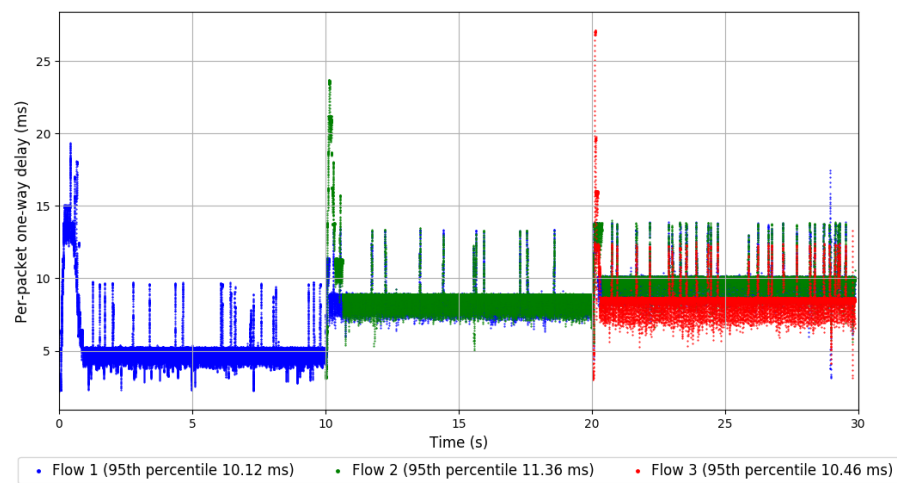
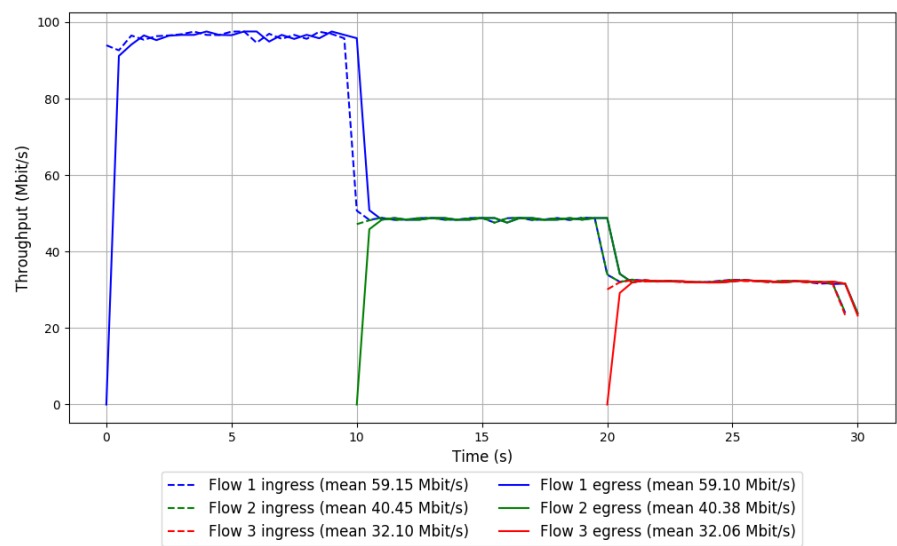


Run 3: Statistics of Indigo

Start at: 2018-08-28 10:14:30
End at: 2018-08-28 10:15:00
Local clock offset: -5.444 ms
Remote clock offset: 0.254 ms

Below is generated by plot.py at 2018-08-28 10:20:20
Datalink statistics
-- Total of 3 flows:
Average throughput: 96.51 Mbit/s
95th percentile per-packet one-way delay: 10.880 ms
Loss rate: 0.12%
-- Flow 1:
Average throughput: 59.10 Mbit/s
95th percentile per-packet one-way delay: 10.115 ms
Loss rate: 0.08%
-- Flow 2:
Average throughput: 40.38 Mbit/s
95th percentile per-packet one-way delay: 11.363 ms
Loss rate: 0.17%
-- Flow 3:
Average throughput: 32.06 Mbit/s
95th percentile per-packet one-way delay: 10.462 ms
Loss rate: 0.17%

Run 3: Report of Indigo — Data Link



Run 1: Statistics of Muses-23

Start at: 2018-08-28 10:06:38

End at: 2018-08-28 10:07:08

Local clock offset: -6.323 ms

Remote clock offset: 0.23 ms

Below is generated by plot.py at 2018-08-28 10:20:24

Datalink statistics

-- Total of 3 flows:

Average throughput: 76.17 Mbit/s

95th percentile per-packet one-way delay: 160.034 ms

Loss rate: 0.29%

-- Flow 1:

Average throughput: 46.22 Mbit/s

95th percentile per-packet one-way delay: 96.090 ms

Loss rate: 0.10%

-- Flow 2:

Average throughput: 32.08 Mbit/s

95th percentile per-packet one-way delay: 248.881 ms

Loss rate: 0.69%

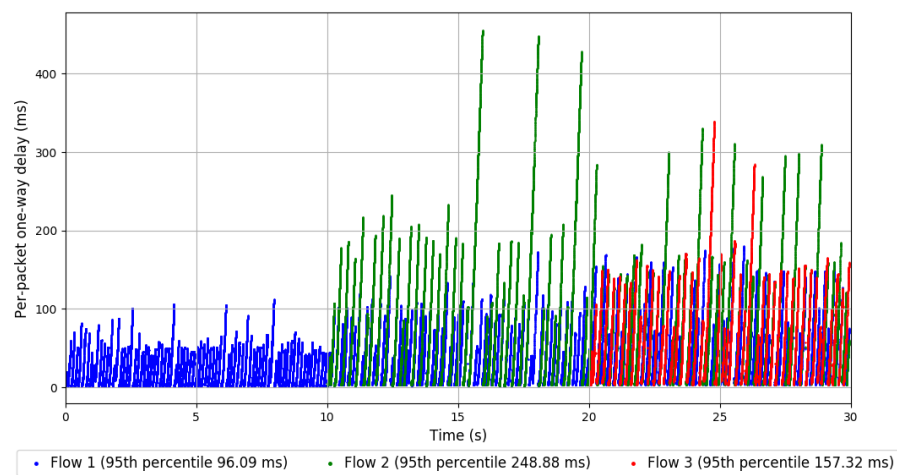
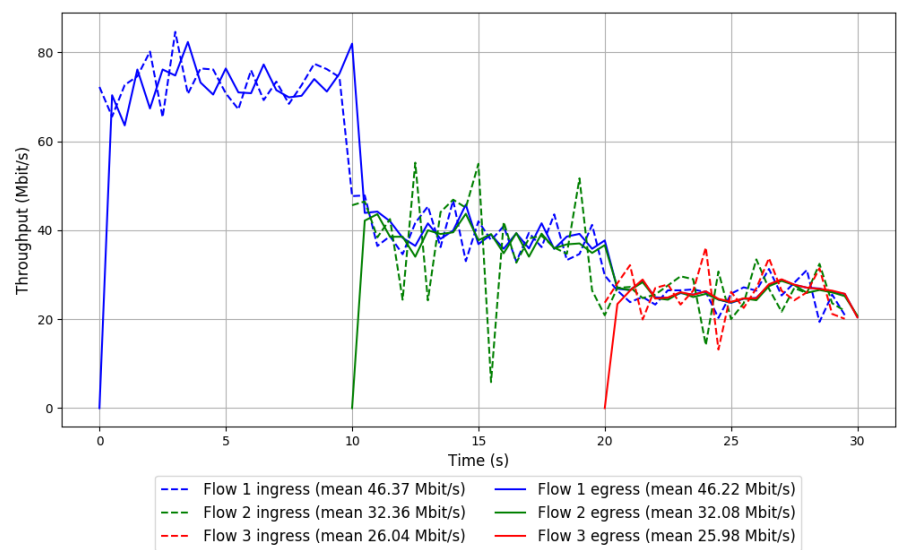
-- Flow 3:

Average throughput: 25.98 Mbit/s

95th percentile per-packet one-way delay: 157.324 ms

Loss rate: 0.27%

Run 1: Report of Muses-23 — Data Link



Run 2: Statistics of Muses-23

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

End at: 2018-08-28 10:11:38

Local clock offset: -5.932 ms

Remote clock offset: 0.233 ms

Below is generated by plot.py at 2018-08-28 10:20:26

Datalink statistics

-- Total of 3 flows:

Average throughput: 85.68 Mbit/s

95th percentile per-packet one-way delay: 127.189 ms

Loss rate: 0.27%

-- Flow 1:

Average throughput: 51.92 Mbit/s

95th percentile per-packet one-way delay: 83.445 ms

Loss rate: 0.16%

-- Flow 2:

Average throughput: 36.42 Mbit/s

95th percentile per-packet one-way delay: 103.645 ms

Loss rate: 0.35%

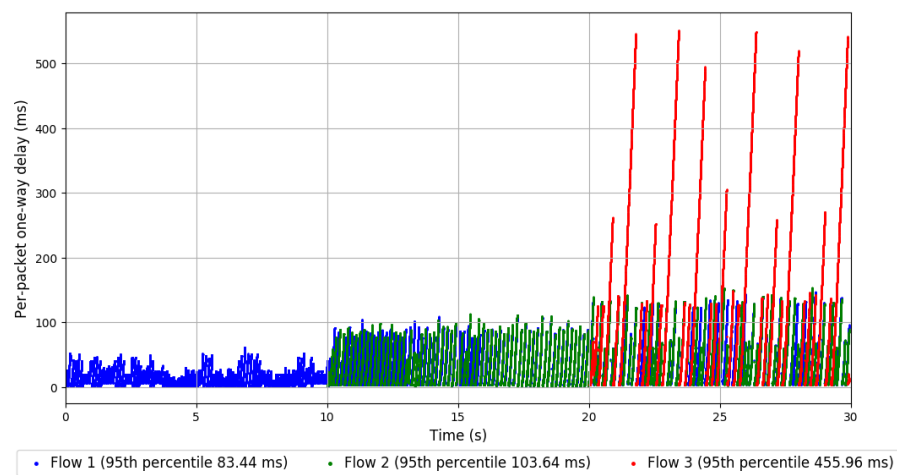
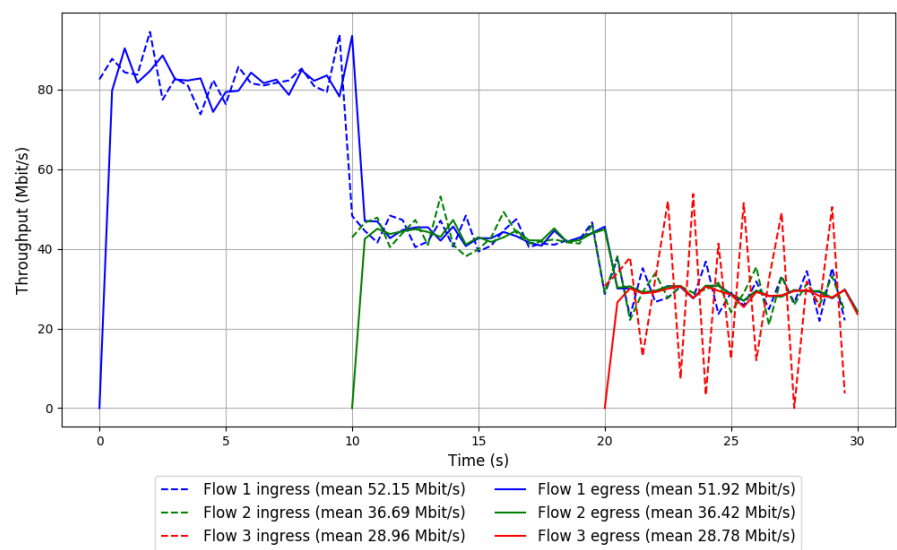
-- Flow 3:

Average throughput: 28.78 Mbit/s

95th percentile per-packet one-way delay: 455.964 ms

Loss rate: 0.66%

Run 2: Report of Muses-23 — Data Link



Run 3: Statistics of Muses-23

Start at: 2018-08-28 10:15:39

End at: 2018-08-28 10:16:09

Local clock offset: -4.514 ms

Remote clock offset: 0.278 ms

Below is generated by plot.py at 2018-08-28 10:20:28

Datalink statistics

-- Total of 3 flows:

Average throughput: 93.10 Mbit/s

95th percentile per-packet one-way delay: 119.850 ms

Loss rate: 0.25%

-- Flow 1:

Average throughput: 55.80 Mbit/s

95th percentile per-packet one-way delay: 123.244 ms

Loss rate: 0.21%

-- Flow 2:

Average throughput: 40.13 Mbit/s

95th percentile per-packet one-way delay: 96.654 ms

Loss rate: 0.09%

-- Flow 3:

Average throughput: 31.95 Mbit/s

95th percentile per-packet one-way delay: 122.433 ms

Loss rate: 0.88%

Run 3: Report of Muses-23 — Data Link

