

Pantheon Report

Generated at 2018-09-05 22:55:21 (UTC).

Data path: GCE London on `ens4` (*remote*) → GCE Tokyo on `ens4` (*local*).

Repeated the test of 4 congestion control schemes twice.

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

NTP offsets were measured against `time.google.com` and have been applied to correct the timestamps in logs.

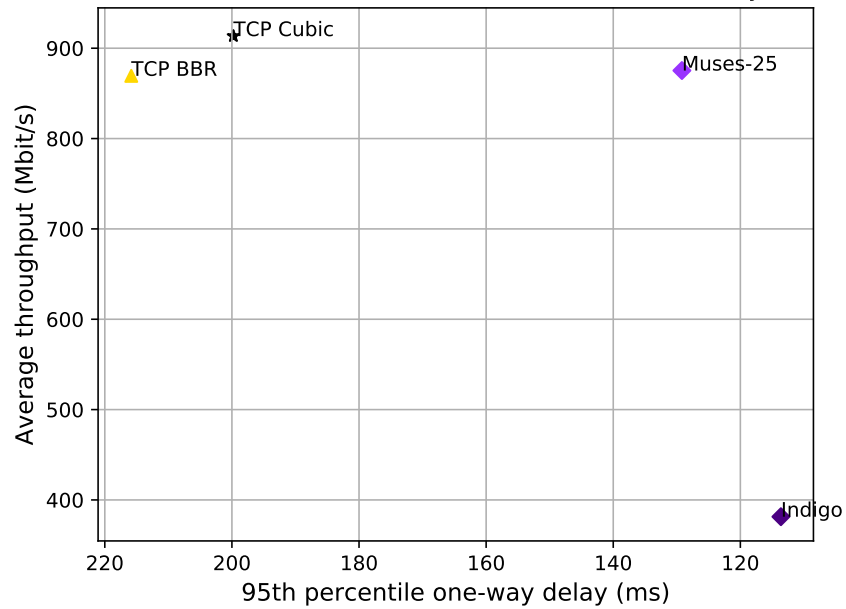
System info:

```
Linux 4.15.0-1018-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
net.ipv4.tcp_mem = 536870912 536870912 536870912
```

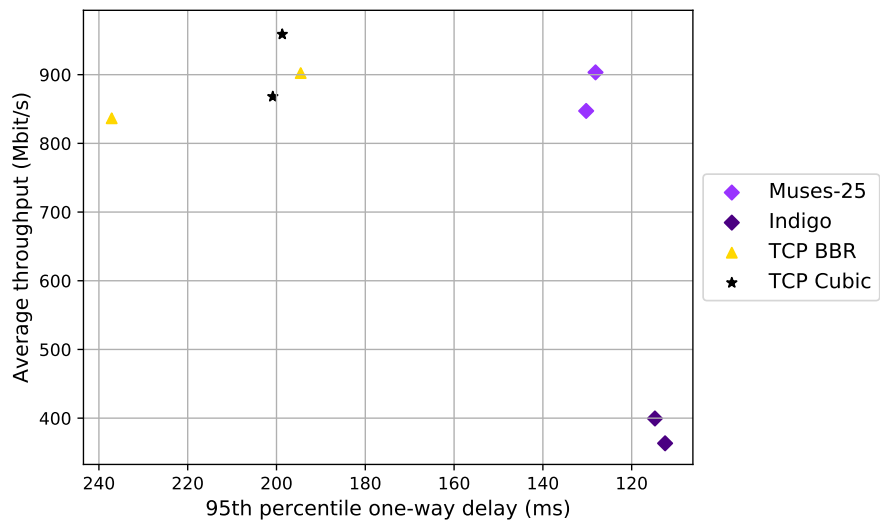
Git summary:

```
branch: muses @ 18b9165265c8ba2915c862e8713fd9ad82c1ac21
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ a28d20fb82a95a965a3da65fd1eb71b8994e9b84
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-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 GCE London to GCE Tokyo, 2 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)



test from GCE London to GCE Tokyo, 2 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	2	469.12	441.82	326.95	230.54	201.76	153.84	2.34	2.04	4.38
TCP Cubic	2	521.64	430.50	323.88	193.07	205.78	157.92	0.86	1.38	4.44
Indigo	2	220.93	177.51	135.44	113.36	112.52	114.24	0.75	1.22	2.81
Muses-25	2	430.55	450.30	451.56	127.95	132.64	121.13	0.52	1.12	2.42

Run 1: Statistics of TCP BBR

Start at: 2018-09-05 22:25:35

End at: 2018-09-05 22:26:05

Local clock offset: 14.403 ms

Remote clock offset: 1.857 ms

Below is generated by plot.py at 2018-09-05 22:55:13

Datalink statistics

-- Total of 3 flows:

Average throughput: 902.35 Mbit/s

95th percentile per-packet one-way delay: 194.549 ms

Loss rate: 1.74%

-- Flow 1:

Average throughput: 497.48 Mbit/s

95th percentile per-packet one-way delay: 200.513 ms

Loss rate: 1.49%

-- Flow 2:

Average throughput: 441.33 Mbit/s

95th percentile per-packet one-way delay: 181.427 ms

Loss rate: 1.42%

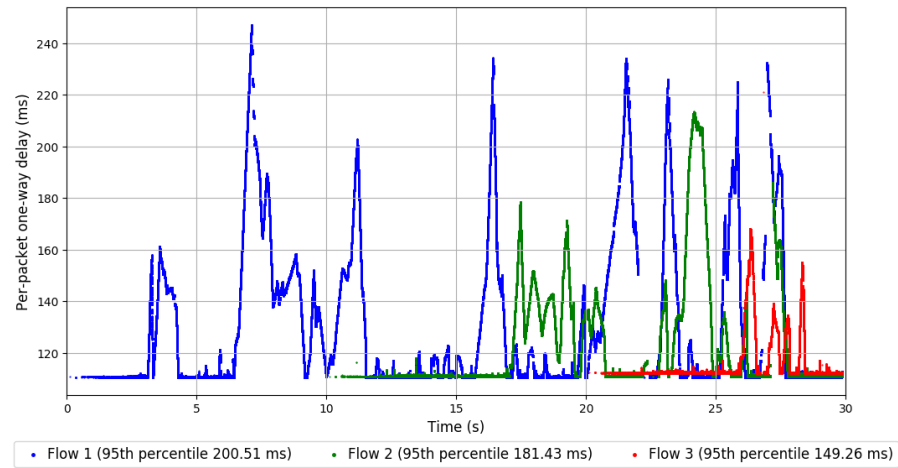
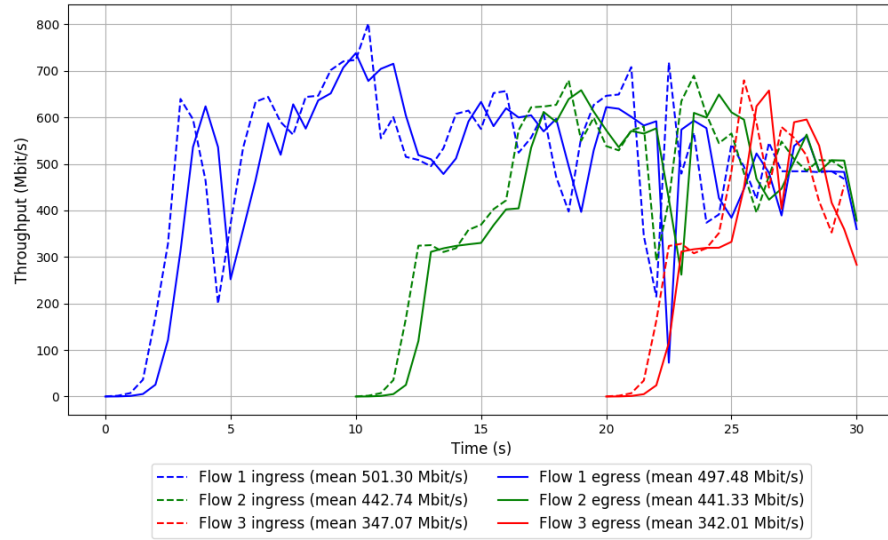
-- Flow 3:

Average throughput: 342.01 Mbit/s

95th percentile per-packet one-way delay: 149.256 ms

Loss rate: 3.65%

Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2018-09-05 22:34:00

End at: 2018-09-05 22:34:30

Local clock offset: 16.012 ms

Remote clock offset: 1.11 ms

Below is generated by plot.py at 2018-09-05 22:55:13

Datalink statistics

-- Total of 3 flows:

Average throughput: 836.51 Mbit/s

95th percentile per-packet one-way delay: 237.124 ms

Loss rate: 3.25%

-- Flow 1:

Average throughput: 440.76 Mbit/s

95th percentile per-packet one-way delay: 260.574 ms

Loss rate: 3.19%

-- Flow 2:

Average throughput: 442.31 Mbit/s

95th percentile per-packet one-way delay: 222.087 ms

Loss rate: 2.67%

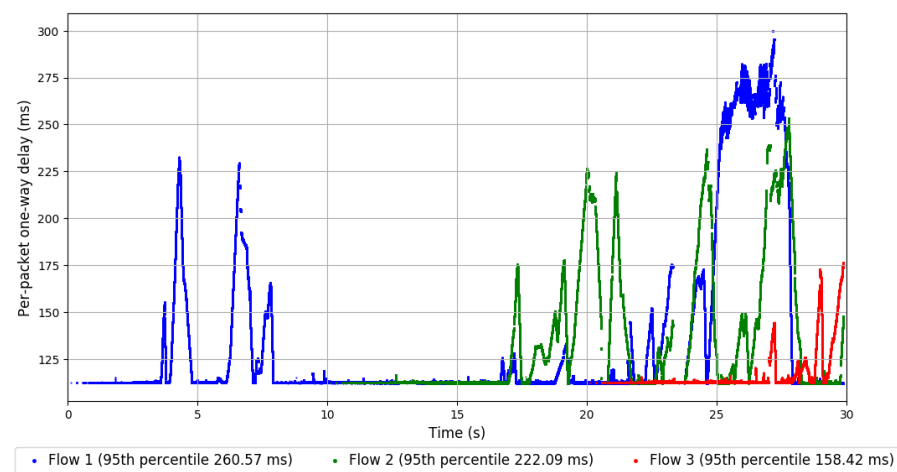
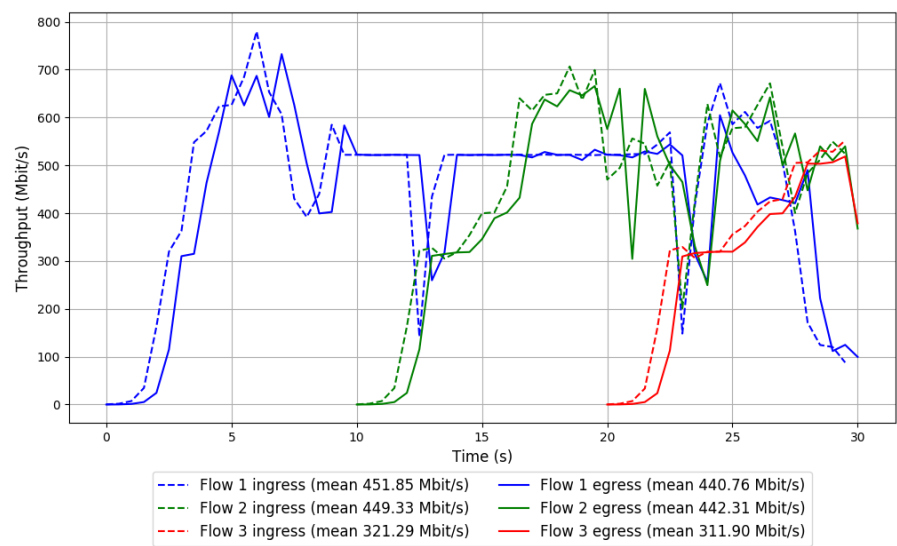
-- Flow 3:

Average throughput: 311.90 Mbit/s

95th percentile per-packet one-way delay: 158.416 ms

Loss rate: 5.11%

Run 2: Report of TCP BBR — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2018-09-05 22:23:30

End at: 2018-09-05 22:24:00

Local clock offset: 14.785 ms

Remote clock offset: 1.84 ms

Below is generated by plot.py at 2018-09-05 22:55:13

Datalink statistics

-- Total of 3 flows:

Average throughput: 868.05 Mbit/s

95th percentile per-packet one-way delay: 200.836 ms

Loss rate: 1.56%

-- Flow 1:

Average throughput: 513.02 Mbit/s

95th percentile per-packet one-way delay: 181.182 ms

Loss rate: 1.11%

-- Flow 2:

Average throughput: 409.99 Mbit/s

95th percentile per-packet one-way delay: 225.222 ms

Loss rate: 1.31%

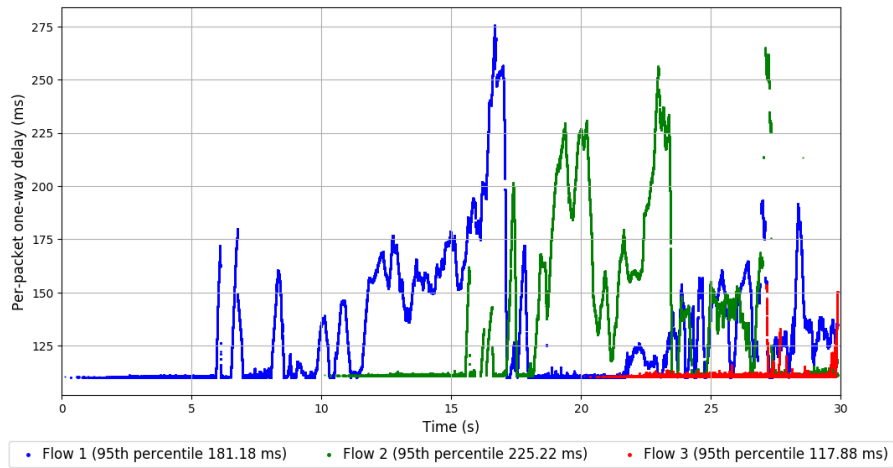
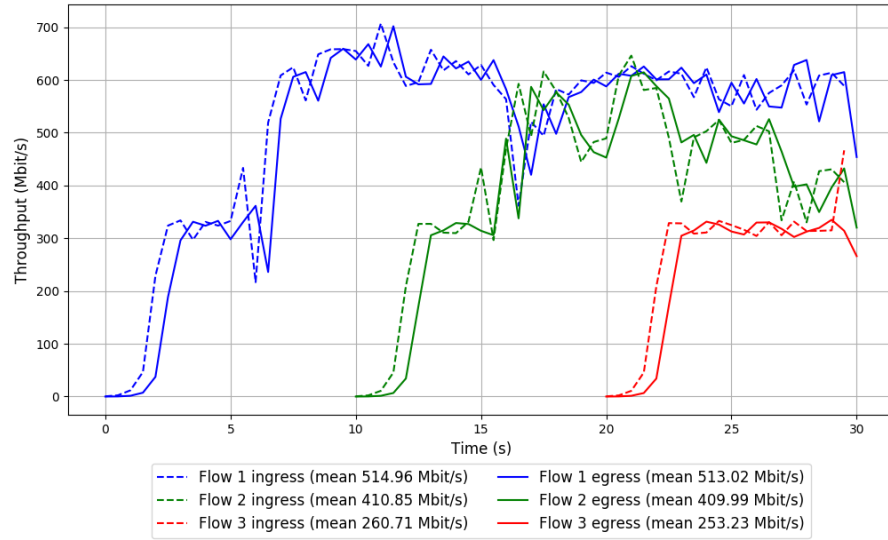
-- Flow 3:

Average throughput: 253.23 Mbit/s

95th percentile per-packet one-way delay: 117.875 ms

Loss rate: 5.01%

Run 1: Report of TCP Cubic — Data Link



Run 2: Statistics of TCP Cubic

Start at: 2018-09-05 22:31:49

End at: 2018-09-05 22:32:19

Local clock offset: 14.953 ms

Remote clock offset: 0.99 ms

Below is generated by plot.py at 2018-09-05 22:55:19

Datalink statistics

-- Total of 3 flows:

Average throughput: 958.79 Mbit/s

95th percentile per-packet one-way delay: 198.704 ms

Loss rate: 1.33%

-- Flow 1:

Average throughput: 530.26 Mbit/s

95th percentile per-packet one-way delay: 204.954 ms

Loss rate: 0.61%

-- Flow 2:

Average throughput: 451.02 Mbit/s

95th percentile per-packet one-way delay: 186.342 ms

Loss rate: 1.45%

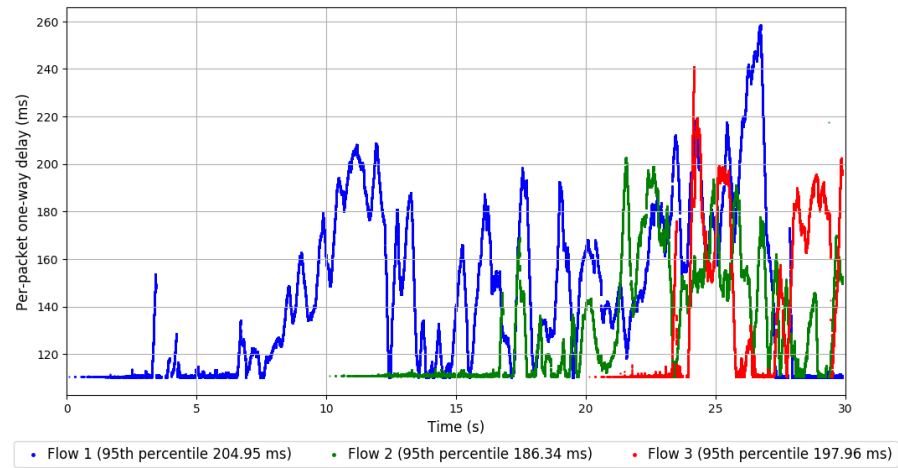
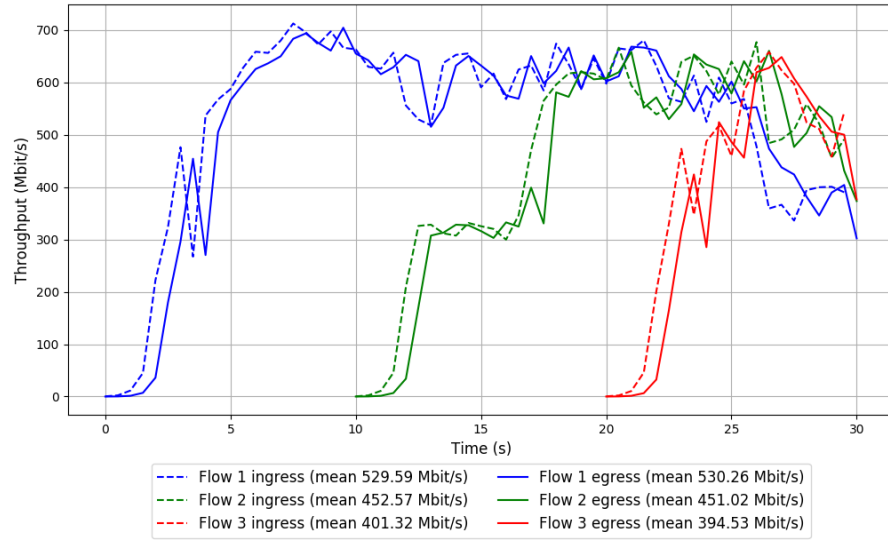
-- Flow 3:

Average throughput: 394.53 Mbit/s

95th percentile per-packet one-way delay: 197.957 ms

Loss rate: 3.87%

Run 2: Report of TCP Cubic — Data Link



Run 1: Statistics of Indigo

Start at: 2018-09-05 22:27:48

End at: 2018-09-05 22:28:18

Local clock offset: 14.464 ms

Remote clock offset: 1.892 ms

Below is generated by plot.py at 2018-09-05 22:55:19

Datalink statistics

-- Total of 3 flows:

Average throughput: 363.37 Mbit/s

95th percentile per-packet one-way delay: 112.472 ms

Loss rate: 1.15%

-- Flow 1:

Average throughput: 222.02 Mbit/s

95th percentile per-packet one-way delay: 111.718 ms

Loss rate: 0.76%

-- Flow 2:

Average throughput: 149.36 Mbit/s

95th percentile per-packet one-way delay: 111.636 ms

Loss rate: 1.29%

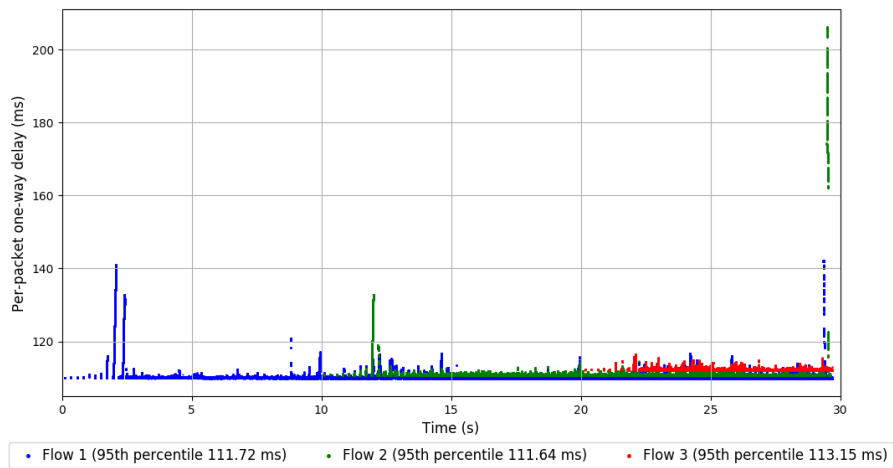
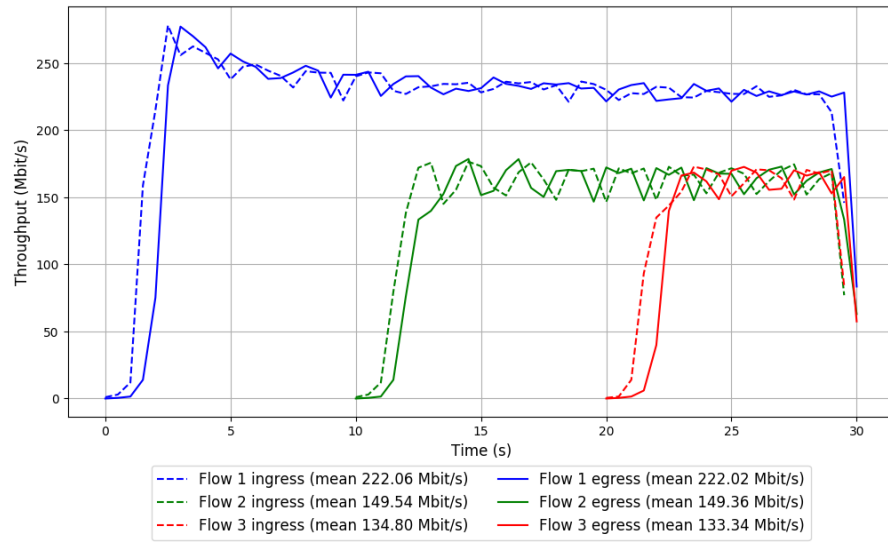
-- Flow 3:

Average throughput: 133.34 Mbit/s

95th percentile per-packet one-way delay: 113.151 ms

Loss rate: 2.82%

Run 1: Report of Indigo — Data Link



Run 2: Statistics of Indigo

Start at: 2018-09-05 22:36:08

End at: 2018-09-05 22:36:38

Local clock offset: 18.114 ms

Remote clock offset: 0.995 ms

Below is generated by plot.py at 2018-09-05 22:55:19

Datalink statistics

-- Total of 3 flows:

Average throughput: 399.51 Mbit/s

95th percentile per-packet one-way delay: 114.763 ms

Loss rate: 1.11%

-- Flow 1:

Average throughput: 219.84 Mbit/s

95th percentile per-packet one-way delay: 115.009 ms

Loss rate: 0.74%

-- Flow 2:

Average throughput: 205.66 Mbit/s

95th percentile per-packet one-way delay: 113.398 ms

Loss rate: 1.15%

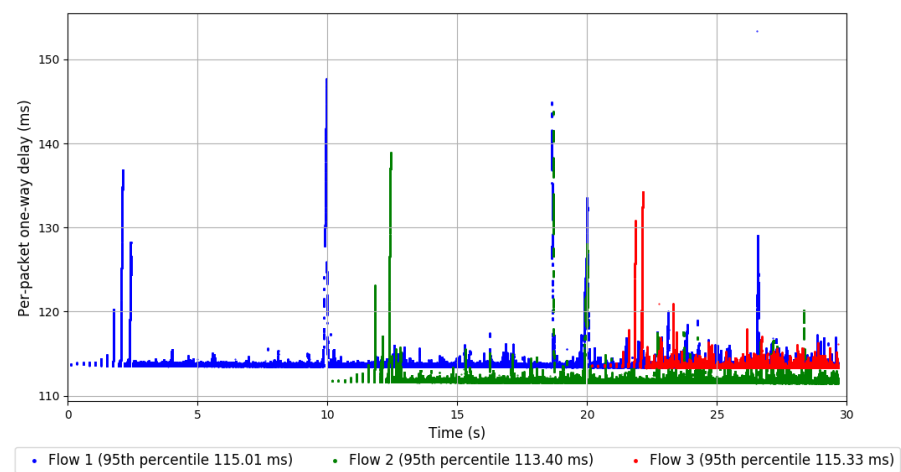
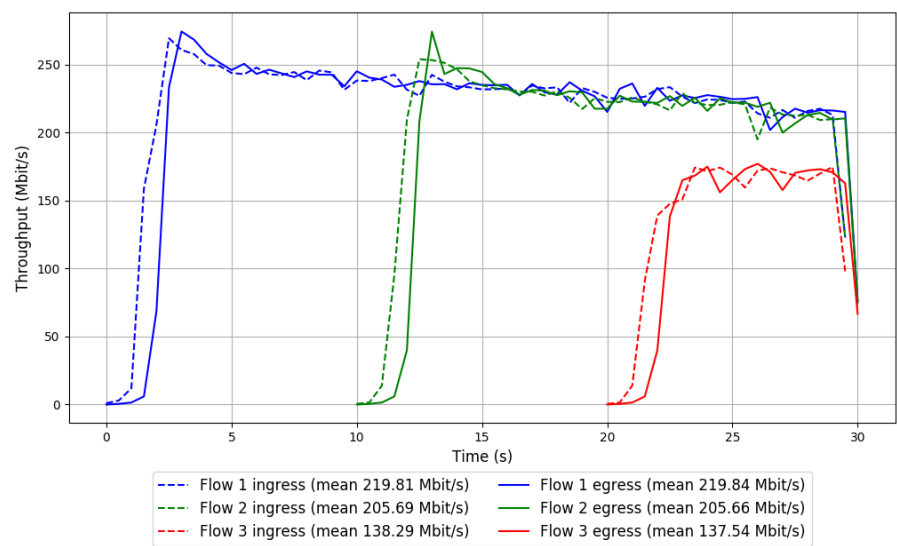
-- Flow 3:

Average throughput: 137.54 Mbit/s

95th percentile per-packet one-way delay: 115.333 ms

Loss rate: 2.80%

Run 2: Report of Indigo — Data Link

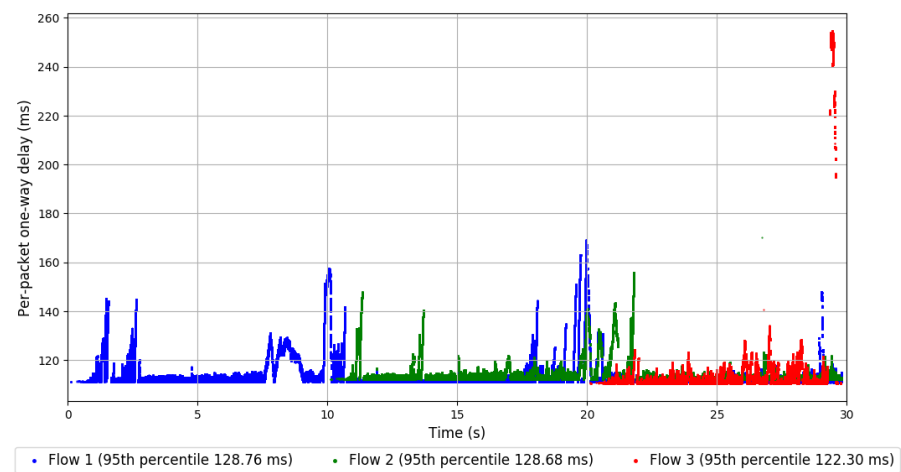
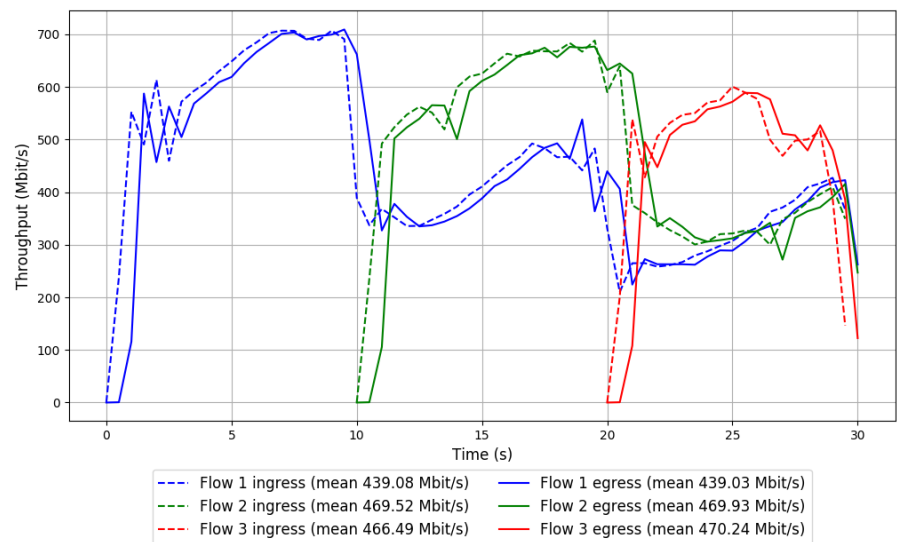


```
Run 1: Statistics of Muses-25

Start at: 2018-09-05 22:29:43
End at: 2018-09-05 22:30:13
Local clock offset: 14.6 ms
Remote clock offset: 1.62 ms

# Below is generated by plot.py at 2018-09-05 22:55:19
# Datalink statistics
-- Total of 3 flows:
Average throughput: 903.36 Mbit/s
95th percentile per-packet one-way delay: 128.143 ms
Loss rate: 1.00%
-- Flow 1:
Average throughput: 439.03 Mbit/s
95th percentile per-packet one-way delay: 128.757 ms
Loss rate: 0.75%
-- Flow 2:
Average throughput: 469.93 Mbit/s
95th percentile per-packet one-way delay: 128.682 ms
Loss rate: 1.03%
-- Flow 3:
Average throughput: 470.24 Mbit/s
95th percentile per-packet one-way delay: 122.302 ms
Loss rate: 1.63%
```


Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

Start at: 2018-09-05 22:38:06

End at: 2018-09-05 22:38:36

Local clock offset: 16.69 ms

Remote clock offset: 0.504 ms

Below is generated by plot.py at 2018-09-05 22:55:19

Datalink statistics

-- Total of 3 flows:

Average throughput: 847.22 Mbit/s

95th percentile per-packet one-way delay: 130.251 ms

Loss rate: 1.09%

-- Flow 1:

Average throughput: 422.07 Mbit/s

95th percentile per-packet one-way delay: 127.142 ms

Loss rate: 0.29%

-- Flow 2:

Average throughput: 430.66 Mbit/s

95th percentile per-packet one-way delay: 136.590 ms

Loss rate: 1.22%

-- Flow 3:

Average throughput: 432.88 Mbit/s

95th percentile per-packet one-way delay: 119.952 ms

Loss rate: 3.21%

Run 2: Report of Muses-25 — Data Link

