

Pantheon Report

Generated at 2018-08-31 05:45:51 (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.

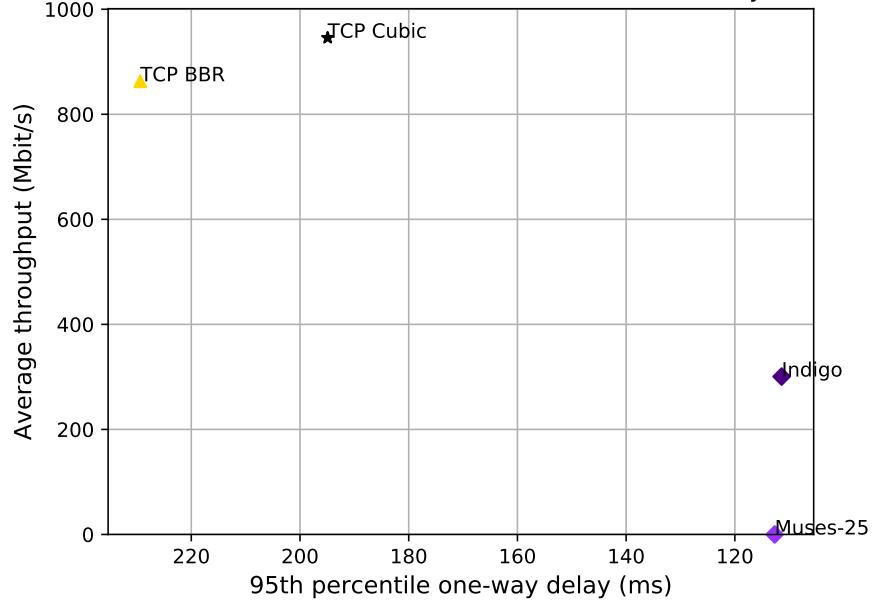
System info:

```
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
```

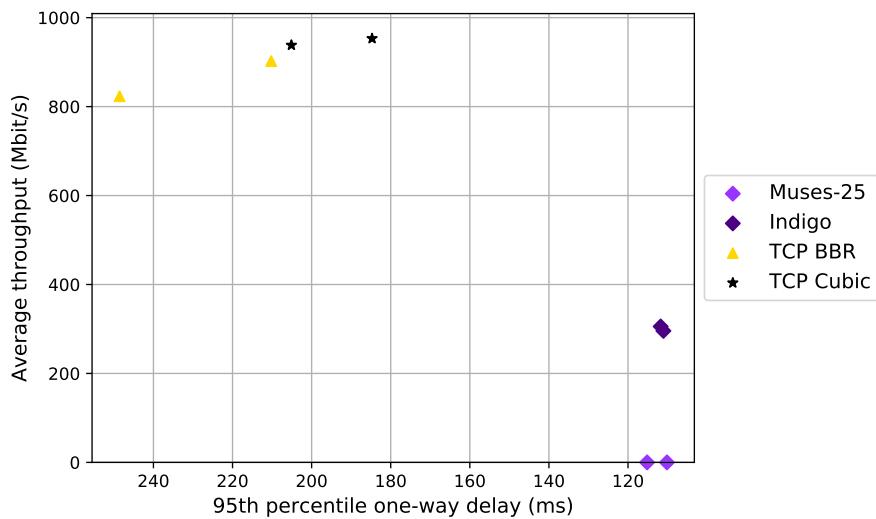
Git summary:

```
branch: muses @ 2de97ca91a065473c29a25ffffe63fb137c97a67c
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b59e0d118c50af3579569c462d33045741c85981
third_party/pantheon-tunnel @ cbfce6db5ff5740dafe1771f813cd646339e1952
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



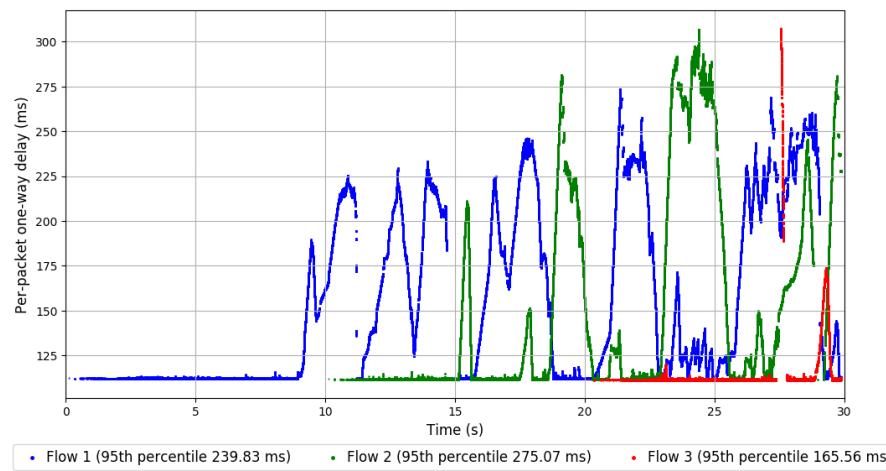
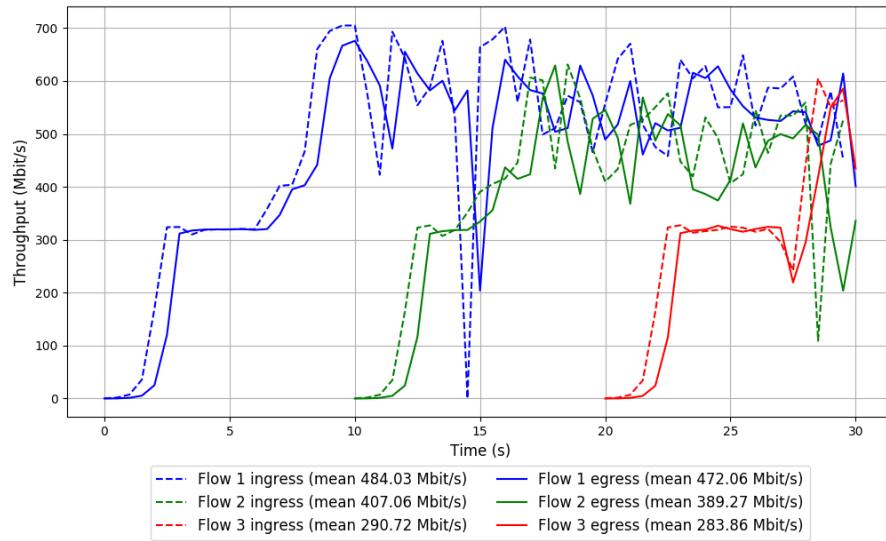
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	500.43	396.75	302.81	224.05	244.92	199.10	2.44	3.50	5.27
TCP Cubic	2	542.85	440.50	337.32	196.42	200.97	168.46	0.99	1.85	4.10
Indigo	2	154.33	155.56	134.44	111.37	110.35	112.36	0.79	1.24	2.77
Muses-25	2	0.00	0.00	0.00	111.94	111.77	112.28	0.00	0.00	0.00

Run 1: Statistics of TCP BBR

```
Start at: 2018-08-31 05:21:44
End at: 2018-08-31 05:22:14
Local clock offset: 35.413 ms
Remote clock offset: 33.414 ms

# Below is generated by plot.py at 2018-08-31 05:45:12
# Datalink statistics
-- Total of 3 flows:
Average throughput: 823.26 Mbit/s
95th percentile per-packet one-way delay: 248.562 ms
Loss rate: 4.06%
-- Flow 1:
Average throughput: 472.06 Mbit/s
95th percentile per-packet one-way delay: 239.831 ms
Loss rate: 3.20%
-- Flow 2:
Average throughput: 389.27 Mbit/s
95th percentile per-packet one-way delay: 275.074 ms
Loss rate: 5.44%
-- Flow 3:
Average throughput: 283.86 Mbit/s
95th percentile per-packet one-way delay: 165.562 ms
Loss rate: 4.54%
```

Run 1: Report of TCP BBR — Data Link

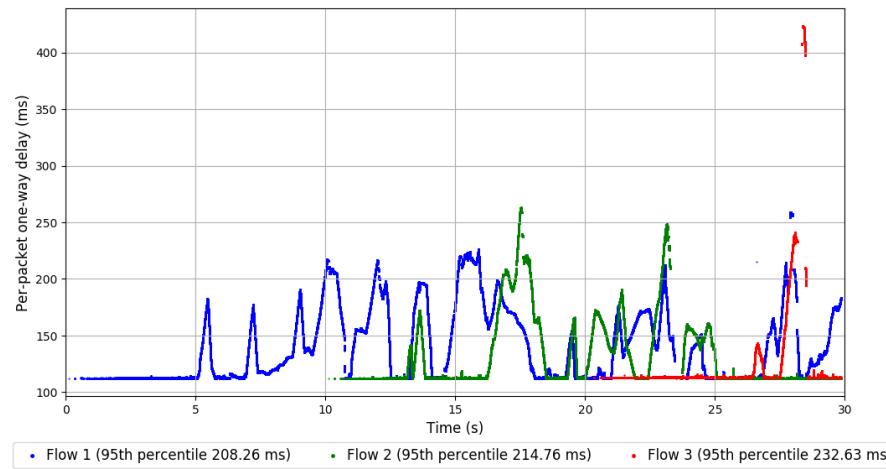
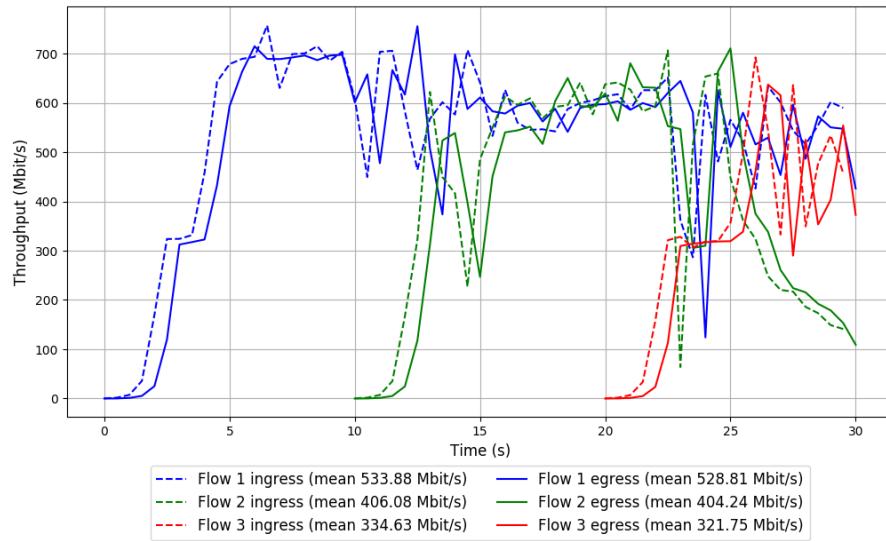


Run 2: Statistics of TCP BBR

```
Start at: 2018-08-31 05:28:59
End at: 2018-08-31 05:29:29
Local clock offset: 25.164 ms
Remote clock offset: 23.198 ms

# Below is generated by plot.py at 2018-08-31 05:45:35
# Datalink statistics
-- Total of 3 flows:
Average throughput: 902.45 Mbit/s
95th percentile per-packet one-way delay: 210.220 ms
Loss rate: 2.17%
-- Flow 1:
Average throughput: 528.81 Mbit/s
95th percentile per-packet one-way delay: 208.261 ms
Loss rate: 1.68%
-- Flow 2:
Average throughput: 404.24 Mbit/s
95th percentile per-packet one-way delay: 214.757 ms
Loss rate: 1.56%
-- Flow 3:
Average throughput: 321.75 Mbit/s
95th percentile per-packet one-way delay: 232.629 ms
Loss rate: 6.00%
```

Run 2: Report of TCP BBR — Data Link

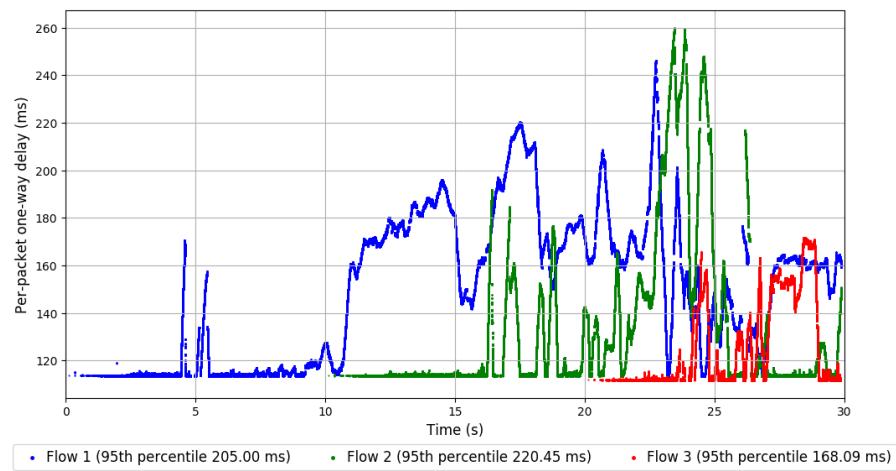
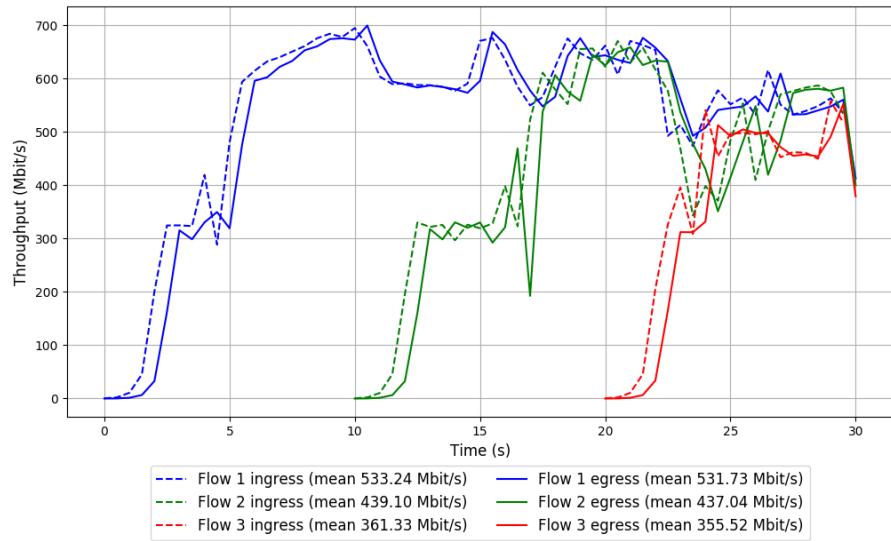


```
Run 1: Statistics of TCP Cubic
```

```
Start at: 2018-08-31 05:26:51
End at: 2018-08-31 05:27:21
Local clock offset: 30.23 ms
Remote clock offset: 28.133 ms

# Below is generated by plot.py at 2018-08-31 05:45:47
# Datalink statistics
-- Total of 3 flows:
Average throughput: 938.24 Mbit/s
95th percentile per-packet one-way delay: 205.111 ms
Loss rate: 1.51%
-- Flow 1:
Average throughput: 531.73 Mbit/s
95th percentile per-packet one-way delay: 204.998 ms
Loss rate: 1.02%
-- Flow 2:
Average throughput: 437.04 Mbit/s
95th percentile per-packet one-way delay: 220.447 ms
Loss rate: 1.58%
-- Flow 3:
Average throughput: 355.52 Mbit/s
95th percentile per-packet one-way delay: 168.085 ms
Loss rate: 3.53%
```

Run 1: Report of TCP Cubic — Data Link

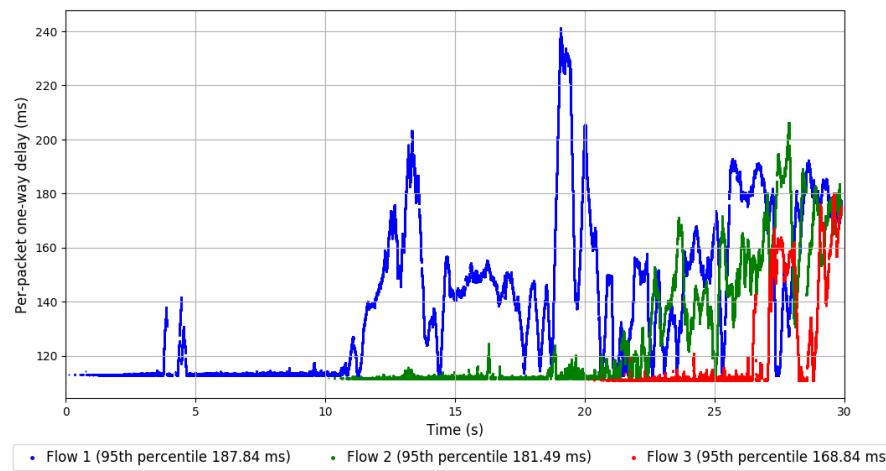
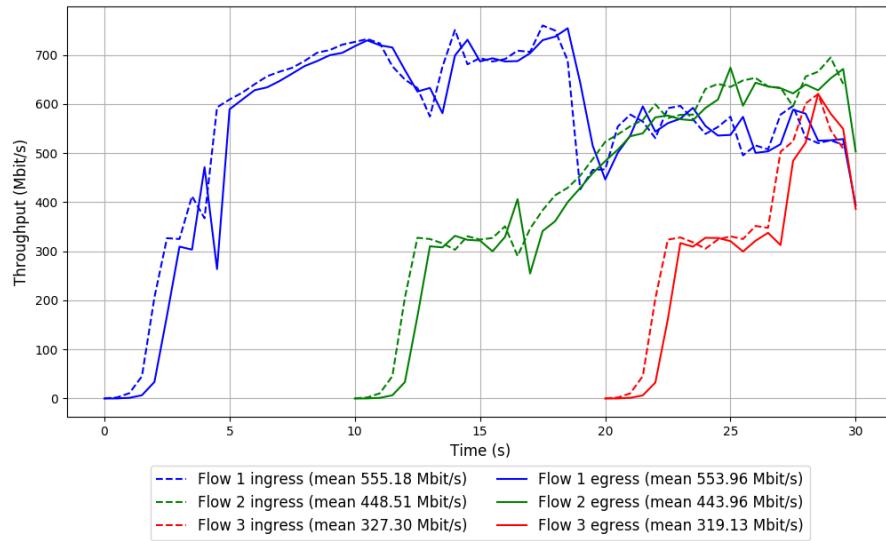


Run 2: Statistics of TCP Cubic

```
Start at: 2018-08-31 05:34:08
End at: 2018-08-31 05:34:38
Local clock offset: 17.601 ms
Remote clock offset: 16.537 ms

# Below is generated by plot.py at 2018-08-31 05:45:50
# Datalink statistics
-- Total of 3 flows:
Average throughput: 953.05 Mbit/s
95th percentile per-packet one-way delay: 184.716 ms
Loss rate: 1.74%
-- Flow 1:
Average throughput: 553.96 Mbit/s
95th percentile per-packet one-way delay: 187.845 ms
Loss rate: 0.96%
-- Flow 2:
Average throughput: 443.96 Mbit/s
95th percentile per-packet one-way delay: 181.492 ms
Loss rate: 2.12%
-- Flow 3:
Average throughput: 319.13 Mbit/s
95th percentile per-packet one-way delay: 168.836 ms
Loss rate: 4.67%
```

Run 2: Report of TCP Cubic — Data Link

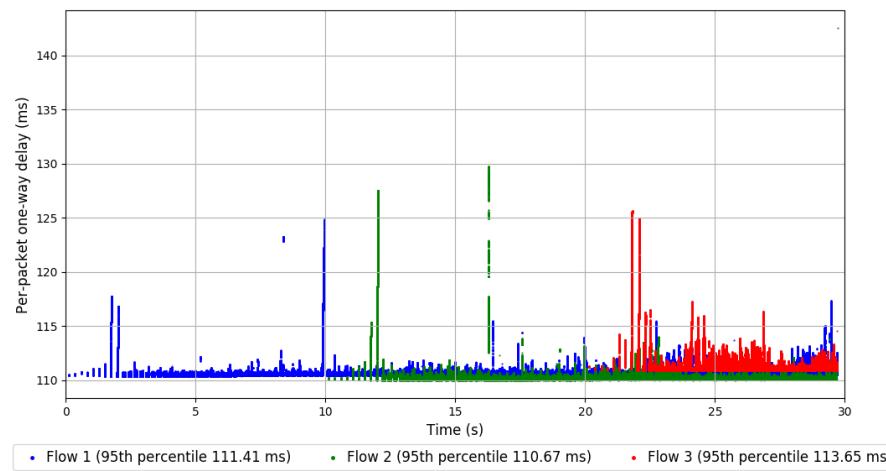
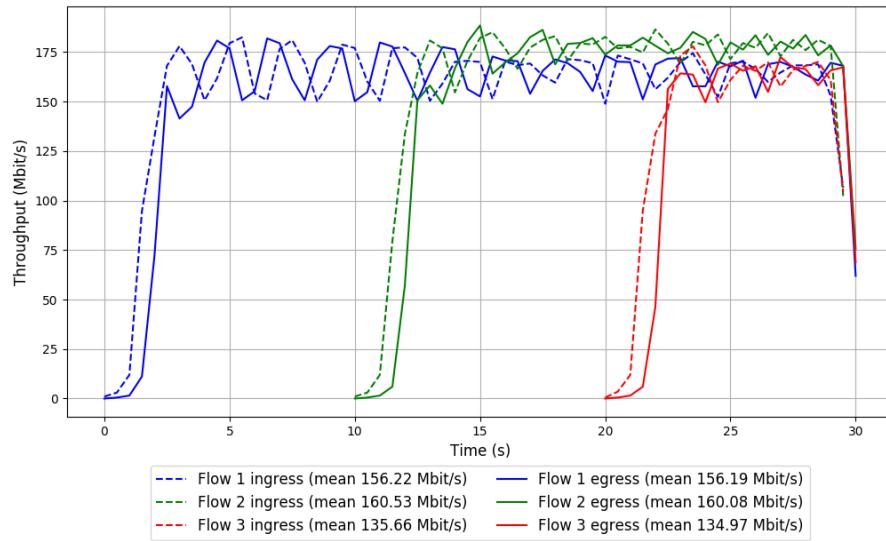


Run 1: Statistics of Indigo

```
Start at: 2018-08-31 05:23:52
End at: 2018-08-31 05:24:22
Local clock offset: 37.653 ms
Remote clock offset: 36.771 ms

# Below is generated by plot.py at 2018-08-31 05:45:50
# Datalink statistics
-- Total of 3 flows:
Average throughput: 305.59 Mbit/s
95th percentile per-packet one-way delay: 111.747 ms
Loss rate: 1.22%
-- Flow 1:
Average throughput: 156.19 Mbit/s
95th percentile per-packet one-way delay: 111.409 ms
Loss rate: 0.77%
-- Flow 2:
Average throughput: 160.08 Mbit/s
95th percentile per-packet one-way delay: 110.675 ms
Loss rate: 1.25%
-- Flow 3:
Average throughput: 134.97 Mbit/s
95th percentile per-packet one-way delay: 113.648 ms
Loss rate: 2.74%
```

Run 1: Report of Indigo — Data Link

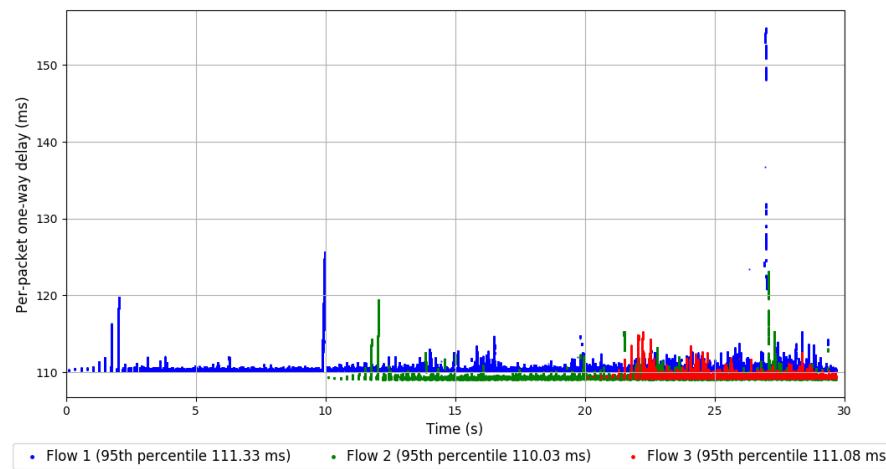
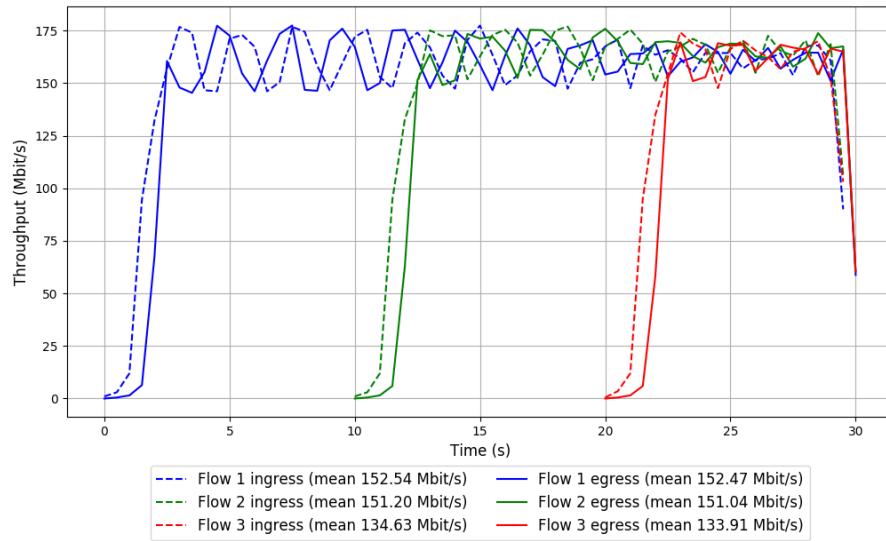


Run 2: Statistics of Indigo

```
Start at: 2018-08-31 05:31:10
End at: 2018-08-31 05:31:40
Local clock offset: 18.225 ms
Remote clock offset: 19.82 ms

# Below is generated by plot.py at 2018-08-31 05:45:50
# Datalink statistics
-- Total of 3 flows:
Average throughput: 295.71 Mbit/s
95th percentile per-packet one-way delay: 111.054 ms
Loss rate: 1.24%
-- Flow 1:
Average throughput: 152.47 Mbit/s
95th percentile per-packet one-way delay: 111.332 ms
Loss rate: 0.80%
-- Flow 2:
Average throughput: 151.04 Mbit/s
95th percentile per-packet one-way delay: 110.031 ms
Loss rate: 1.23%
-- Flow 3:
Average throughput: 133.91 Mbit/s
95th percentile per-packet one-way delay: 111.075 ms
Loss rate: 2.80%
```

Run 2: Report of Indigo — Data Link

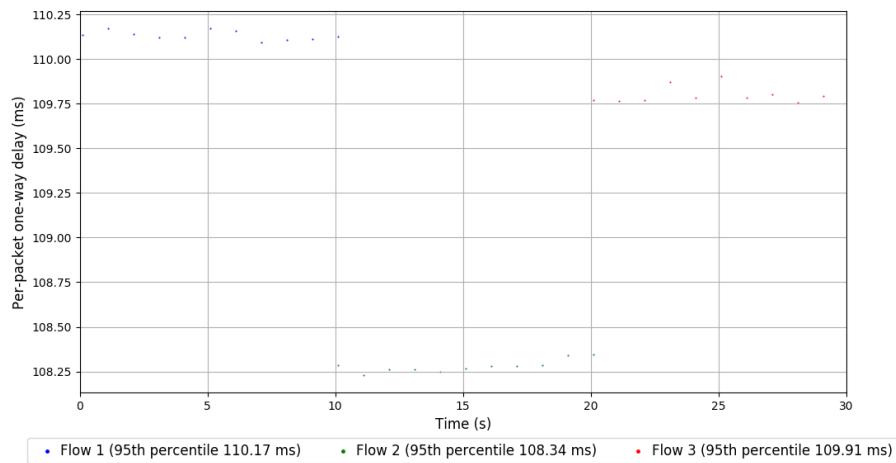
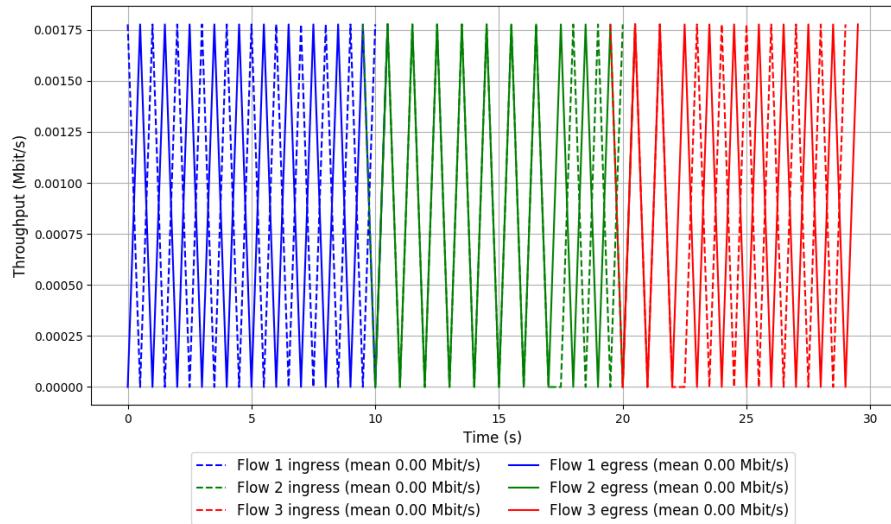


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-08-31 05:25:38
End at: 2018-08-31 05:26:08
Local clock offset: 31.124 ms
Remote clock offset: 31.396 ms

# Below is generated by plot.py at 2018-08-31 05:45:50
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 110.160 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 110.171 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 108.345 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 109.905 ms
Loss rate: 0.00%
```

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-08-31 05:32:55
End at: 2018-08-31 05:33:25
Local clock offset: 21.548 ms
Remote clock offset: 17.115 ms

# Below is generated by plot.py at 2018-08-31 05:45:50
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 115.178 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 113.710 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 115.196 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 114.649 ms
Loss rate: 0.00%
```

Run 2: Report of Muses-25 — Data Link

