

Pantheon Report

Generated at 2018-09-05 23:51:45 (UTC).
Data path: GCE Sydney on `ens4 (local)` → GCE London on `ens4 (remote)`.
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.

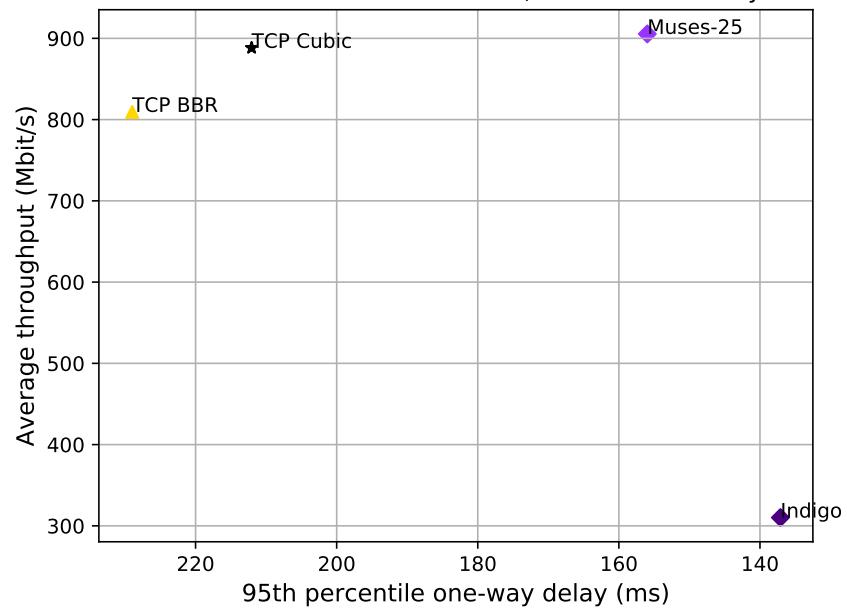
System info:

```
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
```

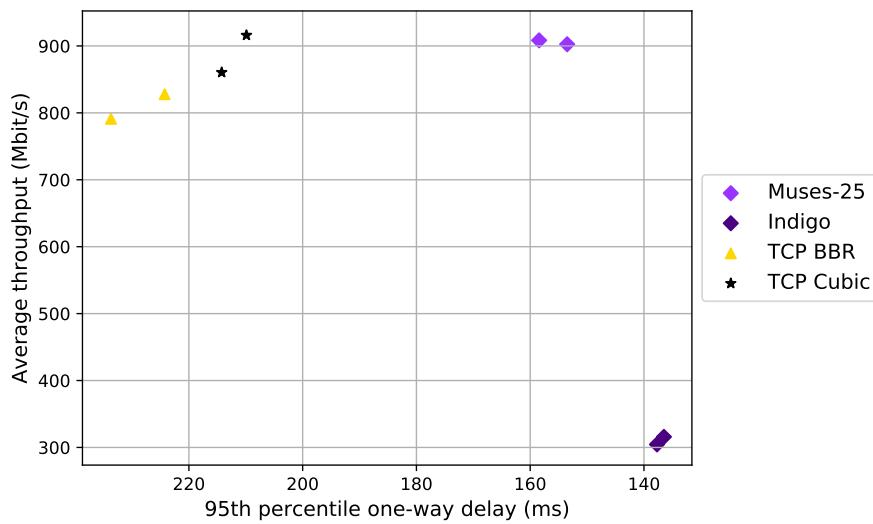
Git summary:

```
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 @ 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 Sydney to GCE London, 2 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)



test from GCE Sydney to GCE London, 2 runs of 30s each per scheme
3 flows with 10s interval between flows



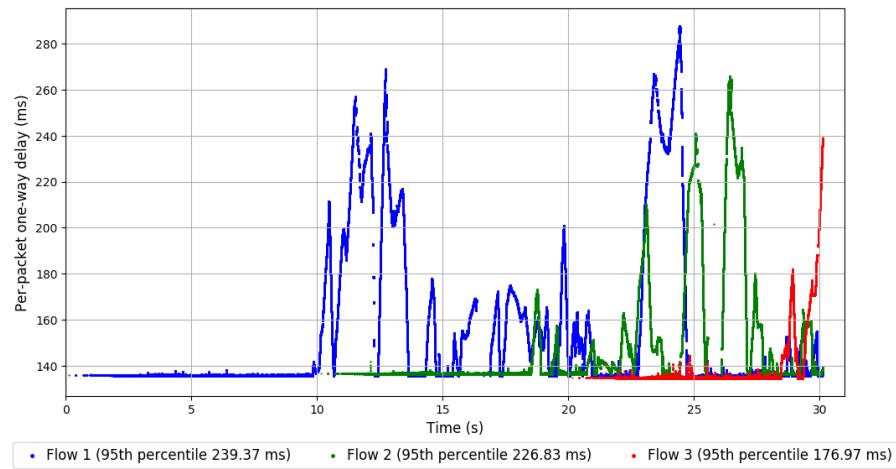
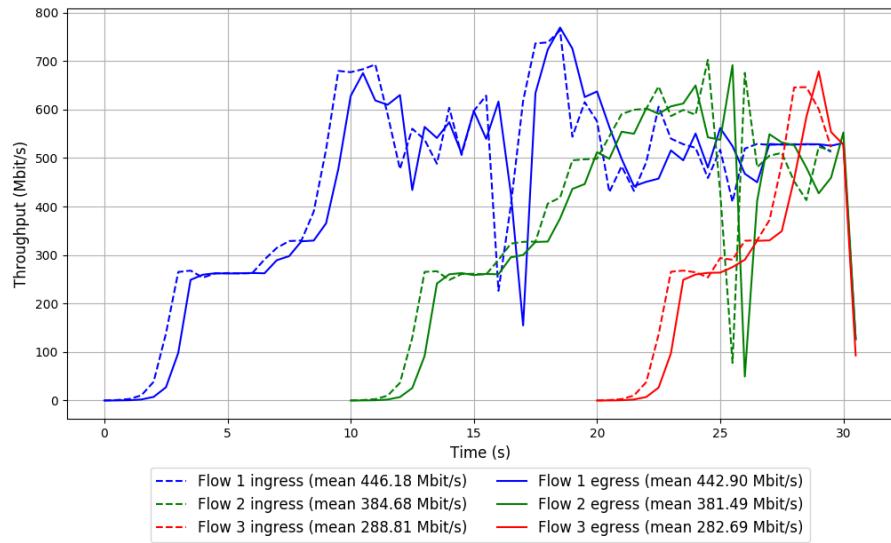
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	456.12	393.78	273.89	228.01	230.57	189.32	0.73	0.98	1.04
TCP Cubic	2	492.32	453.75	281.62	213.79	203.42	209.65	0.18	0.07	0.67
Indigo	2	179.28	132.25	135.32	136.52	137.54	137.67	0.00	0.00	0.00
Muses-25	2	467.96	472.40	385.88	159.88	151.51	152.84	0.00	0.00	0.00

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-05 23:20:49
End at: 2018-09-05 23:21:19
Local clock offset: 6.75 ms
Remote clock offset: 0.763 ms

# Below is generated by plot.py at 2018-09-05 23:50:40
# Datalink statistics
-- Total of 3 flows:
Average throughput: 791.06 Mbit/s
95th percentile per-packet one-way delay: 233.694 ms
Loss rate: 0.93%
-- Flow 1:
Average throughput: 442.90 Mbit/s
95th percentile per-packet one-way delay: 239.372 ms
Loss rate: 0.73%
-- Flow 2:
Average throughput: 381.49 Mbit/s
95th percentile per-packet one-way delay: 226.834 ms
Loss rate: 0.83%
-- Flow 3:
Average throughput: 282.69 Mbit/s
95th percentile per-packet one-way delay: 176.972 ms
Loss rate: 2.09%
```

Run 1: Report of TCP BBR — Data Link

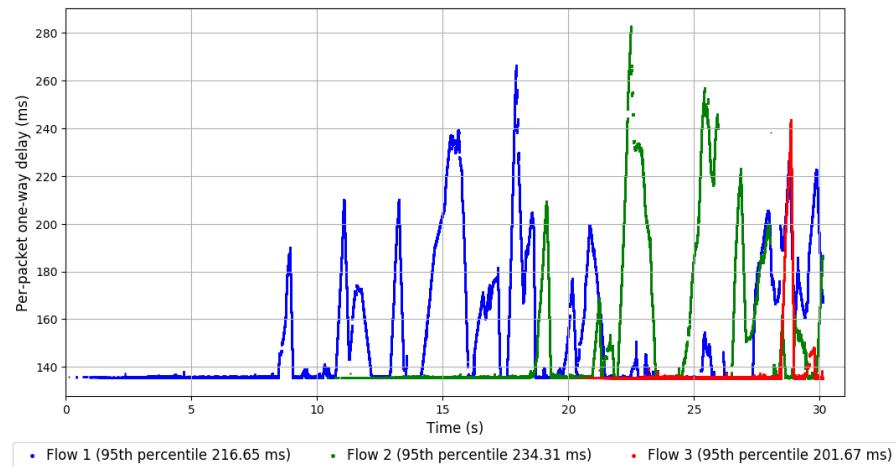
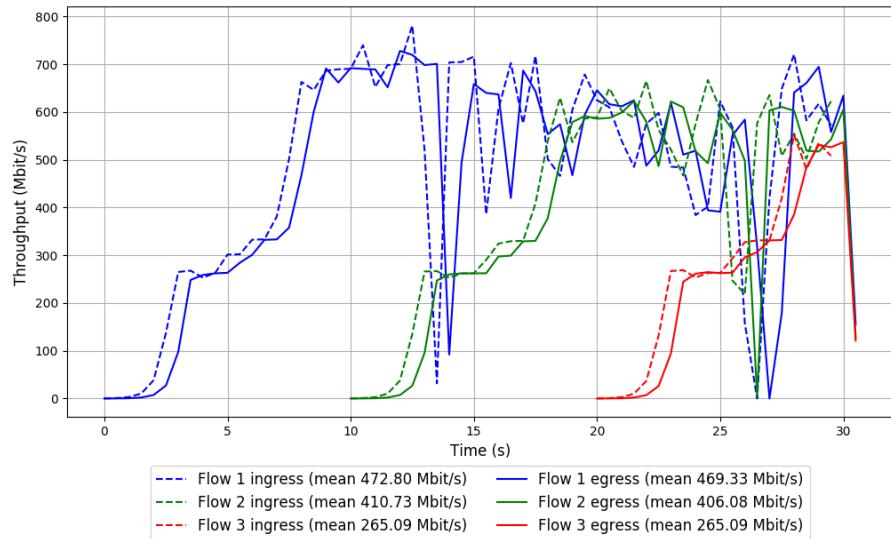


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-05 23:29:16
End at: 2018-09-05 23:29:46
Local clock offset: 4.069 ms
Remote clock offset: 0.404 ms

# Below is generated by plot.py at 2018-09-05 23:51:05
# Datalink statistics
-- Total of 3 flows:
Average throughput: 827.85 Mbit/s
95th percentile per-packet one-way delay: 224.264 ms
Loss rate: 0.78%
-- Flow 1:
Average throughput: 469.33 Mbit/s
95th percentile per-packet one-way delay: 216.650 ms
Loss rate: 0.73%
-- Flow 2:
Average throughput: 406.08 Mbit/s
95th percentile per-packet one-way delay: 234.313 ms
Loss rate: 1.12%
-- Flow 3:
Average throughput: 265.09 Mbit/s
95th percentile per-packet one-way delay: 201.668 ms
Loss rate: 0.00%
```

Run 2: Report of TCP BBR — Data Link

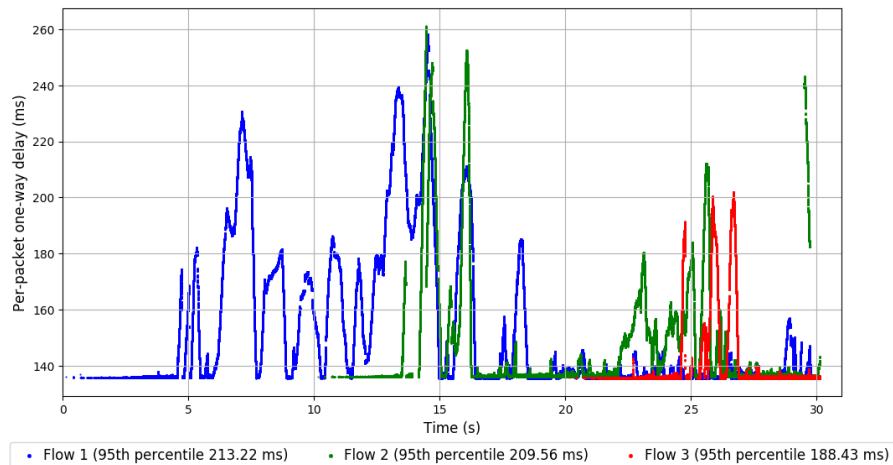
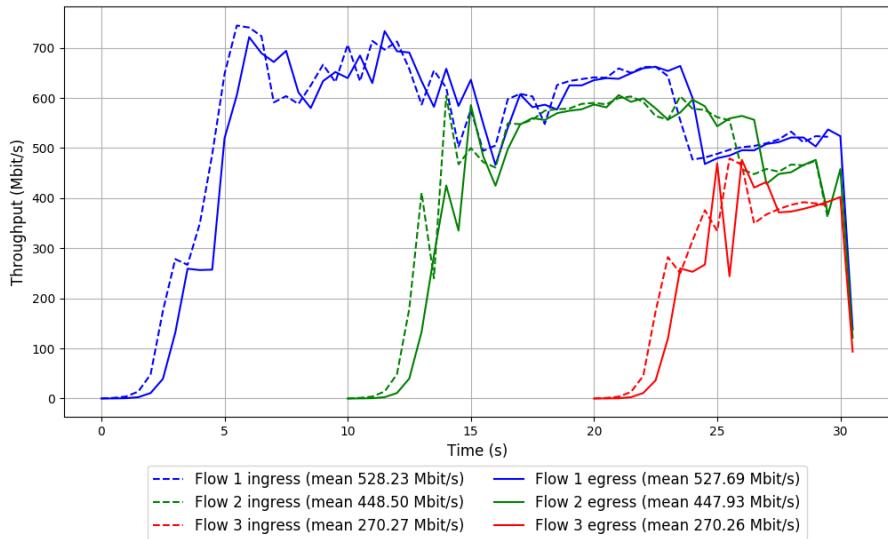


```
Run 1: Statistics of TCP Cubic

Start at: 2018-09-05 23:27:03
End at: 2018-09-05 23:27:33
Local clock offset: 4.297 ms
Remote clock offset: 0.403 ms

# Below is generated by plot.py at 2018-09-05 23:51:44
# Datalink statistics
-- Total of 3 flows:
Average throughput: 916.04 Mbit/s
95th percentile per-packet one-way delay: 209.880 ms
Loss rate: 0.10%
-- Flow 1:
Average throughput: 527.69 Mbit/s
95th percentile per-packet one-way delay: 213.216 ms
Loss rate: 0.10%
-- Flow 2:
Average throughput: 447.93 Mbit/s
95th percentile per-packet one-way delay: 209.559 ms
Loss rate: 0.12%
-- Flow 3:
Average throughput: 270.26 Mbit/s
95th percentile per-packet one-way delay: 188.430 ms
Loss rate: 0.00%
```

Run 1: Report of TCP Cubic — Data Link

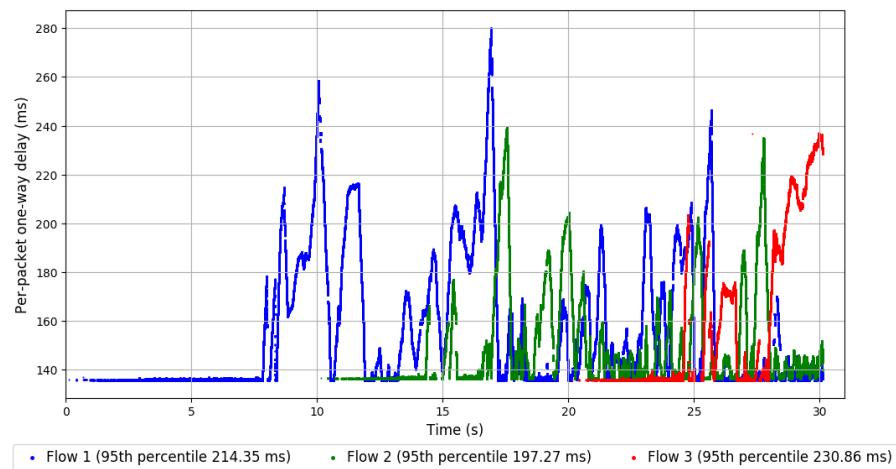
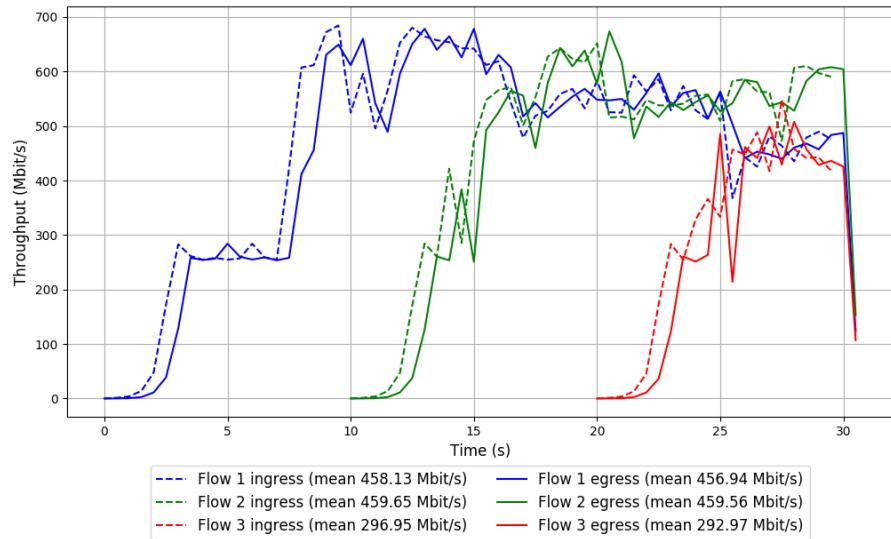


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-05 23:35:31
End at: 2018-09-05 23:36:01
Local clock offset: 3.66 ms
Remote clock offset: 0.521 ms

# Below is generated by plot.py at 2018-09-05 23:51:44
# Datalink statistics
-- Total of 3 flows:
Average throughput: 860.47 Mbit/s
95th percentile per-packet one-way delay: 214.236 ms
Loss rate: 0.29%
-- Flow 1:
Average throughput: 456.94 Mbit/s
95th percentile per-packet one-way delay: 214.354 ms
Loss rate: 0.26%
-- Flow 2:
Average throughput: 459.56 Mbit/s
95th percentile per-packet one-way delay: 197.273 ms
Loss rate: 0.02%
-- Flow 3:
Average throughput: 292.97 Mbit/s
95th percentile per-packet one-way delay: 230.860 ms
Loss rate: 1.33%
```

Run 2: Report of TCP Cubic — Data Link

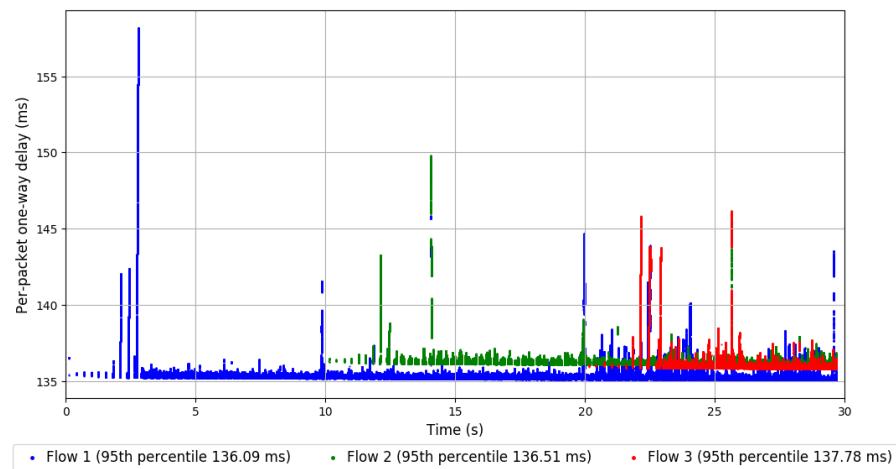
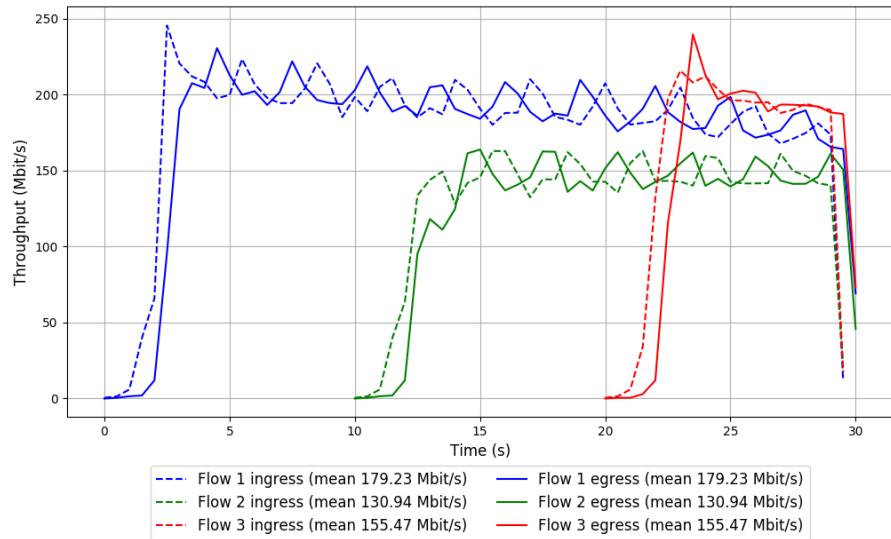


Run 1: Statistics of Indigo

```
Start at: 2018-09-05 23:22:59
End at: 2018-09-05 23:23:29
Local clock offset: 5.645 ms
Remote clock offset: 0.362 ms

# Below is generated by plot.py at 2018-09-05 23:51:44
# Datalink statistics
-- Total of 3 flows:
Average throughput: 315.83 Mbit/s
95th percentile per-packet one-way delay: 136.491 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 179.23 Mbit/s
95th percentile per-packet one-way delay: 136.088 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 130.94 Mbit/s
95th percentile per-packet one-way delay: 136.513 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 155.47 Mbit/s
95th percentile per-packet one-way delay: 137.782 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link

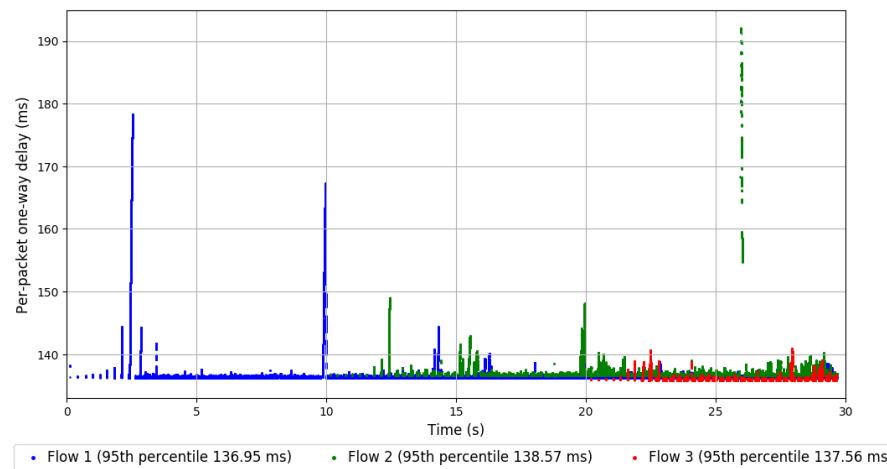
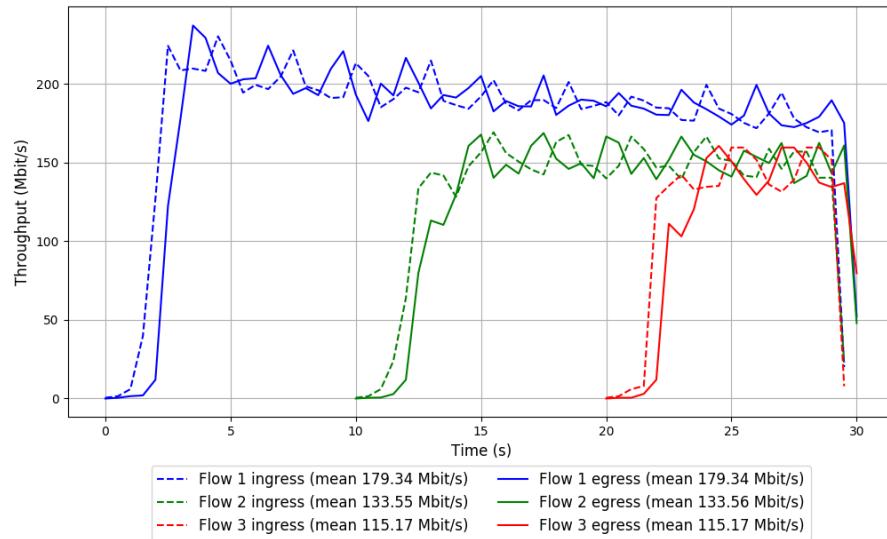


Run 2: Statistics of Indigo

```
Start at: 2018-09-05 23:31:29
End at: 2018-09-05 23:31:59
Local clock offset: 3.556 ms
Remote clock offset: 0.46 ms

# Below is generated by plot.py at 2018-09-05 23:51:44
# Datalink statistics
-- Total of 3 flows:
Average throughput: 304.53 Mbit/s
95th percentile per-packet one-way delay: 137.712 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 179.34 Mbit/s
95th percentile per-packet one-way delay: 136.954 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 133.56 Mbit/s
95th percentile per-packet one-way delay: 138.571 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 115.17 Mbit/s
95th percentile per-packet one-way delay: 137.558 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link

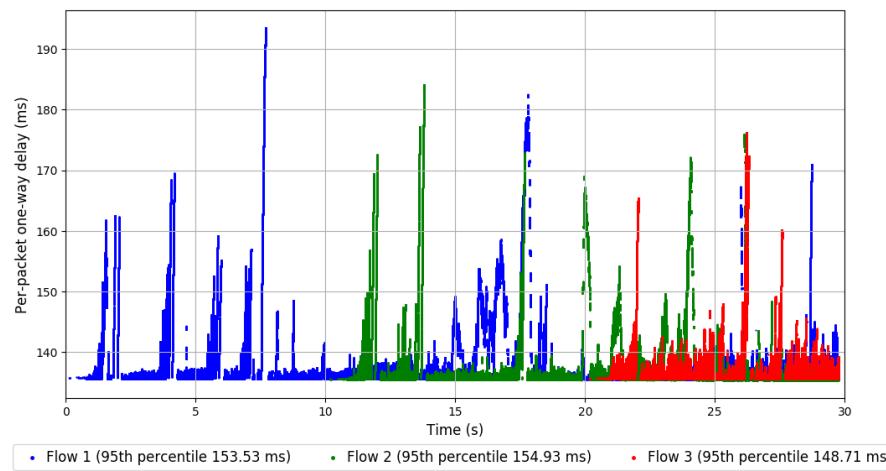
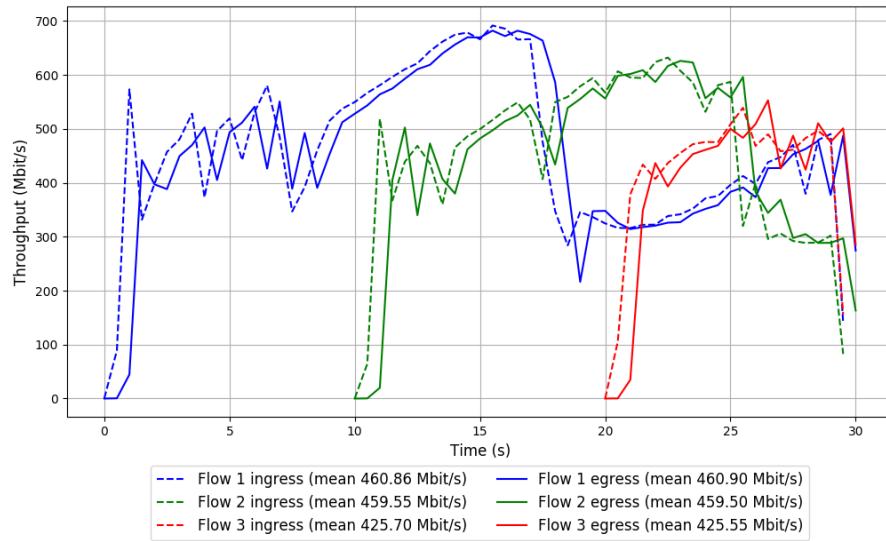


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-09-05 23:24:52
End at: 2018-09-05 23:25:22
Local clock offset: 4.9 ms
Remote clock offset: 0.423 ms

# Below is generated by plot.py at 2018-09-05 23:51:44
# Datalink statistics
-- Total of 3 flows:
Average throughput: 902.53 Mbit/s
95th percentile per-packet one-way delay: 153.501 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 460.90 Mbit/s
95th percentile per-packet one-way delay: 153.529 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 459.50 Mbit/s
95th percentile per-packet one-way delay: 154.928 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 425.55 Mbit/s
95th percentile per-packet one-way delay: 148.705 ms
Loss rate: 0.00%
```

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-09-05 23:33:21
End at: 2018-09-05 23:33:51
Local clock offset: 3.708 ms
Remote clock offset: 0.47 ms

# Below is generated by plot.py at 2018-09-05 23:51:44
# Datalink statistics
-- Total of 3 flows:
Average throughput: 908.37 Mbit/s
95th percentile per-packet one-way delay: 158.436 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 475.02 Mbit/s
95th percentile per-packet one-way delay: 166.226 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 485.30 Mbit/s
95th percentile per-packet one-way delay: 148.102 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 346.22 Mbit/s
95th percentile per-packet one-way delay: 156.981 ms
Loss rate: 0.00%
```

Run 2: Report of Muses-25 — Data Link

