

Pantheon Report

Generated at 2018-09-03 11:13:57 (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.

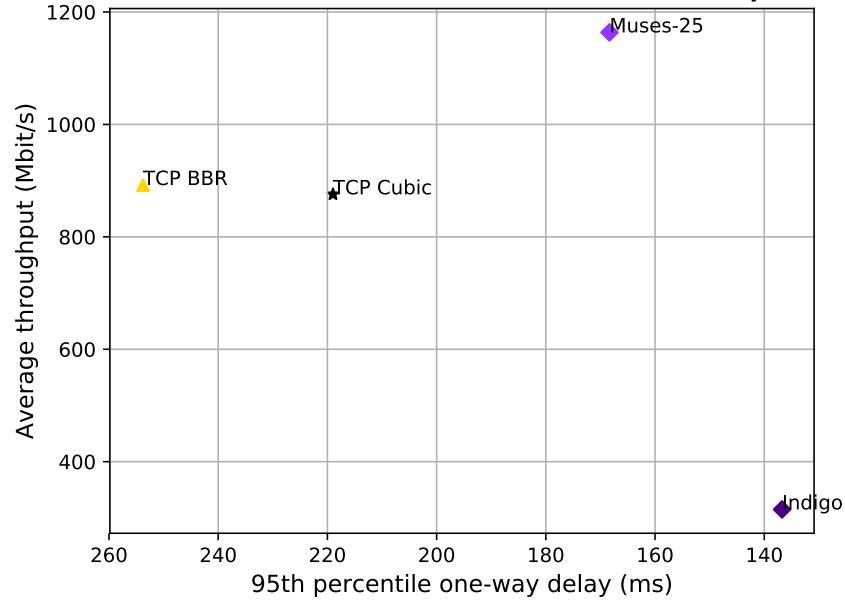
System info:

```
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
```

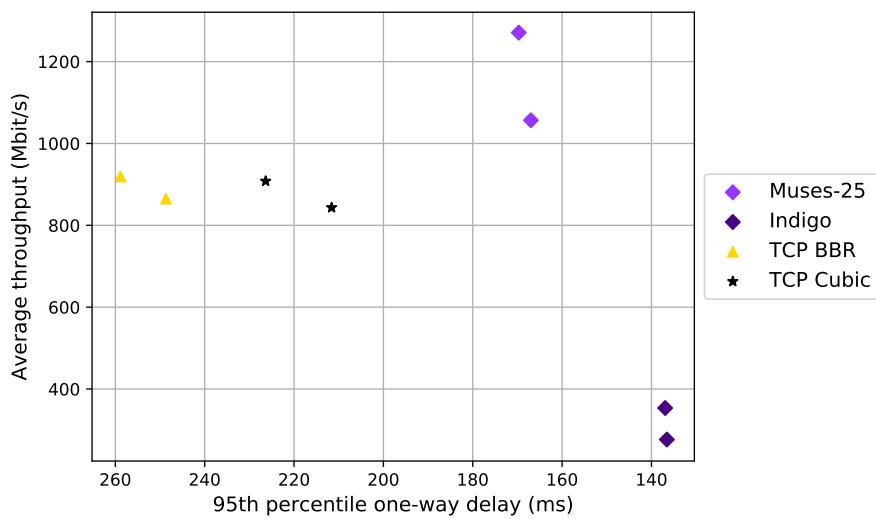
Git summary:

```
branch: muses @ f309f5459e2c5237279a184e52ece7a2b47ef1c9
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b8d5019b83a3a678804d830fcfe1da7b3a63421b
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



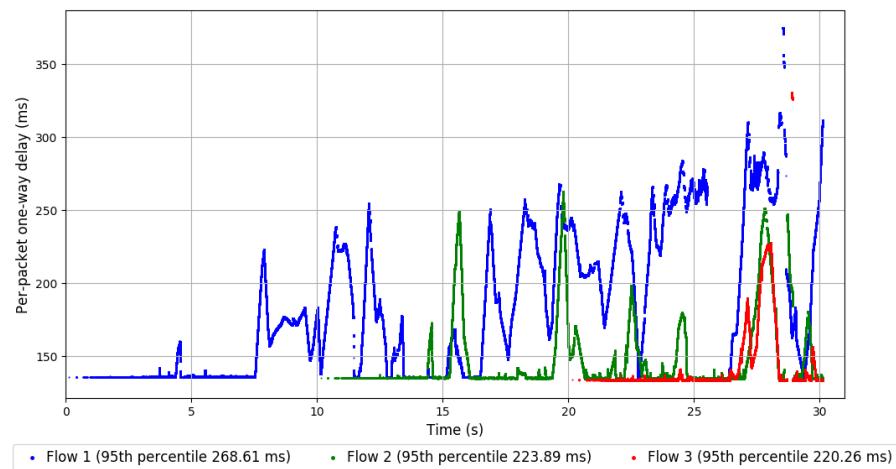
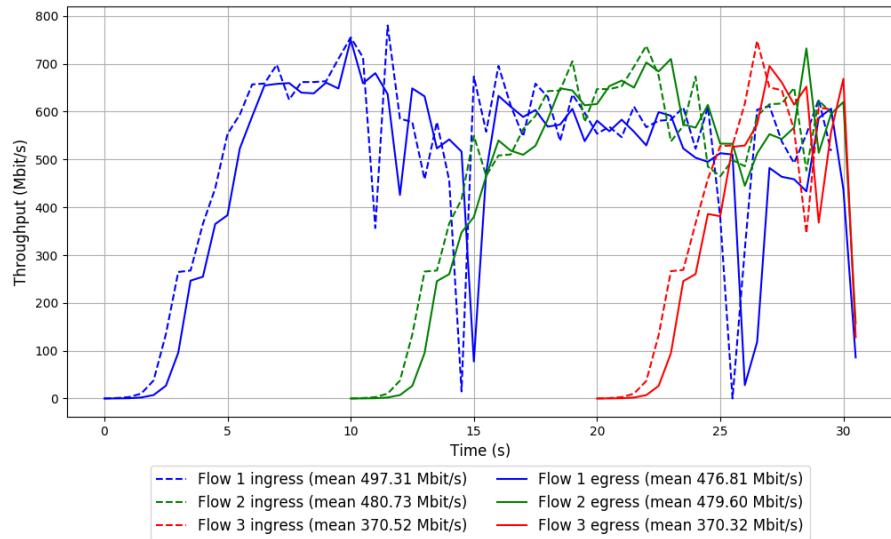
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	484.65	426.42	371.62	256.99	236.13	239.96	3.50	1.75	2.30
TCP Cubic	2	501.49	425.95	272.14	207.11	207.41	193.27	0.01	0.64	0.36
Indigo	2	162.34	155.18	156.09	136.38	136.71	139.00	0.00	0.01	0.01
Muses-25	2	676.54	486.02	512.75	169.96	164.26	170.36	0.04	0.23	0.11

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-03 10:45:11
End at: 2018-09-03 10:45:41
Local clock offset: 4.927 ms
Remote clock offset: 0.374 ms

# Below is generated by plot.py at 2018-09-03 11:13:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 919.35 Mbit/s
95th percentile per-packet one-way delay: 258.864 ms
Loss rate: 2.27%
-- Flow 1:
Average throughput: 476.81 Mbit/s
95th percentile per-packet one-way delay: 268.613 ms
Loss rate: 4.13%
-- Flow 2:
Average throughput: 479.60 Mbit/s
95th percentile per-packet one-way delay: 223.893 ms
Loss rate: 0.24%
-- Flow 3:
Average throughput: 370.32 Mbit/s
95th percentile per-packet one-way delay: 220.260 ms
Loss rate: 0.06%
```

Run 1: Report of TCP BBR — Data Link

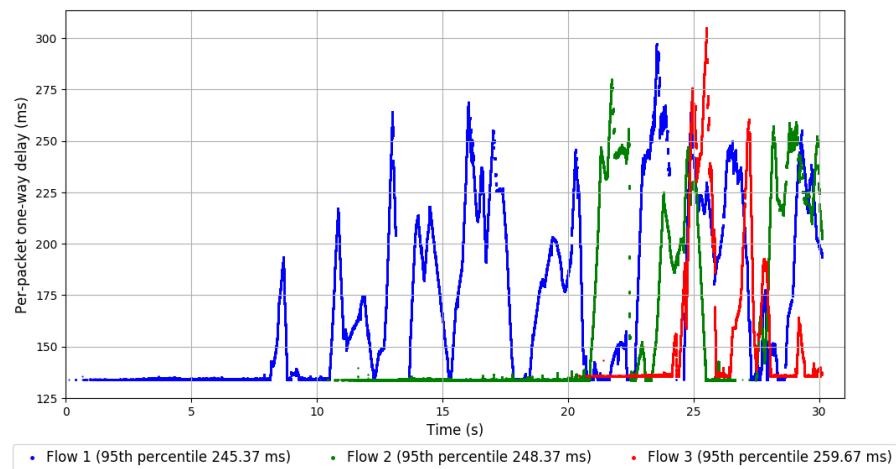
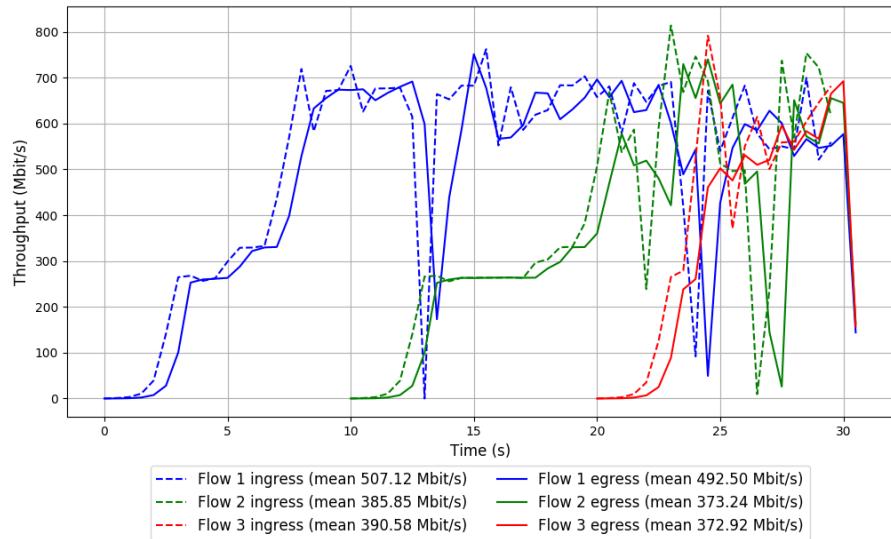


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-03 10:53:44
End at: 2018-09-03 10:54:14
Local clock offset: 3.413 ms
Remote clock offset: -0.088 ms

# Below is generated by plot.py at 2018-09-03 11:13:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 864.95 Mbit/s
95th percentile per-packet one-way delay: 248.666 ms
Loss rate: 3.23%
-- Flow 1:
Average throughput: 492.50 Mbit/s
95th percentile per-packet one-way delay: 245.368 ms
Loss rate: 2.88%
-- Flow 2:
Average throughput: 373.24 Mbit/s
95th percentile per-packet one-way delay: 248.371 ms
Loss rate: 3.27%
-- Flow 3:
Average throughput: 372.92 Mbit/s
95th percentile per-packet one-way delay: 259.666 ms
Loss rate: 4.54%
```

Run 2: Report of TCP BBR — Data Link

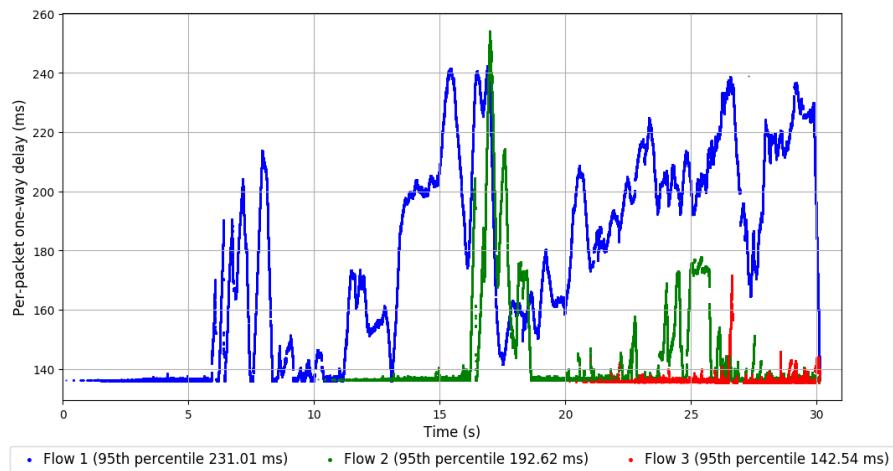
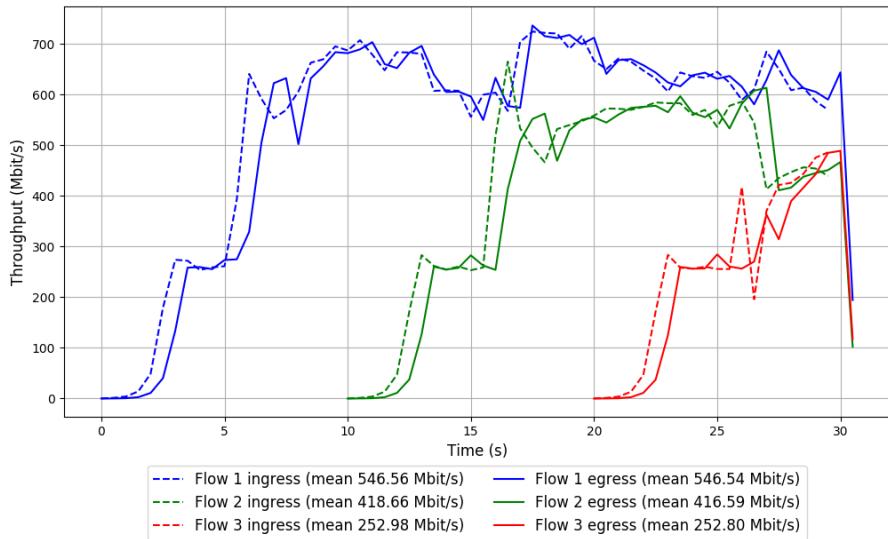


Run 1: Statistics of TCP Cubic

```
Start at: 2018-09-03 10:43:02
End at: 2018-09-03 10:43:32
Local clock offset: 5.718 ms
Remote clock offset: 1.656 ms

# Below is generated by plot.py at 2018-09-03 11:13:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 908.03 Mbit/s
95th percentile per-packet one-way delay: 226.362 ms
Loss rate: 0.16%
-- Flow 1:
Average throughput: 546.54 Mbit/s
95th percentile per-packet one-way delay: 231.013 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 416.59 Mbit/s
95th percentile per-packet one-way delay: 192.620 ms
Loss rate: 0.50%
-- Flow 3:
Average throughput: 252.80 Mbit/s
95th percentile per-packet one-way delay: 142.539 ms
Loss rate: 0.07%
```

Run 1: Report of TCP Cubic — Data Link

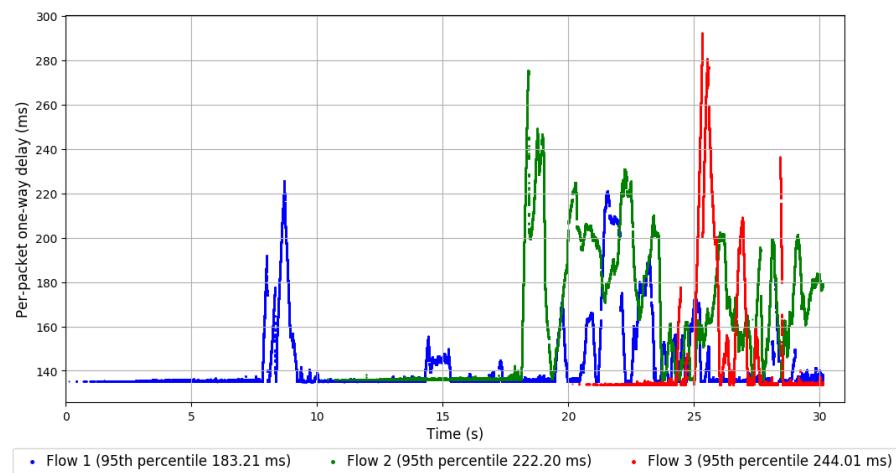
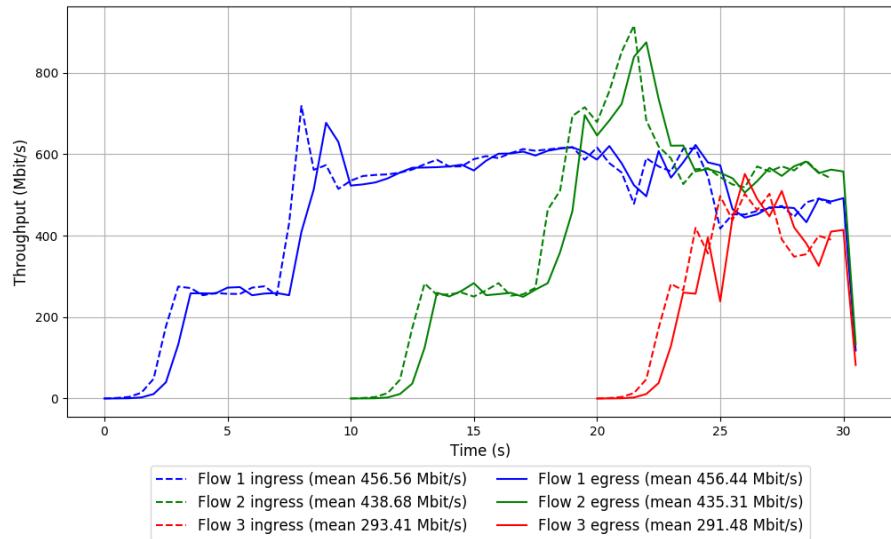


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-03 10:51:38
End at: 2018-09-03 10:52:08
Local clock offset: 3.73 ms
Remote clock offset: 0.563 ms

# Below is generated by plot.py at 2018-09-03 11:13:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 843.28 Mbit/s
95th percentile per-packet one-way delay: 211.602 ms
Loss rate: 0.36%
-- Flow 1:
Average throughput: 456.44 Mbit/s
95th percentile per-packet one-way delay: 183.211 ms
Loss rate: 0.03%
-- Flow 2:
Average throughput: 435.31 Mbit/s
95th percentile per-packet one-way delay: 222.202 ms
Loss rate: 0.78%
-- Flow 3:
Average throughput: 291.48 Mbit/s
95th percentile per-packet one-way delay: 244.007 ms
Loss rate: 0.66%
```

Run 2: Report of TCP Cubic — Data Link

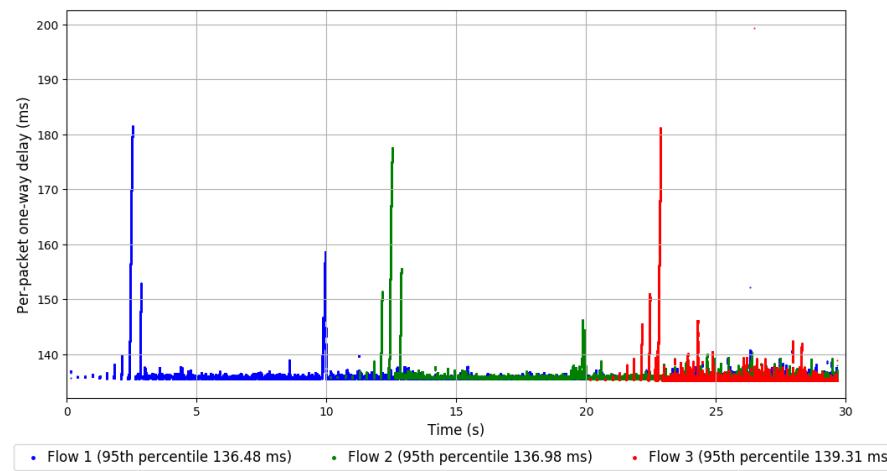
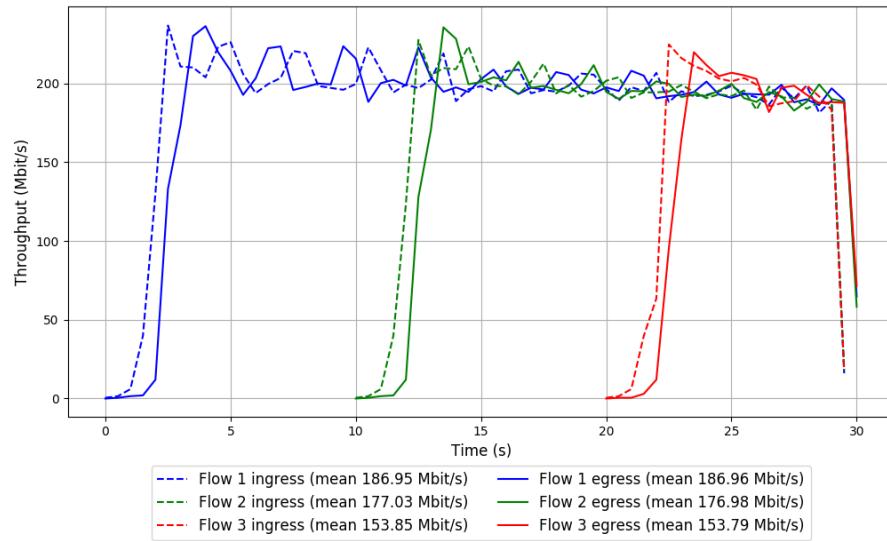


Run 1: Statistics of Indigo

```
Start at: 2018-09-03 10:47:28
End at: 2018-09-03 10:47:58
Local clock offset: 3.974 ms
Remote clock offset: 0.795 ms

# Below is generated by plot.py at 2018-09-03 11:13:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 353.53 Mbit/s
95th percentile per-packet one-way delay: 136.929 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 186.96 Mbit/s
95th percentile per-packet one-way delay: 136.482 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 176.98 Mbit/s
95th percentile per-packet one-way delay: 136.983 ms
Loss rate: 0.03%
-- Flow 3:
Average throughput: 153.79 Mbit/s
95th percentile per-packet one-way delay: 139.312 ms
Loss rate: 0.01%
```

Run 1: Report of Indigo — Data Link

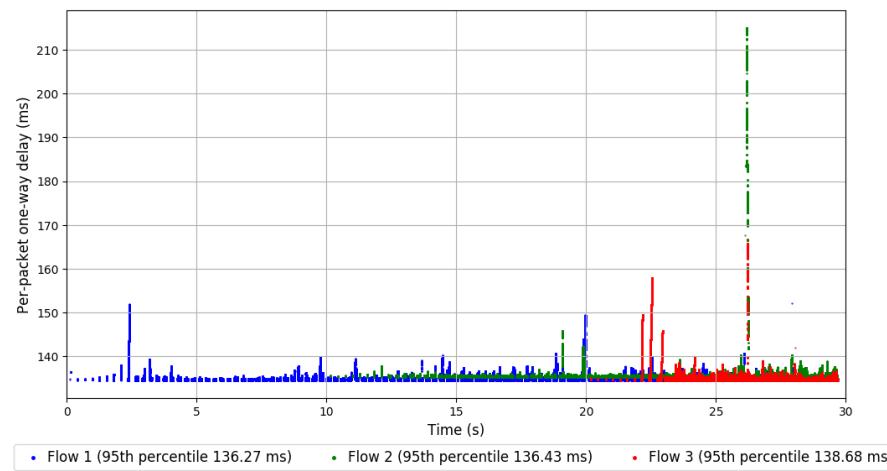
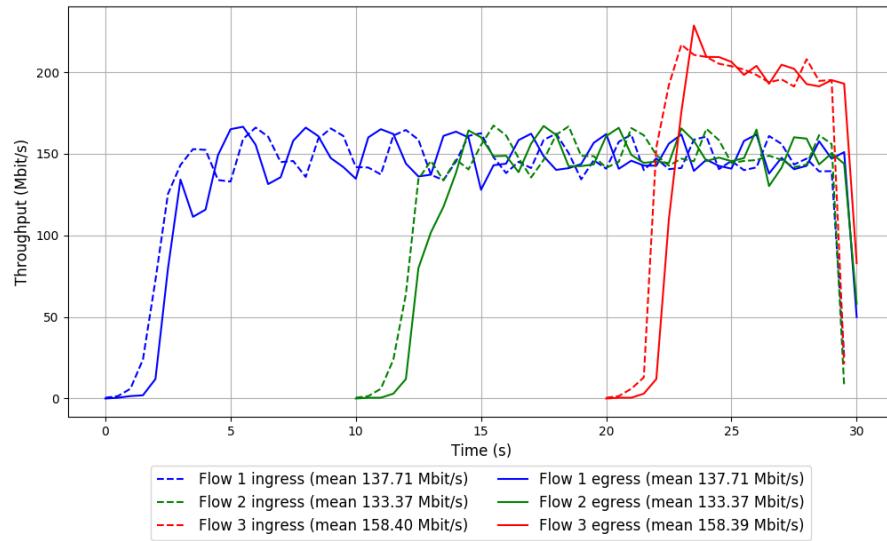


Run 2: Statistics of Indigo

```
Start at: 2018-09-03 10:55:57
End at: 2018-09-03 10:56:27
Local clock offset: 3.427 ms
Remote clock offset: 0.514 ms

# Below is generated by plot.py at 2018-09-03 11:13:01
# Datalink statistics
-- Total of 3 flows:
Average throughput: 276.62 Mbit/s
95th percentile per-packet one-way delay: 136.554 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 137.71 Mbit/s
95th percentile per-packet one-way delay: 136.274 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 133.37 Mbit/s
95th percentile per-packet one-way delay: 136.433 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 158.39 Mbit/s
95th percentile per-packet one-way delay: 138.678 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link

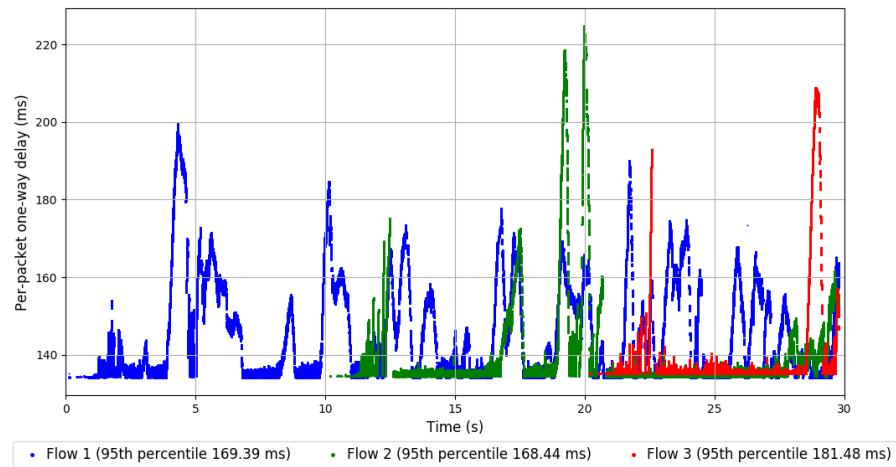
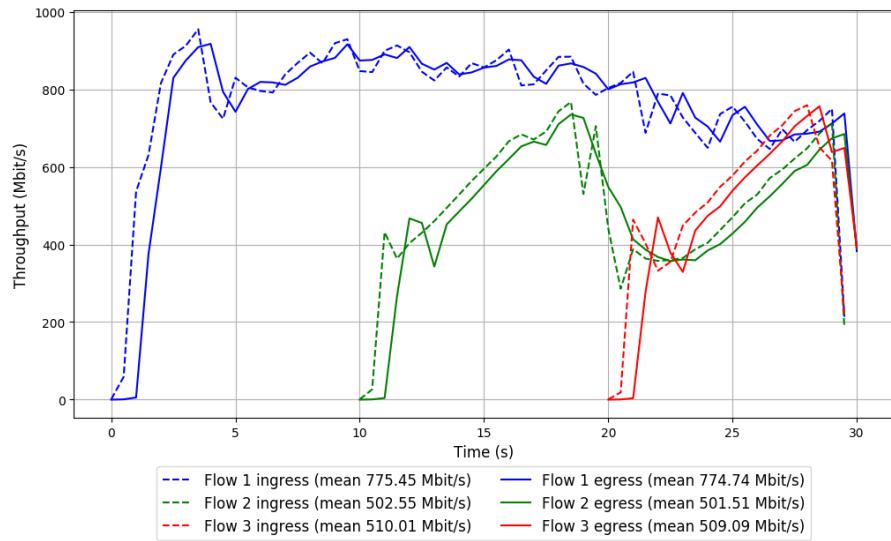


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-09-03 10:49:23
End at: 2018-09-03 10:49:53
Local clock offset: 3.952 ms
Remote clock offset: 0.842 ms

# Below is generated by plot.py at 2018-09-03 11:13:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1270.84 Mbit/s
95th percentile per-packet one-way delay: 169.696 ms
Loss rate: 0.13%
-- Flow 1:
Average throughput: 774.74 Mbit/s
95th percentile per-packet one-way delay: 169.390 ms
Loss rate: 0.09%
-- Flow 2:
Average throughput: 501.51 Mbit/s
95th percentile per-packet one-way delay: 168.445 ms
Loss rate: 0.20%
-- Flow 3:
Average throughput: 509.09 Mbit/s
95th percentile per-packet one-way delay: 181.480 ms
Loss rate: 0.18%
```

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-09-03 10:57:43
End at: 2018-09-03 10:58:13
Local clock offset: 3.444 ms
Remote clock offset: 0.35 ms

# Below is generated by plot.py at 2018-09-03 11:13:56
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1056.66 Mbit/s
95th percentile per-packet one-way delay: 166.986 ms
Loss rate: 0.08%
-- Flow 1:
Average throughput: 578.33 Mbit/s
95th percentile per-packet one-way delay: 170.525 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 470.53 Mbit/s
95th percentile per-packet one-way delay: 160.076 ms
Loss rate: 0.25%
-- Flow 3:
Average throughput: 516.42 Mbit/s
95th percentile per-packet one-way delay: 159.235 ms
Loss rate: 0.05%
```

Run 2: Report of Muses-25 — Data Link

