

Pantheon Report

Generated at 2018-09-03 14:14:06 (UTC).
Data path: GCE Iowa on `ens4` (*remote*) → GCE London 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.

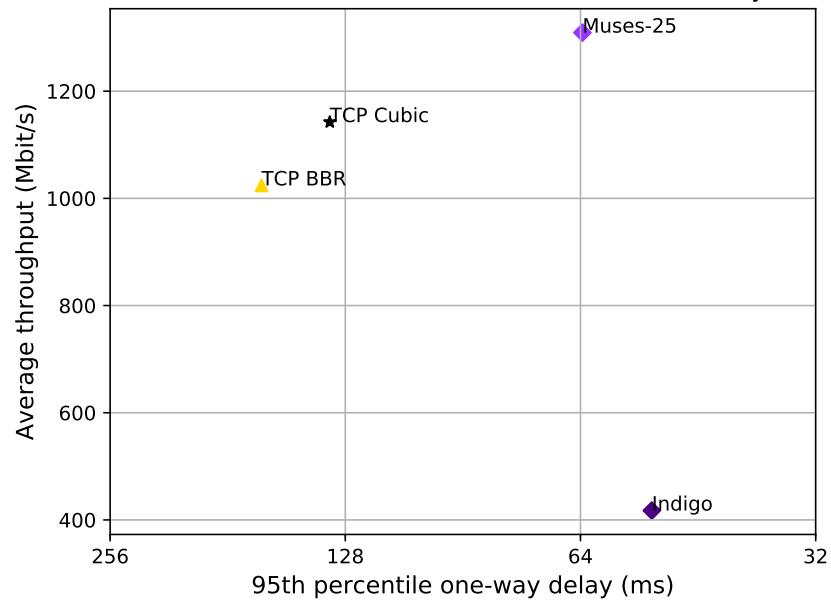
System info:

```
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
```

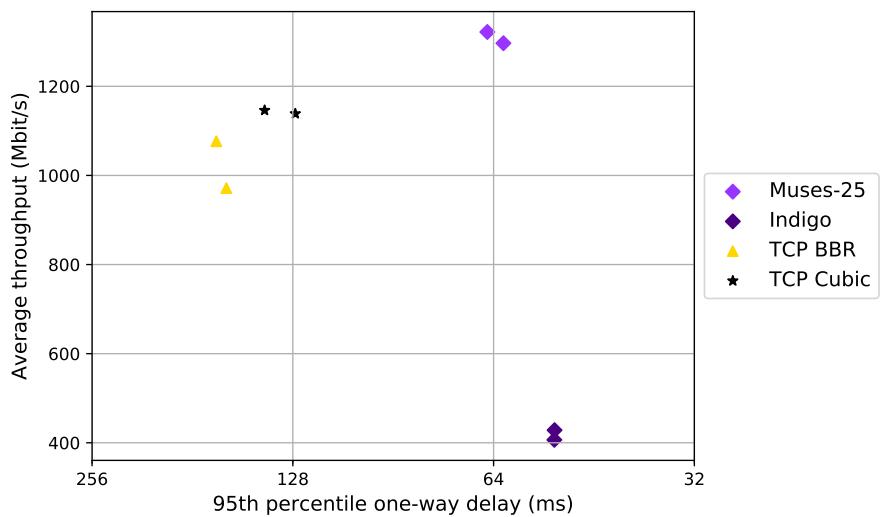
Git summary:

```
branch: muses @ 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 Iowa 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 Iowa to GCE London, 2 runs of 30s each per scheme
3 flows with 10s interval between flows



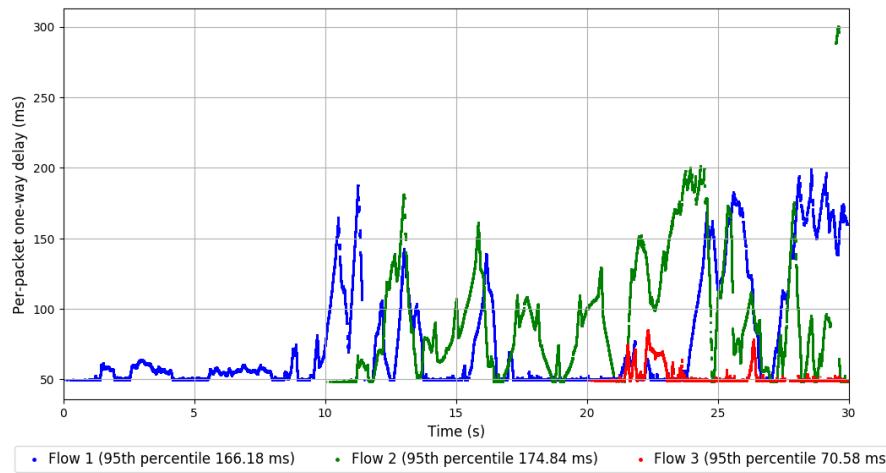
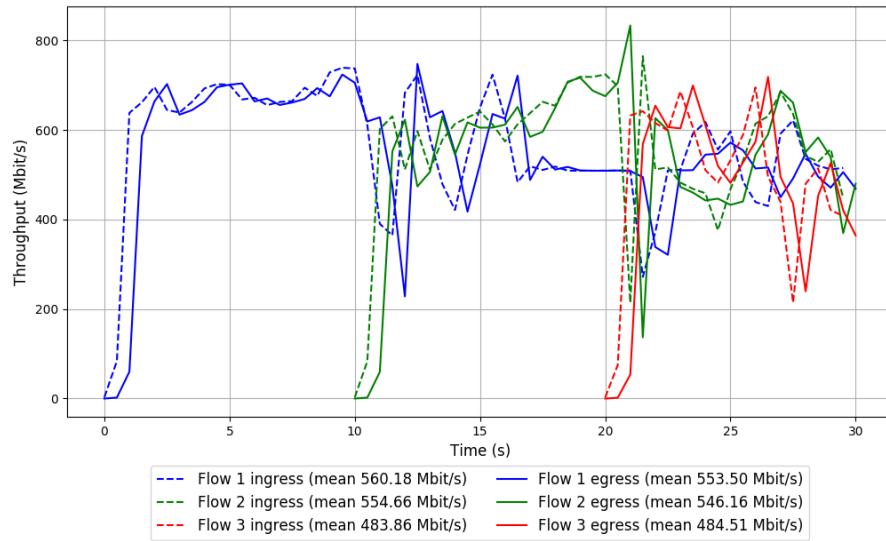
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	525.27	529.27	444.96	164.94	170.33	78.76	1.73	1.86	0.92
TCP Cubic	2	575.40	587.94	532.93	94.63	141.71	121.34	0.35	0.44	1.08
Indigo	2	220.53	208.07	181.34	51.35	52.31	51.89	0.35	0.51	1.17
Muses-25	2	700.28	627.20	590.36	63.73	66.47	57.48	0.33	0.48	1.19

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-03 13:41:42
End at: 2018-09-03 13:42:12
Local clock offset: -0.971 ms
Remote clock offset: -0.077 ms

# Below is generated by plot.py at 2018-09-03 14:12:34
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1076.62 Mbit/s
95th percentile per-packet one-way delay: 166.678 ms
Loss rate: 1.60%
-- Flow 1:
Average throughput: 553.50 Mbit/s
95th percentile per-packet one-way delay: 166.181 ms
Loss rate: 1.53%
-- Flow 2:
Average throughput: 546.16 Mbit/s
95th percentile per-packet one-way delay: 174.838 ms
Loss rate: 2.03%
-- Flow 3:
Average throughput: 484.51 Mbit/s
95th percentile per-packet one-way delay: 70.585 ms
Loss rate: 0.89%
```

Run 1: Report of TCP BBR — Data Link

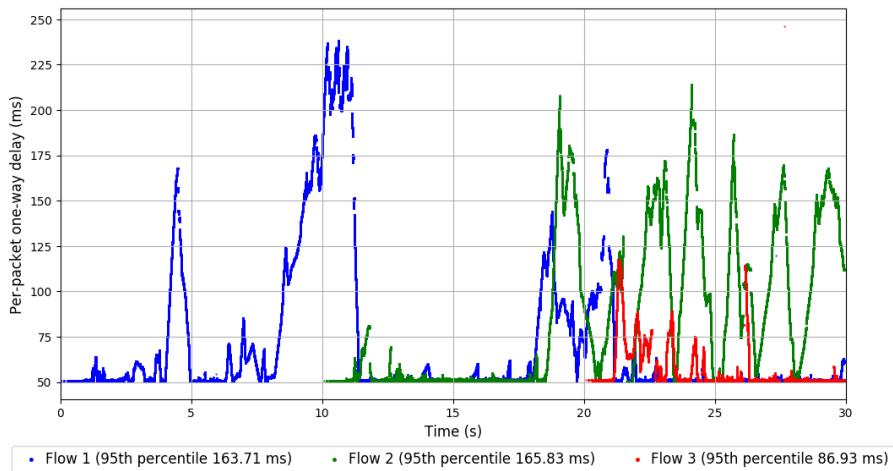
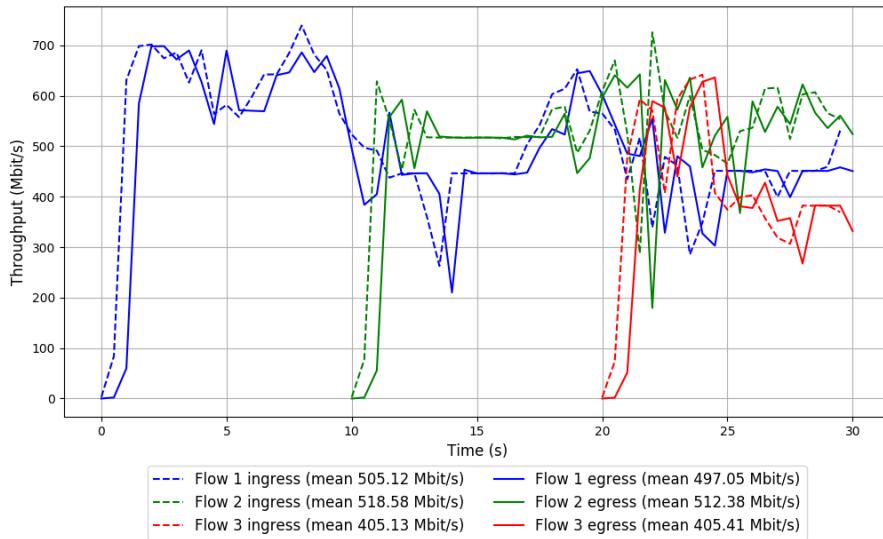


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-03 13:49:37
End at: 2018-09-03 13:50:07
Local clock offset: -0.064 ms
Remote clock offset: -0.023 ms

# Below is generated by plot.py at 2018-09-03 14:12:34
# Datalink statistics
-- Total of 3 flows:
Average throughput: 971.63 Mbit/s
95th percentile per-packet one-way delay: 161.014 ms
Loss rate: 1.71%
-- Flow 1:
Average throughput: 497.05 Mbit/s
95th percentile per-packet one-way delay: 163.707 ms
Loss rate: 1.93%
-- Flow 2:
Average throughput: 512.38 Mbit/s
95th percentile per-packet one-way delay: 165.830 ms
Loss rate: 1.69%
-- Flow 3:
Average throughput: 405.41 Mbit/s
95th percentile per-packet one-way delay: 86.928 ms
Loss rate: 0.95%
```

Run 2: Report of TCP BBR — Data Link

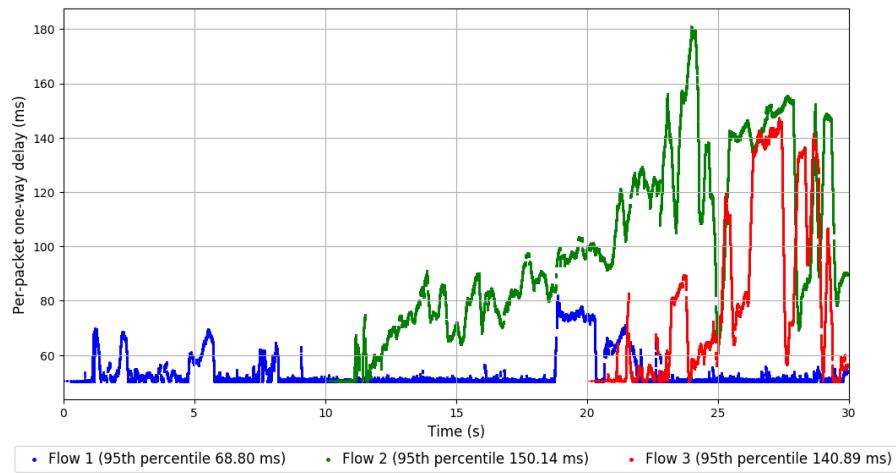
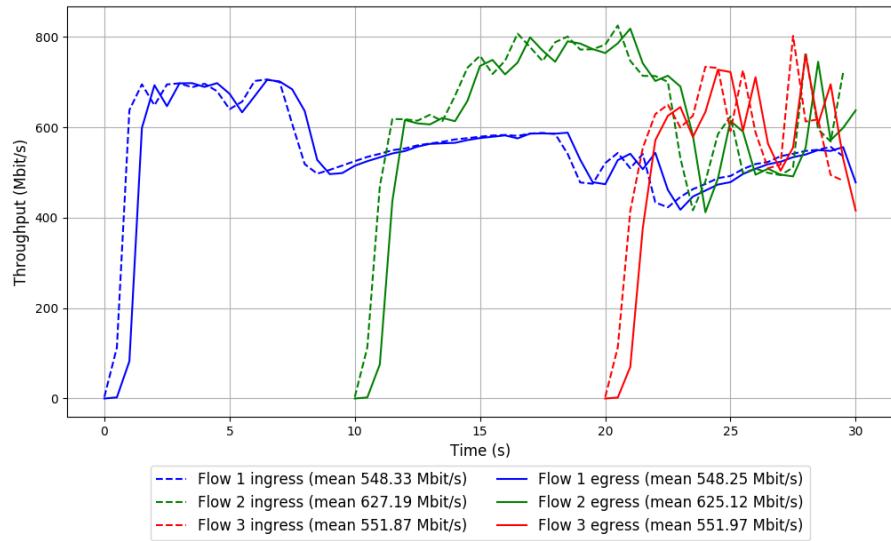


Run 1: Statistics of TCP Cubic

```
Start at: 2018-09-03 13:39:39
End at: 2018-09-03 13:40:09
Local clock offset: -0.316 ms
Remote clock offset: -0.057 ms

# Below is generated by plot.py at 2018-09-03 14:13:21
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1146.11 Mbit/s
95th percentile per-packet one-way delay: 141.096 ms
Loss rate: 0.62%
-- Flow 1:
Average throughput: 548.25 Mbit/s
95th percentile per-packet one-way delay: 68.799 ms
Loss rate: 0.35%
-- Flow 2:
Average throughput: 625.12 Mbit/s
95th percentile per-packet one-way delay: 150.144 ms
Loss rate: 0.83%
-- Flow 3:
Average throughput: 551.97 Mbit/s
95th percentile per-packet one-way delay: 140.886 ms
Loss rate: 0.98%
```

Run 1: Report of TCP Cubic — Data Link

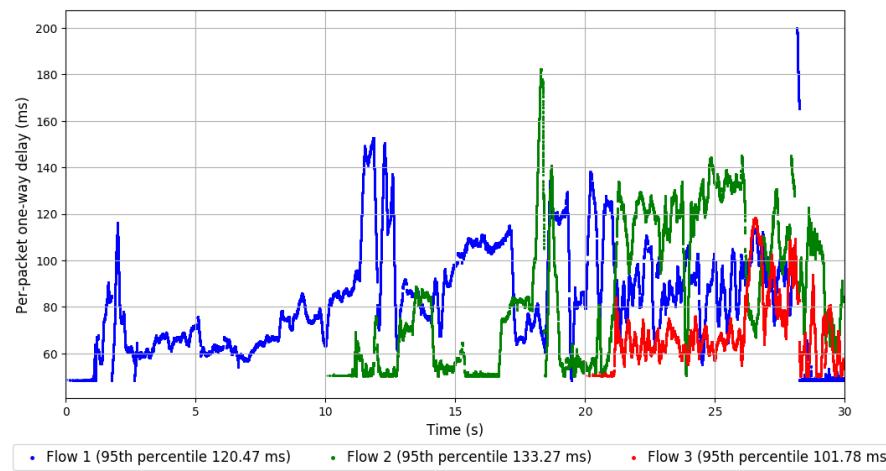
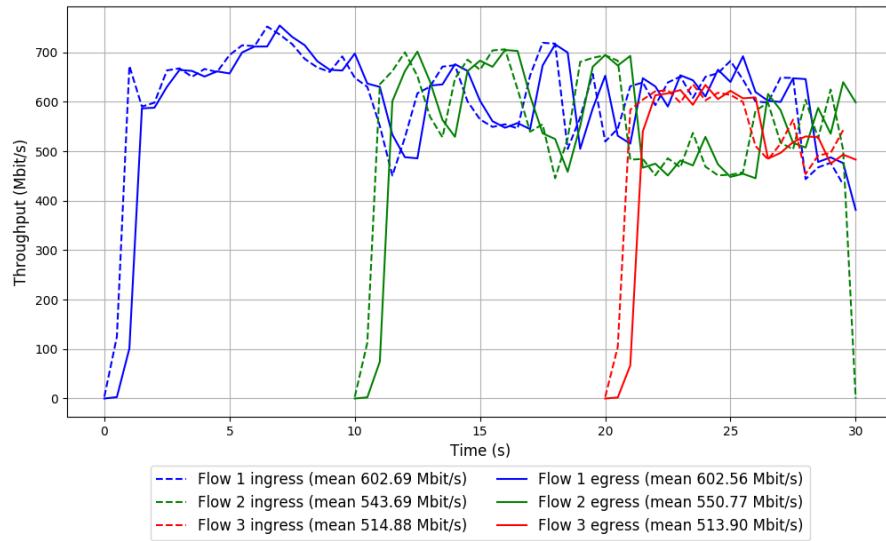


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-03 13:47:34
End at: 2018-09-03 13:48:04
Local clock offset: -0.432 ms
Remote clock offset: 0.021 ms

# Below is generated by plot.py at 2018-09-03 14:13:21
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1138.49 Mbit/s
95th percentile per-packet one-way delay: 126.894 ms
Loss rate: 0.38%
-- Flow 1:
Average throughput: 602.56 Mbit/s
95th percentile per-packet one-way delay: 120.468 ms
Loss rate: 0.35%
-- Flow 2:
Average throughput: 550.77 Mbit/s
95th percentile per-packet one-way delay: 133.269 ms
Loss rate: 0.06%
-- Flow 3:
Average throughput: 513.90 Mbit/s
95th percentile per-packet one-way delay: 101.785 ms
Loss rate: 1.19%
```

Run 2: Report of TCP Cubic — Data Link

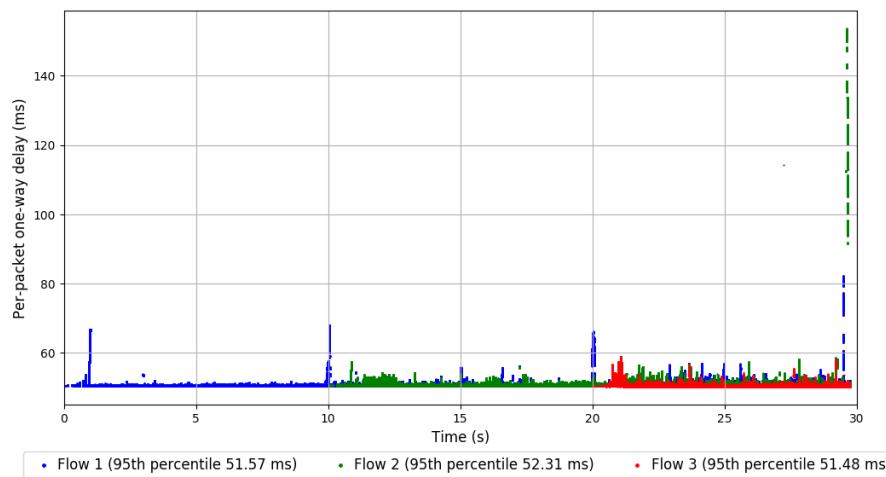
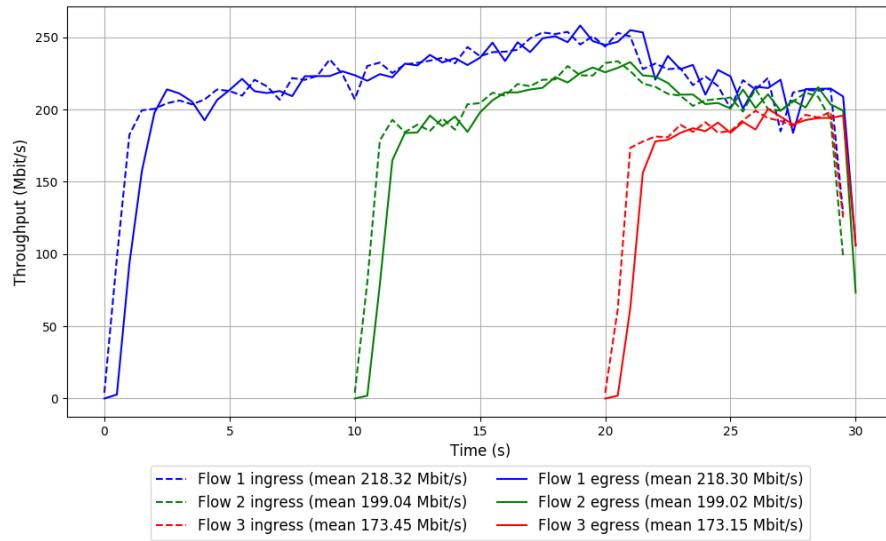


Run 1: Statistics of Indigo

```
Start at: 2018-09-03 13:43:47
End at: 2018-09-03 13:44:17
Local clock offset: -0.314 ms
Remote clock offset: -0.041 ms

# Below is generated by plot.py at 2018-09-03 14:13:21
# Datalink statistics
-- Total of 3 flows:
Average throughput: 406.60 Mbit/s
95th percentile per-packet one-way delay: 51.887 ms
Loss rate: 0.52%
-- Flow 1:
Average throughput: 218.30 Mbit/s
95th percentile per-packet one-way delay: 51.568 ms
Loss rate: 0.35%
-- Flow 2:
Average throughput: 199.02 Mbit/s
95th percentile per-packet one-way delay: 52.310 ms
Loss rate: 0.52%
-- Flow 3:
Average throughput: 173.15 Mbit/s
95th percentile per-packet one-way delay: 51.482 ms
Loss rate: 1.19%
```

Run 1: Report of Indigo — Data Link

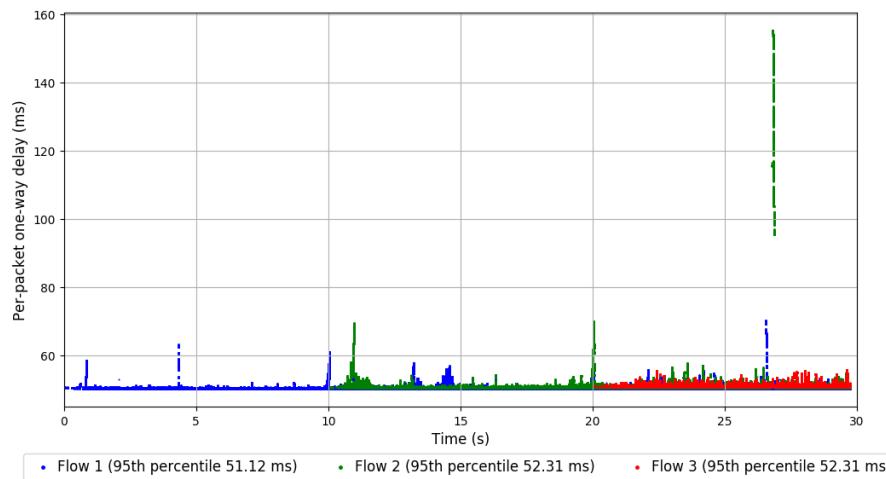
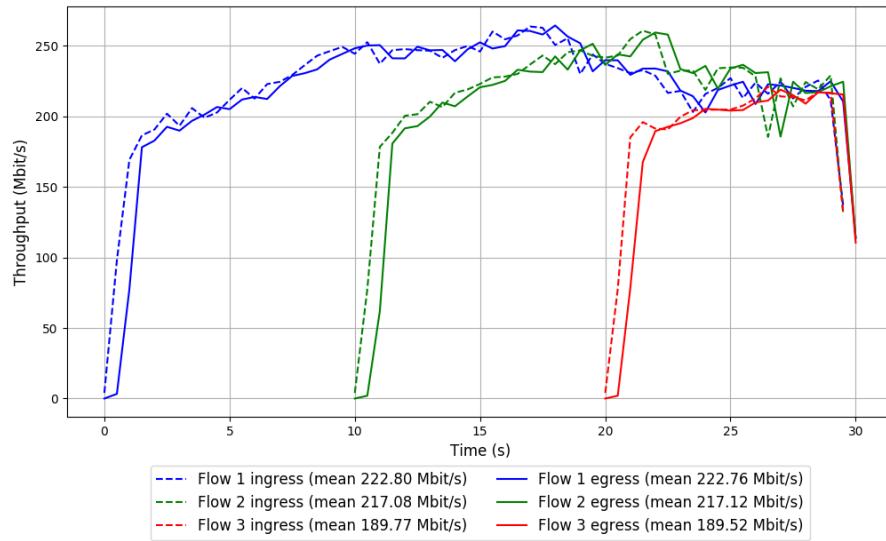


Run 2: Statistics of Indigo

```
Start at: 2018-09-03 13:51:37
End at: 2018-09-03 13:52:07
Local clock offset: 0.15 ms
Remote clock offset: 0.031 ms

# Below is generated by plot.py at 2018-09-03 14:13:21
# Datalink statistics
-- Total of 3 flows:
Average throughput: 428.36 Mbit/s
95th percentile per-packet one-way delay: 51.853 ms
Loss rate: 0.52%
-- Flow 1:
Average throughput: 222.76 Mbit/s
95th percentile per-packet one-way delay: 51.125 ms
Loss rate: 0.35%
-- Flow 2:
Average throughput: 217.12 Mbit/s
95th percentile per-packet one-way delay: 52.308 ms
Loss rate: 0.49%
-- Flow 3:
Average throughput: 189.52 Mbit/s
95th percentile per-packet one-way delay: 52.306 ms
Loss rate: 1.16%
```

Run 2: Report of Indigo — Data Link

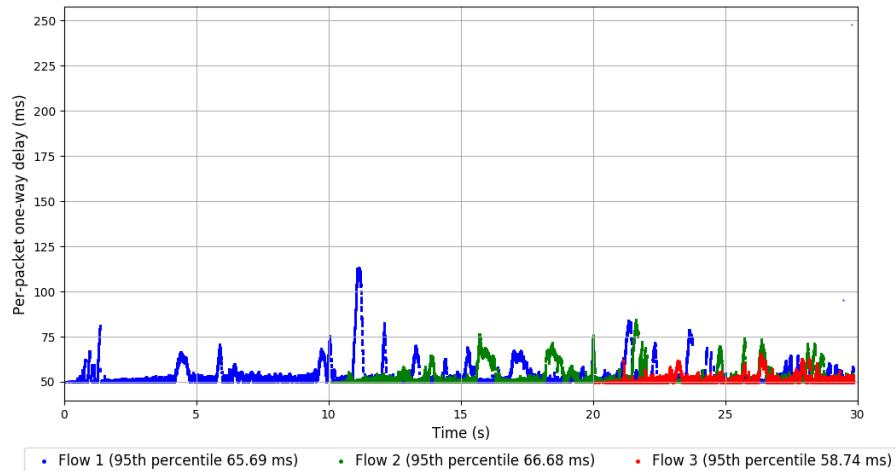
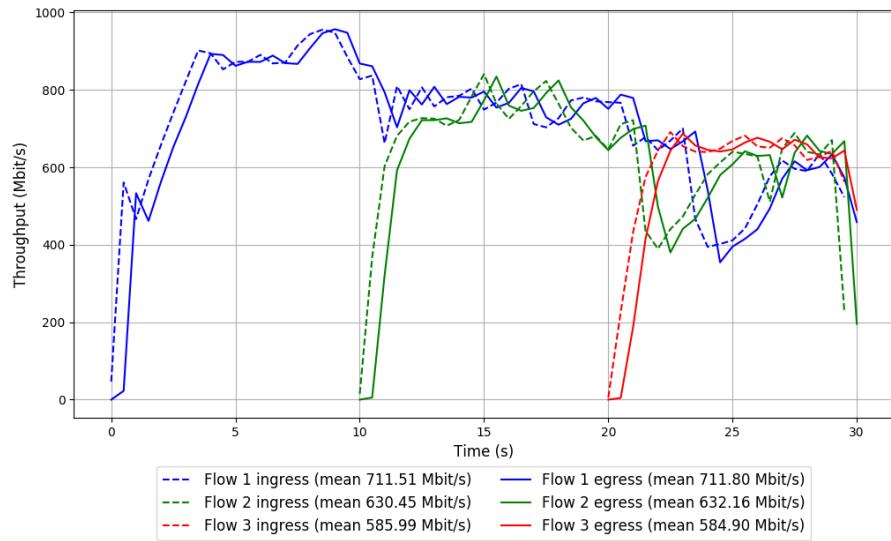


Run 1: Statistics of Muses-25

```
Start at: 2018-09-03 13:45:33
End at: 2018-09-03 13:46:03
Local clock offset: -0.97 ms
Remote clock offset: -0.029 ms

# Below is generated by plot.py at 2018-09-03 14:14:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1321.90 Mbit/s
95th percentile per-packet one-way delay: 65.400 ms
Loss rate: 0.47%
-- Flow 1:
Average throughput: 711.80 Mbit/s
95th percentile per-packet one-way delay: 65.693 ms
Loss rate: 0.31%
-- Flow 2:
Average throughput: 632.16 Mbit/s
95th percentile per-packet one-way delay: 66.683 ms
Loss rate: 0.41%
-- Flow 3:
Average throughput: 584.90 Mbit/s
95th percentile per-packet one-way delay: 58.737 ms
Loss rate: 1.19%
```

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-09-03 13:53:23
End at: 2018-09-03 13:53:53
Local clock offset: -0.549 ms
Remote clock offset: 0.028 ms

# Below is generated by plot.py at 2018-09-03 14:14:04
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1296.68 Mbit/s
95th percentile per-packet one-way delay: 61.863 ms
Loss rate: 0.54%
-- Flow 1:
Average throughput: 688.76 Mbit/s
95th percentile per-packet one-way delay: 61.765 ms
Loss rate: 0.34%
-- Flow 2:
Average throughput: 622.25 Mbit/s
95th percentile per-packet one-way delay: 66.250 ms
Loss rate: 0.55%
-- Flow 3:
Average throughput: 595.82 Mbit/s
95th percentile per-packet one-way delay: 56.221 ms
Loss rate: 1.19%
```

Run 2: Report of Muses-25 — Data Link

