

Pantheon Report

Generated at 2018-09-05 23:53:51 (UTC).
Data path: GCE Iowa on `ens4 (local)` → GCE Tokyo 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.

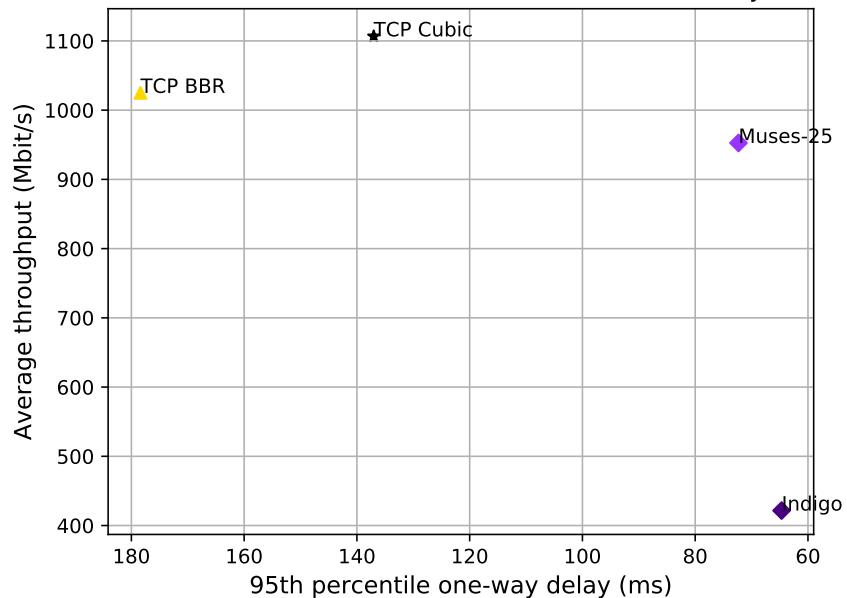
System info:

```
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
```

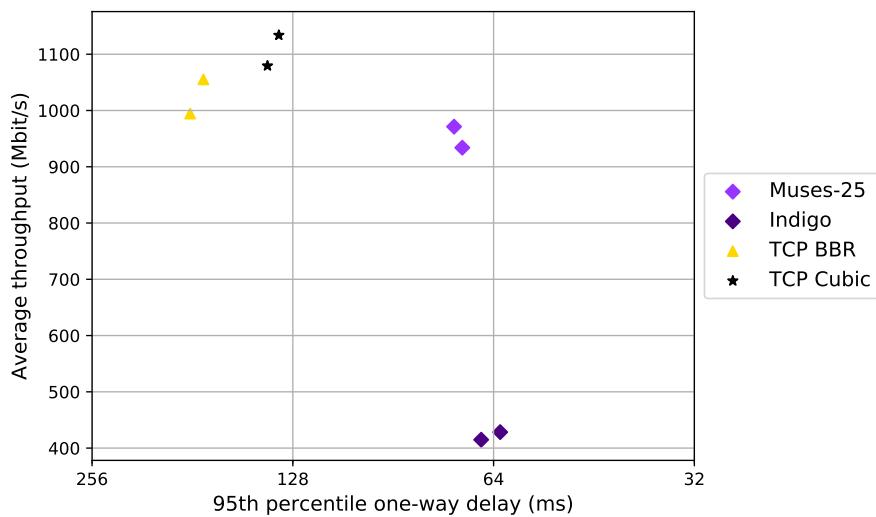
Git summary:

```
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 Iowa 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 Iowa to GCE Tokyo, 2 runs of 30s each per scheme
3 flows with 10s interval between flows



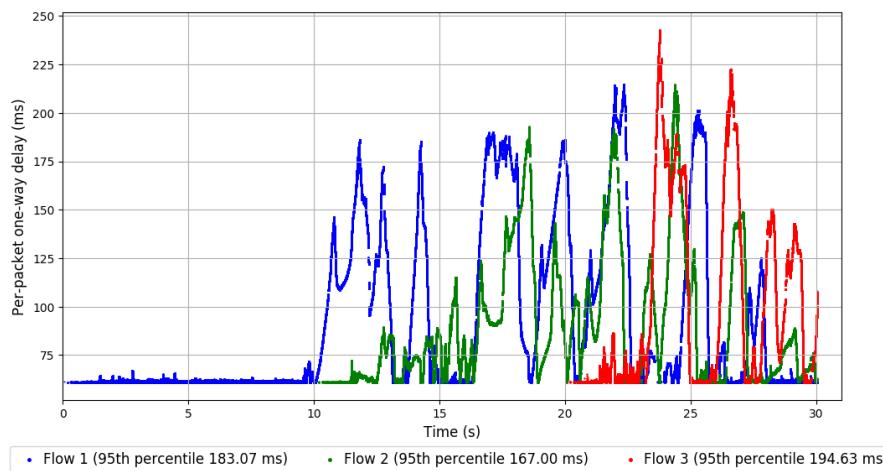
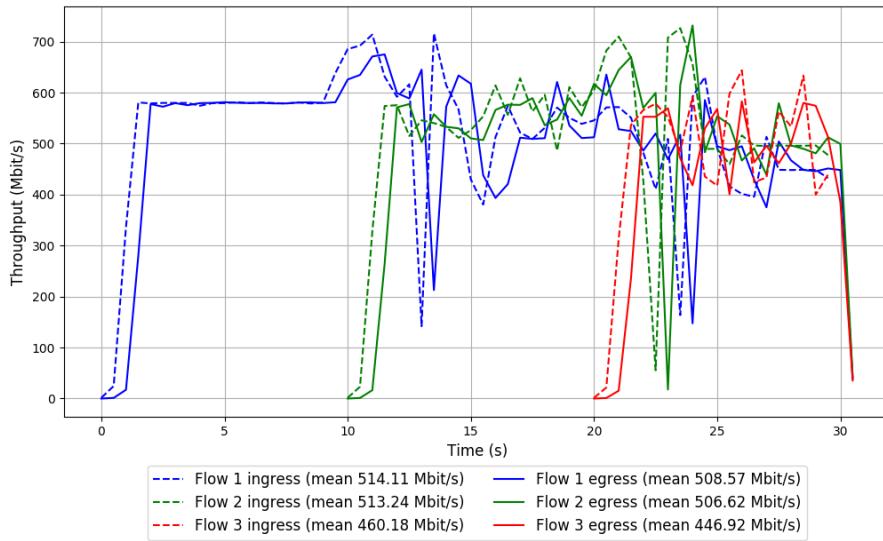
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	524.39	518.03	467.08	183.00	171.61	152.49	1.24	1.85	1.44
TCP Cubic	2	588.51	546.04	463.89	138.25	128.68	102.44	0.05	0.24	0.30
Indigo	2	223.38	215.12	171.71	62.11	63.48	65.10	0.00	0.00	0.03
Muses-25	2	496.44	457.32	469.39	74.74	70.28	68.18	0.00	0.00	0.00

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-05 23:24:46
End at: 2018-09-05 23:25:16
Local clock offset: 0.326 ms
Remote clock offset: 3.834 ms

# Below is generated by plot.py at 2018-09-05 23:53:15
# Datalink statistics
-- Total of 3 flows:
Average throughput: 994.48 Mbit/s
95th percentile per-packet one-way delay: 182.463 ms
Loss rate: 1.42%
-- Flow 1:
Average throughput: 508.57 Mbit/s
95th percentile per-packet one-way delay: 183.075 ms
Loss rate: 1.08%
-- Flow 2:
Average throughput: 506.62 Mbit/s
95th percentile per-packet one-way delay: 166.999 ms
Loss rate: 1.29%
-- Flow 3:
Average throughput: 446.92 Mbit/s
95th percentile per-packet one-way delay: 194.626 ms
Loss rate: 2.88%
```

Run 1: Report of TCP BBR — Data Link

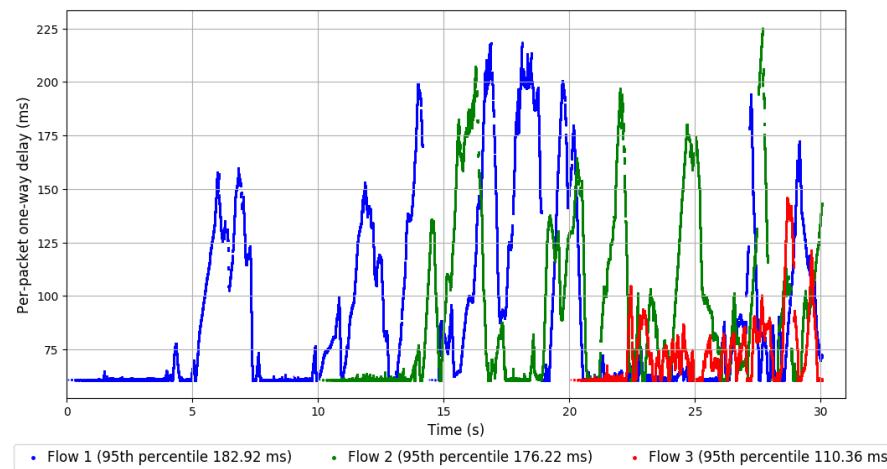
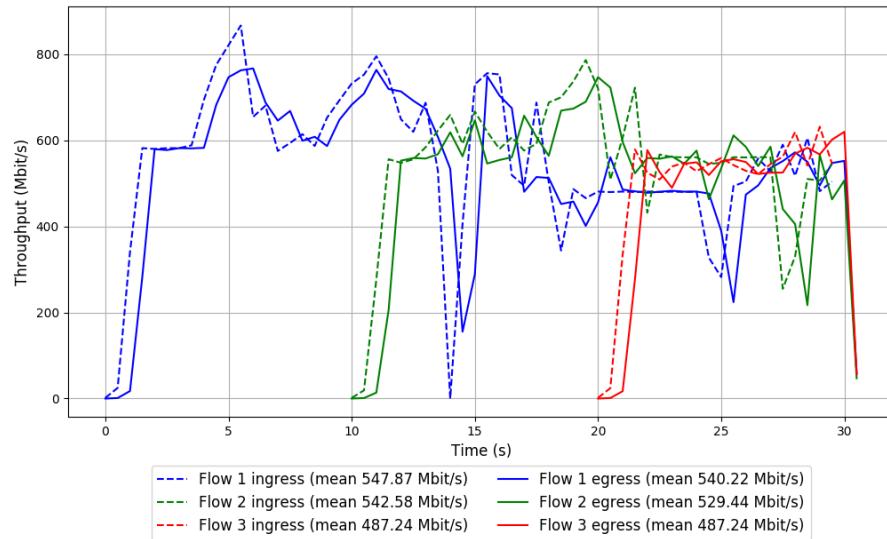


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-05 23:32:45
End at: 2018-09-05 23:33:15
Local clock offset: 0.423 ms
Remote clock offset: 2.035 ms

# Below is generated by plot.py at 2018-09-05 23:53:38
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1055.31 Mbit/s
95th percentile per-packet one-way delay: 174.311 ms
Loss rate: 1.53%
-- Flow 1:
Average throughput: 540.22 Mbit/s
95th percentile per-packet one-way delay: 182.917 ms
Loss rate: 1.40%
-- Flow 2:
Average throughput: 529.44 Mbit/s
95th percentile per-packet one-way delay: 176.222 ms
Loss rate: 2.42%
-- Flow 3:
Average throughput: 487.24 Mbit/s
95th percentile per-packet one-way delay: 110.359 ms
Loss rate: 0.00%
```

Run 2: Report of TCP BBR — Data Link

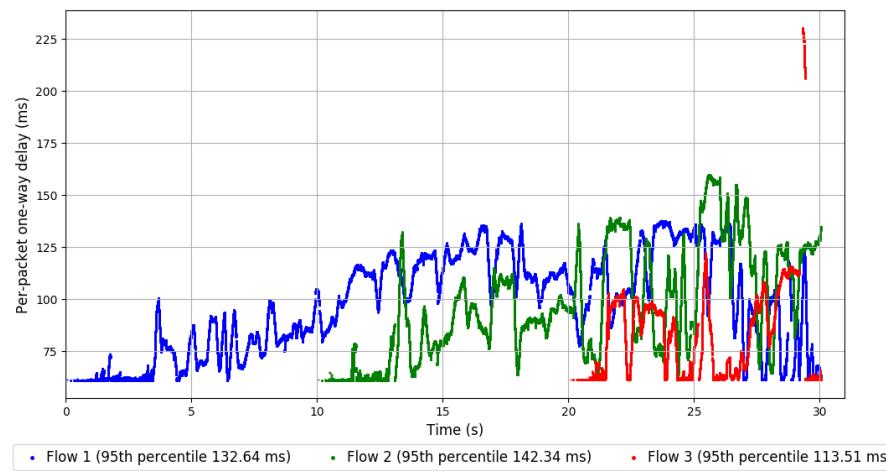
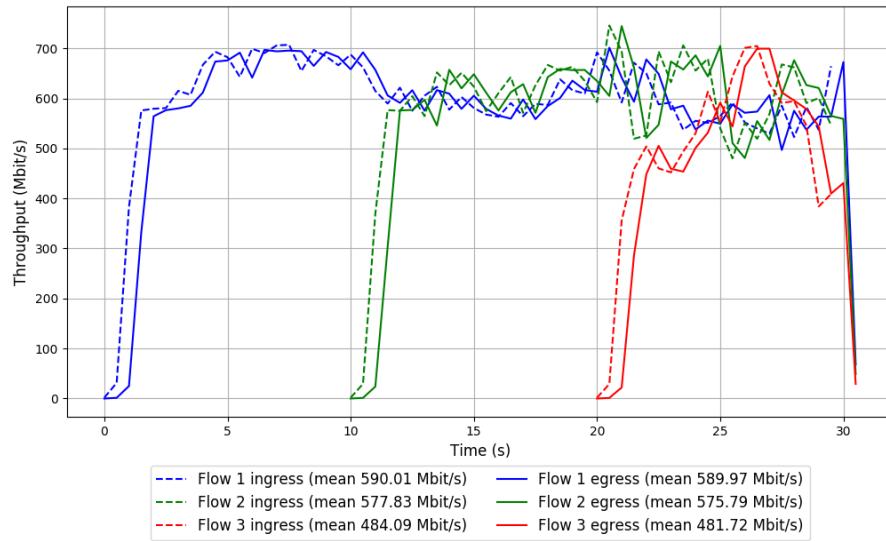


Run 1: Statistics of TCP Cubic

```
Start at: 2018-09-05 23:20:47
End at: 2018-09-05 23:21:17
Local clock offset: 0.342 ms
Remote clock offset: 5.818 ms

# Below is generated by plot.py at 2018-09-05 23:53:49
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1133.79 Mbit/s
95th percentile per-packet one-way delay: 134.335 ms
Loss rate: 0.19%
-- Flow 1:
Average throughput: 589.97 Mbit/s
95th percentile per-packet one-way delay: 132.642 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 575.79 Mbit/s
95th percentile per-packet one-way delay: 142.338 ms
Loss rate: 0.35%
-- Flow 3:
Average throughput: 481.72 Mbit/s
95th percentile per-packet one-way delay: 113.513 ms
Loss rate: 0.49%
```

Run 1: Report of TCP Cubic — Data Link

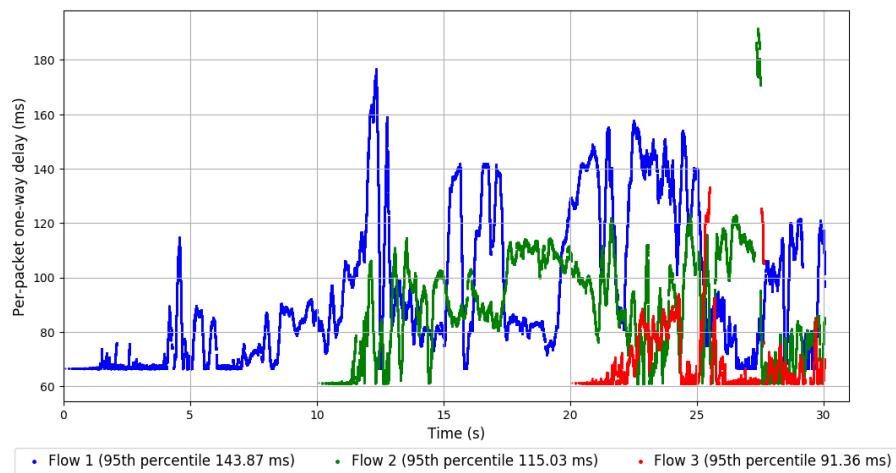
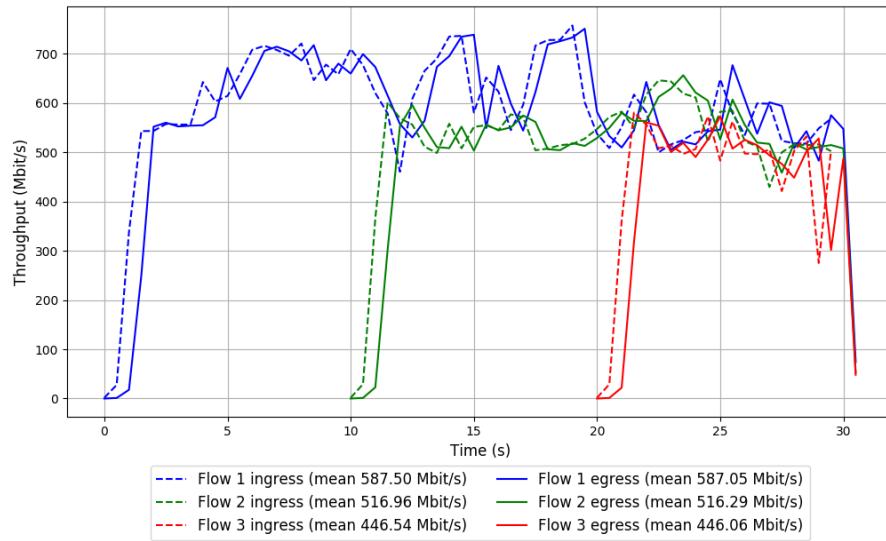


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-05 23:28:49
End at: 2018-09-05 23:29:19
Local clock offset: 0.336 ms
Remote clock offset: 2.802 ms

# Below is generated by plot.py at 2018-09-05 23:53:49
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1079.39 Mbit/s
95th percentile per-packet one-way delay: 139.708 ms
Loss rate: 0.11%
-- Flow 1:
Average throughput: 587.05 Mbit/s
95th percentile per-packet one-way delay: 143.866 ms
Loss rate: 0.10%
-- Flow 2:
Average throughput: 516.29 Mbit/s
95th percentile per-packet one-way delay: 115.025 ms
Loss rate: 0.13%
-- Flow 3:
Average throughput: 446.06 Mbit/s
95th percentile per-packet one-way delay: 91.358 ms
Loss rate: 0.11%
```

Run 2: Report of TCP Cubic — Data Link

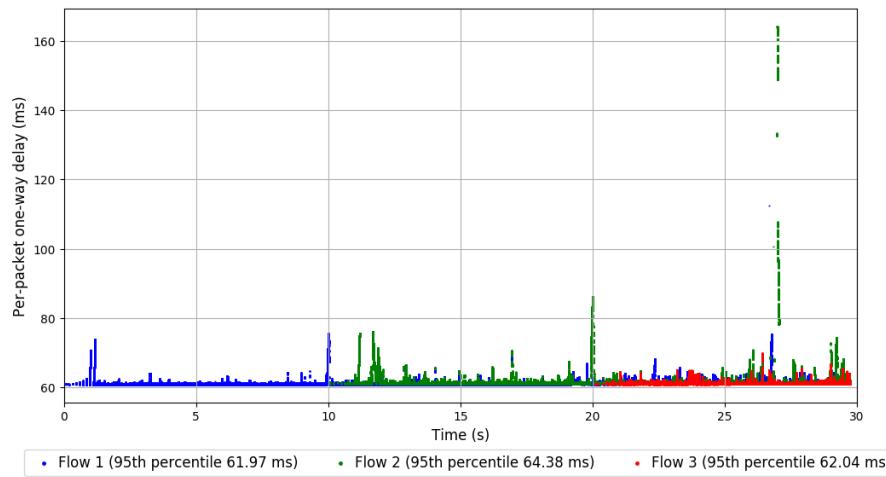
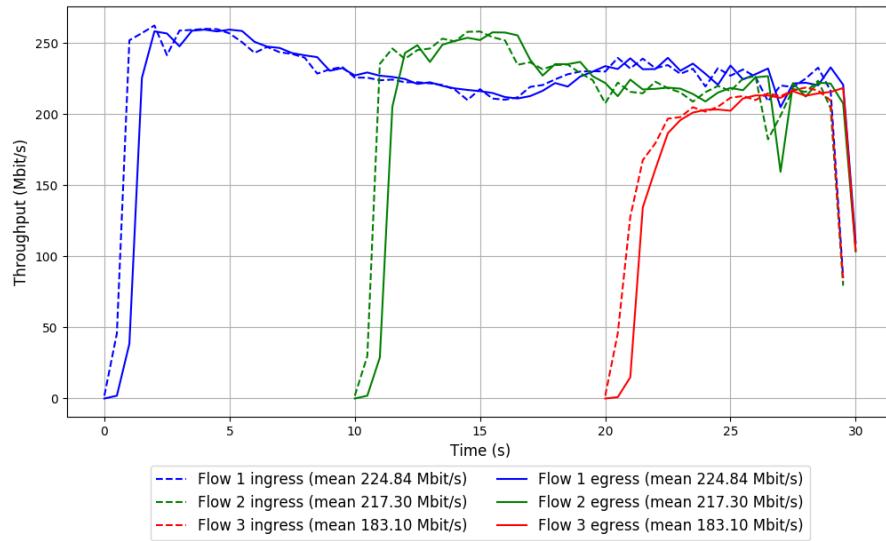


Run 1: Statistics of Indigo

```
Start at: 2018-09-05 23:22:55
End at: 2018-09-05 23:23:25
Local clock offset: 0.31 ms
Remote clock offset: 4.637 ms

# Below is generated by plot.py at 2018-09-05 23:53:49
# Datalink statistics
-- Total of 3 flows:
Average throughput: 428.40 Mbit/s
95th percentile per-packet one-way delay: 62.554 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 224.84 Mbit/s
95th percentile per-packet one-way delay: 61.971 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 217.30 Mbit/s
95th percentile per-packet one-way delay: 64.376 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 183.10 Mbit/s
95th percentile per-packet one-way delay: 62.043 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link

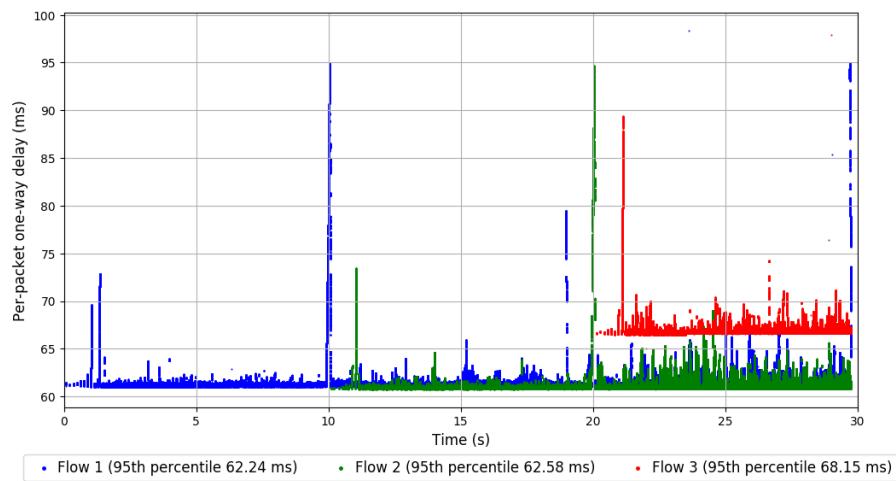
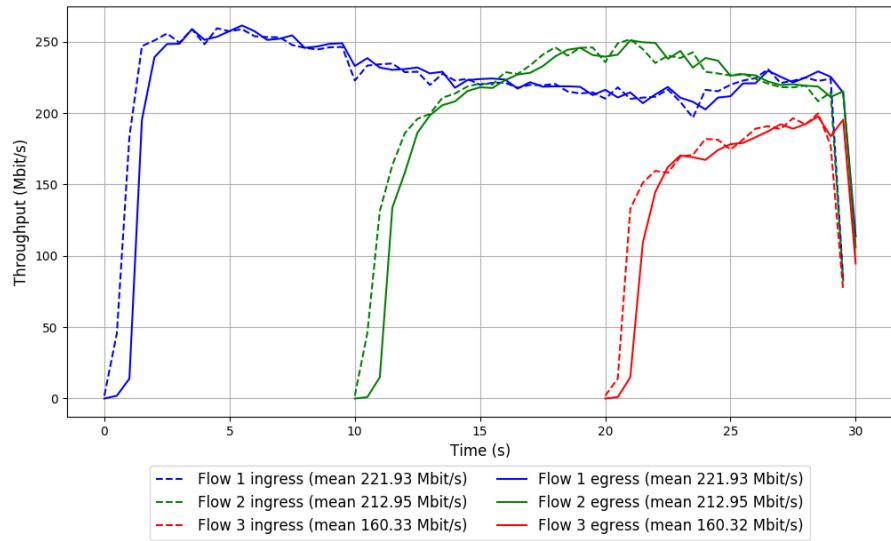


Run 2: Statistics of Indigo

```
Start at: 2018-09-05 23:30:54
End at: 2018-09-05 23:31:24
Local clock offset: 0.382 ms
Remote clock offset: 2.513 ms

# Below is generated by plot.py at 2018-09-05 23:53:49
# Datalink statistics
-- Total of 3 flows:
Average throughput: 414.87 Mbit/s
95th percentile per-packet one-way delay: 66.798 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 221.93 Mbit/s
95th percentile per-packet one-way delay: 62.241 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 212.95 Mbit/s
95th percentile per-packet one-way delay: 62.580 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 160.32 Mbit/s
95th percentile per-packet one-way delay: 68.151 ms
Loss rate: 0.06%
```

Run 2: Report of Indigo — Data Link

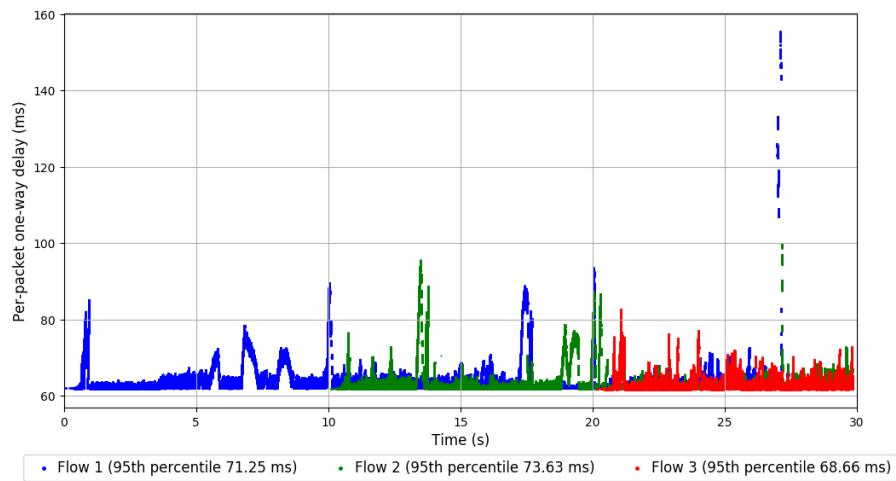
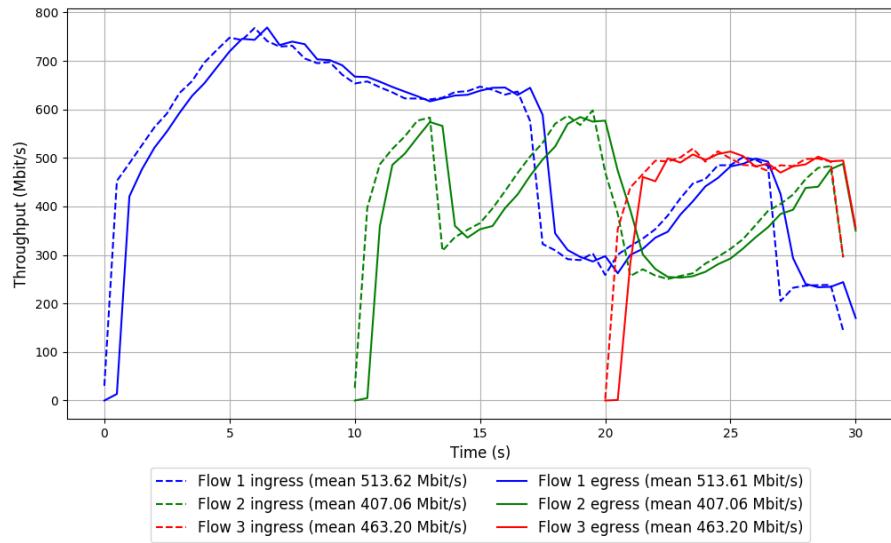


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-09-05 23:26:52
End at: 2018-09-05 23:27:22
Local clock offset: 0.333 ms
Remote clock offset: 4.151 ms

# Below is generated by plot.py at 2018-09-05 23:53:49
# Datalink statistics
-- Total of 3 flows:
Average throughput: 933.92 Mbit/s
95th percentile per-packet one-way delay: 71.300 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 513.61 Mbit/s
95th percentile per-packet one-way delay: 71.248 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 407.06 Mbit/s
95th percentile per-packet one-way delay: 73.632 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 463.20 Mbit/s
95th percentile per-packet one-way delay: 68.657 ms
Loss rate: 0.00%
```

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-09-05 23:34:53
End at: 2018-09-05 23:35:24
Local clock offset: 0.372 ms
Remote clock offset: 3.252 ms

# Below is generated by plot.py at 2018-09-05 23:53:49
# Datalink statistics
-- Total of 3 flows:
Average throughput: 971.28 Mbit/s
95th percentile per-packet one-way delay: 73.354 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 479.28 Mbit/s
95th percentile per-packet one-way delay: 78.241 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 507.59 Mbit/s
95th percentile per-packet one-way delay: 66.938 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 475.59 Mbit/s
95th percentile per-packet one-way delay: 67.704 ms
Loss rate: 0.00%
```

Run 2: Report of Muses-25 — Data Link

