

## Pantheon Report

Generated at 2018-09-05 21:56:23 (UTC).  
Data path: GCE Tokyo 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.

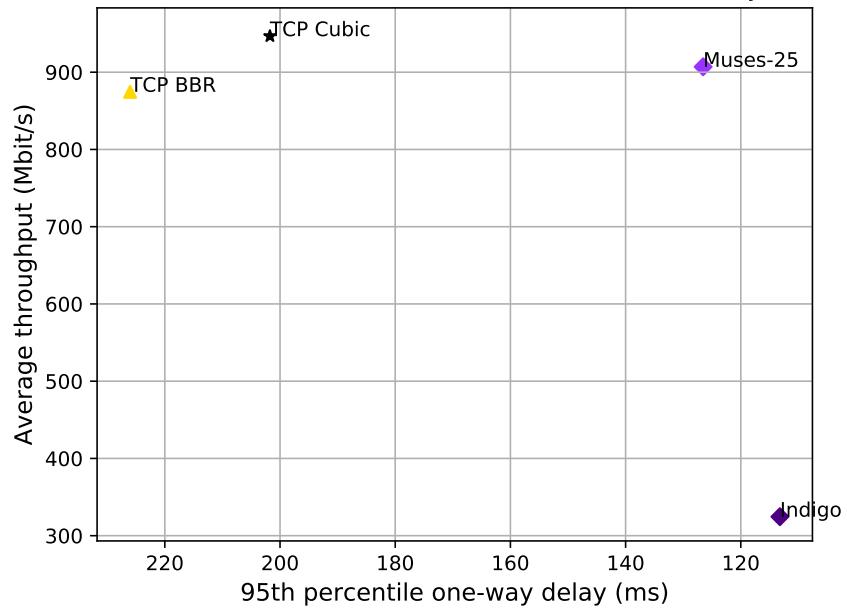
System info:

```
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
```

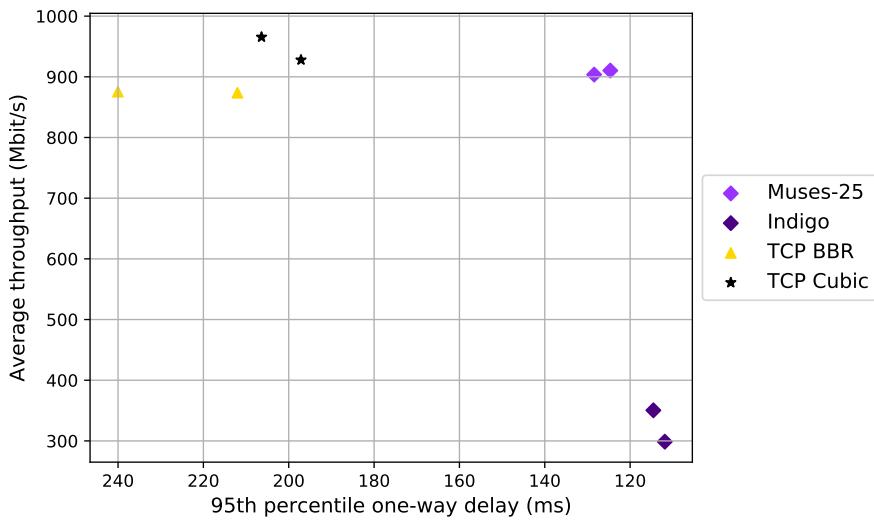
Git summary:

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



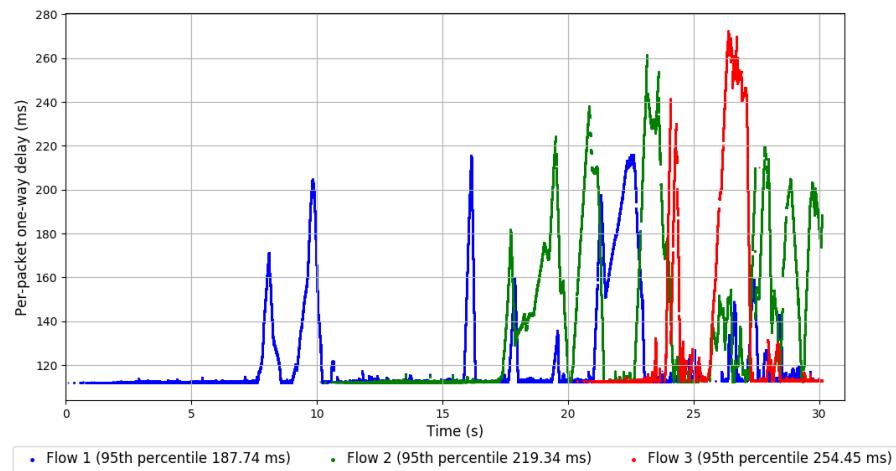
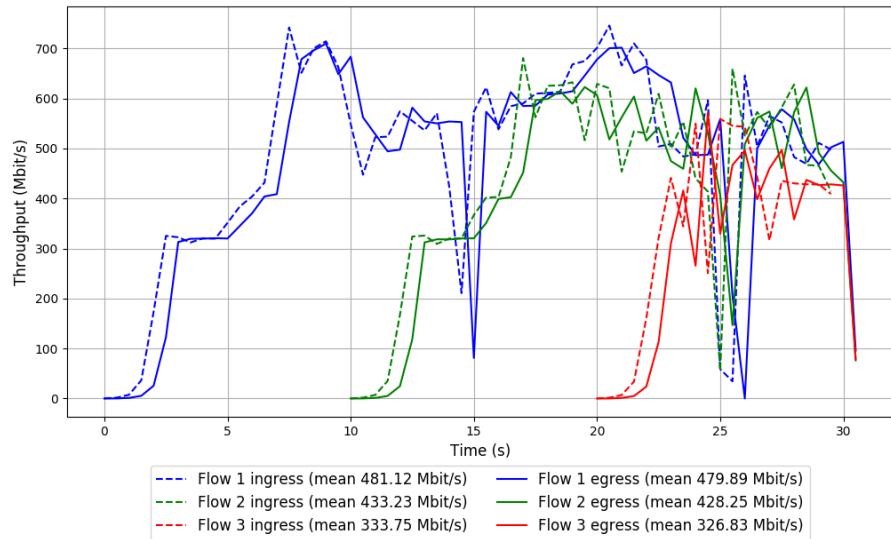
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	469.62	432.14	354.10	218.50	219.38	249.23	1.86	1.84	2.24
TCP Cubic	2	525.71	505.76	253.07	206.46	199.46	116.68	0.16	0.33	0.74
Indigo	2	162.94	179.44	133.62	112.44	113.58	114.37	0.00	0.00	0.00
Muses-25	2	453.91	450.49	477.74	125.71	129.12	120.29	0.00	0.01	0.00

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-05 21:29:23
End at: 2018-09-05 21:29:53
Local clock offset: 19.081 ms
Remote clock offset: 7.525 ms

# Below is generated by plot.py at 2018-09-05 21:55:55
# Datalink statistics
-- Total of 3 flows:
Average throughput: 873.72 Mbit/s
95th percentile per-packet one-way delay: 212.019 ms
Loss rate: 0.78%
-- Flow 1:
Average throughput: 479.89 Mbit/s
95th percentile per-packet one-way delay: 187.736 ms
Loss rate: 0.25%
-- Flow 2:
Average throughput: 428.25 Mbit/s
95th percentile per-packet one-way delay: 219.342 ms
Loss rate: 1.15%
-- Flow 3:
Average throughput: 326.83 Mbit/s
95th percentile per-packet one-way delay: 254.450 ms
Loss rate: 2.08%
```

## Run 1: Report of TCP BBR — Data Link

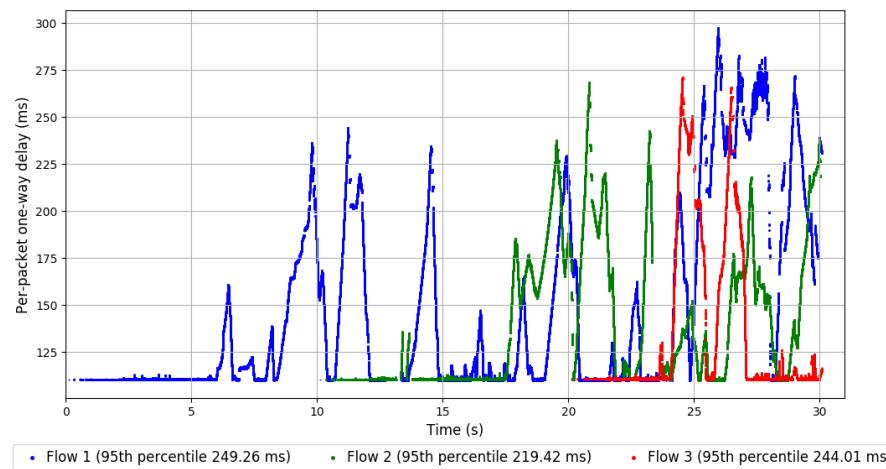
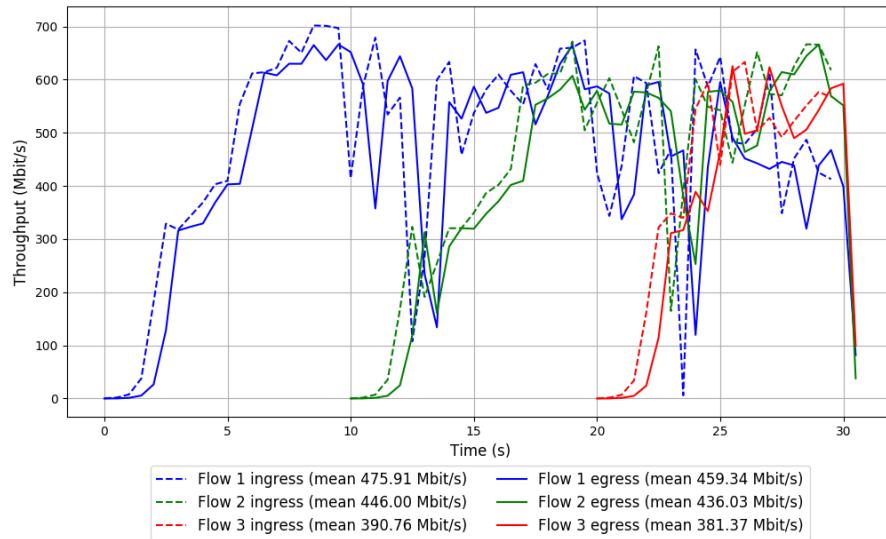


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-05 21:37:37
End at: 2018-09-05 21:38:07
Local clock offset: 21.481 ms
Remote clock offset: 6.109 ms

# Below is generated by plot.py at 2018-09-05 21:56:02
# Datalink statistics
-- Total of 3 flows:
Average throughput: 875.52 Mbit/s
95th percentile per-packet one-way delay: 240.033 ms
Loss rate: 3.01%
-- Flow 1:
Average throughput: 459.34 Mbit/s
95th percentile per-packet one-way delay: 249.258 ms
Loss rate: 3.48%
-- Flow 2:
Average throughput: 436.03 Mbit/s
95th percentile per-packet one-way delay: 219.419 ms
Loss rate: 2.53%
-- Flow 3:
Average throughput: 381.37 Mbit/s
95th percentile per-packet one-way delay: 244.006 ms
Loss rate: 2.39%
```

## Run 2: Report of TCP BBR — Data Link

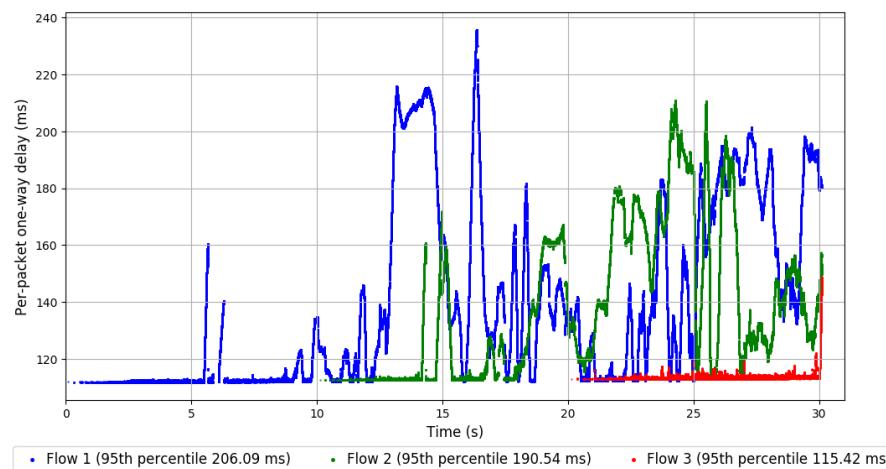
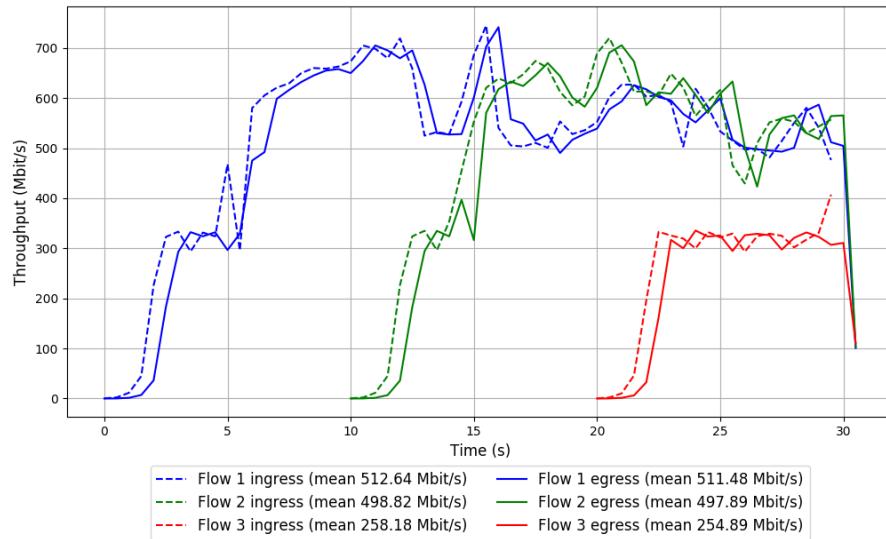


```
Run 1: Statistics of TCP Cubic
```

```
Start at: 2018-09-05 21:31:35
End at: 2018-09-05 21:32:05
Local clock offset: 21.876 ms
Remote clock offset: 7.197 ms

# Below is generated by plot.py at 2018-09-05 21:56:16
# Datalink statistics
-- Total of 3 flows:
Average throughput: 927.85 Mbit/s
95th percentile per-packet one-way delay: 197.128 ms
Loss rate: 0.29%
-- Flow 1:
Average throughput: 511.48 Mbit/s
95th percentile per-packet one-way delay: 206.087 ms
Loss rate: 0.22%
-- Flow 2:
Average throughput: 497.89 Mbit/s
95th percentile per-packet one-way delay: 190.541 ms
Loss rate: 0.17%
-- Flow 3:
Average throughput: 254.89 Mbit/s
95th percentile per-packet one-way delay: 115.418 ms
Loss rate: 1.25%
```

## Run 1: Report of TCP Cubic — Data Link

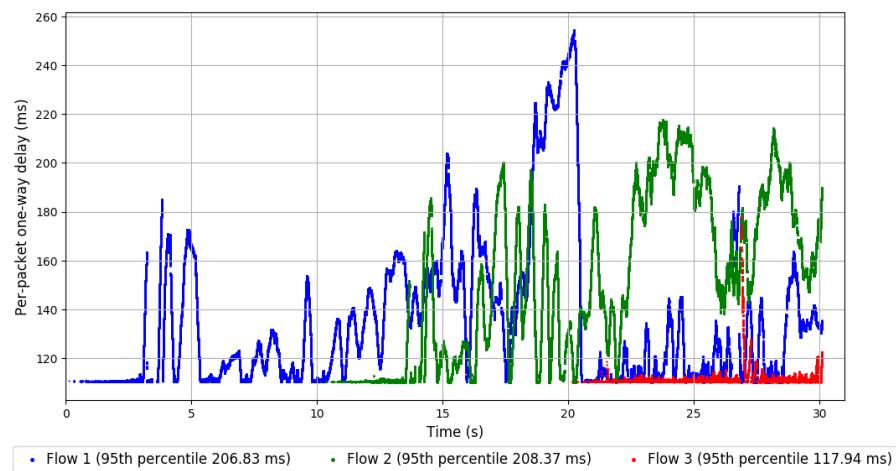
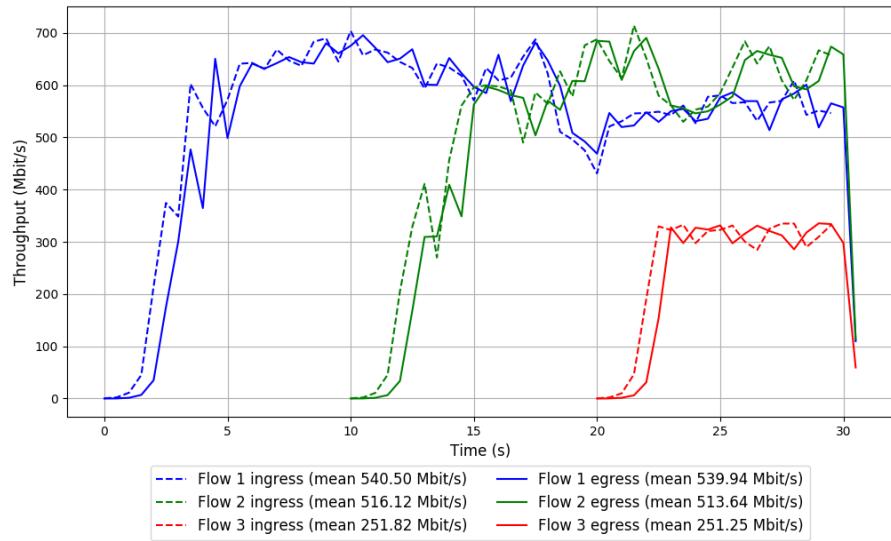


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-05 21:39:49
End at: 2018-09-05 21:40:19
Local clock offset: 20.657 ms
Remote clock offset: 6.182 ms

# Below is generated by plot.py at 2018-09-05 21:56:22
# Datalink statistics
-- Total of 3 flows:
Average throughput: 965.53 Mbit/s
95th percentile per-packet one-way delay: 206.382 ms
Loss rate: 0.25%
-- Flow 1:
Average throughput: 539.94 Mbit/s
95th percentile per-packet one-way delay: 206.834 ms
Loss rate: 0.10%
-- Flow 2:
Average throughput: 513.64 Mbit/s
95th percentile per-packet one-way delay: 208.372 ms
Loss rate: 0.48%
-- Flow 3:
Average throughput: 251.25 Mbit/s
95th percentile per-packet one-way delay: 117.943 ms
Loss rate: 0.23%
```

## Run 2: Report of TCP Cubic — Data Link

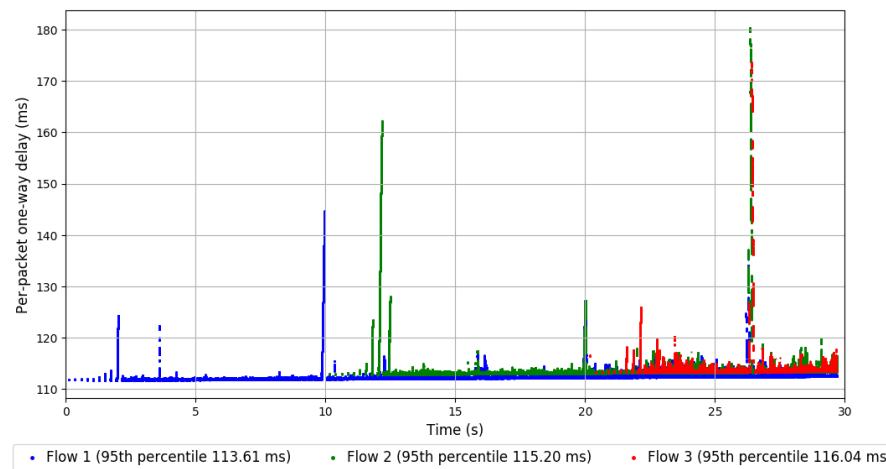
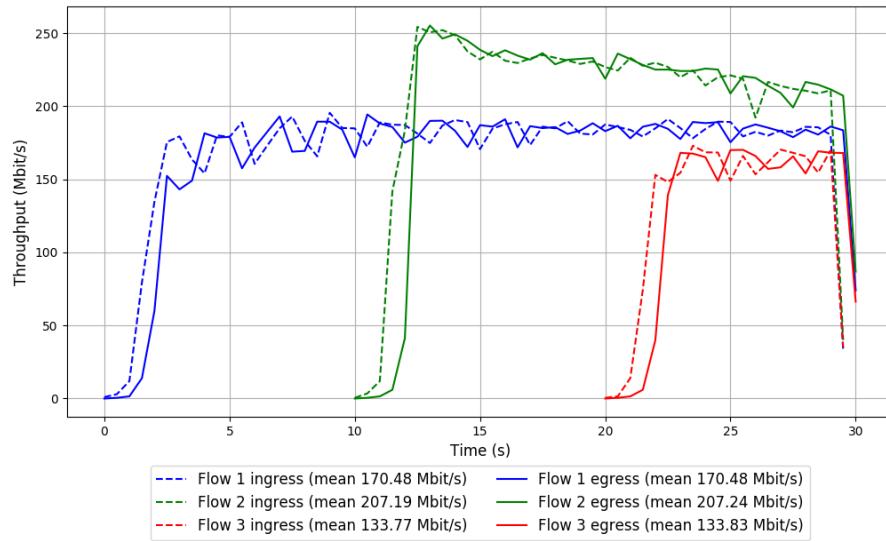


Run 1: Statistics of Indigo

```
Start at: 2018-09-05 21:27:31
End at: 2018-09-05 21:28:01
Local clock offset: 16.104 ms
Remote clock offset: 8.395 ms

# Below is generated by plot.py at 2018-09-05 21:56:22
# Datalink statistics
-- Total of 3 flows:
Average throughput: 350.42 Mbit/s
95th percentile per-packet one-way delay: 114.548 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 170.48 Mbit/s
95th percentile per-packet one-way delay: 113.608 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 207.24 Mbit/s
95th percentile per-packet one-way delay: 115.202 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 133.83 Mbit/s
95th percentile per-packet one-way delay: 116.043 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link

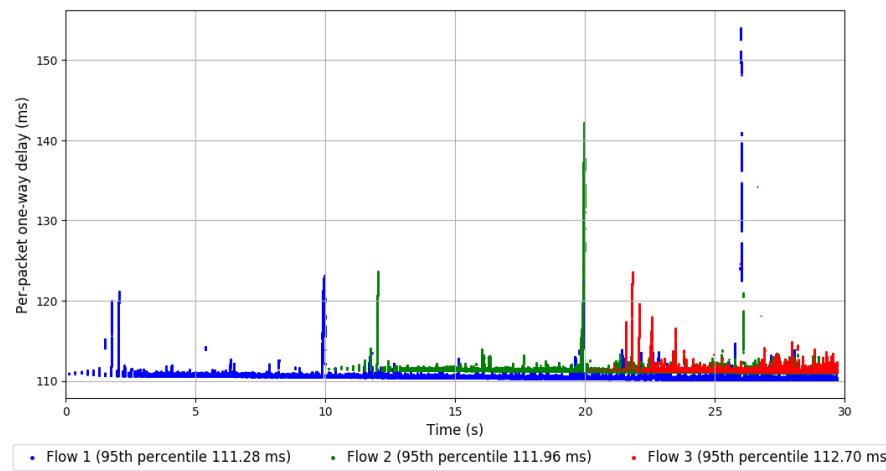
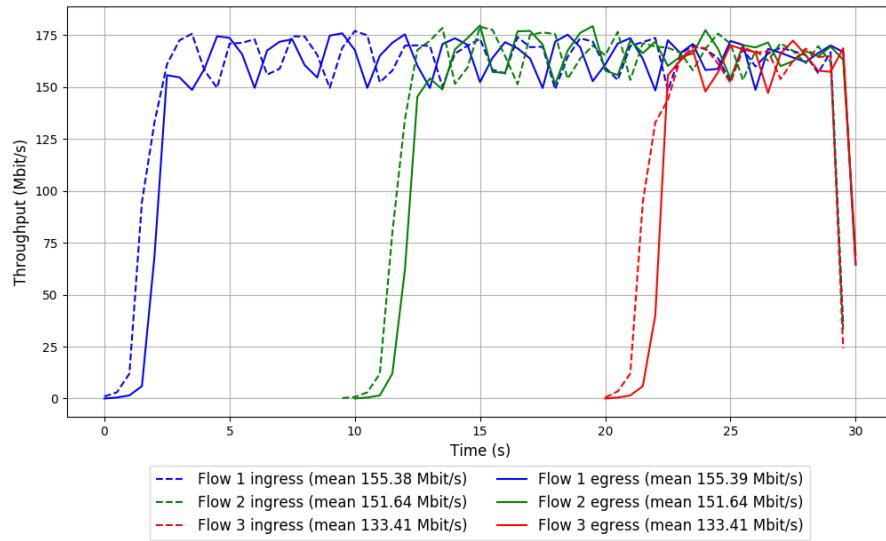


Run 2: Statistics of Indigo

```
Start at: 2018-09-05 21:35:49
End at: 2018-09-05 21:36:19
Local clock offset: 23.773 ms
Remote clock offset: 6.232 ms

# Below is generated by plot.py at 2018-09-05 21:56:22
# Datalink statistics
-- Total of 3 flows:
Average throughput: 298.72 Mbit/s
95th percentile per-packet one-way delay: 111.868 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 155.39 Mbit/s
95th percentile per-packet one-way delay: 111.278 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 151.64 Mbit/s
95th percentile per-packet one-way delay: 111.963 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 133.41 Mbit/s
95th percentile per-packet one-way delay: 112.696 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link

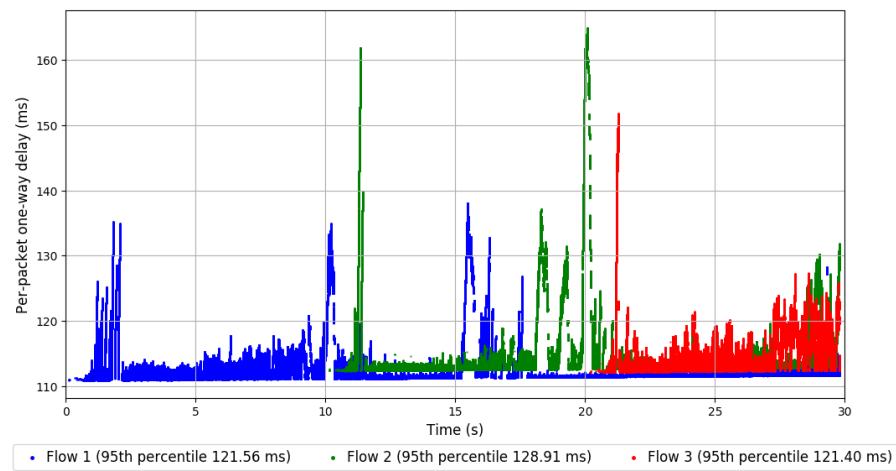
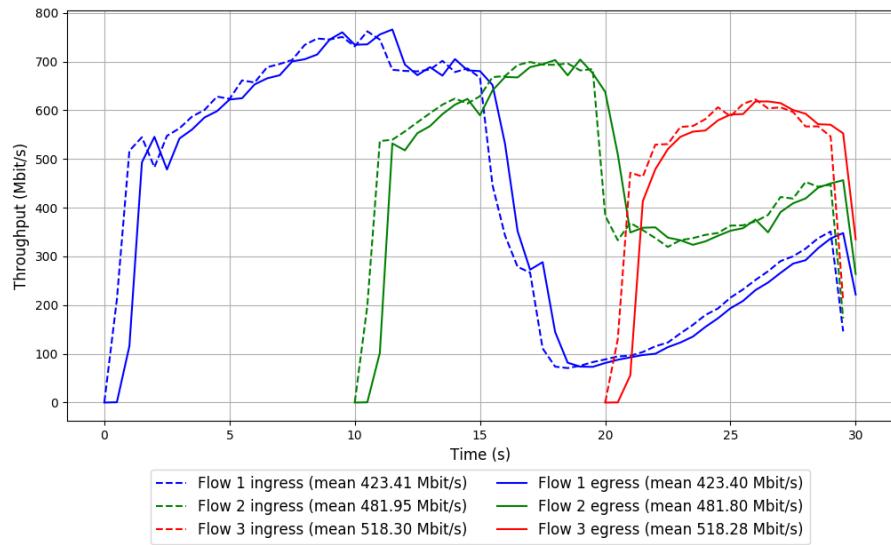


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-09-05 21:25:25
End at: 2018-09-05 21:25:55
Local clock offset: 14.646 ms
Remote clock offset: 9.803 ms

# Below is generated by plot.py at 2018-09-05 21:56:22
# Datalink statistics
-- Total of 3 flows:
Average throughput: 910.33 Mbit/s
95th percentile per-packet one-way delay: 124.649 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 423.40 Mbit/s
95th percentile per-packet one-way delay: 121.559 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 481.80 Mbit/s
95th percentile per-packet one-way delay: 128.914 ms
Loss rate: 0.03%
-- Flow 3:
Average throughput: 518.28 Mbit/s
95th percentile per-packet one-way delay: 121.396 ms
Loss rate: 0.00%
```

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-09-05 21:33:43
End at: 2018-09-05 21:34:13
Local clock offset: 24.009 ms
Remote clock offset: 6.412 ms

# Below is generated by plot.py at 2018-09-05 21:56:22
# Datalink statistics
-- Total of 3 flows:
Average throughput: 903.68 Mbit/s
95th percentile per-packet one-way delay: 128.426 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 484.42 Mbit/s
95th percentile per-packet one-way delay: 129.862 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 419.17 Mbit/s
95th percentile per-packet one-way delay: 129.321 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 437.20 Mbit/s
95th percentile per-packet one-way delay: 119.183 ms
Loss rate: 0.00%
```

Run 2: Report of Muses-25 — Data Link

