

Pantheon Report

Generated at 2018-09-03 09:17:47 (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.

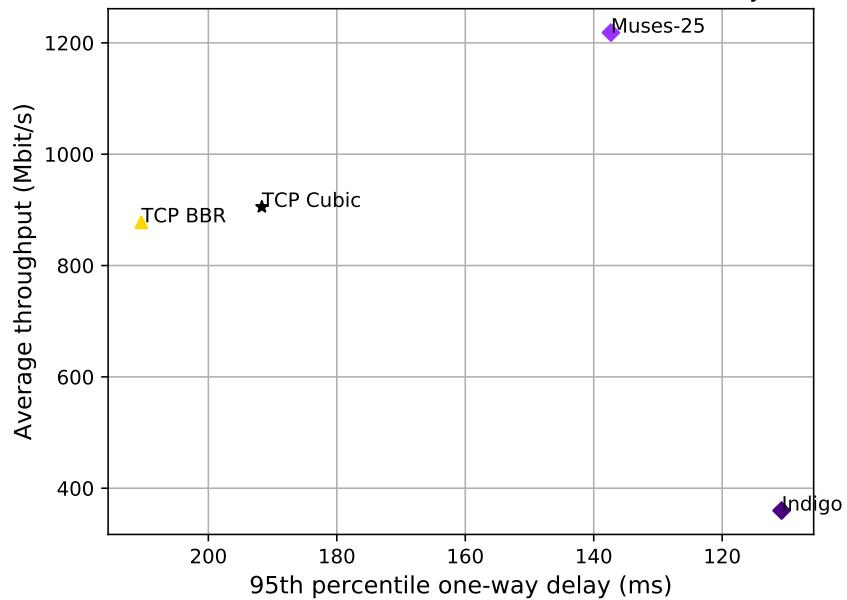
System info:

```
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
```

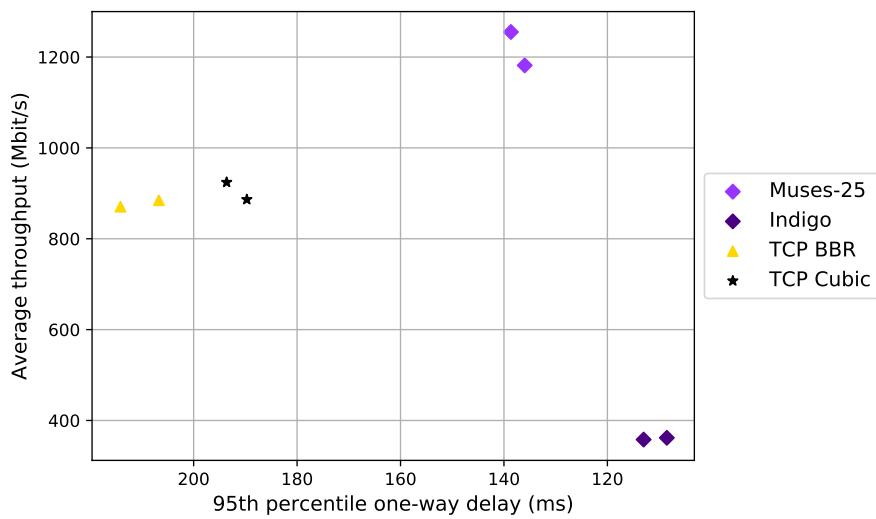
Git summary:

```
branch: muses @ 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 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



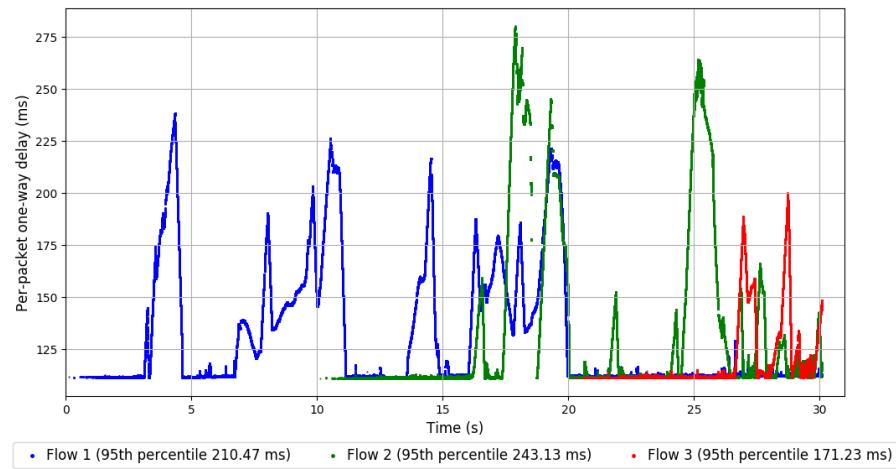
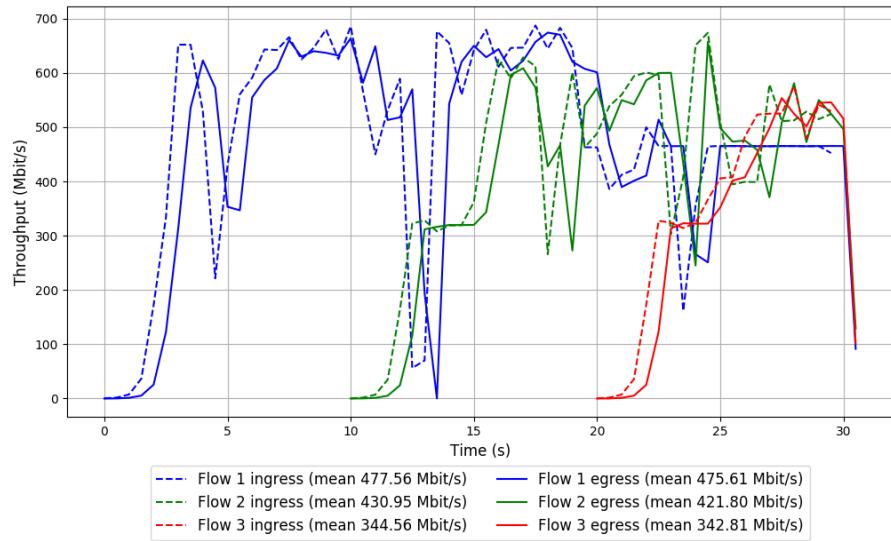
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	486.85	419.45	335.05	209.94	228.65	164.94	0.81	1.94	1.04
TCP Cubic	2	511.15	427.11	329.65	197.64	163.83	154.72	0.14	0.10	0.36
Indigo	2	219.75	147.74	131.79	110.48	110.89	111.16	0.00	0.00	0.00
Muses-25	2	710.98	481.90	581.04	138.63	136.41	131.83	0.02	0.00	0.96

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-03 08:48:08
End at: 2018-09-03 08:48:38
Local clock offset: 16.227 ms
Remote clock offset: 11.494 ms

# Below is generated by plot.py at 2018-09-03 09:15:59
# Datalink statistics
-- Total of 3 flows:
Average throughput: 870.53 Mbit/s
95th percentile per-packet one-way delay: 214.148 ms
Loss rate: 0.97%
-- Flow 1:
Average throughput: 475.61 Mbit/s
95th percentile per-packet one-way delay: 210.475 ms
Loss rate: 0.40%
-- Flow 2:
Average throughput: 421.80 Mbit/s
95th percentile per-packet one-way delay: 243.131 ms
Loss rate: 2.11%
-- Flow 3:
Average throughput: 342.81 Mbit/s
95th percentile per-packet one-way delay: 171.229 ms
Loss rate: 0.50%
```

Run 1: Report of TCP BBR — Data Link

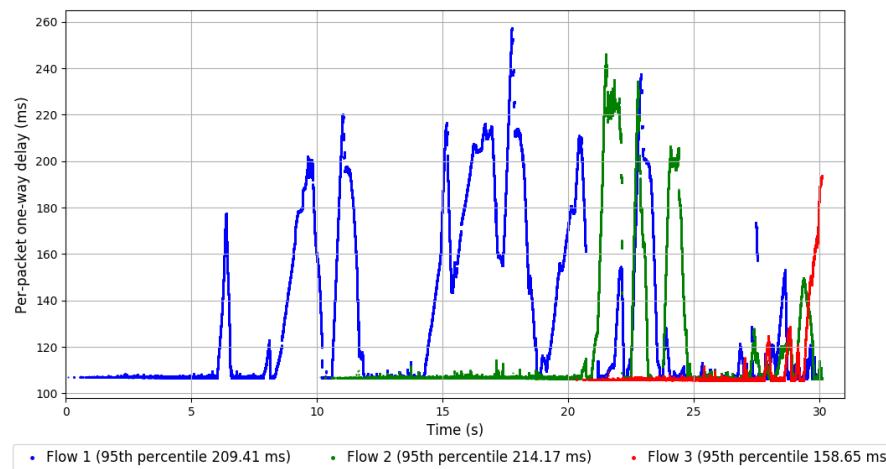
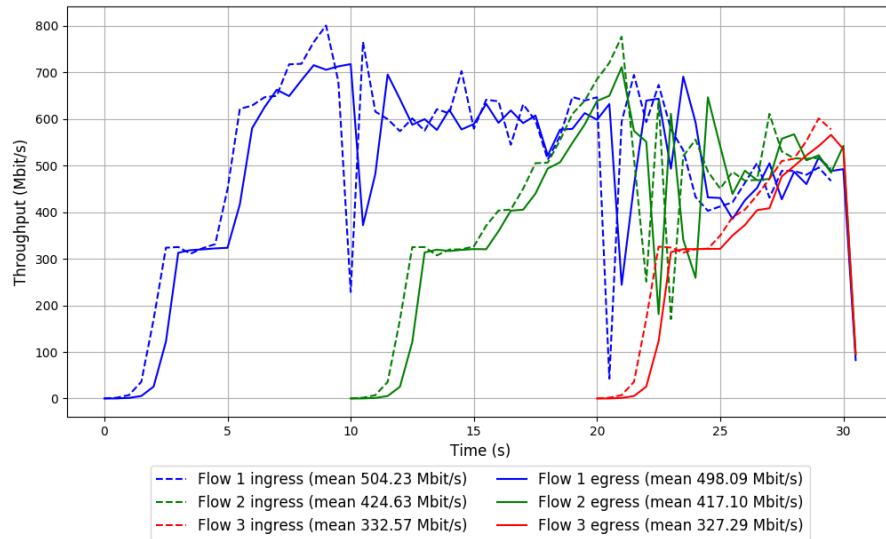


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-03 08:56:20
End at: 2018-09-03 08:56:50
Local clock offset: 26.355 ms
Remote clock offset: 7.667 ms

# Below is generated by plot.py at 2018-09-03 09:16:17
# Datalink statistics
-- Total of 3 flows:
Average throughput: 884.71 Mbit/s
95th percentile per-packet one-way delay: 206.720 ms
Loss rate: 1.44%
-- Flow 1:
Average throughput: 498.09 Mbit/s
95th percentile per-packet one-way delay: 209.411 ms
Loss rate: 1.22%
-- Flow 2:
Average throughput: 417.10 Mbit/s
95th percentile per-packet one-way delay: 214.173 ms
Loss rate: 1.78%
-- Flow 3:
Average throughput: 327.29 Mbit/s
95th percentile per-packet one-way delay: 158.654 ms
Loss rate: 1.59%
```

Run 2: Report of TCP BBR — Data Link

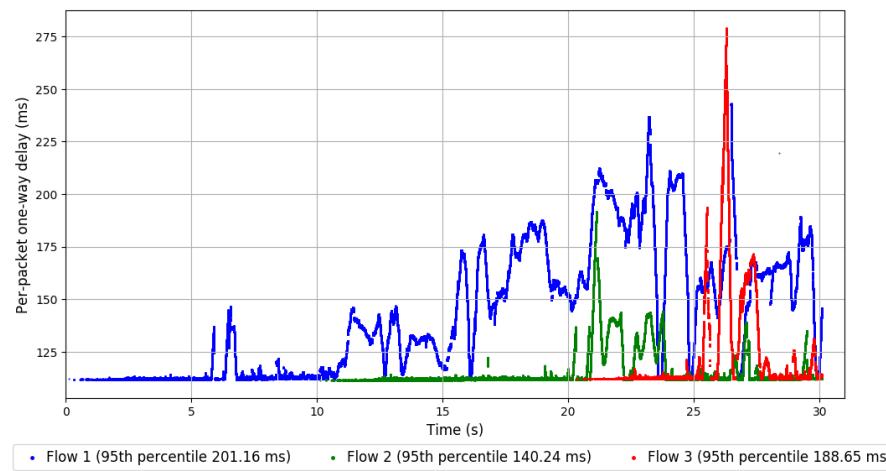
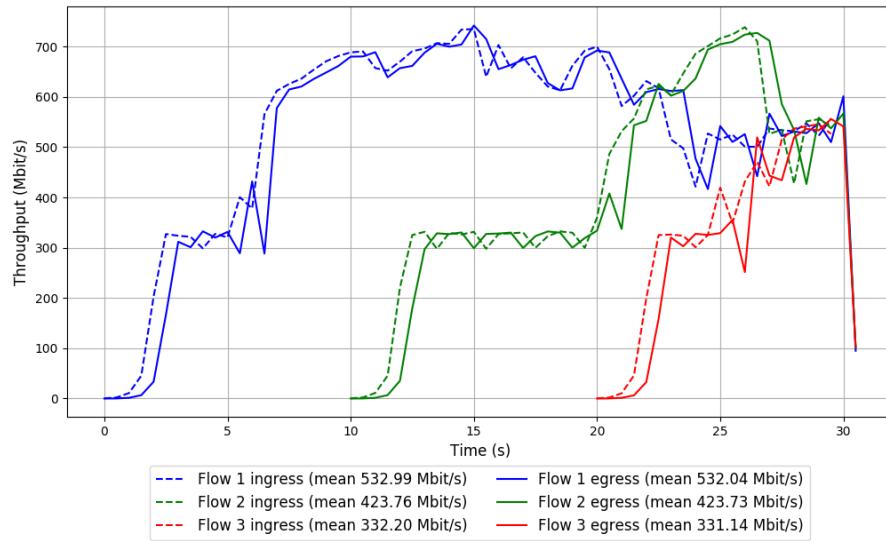


Run 1: Statistics of TCP Cubic

```
Start at: 2018-09-03 08:46:03
End at: 2018-09-03 08:46:33
Local clock offset: 14.095 ms
Remote clock offset: 13.081 ms

# Below is generated by plot.py at 2018-09-03 09:16:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 924.28 Mbit/s
95th percentile per-packet one-way delay: 193.623 ms
Loss rate: 0.14%
-- Flow 1:
Average throughput: 532.04 Mbit/s
95th percentile per-packet one-way delay: 201.155 ms
Loss rate: 0.17%
-- Flow 2:
Average throughput: 423.73 Mbit/s
95th percentile per-packet one-way delay: 140.241 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 331.14 Mbit/s
95th percentile per-packet one-way delay: 188.649 ms
Loss rate: 0.31%
```

Run 1: Report of TCP Cubic — Data Link

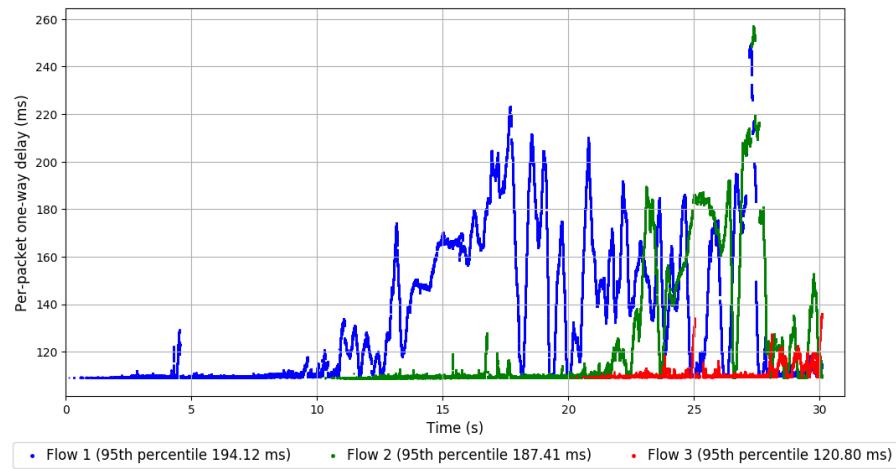
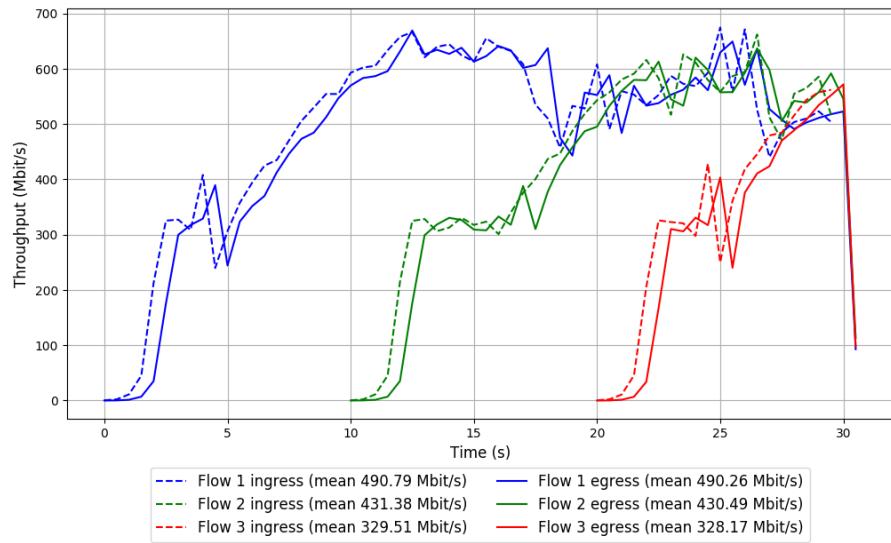


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-03 08:54:16
End at: 2018-09-03 08:54:46
Local clock offset: 27.01 ms
Remote clock offset: 9.076 ms

# Below is generated by plot.py at 2018-09-03 09:16:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 886.36 Mbit/s
95th percentile per-packet one-way delay: 189.720 ms
Loss rate: 0.17%
-- Flow 1:
Average throughput: 490.26 Mbit/s
95th percentile per-packet one-way delay: 194.120 ms
Loss rate: 0.10%
-- Flow 2:
Average throughput: 430.49 Mbit/s
95th percentile per-packet one-way delay: 187.414 ms
Loss rate: 0.20%
-- Flow 3:
Average throughput: 328.17 Mbit/s
95th percentile per-packet one-way delay: 120.800 ms
Loss rate: 0.41%
```

Run 2: Report of TCP Cubic — Data Link

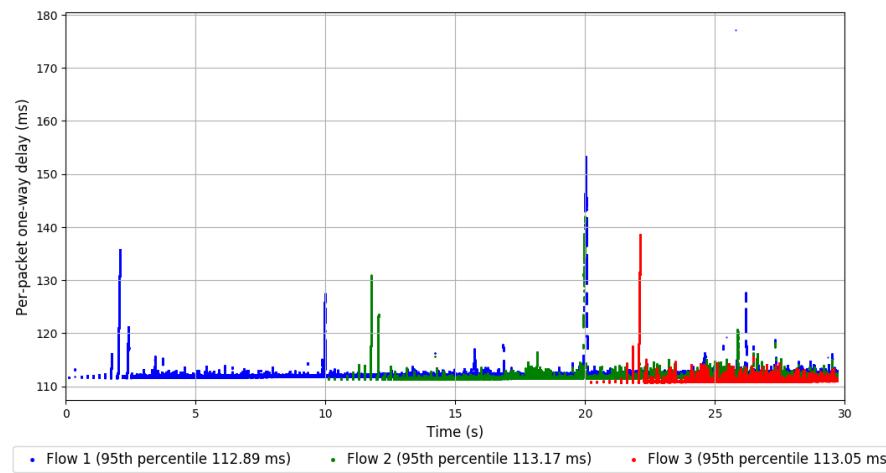
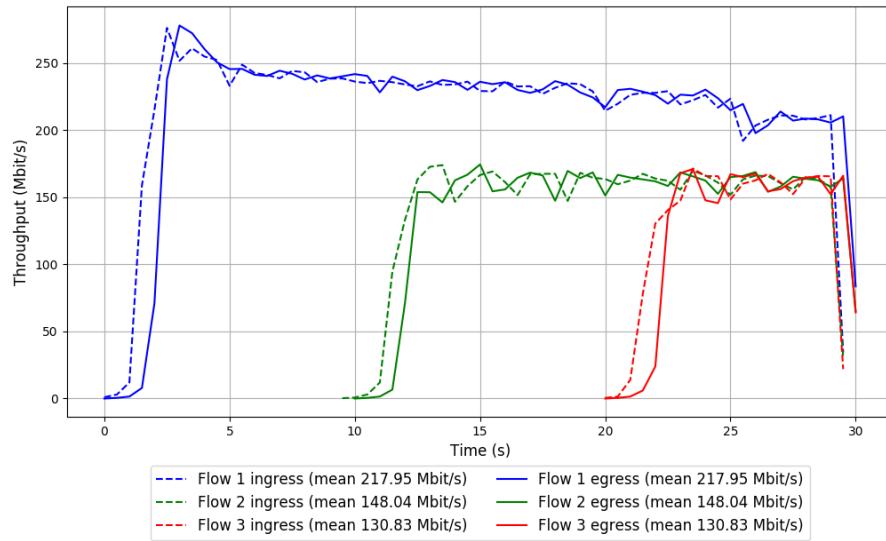


Run 1: Statistics of Indigo

```
Start at: 2018-09-03 08:50:15
End at: 2018-09-03 08:50:45
Local clock offset: 19.054 ms
Remote clock offset: 10.324 ms

# Below is generated by plot.py at 2018-09-03 09:16:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 357.96 Mbit/s
95th percentile per-packet one-way delay: 112.994 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 217.95 Mbit/s
95th percentile per-packet one-way delay: 112.886 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 148.04 Mbit/s
95th percentile per-packet one-way delay: 113.169 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 130.83 Mbit/s
95th percentile per-packet one-way delay: 113.052 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link

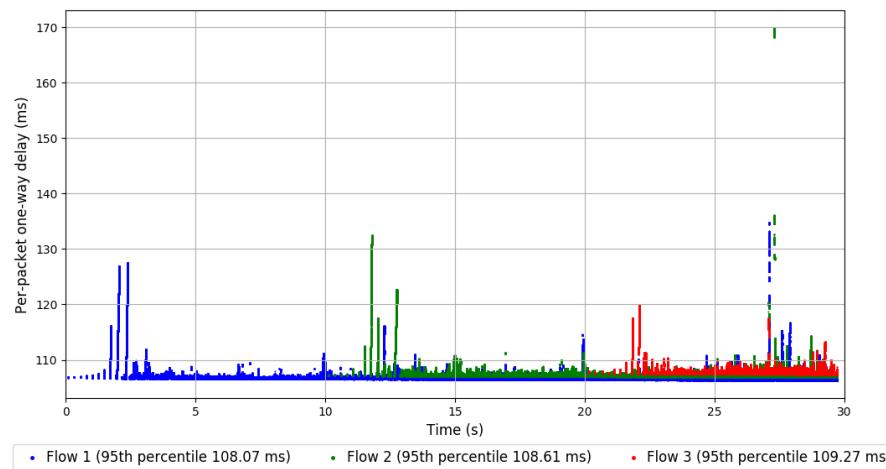
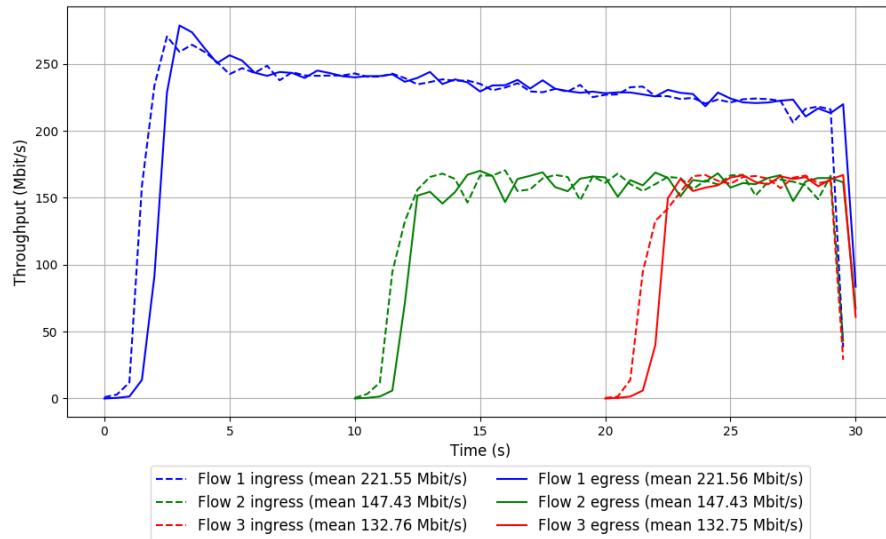


Run 2: Statistics of Indigo

```
Start at: 2018-09-03 08:58:28
End at: 2018-09-03 08:58:58
Local clock offset: 23.79 ms
Remote clock offset: 8.374 ms

# Below is generated by plot.py at 2018-09-03 09:16:42
# Datalink statistics
-- Total of 3 flows:
Average throughput: 361.83 Mbit/s
95th percentile per-packet one-way delay: 108.506 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 221.56 Mbit/s
95th percentile per-packet one-way delay: 108.068 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 147.43 Mbit/s
95th percentile per-packet one-way delay: 108.613 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 132.75 Mbit/s
95th percentile per-packet one-way delay: 109.267 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link

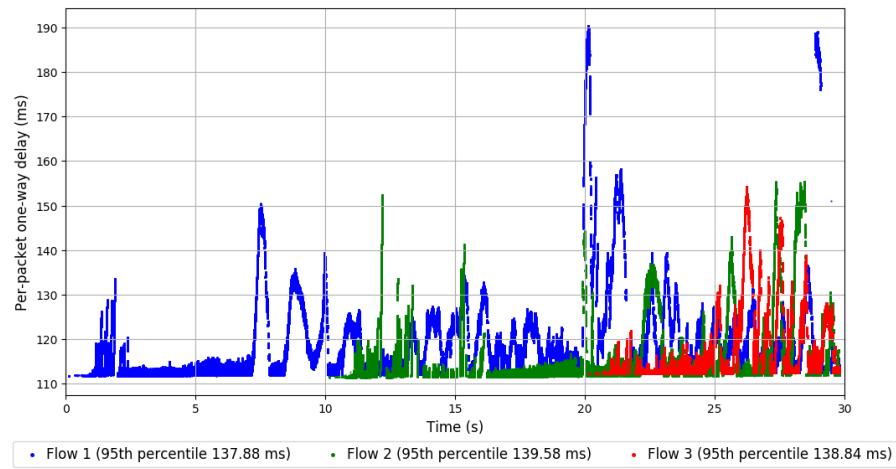
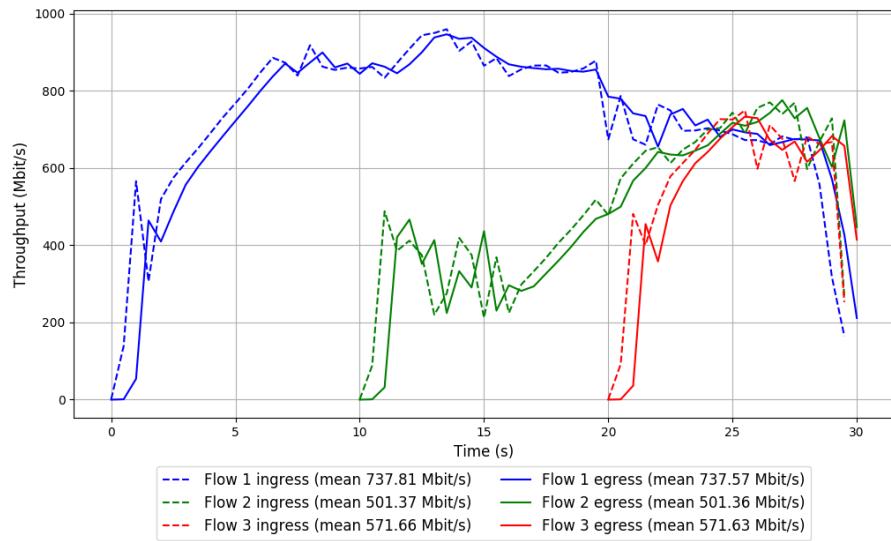


```
Run 1: Statistics of Muses-25
```

```
Start at: 2018-09-03 08:52:06
End at: 2018-09-03 08:52:36
Local clock offset: 21.252 ms
Remote clock offset: 9.498 ms

# Below is generated by plot.py at 2018-09-03 09:17:46
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1255.15 Mbit/s
95th percentile per-packet one-way delay: 138.656 ms
Loss rate: 0.02%
-- Flow 1:
Average throughput: 737.57 Mbit/s
95th percentile per-packet one-way delay: 137.883 ms
Loss rate: 0.03%
-- Flow 2:
Average throughput: 501.36 Mbit/s
95th percentile per-packet one-way delay: 139.581 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 571.63 Mbit/s
95th percentile per-packet one-way delay: 138.835 ms
Loss rate: 0.00%
```

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-09-03 09:00:20
End at: 2018-09-03 09:00:50
Local clock offset: 22.394 ms
Remote clock offset: 8.478 ms

# Below is generated by plot.py at 2018-09-03 09:17:46
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1181.64 Mbit/s
95th percentile per-packet one-way delay: 135.989 ms
Loss rate: 0.33%
-- Flow 1:
Average throughput: 684.39 Mbit/s
95th percentile per-packet one-way delay: 139.375 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 462.44 Mbit/s
95th percentile per-packet one-way delay: 133.244 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 590.44 Mbit/s
95th percentile per-packet one-way delay: 124.817 ms
Loss rate: 1.92%
```

Run 2: Report of Muses-25 — Data Link

