

Pantheon Report

Generated at 2018-08-31 11:17:48 (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.

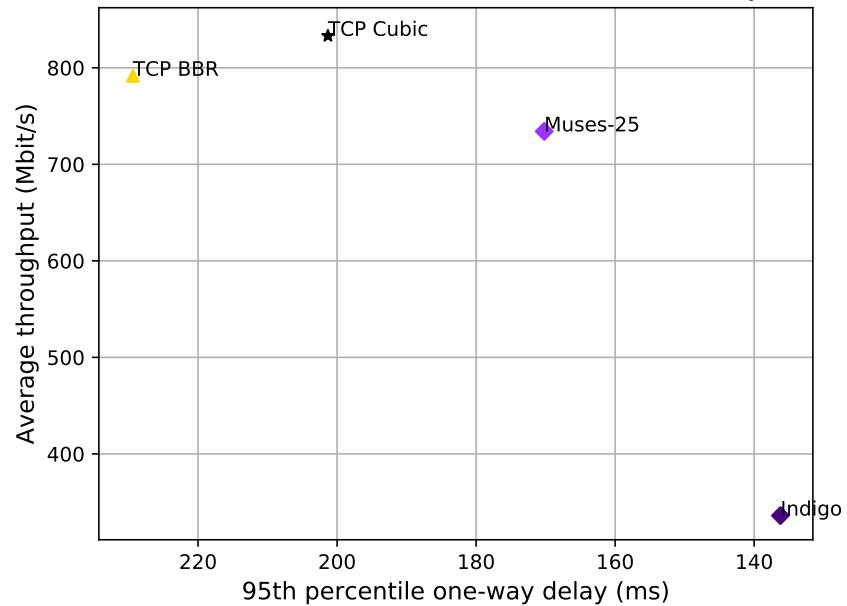
System info:

```
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
```

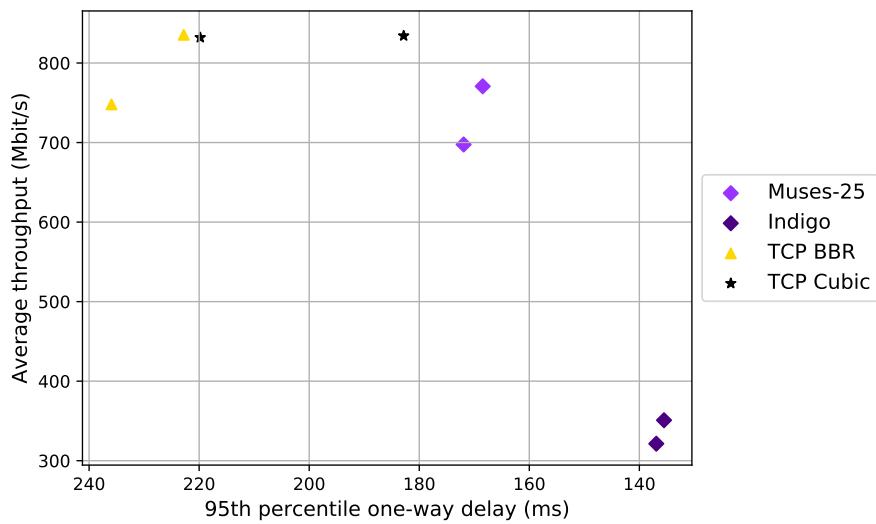
Git summary:

```
branch: muses @ e3c5aa19ca94c3066828fb83f16a8fb6b2731e7a
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b59e0d118c50af3579569c462d33045741c85981
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



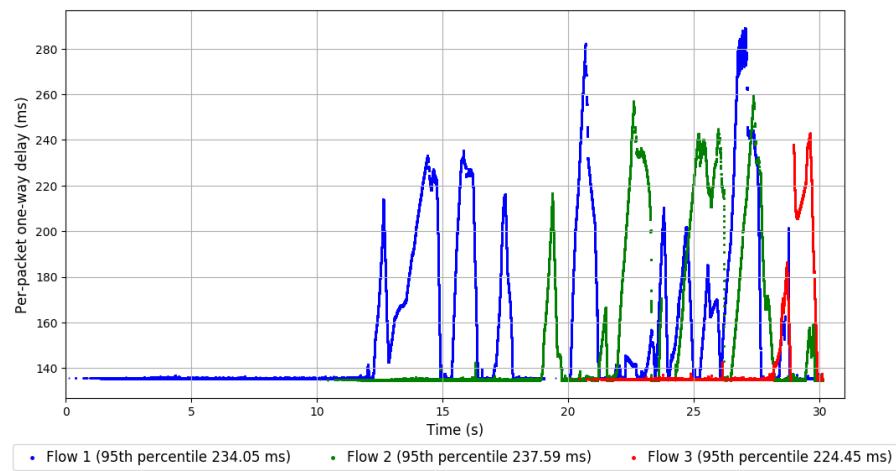
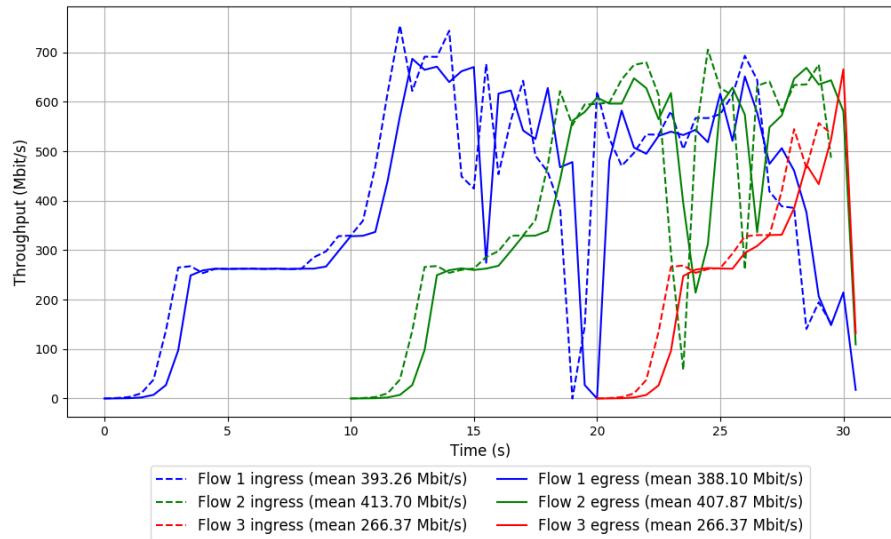
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	425.35	416.36	268.49	224.69	234.23	226.83	0.83	1.11	1.47
TCP Cubic	2	430.60	449.59	309.91	208.99	174.67	153.80	0.22	0.15	0.05
Indigo	2	181.68	167.57	136.45	135.96	136.26	137.05	0.00	0.00	0.00
Muses-25	2	407.59	316.34	361.62	171.52	171.73	159.24	0.12	0.24	0.03

Run 1: Statistics of TCP BBR

```
Start at: 2018-08-31 10:47:09
End at: 2018-08-31 10:47:39
Local clock offset: 4.183 ms
Remote clock offset: 2.398 ms

# Below is generated by plot.py at 2018-08-31 11:16:00
# Datalink statistics
-- Total of 3 flows:
Average throughput: 747.97 Mbit/s
95th percentile per-packet one-way delay: 235.930 ms
Loss rate: 1.20%
-- Flow 1:
Average throughput: 388.10 Mbit/s
95th percentile per-packet one-way delay: 234.048 ms
Loss rate: 1.31%
-- Flow 2:
Average throughput: 407.87 Mbit/s
95th percentile per-packet one-way delay: 237.595 ms
Loss rate: 1.41%
-- Flow 3:
Average throughput: 266.37 Mbit/s
95th percentile per-packet one-way delay: 224.451 ms
Loss rate: 0.00%
```

Run 1: Report of TCP BBR — Data Link

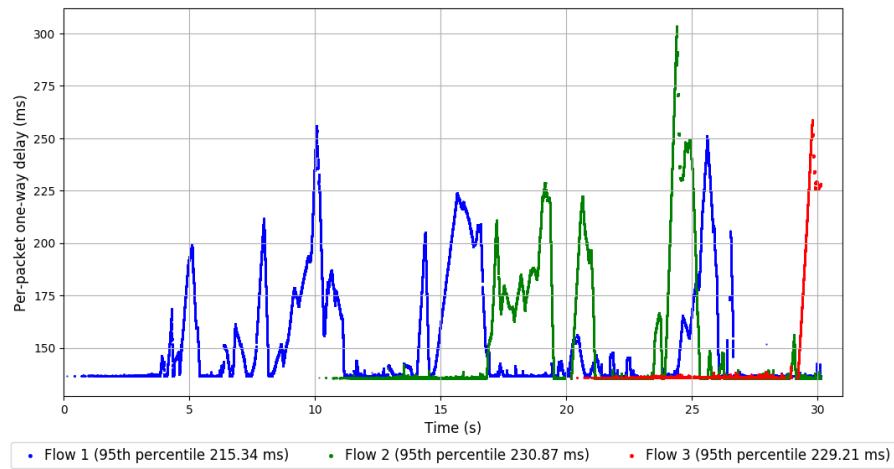
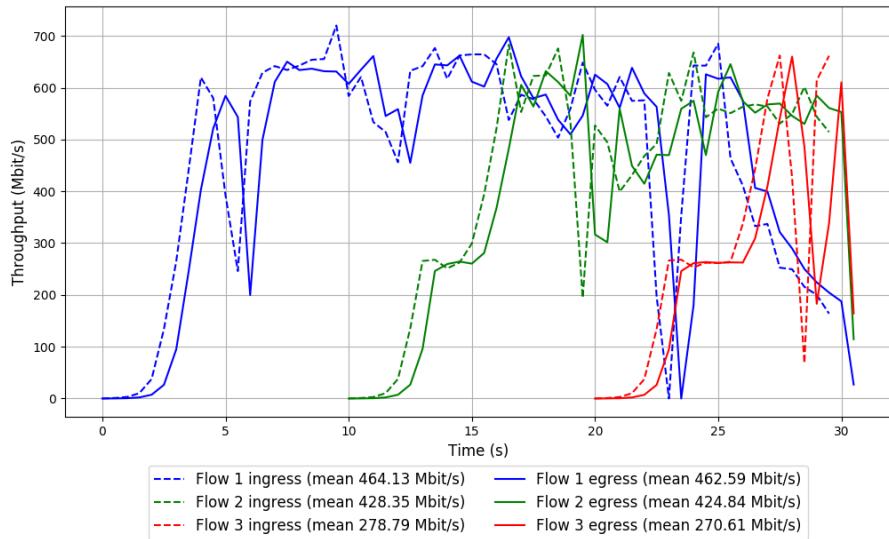


Run 2: Statistics of TCP BBR

```
Start at: 2018-08-31 10:55:20
End at: 2018-08-31 10:55:50
Local clock offset: 2.136 ms
Remote clock offset: 1.638 ms

# Below is generated by plot.py at 2018-08-31 11:17:05
# Datalink statistics
-- Total of 3 flows:
Average throughput: 835.46 Mbit/s
95th percentile per-packet one-way delay: 222.809 ms
Loss rate: 0.79%
-- Flow 1:
Average throughput: 462.59 Mbit/s
95th percentile per-packet one-way delay: 215.342 ms
Loss rate: 0.34%
-- Flow 2:
Average throughput: 424.84 Mbit/s
95th percentile per-packet one-way delay: 230.870 ms
Loss rate: 0.82%
-- Flow 3:
Average throughput: 270.61 Mbit/s
95th percentile per-packet one-way delay: 229.212 ms
Loss rate: 2.93%
```

Run 2: Report of TCP BBR — Data Link

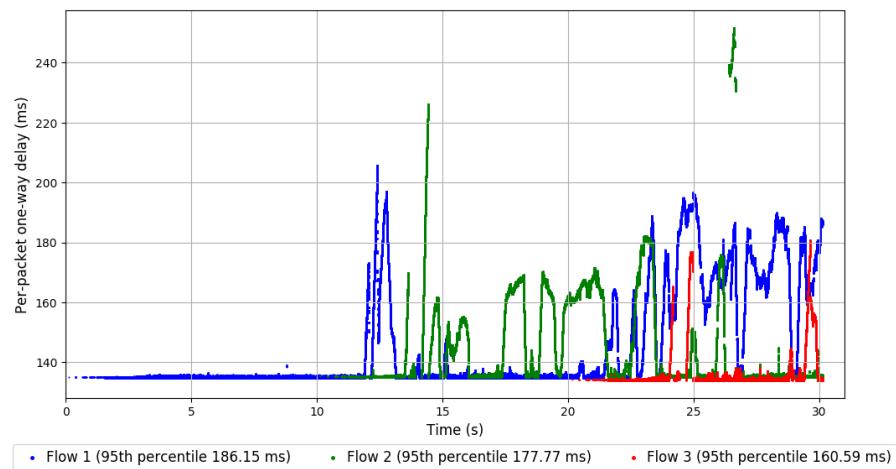
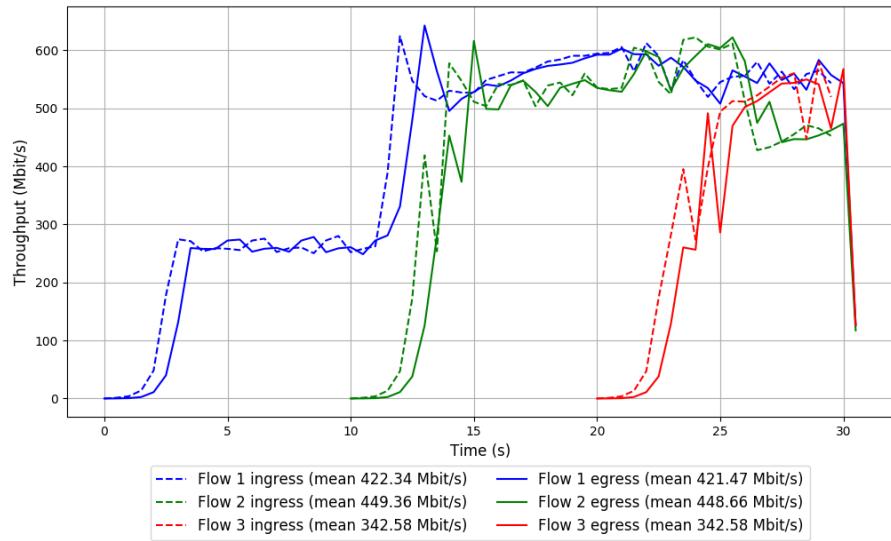


```
Run 1: Statistics of TCP Cubic
```

```
Start at: 2018-08-31 10:53:14
End at: 2018-08-31 10:53:44
Local clock offset: 2.615 ms
Remote clock offset: 1.25 ms

# Below is generated by plot.py at 2018-08-31 11:17:05
# Datalink statistics
-- Total of 3 flows:
Average throughput: 834.19 Mbit/s
95th percentile per-packet one-way delay: 182.833 ms
Loss rate: 0.16%
-- Flow 1:
Average throughput: 421.47 Mbit/s
95th percentile per-packet one-way delay: 186.146 ms
Loss rate: 0.20%
-- Flow 2:
Average throughput: 448.66 Mbit/s
95th percentile per-packet one-way delay: 177.772 ms
Loss rate: 0.16%
-- Flow 3:
Average throughput: 342.58 Mbit/s
95th percentile per-packet one-way delay: 160.591 ms
Loss rate: 0.00%
```

Run 1: Report of TCP Cubic — Data Link

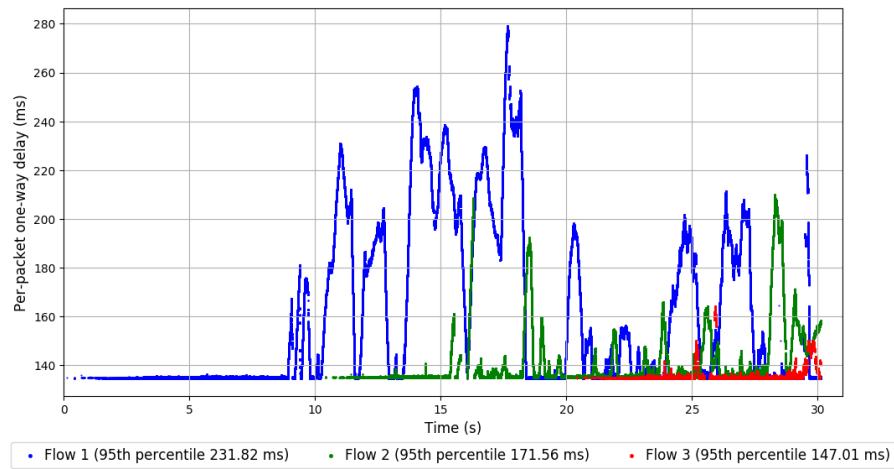
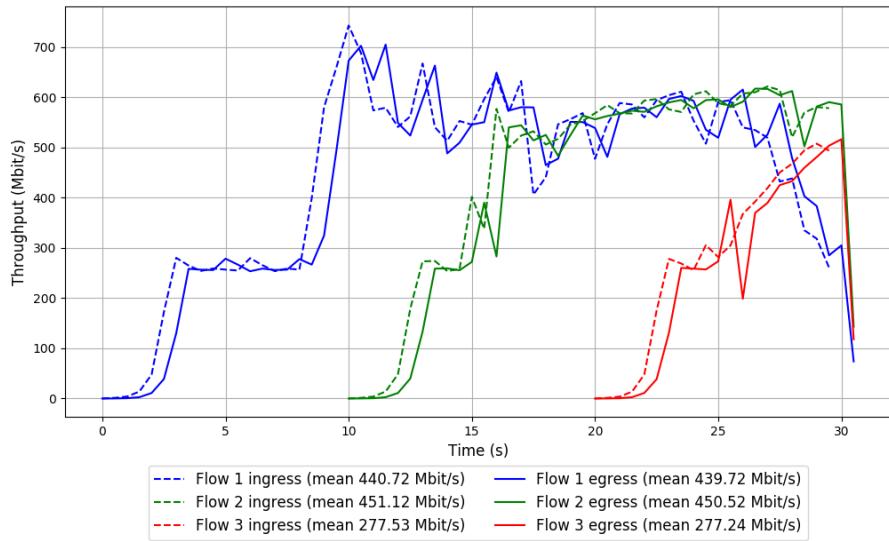


Run 2: Statistics of TCP Cubic

```
Start at: 2018-08-31 11:01:24
End at: 2018-08-31 11:01:54
Local clock offset: 1.772 ms
Remote clock offset: 0.828 ms

# Below is generated by plot.py at 2018-08-31 11:17:05
# Datalink statistics
-- Total of 3 flows:
Average throughput: 832.00 Mbit/s
95th percentile per-packet one-way delay: 219.798 ms
Loss rate: 0.18%
-- Flow 1:
Average throughput: 439.72 Mbit/s
95th percentile per-packet one-way delay: 231.824 ms
Loss rate: 0.23%
-- Flow 2:
Average throughput: 450.52 Mbit/s
95th percentile per-packet one-way delay: 171.564 ms
Loss rate: 0.13%
-- Flow 3:
Average throughput: 277.24 Mbit/s
95th percentile per-packet one-way delay: 147.012 ms
Loss rate: 0.10%
```

Run 2: Report of TCP Cubic — Data Link

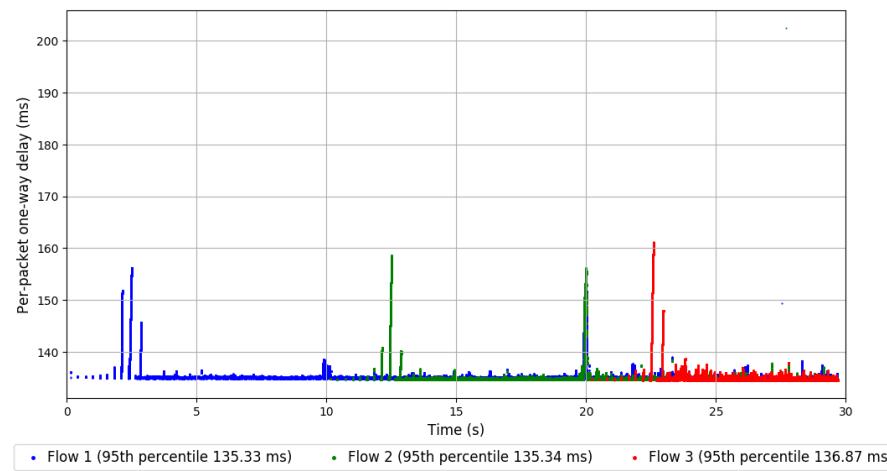
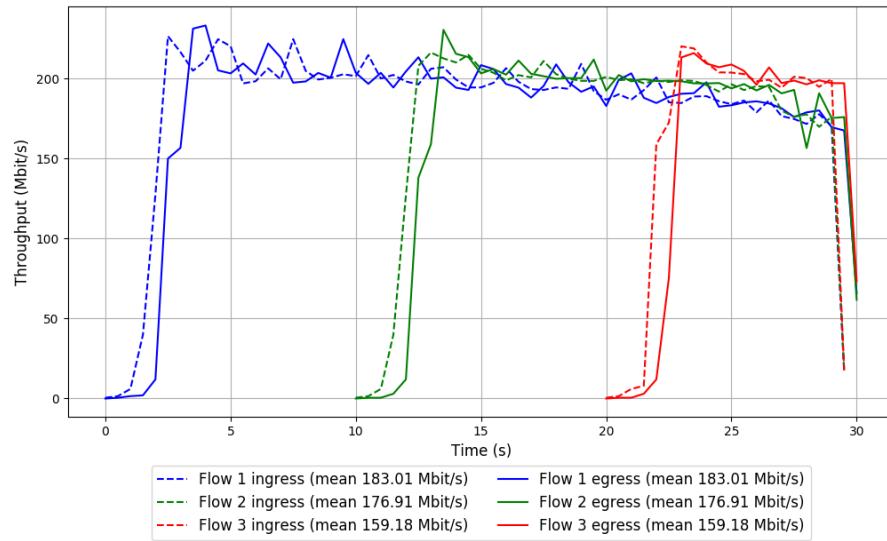


Run 1: Statistics of Indigo

```
Start at: 2018-08-31 10:49:15
End at: 2018-08-31 10:49:45
Local clock offset: 3.478 ms
Remote clock offset: 1.564 ms

# Below is generated by plot.py at 2018-08-31 11:17:05
# Datalink statistics
-- Total of 3 flows:
Average throughput: 350.88 Mbit/s
95th percentile per-packet one-way delay: 135.520 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 183.01 Mbit/s
95th percentile per-packet one-way delay: 135.330 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 176.91 Mbit/s
95th percentile per-packet one-way delay: 135.341 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 159.18 Mbit/s
95th percentile per-packet one-way delay: 136.866 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link

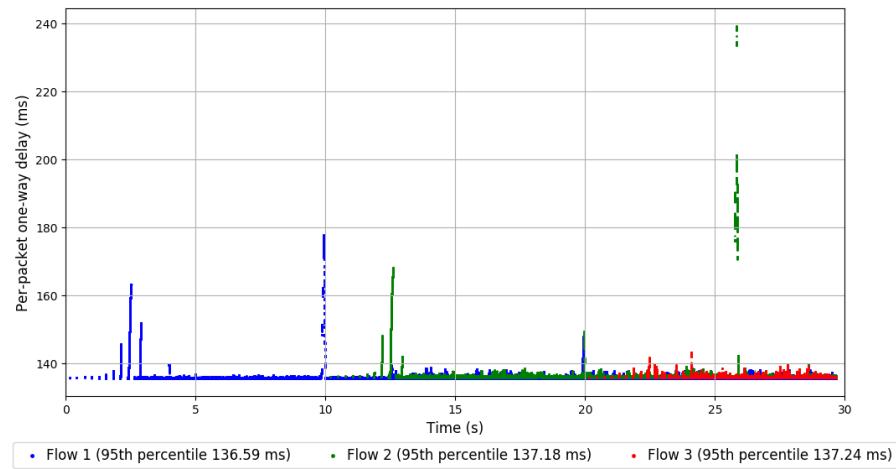
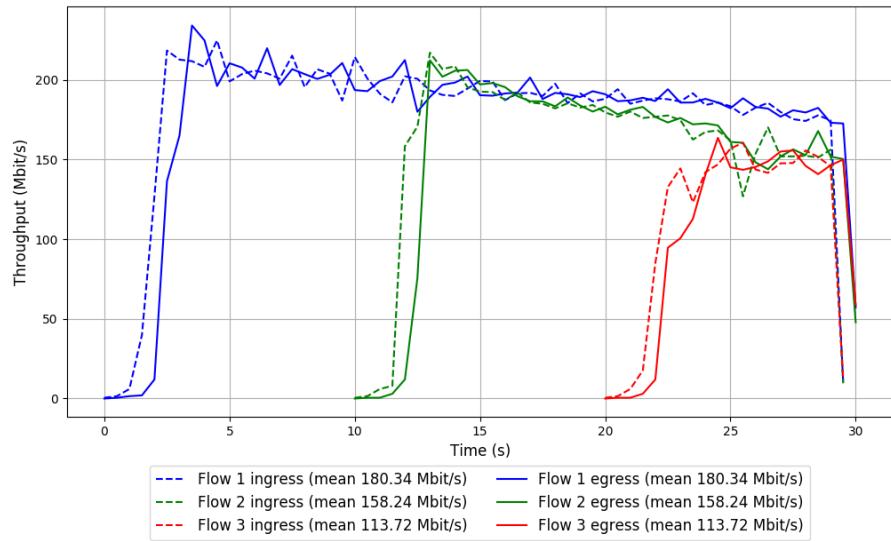


Run 2: Statistics of Indigo

```
Start at: 2018-08-31 10:57:32
End at: 2018-08-31 10:58:02
Local clock offset: 1.915 ms
Remote clock offset: 1.56 ms

# Below is generated by plot.py at 2018-08-31 11:17:05
# Datalink statistics
-- Total of 3 flows:
Average throughput: 321.35 Mbit/s
95th percentile per-packet one-way delay: 136.922 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 180.34 Mbit/s
95th percentile per-packet one-way delay: 136.590 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 158.24 Mbit/s
95th percentile per-packet one-way delay: 137.184 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 113.72 Mbit/s
95th percentile per-packet one-way delay: 137.237 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link

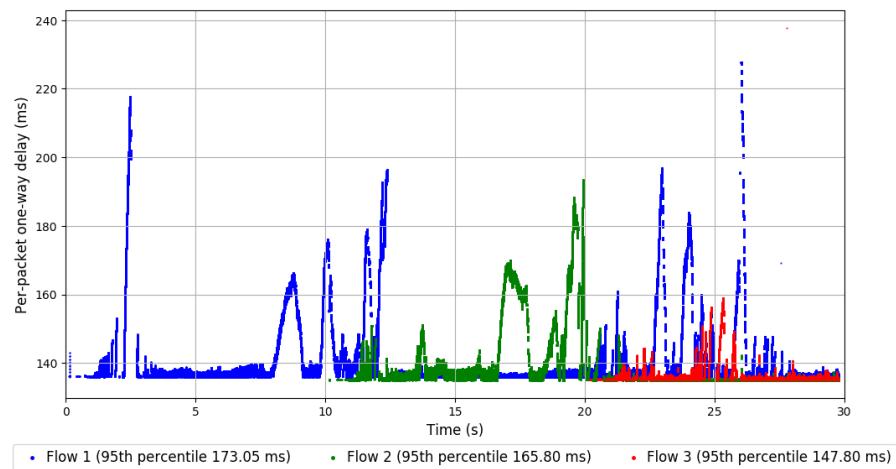
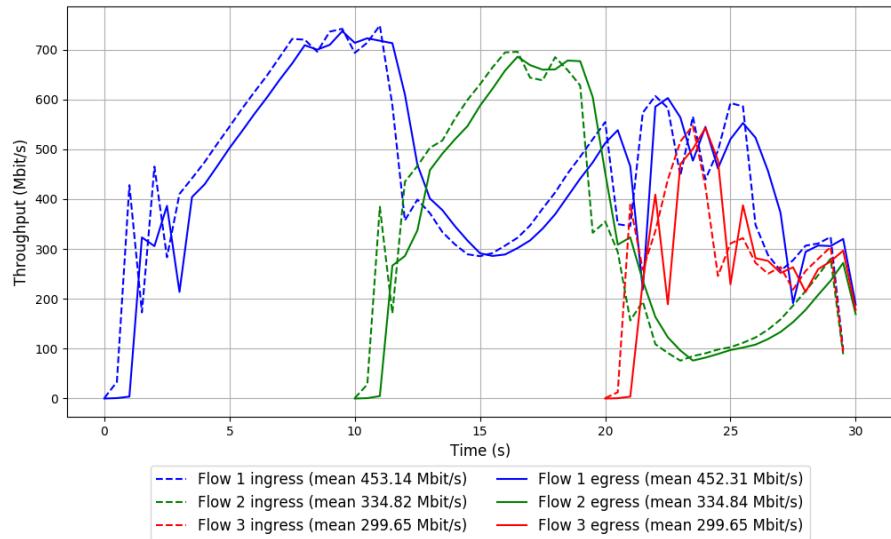


Run 1: Statistics of Muses-25

```
Start at: 2018-08-31 10:51:09
End at: 2018-08-31 10:51:39
Local clock offset: 2.824 ms
Remote clock offset: 1.47 ms

# Below is generated by plot.py at 2018-08-31 11:17:46
# Datalink statistics
-- Total of 3 flows:
Average throughput: 770.74 Mbit/s
95th percentile per-packet one-way delay: 168.465 ms
Loss rate: 0.11%
-- Flow 1:
Average throughput: 452.31 Mbit/s
95th percentile per-packet one-way delay: 173.049 ms
Loss rate: 0.18%
-- Flow 2:
Average throughput: 334.84 Mbit/s
95th percentile per-packet one-way delay: 165.796 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 299.65 Mbit/s
95th percentile per-packet one-way delay: 147.798 ms
Loss rate: 0.00%
```

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-08-31 10:59:24
End at: 2018-08-31 10:59:54
Local clock offset: 1.785 ms
Remote clock offset: 0.759 ms

# Below is generated by plot.py at 2018-08-31 11:17:46
# Datalink statistics
-- Total of 3 flows:
Average throughput: 697.55 Mbit/s
95th percentile per-packet one-way delay: 171.931 ms
Loss rate: 0.19%
-- Flow 1:
Average throughput: 362.86 Mbit/s
95th percentile per-packet one-way delay: 169.991 ms
Loss rate: 0.07%
-- Flow 2:
Average throughput: 297.84 Mbit/s
95th percentile per-packet one-way delay: 177.658 ms
Loss rate: 0.49%
-- Flow 3:
Average throughput: 423.59 Mbit/s
95th percentile per-packet one-way delay: 170.687 ms
Loss rate: 0.05%
```

Run 2: Report of Muses-25 — Data Link

