

Pantheon Report

Generated at 2018-09-06 00:51:43 (UTC).
Data path: GCE London on `ens4` (*remote*) → GCE Sydney 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.

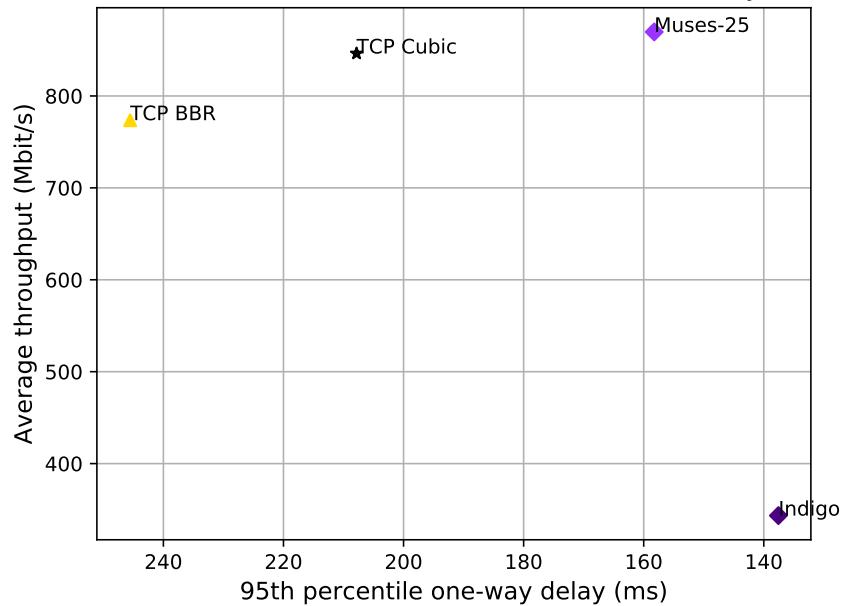
System info:

```
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
```

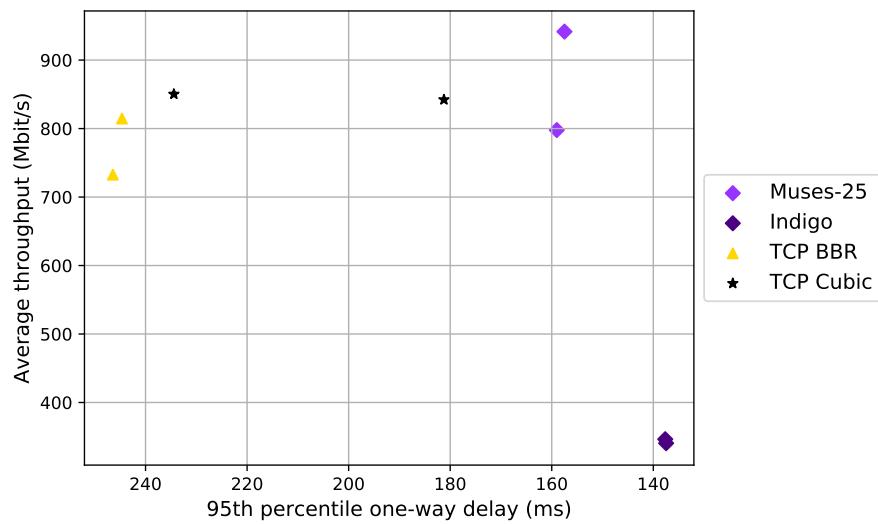
Git summary:

```
branch: muses @ 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 London to GCE Sydney, 2 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)



test from GCE London to GCE Sydney, 2 runs of 30s each per scheme
3 flows with 10s interval between flows



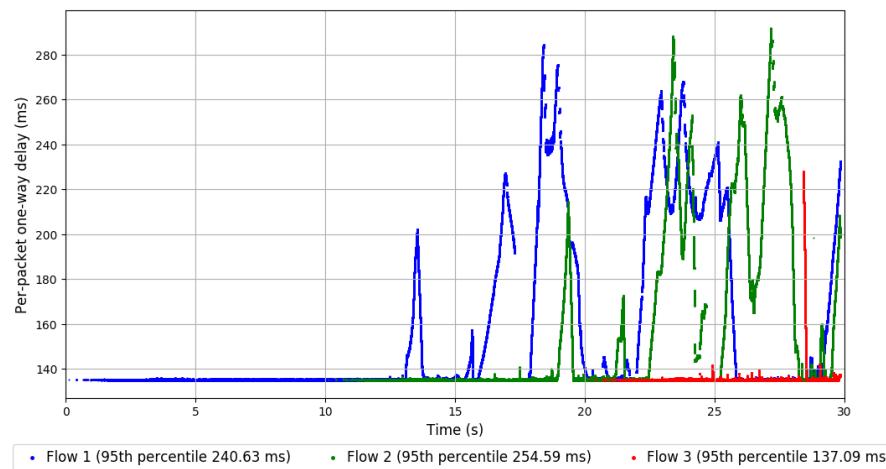
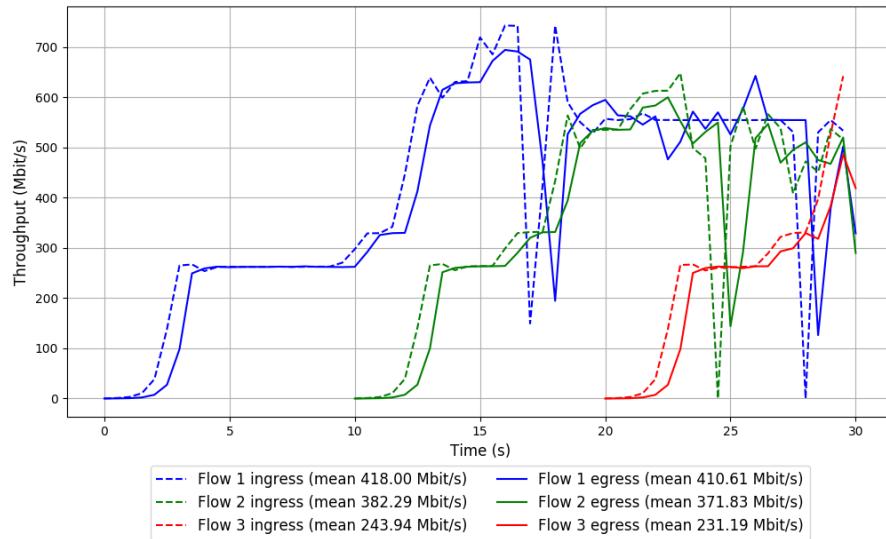
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	436.45	385.65	249.44	235.99	262.43	170.36	2.13	4.23	6.46
TCP Cubic	2	495.96	359.47	342.95	217.96	188.80	212.72	0.84	1.91	4.58
Indigo	2	183.32	175.94	136.47	136.83	138.03	140.30	0.90	1.39	3.54
Muses-25	2	448.79	472.31	333.02	160.72	156.09	152.78	0.93	1.26	3.12

Run 1: Statistics of TCP BBR

```
Start at: 2018-09-06 00:20:27
End at: 2018-09-06 00:20:57
Local clock offset: 0.854 ms
Remote clock offset: -0.269 ms

# Below is generated by plot.py at 2018-09-06 00:50:16
# Datalink statistics
-- Total of 3 flows:
Average throughput: 732.69 Mbit/s
95th percentile per-packet one-way delay: 246.432 ms
Loss rate: 3.68%
-- Flow 1:
Average throughput: 410.61 Mbit/s
95th percentile per-packet one-way delay: 240.632 ms
Loss rate: 2.65%
-- Flow 2:
Average throughput: 371.83 Mbit/s
95th percentile per-packet one-way delay: 254.595 ms
Loss rate: 4.05%
-- Flow 3:
Average throughput: 231.19 Mbit/s
95th percentile per-packet one-way delay: 137.094 ms
Loss rate: 7.81%
```

Run 1: Report of TCP BBR — Data Link

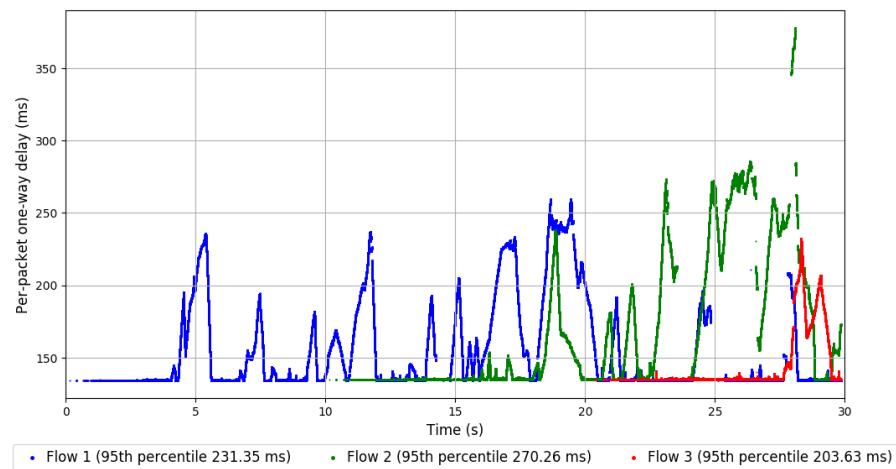
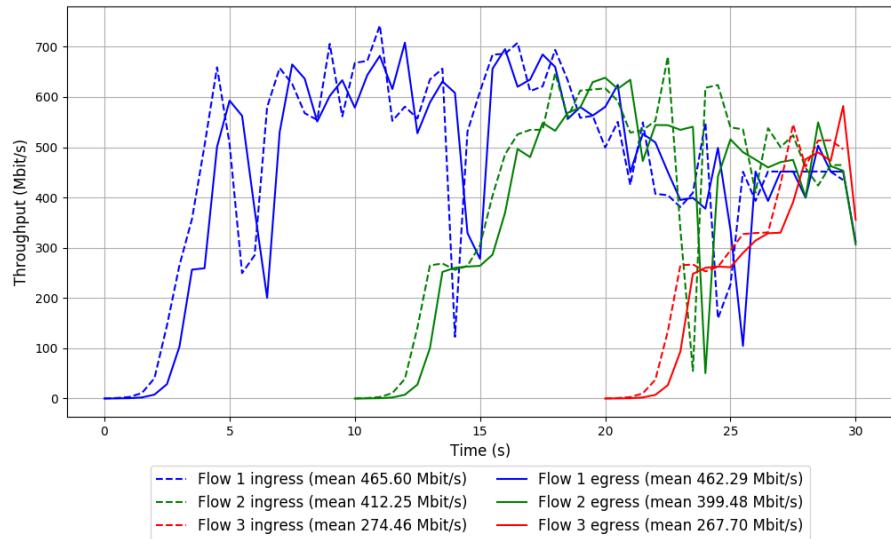


Run 2: Statistics of TCP BBR

```
Start at: 2018-09-06 00:29:53
End at: 2018-09-06 00:30:23
Local clock offset: 0.825 ms
Remote clock offset: 0.413 ms

# Below is generated by plot.py at 2018-09-06 00:51:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 814.60 Mbit/s
95th percentile per-packet one-way delay: 244.640 ms
Loss rate: 2.92%
-- Flow 1:
Average throughput: 462.29 Mbit/s
95th percentile per-packet one-way delay: 231.352 ms
Loss rate: 1.61%
-- Flow 2:
Average throughput: 399.48 Mbit/s
95th percentile per-packet one-way delay: 270.259 ms
Loss rate: 4.41%
-- Flow 3:
Average throughput: 267.70 Mbit/s
95th percentile per-packet one-way delay: 203.627 ms
Loss rate: 5.11%
```

Run 2: Report of TCP BBR — Data Link

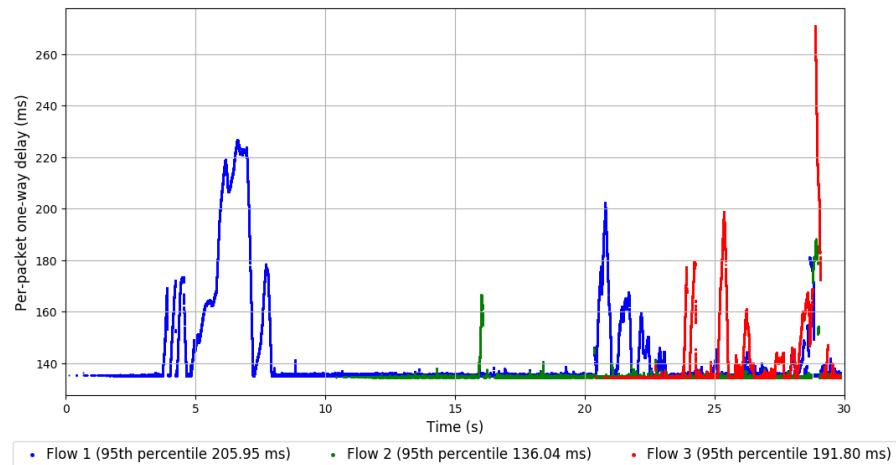
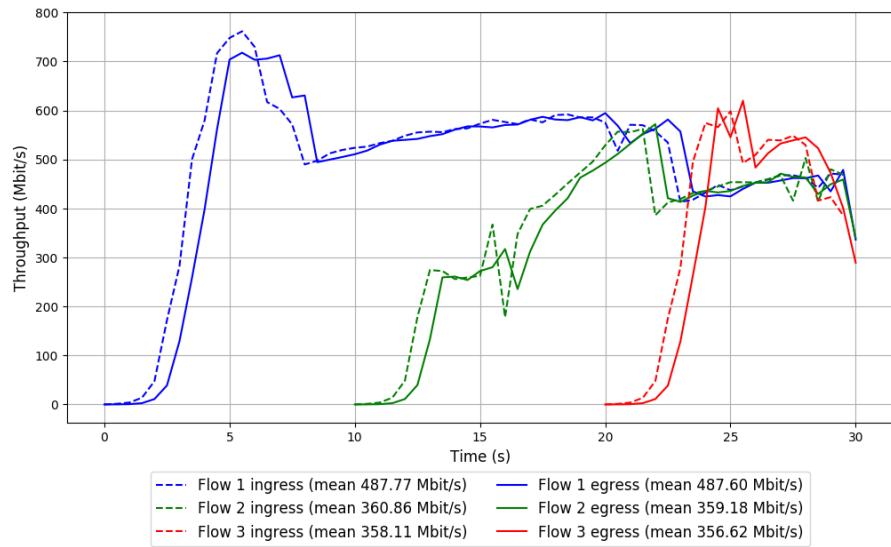


```
Run 1: Statistics of TCP Cubic
```

```
Start at: 2018-09-06 00:18:16
End at: 2018-09-06 00:18:46
Local clock offset: 0.694 ms
Remote clock offset: 0.078 ms

# Below is generated by plot.py at 2018-09-06 00:51:32
# Datalink statistics
-- Total of 3 flows:
Average throughput: 842.12 Mbit/s
95th percentile per-packet one-way delay: 181.231 ms
Loss rate: 1.49%
-- Flow 1:
Average throughput: 487.60 Mbit/s
95th percentile per-packet one-way delay: 205.948 ms
Loss rate: 0.94%
-- Flow 2:
Average throughput: 359.18 Mbit/s
95th percentile per-packet one-way delay: 136.040 ms
Loss rate: 1.81%
-- Flow 3:
Average throughput: 356.62 Mbit/s
95th percentile per-packet one-way delay: 191.796 ms
Loss rate: 3.11%
```

Run 1: Report of TCP Cubic — Data Link

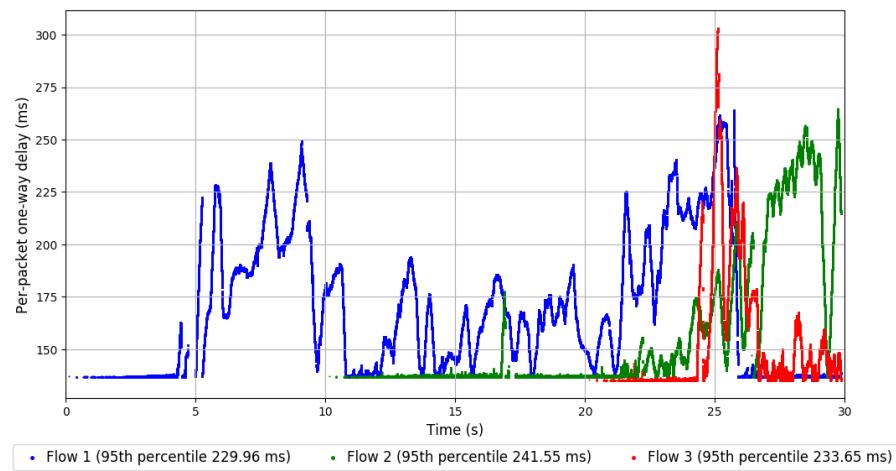
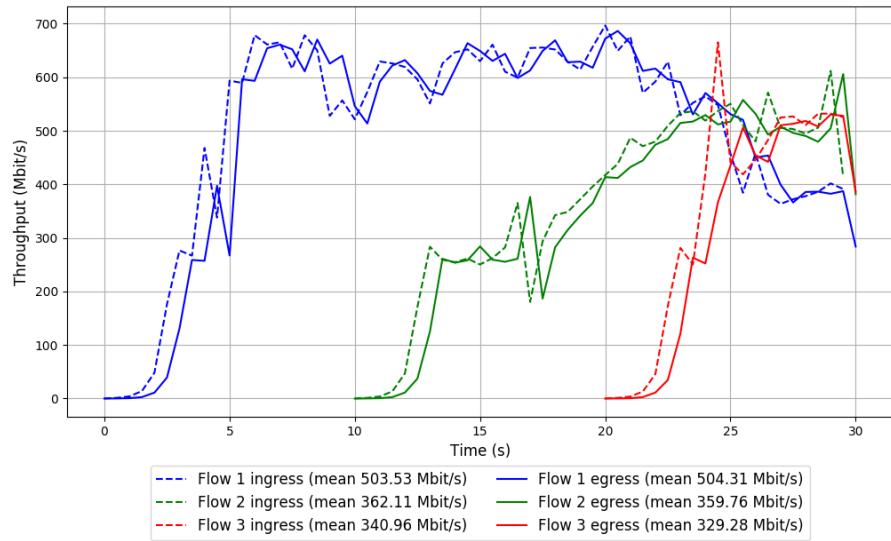


Run 2: Statistics of TCP Cubic

```
Start at: 2018-09-06 00:27:30
End at: 2018-09-06 00:28:00
Local clock offset: 0.773 ms
Remote clock offset: -0.277 ms

# Below is generated by plot.py at 2018-09-06 00:51:34
# Datalink statistics
-- Total of 3 flows:
Average throughput: 850.29 Mbit/s
95th percentile per-packet one-way delay: 234.422 ms
Loss rate: 1.80%
-- Flow 1:
Average throughput: 504.31 Mbit/s
95th percentile per-packet one-way delay: 229.964 ms
Loss rate: 0.75%
-- Flow 2:
Average throughput: 359.76 Mbit/s
95th percentile per-packet one-way delay: 241.551 ms
Loss rate: 2.00%
-- Flow 3:
Average throughput: 329.28 Mbit/s
95th percentile per-packet one-way delay: 233.649 ms
Loss rate: 6.04%
```

Run 2: Report of TCP Cubic — Data Link

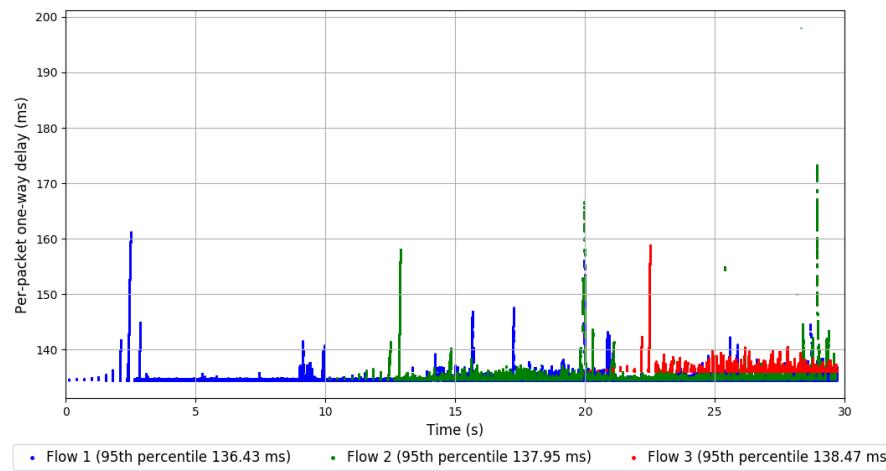
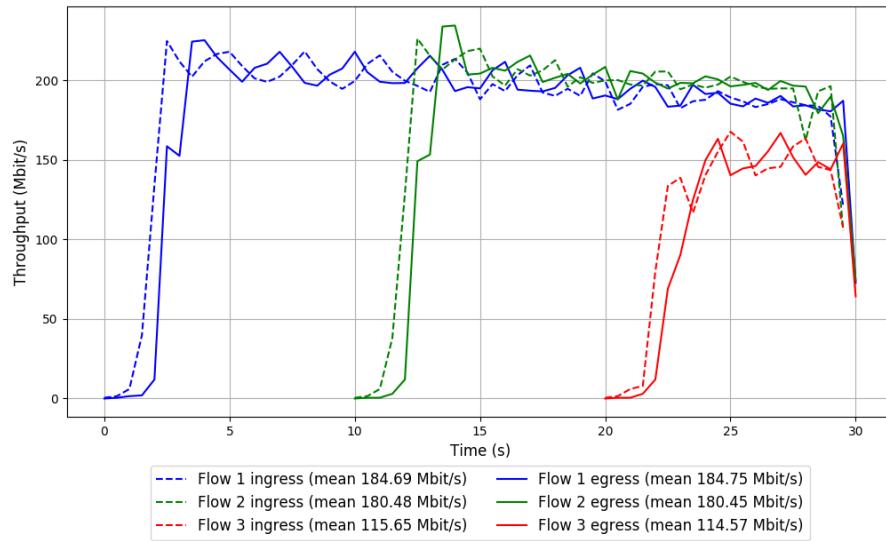


Run 1: Statistics of Indigo

```
Start at: 2018-09-06 00:25:22
End at: 2018-09-06 00:25:52
Local clock offset: 1.042 ms
Remote clock offset: 0.421 ms

# Below is generated by plot.py at 2018-09-06 00:51:34
# Datalink statistics
-- Total of 3 flows:
Average throughput: 340.54 Mbit/s
95th percentile per-packet one-way delay: 137.475 ms
Loss rate: 1.37%
-- Flow 1:
Average throughput: 184.75 Mbit/s
95th percentile per-packet one-way delay: 136.426 ms
Loss rate: 0.88%
-- Flow 2:
Average throughput: 180.45 Mbit/s
95th percentile per-packet one-way delay: 137.947 ms
Loss rate: 1.40%
-- Flow 3:
Average throughput: 114.57 Mbit/s
95th percentile per-packet one-way delay: 138.469 ms
Loss rate: 3.66%
```

Run 1: Report of Indigo — Data Link

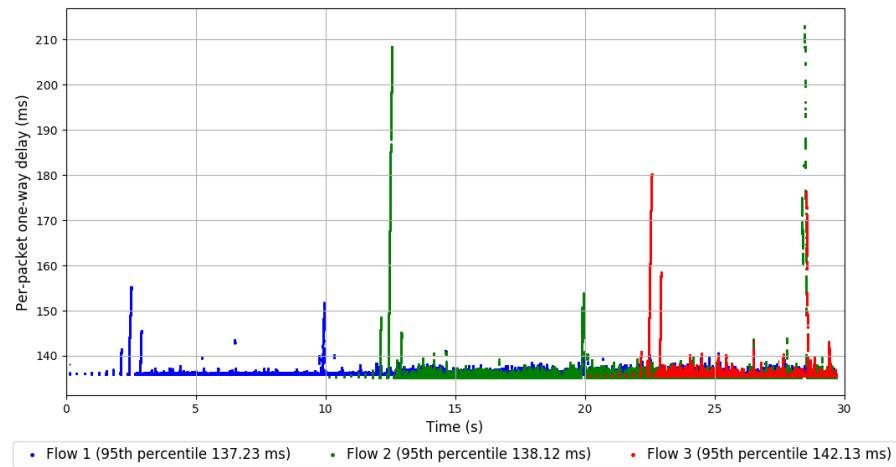
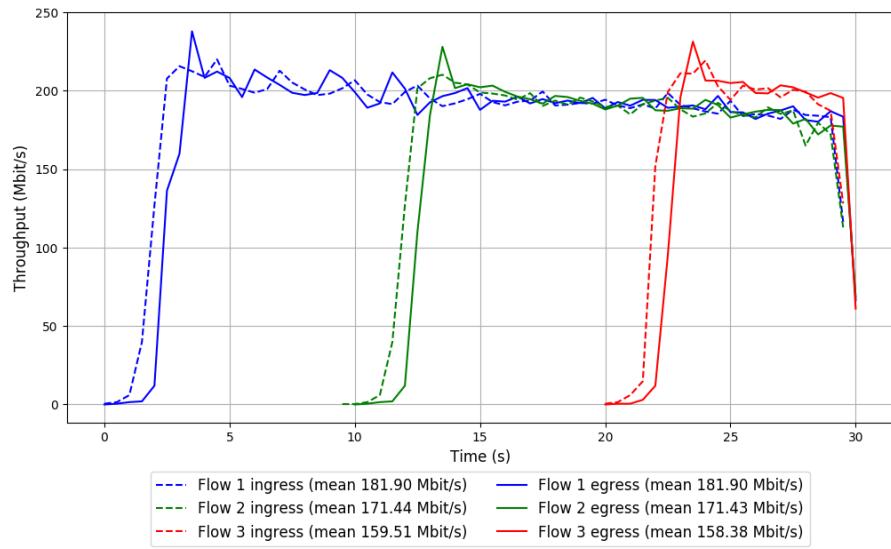


Run 2: Statistics of Indigo

```
Start at: 2018-09-06 00:34:54
End at: 2018-09-06 00:35:24
Local clock offset: 0.435 ms
Remote clock offset: 0.435 ms

# Below is generated by plot.py at 2018-09-06 00:51:34
# Datalink statistics
-- Total of 3 flows:
Average throughput: 346.37 Mbit/s
95th percentile per-packet one-way delay: 137.651 ms
Loss rate: 1.45%
-- Flow 1:
Average throughput: 181.90 Mbit/s
95th percentile per-packet one-way delay: 137.228 ms
Loss rate: 0.92%
-- Flow 2:
Average throughput: 171.43 Mbit/s
95th percentile per-packet one-way delay: 138.117 ms
Loss rate: 1.38%
-- Flow 3:
Average throughput: 158.38 Mbit/s
95th percentile per-packet one-way delay: 142.132 ms
Loss rate: 3.43%
```

Run 2: Report of Indigo — Data Link

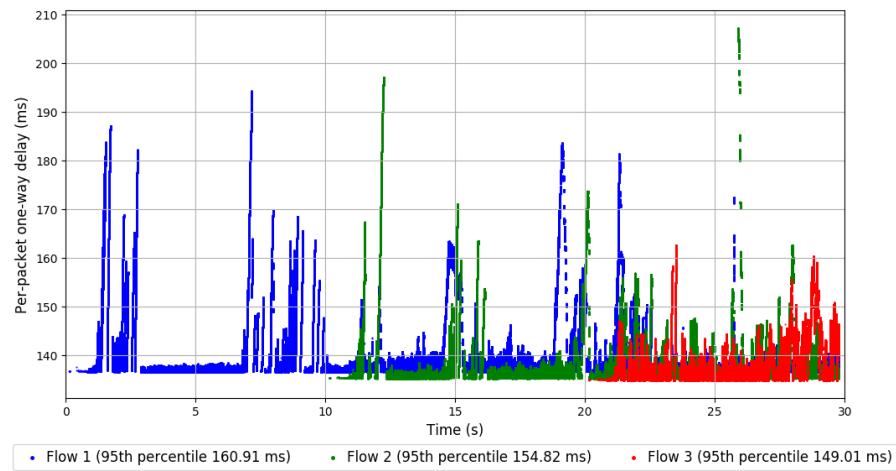
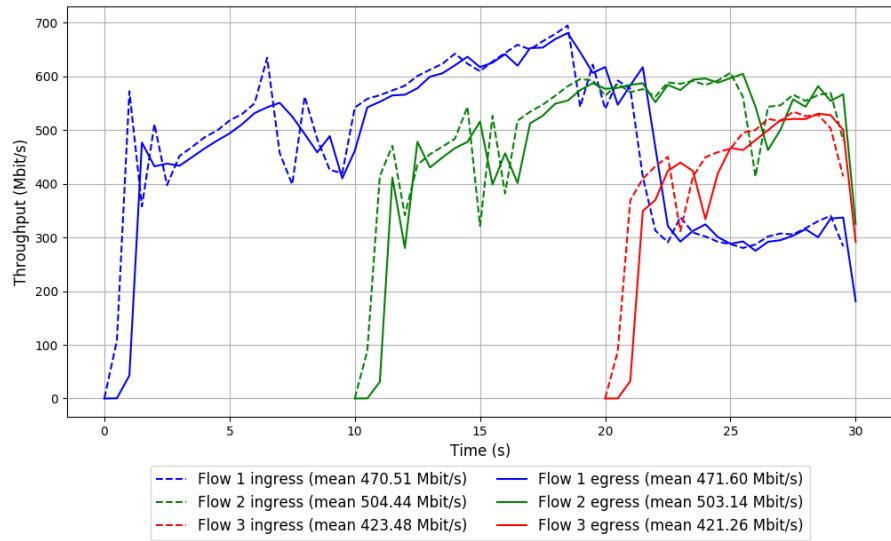


Run 1: Statistics of Muses-25

```
Start at: 2018-09-06 00:22:39
End at: 2018-09-06 00:23:09
Local clock offset: 1.084 ms
Remote clock offset: -0.293 ms

# Below is generated by plot.py at 2018-09-06 00:51:41
# Datalink statistics
-- Total of 3 flows:
Average throughput: 941.57 Mbit/s
95th percentile per-packet one-way delay: 157.491 ms
Loss rate: 1.39%
-- Flow 1:
Average throughput: 471.60 Mbit/s
95th percentile per-packet one-way delay: 160.907 ms
Loss rate: 0.70%
-- Flow 2:
Average throughput: 503.14 Mbit/s
95th percentile per-packet one-way delay: 154.825 ms
Loss rate: 1.59%
-- Flow 3:
Average throughput: 421.26 Mbit/s
95th percentile per-packet one-way delay: 149.010 ms
Loss rate: 3.25%
```

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-09-06 00:32:23
End at: 2018-09-06 00:32:53
Local clock offset: 0.544 ms
Remote clock offset: -0.293 ms

# Below is generated by plot.py at 2018-09-06 00:51:41
# Datalink statistics
-- Total of 3 flows:
Average throughput: 797.79 Mbit/s
95th percentile per-packet one-way delay: 159.010 ms
Loss rate: 1.26%
-- Flow 1:
Average throughput: 425.97 Mbit/s
95th percentile per-packet one-way delay: 160.527 ms
Loss rate: 1.17%
-- Flow 2:
Average throughput: 441.48 Mbit/s
95th percentile per-packet one-way delay: 157.356 ms
Loss rate: 0.92%
-- Flow 3:
Average throughput: 244.78 Mbit/s
95th percentile per-packet one-way delay: 156.549 ms
Loss rate: 3.00%
```

Run 2: Report of Muses-25 — Data Link

