

## Pantheon Report

Generated at 2018-08-31 05:47:37 (UTC).  
Data path: GCE Iowa 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.

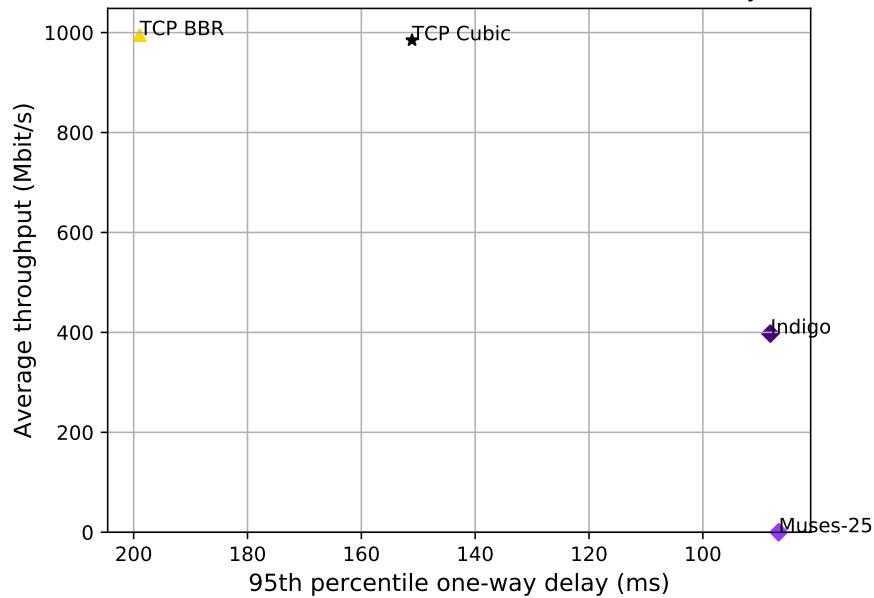
System info:

```
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
```

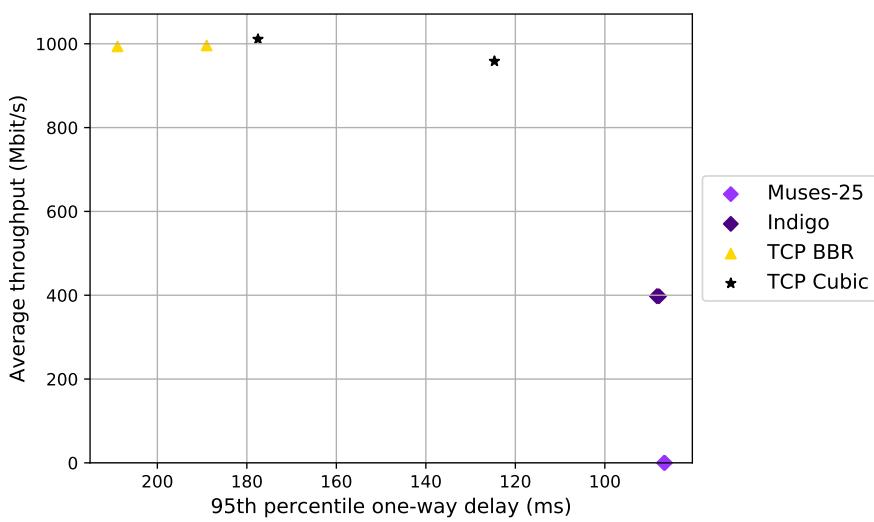
Git summary:

```
branch: muses @ 2de97ca91a065473c29a25ffffe63fb137c97a67c
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 Iowa 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 Iowa to GCE Sydney, 2 runs of 30s each per scheme  
3 flows with 10s interval between flows



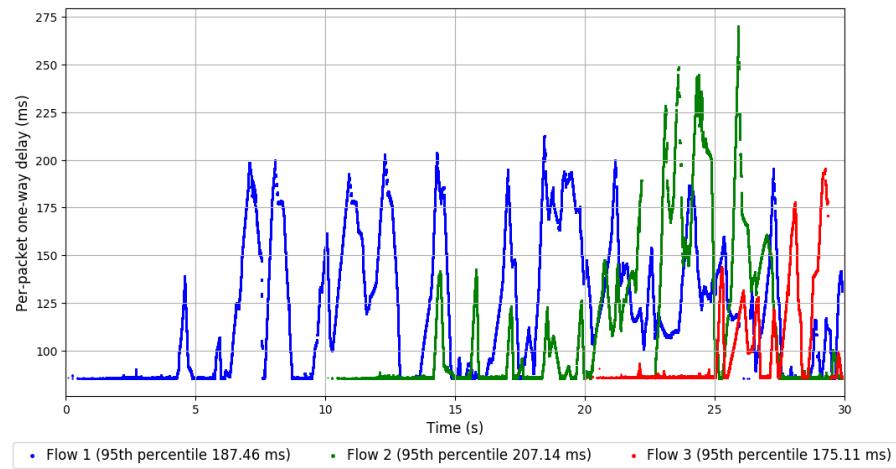
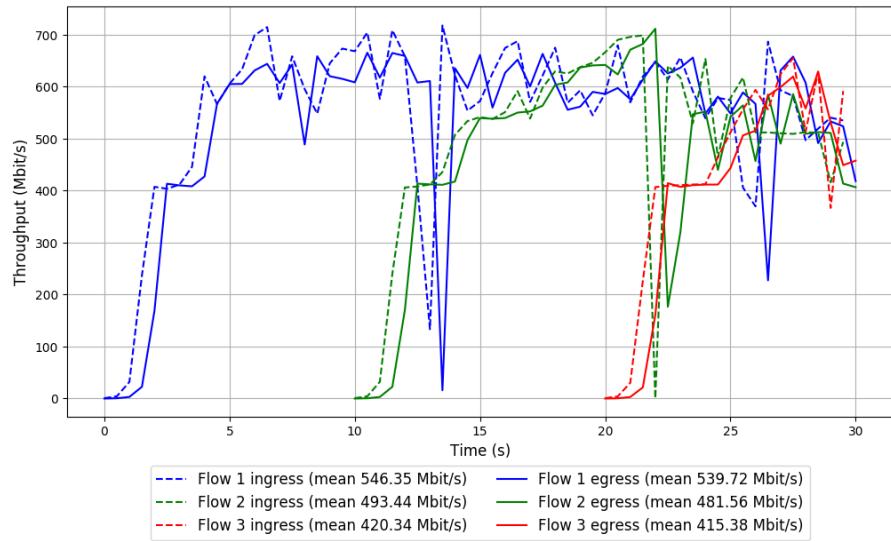
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	542.58	476.54	412.89	199.41	207.78	177.97	2.93	3.53	2.52
TCP Cubic	2	539.70	475.81	392.06	151.26	150.26	136.98	0.73	1.07	2.27
Indigo	2	208.41	203.11	169.56	87.89	88.10	88.76	0.53	0.85	2.10
Muses-25	2	0.00	0.00	0.00	86.66	86.67	87.17	0.00	0.00	0.00

Run 1: Statistics of TCP BBR

```
Start at: 2018-08-31 05:21:44
End at: 2018-08-31 05:22:14
Local clock offset: 35.022 ms
Remote clock offset: 42.438 ms

# Below is generated by plot.py at 2018-08-31 05:47:29
# Datalink statistics
-- Total of 3 flows:
Average throughput: 996.08 Mbit/s
95th percentile per-packet one-way delay: 188.978 ms
Loss rate: 2.41%
-- Flow 1:
Average throughput: 539.72 Mbit/s
95th percentile per-packet one-way delay: 187.464 ms
Loss rate: 1.78%
-- Flow 2:
Average throughput: 481.56 Mbit/s
95th percentile per-packet one-way delay: 207.143 ms
Loss rate: 3.25%
-- Flow 3:
Average throughput: 415.38 Mbit/s
95th percentile per-packet one-way delay: 175.114 ms
Loss rate: 2.90%
```

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

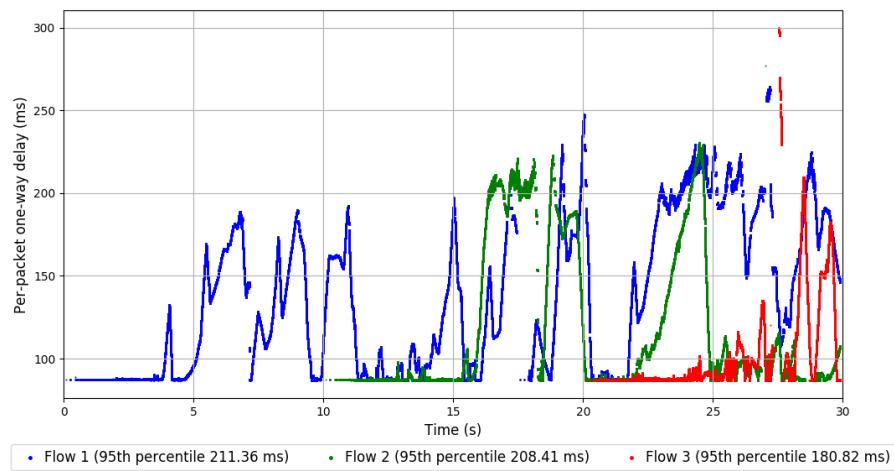
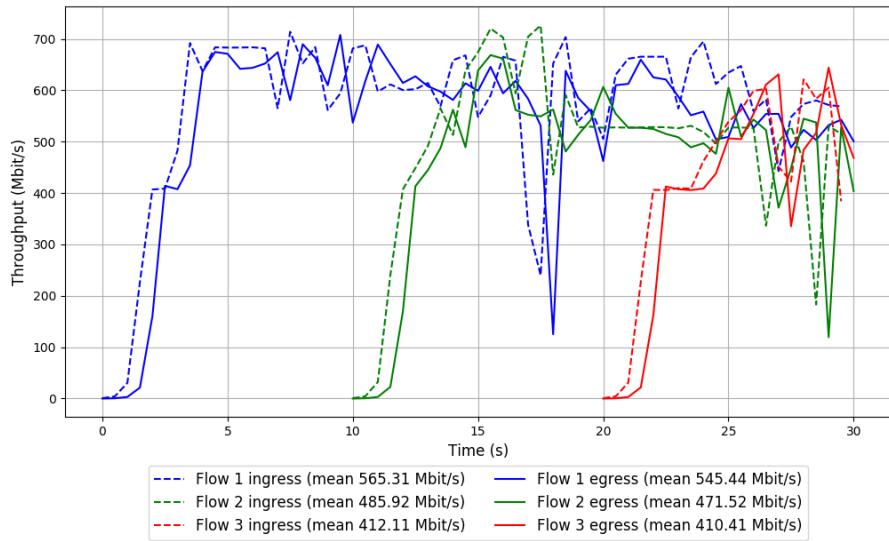


Run 2: Statistics of TCP BBR

```
Start at: 2018-08-31 05:28:55
End at: 2018-08-31 05:29:25
Local clock offset: 25.049 ms
Remote clock offset: 29.222 ms

# Below is generated by plot.py at 2018-08-31 05:47:32
# Datalink statistics
-- Total of 3 flows:
Average throughput: 993.77 Mbit/s
95th percentile per-packet one-way delay: 208.910 ms
Loss rate: 3.73%
-- Flow 1:
Average throughput: 545.44 Mbit/s
95th percentile per-packet one-way delay: 211.363 ms
Loss rate: 4.07%
-- Flow 2:
Average throughput: 471.52 Mbit/s
95th percentile per-packet one-way delay: 208.414 ms
Loss rate: 3.81%
-- Flow 3:
Average throughput: 410.41 Mbit/s
95th percentile per-packet one-way delay: 180.817 ms
Loss rate: 2.15%
```

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

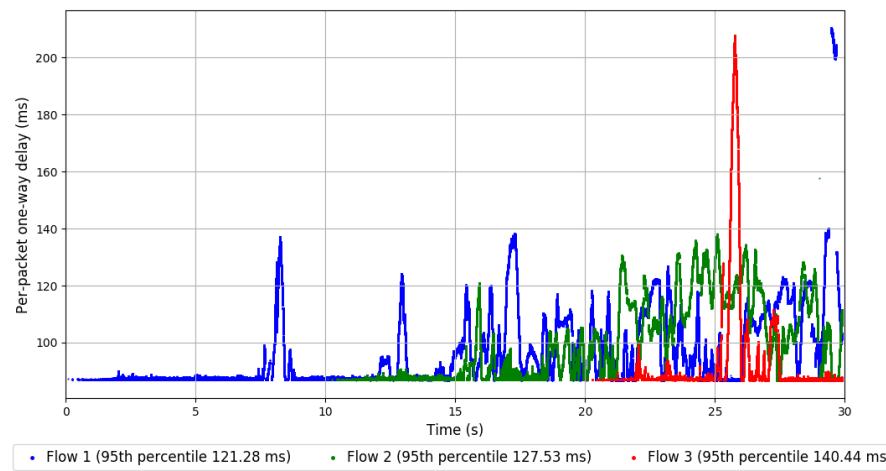
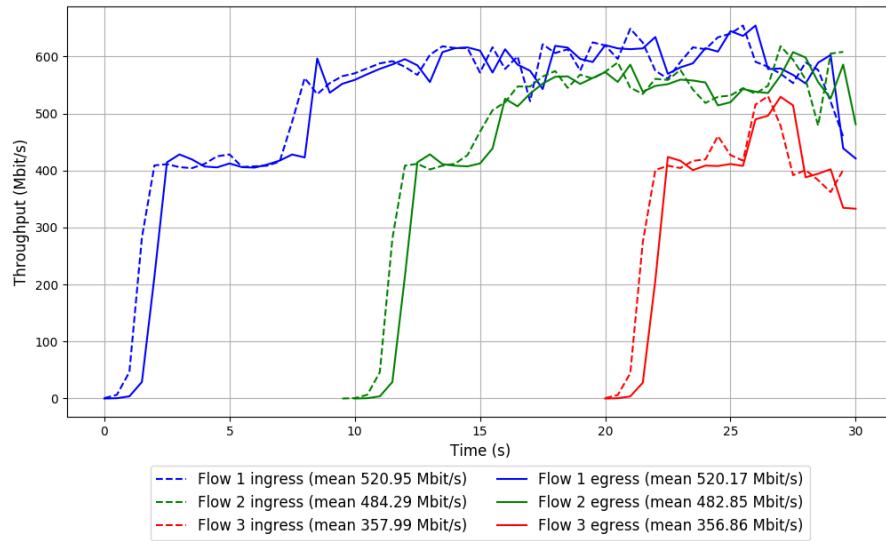


```
Run 1: Statistics of TCP Cubic
```

```
Start at: 2018-08-31 05:26:53
End at: 2018-08-31 05:27:23
Local clock offset: 29.668 ms
Remote clock offset: 34.7 ms

# Below is generated by plot.py at 2018-08-31 05:47:32
# Datalink statistics
-- Total of 3 flows:
Average throughput: 958.41 Mbit/s
95th percentile per-packet one-way delay: 124.666 ms
Loss rate: 1.03%
-- Flow 1:
Average throughput: 520.17 Mbit/s
95th percentile per-packet one-way delay: 121.275 ms
Loss rate: 0.72%
-- Flow 2:
Average throughput: 482.85 Mbit/s
95th percentile per-packet one-way delay: 127.526 ms
Loss rate: 1.16%
-- Flow 3:
Average throughput: 356.86 Mbit/s
95th percentile per-packet one-way delay: 140.438 ms
Loss rate: 2.04%
```

Run 1: Report of TCP Cubic — Data Link

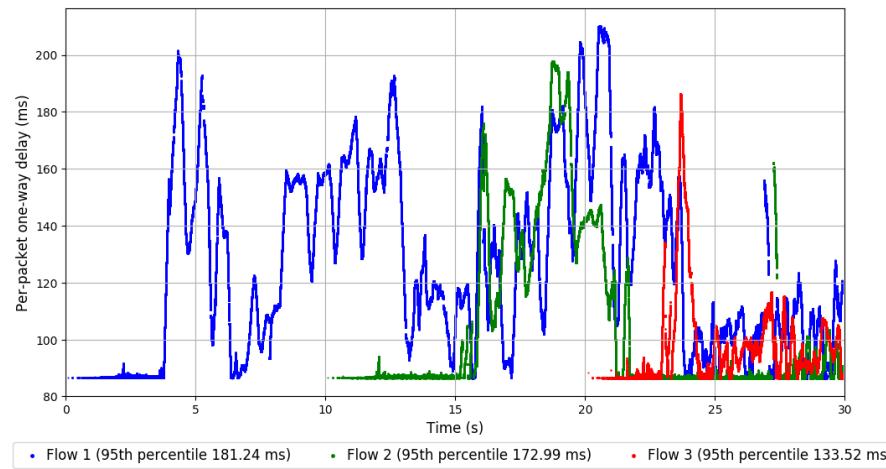
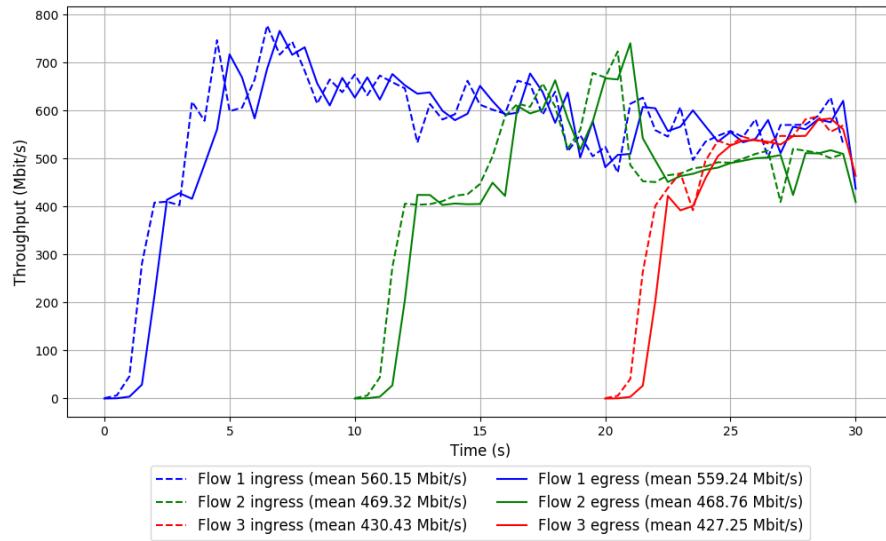


Run 2: Statistics of TCP Cubic

```
Start at: 2018-08-31 05:34:07
End at: 2018-08-31 05:34:37
Local clock offset: 17.523 ms
Remote clock offset: 20.726 ms

# Below is generated by plot.py at 2018-08-31 05:47:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1011.03 Mbit/s
95th percentile per-packet one-way delay: 177.512 ms
Loss rate: 1.06%
-- Flow 1:
Average throughput: 559.24 Mbit/s
95th percentile per-packet one-way delay: 181.243 ms
Loss rate: 0.74%
-- Flow 2:
Average throughput: 468.76 Mbit/s
95th percentile per-packet one-way delay: 172.986 ms
Loss rate: 0.98%
-- Flow 3:
Average throughput: 427.25 Mbit/s
95th percentile per-packet one-way delay: 133.523 ms
Loss rate: 2.49%
```

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

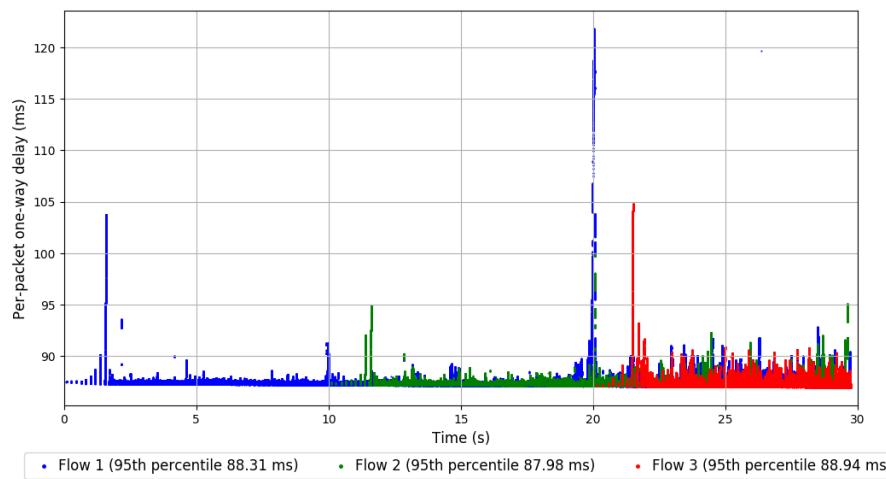
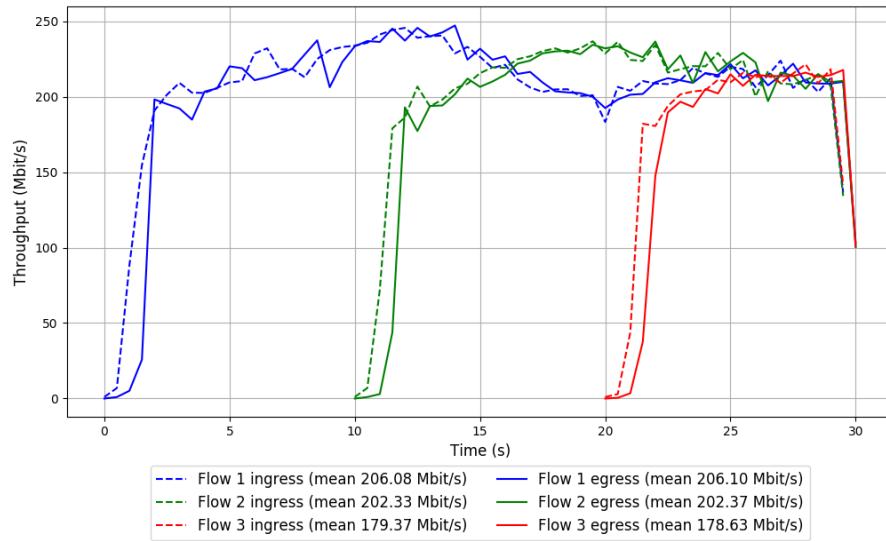


Run 1: Statistics of Indigo

```
Start at: 2018-08-31 05:25:02
End at: 2018-08-31 05:25:32
Local clock offset: 36.068 ms
Remote clock offset: 41.759 ms

# Below is generated by plot.py at 2018-08-31 05:47:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 397.72 Mbit/s
95th percentile per-packet one-way delay: 88.363 ms
Loss rate: 0.91%
-- Flow 1:
Average throughput: 206.10 Mbit/s
95th percentile per-packet one-way delay: 88.307 ms
Loss rate: 0.57%
-- Flow 2:
Average throughput: 202.37 Mbit/s
95th percentile per-packet one-way delay: 87.976 ms
Loss rate: 0.86%
-- Flow 3:
Average throughput: 178.63 Mbit/s
95th percentile per-packet one-way delay: 88.936 ms
Loss rate: 2.19%
```

## Run 1: Report of Indigo — Data Link

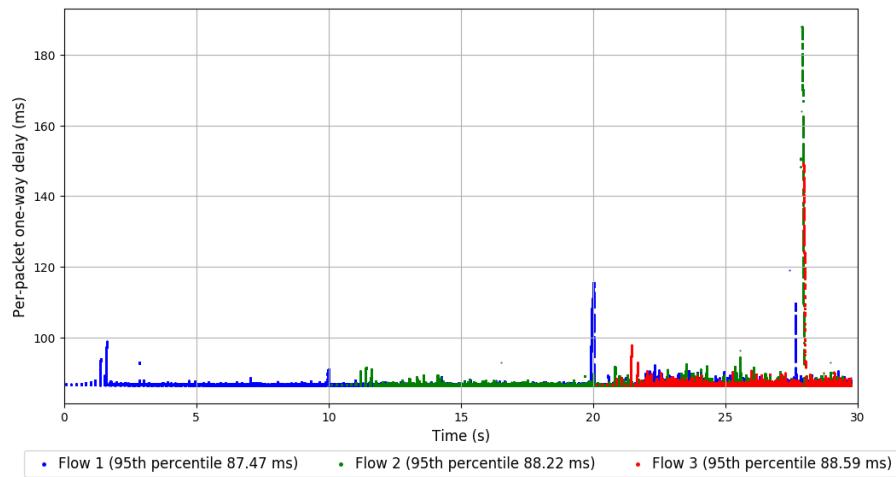
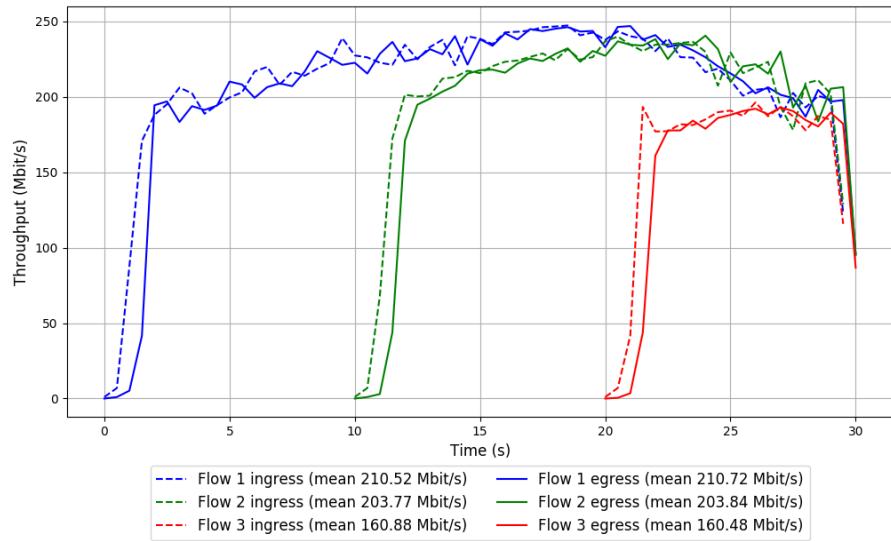


Run 2: Statistics of Indigo

```
Start at: 2018-08-31 05:32:17
End at: 2018-08-31 05:32:47
Local clock offset: 19.466 ms
Remote clock offset: 22.905 ms

# Below is generated by plot.py at 2018-08-31 05:47:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 397.57 Mbit/s
95th percentile per-packet one-way delay: 87.901 ms
Loss rate: 0.81%
-- Flow 1:
Average throughput: 210.72 Mbit/s
95th percentile per-packet one-way delay: 87.467 ms
Loss rate: 0.49%
-- Flow 2:
Average throughput: 203.84 Mbit/s
95th percentile per-packet one-way delay: 88.223 ms
Loss rate: 0.84%
-- Flow 3:
Average throughput: 160.48 Mbit/s
95th percentile per-packet one-way delay: 88.590 ms
Loss rate: 2.02%
```

## Run 2: Report of Indigo — Data Link

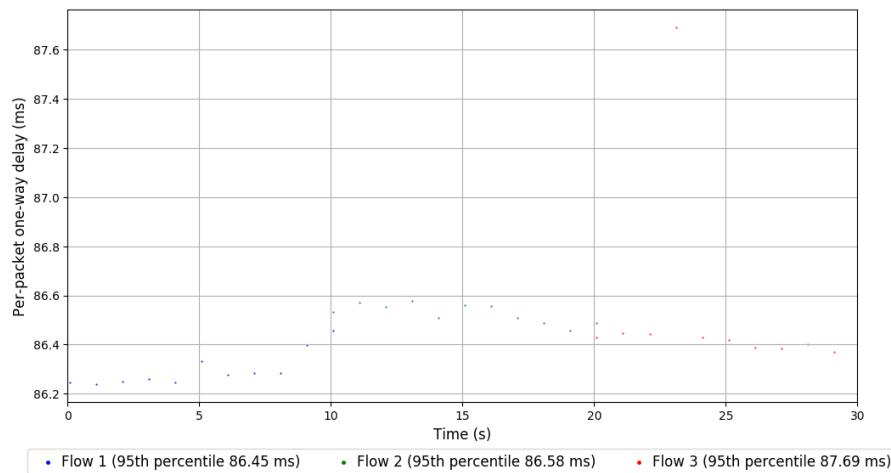
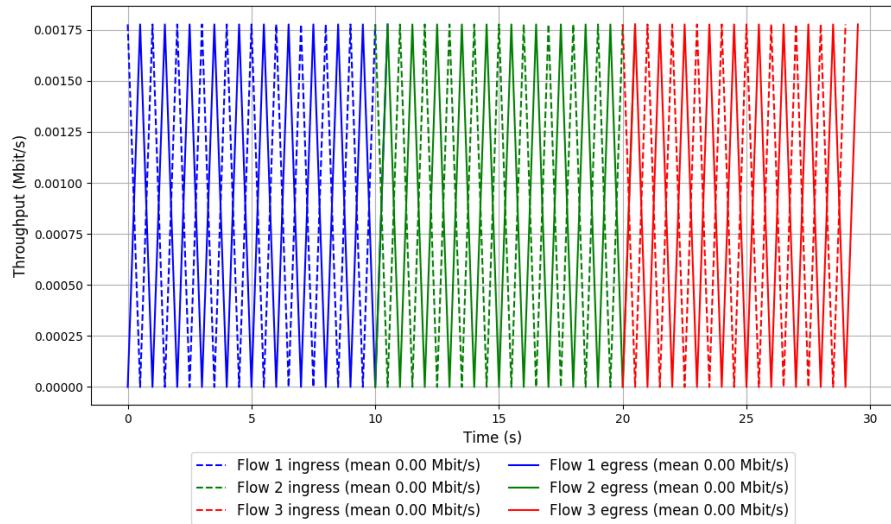


Run 1: Statistics of Muses-25

```
Start at: 2018-08-31 05:23:52
End at: 2018-08-31 05:24:22
Local clock offset: 37.577 ms
Remote clock offset: 44.943 ms

# Below is generated by plot.py at 2018-08-31 05:47:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.569 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.455 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.578 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 87.690 ms
Loss rate: 0.00%
```

## Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

```
Start at: 2018-08-31 05:31:06
End at: 2018-08-31 05:31:36
Local clock offset: 21.087 ms
Remote clock offset: 24.76 ms

# Below is generated by plot.py at 2018-08-31 05:47:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.787 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.875 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.755 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.652 ms
Loss rate: 0.00%
```

## Run 2: Report of Muses-25 — Data Link

