

## Pantheon Report

Generated at 2018-08-31 05:01:52 (UTC).

Data path: GCE Sydney on `ens4` (*local*) → GCE Iowa 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.

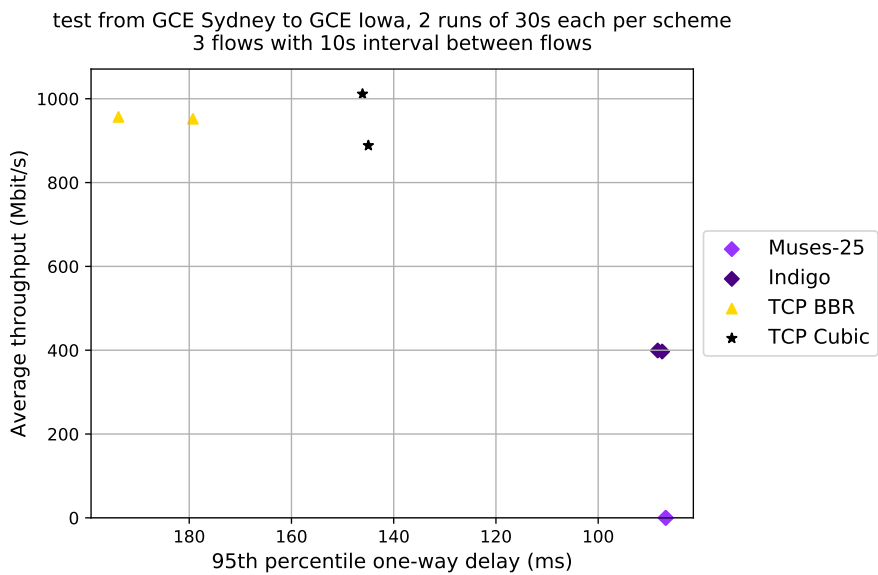
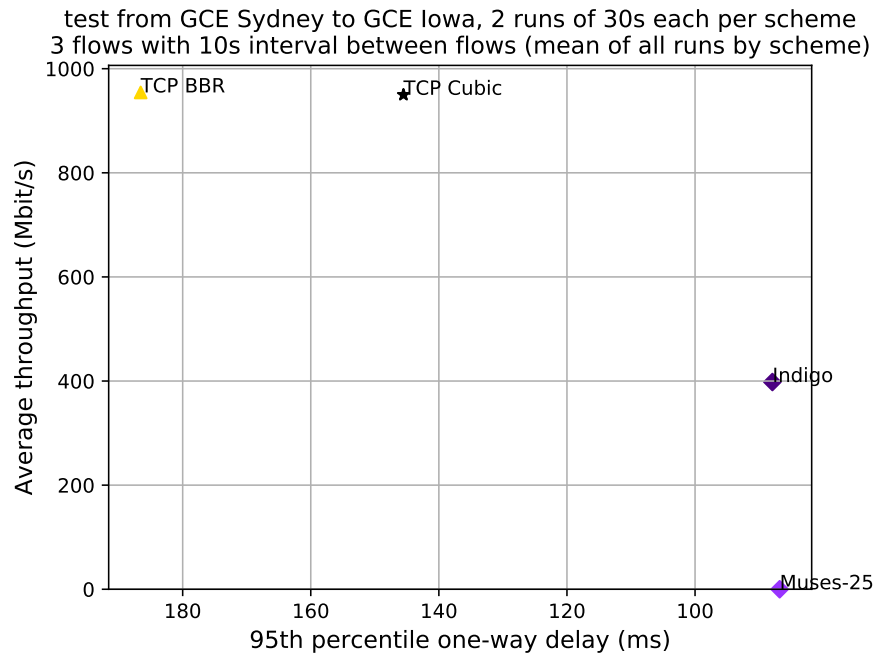
NTP offsets were measured against `time.google.com` and have been applied to correct the timestamps in logs.

### 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 @ 2de97ca91a065473c29a25fffe63fb137c97a67c
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 @ cbfce6db5ff5740dafa1771f813cd646339e1952
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
```



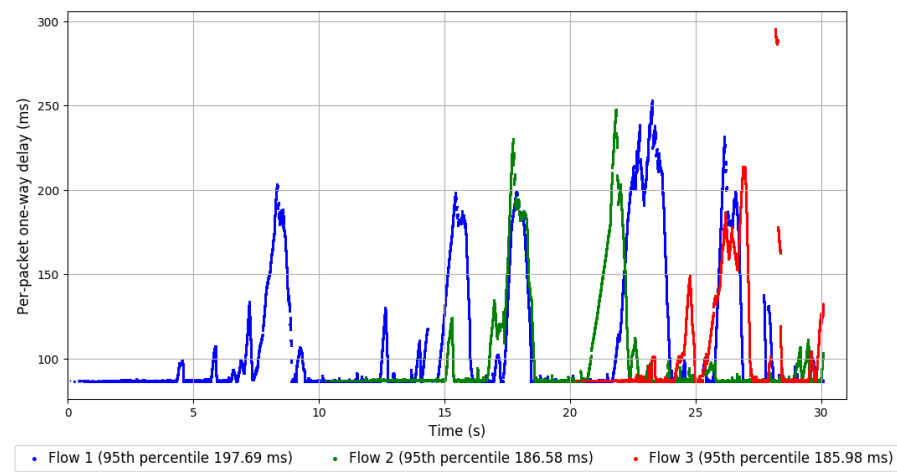
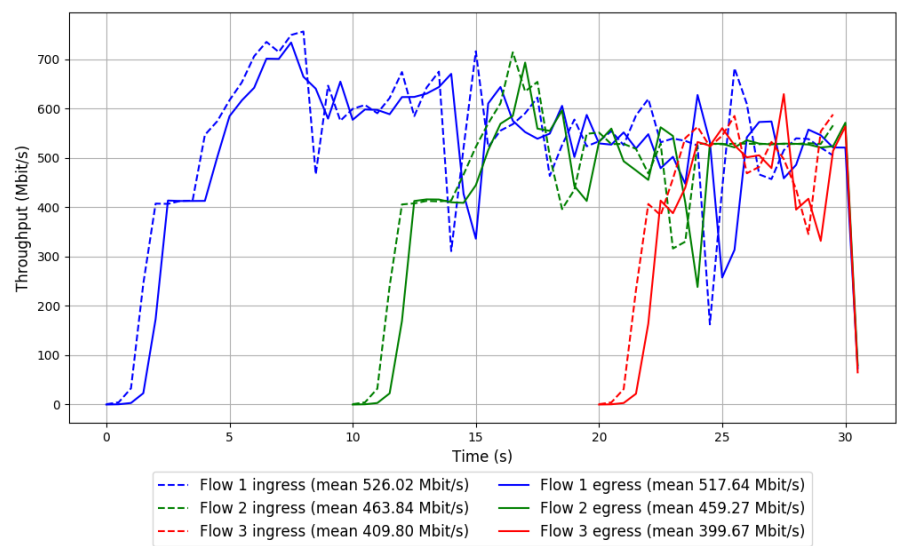
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	503.75	469.81	413.98	162.42	190.54	190.04	0.94	0.92	1.90
TCP Cubic	2	488.31	496.87	393.13	124.76	134.04	124.03	0.00	0.20	0.04
Indigo	2	210.66	201.00	168.31	88.00	87.75	88.07	0.00	0.01	0.01
Muses-25	2	0.00	0.00	0.00	86.76	86.81	86.71	0.00	0.00	0.00

Run 1: Statistics of TCP BBR

Start at: 2018-08-31 04:41:53  
End at: 2018-08-31 04:42:23  
Local clock offset: 14.825 ms  
Remote clock offset: 18.267 ms

# Below is generated by plot.py at 2018-08-31 05:01:45  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 956.69 Mbit/s  
95th percentile per-packet one-way delay: 193.837 ms  
Loss rate: 1.52%  
-- Flow 1:  
Average throughput: 517.64 Mbit/s  
95th percentile per-packet one-way delay: 197.691 ms  
Loss rate: 1.59%  
-- Flow 2:  
Average throughput: 459.27 Mbit/s  
95th percentile per-packet one-way delay: 186.578 ms  
Loss rate: 0.98%  
-- Flow 3:  
Average throughput: 399.67 Mbit/s  
95th percentile per-packet one-way delay: 185.984 ms  
Loss rate: 2.46%

Run 1: Report of TCP BBR — Data Link

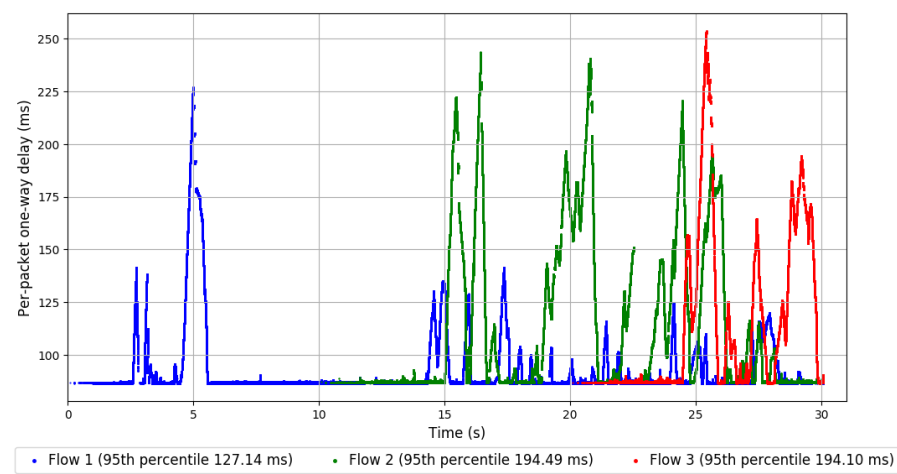
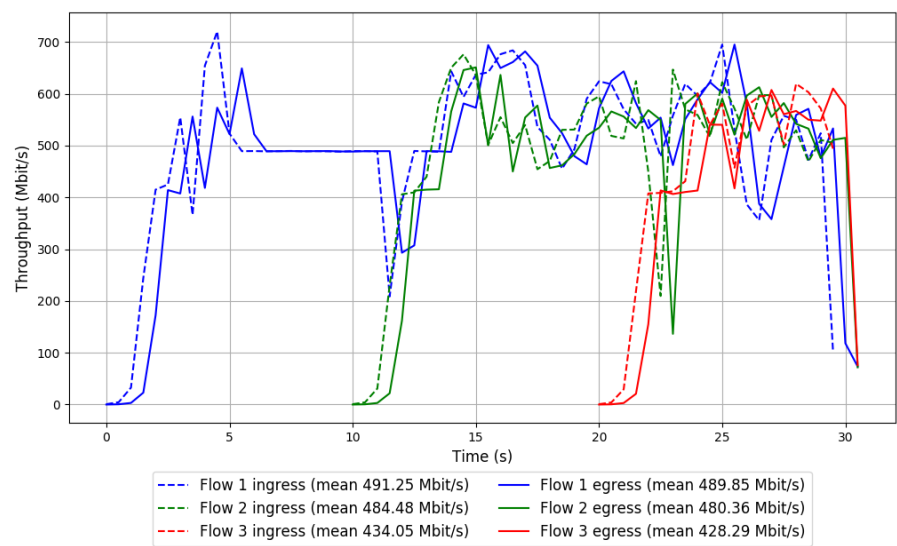


Run 2: Statistics of TCP BBR

Start at: 2018-08-31 04:49:01  
End at: 2018-08-31 04:49:31  
Local clock offset: 23.783 ms  
Remote clock offset: 28.861 ms

# Below is generated by plot.py at 2018-08-31 05:01:45  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 952.13 Mbit/s  
95th percentile per-packet one-way delay: 179.278 ms  
Loss rate: 0.63%  
-- Flow 1:  
Average throughput: 489.85 Mbit/s  
95th percentile per-packet one-way delay: 127.145 ms  
Loss rate: 0.28%  
-- Flow 2:  
Average throughput: 480.36 Mbit/s  
95th percentile per-packet one-way delay: 194.493 ms  
Loss rate: 0.85%  
-- Flow 3:  
Average throughput: 428.29 Mbit/s  
95th percentile per-packet one-way delay: 194.102 ms  
Loss rate: 1.33%

Run 2: Report of TCP BBR — Data Link



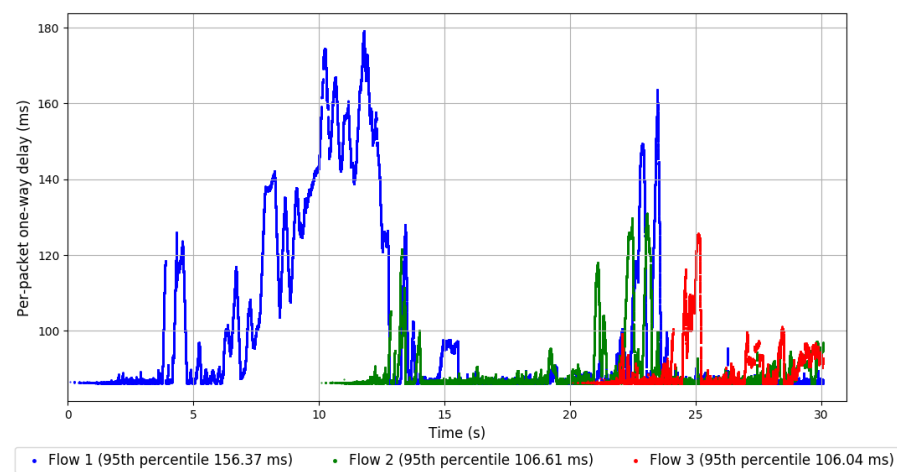
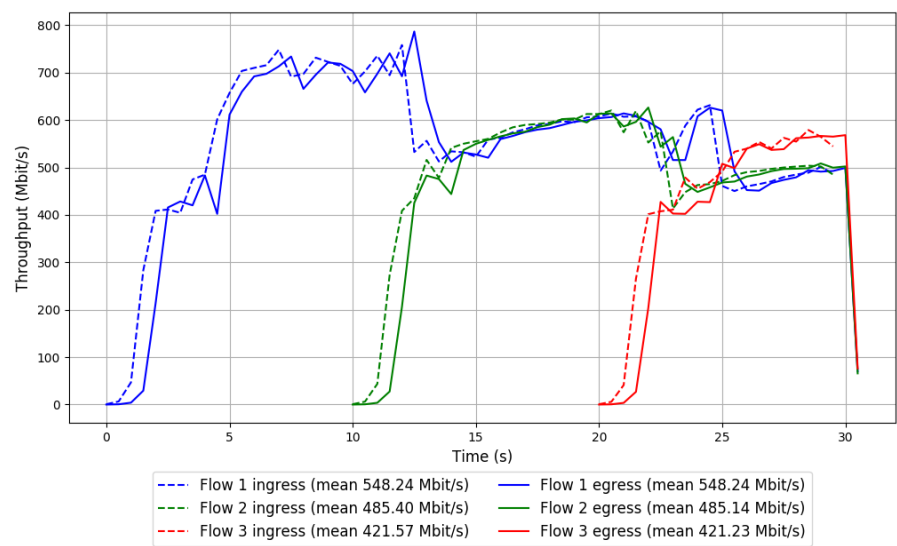
Run 1: Statistics of TCP Cubic

Start at: 2018-08-31 04:36:47  
End at: 2018-08-31 04:37:17  
Local clock offset: 12.708 ms  
Remote clock offset: 15.036 ms

# Below is generated by plot.py at 2018-08-31 05:01:51  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1011.32 Mbit/s  
95th percentile per-packet one-way delay: 146.104 ms  
Loss rate: 0.03%  
-- Flow 1:  
Average throughput: 548.24 Mbit/s  
95th percentile per-packet one-way delay: 156.373 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 485.14 Mbit/s  
95th percentile per-packet one-way delay: 106.607 ms  
Loss rate: 0.05%  
-- Flow 3:  
Average throughput: 421.23 Mbit/s  
95th percentile per-packet one-way delay: 106.043 ms  
Loss rate: 0.08%



Run 1: Report of TCP Cubic — Data Link

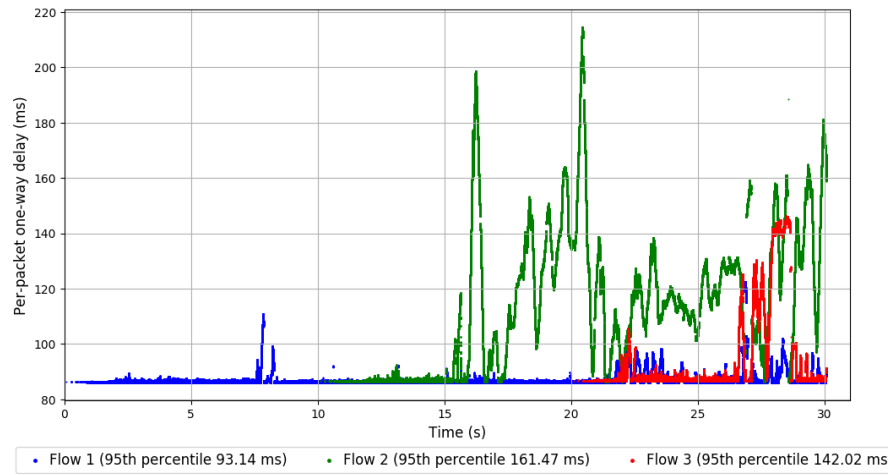
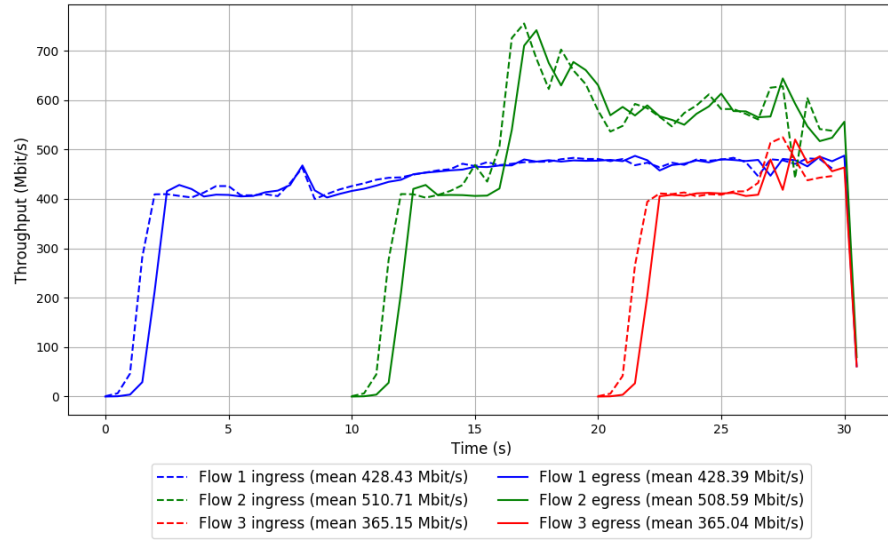


Run 2: Statistics of TCP Cubic

Start at: 2018-08-31 04:44:02  
End at: 2018-08-31 04:44:32  
Local clock offset: 17.316 ms  
Remote clock offset: 20.904 ms

# Below is generated by plot.py at 2018-08-31 05:01:51  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 888.40 Mbit/s  
95th percentile per-packet one-way delay: 144.952 ms  
Loss rate: 0.14%  
-- Flow 1:  
Average throughput: 428.39 Mbit/s  
95th percentile per-packet one-way delay: 93.138 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 508.59 Mbit/s  
95th percentile per-packet one-way delay: 161.475 ms  
Loss rate: 0.36%  
-- Flow 3:  
Average throughput: 365.04 Mbit/s  
95th percentile per-packet one-way delay: 142.023 ms  
Loss rate: 0.00%

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

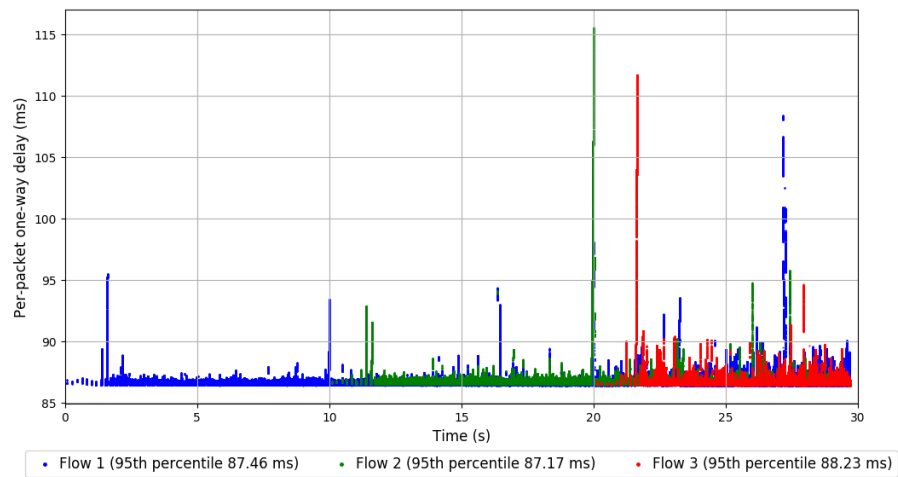
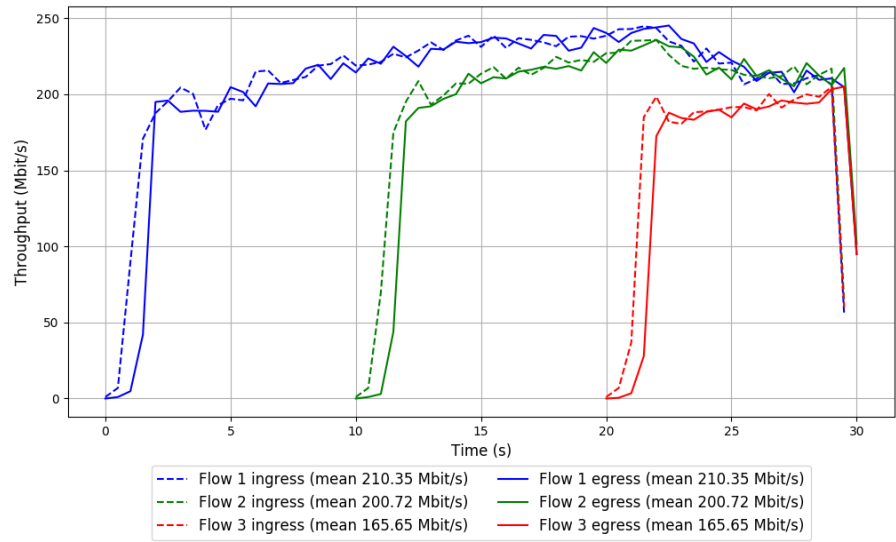


Run 1: Statistics of Indigo

Start at: 2018-08-31 04:38:52  
End at: 2018-08-31 04:39:22  
Local clock offset: 12.657 ms  
Remote clock offset: 15.423 ms

# Below is generated by plot.py at 2018-08-31 05:01:51  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 396.87 Mbit/s  
95th percentile per-packet one-way delay: 87.487 ms  
Loss rate: 0.00%  
-- Flow 1:  
Average throughput: 210.35 Mbit/s  
95th percentile per-packet one-way delay: 87.463 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 200.72 Mbit/s  
95th percentile per-packet one-way delay: 87.174 ms  
Loss rate: 0.00%  
-- Flow 3:  
Average throughput: 165.65 Mbit/s  
95th percentile per-packet one-way delay: 88.235 ms  
Loss rate: 0.00%

## Run 1: Report of Indigo — Data Link

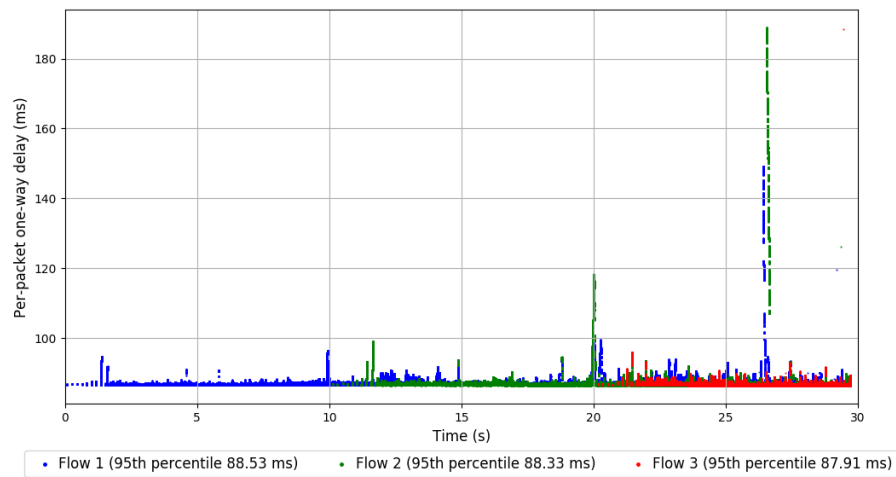
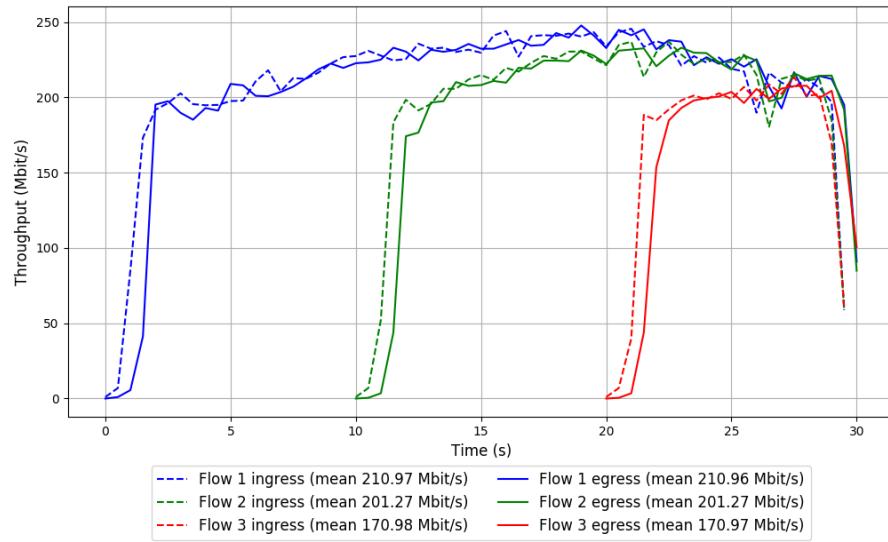


Run 2: Statistics of Indigo

Start at: 2018-08-31 04:46:00  
End at: 2018-08-31 04:46:30  
Local clock offset: 19.593 ms  
Remote clock offset: 23.871 ms

# Below is generated by plot.py at 2018-08-31 05:01:51  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 399.29 Mbit/s  
95th percentile per-packet one-way delay: 88.359 ms  
Loss rate: 0.01%  
-- Flow 1:  
Average throughput: 210.96 Mbit/s  
95th percentile per-packet one-way delay: 88.527 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 201.27 Mbit/s  
95th percentile per-packet one-way delay: 88.334 ms  
Loss rate: 0.01%  
-- Flow 3:  
Average throughput: 170.97 Mbit/s  
95th percentile per-packet one-way delay: 87.910 ms  
Loss rate: 0.01%

## Run 2: Report of Indigo — Data Link



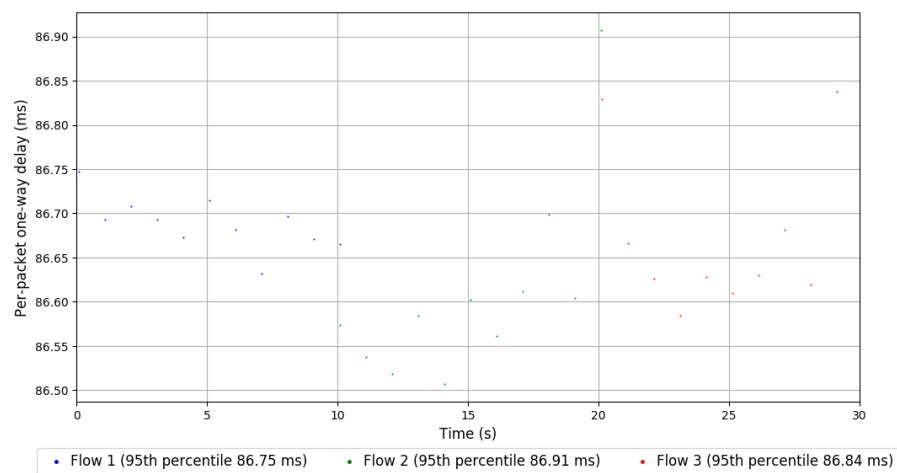
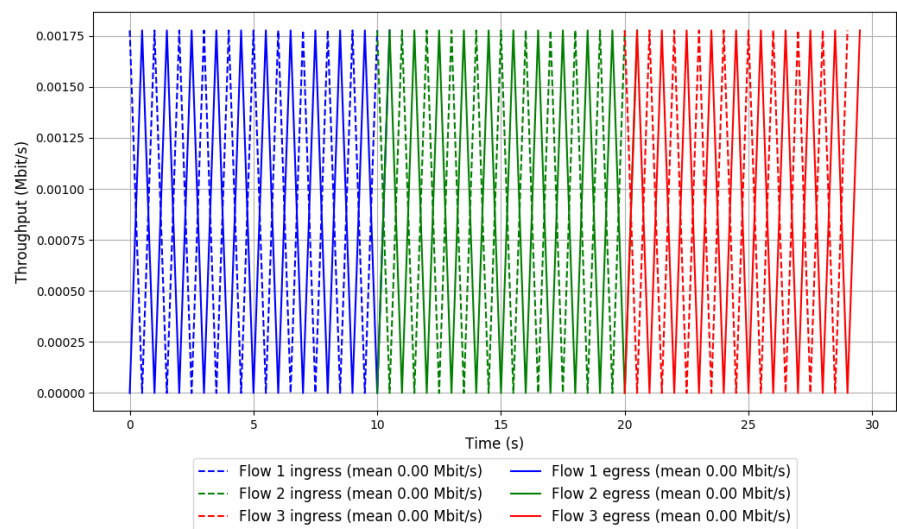
```
Run 1: Statistics of Muses-25

Start at: 2018-08-31 04:40:42
End at: 2018-08-31 04:41:12
Local clock offset: 13.887 ms
Remote clock offset: 16.88 ms

# Below is generated by plot.py at 2018-08-31 05:01:51
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.829 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.747 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.907 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 86.838 ms
Loss rate: 0.00%
```



Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

Start at: 2018-08-31 04:47:50  
End at: 2018-08-31 04:48:20  
Local clock offset: 22.004 ms  
Remote clock offset: 26.654 ms

# Below is generated by plot.py at 2018-08-31 05:01:51  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 86.748 ms  
Loss rate: 0.00%  
-- Flow 1:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 86.764 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 86.709 ms  
Loss rate: 0.00%  
-- Flow 3:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 86.574 ms  
Loss rate: 0.00%

Run 2: Report of Muses-25 — Data Link

