

Pantheon Report

Generated at 2018-08-28 06:26:29 (UTC).

Data path: Brazil on p4p1 (*remote*) → AWS Brazil 1 on ens5 (*local*).

Repeated the test of 4 congestion control schemes 3 times.

Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.

NTP offsets were measured against gps.ntp.br and have been applied to correct the timestamps in logs.

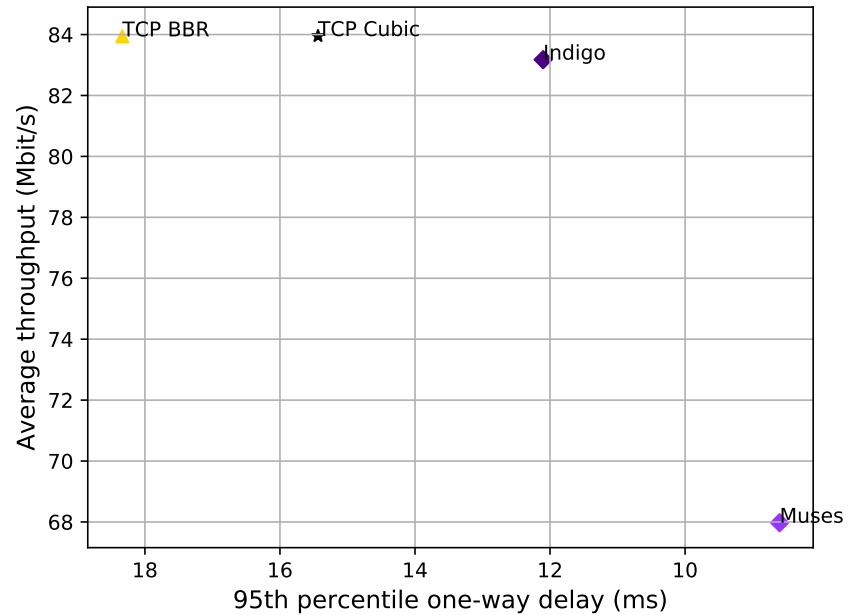
System info:

```
Linux 4.15.0-1019-aws
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
```

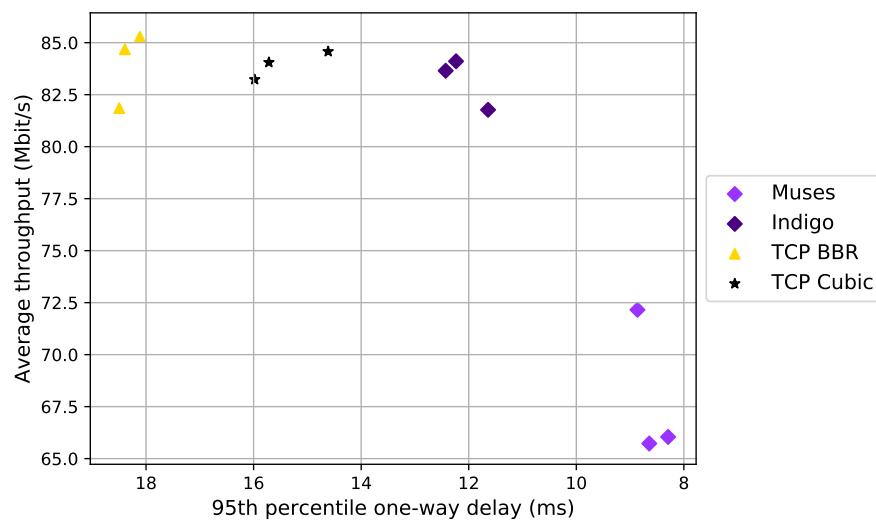
Git summary:

```
branch: muses @ 86ef433b09b2f4ecae1186d6940af93bcf0969cd
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbfe58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b261c9e99c63be452bc16f94ce0caa99a4c9d39a
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 Brazil to AWS Brazil 1, 3 runs of 30s each per scheme
 3 flows with 10s interval between flows (mean of all runs by scheme)



test from Brazil to AWS Brazil 1, 3 runs of 30s each per scheme
 3 flows with 10s interval between flows



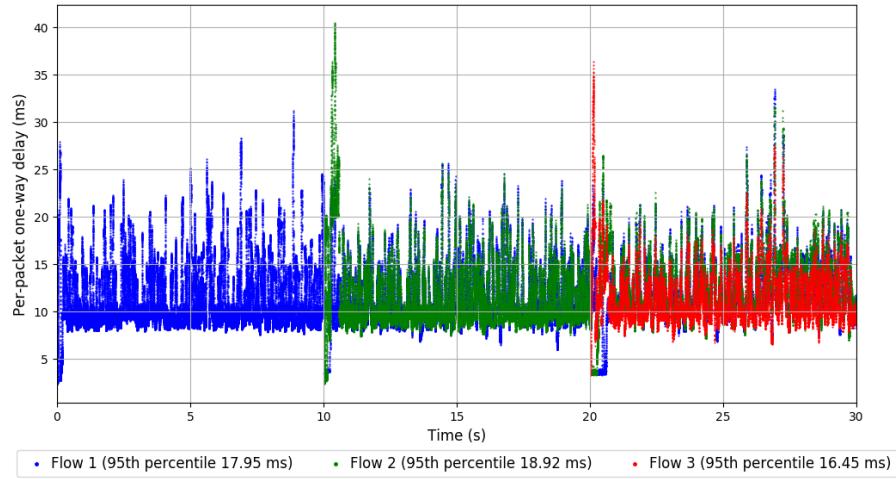
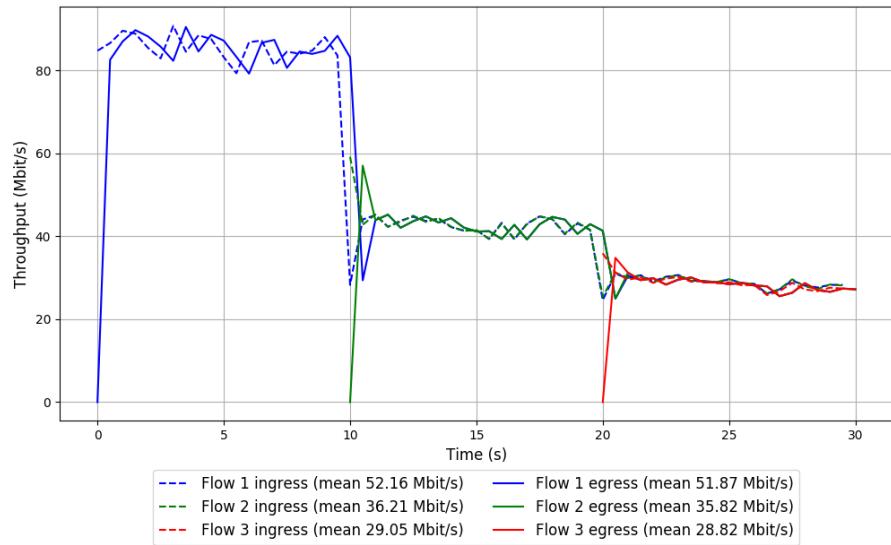
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	50.96	35.26	28.57	17.65	19.33	18.01	0.65	1.35	1.79
TCP Cubic	3	51.20	35.27	27.86	15.77	14.93	15.02	0.09	0.15	0.27
Indigo	3	50.77	34.91	27.90	10.95	12.66	14.17	0.02	0.05	0.26
Muses	3	35.58	35.19	27.08	7.68	8.91	9.85	0.02	0.04	0.08

Run 1: Statistics of TCP BBR

```
Start at: 2018-08-28 06:13:57
End at: 2018-08-28 06:14:27
Local clock offset: 4.092 ms
Remote clock offset: 0.187 ms

# Below is generated by plot.py at 2018-08-28 06:25:57
# Datalink statistics
-- Total of 3 flows:
Average throughput: 85.28 Mbit/s
95th percentile per-packet one-way delay: 18.114 ms
Loss rate: 0.75%
-- Flow 1:
Average throughput: 51.87 Mbit/s
95th percentile per-packet one-way delay: 17.946 ms
Loss rate: 0.57%
-- Flow 2:
Average throughput: 35.82 Mbit/s
95th percentile per-packet one-way delay: 18.920 ms
Loss rate: 1.12%
-- Flow 3:
Average throughput: 28.82 Mbit/s
95th percentile per-packet one-way delay: 16.453 ms
Loss rate: 0.84%
```

Run 1: Report of TCP BBR — Data Link

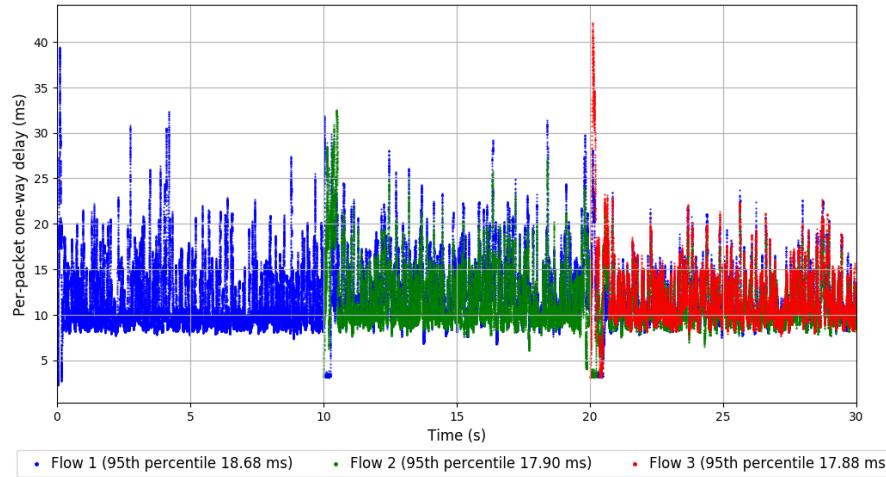
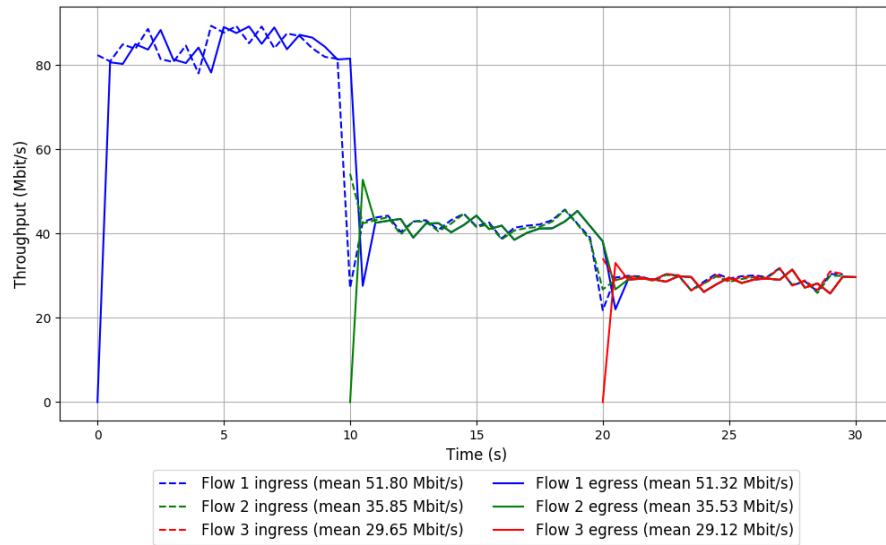


Run 2: Statistics of TCP BBR

```
Start at: 2018-08-28 06:18:27
End at: 2018-08-28 06:18:57
Local clock offset: 3.84 ms
Remote clock offset: 0.261 ms

# Below is generated by plot.py at 2018-08-28 06:25:57
# Datalink statistics
-- Total of 3 flows:
Average throughput: 84.68 Mbit/s
95th percentile per-packet one-way delay: 18.394 ms
Loss rate: 1.03%
-- Flow 1:
Average throughput: 51.32 Mbit/s
95th percentile per-packet one-way delay: 18.676 ms
Loss rate: 0.94%
-- Flow 2:
Average throughput: 35.53 Mbit/s
95th percentile per-packet one-way delay: 17.897 ms
Loss rate: 0.89%
-- Flow 3:
Average throughput: 29.12 Mbit/s
95th percentile per-packet one-way delay: 17.884 ms
Loss rate: 1.82%
```

Run 2: Report of TCP BBR — Data Link

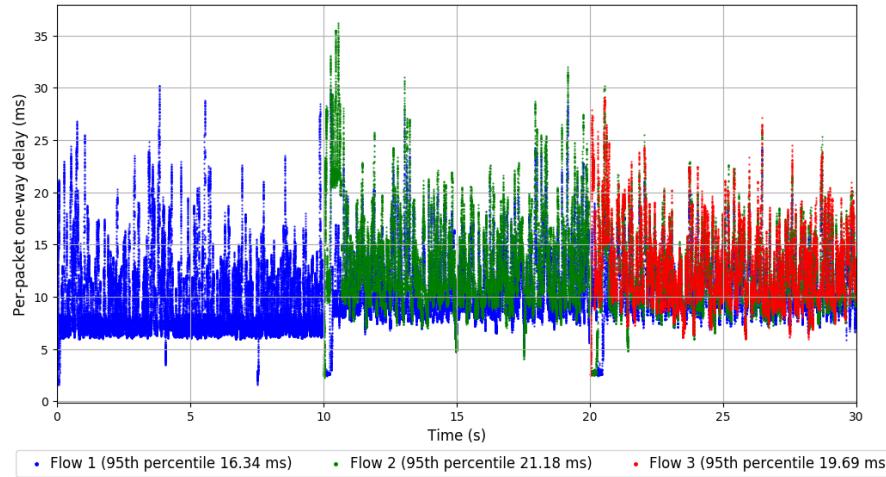
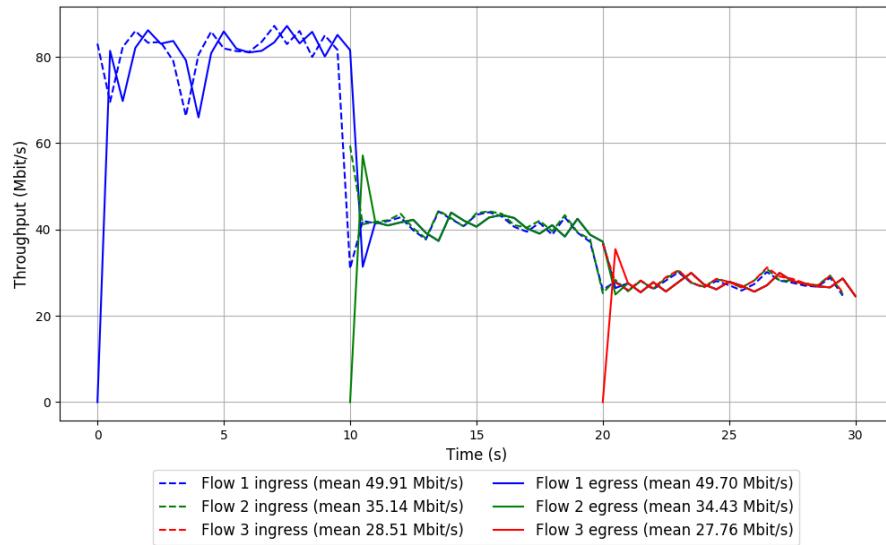


Run 3: Statistics of TCP BBR

```
Start at: 2018-08-28 06:22:56
End at: 2018-08-28 06:23:26
Local clock offset: 3.017 ms
Remote clock offset: 0.285 ms

# Below is generated by plot.py at 2018-08-28 06:25:57
# Datalink statistics
-- Total of 3 flows:
Average throughput: 81.86 Mbit/s
95th percentile per-packet one-way delay: 18.497 ms
Loss rate: 1.15%
-- Flow 1:
Average throughput: 49.70 Mbit/s
95th percentile per-packet one-way delay: 16.340 ms
Loss rate: 0.43%
-- Flow 2:
Average throughput: 34.43 Mbit/s
95th percentile per-packet one-way delay: 21.181 ms
Loss rate: 2.04%
-- Flow 3:
Average throughput: 27.76 Mbit/s
95th percentile per-packet one-way delay: 19.691 ms
Loss rate: 2.71%
```

Run 3: Report of TCP BBR — Data Link

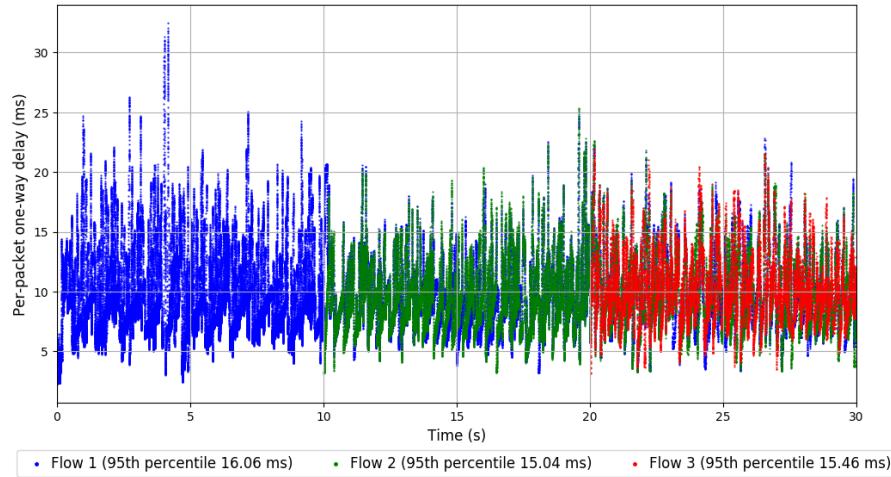
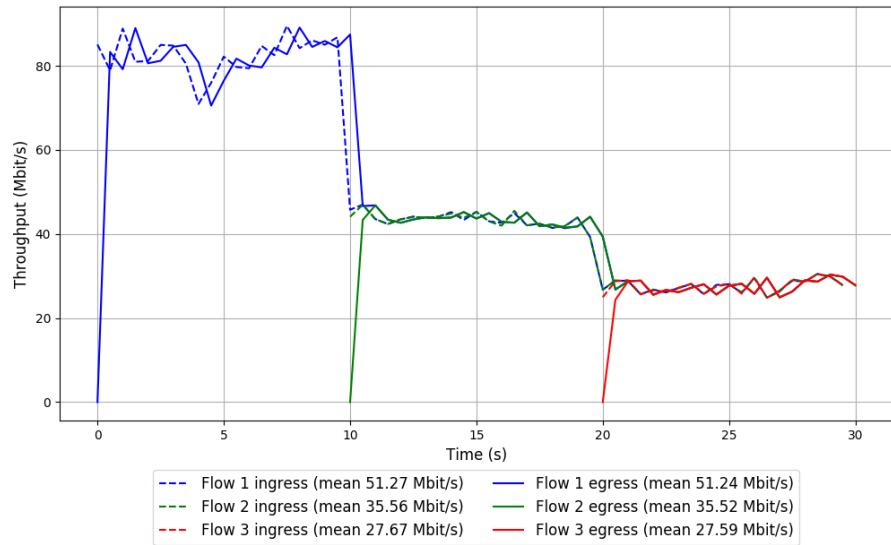


```
Run 1: Statistics of TCP Cubic

Start at: 2018-08-28 06:11:43
End at: 2018-08-28 06:12:13
Local clock offset: 4.22 ms
Remote clock offset: 0.27 ms

# Below is generated by plot.py at 2018-08-28 06:25:57
# Datalink statistics
-- Total of 3 flows:
Average throughput: 84.05 Mbit/s
95th percentile per-packet one-way delay: 15.716 ms
Loss rate: 0.12%
-- Flow 1:
Average throughput: 51.24 Mbit/s
95th percentile per-packet one-way delay: 16.059 ms
Loss rate: 0.08%
-- Flow 2:
Average throughput: 35.52 Mbit/s
95th percentile per-packet one-way delay: 15.044 ms
Loss rate: 0.14%
-- Flow 3:
Average throughput: 27.59 Mbit/s
95th percentile per-packet one-way delay: 15.462 ms
Loss rate: 0.29%
```

Run 1: Report of TCP Cubic — Data Link

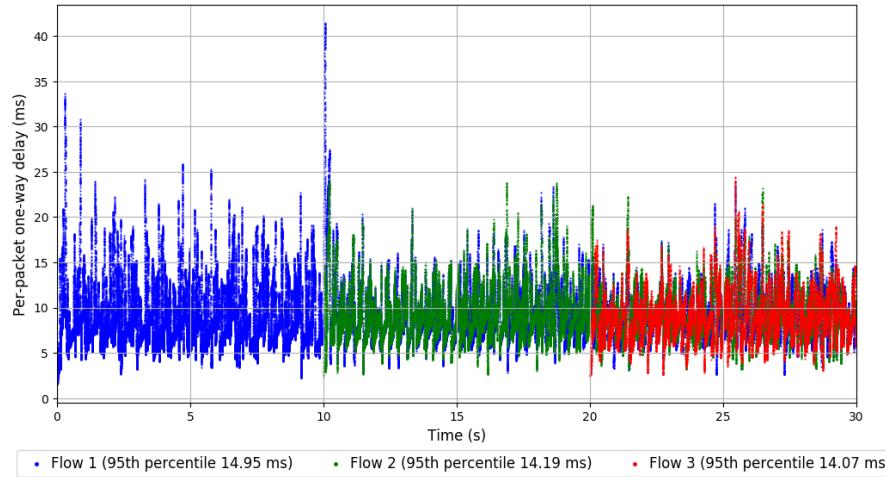
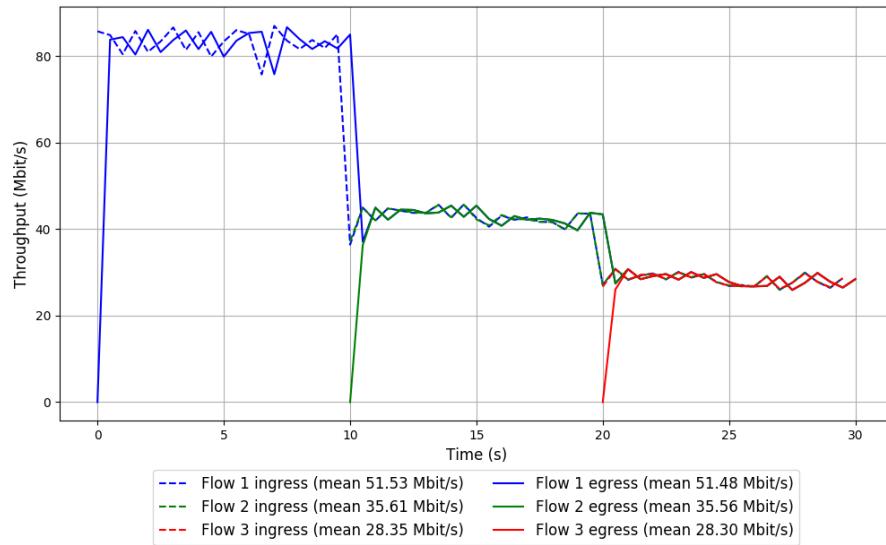


Run 2: Statistics of TCP Cubic

```
Start at: 2018-08-28 06:16:13
End at: 2018-08-28 06:16:43
Local clock offset: 3.214 ms
Remote clock offset: 0.235 ms

# Below is generated by plot.py at 2018-08-28 06:25:57
# Datalink statistics
-- Total of 3 flows:
Average throughput: 84.57 Mbit/s
95th percentile per-packet one-way delay: 14.614 ms
Loss rate: 0.14%
-- Flow 1:
Average throughput: 51.48 Mbit/s
95th percentile per-packet one-way delay: 14.947 ms
Loss rate: 0.11%
-- Flow 2:
Average throughput: 35.56 Mbit/s
95th percentile per-packet one-way delay: 14.187 ms
Loss rate: 0.16%
-- Flow 3:
Average throughput: 28.30 Mbit/s
95th percentile per-packet one-way delay: 14.069 ms
Loss rate: 0.25%
```

Run 2: Report of TCP Cubic — Data Link

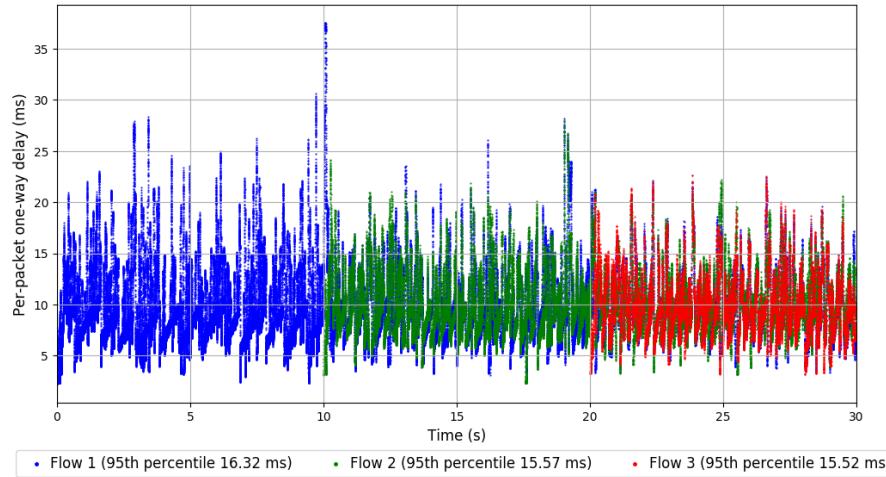
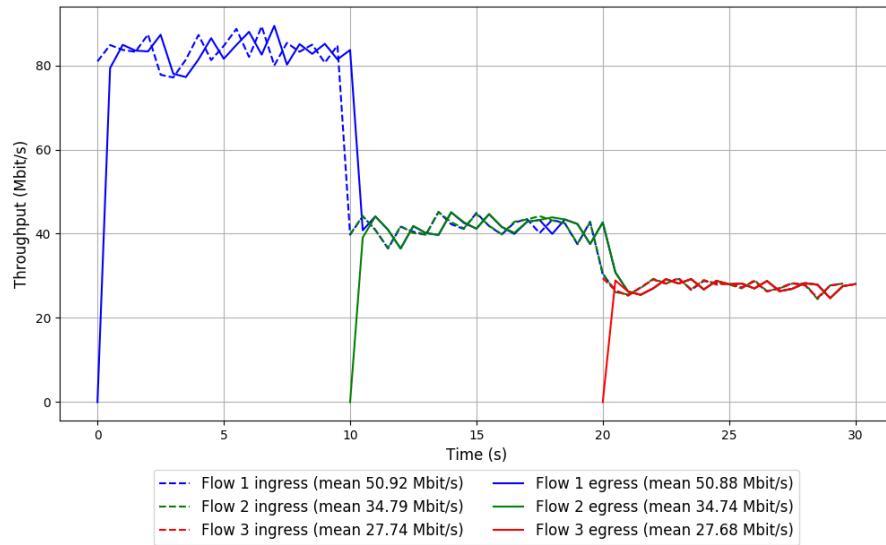


Run 3: Statistics of TCP Cubic

```
Start at: 2018-08-28 06:20:42
End at: 2018-08-28 06:21:12
Local clock offset: 3.772 ms
Remote clock offset: 0.267 ms

# Below is generated by plot.py at 2018-08-28 06:25:57
# Datalink statistics
-- Total of 3 flows:
Average throughput: 83.23 Mbit/s
95th percentile per-packet one-way delay: 15.980 ms
Loss rate: 0.12%
-- Flow 1:
Average throughput: 50.88 Mbit/s
95th percentile per-packet one-way delay: 16.317 ms
Loss rate: 0.08%
-- Flow 2:
Average throughput: 34.74 Mbit/s
95th percentile per-packet one-way delay: 15.570 ms
Loss rate: 0.16%
-- Flow 3:
Average throughput: 27.68 Mbit/s
95th percentile per-packet one-way delay: 15.516 ms
Loss rate: 0.26%
```

Run 3: Report of TCP Cubic — Data Link

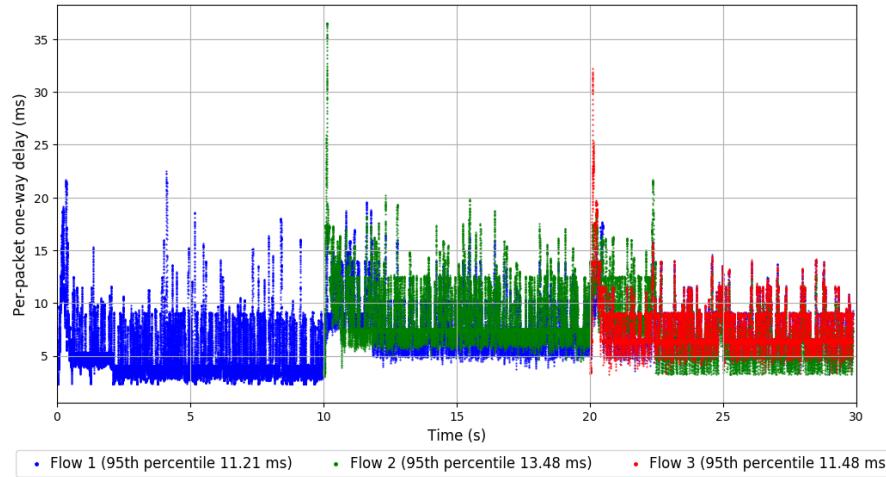
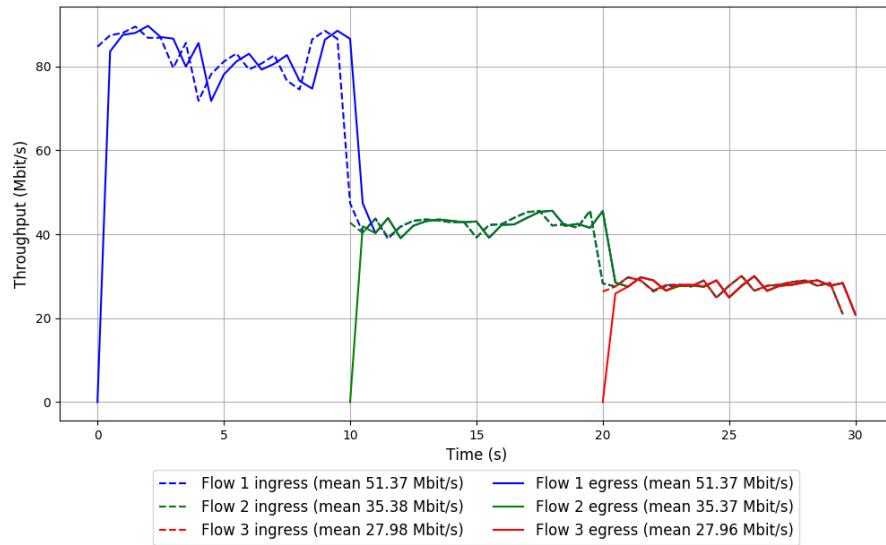


```
Run 1: Statistics of Indigo
```

```
Start at: 2018-08-28 06:15:04
End at: 2018-08-28 06:15:34
Local clock offset: 4.03 ms
Remote clock offset: 0.246 ms

# Below is generated by plot.py at 2018-08-28 06:25:57
# Datalink statistics
-- Total of 3 flows:
Average throughput: 84.11 Mbit/s
95th percentile per-packet one-way delay: 12.236 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 51.37 Mbit/s
95th percentile per-packet one-way delay: 11.209 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 35.37 Mbit/s
95th percentile per-packet one-way delay: 13.480 ms
Loss rate: 0.05%
-- Flow 3:
Average throughput: 27.96 Mbit/s
95th percentile per-packet one-way delay: 11.476 ms
Loss rate: 0.10%
```

Run 1: Report of Indigo — Data Link

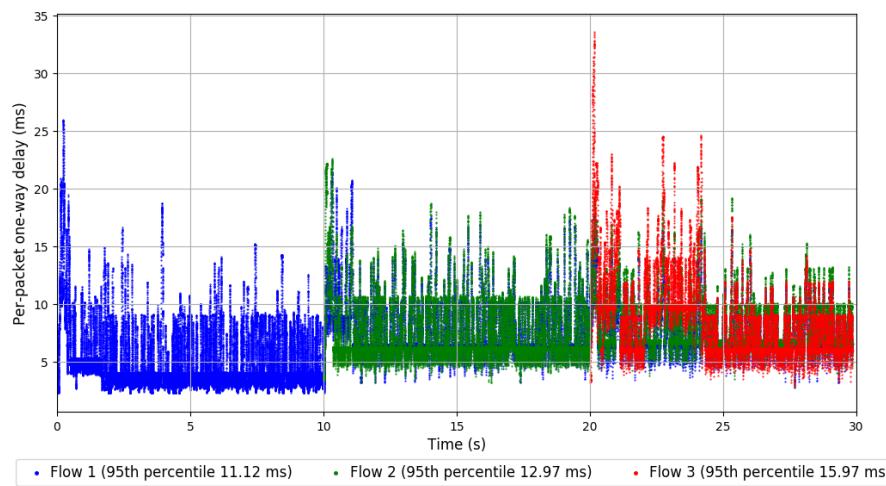
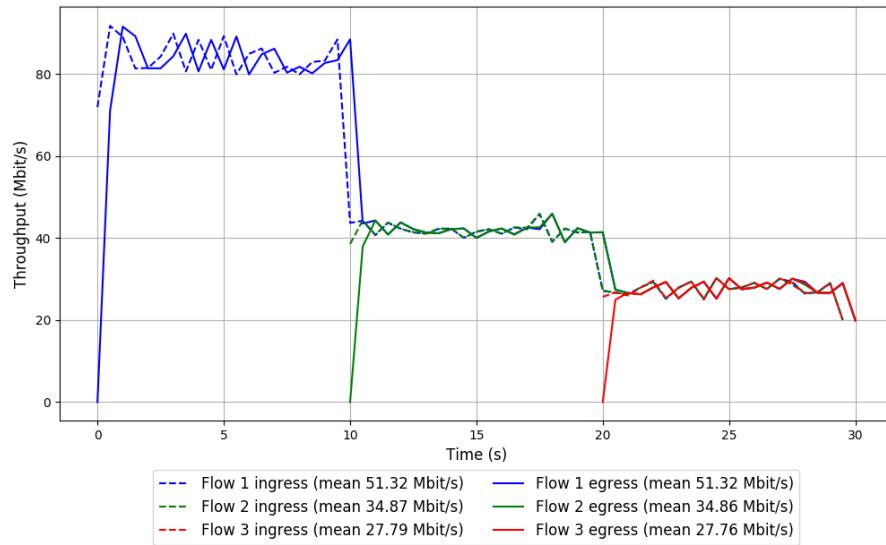


Run 2: Statistics of Indigo

```
Start at: 2018-08-28 06:19:34
End at: 2018-08-28 06:20:04
Local clock offset: 3.855 ms
Remote clock offset: 0.269 ms

# Below is generated by plot.py at 2018-08-28 06:25:57
# Datalink statistics
-- Total of 3 flows:
Average throughput: 83.65 Mbit/s
95th percentile per-packet one-way delay: 12.429 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 51.32 Mbit/s
95th percentile per-packet one-way delay: 11.115 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 34.86 Mbit/s
95th percentile per-packet one-way delay: 12.970 ms
Loss rate: 0.05%
-- Flow 3:
Average throughput: 27.76 Mbit/s
95th percentile per-packet one-way delay: 15.971 ms
Loss rate: 0.14%
```

Run 2: Report of Indigo — Data Link

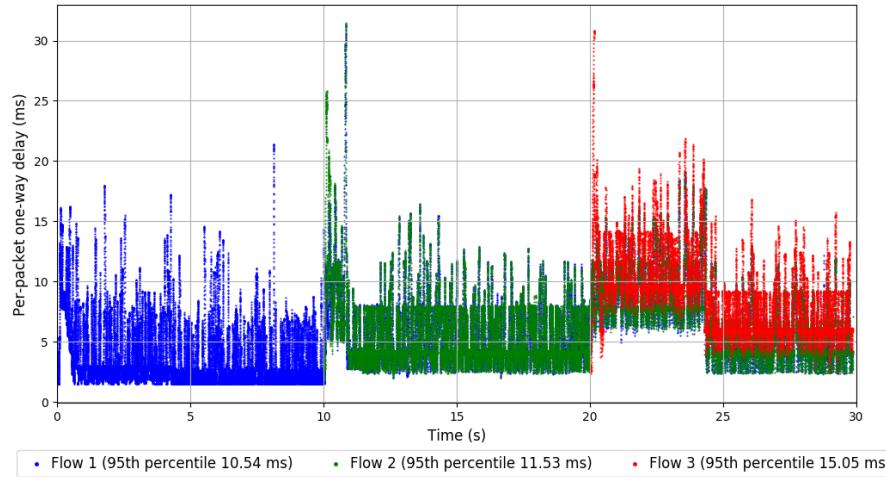
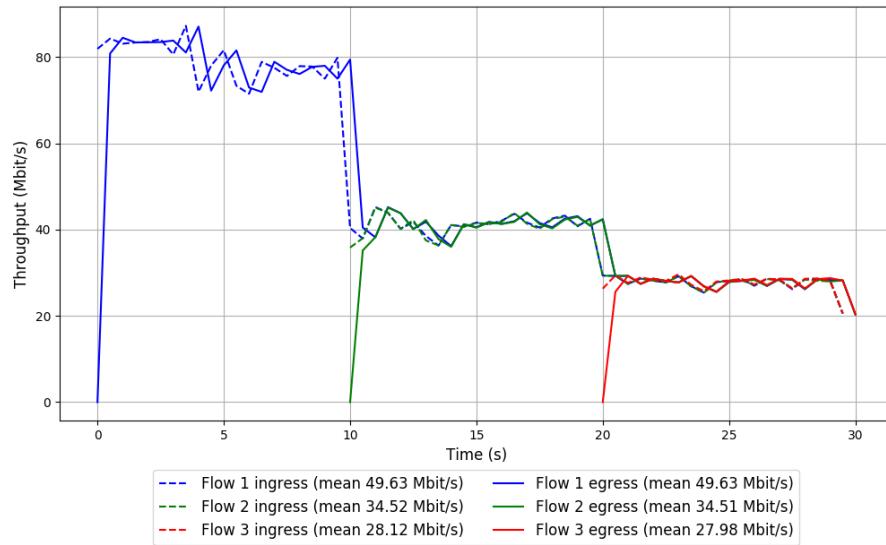


Run 3: Statistics of Indigo

```
Start at: 2018-08-28 06:24:04
End at: 2018-08-28 06:24:34
Local clock offset: 2.923 ms
Remote clock offset: 0.296 ms

# Below is generated by plot.py at 2018-08-28 06:26:24
# Datalink statistics
-- Total of 3 flows:
Average throughput: 81.77 Mbit/s
95th percentile per-packet one-way delay: 11.641 ms
Loss rate: 0.09%
-- Flow 1:
Average throughput: 49.63 Mbit/s
95th percentile per-packet one-way delay: 10.538 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 34.51 Mbit/s
95th percentile per-packet one-way delay: 11.528 ms
Loss rate: 0.04%
-- Flow 3:
Average throughput: 27.98 Mbit/s
95th percentile per-packet one-way delay: 15.055 ms
Loss rate: 0.55%
```

Run 3: Report of Indigo — Data Link

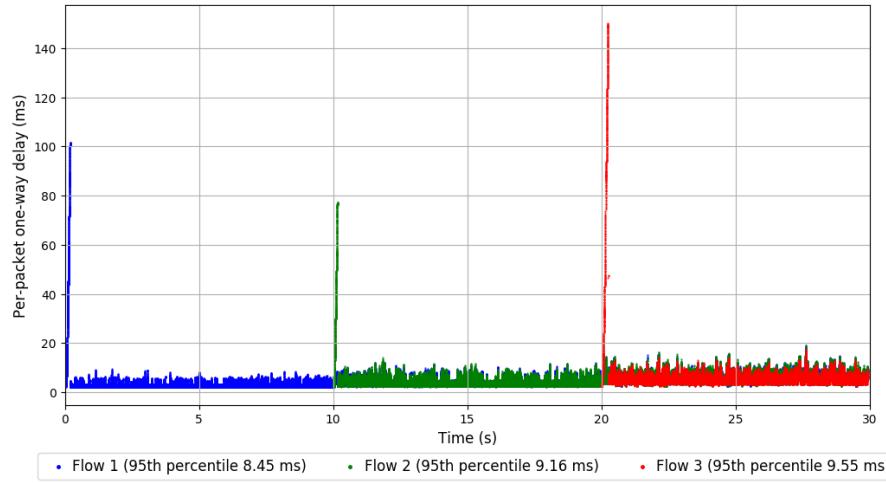
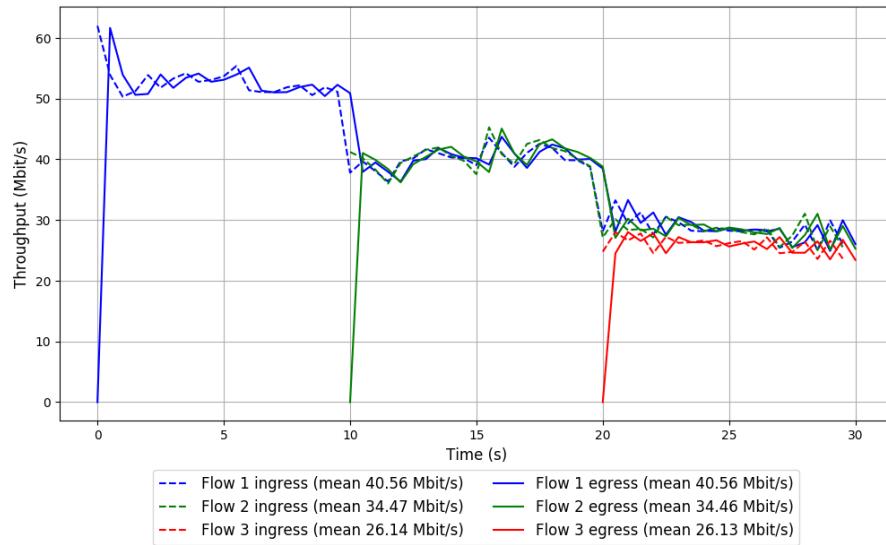


```
Run 1: Statistics of Muses
```

```
Start at: 2018-08-28 06:12:50
End at: 2018-08-28 06:13:20
Local clock offset: 4.096 ms
Remote clock offset: 0.237 ms

# Below is generated by plot.py at 2018-08-28 06:26:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 72.16 Mbit/s
95th percentile per-packet one-way delay: 8.863 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 40.56 Mbit/s
95th percentile per-packet one-way delay: 8.446 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 34.46 Mbit/s
95th percentile per-packet one-way delay: 9.161 ms
Loss rate: 0.04%
-- Flow 3:
Average throughput: 26.13 Mbit/s
95th percentile per-packet one-way delay: 9.550 ms
Loss rate: 0.08%
```

Run 1: Report of Muses — Data Link

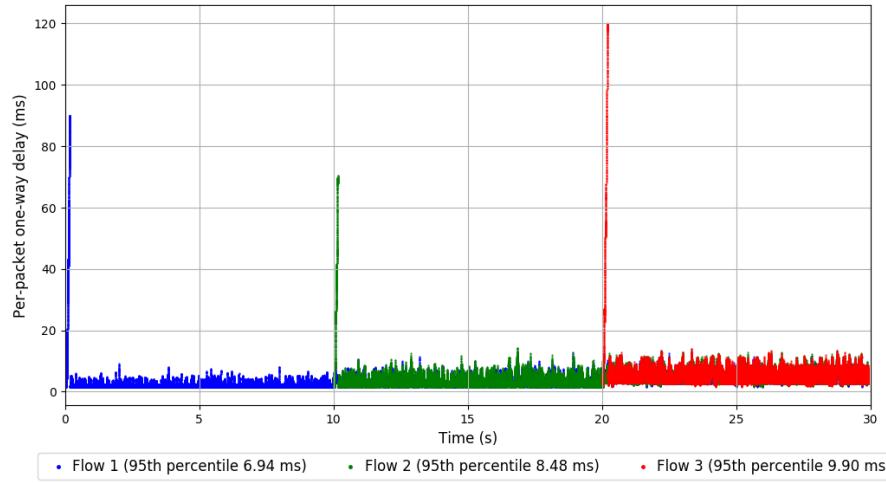
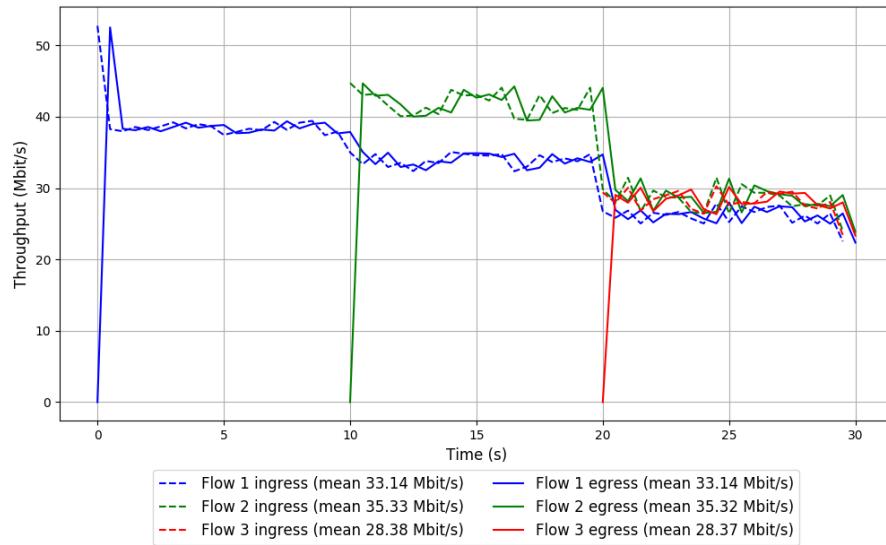


Run 2: Statistics of Muses

```
Start at: 2018-08-28 06:17:20
End at: 2018-08-28 06:17:50
Local clock offset: 3.169 ms
Remote clock offset: 0.247 ms

# Below is generated by plot.py at 2018-08-28 06:26:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 66.04 Mbit/s
95th percentile per-packet one-way delay: 8.293 ms
Loss rate: 0.03%
-- Flow 1:
Average throughput: 33.14 Mbit/s
95th percentile per-packet one-way delay: 6.943 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 35.32 Mbit/s
95th percentile per-packet one-way delay: 8.478 ms
Loss rate: 0.03%
-- Flow 3:
Average throughput: 28.37 Mbit/s
95th percentile per-packet one-way delay: 9.903 ms
Loss rate: 0.08%
```

Run 2: Report of Muses — Data Link



Run 3: Statistics of Muses

```
Start at: 2018-08-28 06:21:50
End at: 2018-08-28 06:22:20
Local clock offset: 3.812 ms
Remote clock offset: 0.232 ms

# Below is generated by plot.py at 2018-08-28 06:26:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 65.73 Mbit/s
95th percentile per-packet one-way delay: 8.643 ms
Loss rate: 0.04%
-- Flow 1:
Average throughput: 33.04 Mbit/s
95th percentile per-packet one-way delay: 7.651 ms
Loss rate: 0.03%
-- Flow 2:
Average throughput: 35.79 Mbit/s
95th percentile per-packet one-way delay: 9.092 ms
Loss rate: 0.04%
-- Flow 3:
Average throughput: 26.74 Mbit/s
95th percentile per-packet one-way delay: 10.109 ms
Loss rate: 0.09%
```

Run 3: Report of Muses — Data Link

