

Pantheon Report

Generated at 2018-08-28 13:11:45 (UTC).
Data path: GCE Tokyo 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.

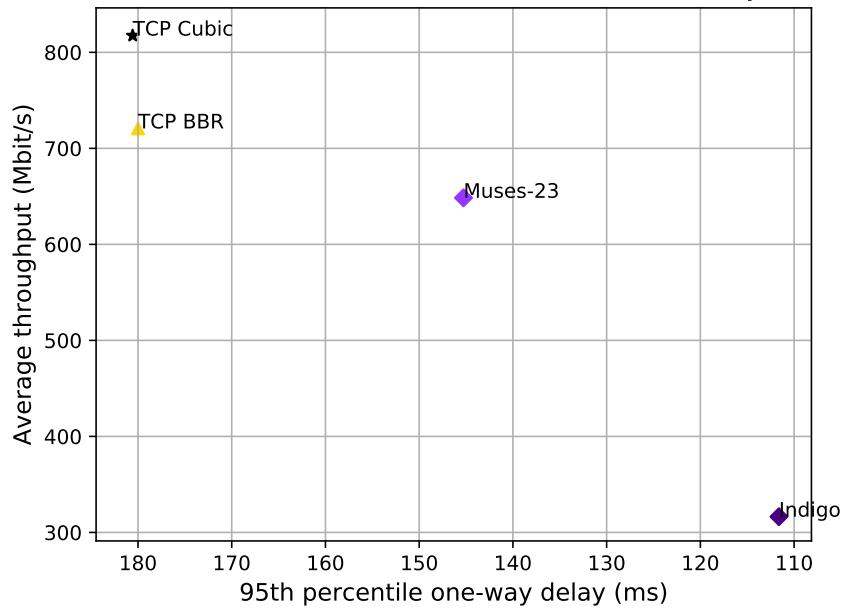
System info:

```
Linux 4.15.0-1015-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
```

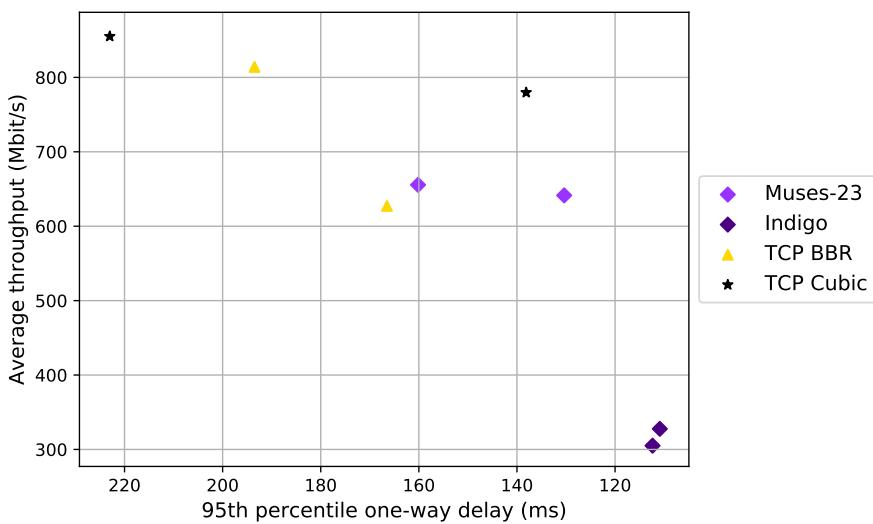
Git summary:

```
branch: muses-23 @ 88af05c5b0b7531637ca401951507a2fde628df6
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 GCE Tokyo 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 Tokyo to GCE London, 2 runs of 30s each per scheme
3 flows with 10s interval between flows



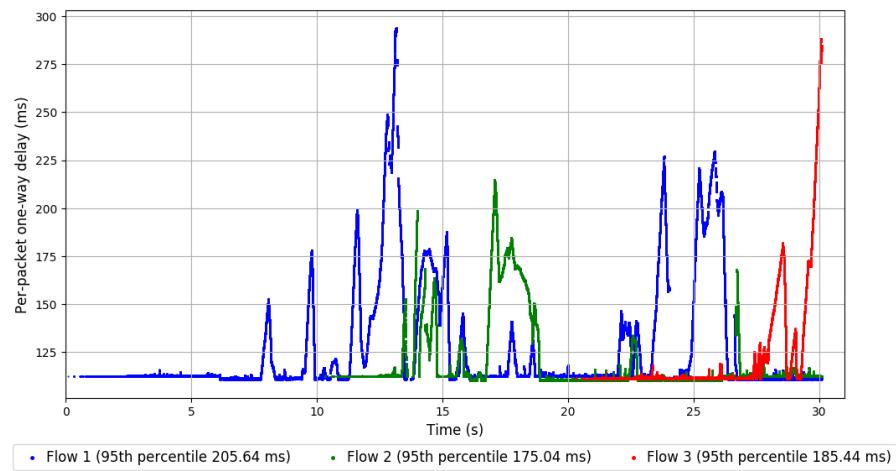
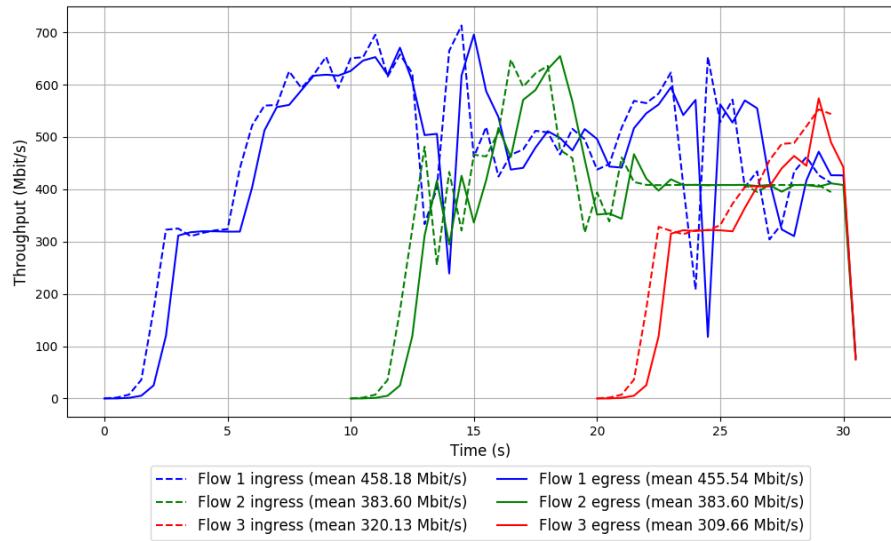
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	365.26	389.75	288.42	185.96	153.66	194.98	0.29	0.18	1.64
TCP Cubic	2	446.19	390.75	333.88	179.12	180.63	166.32	0.08	0.15	0.30
Indigo	2	172.91	154.57	128.50	111.13	111.29	110.42	0.00	0.01	0.00
Muses-23	2	346.75	346.44	222.75	147.10	144.27	123.72	0.47	0.09	0.01

Run 1: Statistics of TCP BBR

```
Start at: 2018-08-28 12:48:20
End at: 2018-08-28 12:48:50
Local clock offset: -0.114 ms
Remote clock offset: -0.421 ms

# Below is generated by plot.py at 2018-08-28 13:11:18
# Datalink statistics
-- Total of 3 flows:
Average throughput: 814.15 Mbit/s
95th percentile per-packet one-way delay: 193.496 ms
Loss rate: 0.76%
-- Flow 1:
Average throughput: 455.54 Mbit/s
95th percentile per-packet one-way delay: 205.641 ms
Loss rate: 0.59%
-- Flow 2:
Average throughput: 383.60 Mbit/s
95th percentile per-packet one-way delay: 175.041 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 309.66 Mbit/s
95th percentile per-packet one-way delay: 185.436 ms
Loss rate: 3.28%
```

Run 1: Report of TCP BBR — Data Link

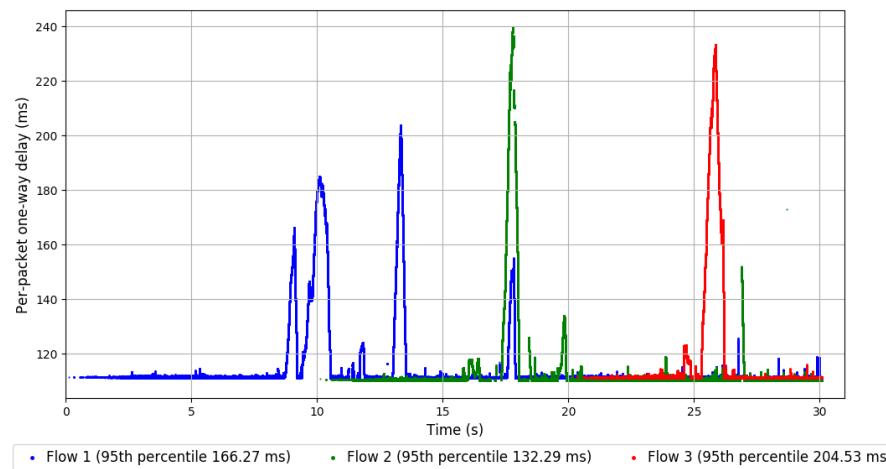
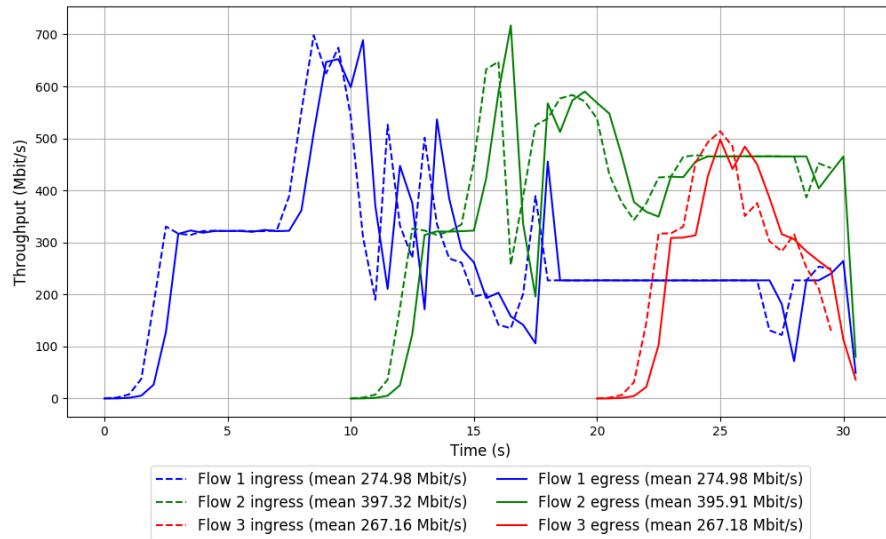


Run 2: Statistics of TCP BBR

```
Start at: 2018-08-28 12:56:00
End at: 2018-08-28 12:56:30
Local clock offset: -0.111 ms
Remote clock offset: -0.491 ms

# Below is generated by plot.py at 2018-08-28 13:11:18
# Datalink statistics
-- Total of 3 flows:
Average throughput: 627.34 Mbit/s
95th percentile per-packet one-way delay: 166.499 ms
Loss rate: 0.15%
-- Flow 1:
Average throughput: 274.98 Mbit/s
95th percentile per-packet one-way delay: 166.273 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 395.91 Mbit/s
95th percentile per-packet one-way delay: 132.289 ms
Loss rate: 0.35%
-- Flow 3:
Average throughput: 267.18 Mbit/s
95th percentile per-packet one-way delay: 204.530 ms
Loss rate: 0.00%
```

Run 2: Report of TCP BBR — Data Link

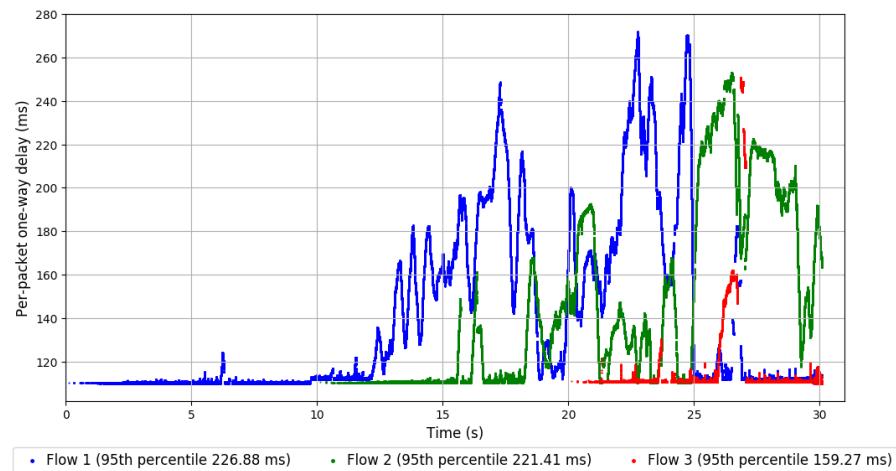
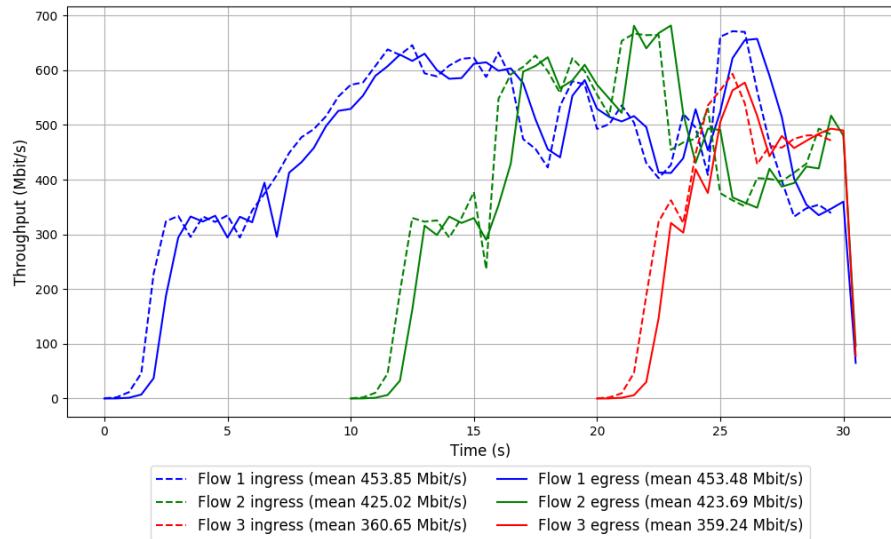


Run 1: Statistics of TCP Cubic

```
Start at: 2018-08-28 12:46:17
End at: 2018-08-28 12:46:47
Local clock offset: -0.199 ms
Remote clock offset: -0.896 ms

# Below is generated by plot.py at 2018-08-28 13:11:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 855.16 Mbit/s
95th percentile per-packet one-way delay: 223.015 ms
Loss rate: 0.20%
-- Flow 1:
Average throughput: 453.48 Mbit/s
95th percentile per-packet one-way delay: 226.884 ms
Loss rate: 0.08%
-- Flow 2:
Average throughput: 423.69 Mbit/s
95th percentile per-packet one-way delay: 221.414 ms
Loss rate: 0.31%
-- Flow 3:
Average throughput: 359.24 Mbit/s
95th percentile per-packet one-way delay: 159.266 ms
Loss rate: 0.39%
```

Run 1: Report of TCP Cubic — Data Link

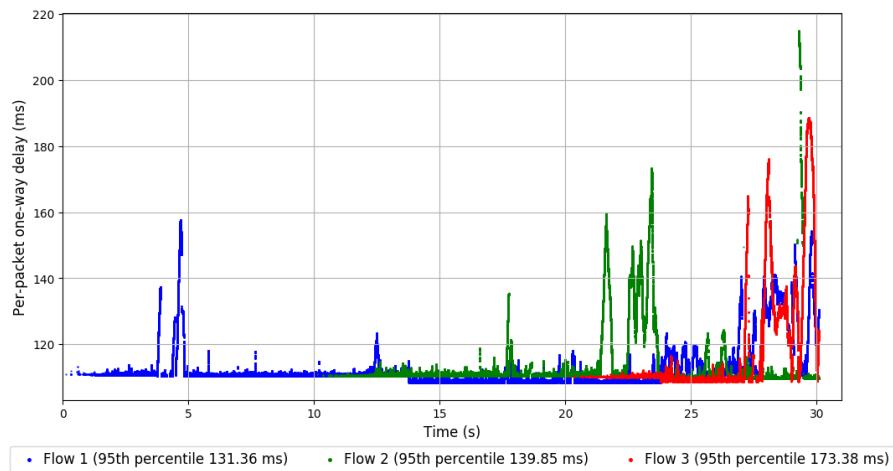
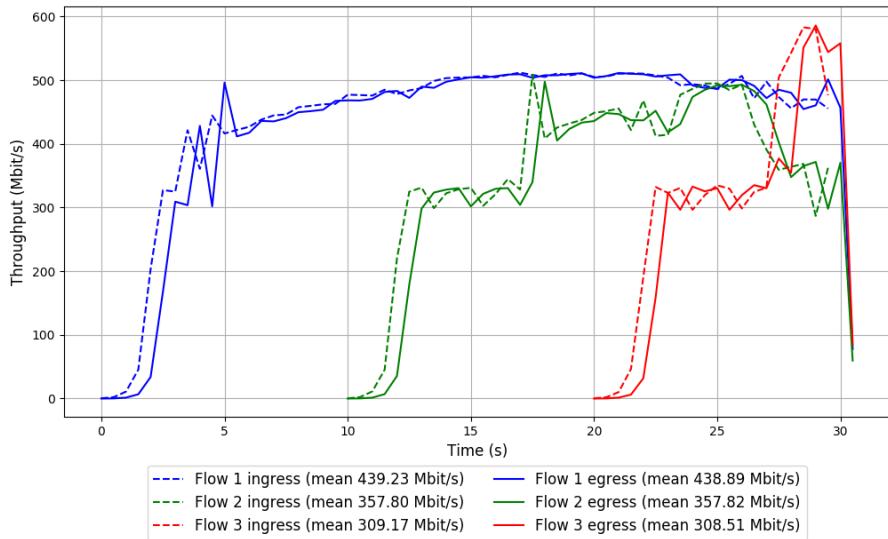


Run 2: Statistics of TCP Cubic

```
Start at: 2018-08-28 12:54:03
End at: 2018-08-28 12:54:33
Local clock offset: -0.096 ms
Remote clock offset: -0.404 ms

# Below is generated by plot.py at 2018-08-28 13:11:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 779.68 Mbit/s
95th percentile per-packet one-way delay: 138.119 ms
Loss rate: 0.07%
-- Flow 1:
Average throughput: 438.89 Mbit/s
95th percentile per-packet one-way delay: 131.359 ms
Loss rate: 0.08%
-- Flow 2:
Average throughput: 357.82 Mbit/s
95th percentile per-packet one-way delay: 139.850 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 308.51 Mbit/s
95th percentile per-packet one-way delay: 173.384 ms
Loss rate: 0.22%
```

Run 2: Report of TCP Cubic — Data Link

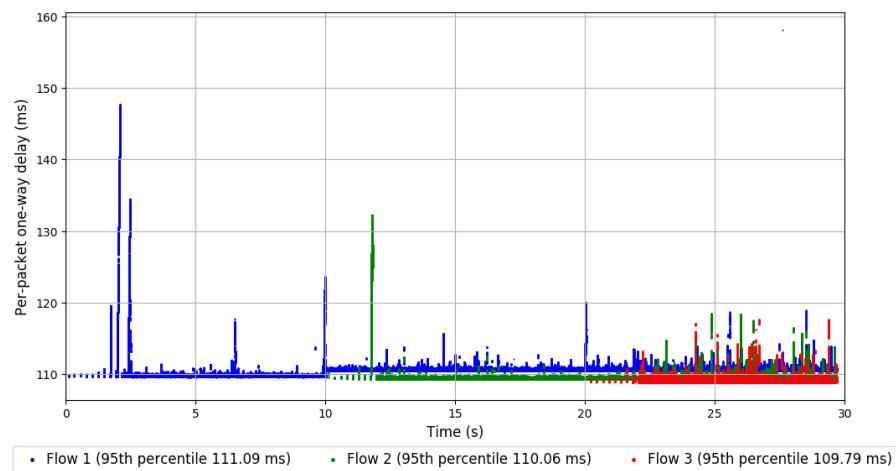
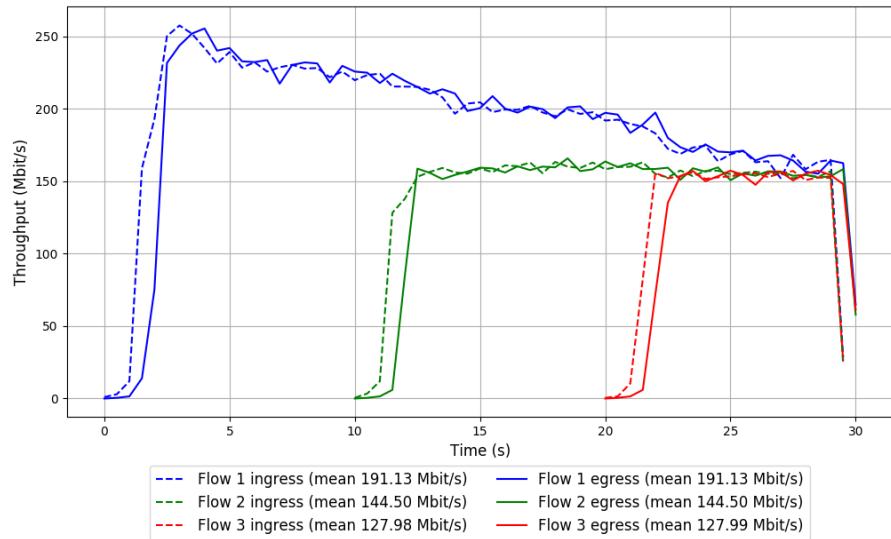


Run 1: Statistics of Indigo

```
Start at: 2018-08-28 12:42:36
End at: 2018-08-28 12:43:06
Local clock offset: -0.12 ms
Remote clock offset: -0.247 ms

# Below is generated by plot.py at 2018-08-28 13:11:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 327.70 Mbit/s
95th percentile per-packet one-way delay: 110.879 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 191.13 Mbit/s
95th percentile per-packet one-way delay: 111.086 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 144.50 Mbit/s
95th percentile per-packet one-way delay: 110.058 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 127.99 Mbit/s
95th percentile per-packet one-way delay: 109.786 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link

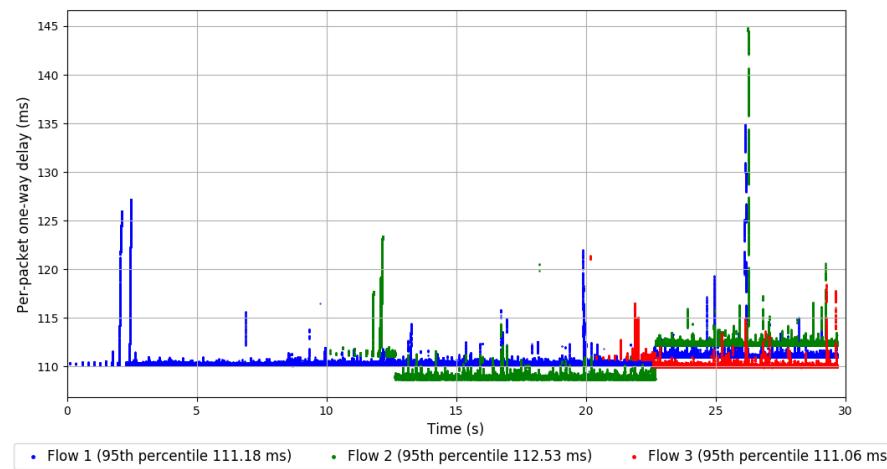
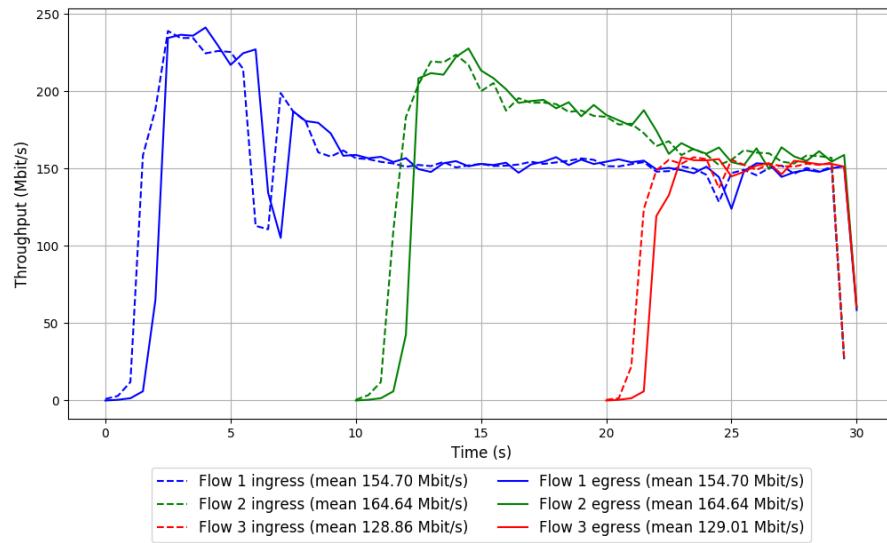


Run 2: Statistics of Indigo

```
Start at: 2018-08-28 12:50:23
End at: 2018-08-28 12:50:53
Local clock offset: -0.055 ms
Remote clock offset: -0.451 ms

# Below is generated by plot.py at 2018-08-28 13:11:36
# Datalink statistics
-- Total of 3 flows:
Average throughput: 305.07 Mbit/s
95th percentile per-packet one-way delay: 112.360 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 154.70 Mbit/s
95th percentile per-packet one-way delay: 111.181 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 164.64 Mbit/s
95th percentile per-packet one-way delay: 112.527 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 129.01 Mbit/s
95th percentile per-packet one-way delay: 111.055 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link

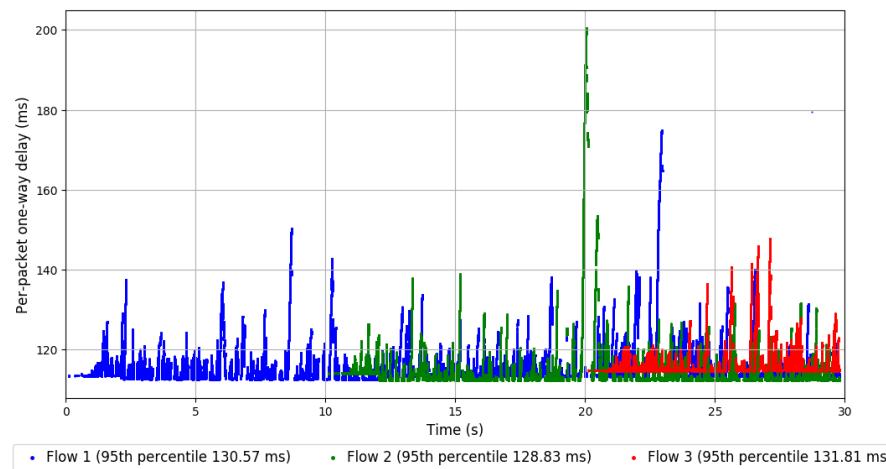
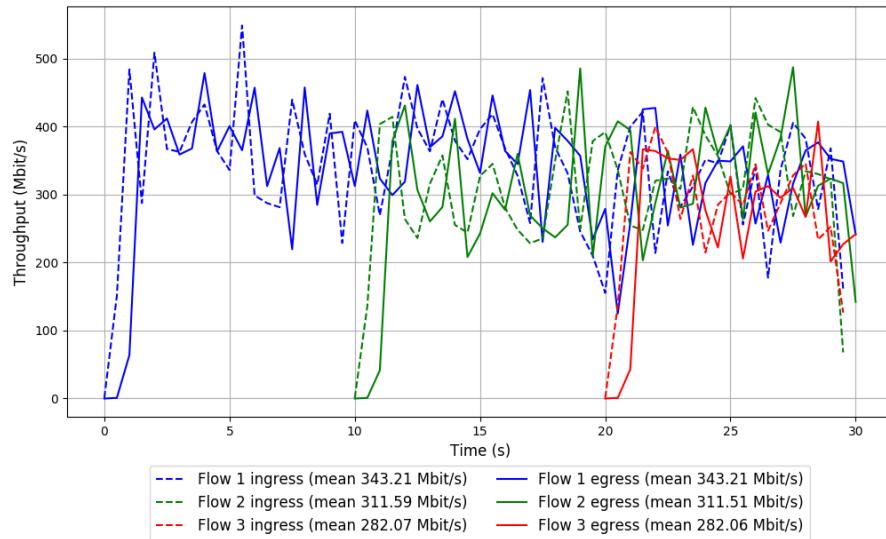


Run 1: Statistics of Muses-23

```
Start at: 2018-08-28 12:44:24
End at: 2018-08-28 12:44:54
Local clock offset: -3.065 ms
Remote clock offset: -0.426 ms

# Below is generated by plot.py at 2018-08-28 13:11:39
# Datalink statistics
-- Total of 3 flows:
Average throughput: 641.41 Mbit/s
95th percentile per-packet one-way delay: 130.375 ms
Loss rate: 0.01%
-- Flow 1:
Average throughput: 343.21 Mbit/s
95th percentile per-packet one-way delay: 130.568 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 311.51 Mbit/s
95th percentile per-packet one-way delay: 128.827 ms
Loss rate: 0.03%
-- Flow 3:
Average throughput: 282.06 Mbit/s
95th percentile per-packet one-way delay: 131.808 ms
Loss rate: 0.02%
```

Run 1: Report of Muses-23 — Data Link



Run 2: Statistics of Muses-23

```
Start at: 2018-08-28 12:52:10
End at: 2018-08-28 12:52:40
Local clock offset: -0.094 ms
Remote clock offset: -0.847 ms

# Below is generated by plot.py at 2018-08-28 13:11:44
# Datalink statistics
-- Total of 3 flows:
Average throughput: 655.57 Mbit/s
95th percentile per-packet one-way delay: 160.167 ms
Loss rate: 0.56%
-- Flow 1:
Average throughput: 350.29 Mbit/s
95th percentile per-packet one-way delay: 163.636 ms
Loss rate: 0.94%
-- Flow 2:
Average throughput: 381.36 Mbit/s
95th percentile per-packet one-way delay: 159.707 ms
Loss rate: 0.15%
-- Flow 3:
Average throughput: 163.45 Mbit/s
95th percentile per-packet one-way delay: 115.626 ms
Loss rate: 0.00%
```

Run 2: Report of Muses-23 — Data Link

