

Pantheon Report

Generated at 2018-08-28 14:57:57 (UTC).

Data path: GCE Sydney 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.

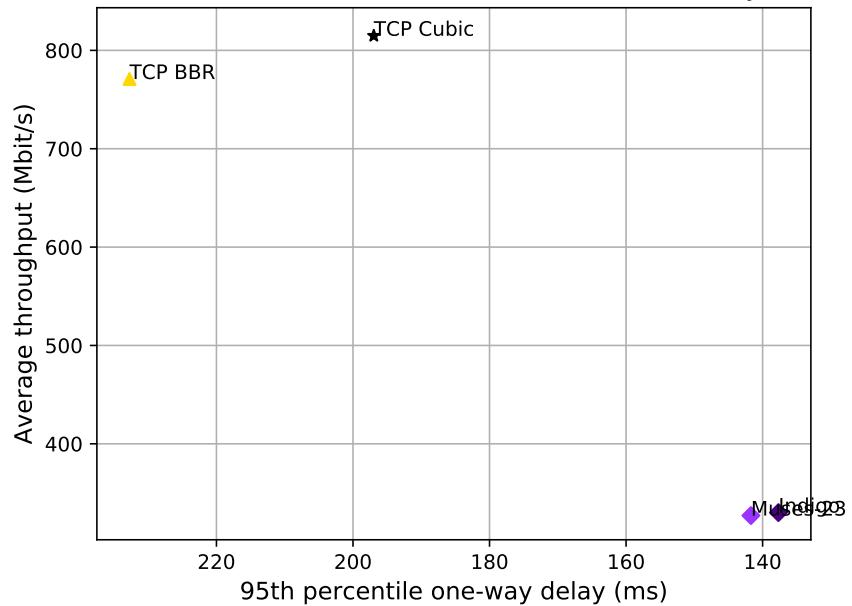
System info:

```
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
```

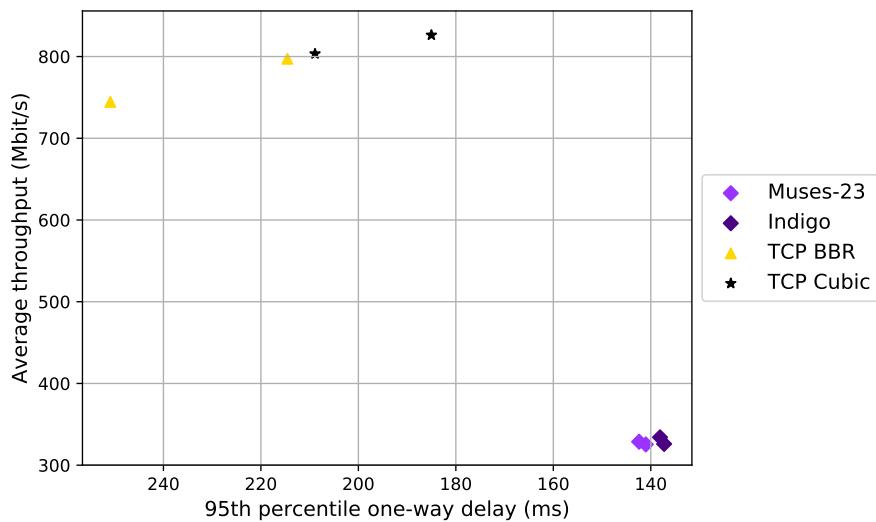
Git summary:

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



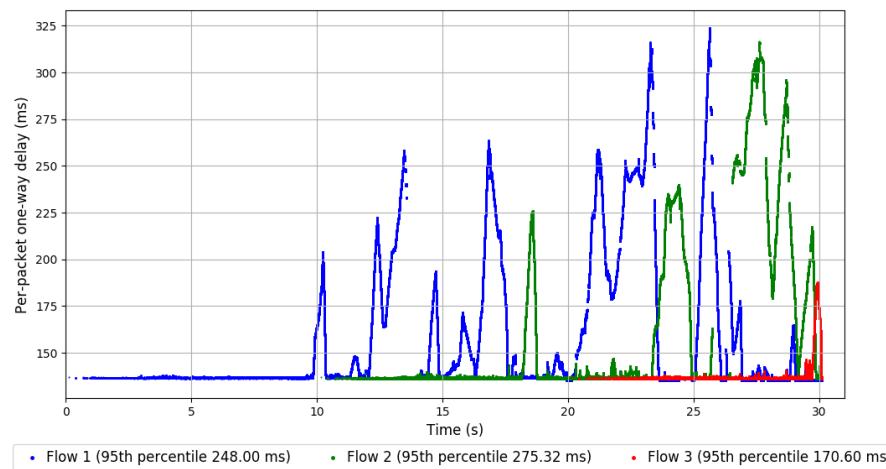
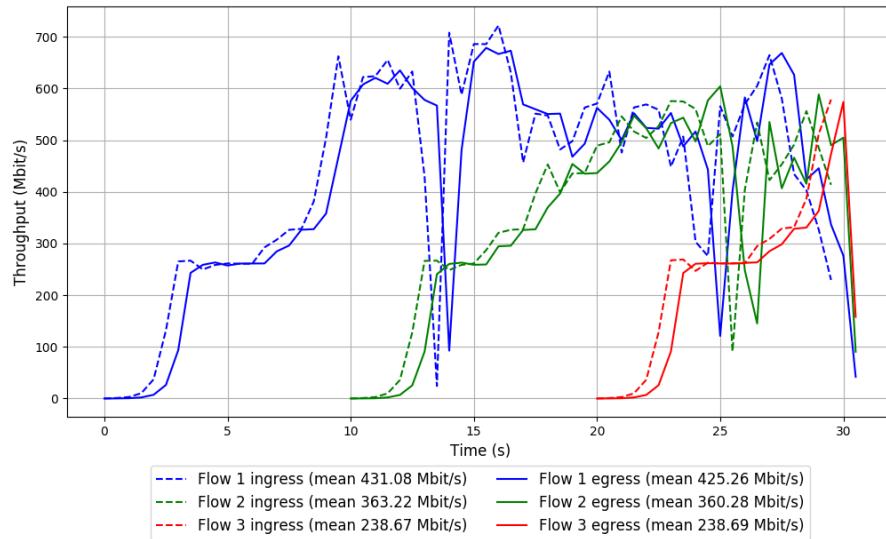
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	2	436.25	364.17	277.15	224.34	255.70	164.74	1.02	0.81	0.07
TCP Cubic	2	444.17	405.78	302.12	194.90	183.00	195.49	0.01	0.10	0.79
Indigo	2	168.28	171.37	150.95	137.17	137.58	138.76	0.00	0.01	0.00
Muses-23	2	165.08	162.66	168.31	141.46	141.20	142.50	0.00	0.01	0.00

Run 1: Statistics of TCP BBR

```
Start at: 2018-08-28 14:29:58
End at: 2018-08-28 14:30:28
Local clock offset: 0.058 ms
Remote clock offset: -0.423 ms

# Below is generated by plot.py at 2018-08-28 14:57:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 744.45 Mbit/s
95th percentile per-packet one-way delay: 250.896 ms
Loss rate: 1.04%
-- Flow 1:
Average throughput: 425.26 Mbit/s
95th percentile per-packet one-way delay: 247.996 ms
Loss rate: 1.36%
-- Flow 2:
Average throughput: 360.28 Mbit/s
95th percentile per-packet one-way delay: 275.319 ms
Loss rate: 0.81%
-- Flow 3:
Average throughput: 238.69 Mbit/s
95th percentile per-packet one-way delay: 170.600 ms
Loss rate: 0.00%
```

Run 1: Report of TCP BBR — Data Link

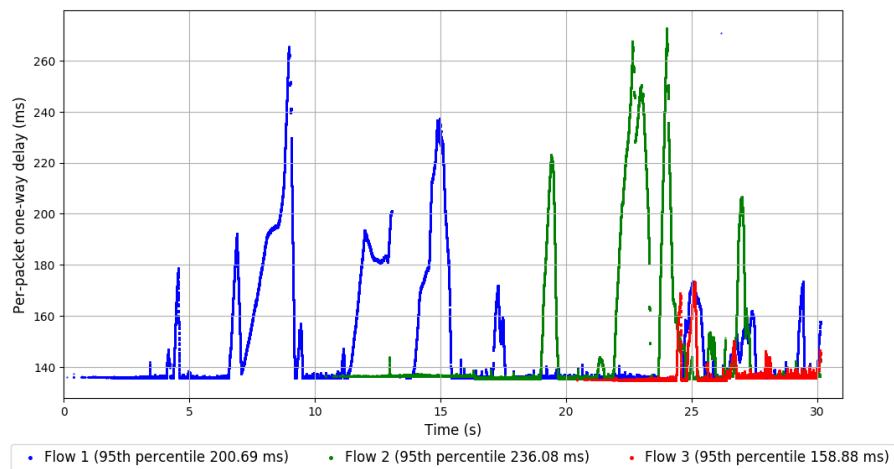
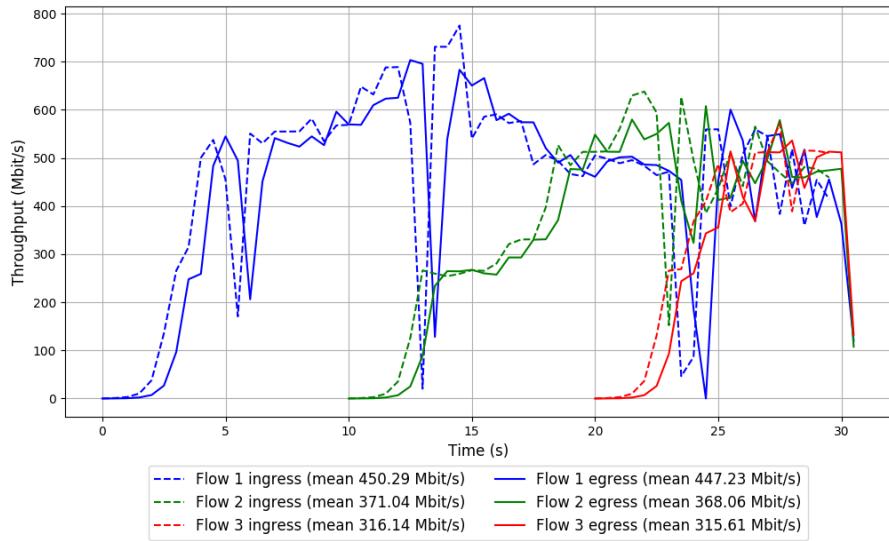


Run 2: Statistics of TCP BBR

```
Start at: 2018-08-28 14:37:42
End at: 2018-08-28 14:38:12
Local clock offset: -0.078 ms
Remote clock offset: -0.051 ms

# Below is generated by plot.py at 2018-08-28 14:57:50
# Datalink statistics
-- Total of 3 flows:
Average throughput: 797.26 Mbit/s
95th percentile per-packet one-way delay: 214.569 ms
Loss rate: 0.64%
-- Flow 1:
Average throughput: 447.23 Mbit/s
95th percentile per-packet one-way delay: 200.687 ms
Loss rate: 0.67%
-- Flow 2:
Average throughput: 368.06 Mbit/s
95th percentile per-packet one-way delay: 236.076 ms
Loss rate: 0.80%
-- Flow 3:
Average throughput: 315.61 Mbit/s
95th percentile per-packet one-way delay: 158.875 ms
Loss rate: 0.15%
```

Run 2: Report of TCP BBR — Data Link

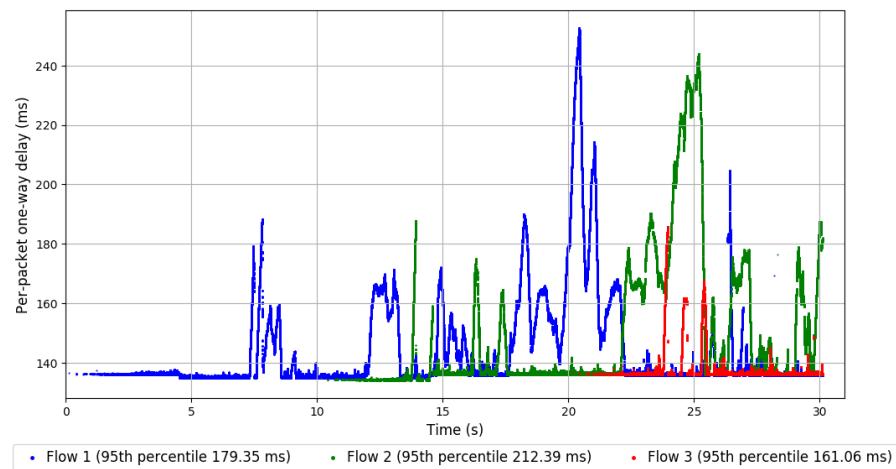
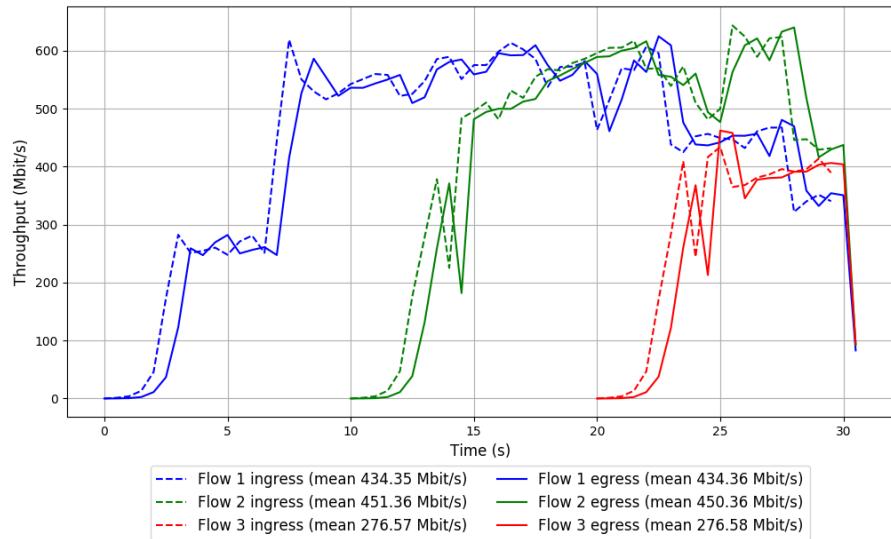


Run 1: Statistics of TCP Cubic

```
Start at: 2018-08-28 14:32:04
End at: 2018-08-28 14:32:34
Local clock offset: 0.176 ms
Remote clock offset: -0.532 ms

# Below is generated by plot.py at 2018-08-28 14:57:55
# Datalink statistics
-- Total of 3 flows:
Average throughput: 826.29 Mbit/s
95th percentile per-packet one-way delay: 185.014 ms
Loss rate: 0.08%
-- Flow 1:
Average throughput: 434.36 Mbit/s
95th percentile per-packet one-way delay: 179.355 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 450.36 Mbit/s
95th percentile per-packet one-way delay: 212.386 ms
Loss rate: 0.21%
-- Flow 3:
Average throughput: 276.58 Mbit/s
95th percentile per-packet one-way delay: 161.055 ms
Loss rate: 0.00%
```

Run 1: Report of TCP Cubic — Data Link

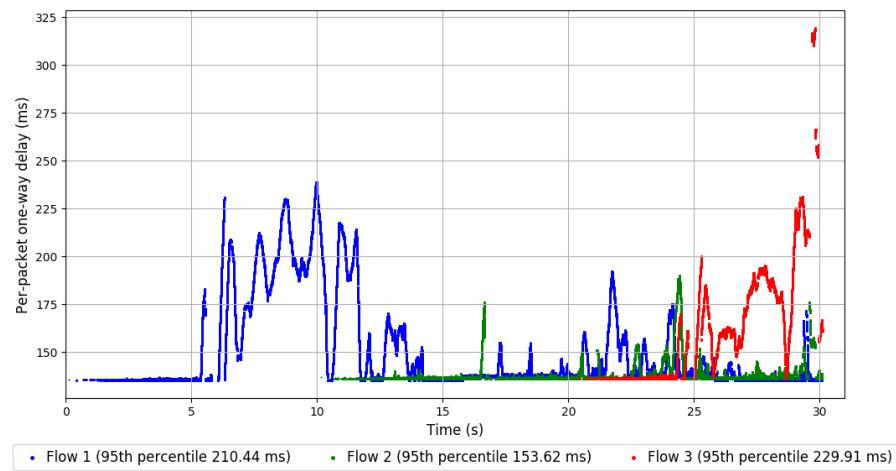
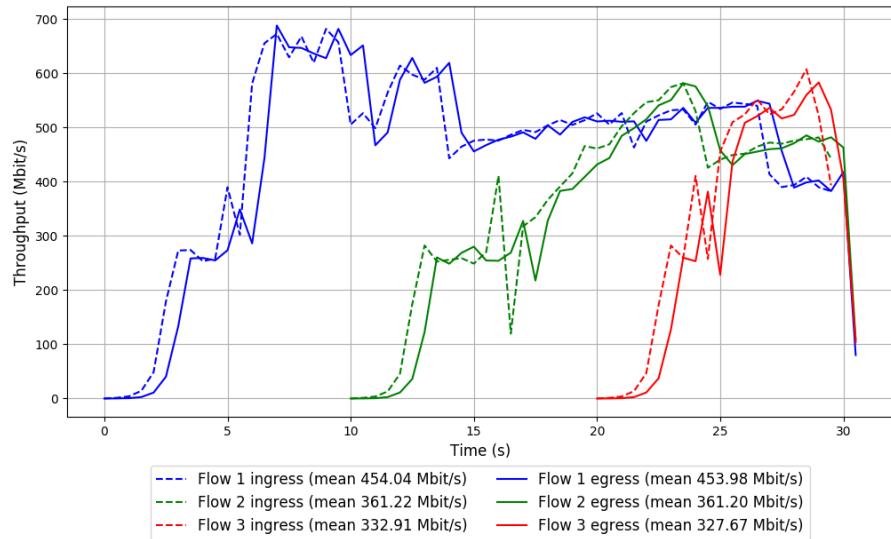


Run 2: Statistics of TCP Cubic

```
Start at: 2018-08-28 14:39:52
End at: 2018-08-28 14:40:22
Local clock offset: 0.061 ms
Remote clock offset: 0.372 ms

# Below is generated by plot.py at 2018-08-28 14:57:55
# Datalink statistics
-- Total of 3 flows:
Average throughput: 803.35 Mbit/s
95th percentile per-packet one-way delay: 208.894 ms
Loss rate: 0.22%
-- Flow 1:
Average throughput: 453.98 Mbit/s
95th percentile per-packet one-way delay: 210.443 ms
Loss rate: 0.01%
-- Flow 2:
Average throughput: 361.20 Mbit/s
95th percentile per-packet one-way delay: 153.619 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 327.67 Mbit/s
95th percentile per-packet one-way delay: 229.915 ms
Loss rate: 1.58%
```

Run 2: Report of TCP Cubic — Data Link

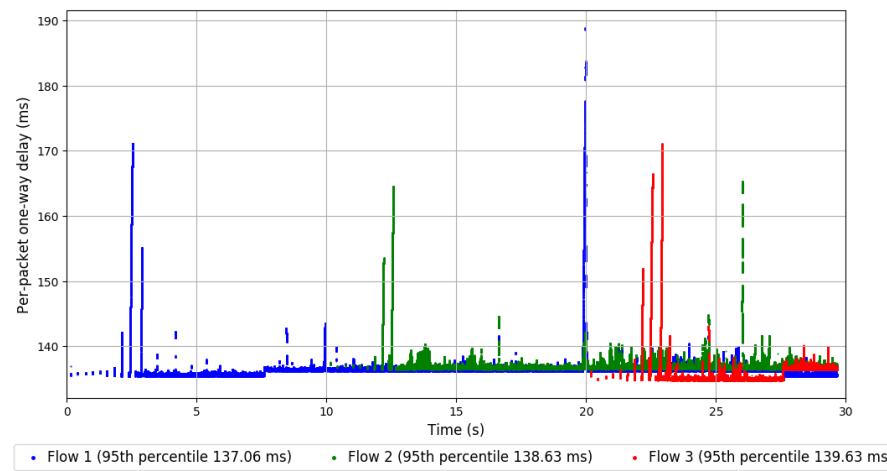
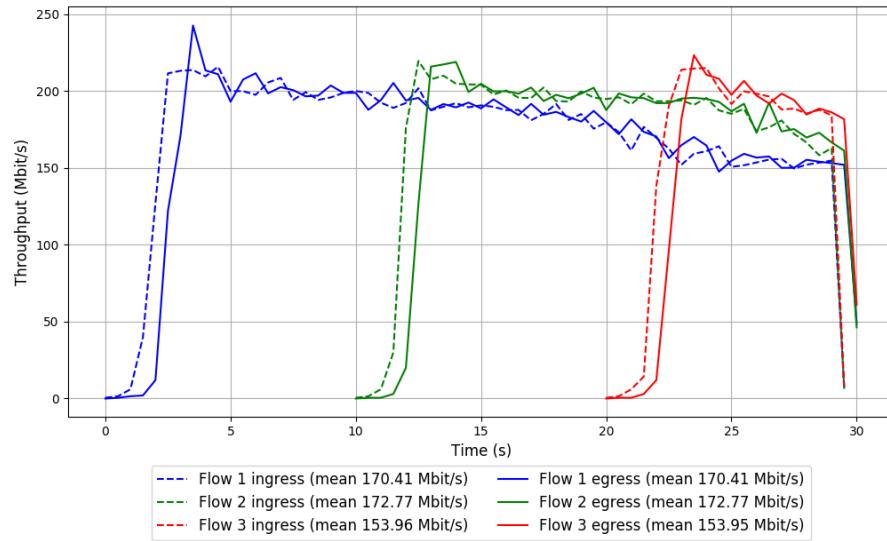


Run 1: Statistics of Indigo

```
Start at: 2018-08-28 14:34:10
End at: 2018-08-28 14:34:40
Local clock offset: 0.192 ms
Remote clock offset: 0.185 ms

# Below is generated by plot.py at 2018-08-28 14:57:55
# Datalink statistics
-- Total of 3 flows:
Average throughput: 334.10 Mbit/s
95th percentile per-packet one-way delay: 138.103 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 170.41 Mbit/s
95th percentile per-packet one-way delay: 137.055 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 172.77 Mbit/s
95th percentile per-packet one-way delay: 138.635 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 153.95 Mbit/s
95th percentile per-packet one-way delay: 139.633 ms
Loss rate: 0.00%
```

Run 1: Report of Indigo — Data Link

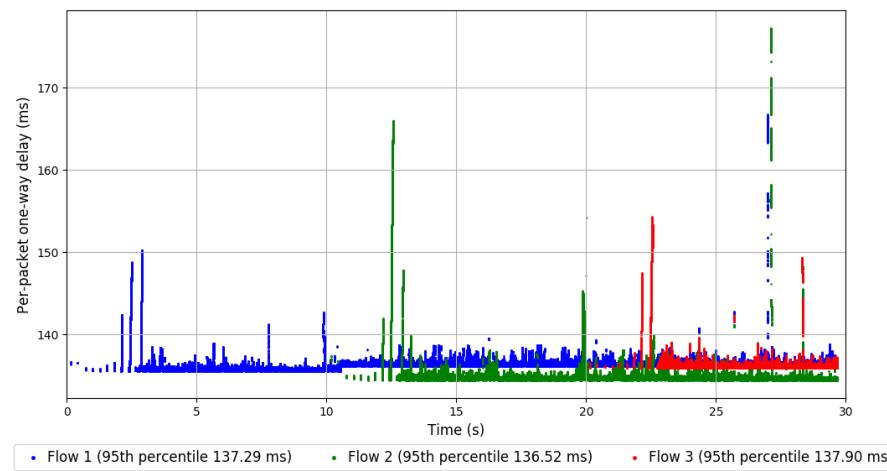
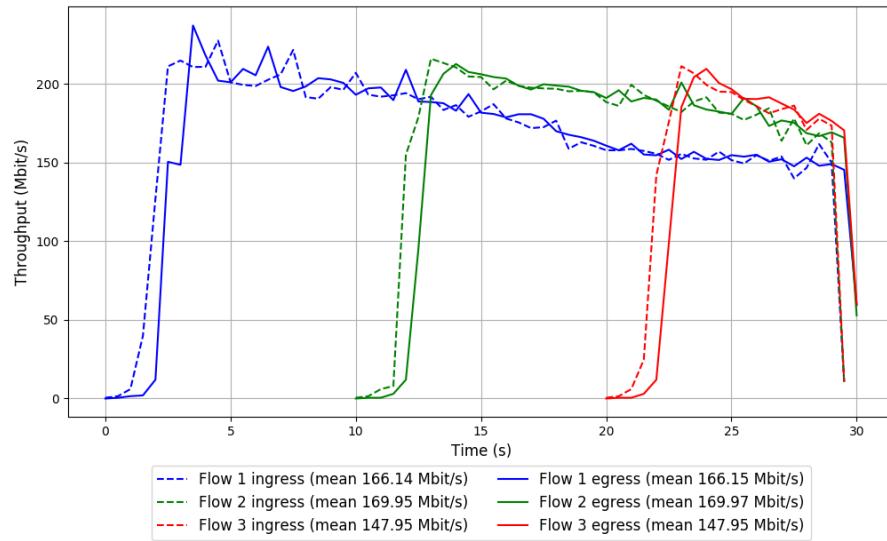


Run 2: Statistics of Indigo

```
Start at: 2018-08-28 14:41:57
End at: 2018-08-28 14:42:27
Local clock offset: 0.183 ms
Remote clock offset: -0.162 ms

# Below is generated by plot.py at 2018-08-28 14:57:55
# Datalink statistics
-- Total of 3 flows:
Average throughput: 325.99 Mbit/s
95th percentile per-packet one-way delay: 137.265 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 166.15 Mbit/s
95th percentile per-packet one-way delay: 137.290 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 169.97 Mbit/s
95th percentile per-packet one-way delay: 136.522 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 147.95 Mbit/s
95th percentile per-packet one-way delay: 137.897 ms
Loss rate: 0.00%
```

Run 2: Report of Indigo — Data Link

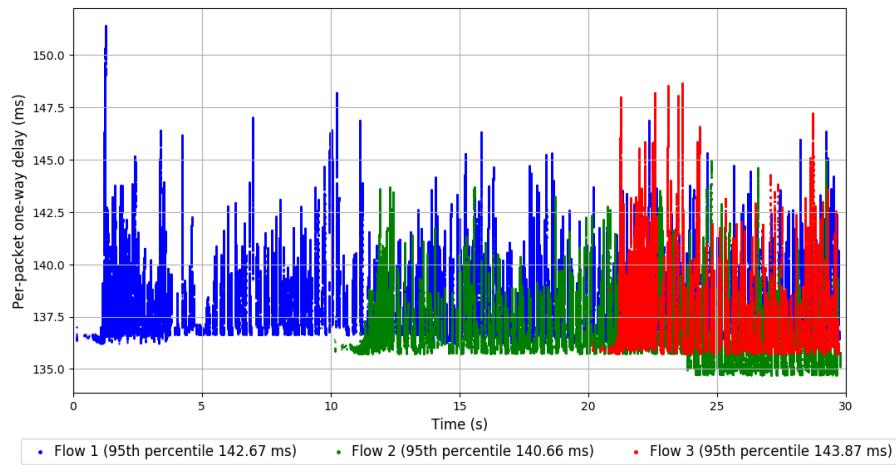
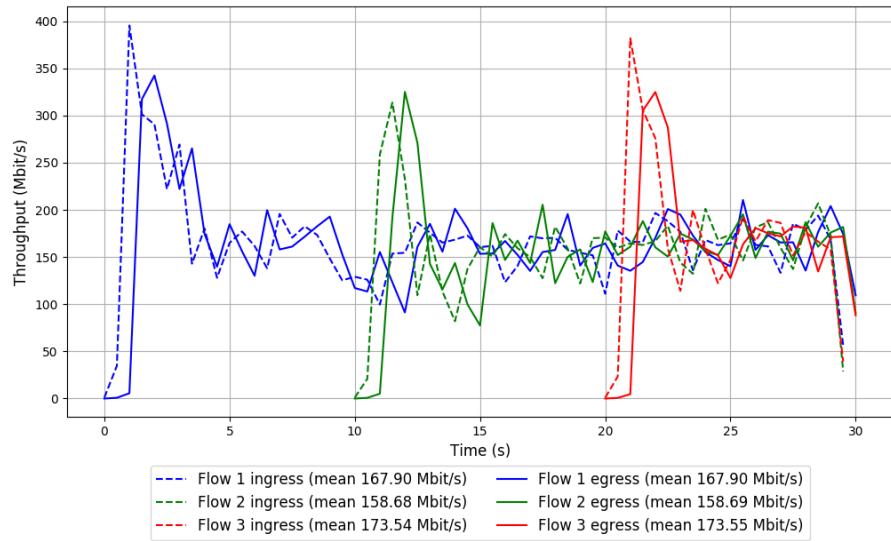


Run 1: Statistics of Muses-23

```
Start at: 2018-08-28 14:36:04
End at: 2018-08-28 14:36:34
Local clock offset: 0.035 ms
Remote clock offset: 0.001 ms

# Below is generated by plot.py at 2018-08-28 14:57:55
# Datalink statistics
-- Total of 3 flows:
Average throughput: 328.70 Mbit/s
95th percentile per-packet one-way delay: 142.395 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 167.90 Mbit/s
95th percentile per-packet one-way delay: 142.670 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 158.69 Mbit/s
95th percentile per-packet one-way delay: 140.658 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 173.55 Mbit/s
95th percentile per-packet one-way delay: 143.865 ms
Loss rate: 0.00%
```

Run 1: Report of Muses-23 — Data Link



Run 2: Statistics of Muses-23

```
Start at: 2018-08-28 14:43:49
End at: 2018-08-28 14:44:19
Local clock offset: 0.046 ms
Remote clock offset: -1.321 ms

# Below is generated by plot.py at 2018-08-28 14:57:55
# Datalink statistics
-- Total of 3 flows:
Average throughput: 325.38 Mbit/s
95th percentile per-packet one-way delay: 141.031 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 162.26 Mbit/s
95th percentile per-packet one-way delay: 140.250 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 166.64 Mbit/s
95th percentile per-packet one-way delay: 141.746 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 163.08 Mbit/s
95th percentile per-packet one-way delay: 141.128 ms
Loss rate: 0.00%
```

Run 2: Report of Muses-23 — Data Link

