Pantheon Report

Generated at 2018-08-31 12:16:04 (UTC).

Data path: GCE London 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.
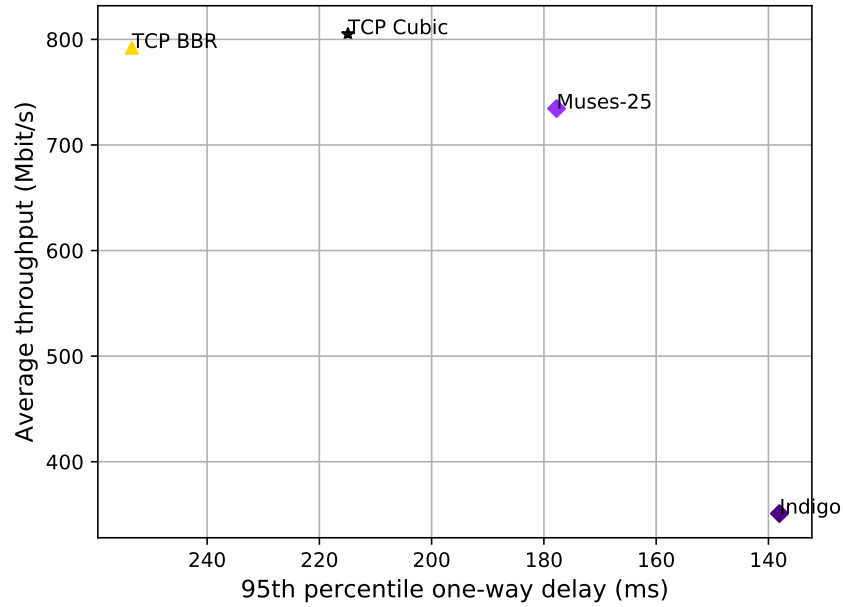
```
System info:
Linux 4.15.0-1018-gcp
net.core.default_qdisc = fq
net.core.rmem_default = 16777216
net.core.rmem_max = 536870912
net.core.wmem_default = 16777216
net.core.wmem_max = 536870912
net.ipv4.tcp_rmem = 4096 16777216 536870912
net.ipv4.tcp_wmem = 4096 16777216 536870912
net.ipv4.tcp_mem = 536870912 536870912 536870912
```
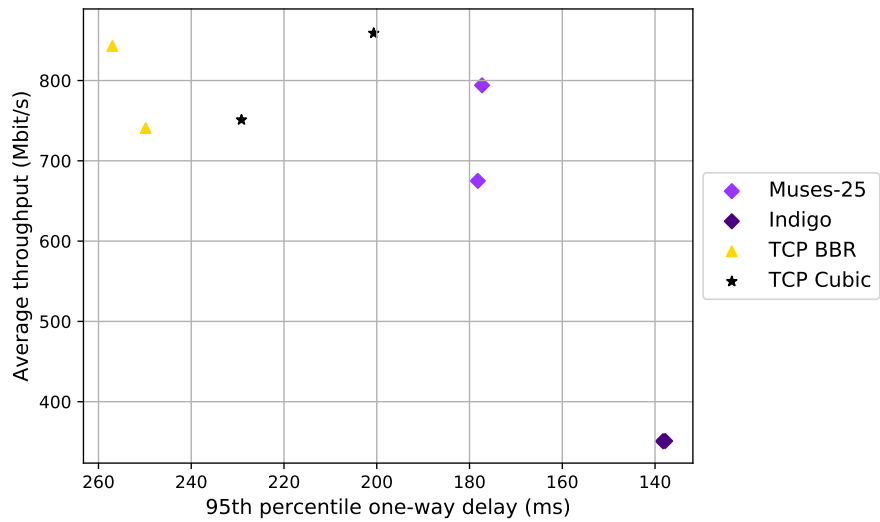
```
Git summary:
branch: muses @ e3c5aa19ca94c3066828fb83f16a8fb6b2731e7a
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdfe58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
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 London 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 London 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	435.49	385.75	308.23	246.46	252.07	228.56	2.42	3.38	5.92
TCP Cubic	2	508.73	351.34	194.05	215.78	193.44	137.99	1.02	2.29	5.06
Indigo	2	182.51	178.43	157.31	136.76	137.16	148.40	0.86	1.40	3.35
Muses-25	2	374.04	334.76	430.22	180.69	164.40	174.00	0.55	1.92	1.62

```
Run 1: Statistics of TCP BBR

Start at: 2018-08-31 11:51:12
End at: 2018-08-31 11:51:42
Local clock offset: 0.53 ms
Remote clock offset: 0.635 ms


# Below is generated by plot.py at 2018-08-31 12:15:27
# Datalink statistics
-- Total of 3 flows:
Average throughput: 843.09 Mbit/s
95th percentile per-packet one-way delay: 256.999 ms
Loss rate: 3.28%
-- Flow 1:
Average throughput: 457.48 Mbit/s
95th percentile per-packet one-way delay: 259.320 ms
Loss rate: 3.09%
-- Flow 2:
Average throughput: 420.43 Mbit/s
95th percentile per-packet one-way delay: 233.463 ms
Loss rate: 2.38%
-- Flow 3:
Average throughput: 327.26 Mbit/s
95th percentile per-packet one-way delay: 270.793 ms
Loss rate: 6.35%
```
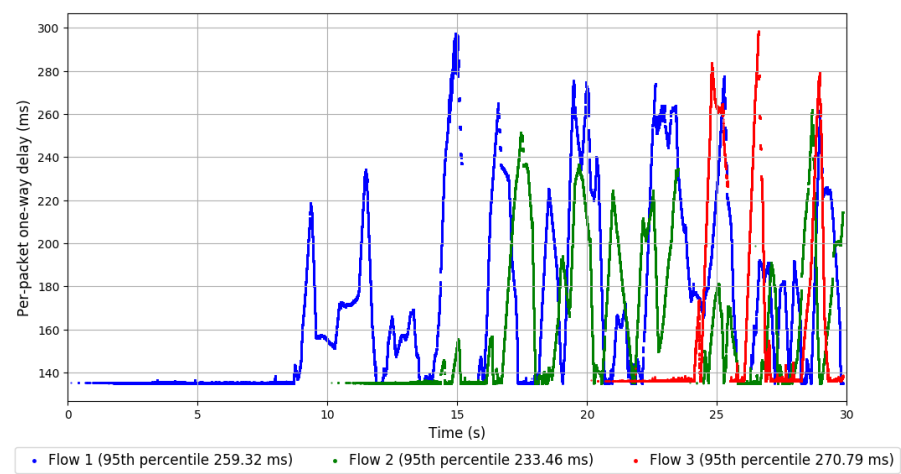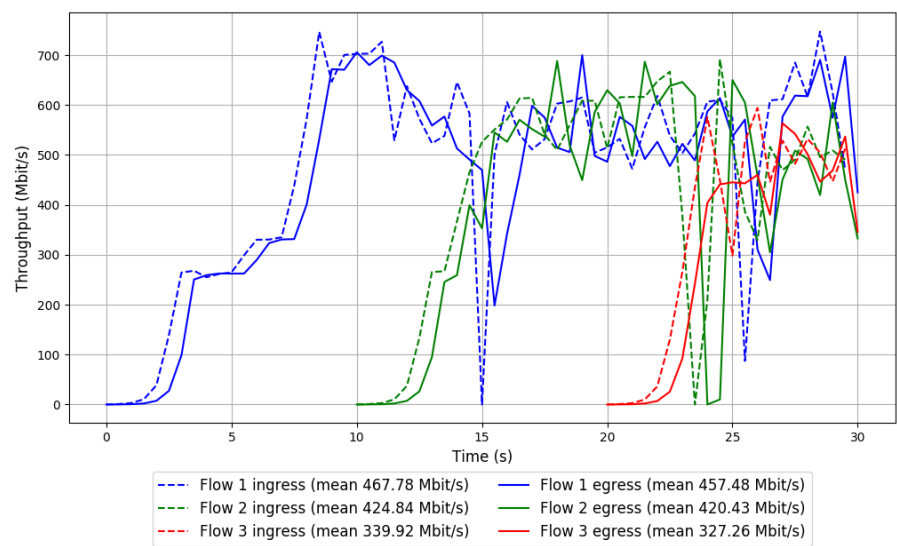
Run 1: Report of TCP BBR — Data Link

```
Run 2: Statistics of TCP BBR

Start at: 2018-08-31 11:59:20
End at: 2018-08-31 11:59:50
Local clock offset: 0.533 ms
Remote clock offset: 0.025 ms


# Below is generated by plot.py at 2018-08-31 12:15:27
# Datalink statistics
-- Total of 3 flows:
Average throughput: 740.77 Mbit/s
95th percentile per-packet one-way delay: 249.826 ms
Loss rate: 3.08%
-- Flow 1:
Average throughput: 413.50 Mbit/s
95th percentile per-packet one-way delay: 233.598 ms
Loss rate: 1.76%
-- Flow 2:
Average throughput: 351.07 Mbit/s
95th percentile per-packet one-way delay: 270.676 ms
Loss rate: 4.38%
-- Flow 3:
Average throughput: 289.20 Mbit/s
95th percentile per-packet one-way delay: 186.321 ms
Loss rate: 5.50%
```
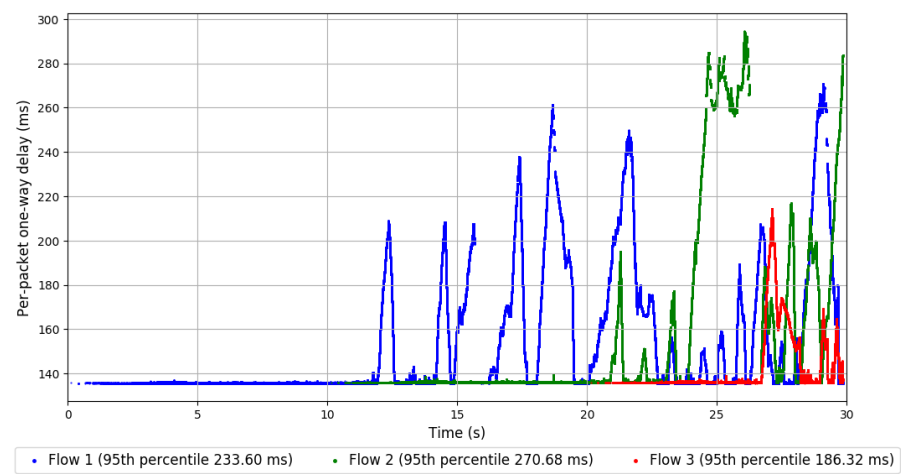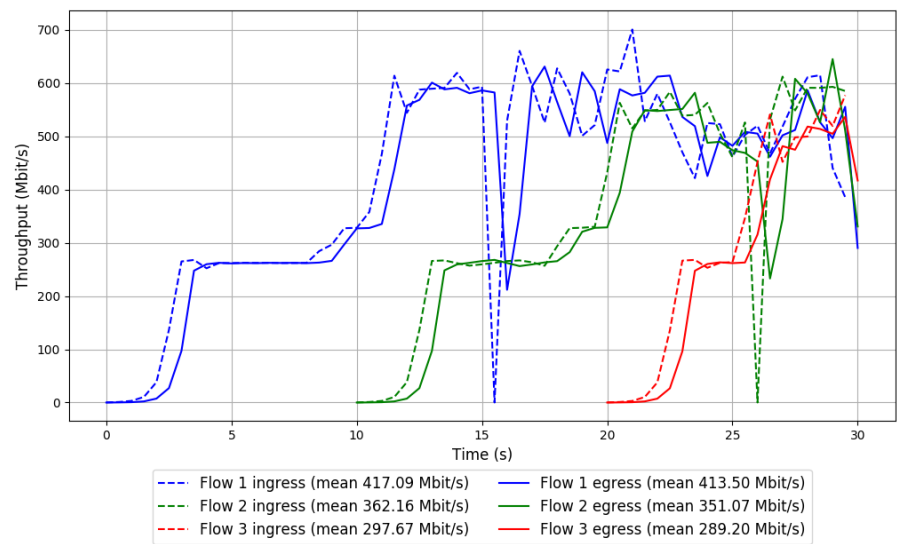
Run 2: Report of TCP BBR — Data Link

```
Run 1: Statistics of TCP Cubic

Start at: 2018-08-31 11:46:59
End at: 2018-08-31 11:47:29
Local clock offset: 0.877 ms
Remote clock offset: 0.513 ms


# Below is generated by plot.py at 2018-08-31 12:15:31
# Datalink statistics
-- Total of 3 flows:
Average throughput: 858.97 Mbit/s
95th percentile per-packet one-way delay: 200.663 ms
Loss rate: 1.74%
-- Flow 1:
Average throughput: 502.18 Mbit/s
95th percentile per-packet one-way delay: 199.491 ms
Loss rate: 0.95%
-- Flow 2:
Average throughput: 442.75 Mbit/s
95th percentile per-packet one-way delay: 207.846 ms
Loss rate: 2.00%
-- Flow 3:
Average throughput: 193.78 Mbit/s
95th percentile per-packet one-way delay: 138.296 ms
Loss rate: 6.47%
```
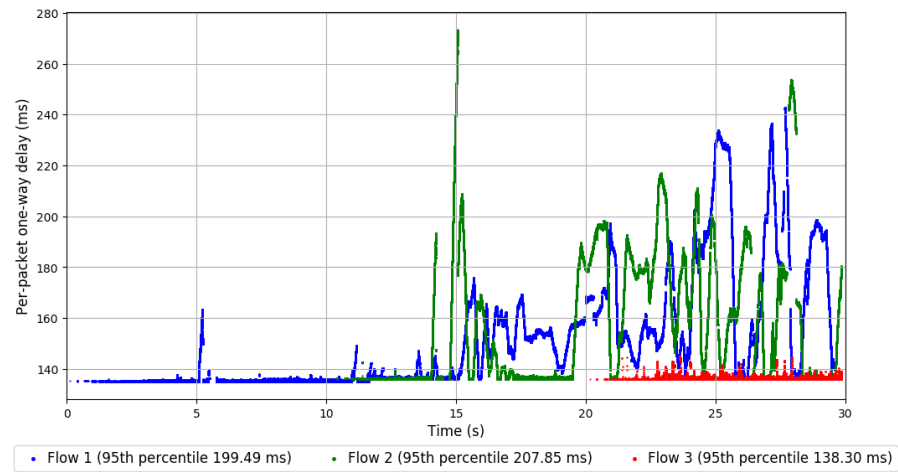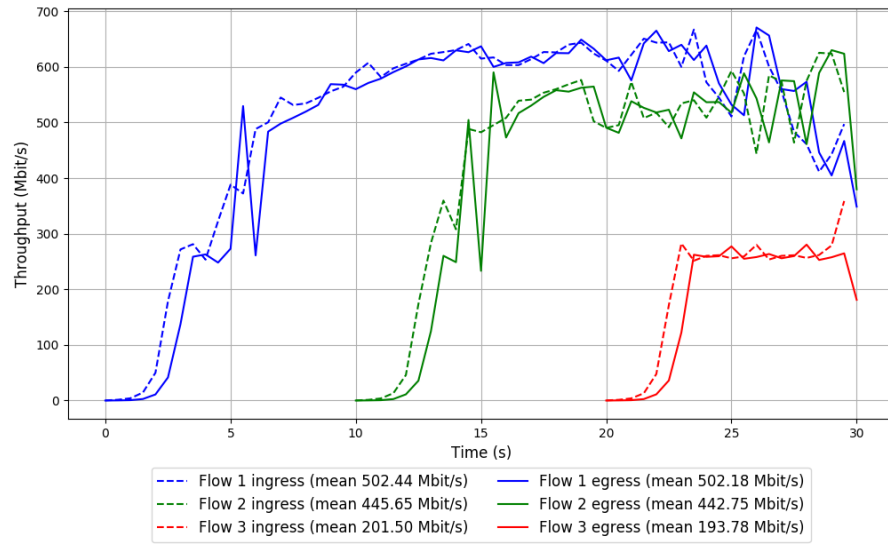
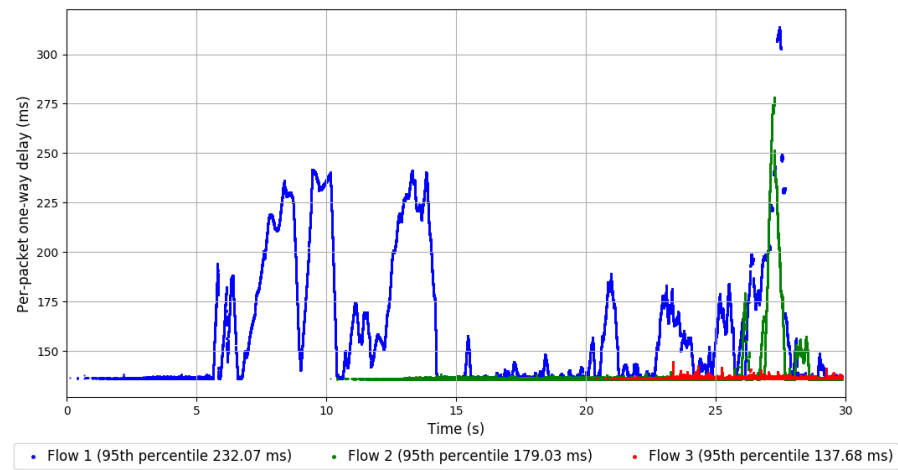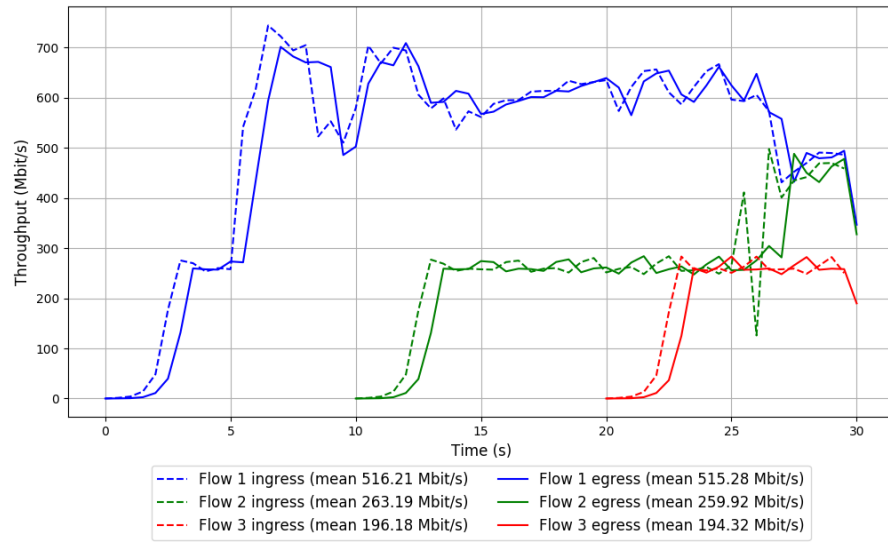Run 1: Report of TCP Cubic — Data Link

```
Run 2: Statistics of TCP Cubic

Start at: 2018-08-31 11:55:19
End at: 2018-08-31 11:55:49
Local clock offset: 0.673 ms
Remote clock offset: -0.029 ms


# Below is generated by plot.py at 2018-08-31 12:15:31
# Datalink statistics
-- Total of 3 flows:
Average throughput: 751.05 Mbit/s
95th percentile per-packet one-way delay: 229.164 ms
Loss rate: 1.65%
-- Flow 1:
Average throughput: 515.28 Mbit/s
95th percentile per-packet one-way delay: 232.067 ms
Loss rate: 1.08%
-- Flow 2:
Average throughput: 259.92 Mbit/s
95th percentile per-packet one-way delay: 179.029 ms
Loss rate: 2.58%
-- Flow 3:
Average throughput: 194.32 Mbit/s
95th percentile per-packet one-way delay: 137.684 ms
Loss rate: 3.65%
```

Run 2: Report of TCP Cubic — Data Link

Flow 1 ingress (mean 516.21 Mbit/s)　　Flow 1 egress (mean 515.28 Mbit/s)
Flow 2 ingress (mean 263.19 Mbit/s)　　Flow 2 egress (mean 259.92 Mbit/s)
Flow 3 ingress (mean 196.18 Mbit/s)　　Flow 3 egress (mean 194.32 Mbit/s)

Flow 1 (95th percentile 232.07 ms)　　Flow 2 (95th percentile 179.03 ms)　　Flow 3 (95th percentile 137.68 ms)

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```
Run 1: Statistics of Indigo

Start at: 2018-08-31 11:45:04
End at: 2018-08-31 11:45:34
Local clock offset: 0.733 ms
Remote clock offset: 0.364 ms


# Below is generated by plot.py at 2018-08-31 12:15:31
# Datalink statistics
-- Total of 3 flows:
Average throughput: 350.77 Mbit/s
95th percentile per-packet one-way delay: 138.269 ms
Loss rate: 1.42%
-- Flow 1:
Average throughput: 182.59 Mbit/s
95th percentile per-packet one-way delay: 137.171 ms
Loss rate: 0.87%
-- Flow 2:
Average throughput: 178.61 Mbit/s
95th percentile per-packet one-way delay: 136.904 ms
Loss rate: 1.43%
-- Flow 3:
Average throughput: 157.08 Mbit/s
95th percentile per-packet one-way delay: 151.559 ms
Loss rate: 3.31%
```
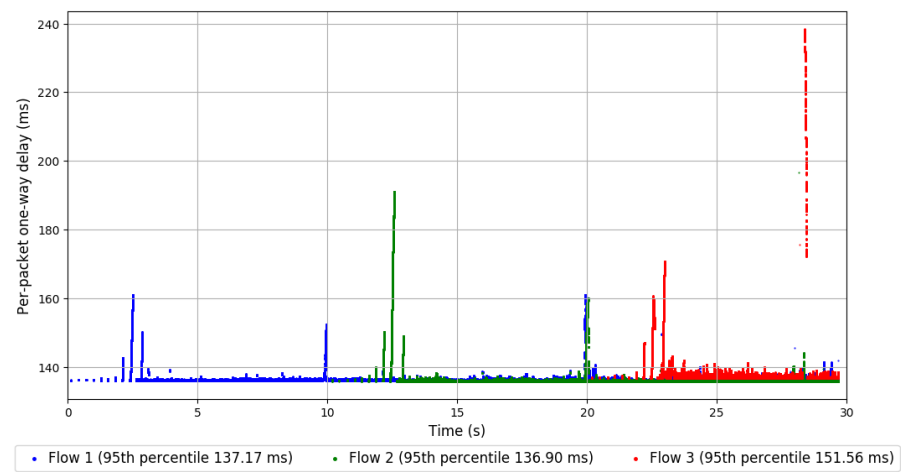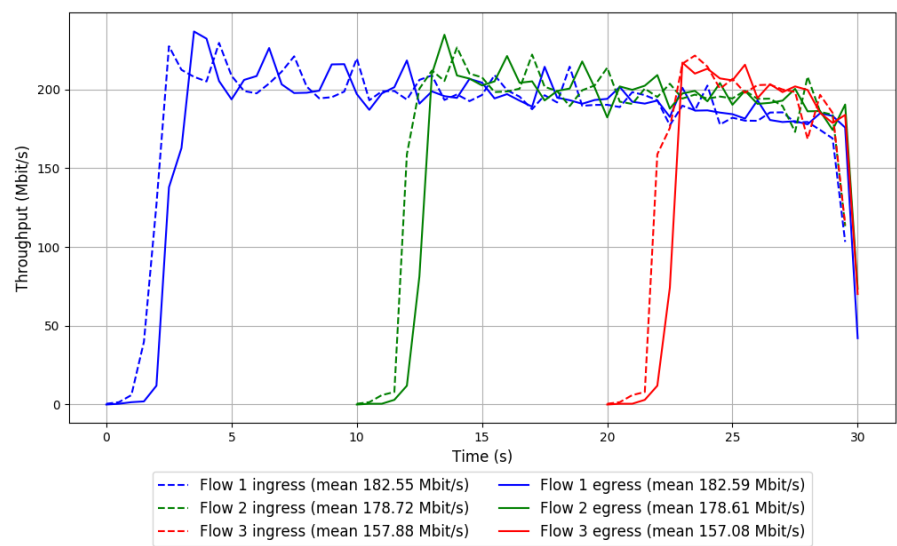
Run 1: Report of Indigo — Data Link

```
Run 2: Statistics of Indigo

Start at: 2018-08-31 11:53:24
End at: 2018-08-31 11:53:54
Local clock offset: 0.533 ms
Remote clock offset: 0.333 ms


# Below is generated by plot.py at 2018-08-31 12:15:31
# Datalink statistics
-- Total of 3 flows:
Average throughput: 351.04 Mbit/s
95th percentile per-packet one-way delay: 137.818 ms
Loss rate: 1.41%
-- Flow 1:
Average throughput: 182.43 Mbit/s
95th percentile per-packet one-way delay: 136.348 ms
Loss rate: 0.86%
-- Flow 2:
Average throughput: 178.25 Mbit/s
95th percentile per-packet one-way delay: 137.418 ms
Loss rate: 1.38%
-- Flow 3:
Average throughput: 157.55 Mbit/s
95th percentile per-packet one-way delay: 145.246 ms
Loss rate: 3.40%
```
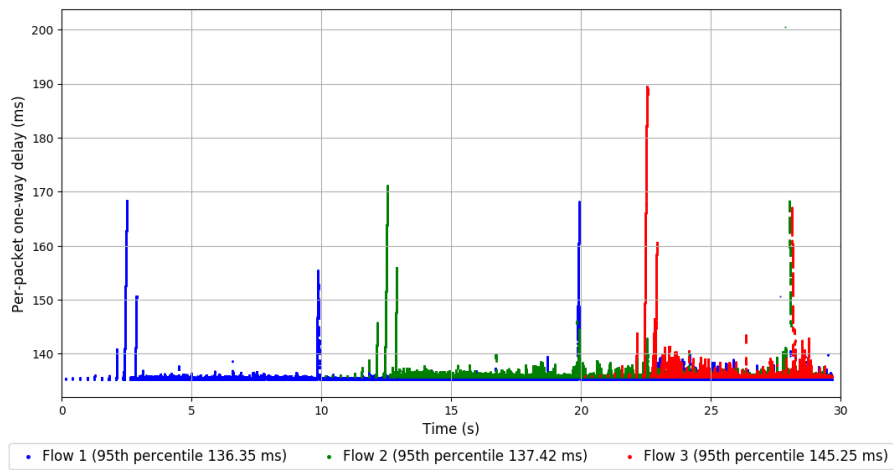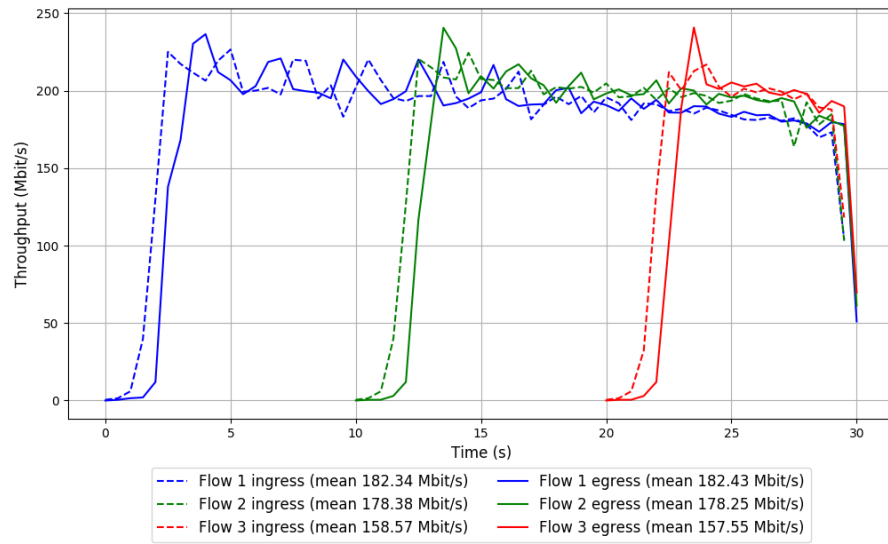
Run 2: Report of Indigo — Data Link

Flow 1 ingress (mean 182.34 Mbit/s)   Flow 1 egress (mean 182.43 Mbit/s)
Flow 2 ingress (mean 178.38 Mbit/s)   Flow 2 egress (mean 178.25 Mbit/s)
Flow 3 ingress (mean 158.57 Mbit/s)   Flow 3 egress (mean 157.55 Mbit/s)

Flow 1 (95th percentile 136.35 ms)   Flow 2 (95th percentile 137.42 ms)   Flow 3 (95th percentile 145.25 ms)
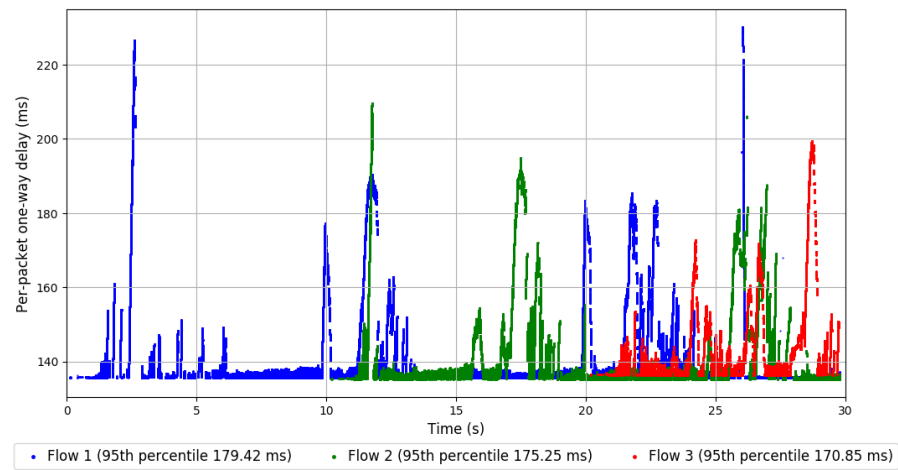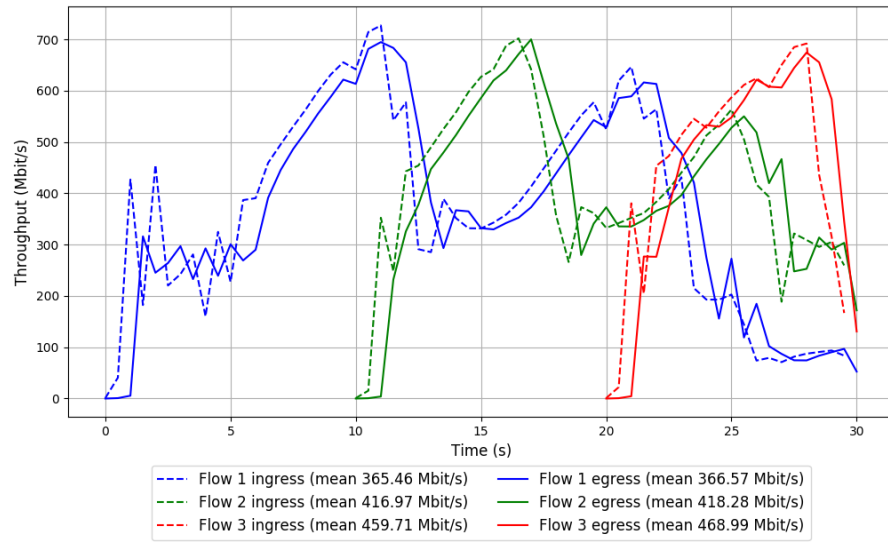
```
Run 1: Statistics of Muses-25

Start at: 2018-08-31 11:49:06
End at: 2018-08-31 11:49:36
Local clock offset: 0.708 ms
Remote clock offset: 0.708 ms


# Below is generated by plot.py at 2018-08-31 12:16:03
# Datalink statistics
-- Total of 3 flows:
Average throughput: 794.03 Mbit/s
95th percentile per-packet one-way delay: 177.293 ms
Loss rate: 0.84%
-- Flow 1:
Average throughput: 366.57 Mbit/s
95th percentile per-packet one-way delay: 179.419 ms
Loss rate: 0.61%
-- Flow 2:
Average throughput: 418.28 Mbit/s
95th percentile per-packet one-way delay: 175.249 ms
Loss rate: 1.05%
-- Flow 3:
Average throughput: 468.99 Mbit/s
95th percentile per-packet one-way delay: 170.851 ms
Loss rate: 1.02%
```

Run 1: Report of Muses-25 — Data Link

```
Run 2: Statistics of Muses-25

Start at: 2018-08-31 11:57:21
End at: 2018-08-31 11:57:51
Local clock offset: 0.601 ms
Remote clock offset: -0.177 ms


# Below is generated by plot.py at 2018-08-31 12:16:03
# Datalink statistics
-- Total of 3 flows:
Average throughput: 674.99 Mbit/s
95th percentile per-packet one-way delay: 178.209 ms
Loss rate: 1.39%
-- Flow 1:
Average throughput: 381.52 Mbit/s
95th percentile per-packet one-way delay: 181.971 ms
Loss rate: 0.49%
-- Flow 2:
Average throughput: 251.25 Mbit/s
95th percentile per-packet one-way delay: 153.549 ms
Loss rate: 2.78%
-- Flow 3:
Average throughput: 391.44 Mbit/s
95th percentile per-packet one-way delay: 177.149 ms
Loss rate: 2.22%
```

Run 2: Report of Muses-25 — Data Link

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