

Pantheon Report

Generated at 2018-09-03 12:12:10 (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.

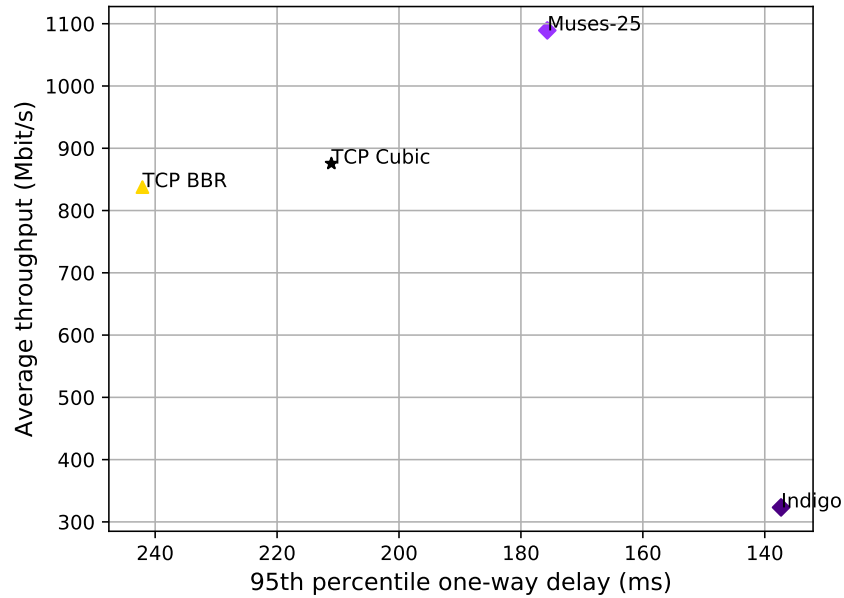
System info:

```
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
```

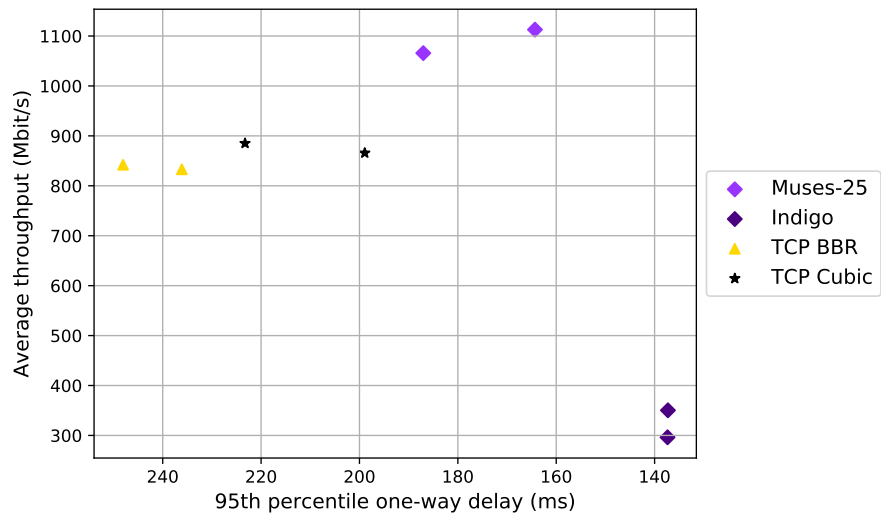
Git summary:

```
branch: muses @ f309f5459e2c5237279a184e52ece7a2b47ef1c9
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ b8d5019b83a3a678804d830fcfe1da7b3a63421b
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
```

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	469.38	429.17	256.41	237.82	239.35	199.41	2.31	4.23	6.56
TCP Cubic	2	502.16	464.54	200.02	213.31	203.59	148.34	0.97	2.16	4.97
Indigo	2	159.34	172.39	155.72	136.75	137.18	138.73	0.93	1.44	3.39
Muses-25	2	525.47	622.29	471.25	178.39	177.42	158.40	0.71	1.81	4.00

Run 1: Statistics of TCP BBR

Start at: 2018-09-03 11:41:02

End at: 2018-09-03 11:41:32

Local clock offset: 0.895 ms

Remote clock offset: 0.008 ms

Below is generated by plot.py at 2018-09-03 12:10:58

Datalink statistics

-- Total of 3 flows:

Average throughput: 833.04 Mbit/s

95th percentile per-packet one-way delay: 236.112 ms

Loss rate: 2.75%

-- Flow 1:

Average throughput: 479.01 Mbit/s

95th percentile per-packet one-way delay: 244.702 ms

Loss rate: 2.28%

-- Flow 2:

Average throughput: 406.78 Mbit/s

95th percentile per-packet one-way delay: 222.453 ms

Loss rate: 2.97%

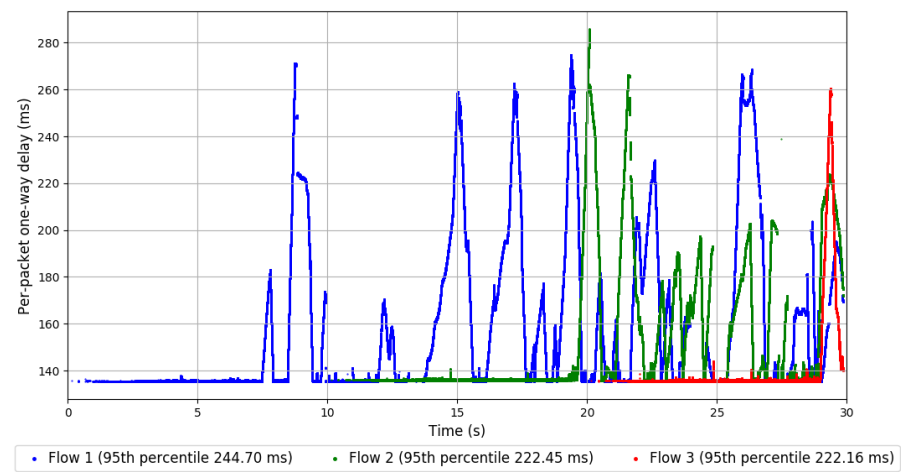
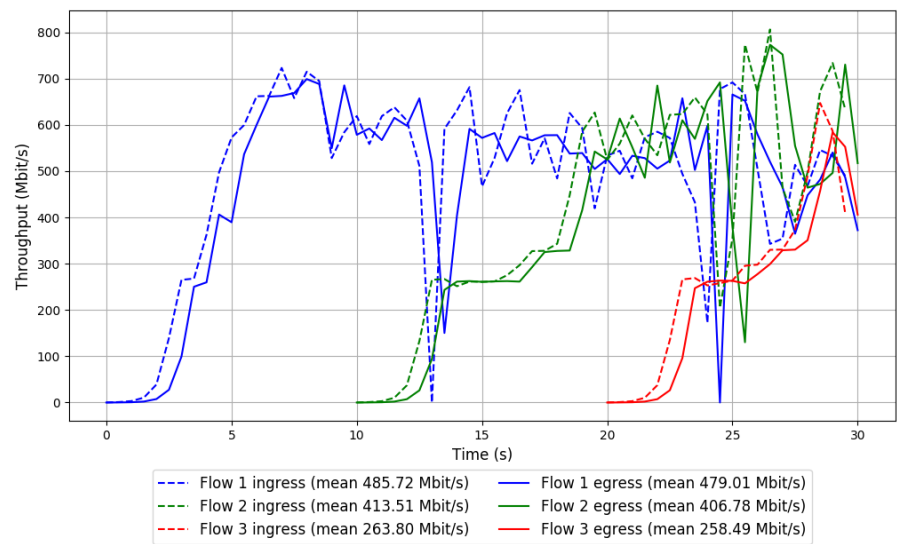
-- Flow 3:

Average throughput: 258.49 Mbit/s

95th percentile per-packet one-way delay: 222.161 ms

Loss rate: 4.68%

Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2018-09-03 11:49:17

End at: 2018-09-03 11:49:47

Local clock offset: 0.529 ms

Remote clock offset: 0.02 ms

Below is generated by plot.py at 2018-09-03 12:11:06

Datalink statistics

-- Total of 3 flows:

Average throughput: 842.20 Mbit/s

95th percentile per-packet one-way delay: 248.060 ms

Loss rate: 4.11%

-- Flow 1:

Average throughput: 459.75 Mbit/s

95th percentile per-packet one-way delay: 230.943 ms

Loss rate: 2.34%

-- Flow 2:

Average throughput: 451.56 Mbit/s

95th percentile per-packet one-way delay: 256.241 ms

Loss rate: 5.49%

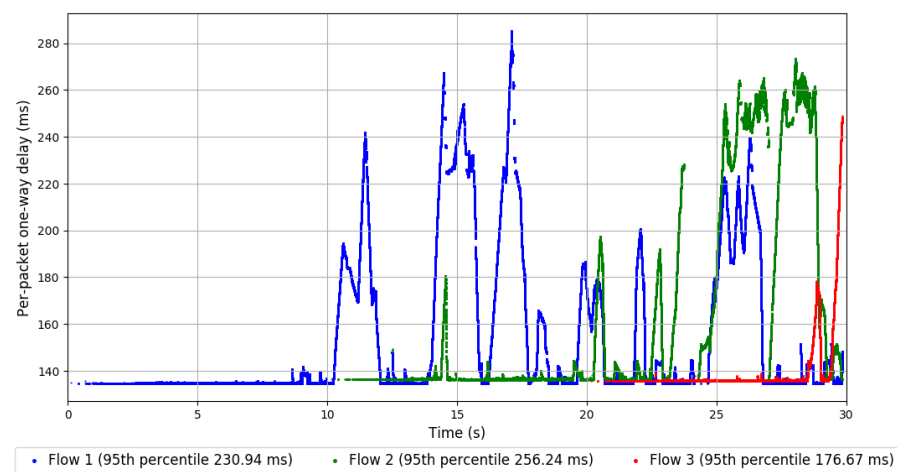
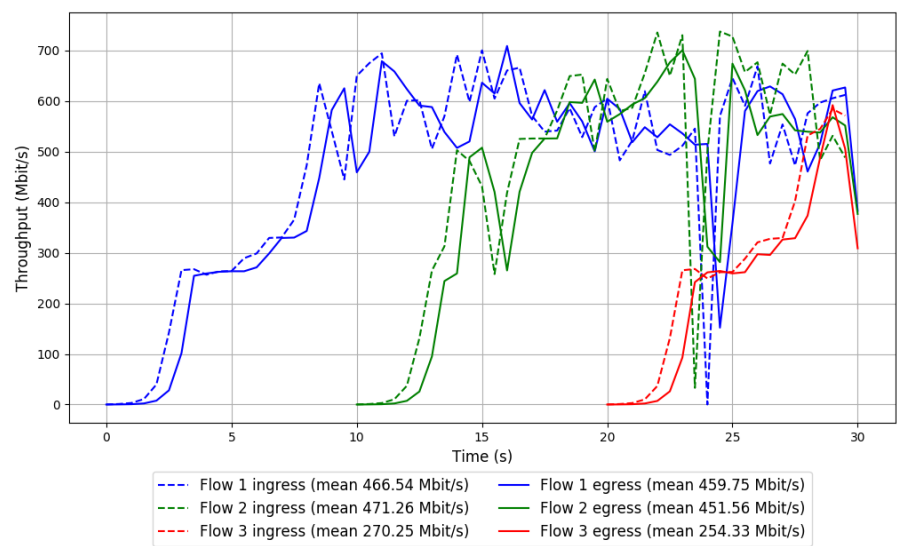
-- Flow 3:

Average throughput: 254.33 Mbit/s

95th percentile per-packet one-way delay: 176.668 ms

Loss rate: 8.45%

Run 2: Report of TCP BBR — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2018-09-03 11:47:09

End at: 2018-09-03 11:47:39

Local clock offset: 0.732 ms

Remote clock offset: 0.196 ms

Below is generated by plot.py at 2018-09-03 12:11:11

Datalink statistics

-- Total of 3 flows:

Average throughput: 865.75 Mbit/s

95th percentile per-packet one-way delay: 198.926 ms

Loss rate: 1.71%

-- Flow 1:

Average throughput: 489.36 Mbit/s

95th percentile per-packet one-way delay: 197.071 ms

Loss rate: 0.89%

-- Flow 2:

Average throughput: 466.31 Mbit/s

95th percentile per-packet one-way delay: 200.167 ms

Loss rate: 1.94%

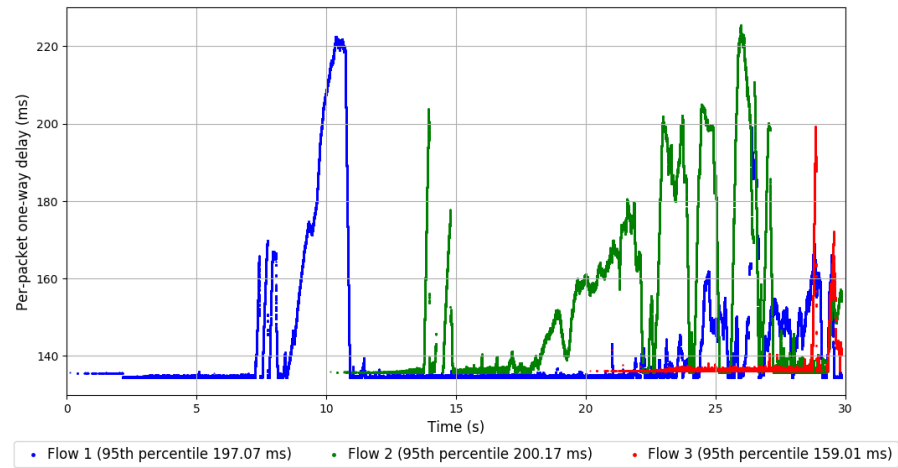
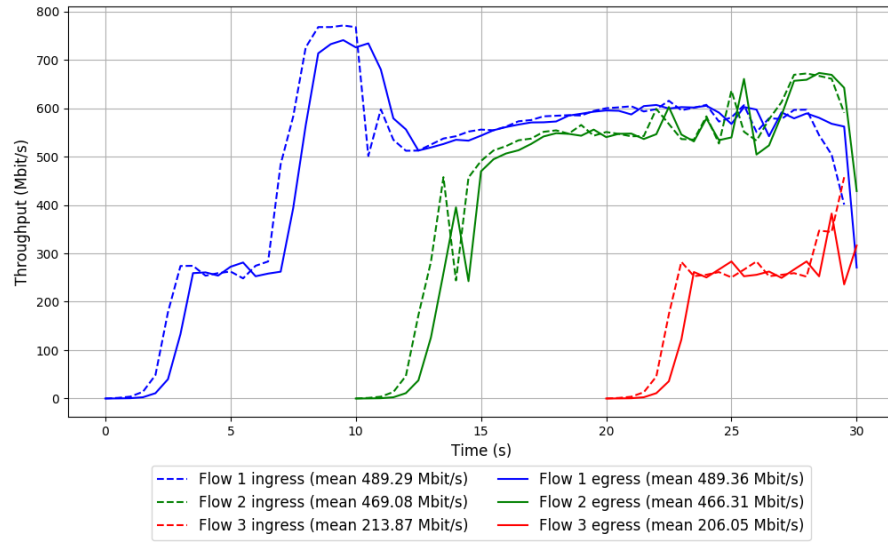
-- Flow 3:

Average throughput: 206.05 Mbit/s

95th percentile per-packet one-way delay: 159.006 ms

Loss rate: 6.28%

Run 1: Report of TCP Cubic — Data Link

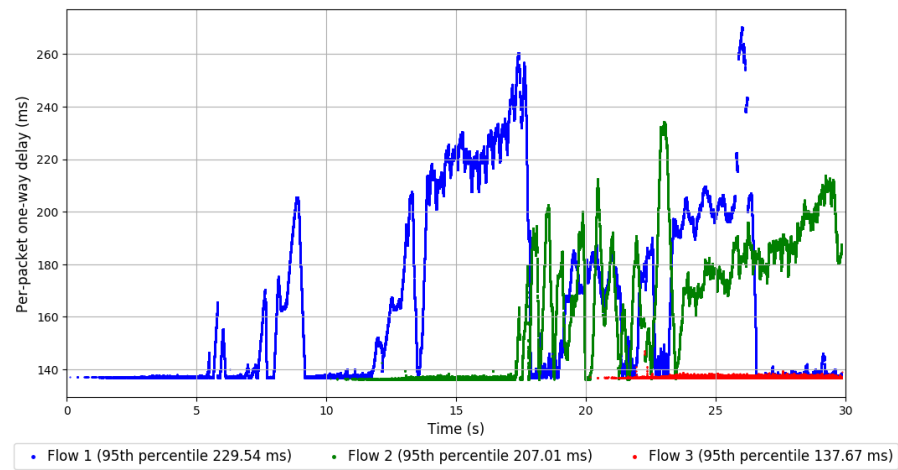
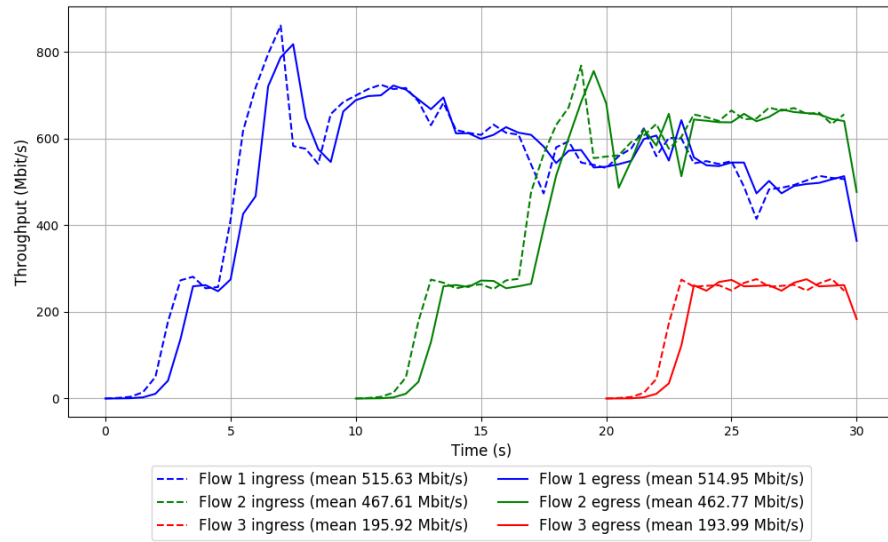


Run 2: Statistics of TCP Cubic

Start at: 2018-09-03 11:55:34
End at: 2018-09-03 11:56:04
Local clock offset: 0.369 ms
Remote clock offset: -1.184 ms

Below is generated by plot.py at 2018-09-03 12:11:18
Datalink statistics
-- Total of 3 flows:
Average throughput: 885.02 Mbit/s
95th percentile per-packet one-way delay: 223.263 ms
Loss rate: 1.69%
-- Flow 1:
Average throughput: 514.95 Mbit/s
95th percentile per-packet one-way delay: 229.544 ms
Loss rate: 1.04%
-- Flow 2:
Average throughput: 462.77 Mbit/s
95th percentile per-packet one-way delay: 207.015 ms
Loss rate: 2.38%
-- Flow 3:
Average throughput: 193.99 Mbit/s
95th percentile per-packet one-way delay: 137.672 ms
Loss rate: 3.66%

Run 2: Report of TCP Cubic — Data Link

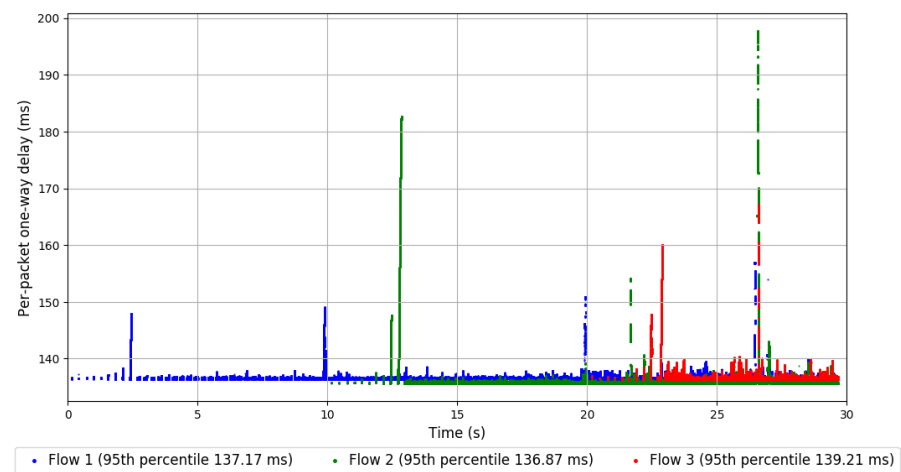
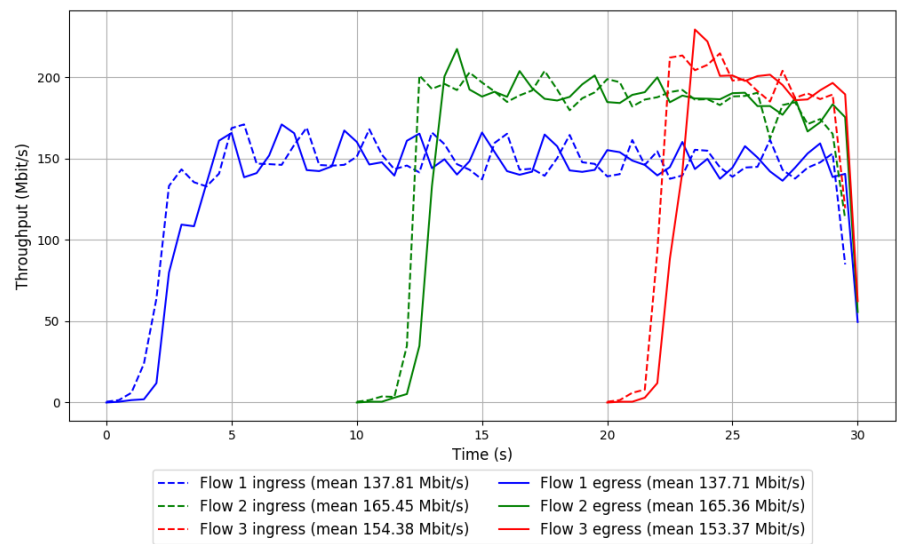


Run 1: Statistics of Indigo

Start at: 2018-09-03 11:45:20
End at: 2018-09-03 11:45:50
Local clock offset: 0.957 ms
Remote clock offset: -0.148 ms

Below is generated by plot.py at 2018-09-03 12:11:18
Datalink statistics
-- Total of 3 flows:
Average throughput: 296.20 Mbit/s
95th percentile per-packet one-way delay: 137.368 ms
Loss rate: 1.56%
-- Flow 1:
Average throughput: 137.71 Mbit/s
95th percentile per-packet one-way delay: 137.172 ms
Loss rate: 0.98%
-- Flow 2:
Average throughput: 165.36 Mbit/s
95th percentile per-packet one-way delay: 136.867 ms
Loss rate: 1.43%
-- Flow 3:
Average throughput: 153.37 Mbit/s
95th percentile per-packet one-way delay: 139.209 ms
Loss rate: 3.44%

Run 1: Report of Indigo — Data Link

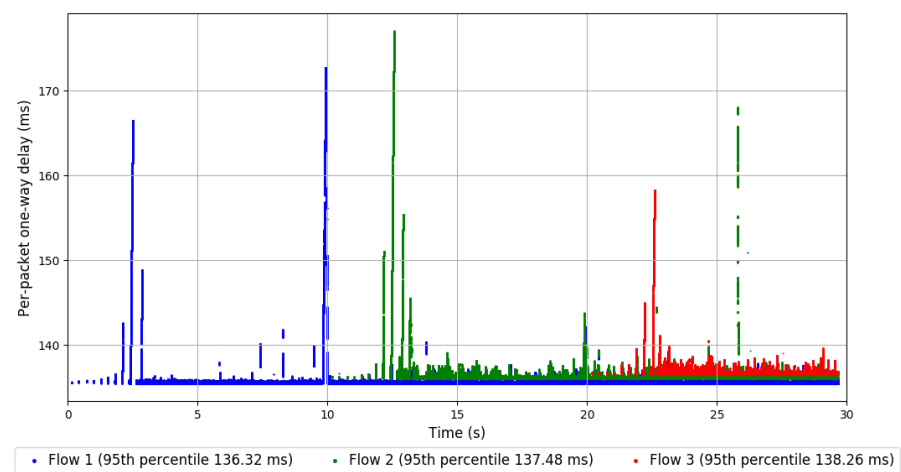
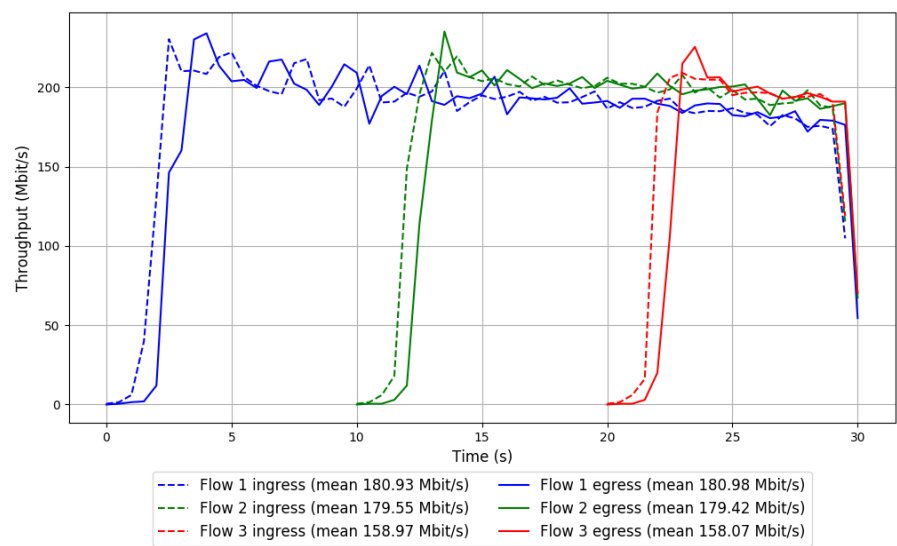


Run 2: Statistics of Indigo

Start at: 2018-09-03 11:53:40
End at: 2018-09-03 11:54:10
Local clock offset: 0.498 ms
Remote clock offset: -0.396 ms

Below is generated by plot.py at 2018-09-03 12:11:18
Datalink statistics
-- Total of 3 flows:
Average throughput: 350.29 Mbit/s
95th percentile per-packet one-way delay: 137.291 ms
Loss rate: 1.43%
-- Flow 1:
Average throughput: 180.98 Mbit/s
95th percentile per-packet one-way delay: 136.324 ms
Loss rate: 0.87%
-- Flow 2:
Average throughput: 179.42 Mbit/s
95th percentile per-packet one-way delay: 137.483 ms
Loss rate: 1.45%
-- Flow 3:
Average throughput: 158.07 Mbit/s
95th percentile per-packet one-way delay: 138.258 ms
Loss rate: 3.34%

Run 2: Report of Indigo — Data Link

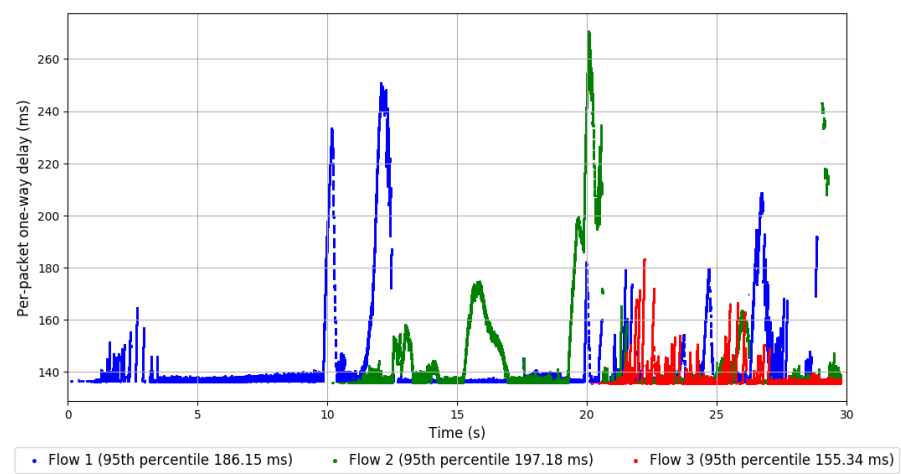
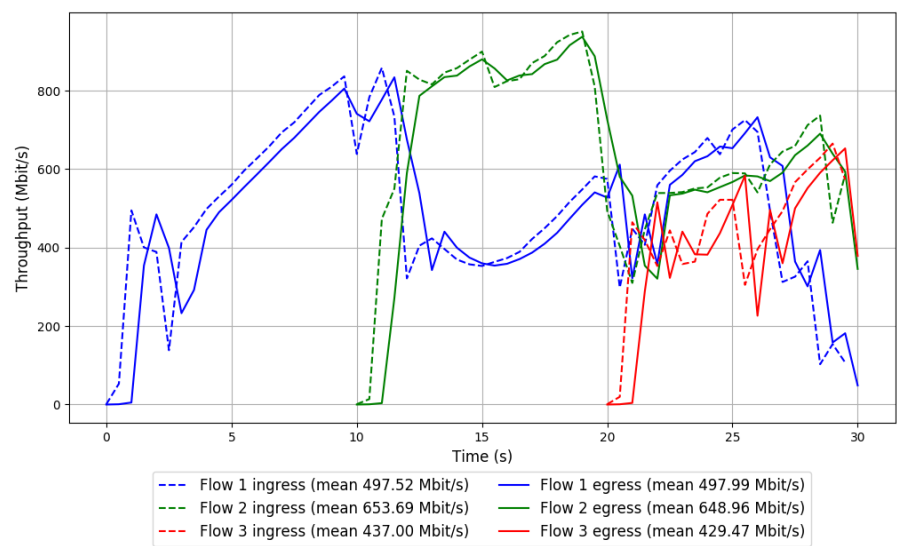


Run 1: Statistics of Muses-25

Start at: 2018-09-03 11:43:12
End at: 2018-09-03 11:43:42
Local clock offset: 0.94 ms
Remote clock offset: -0.023 ms

Below is generated by plot.py at 2018-09-03 12:12:04
Datalink statistics
-- Total of 3 flows:
Average throughput: 1065.74 Mbit/s
95th percentile per-packet one-way delay: 187.026 ms
Loss rate: 1.60%
-- Flow 1:
Average throughput: 497.99 Mbit/s
95th percentile per-packet one-way delay: 186.152 ms
Loss rate: 0.36%
-- Flow 2:
Average throughput: 648.96 Mbit/s
95th percentile per-packet one-way delay: 197.178 ms
Loss rate: 2.08%
-- Flow 3:
Average throughput: 429.47 Mbit/s
95th percentile per-packet one-way delay: 155.344 ms
Loss rate: 4.43%

Run 1: Report of Muses-25 — Data Link



Run 2: Statistics of Muses-25

Start at: 2018-09-03 11:51:30

End at: 2018-09-03 11:52:00

Local clock offset: 0.549 ms

Remote clock offset: 0.265 ms

Below is generated by plot.py at 2018-09-03 12:12:08

Datalink statistics

-- Total of 3 flows:

Average throughput: 1112.81 Mbit/s

95th percentile per-packet one-way delay: 164.323 ms

Loss rate: 1.60%

-- Flow 1:

Average throughput: 552.94 Mbit/s

95th percentile per-packet one-way delay: 170.625 ms

Loss rate: 1.05%

-- Flow 2:

Average throughput: 595.61 Mbit/s

95th percentile per-packet one-way delay: 157.669 ms

Loss rate: 1.53%

-- Flow 3:

Average throughput: 513.04 Mbit/s

95th percentile per-packet one-way delay: 161.463 ms

Loss rate: 3.56%

Run 2: Report of Muses-25 — Data Link

