

## Pantheon Report

Generated at 2018-08-31 10:21:35 (UTC).

Data path: GCE Iowa 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:

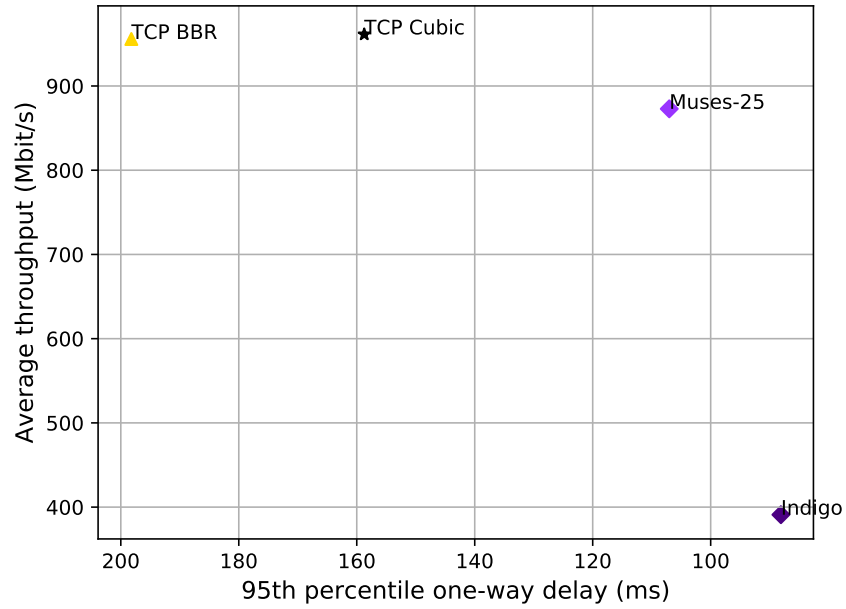
```
Linux 4.15.0-1018-gcp
net.core.default_qdisc = fq
net.core.rmem_default = 16777216
net.core.rmem_max = 536870912
net.core.wmem_default = 16777216
net.core.wmem_max = 536870912
net.ipv4.tcp_rmem = 4096 16777216 536870912
net.ipv4.tcp_wmem = 4096 16777216 536870912
net.ipv4.tcp_mem = 536870912 536870912 536870912
```

### Git summary:

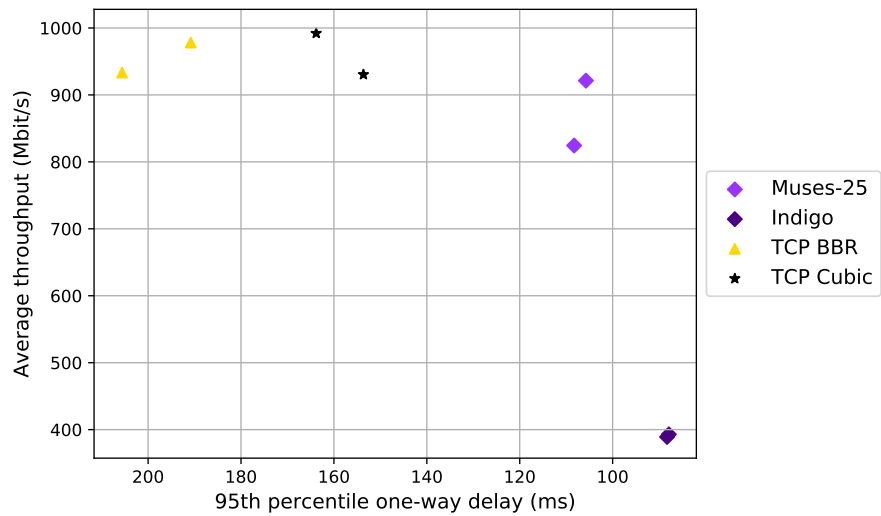
```
branch: muses @ e3c5aa19ca94c3066828fb83f16a8fb6b2731e7a
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
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 Iowa 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 Iowa 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	519.91	451.09	414.46	193.71	204.66	174.21	2.41	2.47	3.70
TCP Cubic	2	508.01	488.86	391.09	156.00	161.44	145.13	0.66	1.15	3.00
Indigo	2	208.05	192.63	171.92	87.92	88.54	87.71	0.59	0.97	2.00
Muses-25	2	485.15	359.98	457.98	107.10	108.59	102.52	0.47	0.93	2.09



Run 1: Statistics of TCP BBR

Start at: 2018-08-31 09:54:11

End at: 2018-08-31 09:54:41

Local clock offset: 13.332 ms

Remote clock offset: 9.688 ms

# Below is generated by plot.py at 2018-08-31 10:19:56

# Datalink statistics

-- Total of 3 flows:

Average throughput: 933.41 Mbit/s

95th percentile per-packet one-way delay: 205.605 ms

Loss rate: 3.36%

-- Flow 1:

Average throughput: 504.88 Mbit/s

95th percentile per-packet one-way delay: 215.353 ms

Loss rate: 3.76%

-- Flow 2:

Average throughput: 441.26 Mbit/s

95th percentile per-packet one-way delay: 199.535 ms

Loss rate: 2.05%

-- Flow 3:

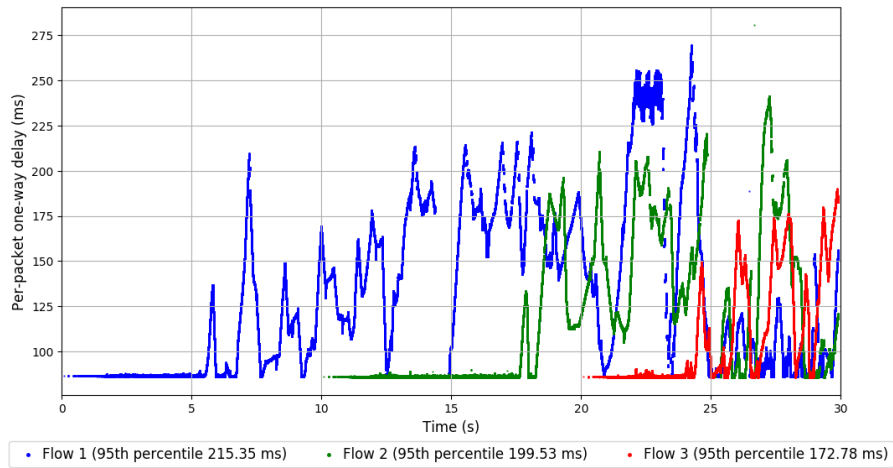
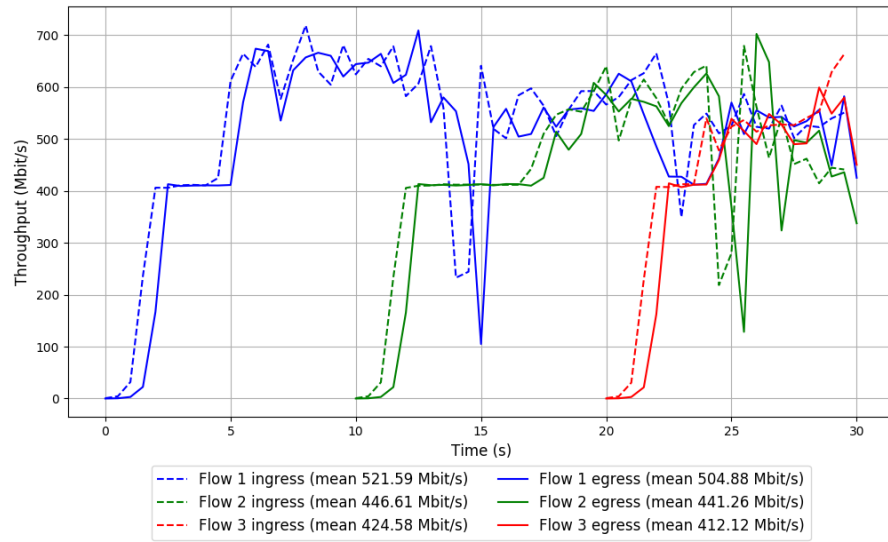
Average throughput: 412.12 Mbit/s

95th percentile per-packet one-way delay: 172.780 ms

Loss rate: 4.62%



# Run 1: Report of TCP BBR — Data Link





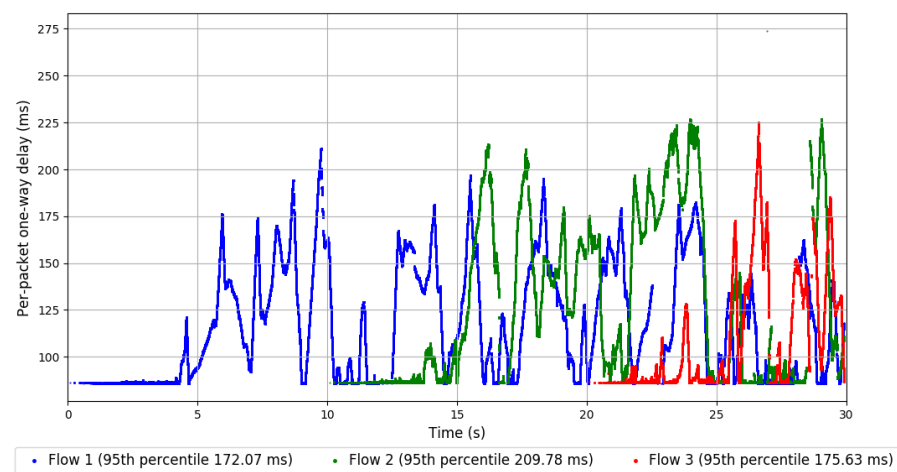
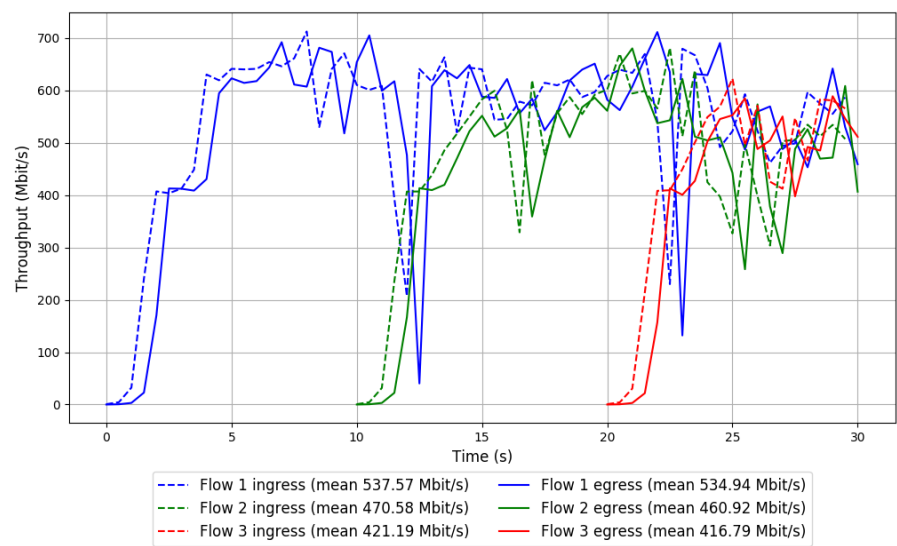
Run 2: Statistics of TCP BBR

Start at: 2018-08-31 10:02:07  
End at: 2018-08-31 10:02:37  
Local clock offset: 15.781 ms  
Remote clock offset: 10.075 ms

# Below is generated by plot.py at 2018-08-31 10:20:43  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 978.21 Mbit/s  
95th percentile per-packet one-way delay: 190.820 ms  
Loss rate: 1.89%  
-- Flow 1:  
Average throughput: 534.94 Mbit/s  
95th percentile per-packet one-way delay: 172.073 ms  
Loss rate: 1.06%  
-- Flow 2:  
Average throughput: 460.92 Mbit/s  
95th percentile per-packet one-way delay: 209.779 ms  
Loss rate: 2.90%  
-- Flow 3:  
Average throughput: 416.79 Mbit/s  
95th percentile per-packet one-way delay: 175.632 ms  
Loss rate: 2.77%



Run 2: Report of TCP BBR — Data Link





Run 1: Statistics of TCP Cubic

Start at: 2018-08-31 09:52:07

End at: 2018-08-31 09:52:37

Local clock offset: 12.985 ms

Remote clock offset: 9.964 ms

# Below is generated by plot.py at 2018-08-31 10:20:48

# Datalink statistics

-- Total of 3 flows:

Average throughput: 992.07 Mbit/s

95th percentile per-packet one-way delay: 163.812 ms

Loss rate: 1.10%

-- Flow 1:

Average throughput: 513.27 Mbit/s

95th percentile per-packet one-way delay: 149.804 ms

Loss rate: 0.59%

-- Flow 2:

Average throughput: 520.27 Mbit/s

95th percentile per-packet one-way delay: 175.039 ms

Loss rate: 1.32%

-- Flow 3:

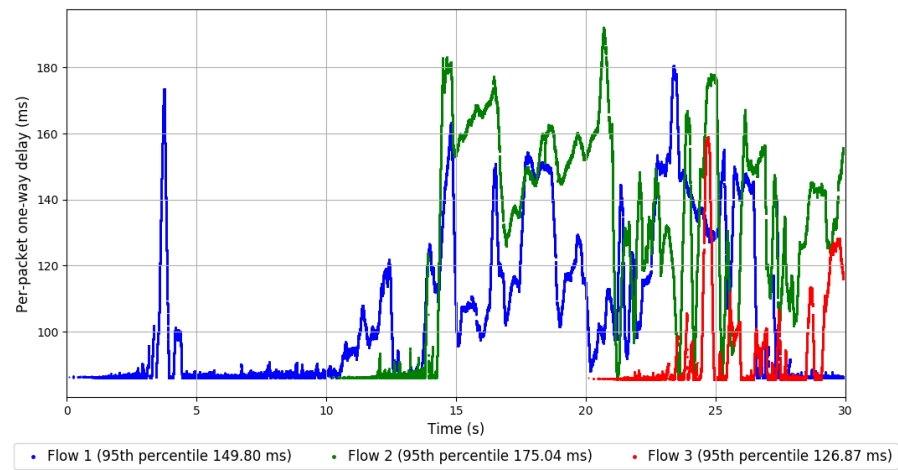
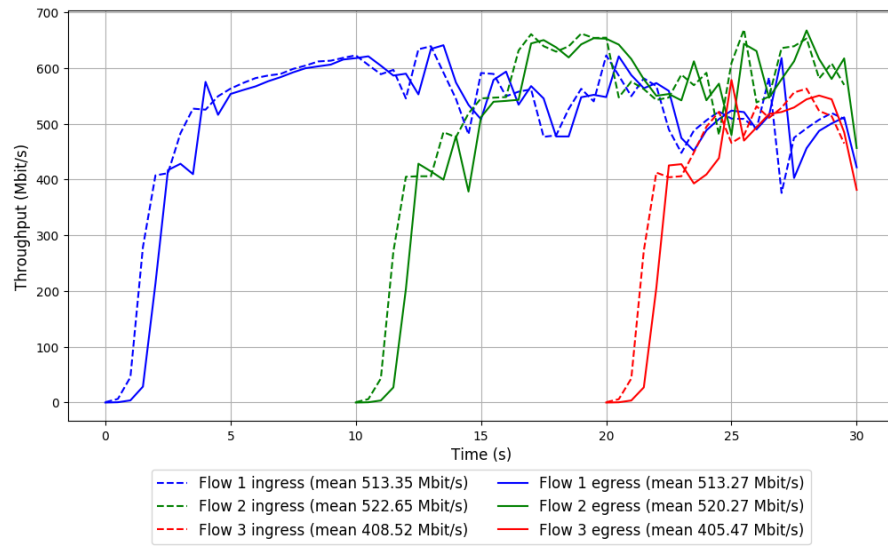
Average throughput: 405.47 Mbit/s

95th percentile per-packet one-way delay: 126.866 ms

Loss rate: 2.47%



# Run 1: Report of TCP Cubic — Data Link





Run 2: Statistics of TCP Cubic

Start at: 2018-08-31 10:00:05

End at: 2018-08-31 10:00:35

Local clock offset: 15.101 ms

Remote clock offset: 9.792 ms

# Below is generated by plot.py at 2018-08-31 10:20:48

# Datalink statistics

-- Total of 3 flows:

Average throughput: 930.45 Mbit/s

95th percentile per-packet one-way delay: 153.650 ms

Loss rate: 1.18%

-- Flow 1:

Average throughput: 502.76 Mbit/s

95th percentile per-packet one-way delay: 162.193 ms

Loss rate: 0.72%

-- Flow 2:

Average throughput: 457.45 Mbit/s

95th percentile per-packet one-way delay: 147.842 ms

Loss rate: 0.98%

-- Flow 3:

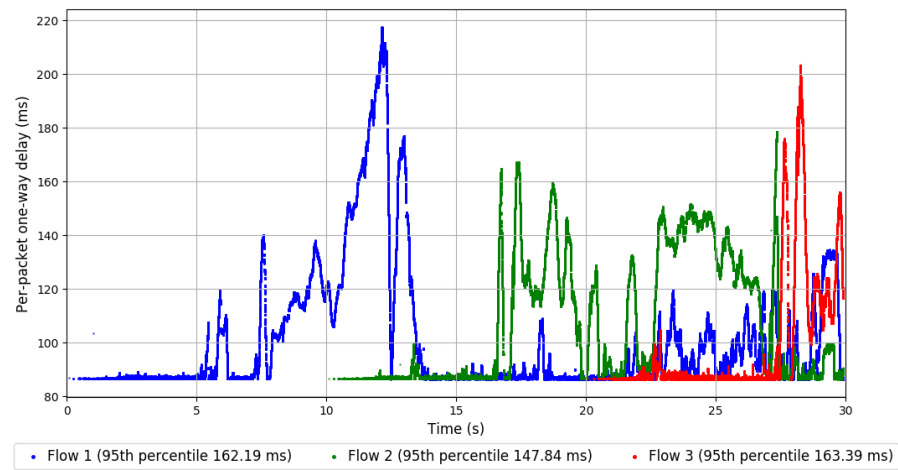
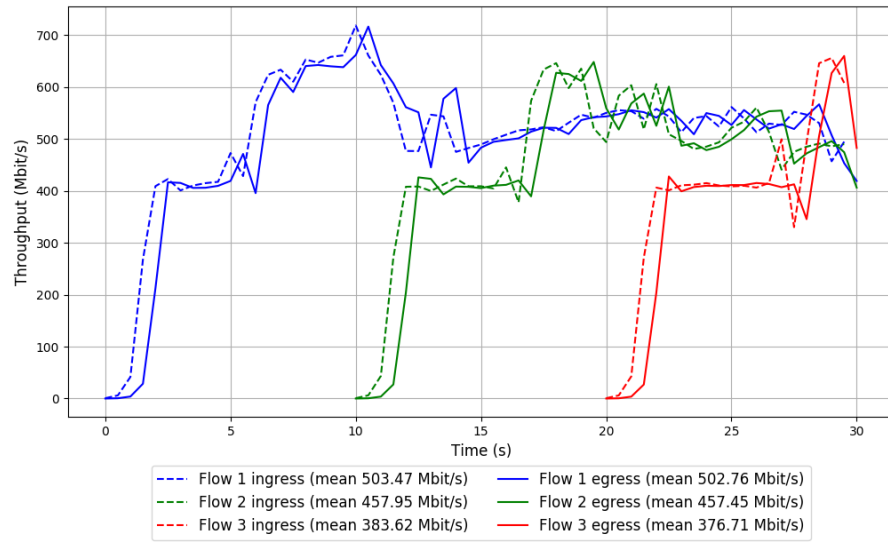
Average throughput: 376.71 Mbit/s

95th percentile per-packet one-way delay: 163.386 ms

Loss rate: 3.52%



## Run 2: Report of TCP Cubic — Data Link





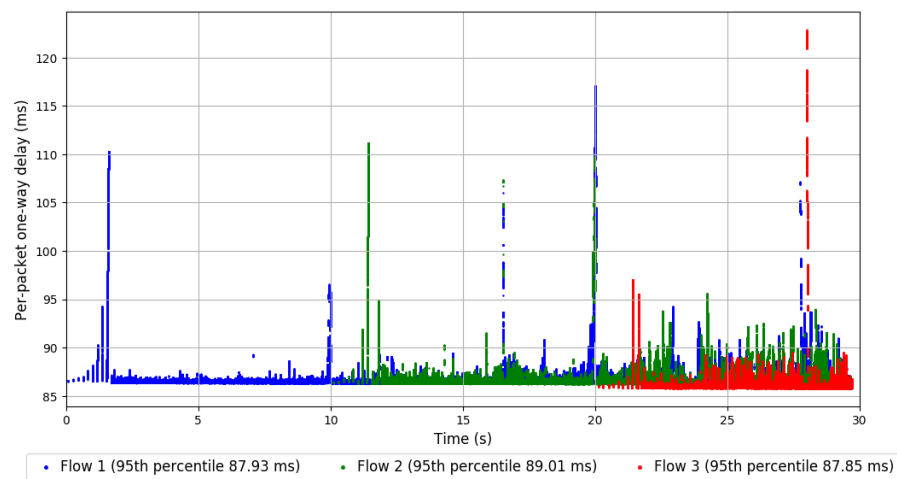
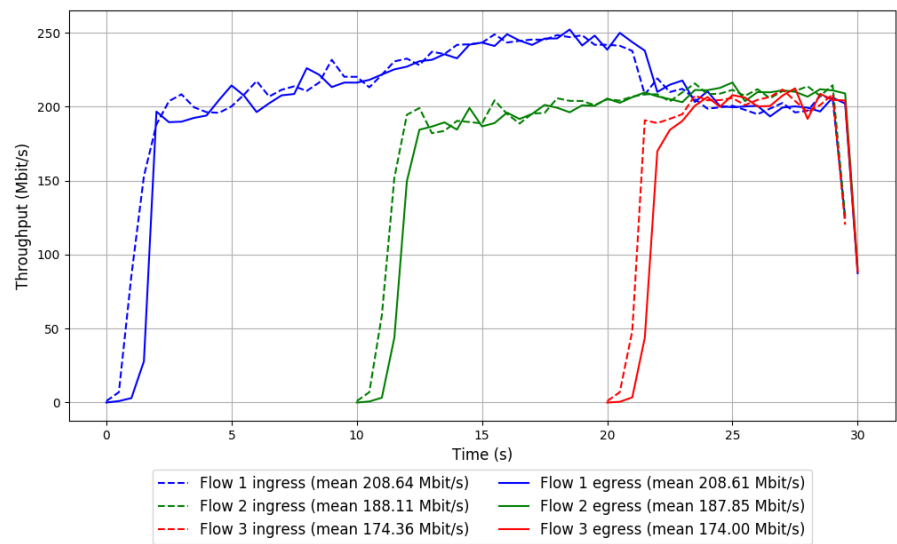
Run 1: Statistics of Indigo

Start at: 2018-08-31 09:50:17  
End at: 2018-08-31 09:50:47  
Local clock offset: 13.041 ms  
Remote clock offset: 10.338 ms

# Below is generated by plot.py at 2018-08-31 10:20:48  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 389.11 Mbit/s  
95th percentile per-packet one-way delay: 88.286 ms  
Loss rate: 0.93%  
-- Flow 1:  
Average throughput: 208.61 Mbit/s  
95th percentile per-packet one-way delay: 87.931 ms  
Loss rate: 0.60%  
-- Flow 2:  
Average throughput: 187.85 Mbit/s  
95th percentile per-packet one-way delay: 89.014 ms  
Loss rate: 1.01%  
-- Flow 3:  
Average throughput: 174.00 Mbit/s  
95th percentile per-packet one-way delay: 87.846 ms  
Loss rate: 1.97%



Run 1: Report of Indigo — Data Link





Run 2: Statistics of Indigo

Start at: 2018-08-31 09:58:15

End at: 2018-08-31 09:58:45

Local clock offset: 14.311 ms

Remote clock offset: 9.676 ms

# Below is generated by plot.py at 2018-08-31 10:20:48

# Datalink statistics

-- Total of 3 flows:

Average throughput: 392.88 Mbit/s

95th percentile per-packet one-way delay: 87.896 ms

Loss rate: 0.90%

-- Flow 1:

Average throughput: 207.48 Mbit/s

95th percentile per-packet one-way delay: 87.907 ms

Loss rate: 0.59%

-- Flow 2:

Average throughput: 197.41 Mbit/s

95th percentile per-packet one-way delay: 88.068 ms

Loss rate: 0.92%

-- Flow 3:

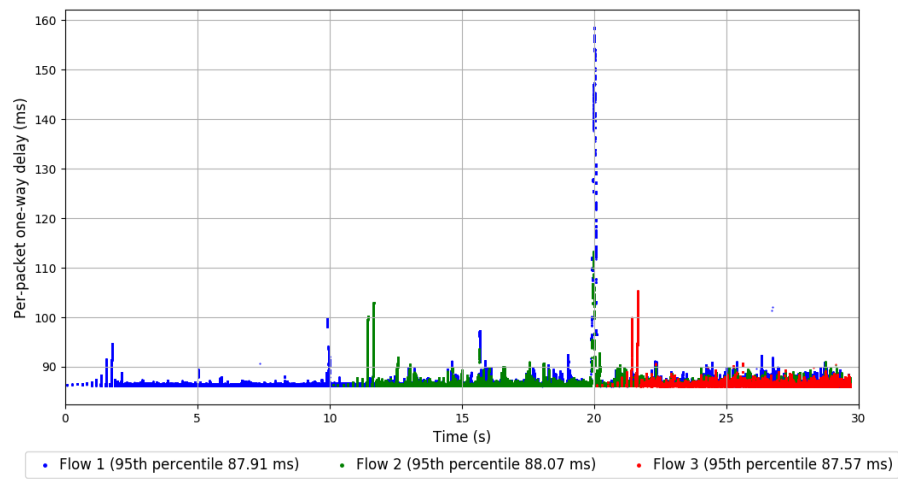
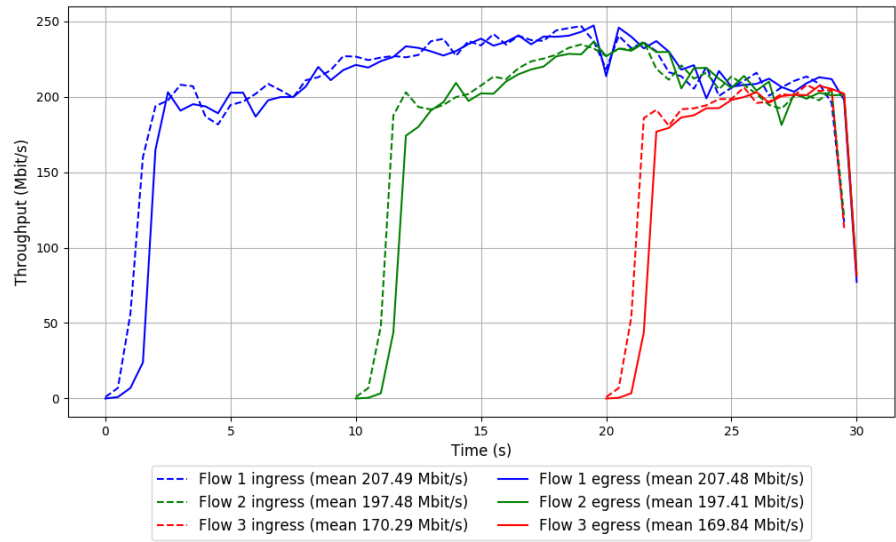
Average throughput: 169.84 Mbit/s

95th percentile per-packet one-way delay: 87.566 ms

Loss rate: 2.02%



## Run 2: Report of Indigo — Data Link





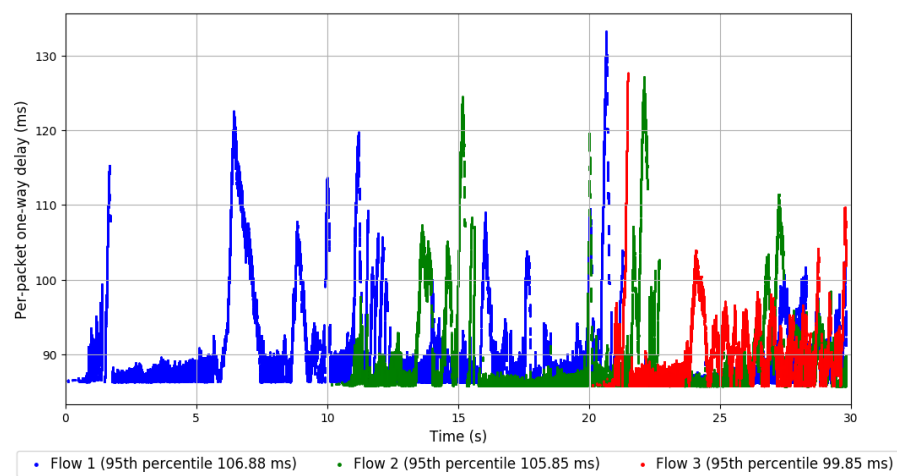
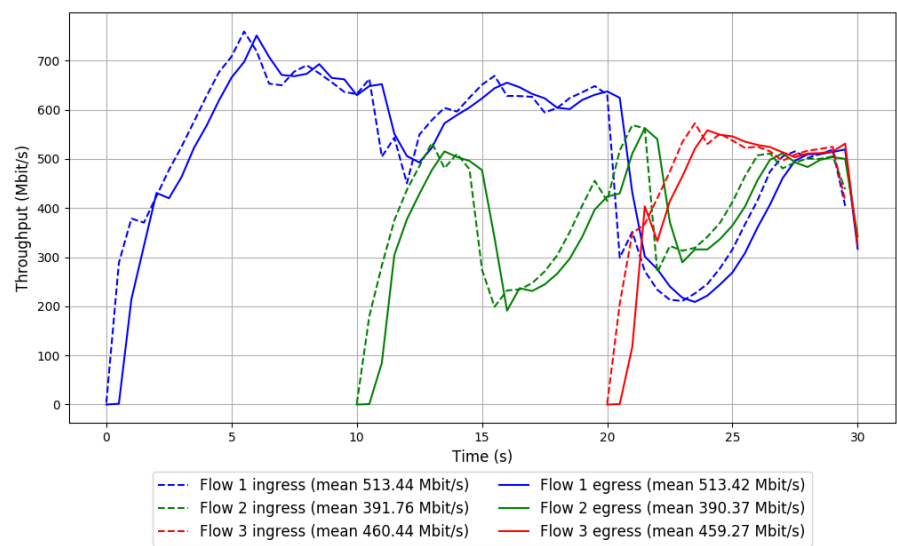
Run 1: Statistics of Muses-25

Start at: 2018-08-31 09:48:14  
End at: 2018-08-31 09:48:44  
Local clock offset: 13.092 ms  
Remote clock offset: 11.178 ms

# Below is generated by plot.py at 2018-08-31 10:21:34  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 921.34 Mbit/s  
95th percentile per-packet one-way delay: 105.752 ms  
Loss rate: 0.99%  
-- Flow 1:  
Average throughput: 513.42 Mbit/s  
95th percentile per-packet one-way delay: 106.883 ms  
Loss rate: 0.58%  
-- Flow 2:  
Average throughput: 390.37 Mbit/s  
95th percentile per-packet one-way delay: 105.848 ms  
Loss rate: 1.22%  
-- Flow 3:  
Average throughput: 459.27 Mbit/s  
95th percentile per-packet one-way delay: 99.846 ms  
Loss rate: 2.00%



Run 1: Report of Muses-25 — Data Link





Run 2: Statistics of Muses-25

Start at: 2018-08-31 09:56:17

End at: 2018-08-31 09:56:47

Local clock offset: 13.812 ms

Remote clock offset: 9.632 ms

# Below is generated by plot.py at 2018-08-31 10:21:34

# Datalink statistics

-- Total of 3 flows:

Average throughput: 824.43 Mbit/s

95th percentile per-packet one-way delay: 108.289 ms

Loss rate: 0.77%

-- Flow 1:

Average throughput: 456.88 Mbit/s

95th percentile per-packet one-way delay: 107.321 ms

Loss rate: 0.36%

-- Flow 2:

Average throughput: 329.59 Mbit/s

95th percentile per-packet one-way delay: 111.326 ms

Loss rate: 0.64%

-- Flow 3:

Average throughput: 456.69 Mbit/s

95th percentile per-packet one-way delay: 105.190 ms

Loss rate: 2.19%



## Run 2: Report of Muses-25 — Data Link

