

Pantheon Report

Generated at 2018-09-06 18:48:02 (UTC).

Data path: Colombia cellular on ppp0 (*remote*) → AWS Brazil 2 on ens5 (*local*).

Repeated the test of 18 congestion control schemes 3 times.

Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.

NTP offsets were measured against `gps.ntp.br` and have been applied to correct the timestamps in logs.

System info:

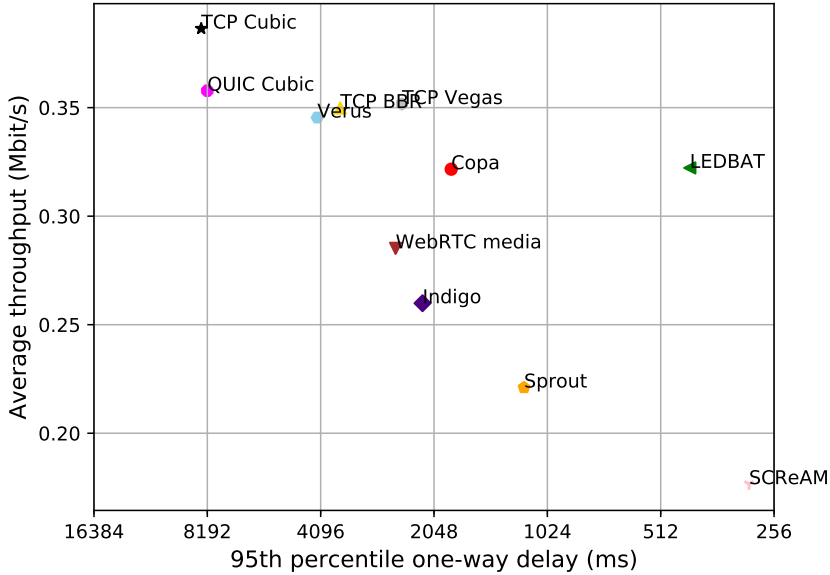
```
Linux 4.15.0-1020-aws
net.core.default_qdisc = fq
net.core.rmem_default = 16777216
net.core.rmem_max = 536870912
net.core.wmem_default = 16777216
net.core.wmem_max = 536870912
net.ipv4.tcp_rmem = 4096 16777216 536870912
net.ipv4.tcp_wmem = 4096 16777216 536870912
net.ipv4.tcp_mem = 536870912 536870912 536870912
```

Git summary:

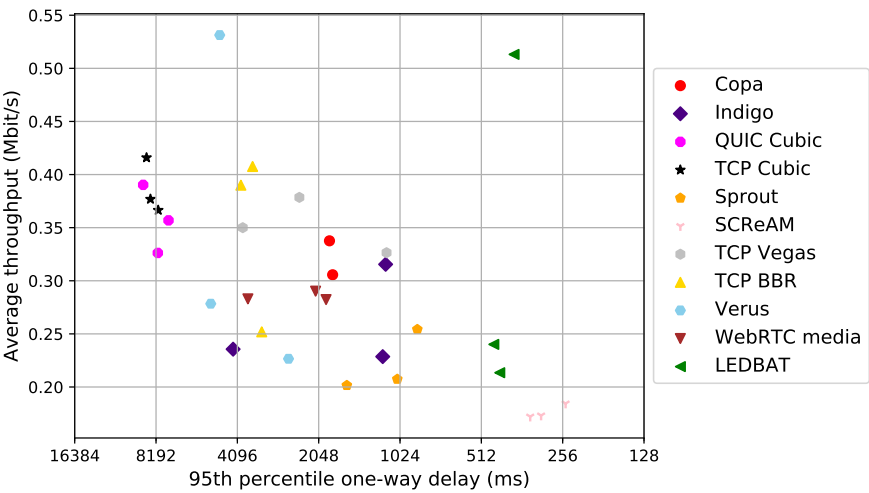
```
branch: muses @ f392ce15d580343f4432c3d7e068b3290f03eb4a
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/fillp-sheep @ daed0c84f98531712514b2231f43ec6901114ffe
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdf58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ a28d20fb82a95a965a3da65fd1eb71b8994e9b84
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-quick @ 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 Colombia cellular to AWS Brazil 2, 3 runs of 30s each per scheme
 3 flows with 10s interval between flows (mean of all runs by scheme)



test from Colombia cellular to AWS Brazil 2, 3 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	3	0.23	0.19	0.02	3617.38	3662.88	3359.11	2.70	4.92	52.61
Copa	2	0.23	0.11	0.09	1760.02	1835.38	1965.43	1.39	8.64	24.51
TCP Cubic	3	0.38	0.02	0.00	8510.52	8145.11	8530.38	30.95	53.75	93.72
FillP	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FillP-Sheep	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indigo	3	0.11	0.13	0.24	1336.39	1327.47	2483.04	1.02	1.70	8.86
LEDBAT	3	0.13	0.20	0.20	476.29	419.78	421.17	1.08	0.48	3.97
Indigo-Muses	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCC-Allegro	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCC-Expr	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
QUIC Cubic	3	0.35	0.02	0.00	8188.61	7293.60	8350.64	29.61	0.00	50.00
SCReAM	3	0.08	0.09	0.10	294.31	300.89	318.43	0.79	0.95	2.16
Sprout	3	0.10	0.11	0.13	1324.14	1060.49	1141.56	0.87	1.39	1.30
TaoVA-100x	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TCP Vegas	3	0.21	0.17	0.12	2311.86	2461.11	2657.55	3.66	9.83	39.81
Verus	3	0.33	0.02	0.01	4202.06	3913.05	3308.00	14.69	3.97	8.02
PCC-Vivace	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WebRTC media	3	0.13	0.11	0.05	2534.35	2654.93	2569.99	0.83	3.58	0.47

Run 1: Statistics of TCP BBR

Start at: 2018-09-06 17:43:34

End at: 2018-09-06 17:44:04

Local clock offset: -0.127 ms

Remote clock offset: 1.194 ms

Below is generated by plot.py at 2018-09-06 18:47:33

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.41 Mbit/s

95th percentile per-packet one-way delay: 3597.485 ms

Loss rate: 0.99%

-- Flow 1:

Average throughput: 0.27 Mbit/s

95th percentile per-packet one-way delay: 3574.636 ms

Loss rate: 0.60%

-- Flow 2:

Average throughput: 0.23 Mbit/s

95th percentile per-packet one-way delay: 3627.181 ms

Loss rate: 0.58%

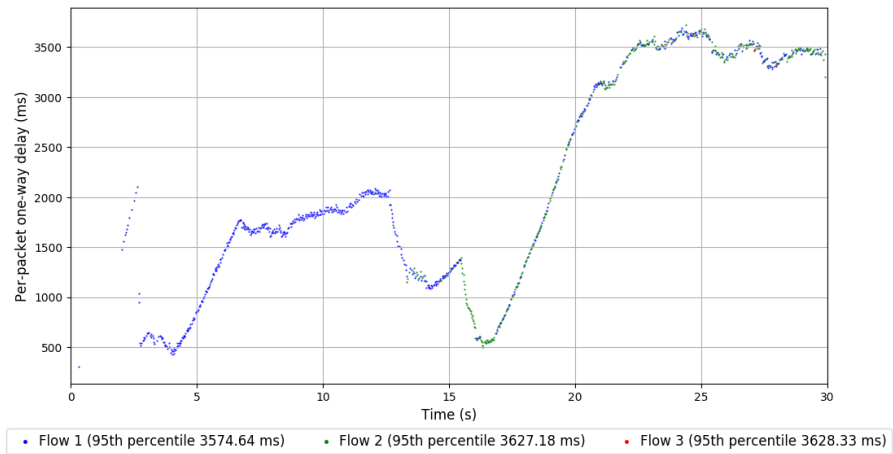
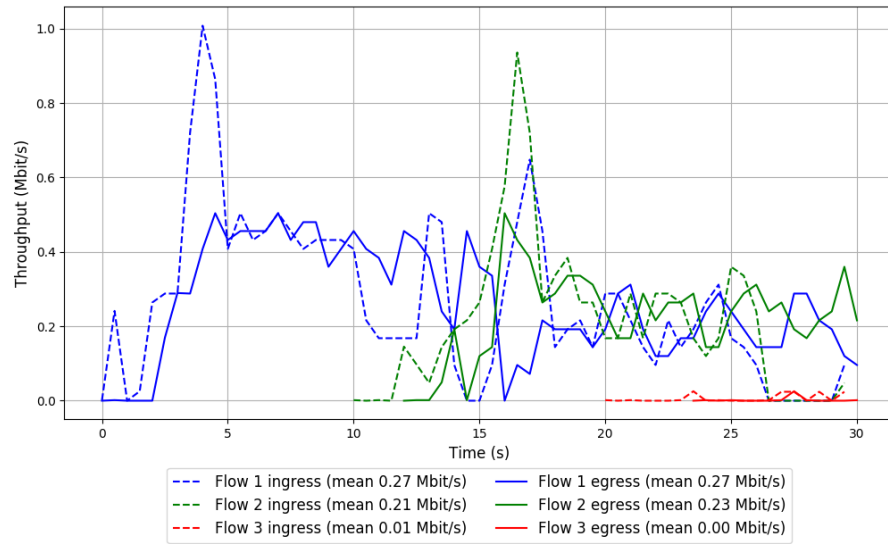
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 3628.328 ms

Loss rate: 74.52%

Run 1: Report of TCP BBR — Data Link



Run 2: Statistics of TCP BBR

Start at: 2018-09-06 18:06:38

End at: 2018-09-06 18:07:08

Local clock offset: 3.738 ms

Remote clock offset: 1.115 ms

Below is generated by plot.py at 2018-09-06 18:47:33

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.25 Mbit/s

95th percentile per-packet one-way delay: 3328.220 ms

Loss rate: 6.48%

-- Flow 1:

Average throughput: 0.16 Mbit/s

95th percentile per-packet one-way delay: 3296.448 ms

Loss rate: 4.00%

-- Flow 2:

Average throughput: 0.13 Mbit/s

95th percentile per-packet one-way delay: 3386.196 ms

Loss rate: 7.45%

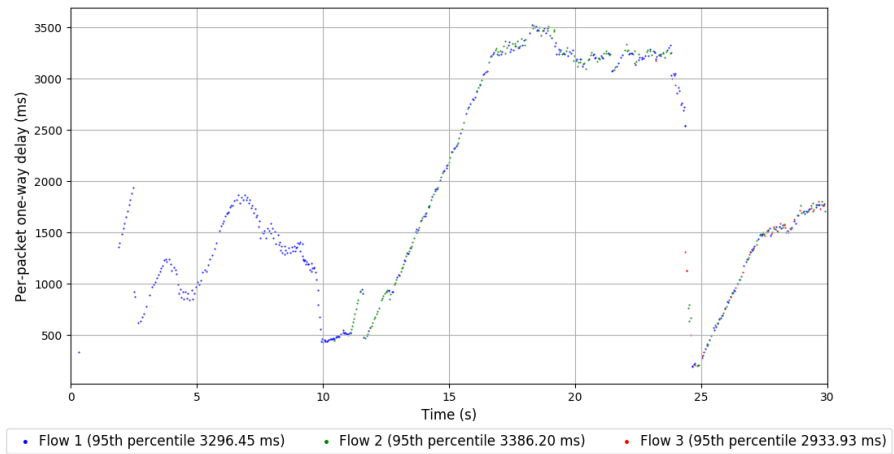
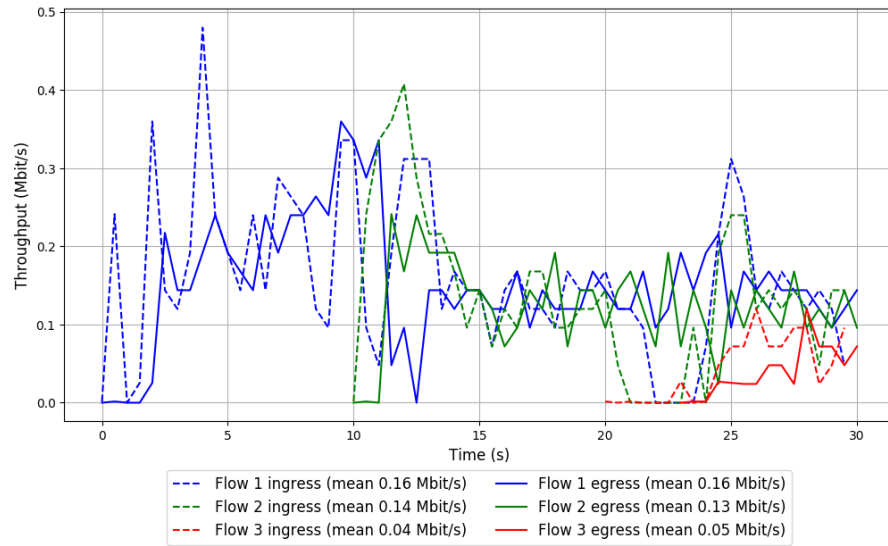
-- Flow 3:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 2933.931 ms

Loss rate: 28.32%

Run 2: Report of TCP BBR — Data Link



Run 3: Statistics of TCP BBR

Start at: 2018-09-06 18:30:09

End at: 2018-09-06 18:30:39

Local clock offset: 4.782 ms

Remote clock offset: 2.422 ms

Below is generated by plot.py at 2018-09-06 18:47:33

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.39 Mbit/s

95th percentile per-packet one-way delay: 3975.251 ms

Loss rate: 5.50%

-- Flow 1:

Average throughput: 0.25 Mbit/s

95th percentile per-packet one-way delay: 3981.055 ms

Loss rate: 3.49%

-- Flow 2:

Average throughput: 0.22 Mbit/s

95th percentile per-packet one-way delay: 3975.251 ms

Loss rate: 6.74%

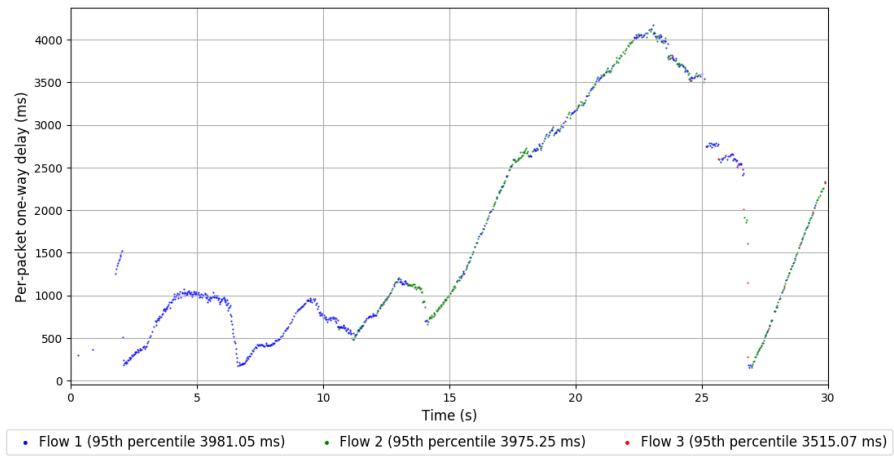
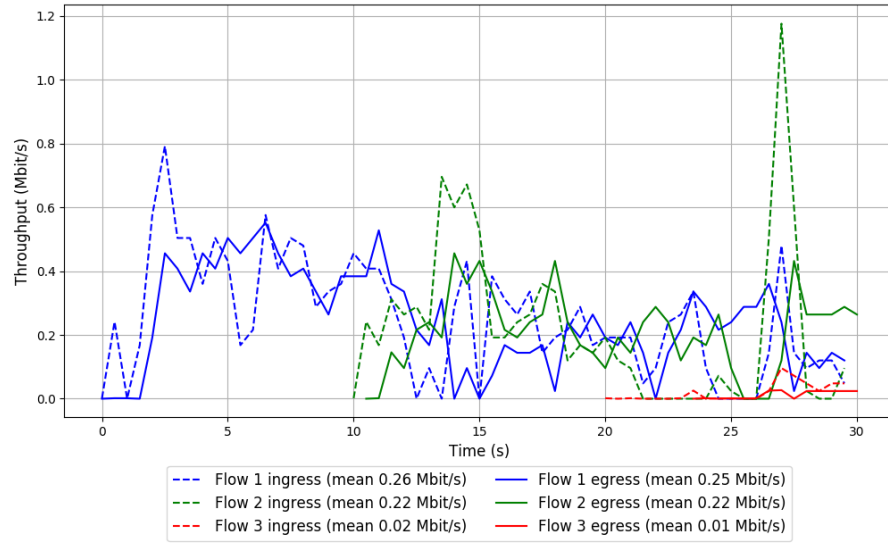
-- Flow 3:

Average throughput: 0.01 Mbit/s

95th percentile per-packet one-way delay: 3515.065 ms

Loss rate: 54.99%

Run 3: Report of TCP BBR — Data Link



Run 1: Statistics of Copa

Start at: 2018-09-06 17:58:52

End at: 2018-09-06 17:59:22

Local clock offset: 3.24 ms

Remote clock offset: 1.178 ms

Below is generated by plot.py at 2018-09-06 18:47:33

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.34 Mbit/s

95th percentile per-packet one-way delay: 1868.278 ms

Loss rate: 6.57%

-- Flow 1:

Average throughput: 0.23 Mbit/s

95th percentile per-packet one-way delay: 1762.314 ms

Loss rate: 1.34%

-- Flow 2:

Average throughput: 0.12 Mbit/s

95th percentile per-packet one-way delay: 1836.172 ms

Loss rate: 5.34%

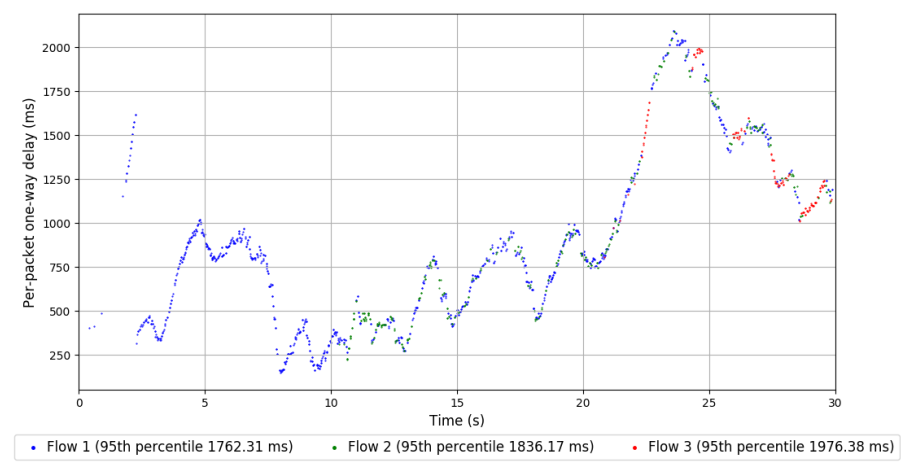
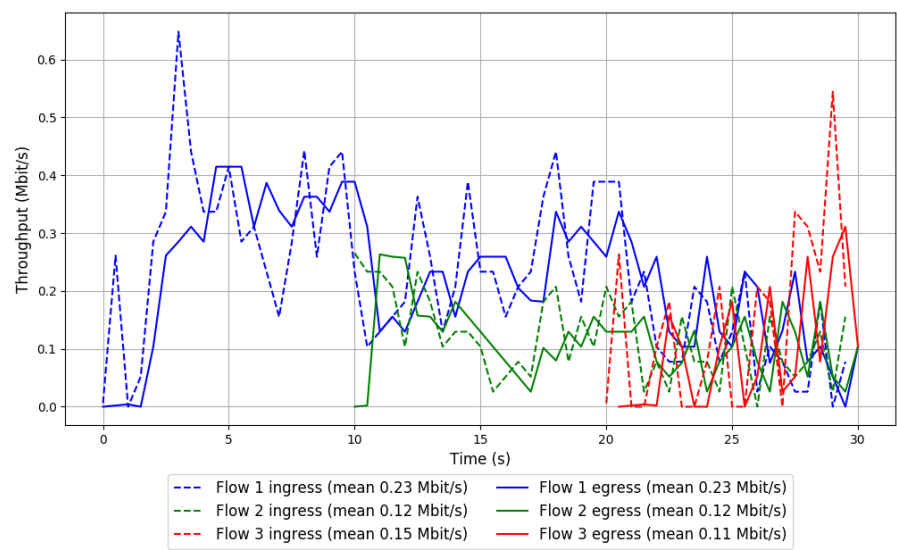
-- Flow 3:

Average throughput: 0.11 Mbit/s

95th percentile per-packet one-way delay: 1976.376 ms

Loss rate: 33.52%

Run 1: Report of Copa — Data Link



Run 2: Statistics of Copa

/home/ubuntu/pantheon/data/2018-09-06T17-38-Colombia-cellular-to-AWS-Brazil-2-3-runs-3-flows

Run 2: Report of Copa — Data Link

Figure is missing

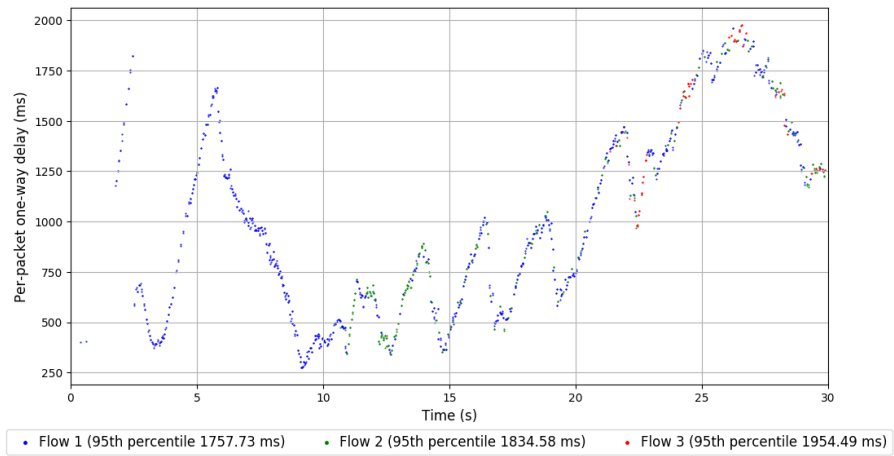
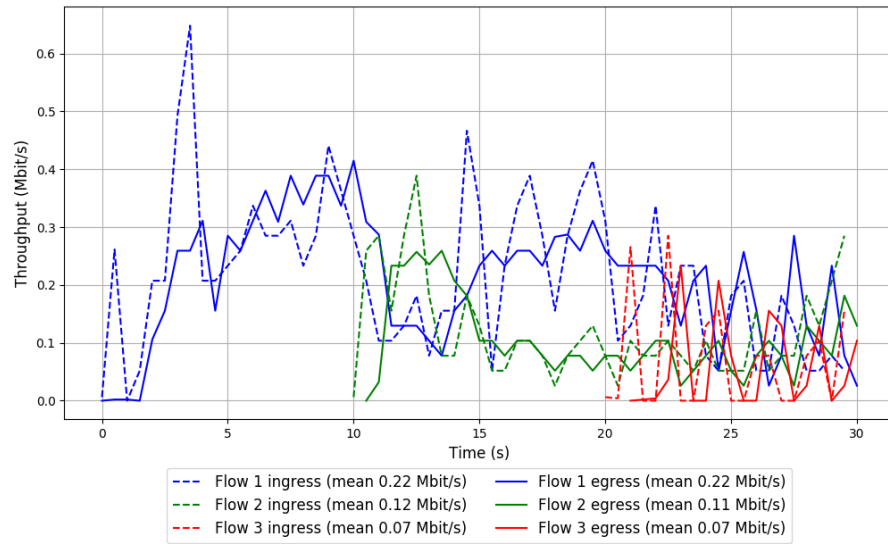
Figure is missing

Run 3: Statistics of Copa

Start at: 2018-09-06 18:45:36
End at: 2018-09-06 18:46:06
Local clock offset: 4.763 ms
Remote clock offset: -0.008 ms

Below is generated by plot.py at 2018-09-06 18:47:33
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.31 Mbit/s
95th percentile per-packet one-way delay: 1818.617 ms
Loss rate: 5.06%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 1757.727 ms
Loss rate: 1.43%
-- Flow 2:
Average throughput: 0.11 Mbit/s
95th percentile per-packet one-way delay: 1834.579 ms
Loss rate: 11.94%
-- Flow 3:
Average throughput: 0.07 Mbit/s
95th percentile per-packet one-way delay: 1954.487 ms
Loss rate: 15.49%

Run 3: Report of Copa — Data Link



Run 1: Statistics of TCP Cubic

Start at: 2018-09-06 17:54:51

End at: 2018-09-06 17:55:21

Local clock offset: 2.73 ms

Remote clock offset: 2.348 ms

Below is generated by plot.py at 2018-09-06 18:47:33

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.38 Mbit/s

95th percentile per-packet one-way delay: 8591.247 ms

Loss rate: 31.96%

-- Flow 1:

Average throughput: 0.38 Mbit/s

95th percentile per-packet one-way delay: 8595.842 ms

Loss rate: 31.78%

-- Flow 2:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 8097.221 ms

Loss rate: 53.44%

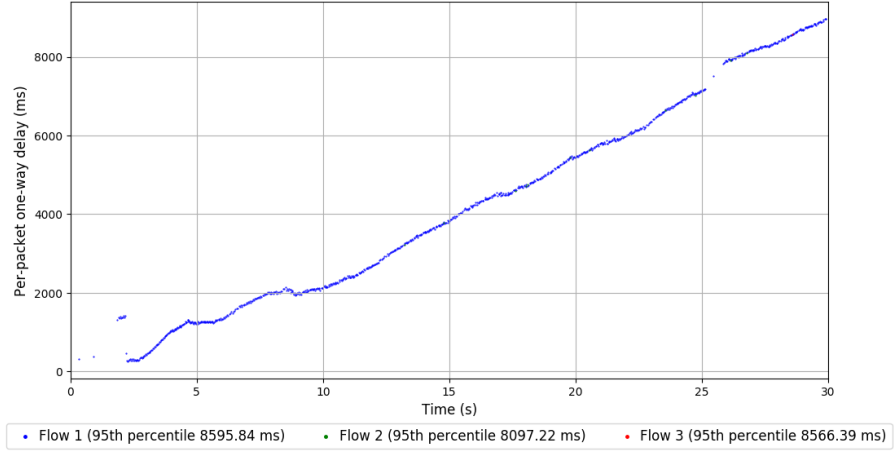
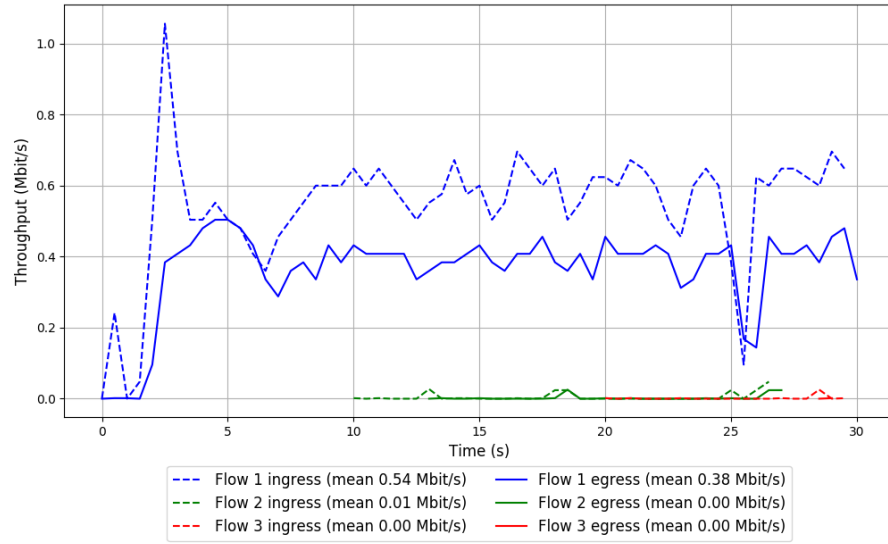
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 8566.387 ms

Loss rate: 95.34%

Run 1: Report of TCP Cubic — Data Link



Run 2: Statistics of TCP Cubic

Start at: 2018-09-06 18:18:06

End at: 2018-09-06 18:18:36

Local clock offset: 3.392 ms

Remote clock offset: 1.244 ms

Below is generated by plot.py at 2018-09-06 18:47:33

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.42 Mbit/s

95th percentile per-packet one-way delay: 8883.433 ms

Loss rate: 32.36%

-- Flow 1:

Average throughput: 0.40 Mbit/s

95th percentile per-packet one-way delay: 8895.431 ms

Loss rate: 31.35%

-- Flow 2:

Average throughput: 0.02 Mbit/s

95th percentile per-packet one-way delay: 8600.058 ms

Loss rate: 53.55%

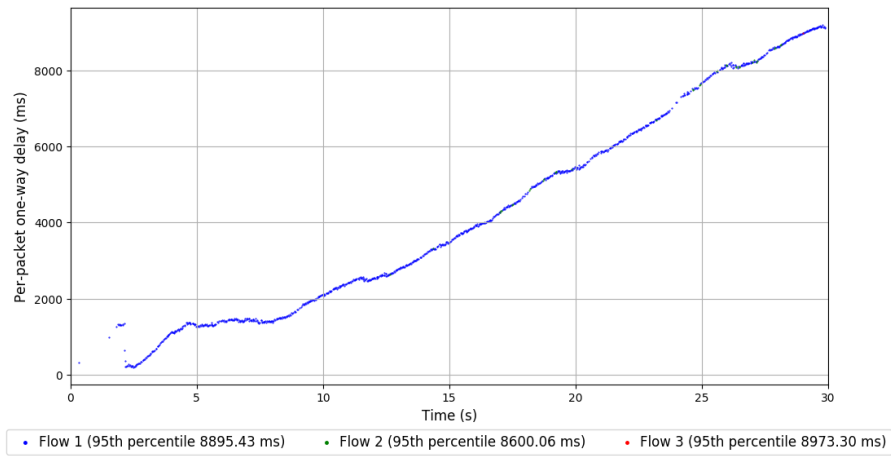
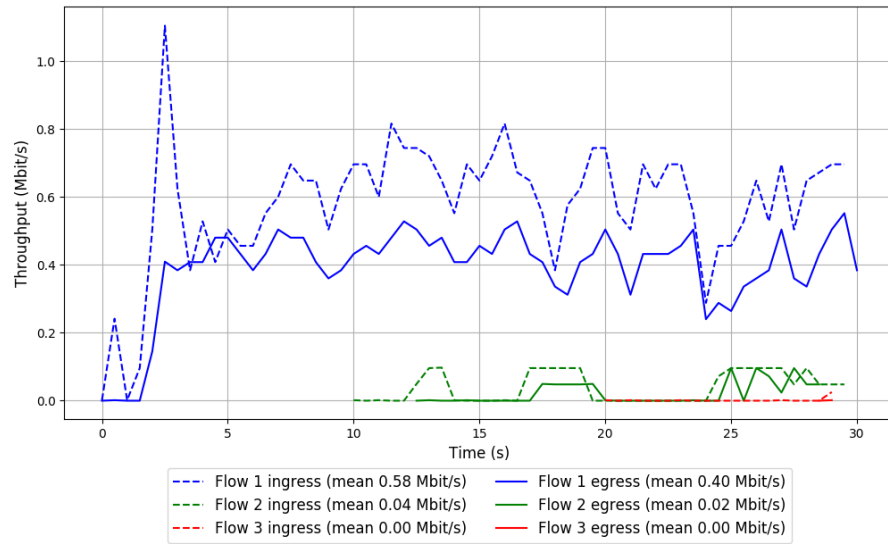
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 8973.303 ms

Loss rate: 95.13%

Run 2: Report of TCP Cubic — Data Link



Run 3: Statistics of TCP Cubic

Start at: 2018-09-06 18:41:36

End at: 2018-09-06 18:42:06

Local clock offset: 4.857 ms

Remote clock offset: 2.236 ms

Below is generated by plot.py at 2018-09-06 18:47:33

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.37 Mbit/s

95th percentile per-packet one-way delay: 8040.266 ms

Loss rate: 31.04%

-- Flow 1:

Average throughput: 0.35 Mbit/s

95th percentile per-packet one-way delay: 8040.276 ms

Loss rate: 29.73%

-- Flow 2:

Average throughput: 0.03 Mbit/s

95th percentile per-packet one-way delay: 7738.050 ms

Loss rate: 54.25%

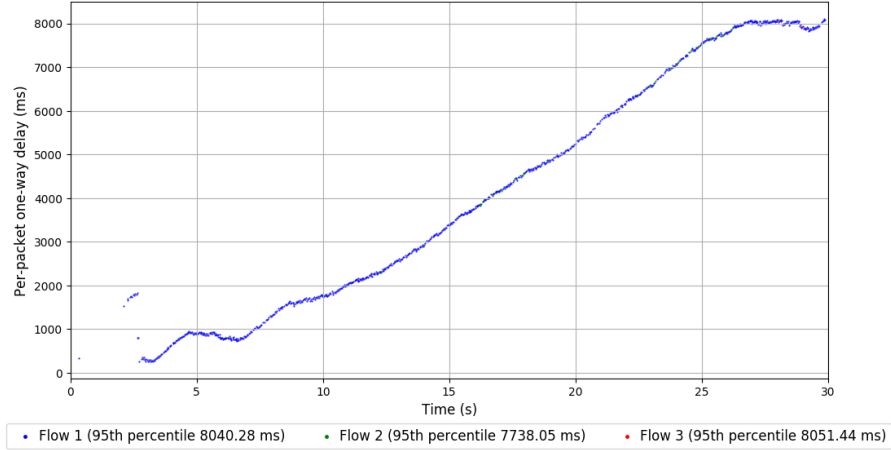
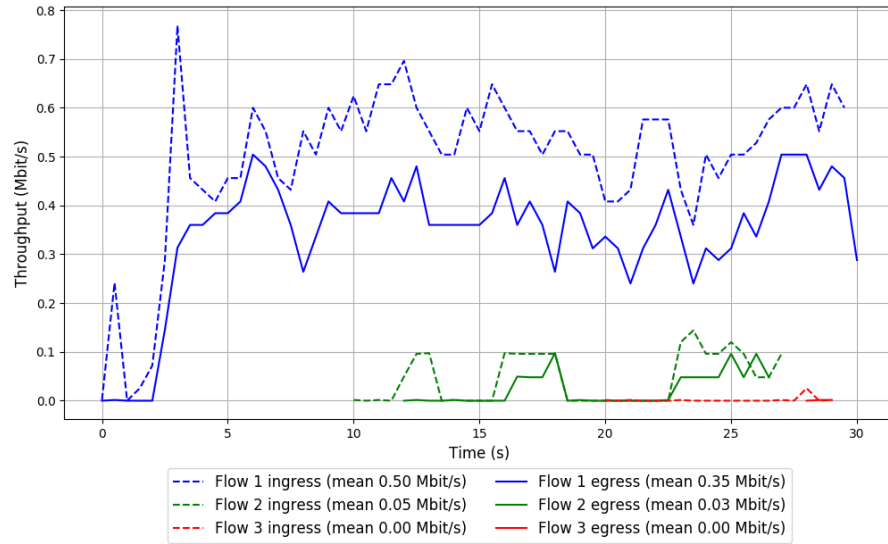
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 8051.443 ms

Loss rate: 90.68%

Run 3: Report of TCP Cubic — Data Link



Run 1: Statistics of FillP

/home/ubuntu/pantheon/data/2018-09-06T17-38-Colombia-cellular-to-AWS-Brazil-2-3-runs-3-flows

Run 1: Report of FillP — Data Link

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Run 2: Statistics of FillP

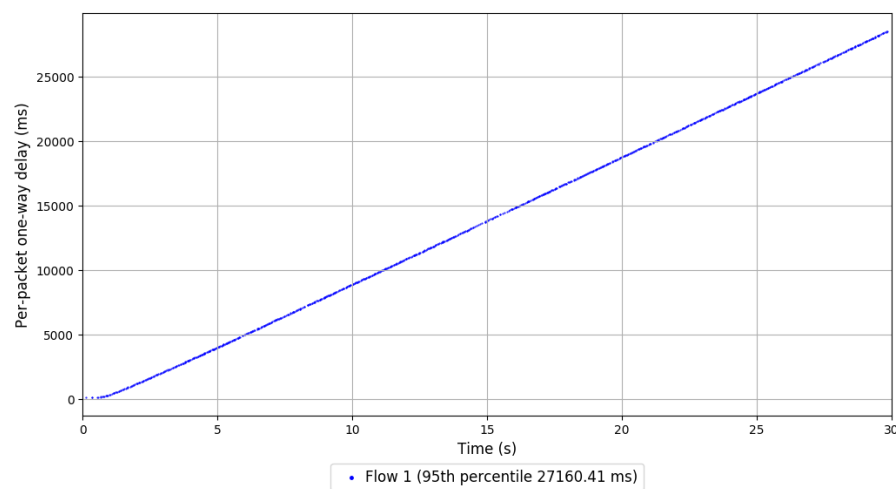
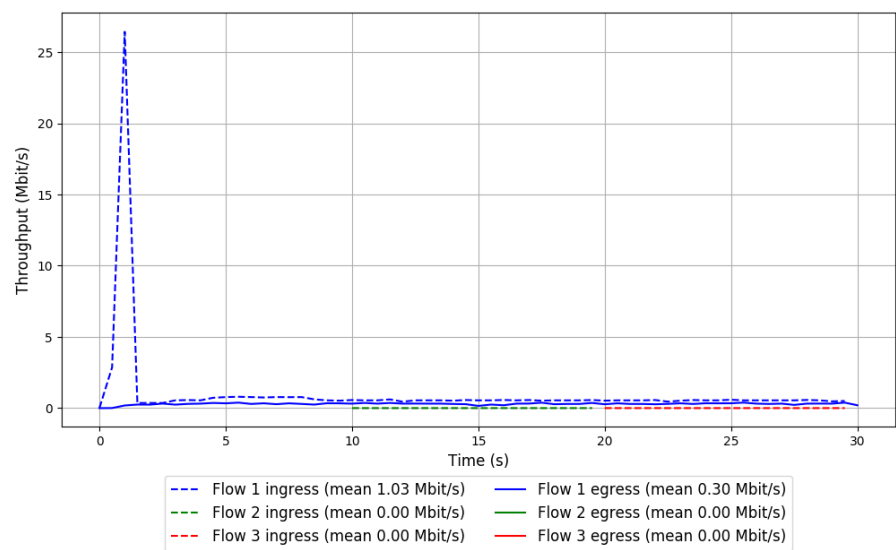
Start at: 2018-09-06 18:20:57

End at: 2018-09-06 18:21:27

Local clock offset: 4.313 ms

Remote clock offset: 1.126 ms

Run 2: Report of FillP — Data Link



Run 3: Statistics of FillP

/home/ubuntu/pantheon/data/2018-09-06T17-38-Colombia-cellular-to-AWS-Brazil-2-3-runs-3-flows

Run 3: Report of FillP — Data Link

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Run 1: Statistics of FillP-Sheep

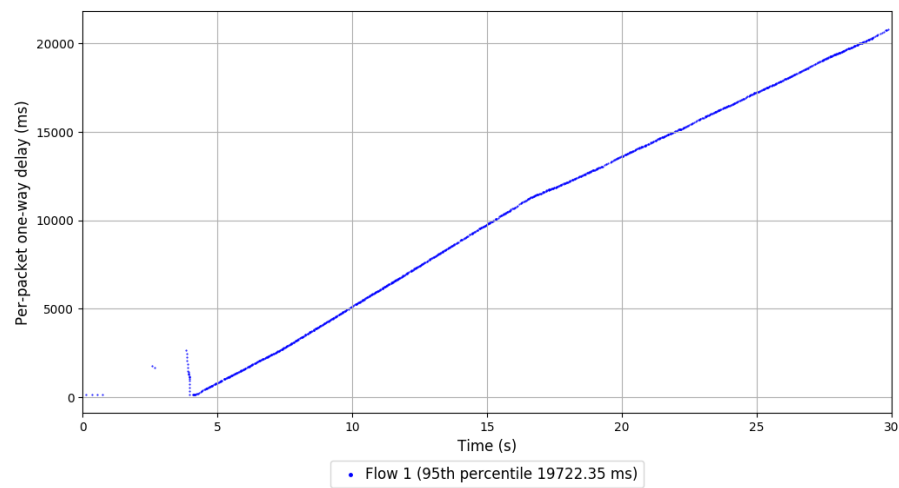
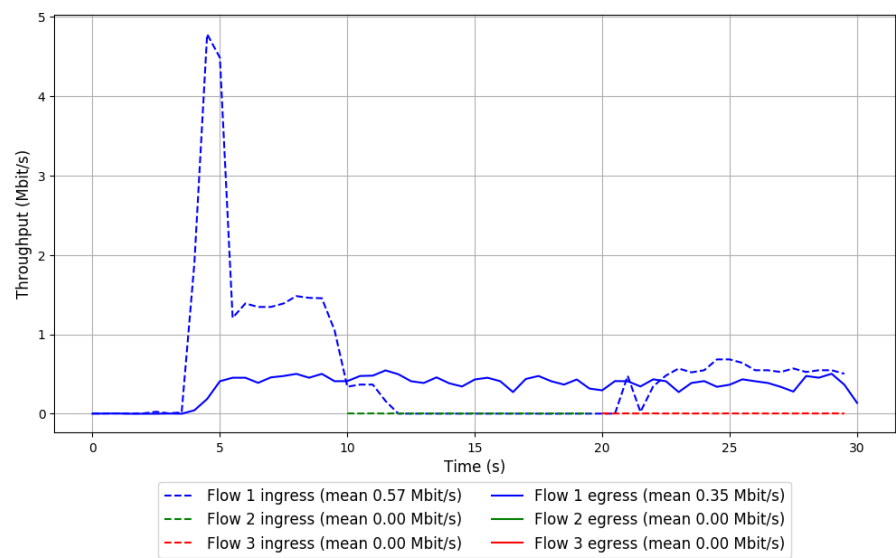
Start at: 2018-09-06 17:42:20

End at: 2018-09-06 17:42:50

Local clock offset: -0.021 ms

Remote clock offset: 0.011 ms

Run 1: Report of FillP-Sheep — Data Link



Run 2: Statistics of FillP-Sheep

/home/ubuntu/pantheon/data/2018-09-06T17-38-Colombia-cellular-to-AWS-Brazil-2-3-runs-3-flows

Run 2: Report of FillP-Sheep — Data Link

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Run 3: Statistics of FillP-Sheep

/home/ubuntu/pantheon/data/2018-09-06T17-38-Colombia-cellular-to-AWS-Brazil-2-3-runs-3-flows

Run 3: Report of FillP-Sheep — Data Link

Figure is missing

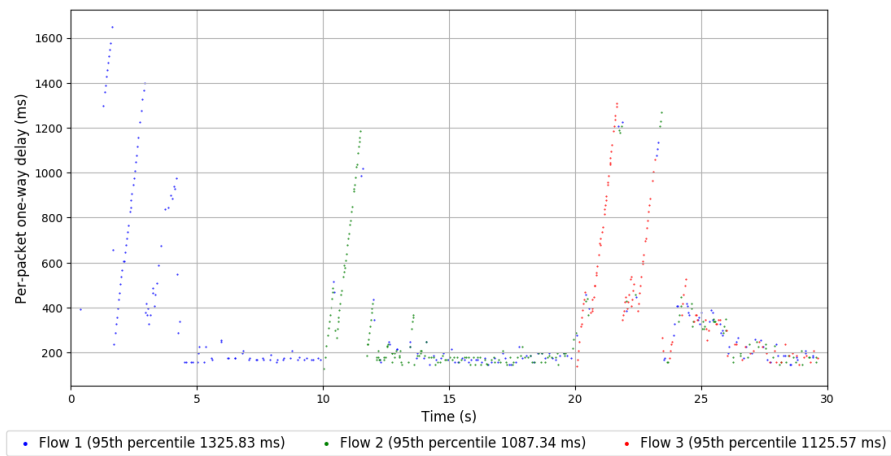
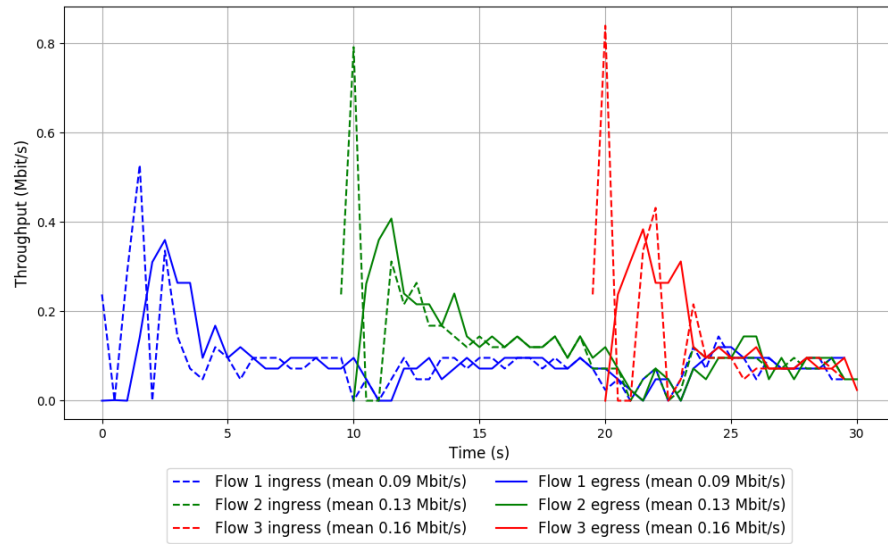
Figure is missing

```
Run 1: Statistics of Indigo

Start at: 2018-09-06 17:52:25
End at: 2018-09-06 17:52:55
Local clock offset: 2.254 ms
Remote clock offset: 1.19 ms

# Below is generated by plot.py at 2018-09-06 18:47:37
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.23 Mbit/s
95th percentile per-packet one-way delay: 1186.586 ms
Loss rate: 1.07%
-- Flow 1:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 1325.829 ms
Loss rate: 0.89%
-- Flow 2:
Average throughput: 0.13 Mbit/s
95th percentile per-packet one-way delay: 1087.342 ms
Loss rate: 0.95%
-- Flow 3:
Average throughput: 0.16 Mbit/s
95th percentile per-packet one-way delay: 1125.569 ms
Loss rate: 1.58%
```

Run 1: Report of Indigo — Data Link



Run 2: Statistics of Indigo

Start at: 2018-09-06 18:15:39

End at: 2018-09-06 18:16:09

Local clock offset: 3.893 ms

Remote clock offset: 2.173 ms

Below is generated by plot.py at 2018-09-06 18:47:38

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.24 Mbit/s

95th percentile per-packet one-way delay: 4246.776 ms

Loss rate: 9.47%

-- Flow 1:

Average throughput: 0.11 Mbit/s

95th percentile per-packet one-way delay: 1657.190 ms

Loss rate: 1.56%

-- Flow 2:

Average throughput: 0.08 Mbit/s

95th percentile per-packet one-way delay: 1987.404 ms

Loss rate: 3.10%

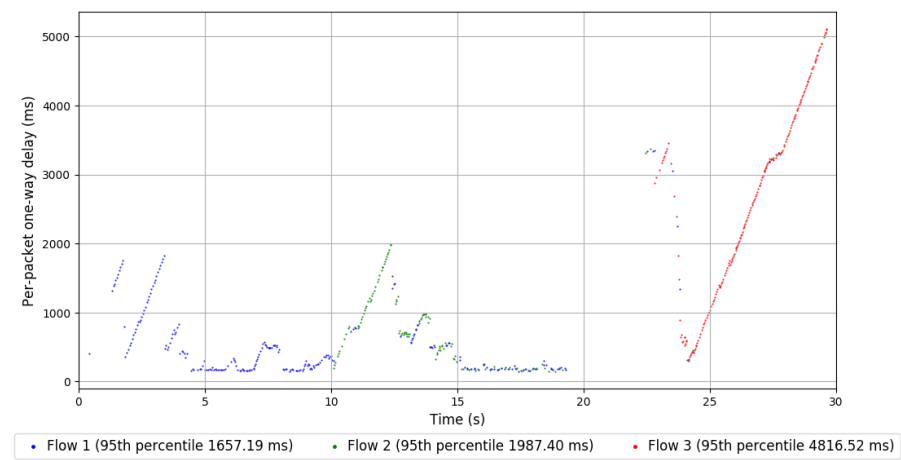
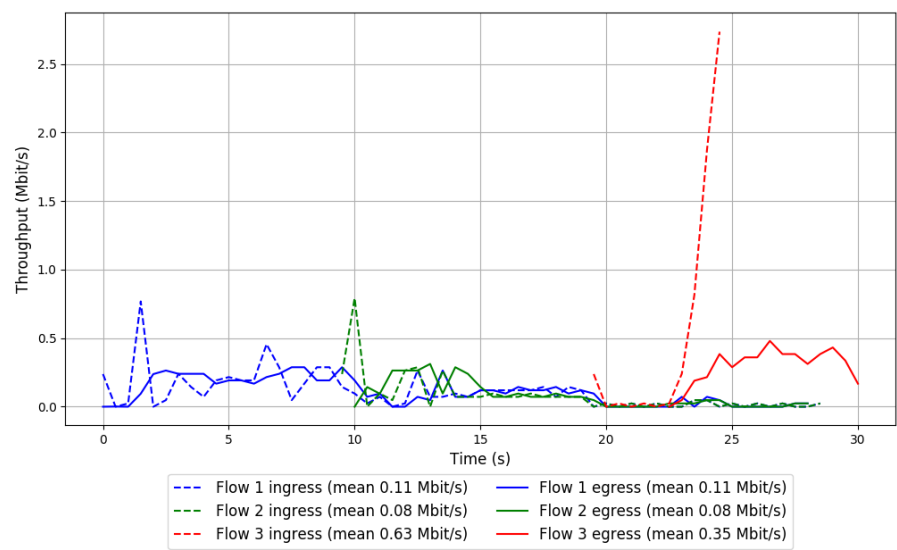
-- Flow 3:

Average throughput: 0.35 Mbit/s

95th percentile per-packet one-way delay: 4816.521 ms

Loss rate: 20.89%

Run 2: Report of Indigo — Data Link



Run 3: Statistics of Indigo

Start at: 2018-09-06 18:39:08

End at: 2018-09-06 18:39:38

Local clock offset: 4.842 ms

Remote clock offset: 0.072 ms

Below is generated by plot.py at 2018-09-06 18:47:38

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.32 Mbit/s

95th percentile per-packet one-way delay: 1157.606 ms

Loss rate: 1.54%

-- Flow 1:

Average throughput: 0.13 Mbit/s

95th percentile per-packet one-way delay: 1026.153 ms

Loss rate: 0.61%

-- Flow 2:

Average throughput: 0.17 Mbit/s

95th percentile per-packet one-way delay: 907.660 ms

Loss rate: 1.06%

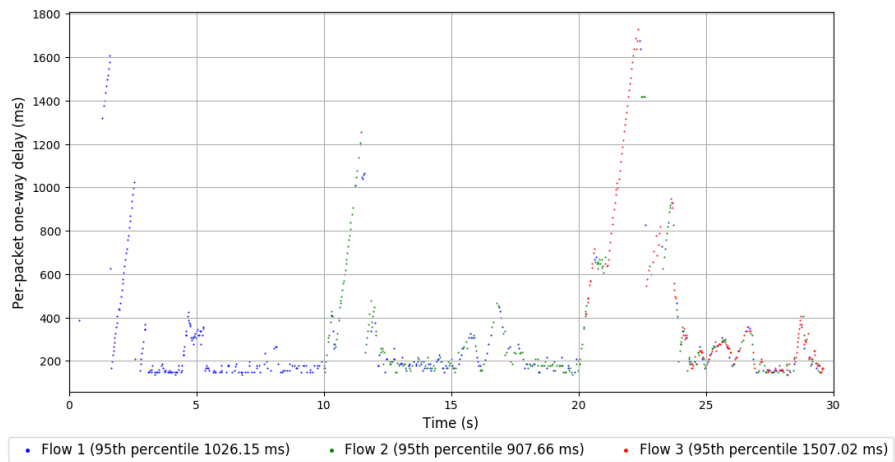
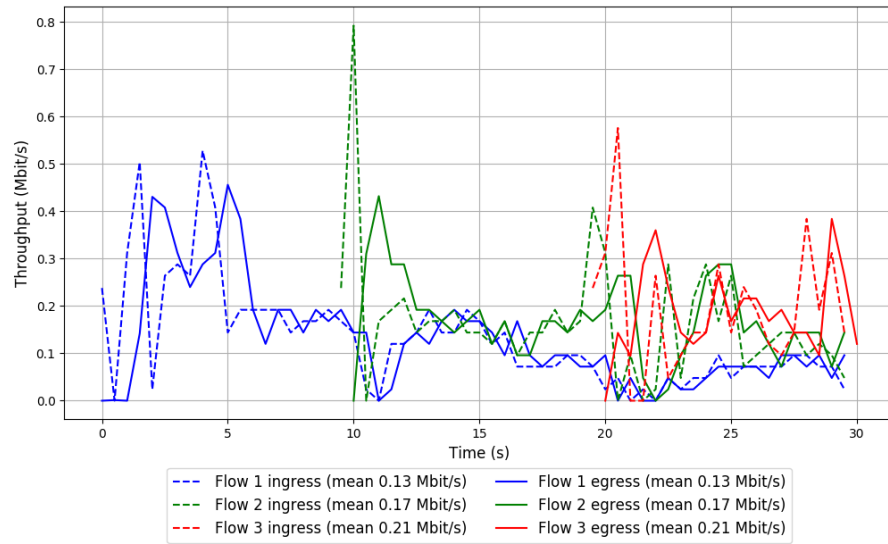
-- Flow 3:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 1507.019 ms

Loss rate: 4.12%

Run 3: Report of Indigo — Data Link

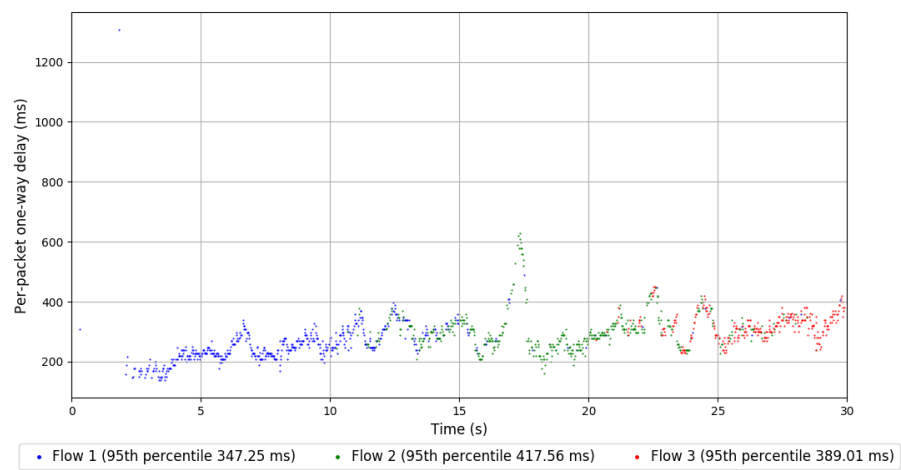
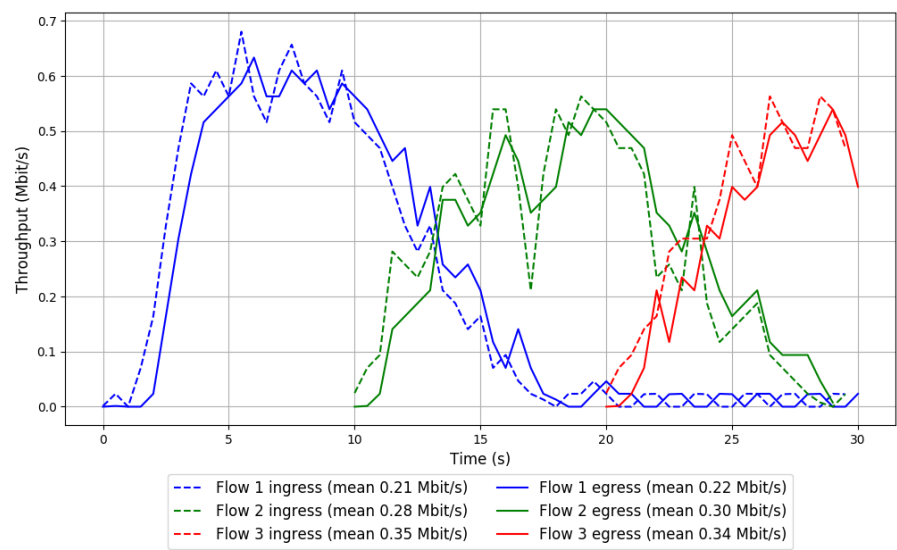



```
Run 1: Statistics of LEDBAT

Start at: 2018-09-06 17:46:01
End at: 2018-09-06 17:46:31
Local clock offset: -0.006 ms
Remote clock offset: 0.259 ms

# Below is generated by plot.py at 2018-09-06 18:47:38
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.51 Mbit/s
95th percentile per-packet one-way delay: 387.521 ms
Loss rate: 1.59%
-- Flow 1:
Average throughput: 0.22 Mbit/s
95th percentile per-packet one-way delay: 347.249 ms
Loss rate: 0.18%
-- Flow 2:
Average throughput: 0.30 Mbit/s
95th percentile per-packet one-way delay: 417.562 ms
Loss rate: 0.20%
-- Flow 3:
Average throughput: 0.34 Mbit/s
95th percentile per-packet one-way delay: 389.014 ms
Loss rate: 6.37%
```

Run 1: Report of LEDBAT — Data Link



Run 2: Statistics of LEDBAT

Start at: 2018-09-06 18:09:05

End at: 2018-09-06 18:09:35

Local clock offset: 2.955 ms

Remote clock offset: 1.155 ms

Below is generated by plot.py at 2018-09-06 18:47:38

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.24 Mbit/s

95th percentile per-packet one-way delay: 460.498 ms

Loss rate: 0.82%

-- Flow 1:

Average throughput: 0.11 Mbit/s

95th percentile per-packet one-way delay: 540.442 ms

Loss rate: 1.11%

-- Flow 2:

Average throughput: 0.12 Mbit/s

95th percentile per-packet one-way delay: 430.904 ms

Loss rate: 0.00%

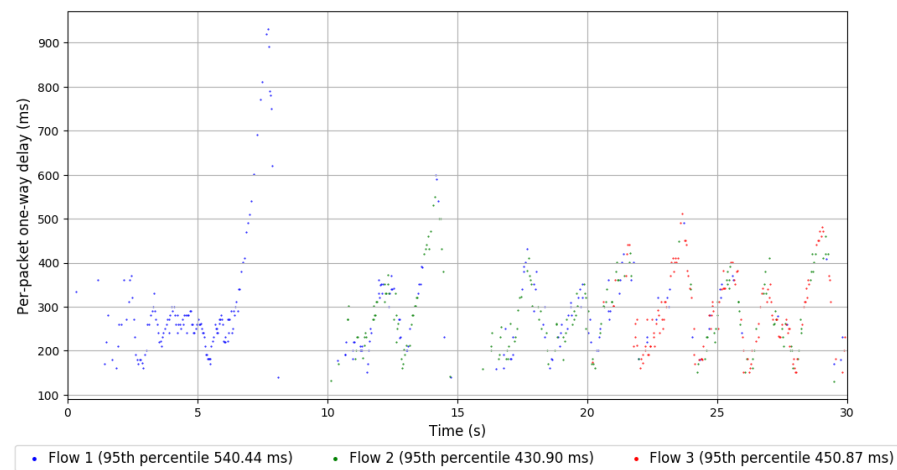
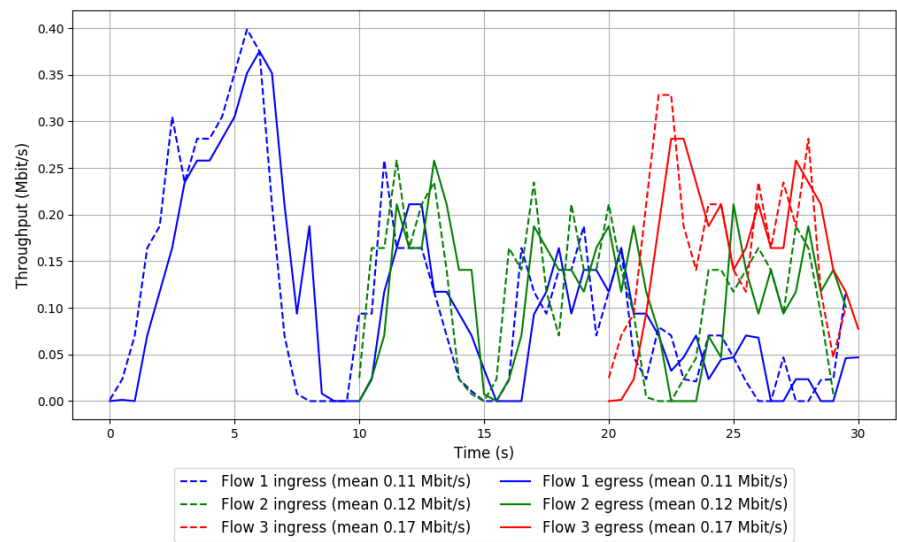
-- Flow 3:

Average throughput: 0.17 Mbit/s

95th percentile per-packet one-way delay: 450.870 ms

Loss rate: 1.37%

Run 2: Report of LEDBAT — Data Link

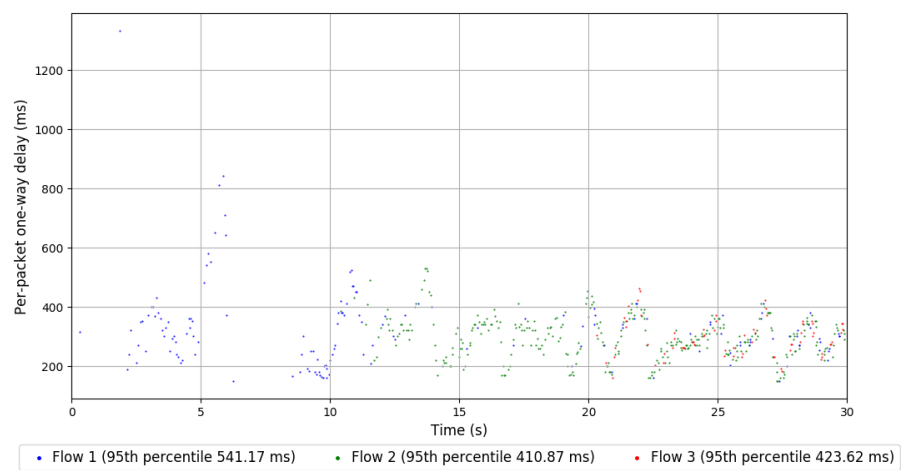
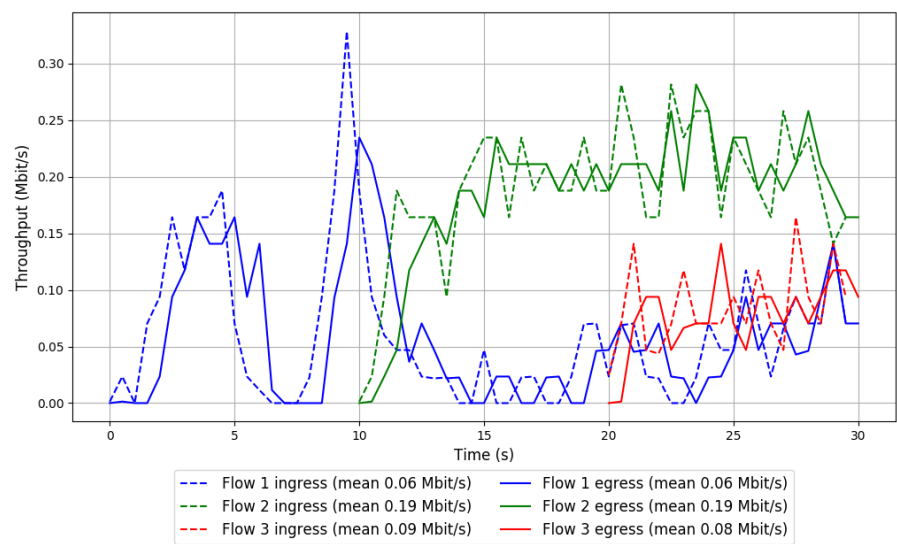


Run 3: Statistics of LEDBAT

Start at: 2018-09-06 18:32:38
End at: 2018-09-06 18:33:08
Local clock offset: 4.808 ms
Remote clock offset: -0.179 ms

Below is generated by plot.py at 2018-09-06 18:47:38
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 437.729 ms
Loss rate: 1.82%
-- Flow 1:
Average throughput: 0.06 Mbit/s
95th percentile per-packet one-way delay: 541.172 ms
Loss rate: 1.95%
-- Flow 2:
Average throughput: 0.19 Mbit/s
95th percentile per-packet one-way delay: 410.870 ms
Loss rate: 1.24%
-- Flow 3:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 423.621 ms
Loss rate: 4.17%

Run 3: Report of LEDBAT — Data Link



Run 1: Statistics of Indigo-Muses

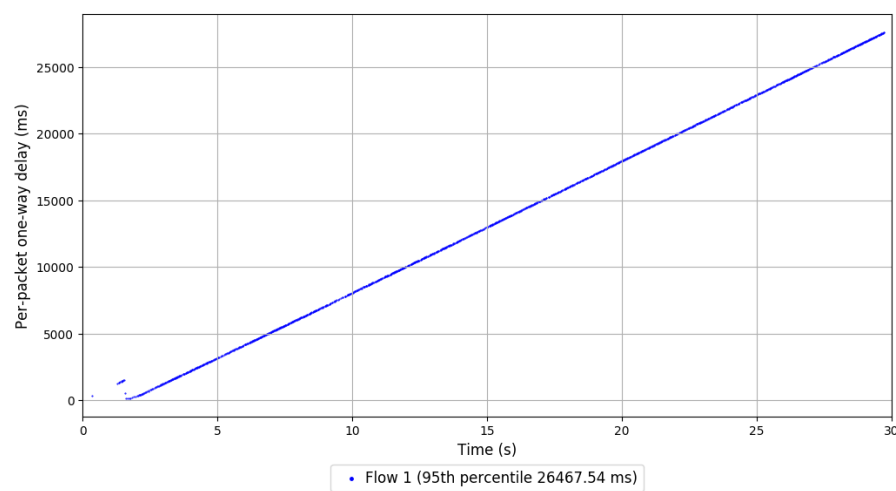
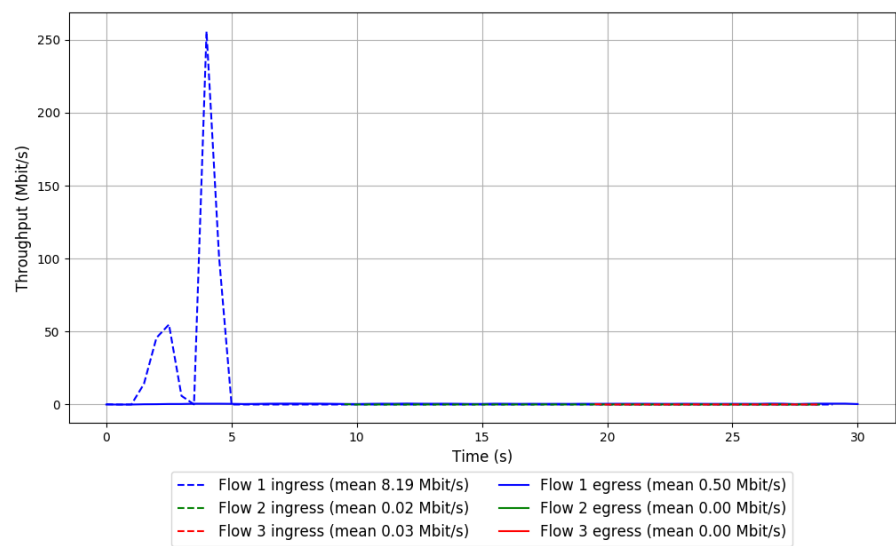
Start at: 2018-09-06 17:39:52

End at: 2018-09-06 17:40:22

Local clock offset: 0.086 ms

Remote clock offset: 1.414 ms

Run 1: Report of Indigo-Muses — Data Link



Run 2: Statistics of Indigo-Muses

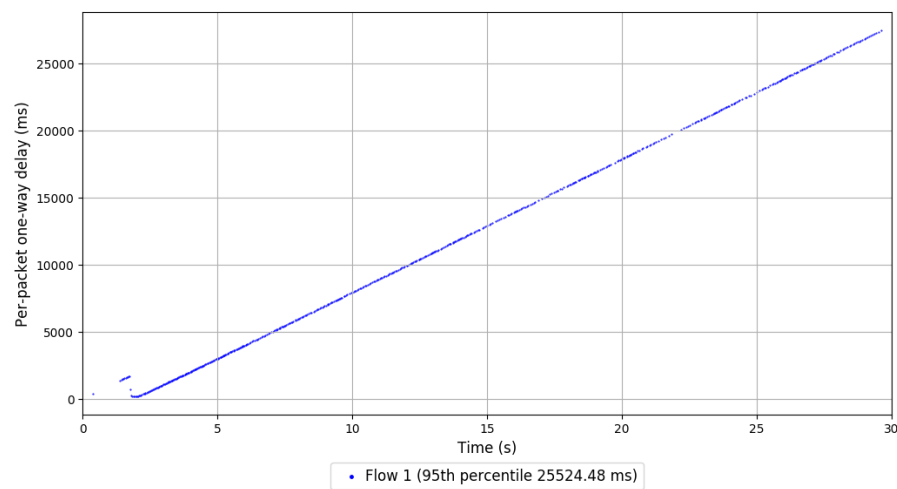
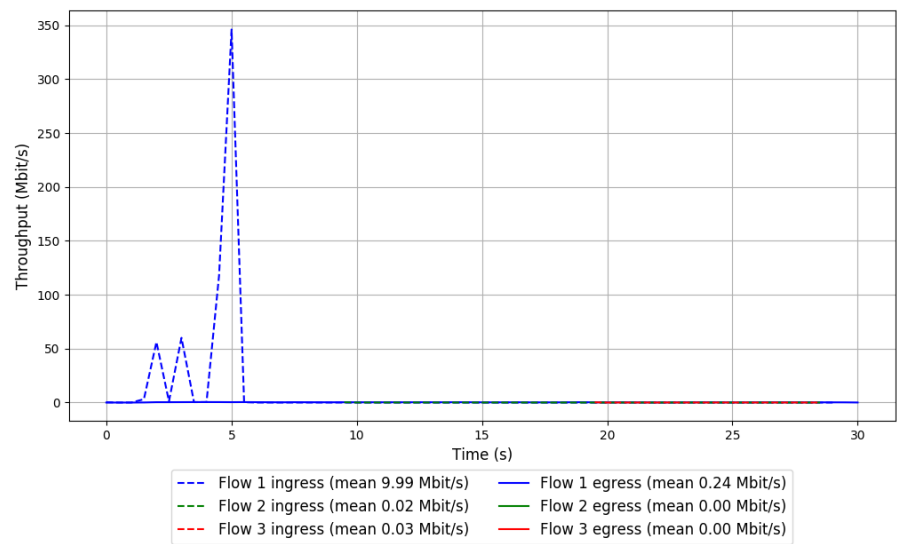
Start at: 2018-09-06 18:02:32

End at: 2018-09-06 18:03:02

Local clock offset: 2.765 ms

Remote clock offset: 0.046 ms

Run 2: Report of Indigo-Muses — Data Link



Run 3: Statistics of Indigo-Muses

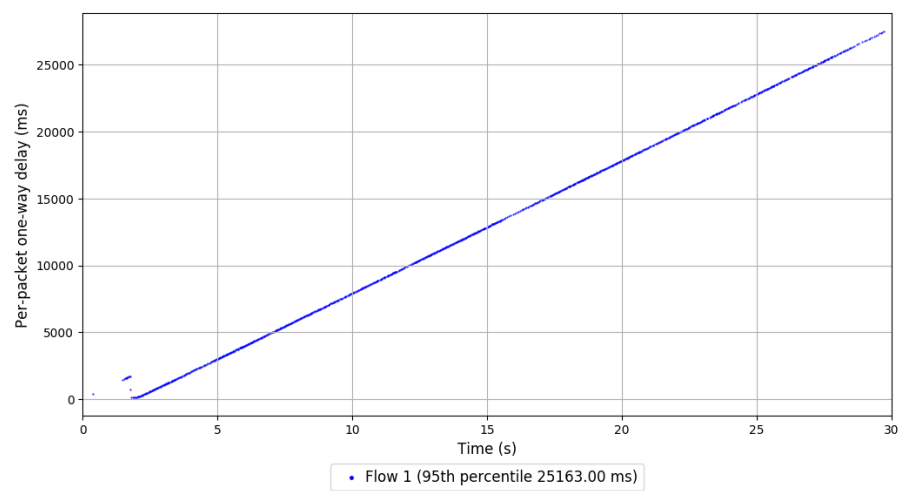
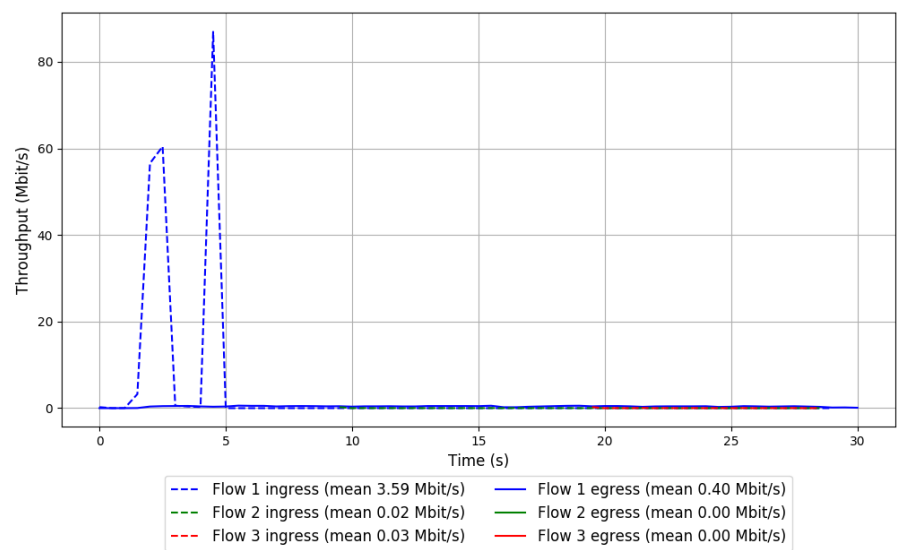
Start at: 2018-09-06 18:26:09

End at: 2018-09-06 18:26:39

Local clock offset: 3.904 ms

Remote clock offset: -0.147 ms

Run 3: Report of Indigo-Muses — Data Link



Run 1: Statistics of PCC-Allegro

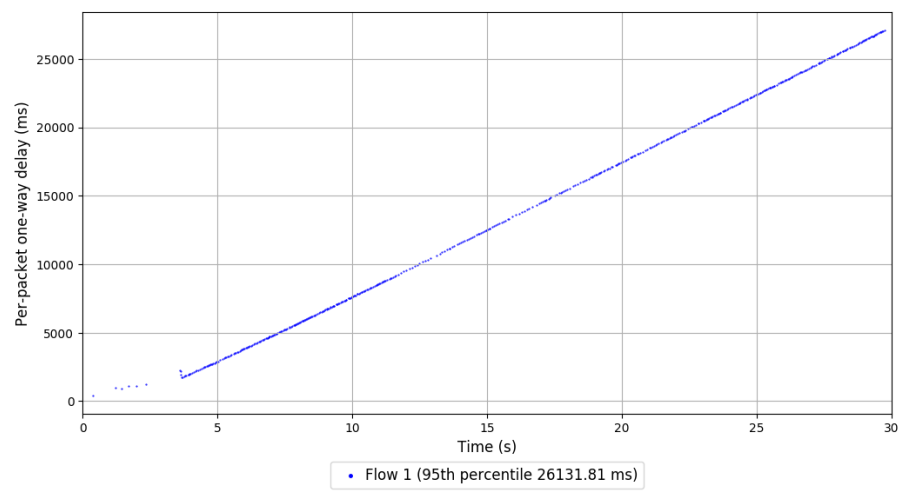
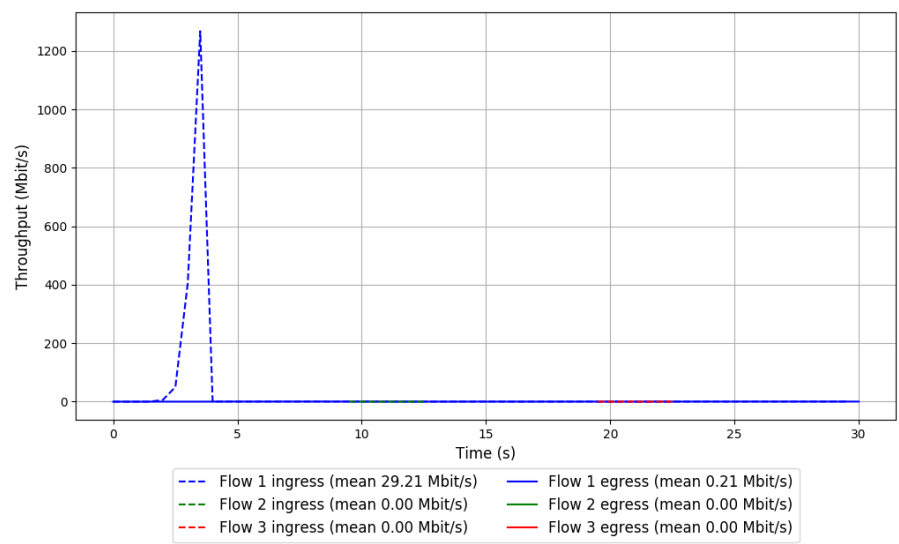
Start at: 2018-09-06 17:49:40

End at: 2018-09-06 17:50:10

Local clock offset: 0.612 ms

Remote clock offset: 2.365 ms

Run 1: Report of PCC-Allegro — Data Link



Run 2: Statistics of PCC-Allegro

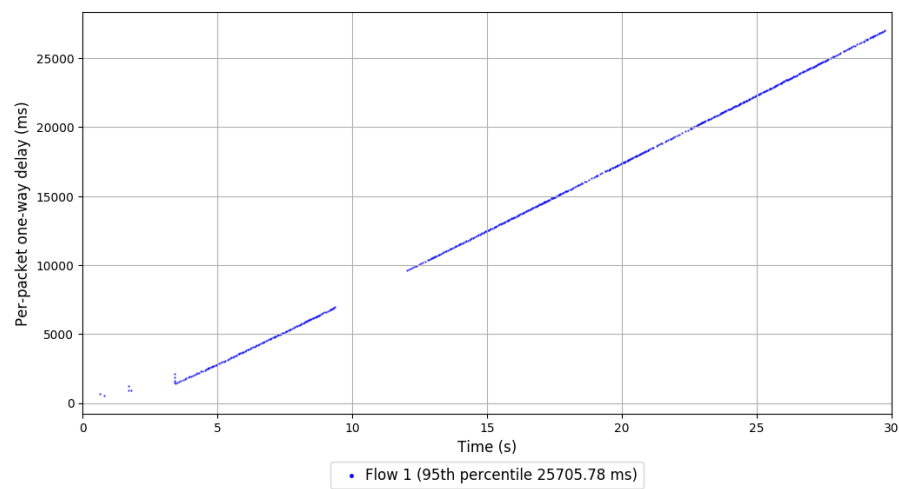
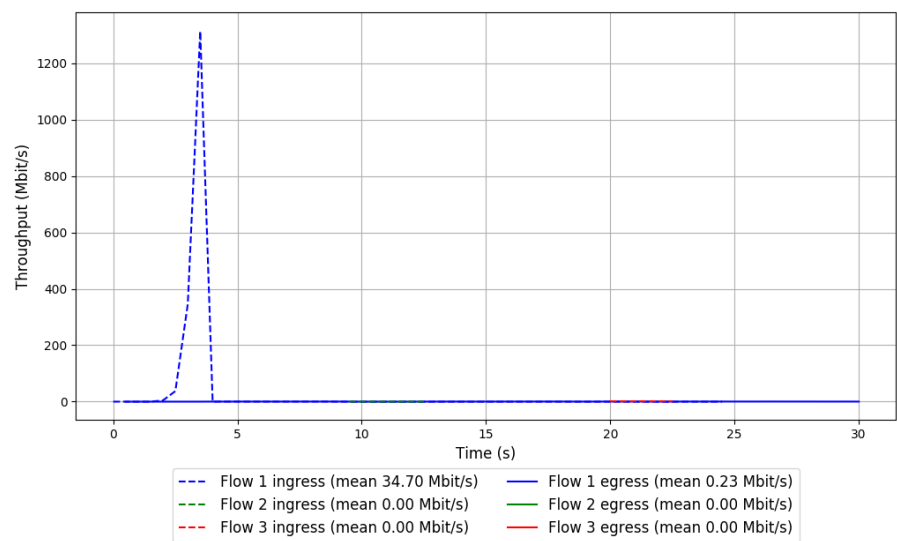
Start at: 2018-09-06 18:12:48

End at: 2018-09-06 18:13:19

Local clock offset: 3.091 ms

Remote clock offset: 1.318 ms

Run 2: Report of PCC-Allegro — Data Link



Run 3: Statistics of PCC-Allegro

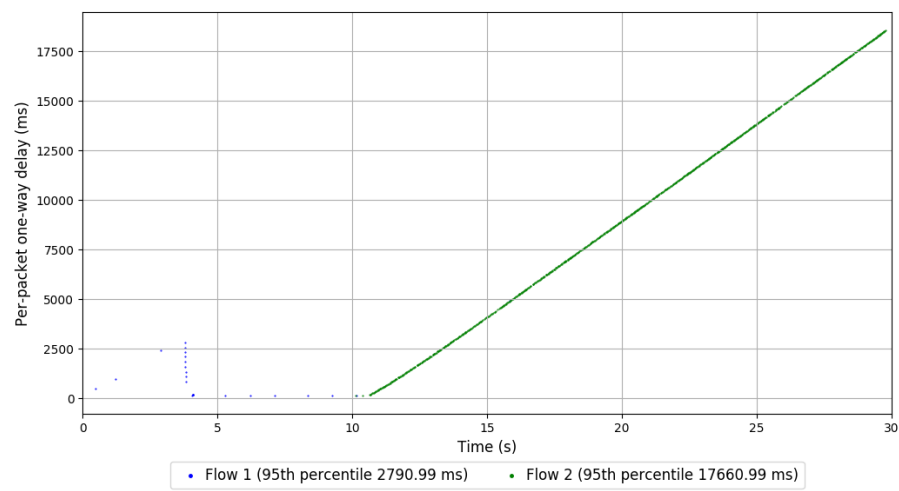
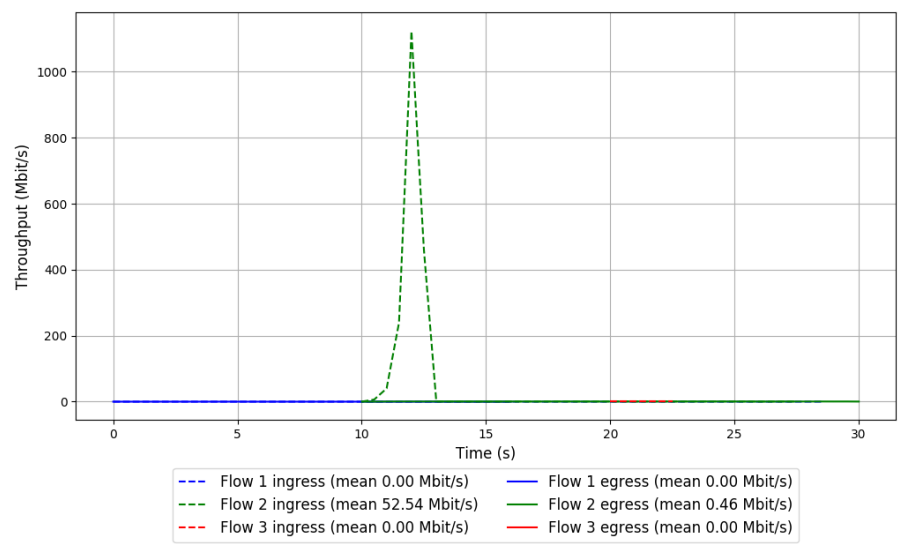
Start at: 2018-09-06 18:36:19

End at: 2018-09-06 18:36:49

Local clock offset: 4.077 ms

Remote clock offset: 1.106 ms

Run 3: Report of PCC-Allegro — Data Link



Run 1: Statistics of PCC-Expr

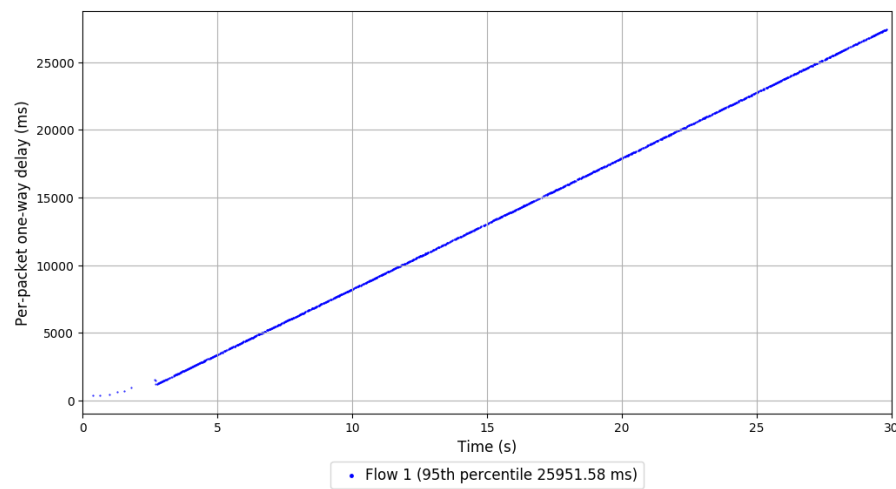
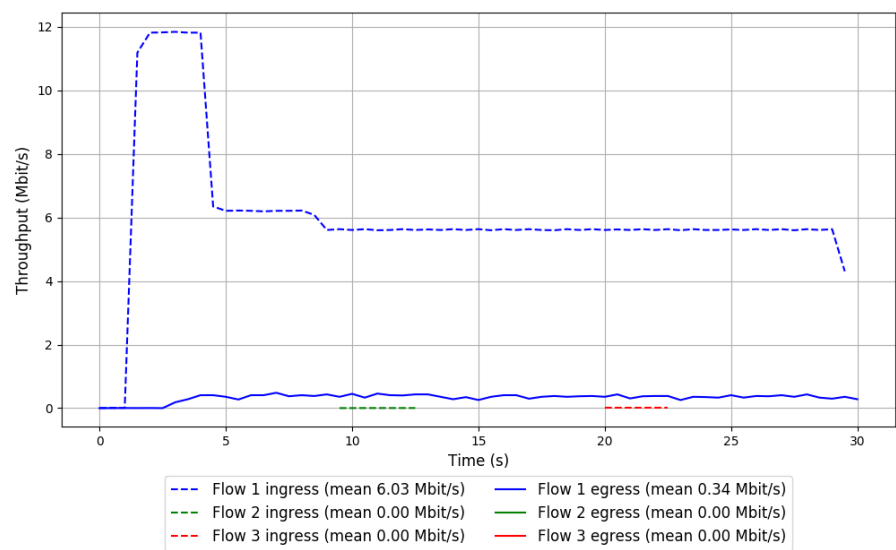
Start at: 2018-09-06 17:56:04

End at: 2018-09-06 17:56:34

Local clock offset: 2.838 ms

Remote clock offset: 1.104 ms

Run 1: Report of PCC-Expr — Data Link



Run 2: Statistics of PCC-Expr

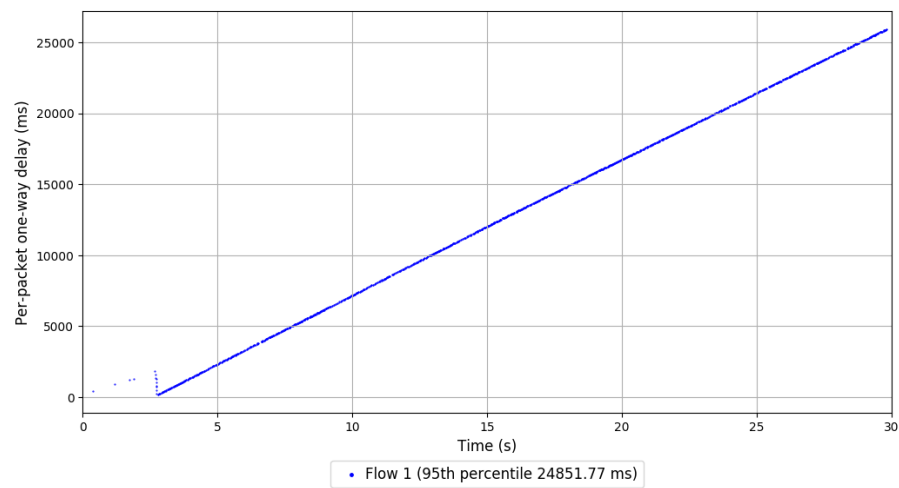
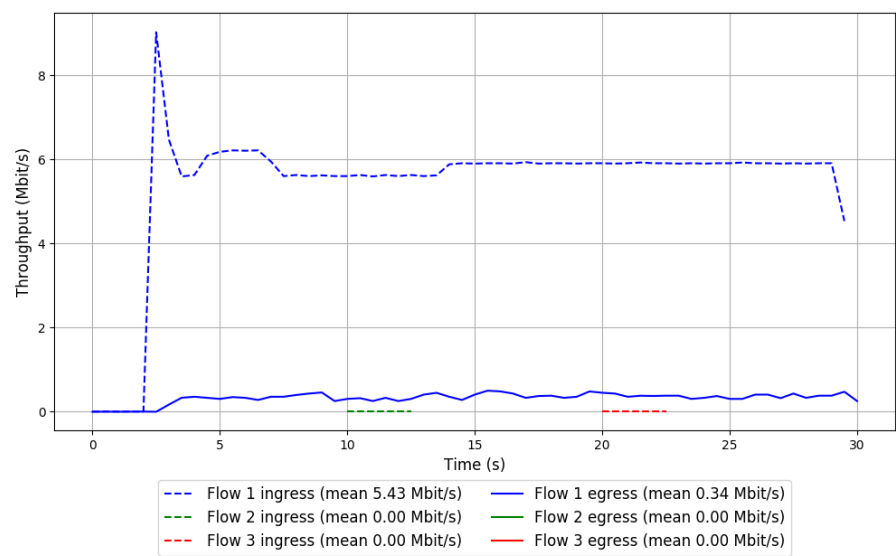
Start at: 2018-09-06 18:19:21

End at: 2018-09-06 18:19:51

Local clock offset: 4.206 ms

Remote clock offset: 0.049 ms

Run 2: Report of PCC-Expr — Data Link



Run 3: Statistics of PCC-Expr

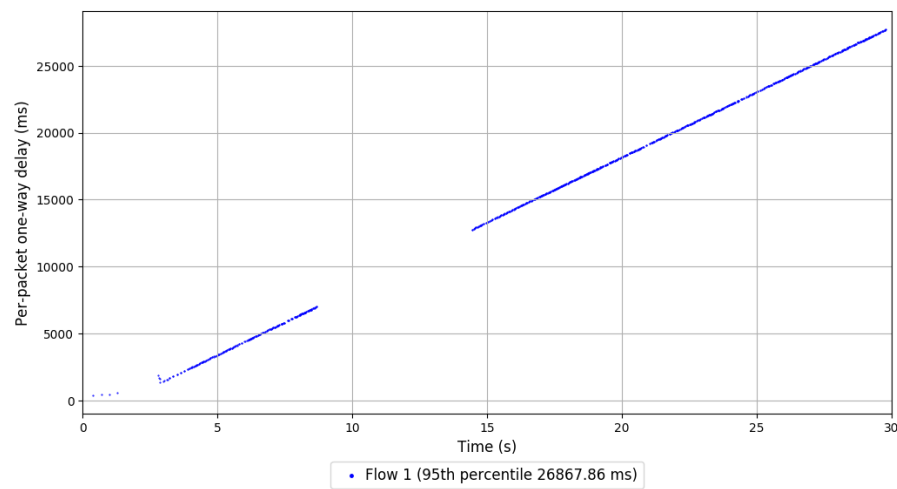
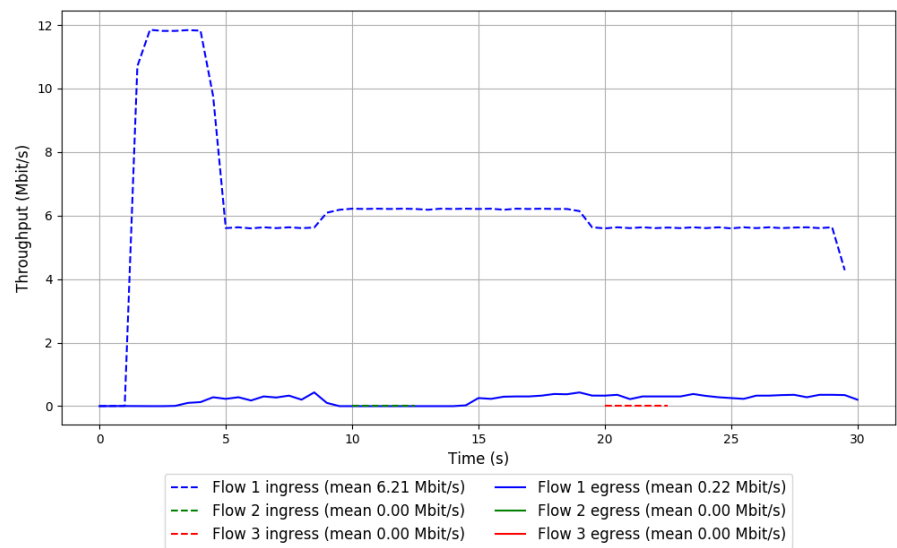
Start at: 2018-09-06 18:42:49

End at: 2018-09-06 18:43:19

Local clock offset: 4.078 ms

Remote clock offset: -0.136 ms

Run 3: Report of PCC-Expr — Data Link



Run 1: Statistics of QUIC Cubic

Start at: 2018-09-06 18:00:05

End at: 2018-09-06 18:00:35

Local clock offset: 2.58 ms

Remote clock offset: 0.047 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.36 Mbit/s

95th percentile per-packet one-way delay: 7365.930 ms

Loss rate: 24.86%

-- Flow 1:

Average throughput: 0.34 Mbit/s

95th percentile per-packet one-way delay: 7356.140 ms

Loss rate: 25.82%

-- Flow 2:

Average throughput: 0.04 Mbit/s

95th percentile per-packet one-way delay: 7396.168 ms

Loss rate: 0.00%

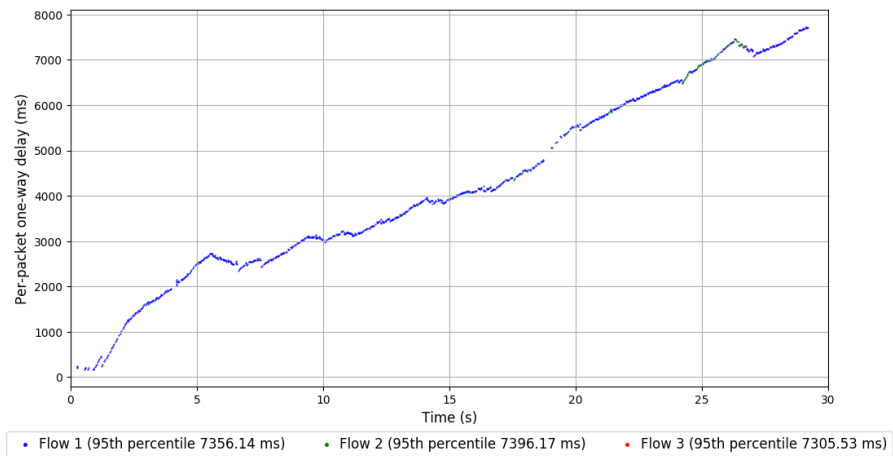
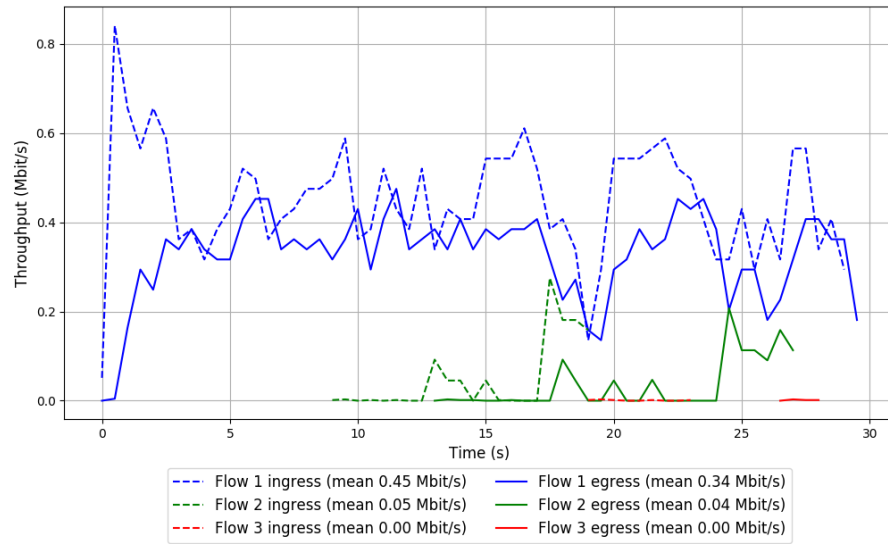
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 7305.528 ms

Loss rate: 33.33%

Run 1: Report of QUIC Cubic — Data Link



Run 2: Statistics of QUIC Cubic

Start at: 2018-09-06 18:23:41

End at: 2018-09-06 18:24:11

Local clock offset: 3.742 ms

Remote clock offset: 1.086 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.39 Mbit/s

95th percentile per-packet one-way delay: 9140.891 ms

Loss rate: 32.24%

-- Flow 1:

Average throughput: 0.39 Mbit/s

95th percentile per-packet one-way delay: 9140.891 ms

Loss rate: 32.24%

-- Flow 2:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 6788.462 ms

Loss rate: 0.00%

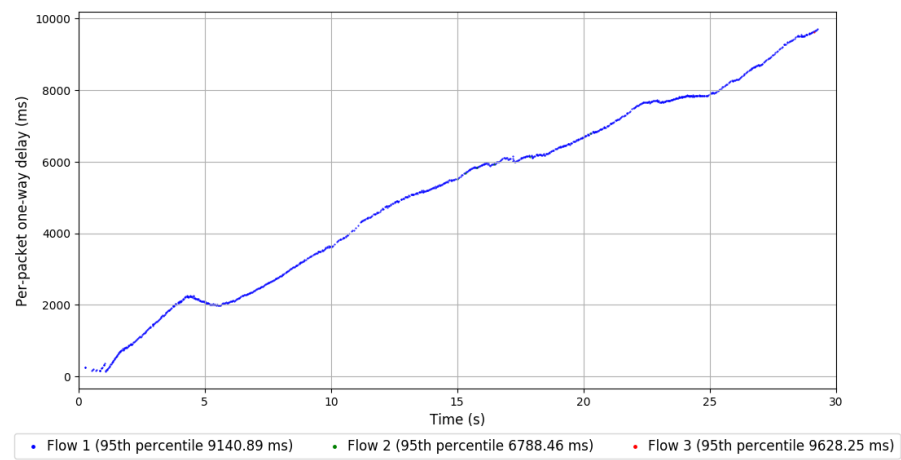
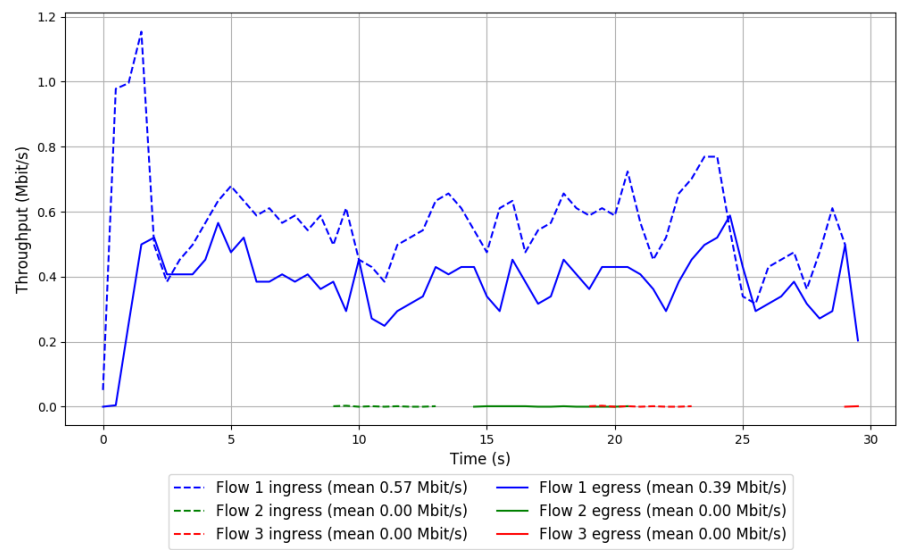
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 9628.255 ms

Loss rate: 83.33%

Run 2: Report of QUIC Cubic — Data Link



Run 3: Statistics of QUIC Cubic

Start at: 2018-09-06 18:46:49

End at: 2018-09-06 18:47:19

Local clock offset: 4.713 ms

Remote clock offset: 2.244 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.33 Mbit/s

95th percentile per-packet one-way delay: 8068.516 ms

Loss rate: 29.89%

-- Flow 1:

Average throughput: 0.31 Mbit/s

95th percentile per-packet one-way delay: 8068.811 ms

Loss rate: 30.77%

-- Flow 2:

Average throughput: 0.03 Mbit/s

95th percentile per-packet one-way delay: 7696.167 ms

Loss rate: 0.00%

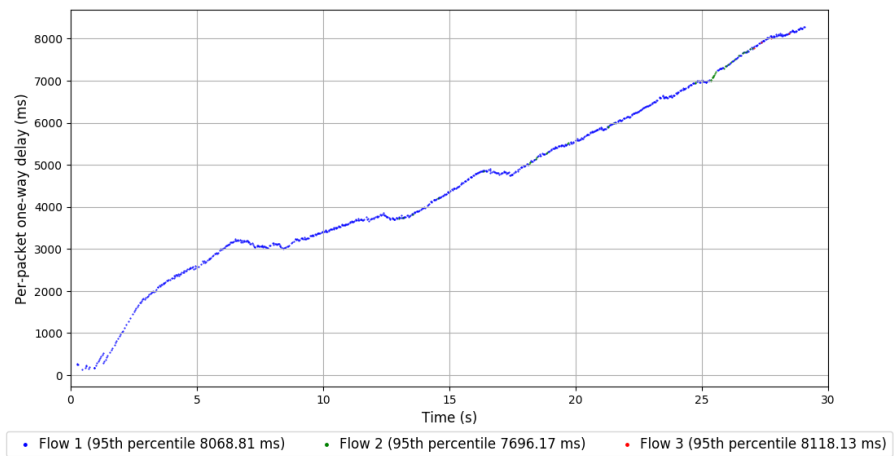
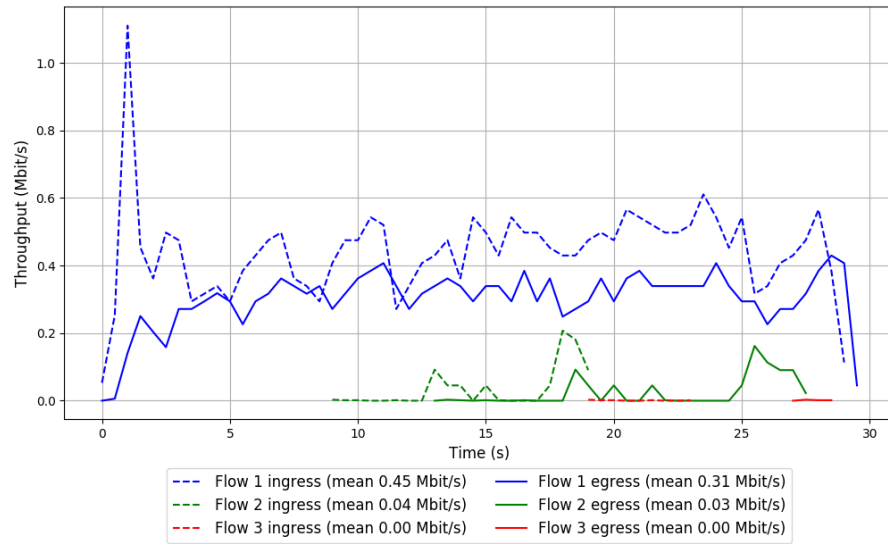
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 8118.126 ms

Loss rate: 33.33%

Run 3: Report of QUIC Cubic — Data Link

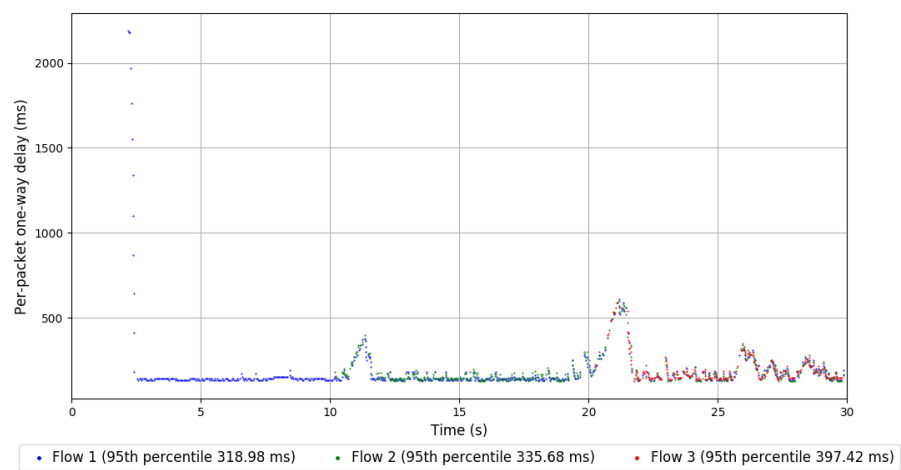
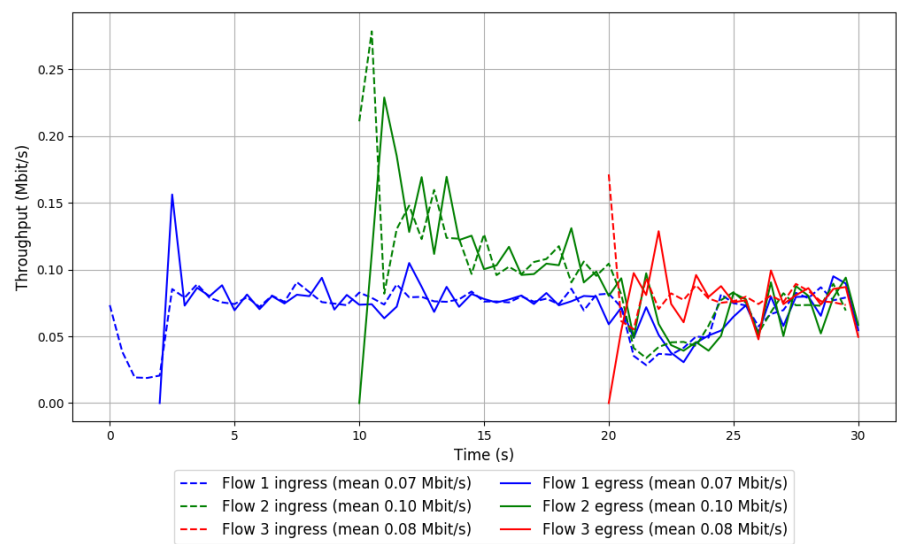


```
Run 1: Statistics of SCReAM

Start at: 2018-09-06 17:47:13
End at: 2018-09-06 17:47:43
Local clock offset: 0.684 ms
Remote clock offset: 2.232 ms

# Below is generated by plot.py at 2018-09-06 18:48:00
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 337.669 ms
Loss rate: 1.29%
-- Flow 1:
Average throughput: 0.07 Mbit/s
95th percentile per-packet one-way delay: 318.980 ms
Loss rate: 1.03%
-- Flow 2:
Average throughput: 0.10 Mbit/s
95th percentile per-packet one-way delay: 335.682 ms
Loss rate: 1.02%
-- Flow 3:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 397.417 ms
Loss rate: 2.58%
```

Run 1: Report of SCSReAM — Data Link

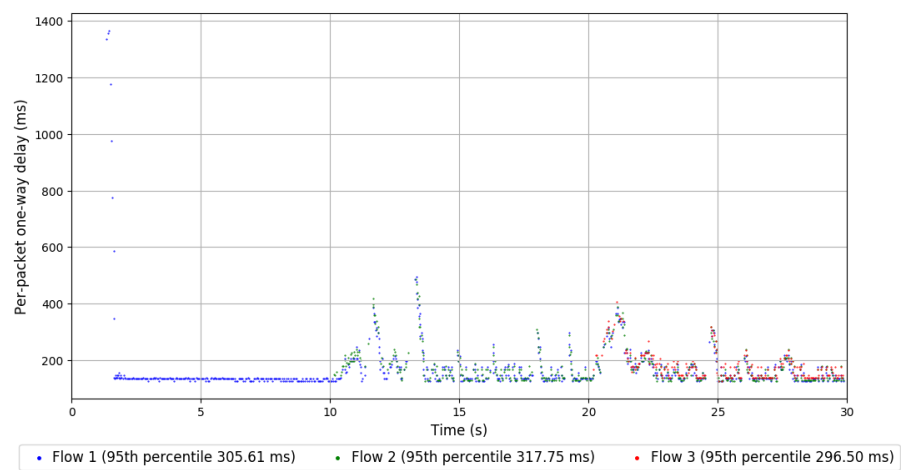
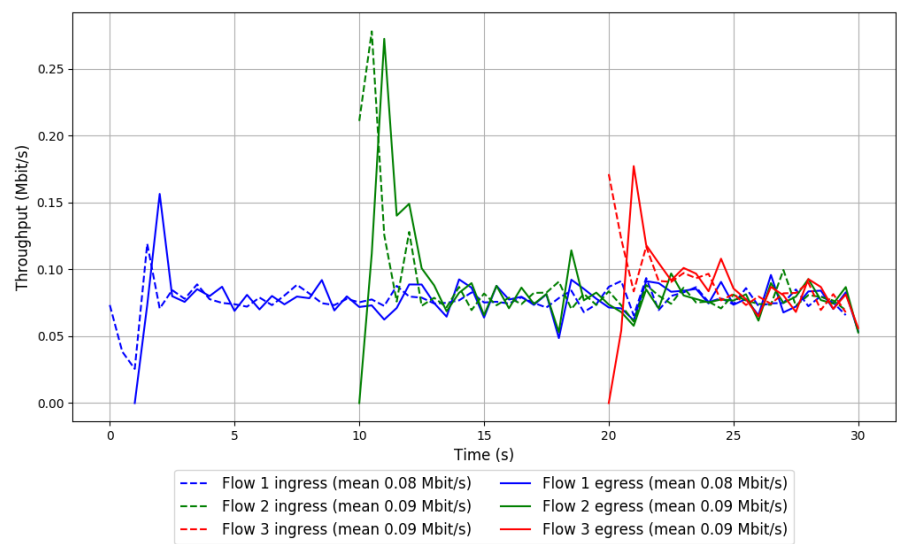


Run 2: Statistics of SCReAM

Start at: 2018-09-06 18:10:22
End at: 2018-09-06 18:10:52
Local clock offset: 3.056 ms
Remote clock offset: 2.442 ms

Below is generated by plot.py at 2018-09-06 18:48:00
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 307.714 ms
Loss rate: 0.99%
-- Flow 1:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 305.613 ms
Loss rate: 0.65%
-- Flow 2:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 317.750 ms
Loss rate: 0.93%
-- Flow 3:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 296.495 ms
Loss rate: 1.99%

Run 2: Report of SReAM — Data Link

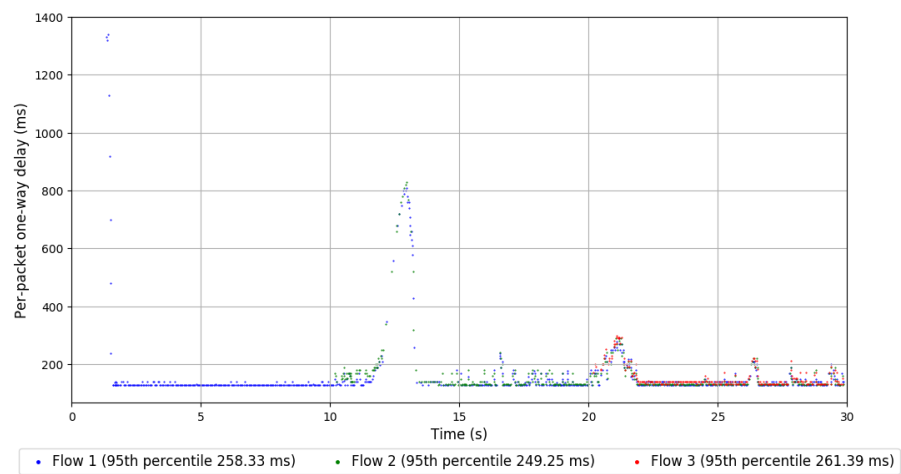
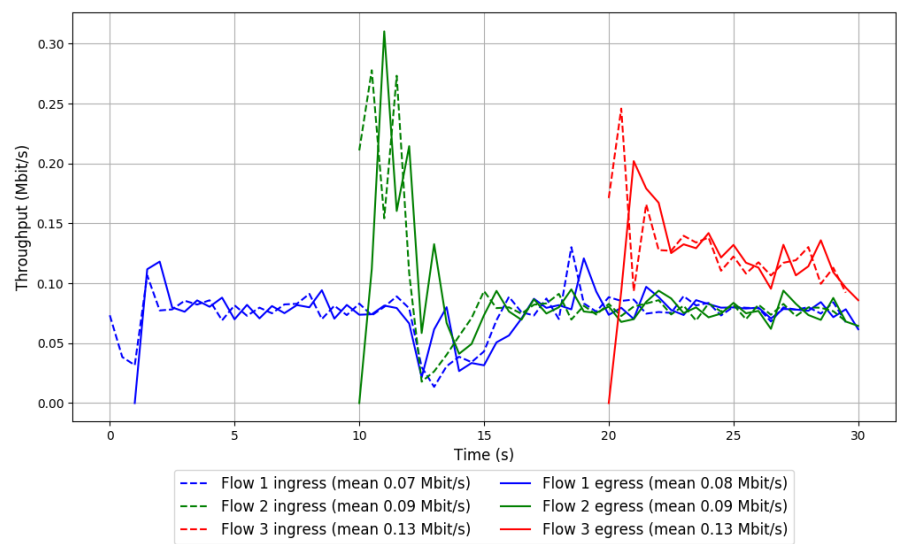


Run 3: Statistics of SCReAM

Start at: 2018-09-06 18:33:51
End at: 2018-09-06 18:34:21
Local clock offset: 4.049 ms
Remote clock offset: 2.204 ms

Below is generated by plot.py at 2018-09-06 18:48:00
Datalink statistics
-- Total of 3 flows:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 249.708 ms
Loss rate: 1.05%
-- Flow 1:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 258.327 ms
Loss rate: 0.69%
-- Flow 2:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 249.248 ms
Loss rate: 0.89%
-- Flow 3:
Average throughput: 0.13 Mbit/s
95th percentile per-packet one-way delay: 261.392 ms
Loss rate: 1.91%

Run 3: Report of SReAM — Data Link



Run 1: Statistics of Sprout

Start at: 2018-09-06 17:48:26

End at: 2018-09-06 17:48:56

Local clock offset: 0.309 ms

Remote clock offset: 0.055 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 1048.064 ms

Loss rate: 1.46%

-- Flow 1:

Average throughput: 0.10 Mbit/s

95th percentile per-packet one-way delay: 1078.240 ms

Loss rate: 0.79%

-- Flow 2:

Average throughput: 0.10 Mbit/s

95th percentile per-packet one-way delay: 944.323 ms

Loss rate: 2.20%

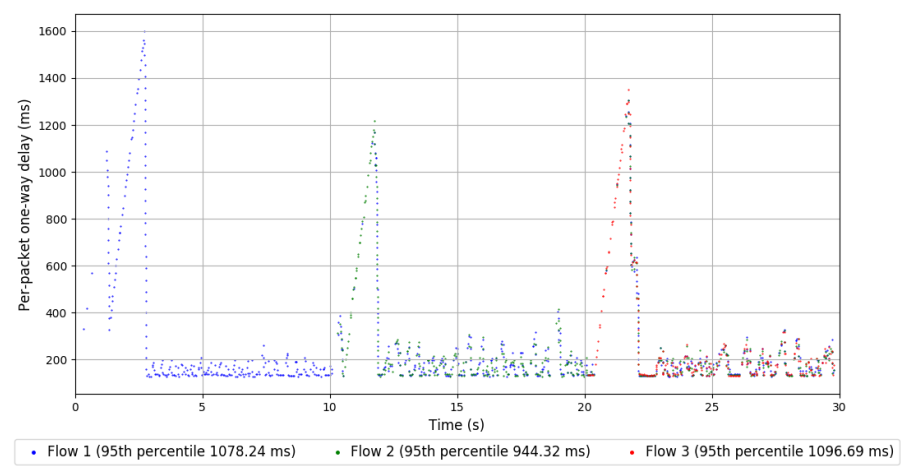
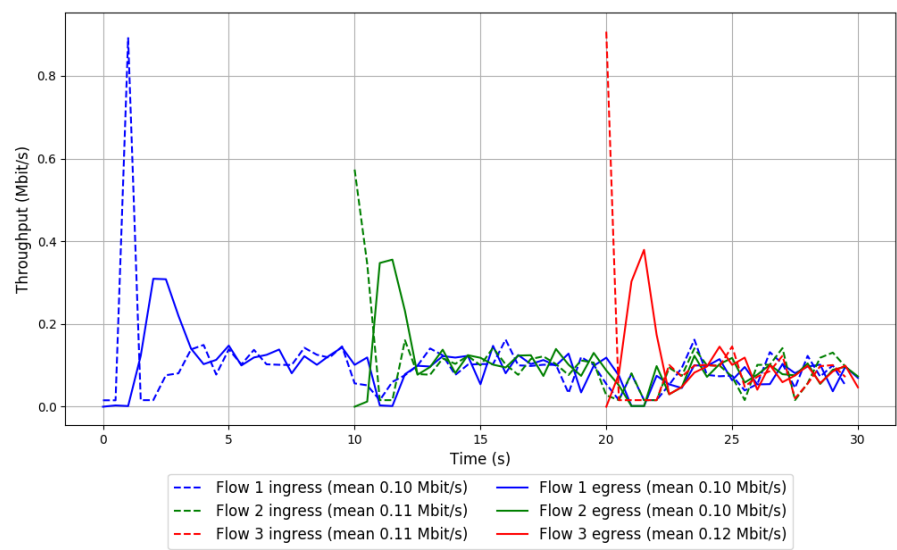
-- Flow 3:

Average throughput: 0.12 Mbit/s

95th percentile per-packet one-way delay: 1096.692 ms

Loss rate: 1.87%

Run 1: Report of Sprout — Data Link



Run 2: Statistics of Sprout

Start at: 2018-09-06 18:11:36

End at: 2018-09-06 18:12:06

Local clock offset: 3.832 ms

Remote clock offset: 1.096 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.20 Mbit/s

95th percentile per-packet one-way delay: 1611.347 ms

Loss rate: 0.86%

-- Flow 1:

Average throughput: 0.09 Mbit/s

95th percentile per-packet one-way delay: 1996.119 ms

Loss rate: 0.84%

-- Flow 2:

Average throughput: 0.11 Mbit/s

95th percentile per-packet one-way delay: 1448.812 ms

Loss rate: 1.09%

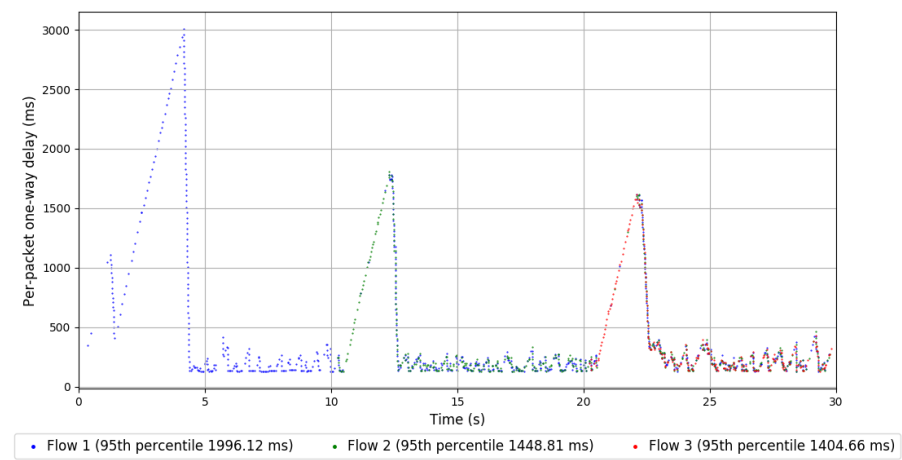
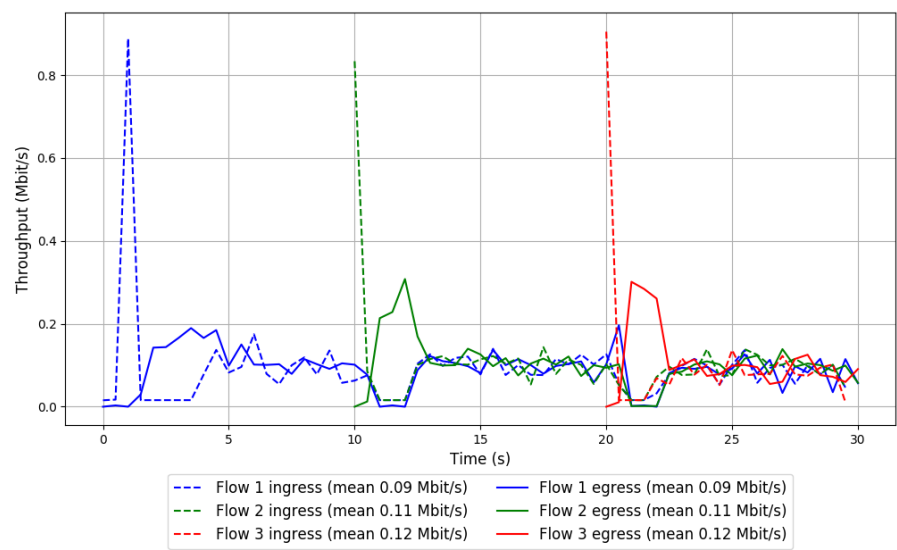
-- Flow 3:

Average throughput: 0.12 Mbit/s

95th percentile per-packet one-way delay: 1404.662 ms

Loss rate: 0.49%

Run 2: Report of Sprout — Data Link



Run 3: Statistics of Sprout

Start at: 2018-09-06 18:35:04

End at: 2018-09-06 18:35:34

Local clock offset: 4.071 ms

Remote clock offset: 0.067 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.25 Mbit/s

95th percentile per-packet one-way delay: 883.621 ms

Loss rate: 1.05%

-- Flow 1:

Average throughput: 0.12 Mbit/s

95th percentile per-packet one-way delay: 898.073 ms

Loss rate: 0.98%

-- Flow 2:

Average throughput: 0.13 Mbit/s

95th percentile per-packet one-way delay: 788.347 ms

Loss rate: 0.88%

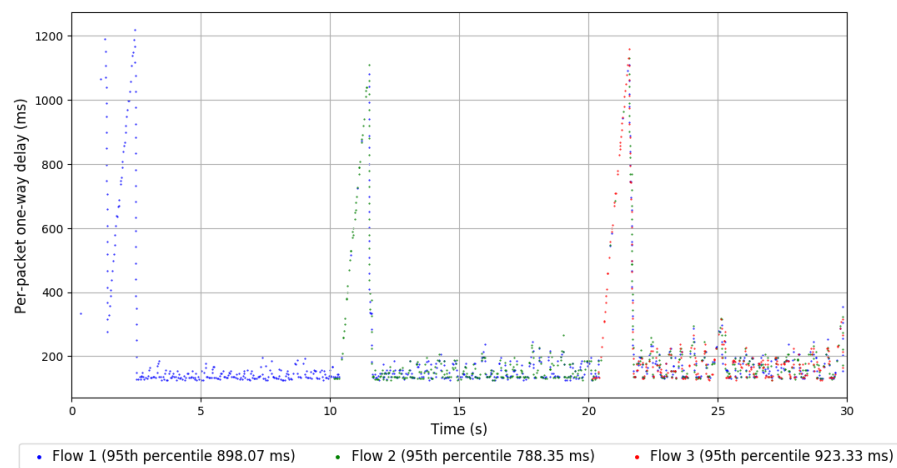
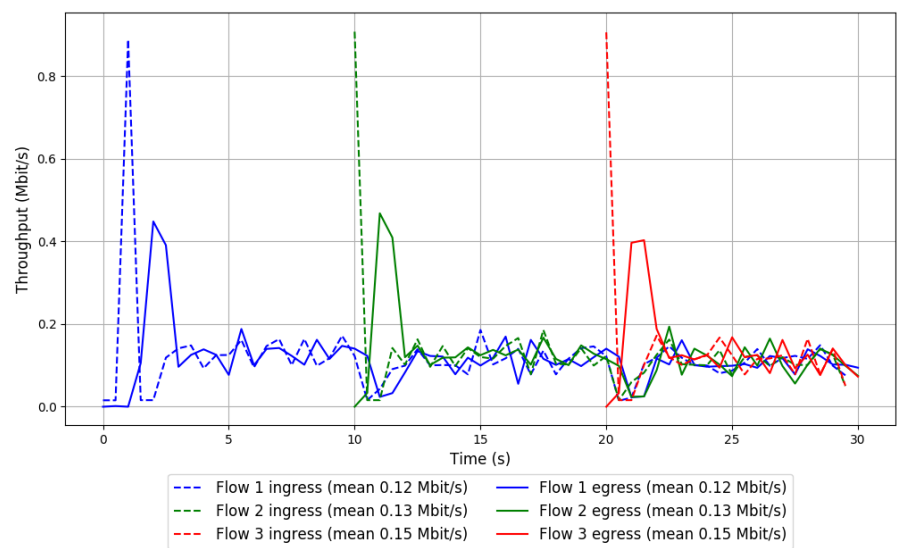
-- Flow 3:

Average throughput: 0.15 Mbit/s

95th percentile per-packet one-way delay: 923.330 ms

Loss rate: 1.53%

Run 3: Report of Sprout — Data Link



Run 1: Statistics of TaoVA-100x

/home/ubuntu/pantheon/data/2018-09-06T17-38-Colombia-cellular-to-AWS-Brazil-2-3-runs-3-flows

Run 1: Report of TaoVA-100x — Data Link

Figure is missing

Figure is missing

Run 2: Statistics of TaoVA-100x

/home/ubuntu/pantheon/data/2018-09-06T17-38-Colombia-cellular-to-AWS-Brazil-2-3-runs-3-flows

Run 2: Report of TaoVA-100x — Data Link

Figure is missing

Figure is missing

Run 3: Statistics of TaoVA-100x

/home/ubuntu/pantheon/data/2018-09-06T17-38-Colombia-cellular-to-AWS-Brazil-2-3-runs-3-flows

Run 3: Report of TaoVA-100x — Data Link

Figure is missing

Figure is missing

Run 1: Statistics of TCP Vegas

Start at: 2018-09-06 17:53:38

End at: 2018-09-06 17:54:08

Local clock offset: 2.522 ms

Remote clock offset: 0.091 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.33 Mbit/s

95th percentile per-packet one-way delay: 1148.590 ms

Loss rate: 2.53%

-- Flow 1:

Average throughput: 0.14 Mbit/s

95th percentile per-packet one-way delay: 895.029 ms

Loss rate: 0.57%

-- Flow 2:

Average throughput: 0.17 Mbit/s

95th percentile per-packet one-way delay: 977.518 ms

Loss rate: 1.09%

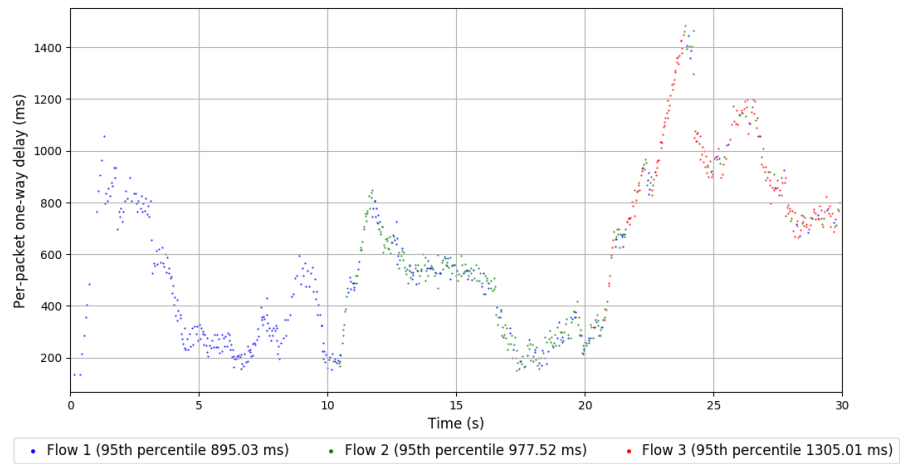
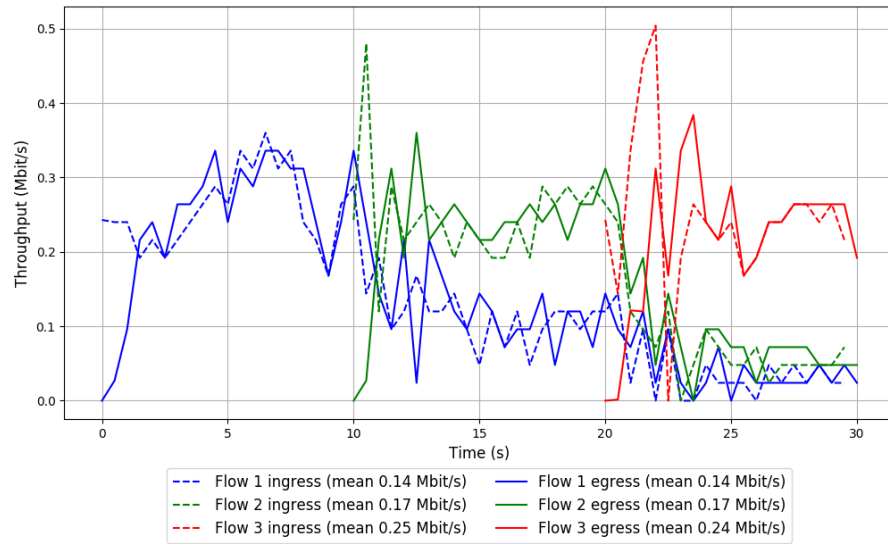
-- Flow 3:

Average throughput: 0.24 Mbit/s

95th percentile per-packet one-way delay: 1305.012 ms

Loss rate: 7.80%

Run 1: Report of TCP Vegas — Data Link



Run 2: Statistics of TCP Vegas

Start at: 2018-09-06 18:16:52

End at: 2018-09-06 18:17:22

Local clock offset: 4.057 ms

Remote clock offset: 1.324 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.38 Mbit/s

95th percentile per-packet one-way delay: 2414.872 ms

Loss rate: 12.66%

-- Flow 1:

Average throughput: 0.24 Mbit/s

95th percentile per-packet one-way delay: 2178.644 ms

Loss rate: 4.33%

-- Flow 2:

Average throughput: 0.17 Mbit/s

95th percentile per-packet one-way delay: 2385.448 ms

Loss rate: 9.55%

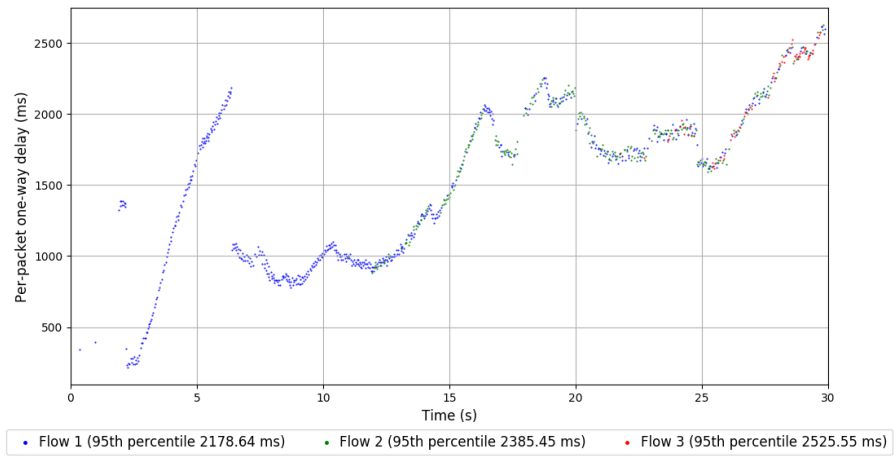
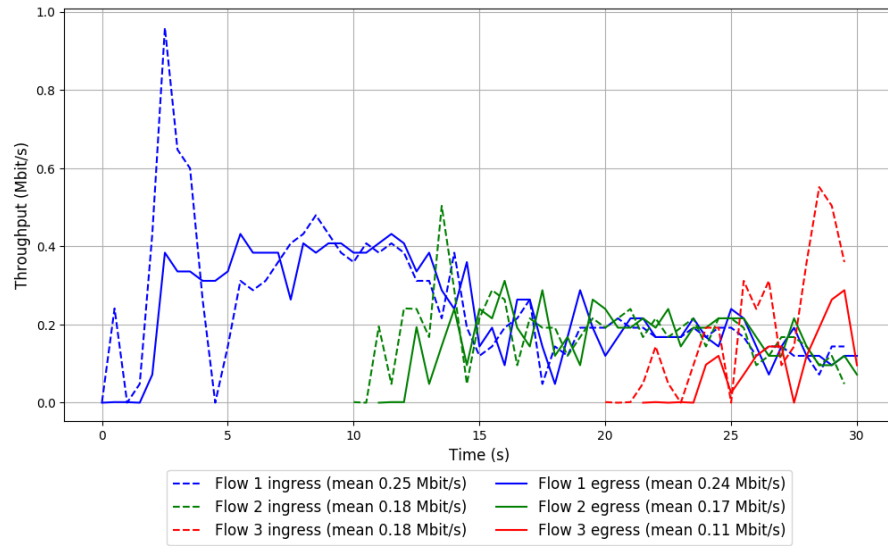
-- Flow 3:

Average throughput: 0.11 Mbit/s

95th percentile per-packet one-way delay: 2525.550 ms

Loss rate: 53.25%

Run 2: Report of TCP Vegas — Data Link



Run 3: Statistics of TCP Vegas

Start at: 2018-09-06 18:40:22

End at: 2018-09-06 18:40:52

Local clock offset: 4.023 ms

Remote clock offset: 2.22 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.35 Mbit/s

95th percentile per-packet one-way delay: 3911.757 ms

Loss rate: 10.49%

-- Flow 1:

Average throughput: 0.24 Mbit/s

95th percentile per-packet one-way delay: 3861.910 ms

Loss rate: 6.08%

-- Flow 2:

Average throughput: 0.17 Mbit/s

95th percentile per-packet one-way delay: 4020.354 ms

Loss rate: 18.85%

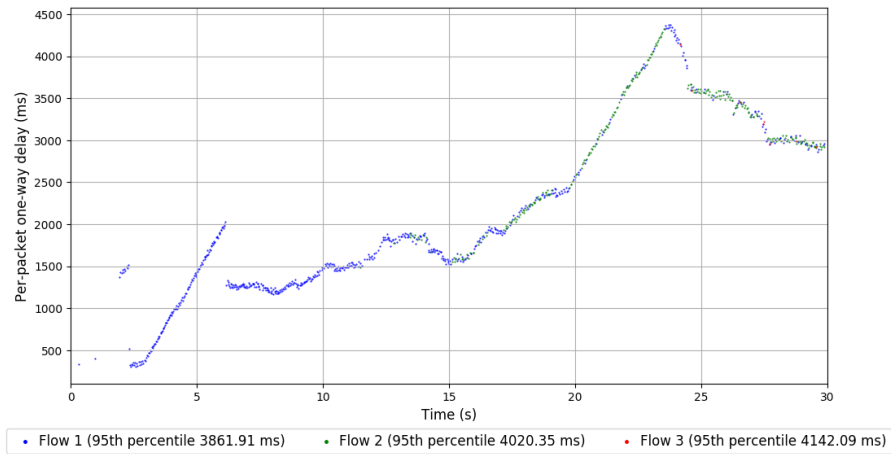
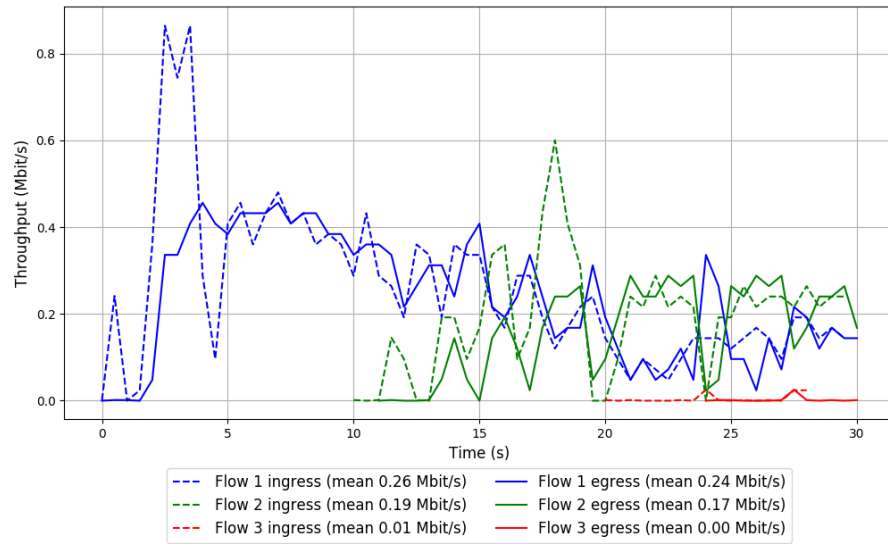
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 4142.094 ms

Loss rate: 58.37%

Run 3: Report of TCP Vegas — Data Link



Run 1: Statistics of Verus

Start at: 2018-09-06 17:44:47

End at: 2018-09-06 17:45:17

Local clock offset: -0.978 ms

Remote clock offset: 0.178 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.53 Mbit/s

95th percentile per-packet one-way delay: 4760.616 ms

Loss rate: 34.91%

-- Flow 1:

Average throughput: 0.51 Mbit/s

95th percentile per-packet one-way delay: 4780.618 ms

Loss rate: 35.63%

-- Flow 2:

Average throughput: 0.02 Mbit/s

95th percentile per-packet one-way delay: 4455.225 ms

Loss rate: 3.57%

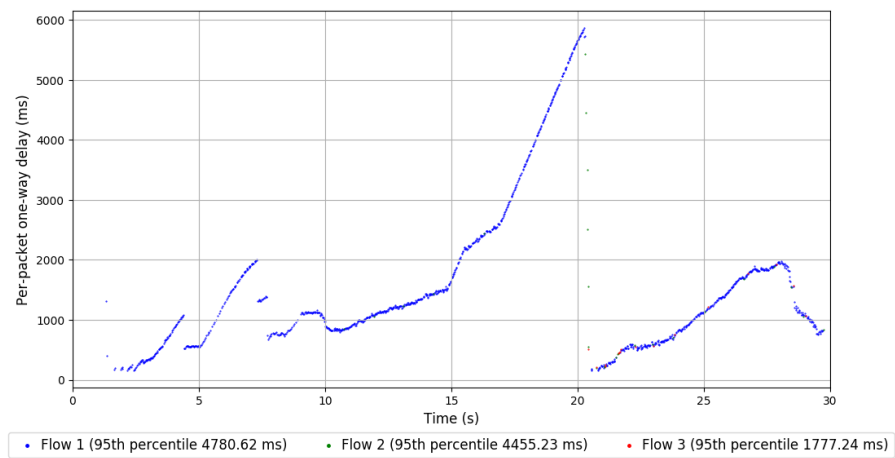
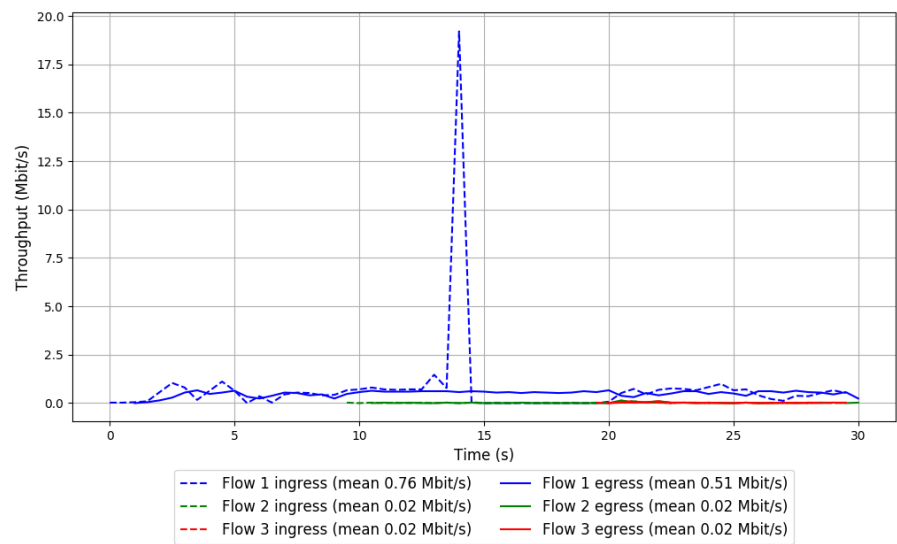
-- Flow 3:

Average throughput: 0.02 Mbit/s

95th percentile per-packet one-way delay: 1777.245 ms

Loss rate: 5.88%

Run 1: Report of Verus — Data Link



Run 2: Statistics of Verus

Start at: 2018-09-06 18:07:52

End at: 2018-09-06 18:08:22

Local clock offset: 3.768 ms

Remote clock offset: 1.221 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.23 Mbit/s

95th percentile per-packet one-way delay: 2648.390 ms

Loss rate: 7.17%

-- Flow 1:

Average throughput: 0.21 Mbit/s

95th percentile per-packet one-way delay: 2717.589 ms

Loss rate: 7.31%

-- Flow 2:

Average throughput: 0.02 Mbit/s

95th percentile per-packet one-way delay: 2540.984 ms

Loss rate: 3.57%

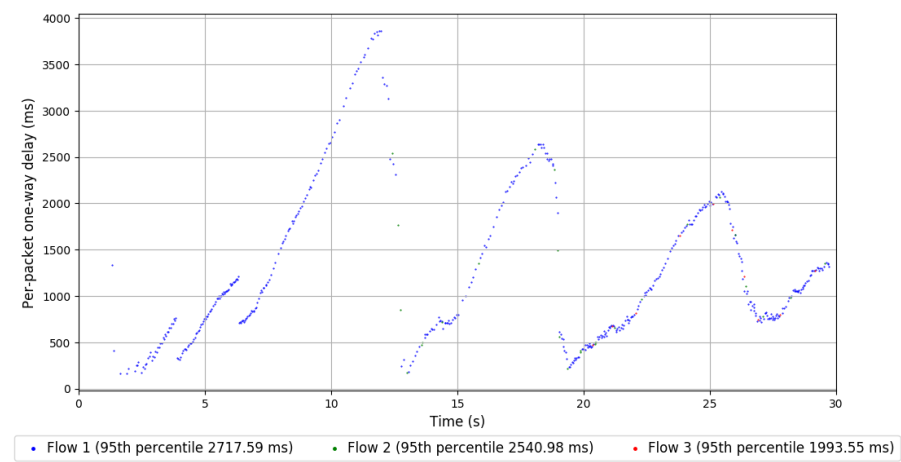
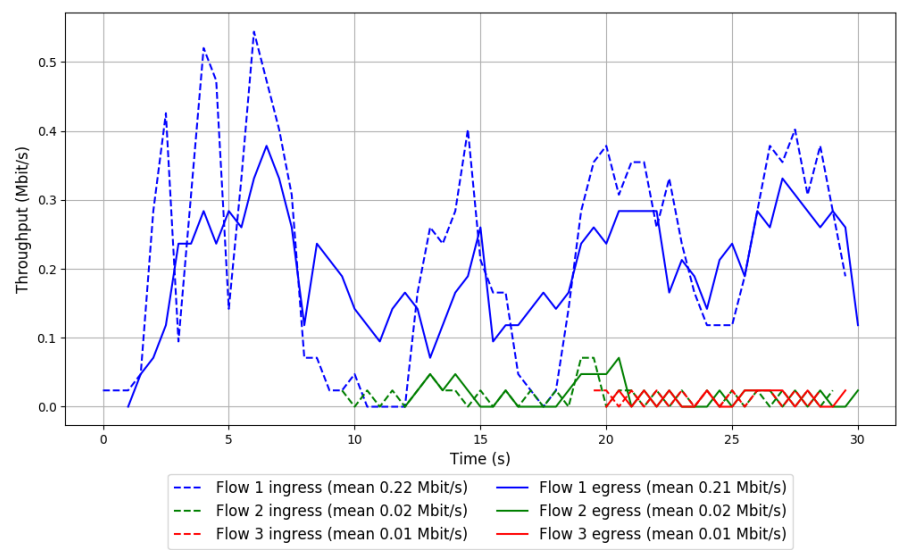
-- Flow 3:

Average throughput: 0.01 Mbit/s

95th percentile per-packet one-way delay: 1993.552 ms

Loss rate: 9.09%

Run 2: Report of Verus — Data Link



Run 3: Statistics of Verus

Start at: 2018-09-06 18:31:25

End at: 2018-09-06 18:31:55

Local clock offset: 4.803 ms

Remote clock offset: 0.067 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.28 Mbit/s

95th percentile per-packet one-way delay: 5138.283 ms

Loss rate: 1.37%

-- Flow 1:

Average throughput: 0.27 Mbit/s

95th percentile per-packet one-way delay: 5107.966 ms

Loss rate: 1.12%

-- Flow 2:

Average throughput: 0.01 Mbit/s

95th percentile per-packet one-way delay: 4742.950 ms

Loss rate: 4.76%

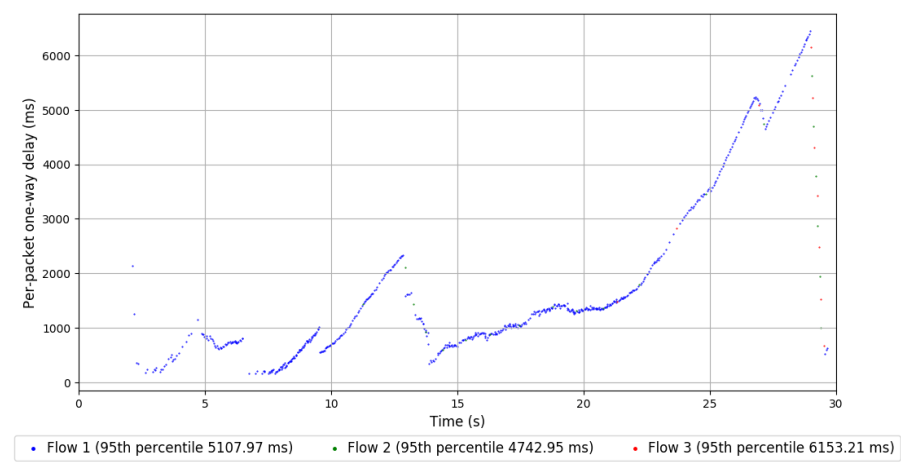
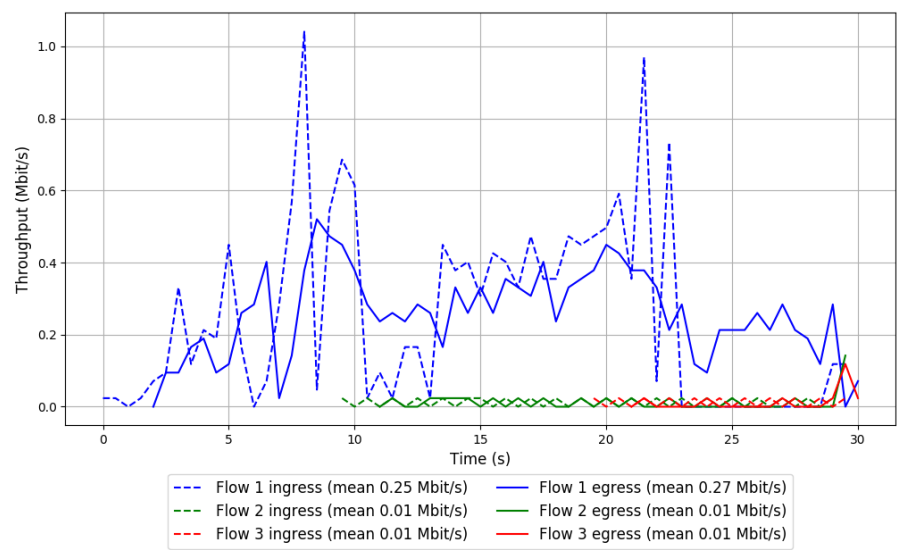
-- Flow 3:

Average throughput: 0.01 Mbit/s

95th percentile per-packet one-way delay: 6153.210 ms

Loss rate: 9.09%

Run 3: Report of Verus — Data Link



Run 1: Statistics of PCC-Vivace

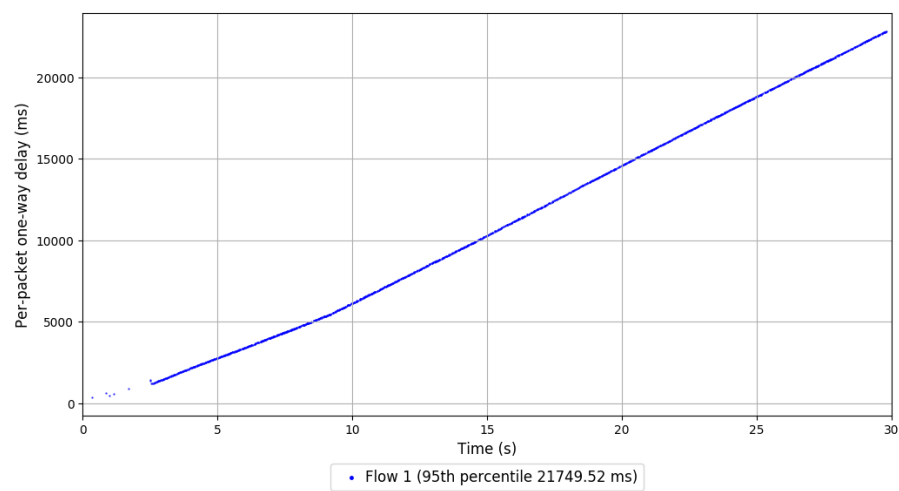
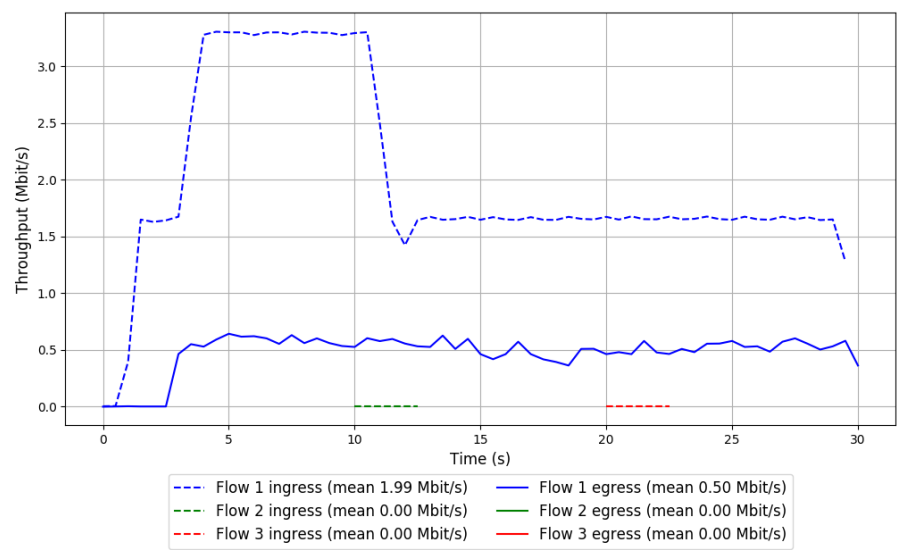
Start at: 2018-09-06 17:41:06

End at: 2018-09-06 17:41:36

Local clock offset: -0.688 ms

Remote clock offset: 0.101 ms

Run 1: Report of PCC-Vivace — Data Link



Run 2: Statistics of PCC-Vivace

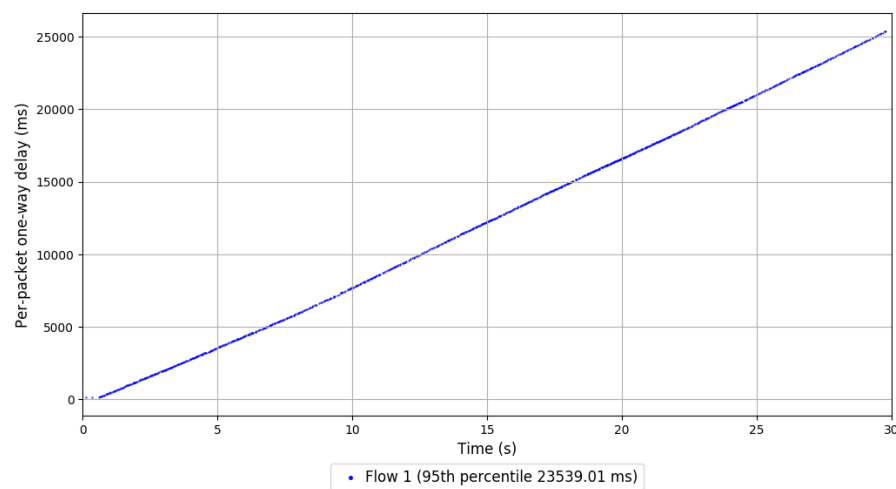
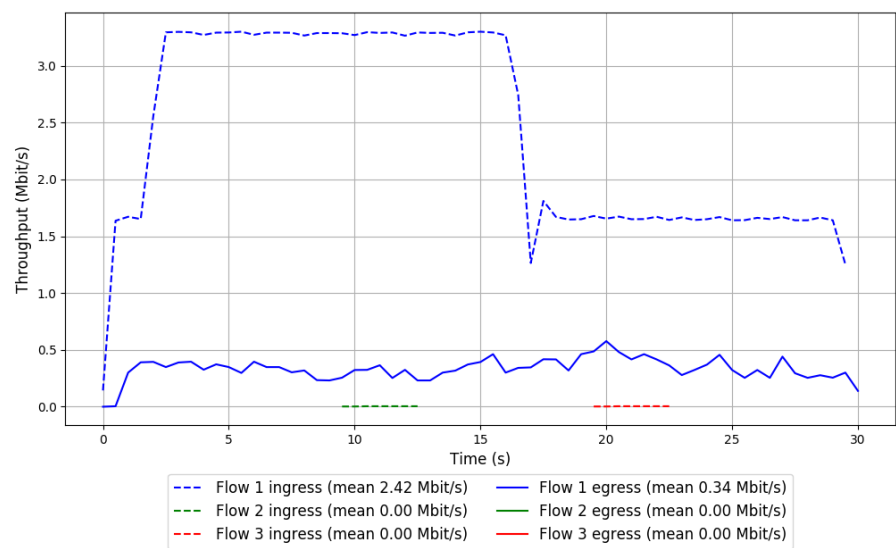
Start at: 2018-09-06 18:03:53

End at: 2018-09-06 18:04:23

Local clock offset: 2.786 ms

Remote clock offset: 2.358 ms

Run 2: Report of PCC-Vivace — Data Link



Run 3: Statistics of PCC-Vivace

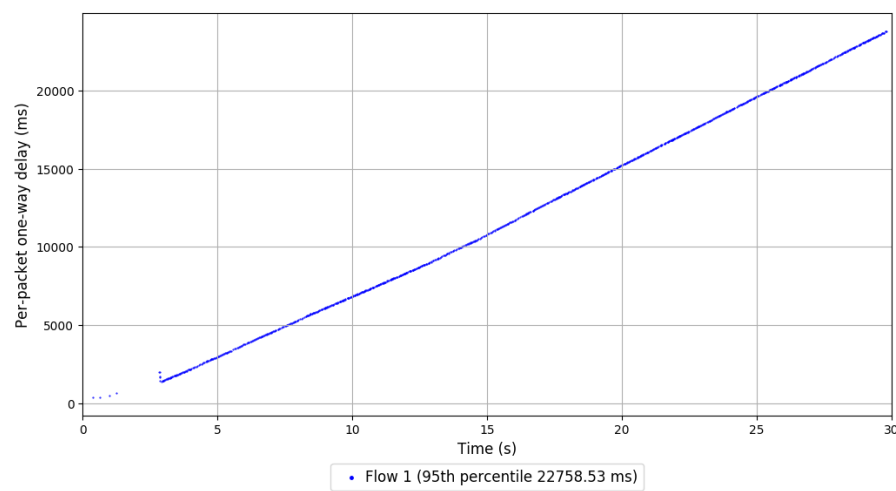
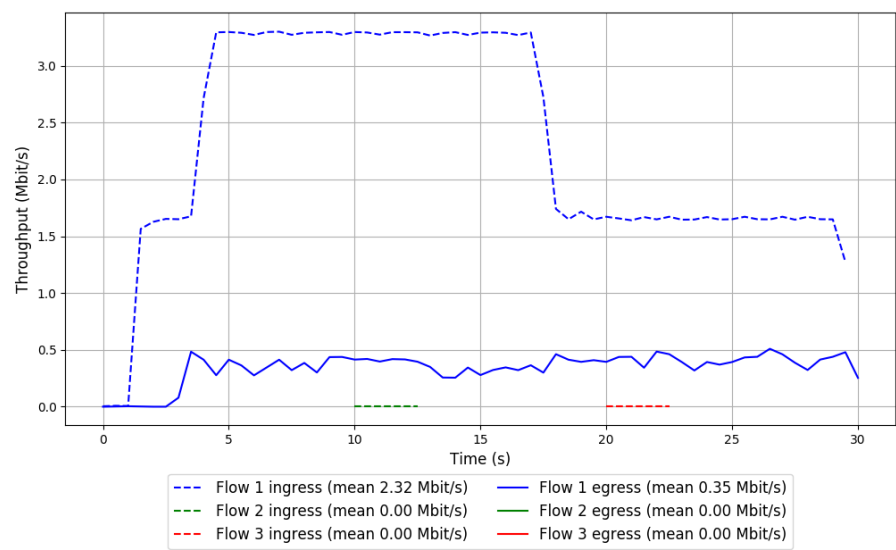
Start at: 2018-09-06 18:27:24

End at: 2018-09-06 18:27:54

Local clock offset: 4.717 ms

Remote clock offset: -0.037 ms

Run 3: Report of PCC-Vivace — Data Link



Run 1: Statistics of WebRTC media

Start at: 2018-09-06 17:38:40

End at: 2018-09-06 17:39:10

Local clock offset: 0.189 ms

Remote clock offset: 1.172 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.28 Mbit/s

95th percentile per-packet one-way delay: 1923.205 ms

Loss rate: 0.18%

-- Flow 1:

Average throughput: 0.13 Mbit/s

95th percentile per-packet one-way delay: 1958.327 ms

Loss rate: 0.27%

-- Flow 2:

Average throughput: 0.11 Mbit/s

95th percentile per-packet one-way delay: 1931.788 ms

Loss rate: 0.00%

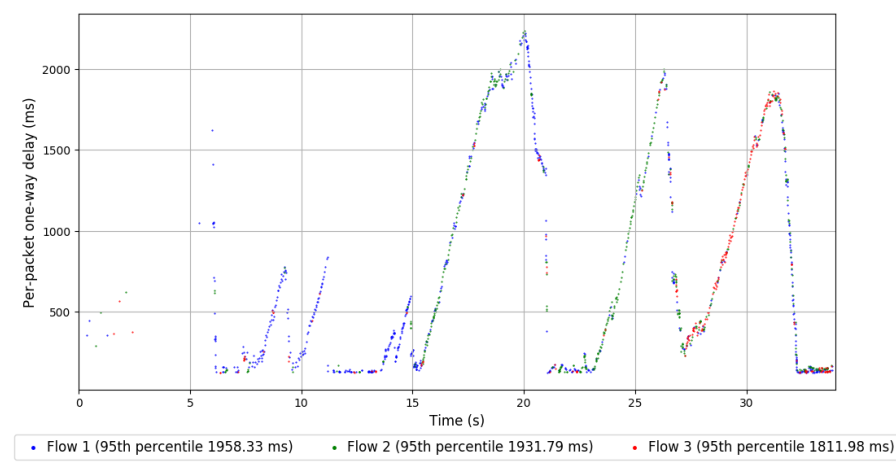
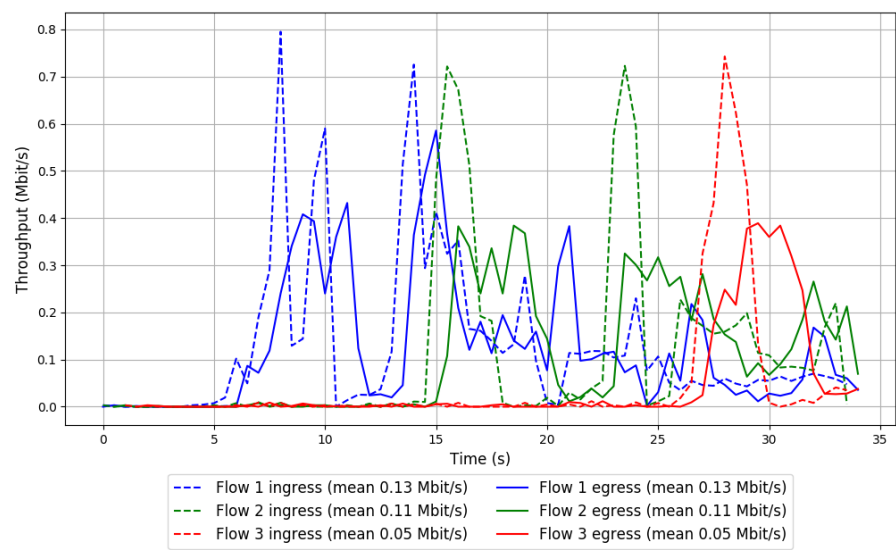
-- Flow 3:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 1811.981 ms

Loss rate: 0.33%

Run 1: Report of WebRTC media — Data Link



Run 2: Statistics of WebRTC media

Start at: 2018-09-06 18:01:19

End at: 2018-09-06 18:01:49

Local clock offset: 3.441 ms

Remote clock offset: 2.413 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.28 Mbit/s

95th percentile per-packet one-way delay: 3744.255 ms

Loss rate: 4.88%

-- Flow 1:

Average throughput: 0.14 Mbit/s

95th percentile per-packet one-way delay: 3620.731 ms

Loss rate: 1.69%

-- Flow 2:

Average throughput: 0.10 Mbit/s

95th percentile per-packet one-way delay: 3913.476 ms

Loss rate: 10.48%

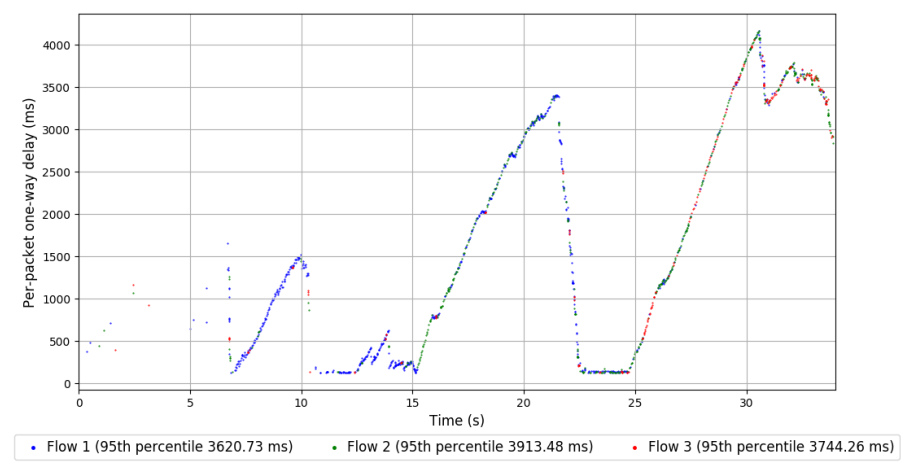
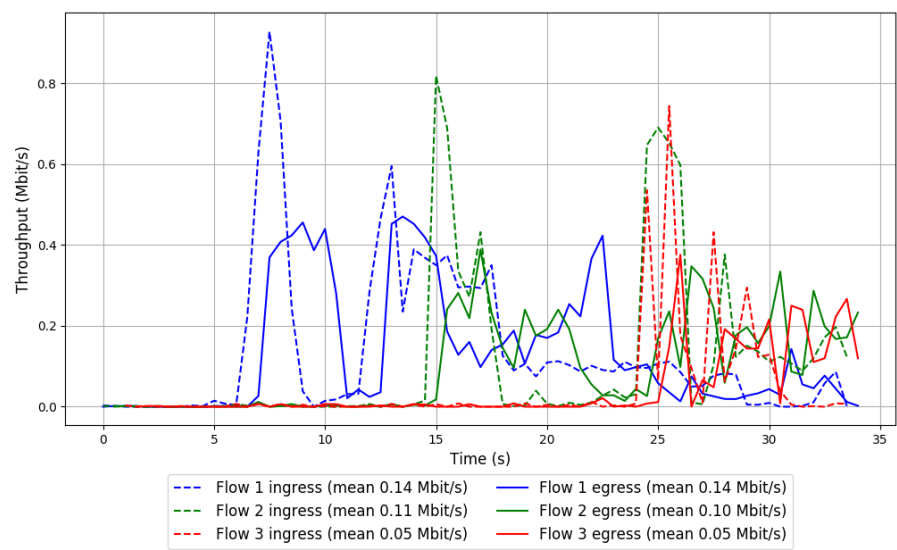
-- Flow 3:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 3744.255 ms

Loss rate: 0.74%

Run 2: Report of WebRTC media — Data Link



Run 3: Statistics of WebRTC media

Start at: 2018-09-06 18:24:56

End at: 2018-09-06 18:25:26

Local clock offset: 3.858 ms

Remote clock offset: 2.231 ms

Below is generated by plot.py at 2018-09-06 18:48:00

Datalink statistics

-- Total of 3 flows:

Average throughput: 0.29 Mbit/s

95th percentile per-packet one-way delay: 2103.018 ms

Loss rate: 0.39%

-- Flow 1:

Average throughput: 0.13 Mbit/s

95th percentile per-packet one-way delay: 2023.984 ms

Loss rate: 0.53%

-- Flow 2:

Average throughput: 0.11 Mbit/s

95th percentile per-packet one-way delay: 2119.527 ms

Loss rate: 0.25%

-- Flow 3:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 2153.723 ms

Loss rate: 0.33%

Run 3: Report of WebRTC media — Data Link

