

## Pantheon Report

Generated at 2018-06-18 16:04:05 (UTC).

Data path: AWS Korea Ethernet (*local*) → China ppp0 ppp0 (*remote*).

Repeated the test of 16 congestion control schemes 3 times.

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

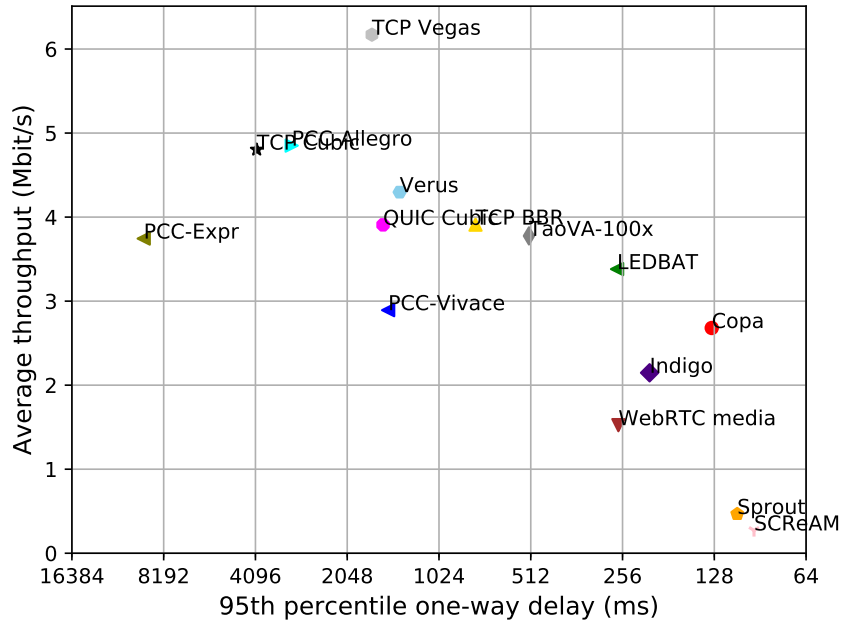
Increased UDP receive buffer to 16 MB (default) and 32 MB (max).

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

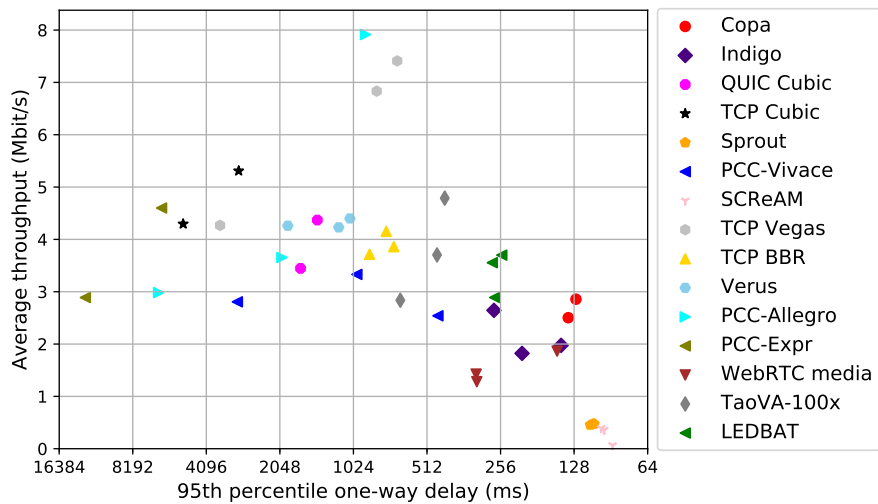
Git summary:

```
branch: master @ 9141c5f9450c85ea5ea2ea755a8e946998d3abf3
third_party/fillp @ d47f4fa1b454a5e3c0537115c5a28436dbd4b834
third_party/genericCC @ c7966e494a929986eaa5a9c169a7f381fe1bbbe5
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/pantheon-tunnel @ 6f038ed31259d366f9840f65b82cbe8f464b1b39
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-quirk @ 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 AWS Korea to China ppp0, 3 runs of 30s each per scheme  
 3 flows with 10s interval between flows (mean of all runs by scheme)



test from AWS Korea to China ppp0, 3 runs of 30s each per scheme  
 3 flows with 10s interval between flows



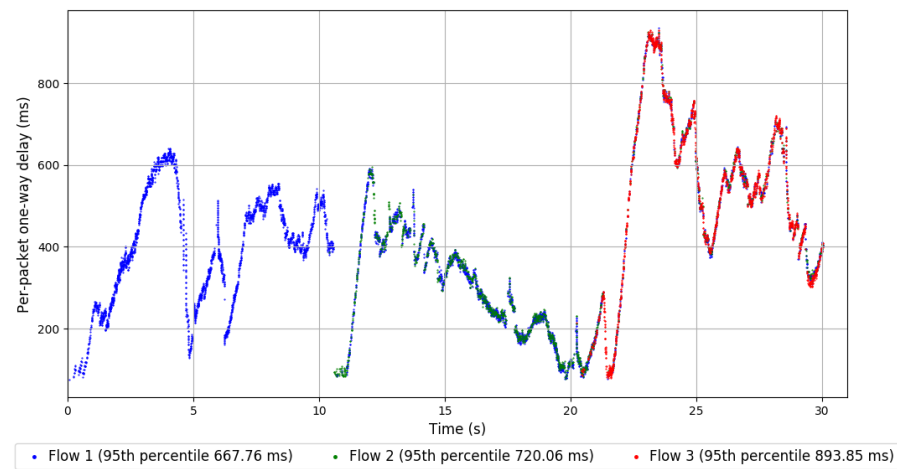
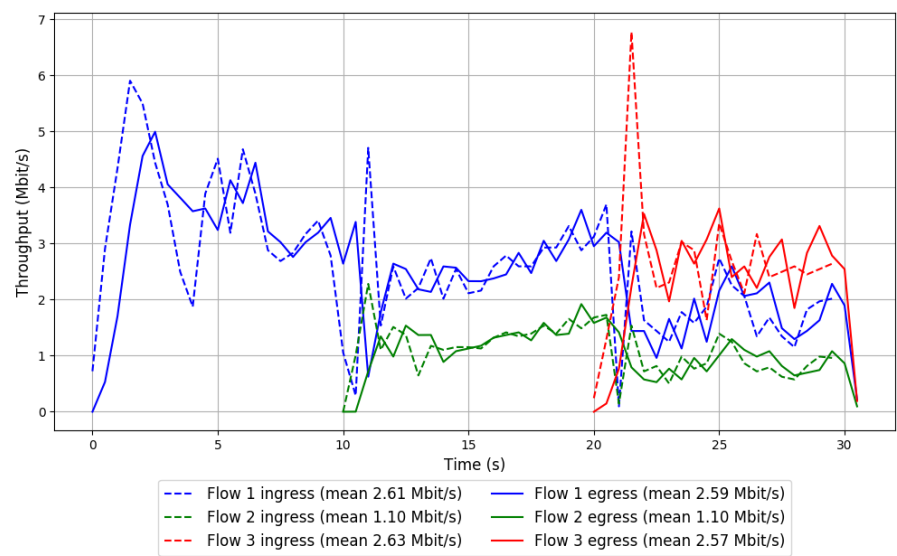
scheme	# runs	mean avg tput (Mbit/s)			mean 95th-%ile delay (ms)			mean loss rate (%)		
		flow 1	flow 2	flow 3	flow 1	flow 2	flow 3	flow 1	flow 2	flow 3
TCP BBR	3	2.55	1.35	1.46	737.40	786.54	911.22	1.09	1.99	5.92
Copa	2	1.33	1.35	1.36	121.67	131.53	147.09	0.10	0.24	0.29
TCP Cubic	2	4.53	0.44	0.04	4007.40	4046.58	3964.71	11.49	32.05	56.60
FillP	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indigo	3	0.83	1.28	1.46	334.95	190.19	180.14	0.16	0.19	0.29
LEDBAT	3	2.63	0.85	0.56	262.08	269.78	278.61	0.32	0.95	2.25
PCC-Allegro	3	3.70	1.57	0.39	3051.96	3241.02	3259.51	36.67	41.34	49.22
PCC-Expr	2	3.75	0.01	0.00	9526.16	8928.24	7222.75	35.72	40.42	62.84
QUIC Cubic	2	3.25	0.83	0.40	1541.92	1578.91	1633.28	3.93	6.89	22.23
SCReAM	3	0.16	0.11	0.12	99.02	92.21	95.41	0.00	0.00	0.64
Sprout	3	0.22	0.25	0.25	108.54	104.81	108.74	0.06	0.16	0.00
TaoVA-100x	3	2.08	1.71	1.68	380.06	544.11	722.81	0.85	1.20	0.73
TCP Vegas	3	4.56	1.56	2.16	540.87	675.11	1925.83	3.43	2.47	11.81
Verus	3	4.08	0.32	0.04	1126.76	1625.18	1072.40	2.19	3.20	9.72
PCC-Vivace	3	1.48	1.88	0.50	1482.34	1513.50	1422.77	4.04	4.61	6.51
WebRTC media	3	0.75	0.54	0.24	245.73	281.67	233.03	0.04	0.16	0.62

Run 1: Statistics of TCP BBR

Start at: 2018-06-18 15:09:49  
End at: 2018-06-18 15:10:19  
Local clock offset: -1.651 ms  
Remote clock offset: -1.117 ms

# Below is generated by plot.py at 2018-06-18 16:03:25  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 4.15 Mbit/s  
95th percentile per-packet one-way delay: 751.743 ms  
Loss rate: 1.50%  
-- Flow 1:  
Average throughput: 2.59 Mbit/s  
95th percentile per-packet one-way delay: 667.760 ms  
Loss rate: 0.78%  
-- Flow 2:  
Average throughput: 1.10 Mbit/s  
95th percentile per-packet one-way delay: 720.063 ms  
Loss rate: 1.48%  
-- Flow 3:  
Average throughput: 2.57 Mbit/s  
95th percentile per-packet one-way delay: 893.850 ms  
Loss rate: 3.67%

Run 1: Report of TCP BBR — Data Link

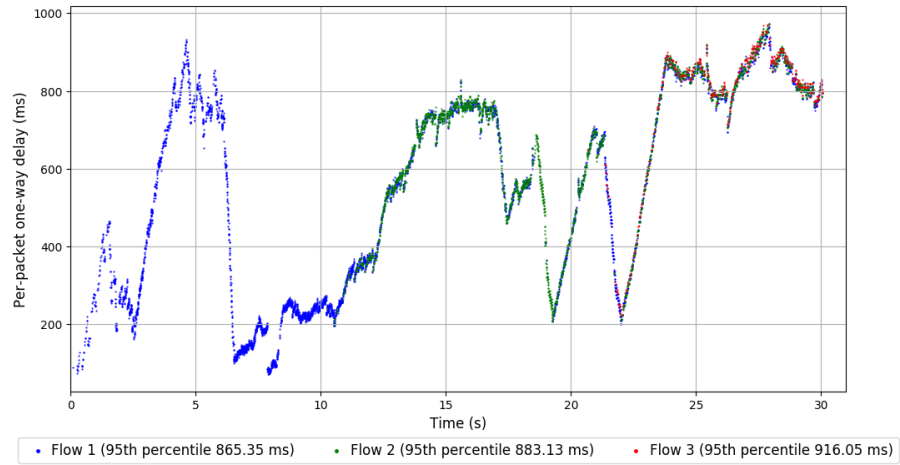
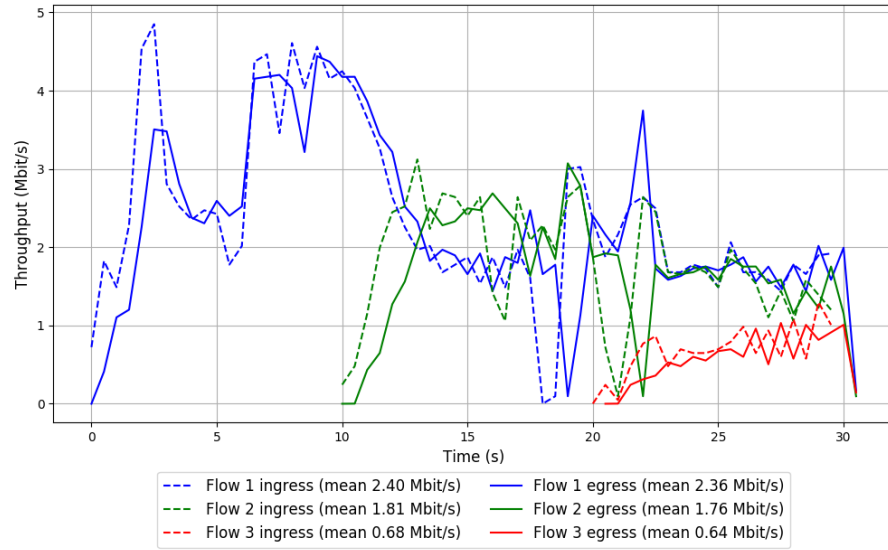


Run 2: Statistics of TCP BBR

Start at: 2018-06-18 15:33:32  
End at: 2018-06-18 15:34:02  
Local clock offset: -1.094 ms  
Remote clock offset: -0.869 ms

# Below is generated by plot.py at 2018-06-18 16:03:25  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 3.72 Mbit/s  
95th percentile per-packet one-way delay: 879.663 ms  
Loss rate: 2.75%  
-- Flow 1:  
Average throughput: 2.36 Mbit/s  
95th percentile per-packet one-way delay: 865.346 ms  
Loss rate: 1.87%  
-- Flow 2:  
Average throughput: 1.76 Mbit/s  
95th percentile per-packet one-way delay: 883.133 ms  
Loss rate: 2.95%  
-- Flow 3:  
Average throughput: 0.64 Mbit/s  
95th percentile per-packet one-way delay: 916.053 ms  
Loss rate: 11.03%

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



Run 3: Statistics of TCP BBR

Start at: 2018-06-18 15:56:27

End at: 2018-06-18 15:56:57

Local clock offset: -4.641 ms

Remote clock offset: -0.51 ms

# Below is generated by plot.py at 2018-06-18 16:03:25

# Datalink statistics

-- Total of 3 flows:

Average throughput: 3.86 Mbit/s

95th percentile per-packet one-way delay: 699.882 ms

Loss rate: 1.06%

-- Flow 1:

Average throughput: 2.69 Mbit/s

95th percentile per-packet one-way delay: 679.103 ms

Loss rate: 0.62%

-- Flow 2:

Average throughput: 1.20 Mbit/s

95th percentile per-packet one-way delay: 756.413 ms

Loss rate: 1.54%

-- Flow 3:

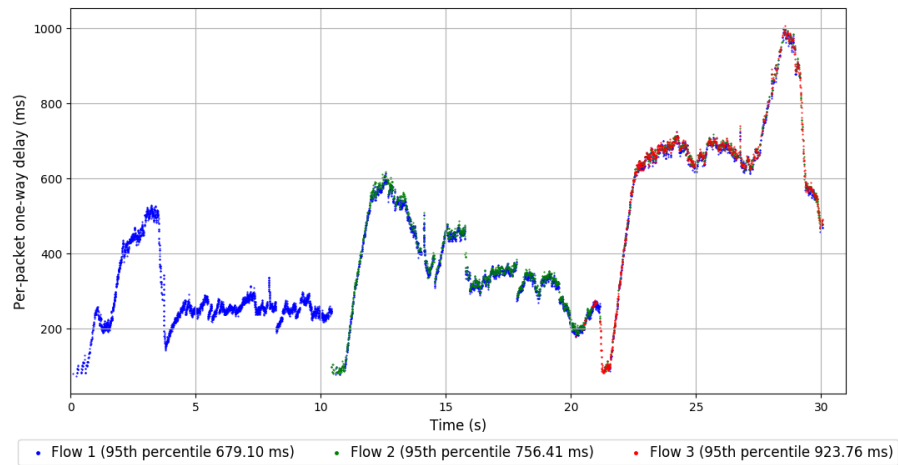
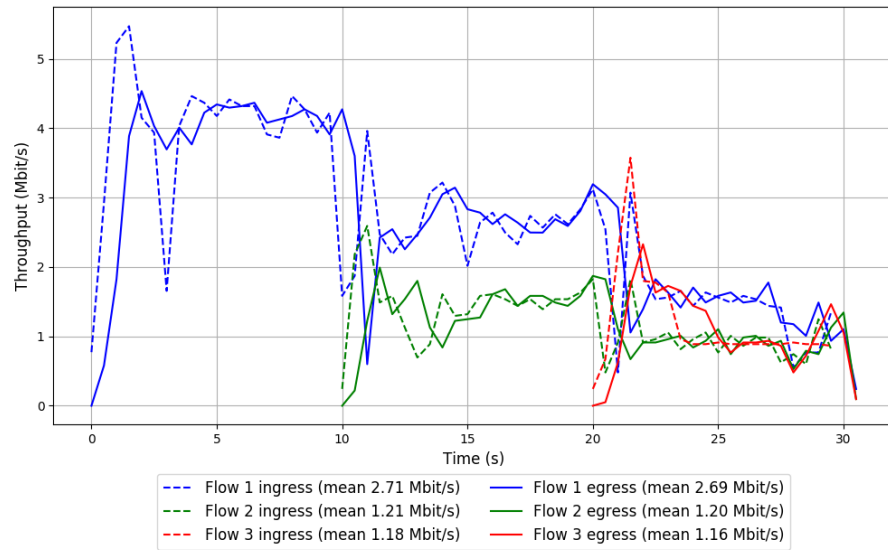
Average throughput: 1.16 Mbit/s

95th percentile per-packet one-way delay: 923.764 ms

Loss rate: 3.06%



### Run 3: Report of TCP BBR — Data Link



Run 1: Statistics of Copa

Start at: 2018-06-18 15:15:41

End at: 2018-06-18 15:16:11

Local clock offset: -0.838 ms

Remote clock offset: -1.15 ms

# Below is generated by plot.py at 2018-06-18 16:03:26

# Datalink statistics

-- Total of 3 flows:

Average throughput: 2.50 Mbit/s

95th percentile per-packet one-way delay: 135.247 ms

Loss rate: 0.17%

-- Flow 1:

Average throughput: 1.37 Mbit/s

95th percentile per-packet one-way delay: 120.458 ms

Loss rate: 0.09%

-- Flow 2:

Average throughput: 1.20 Mbit/s

95th percentile per-packet one-way delay: 144.743 ms

Loss rate: 0.27%

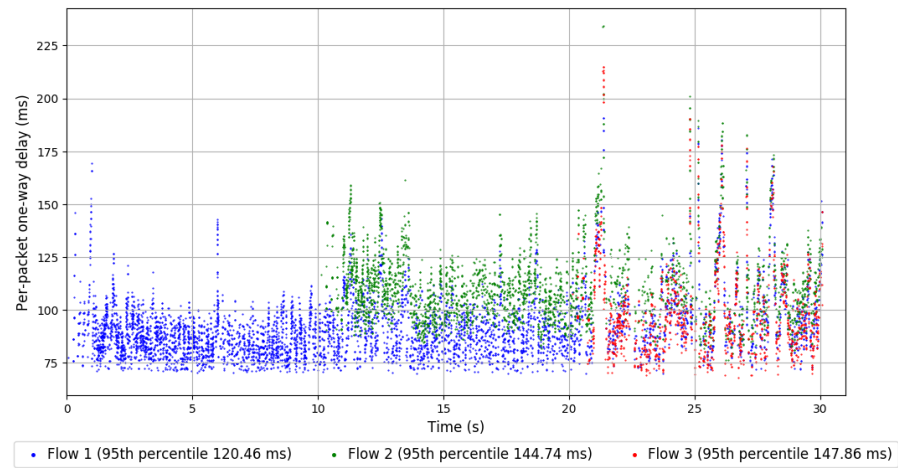
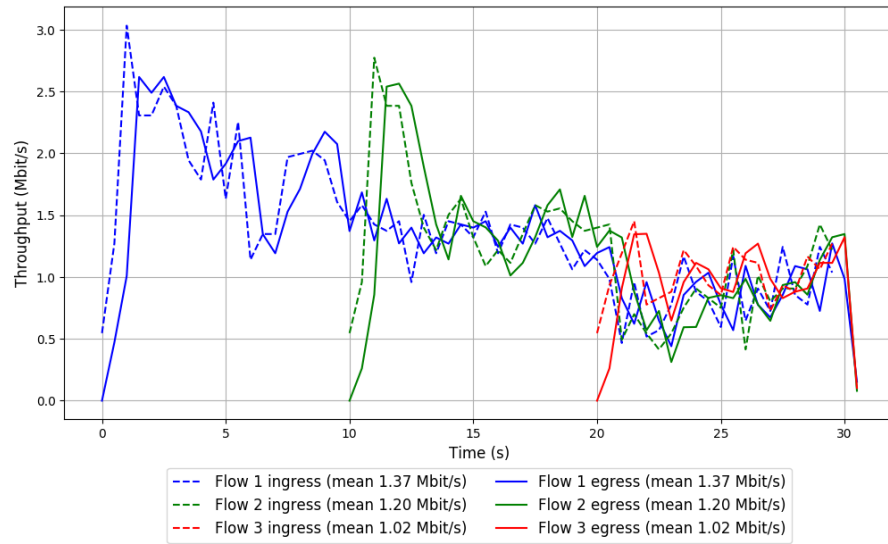
-- Flow 3:

Average throughput: 1.02 Mbit/s

95th percentile per-packet one-way delay: 147.860 ms

Loss rate: 0.26%

## Run 1: Report of Copa — Data Link

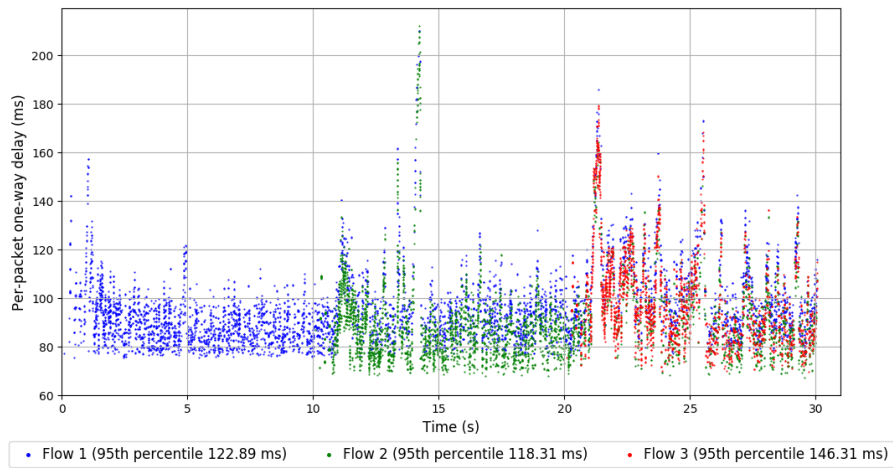
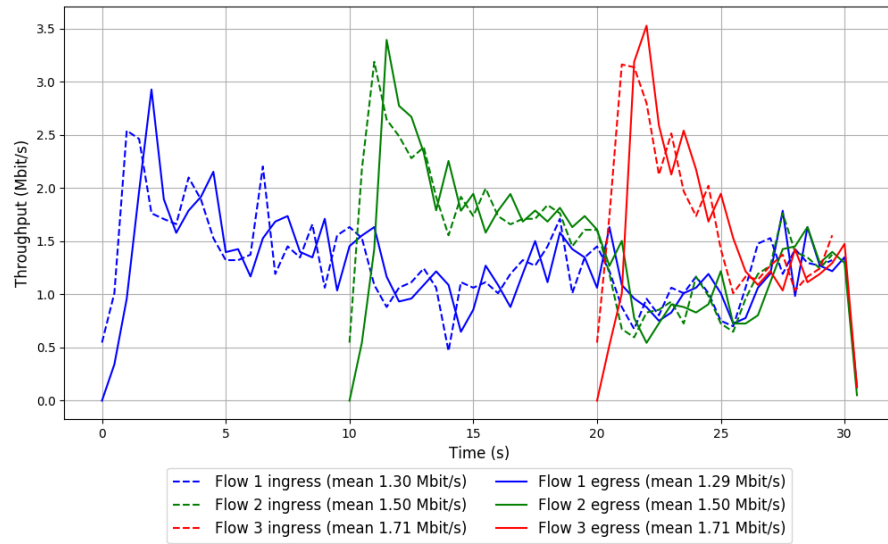


Run 2: Statistics of Copa

Start at: 2018-06-18 15:39:13  
End at: 2018-06-18 15:39:43  
Local clock offset: -2.586 ms  
Remote clock offset: -0.817 ms

# Below is generated by plot.py at 2018-06-18 16:03:27  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.86 Mbit/s  
95th percentile per-packet one-way delay: 125.789 ms  
Loss rate: 0.19%  
-- Flow 1:  
Average throughput: 1.29 Mbit/s  
95th percentile per-packet one-way delay: 122.885 ms  
Loss rate: 0.10%  
-- Flow 2:  
Average throughput: 1.50 Mbit/s  
95th percentile per-packet one-way delay: 118.313 ms  
Loss rate: 0.22%  
-- Flow 3:  
Average throughput: 1.71 Mbit/s  
95th percentile per-packet one-way delay: 146.312 ms  
Loss rate: 0.32%

## Run 2: Report of Copa — Data Link



Run 3: Statistics of Copa

/home/ubuntu/pantheon/data/2018-06-18T14-53-AWS-Korea-to-China-ppp0-3-runs-3-flows/copa\_stat

Run 3: Report of Copa — Data Link

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Run 1: Statistics of TCP Cubic

Start at: 2018-06-18 15:11:16

End at: 2018-06-18 15:11:46

Local clock offset: -1.45 ms

Remote clock offset: -1.09 ms

# Below is generated by plot.py at 2018-06-18 16:03:27

# Datalink statistics

-- Total of 3 flows:

Average throughput: 5.31 Mbit/s

95th percentile per-packet one-way delay: 3019.384 ms

Loss rate: 13.46%

-- Flow 1:

Average throughput: 4.87 Mbit/s

95th percentile per-packet one-way delay: 2919.388 ms

Loss rate: 11.52%

-- Flow 2:

Average throughput: 0.68 Mbit/s

95th percentile per-packet one-way delay: 3690.413 ms

Loss rate: 28.81%

-- Flow 3:

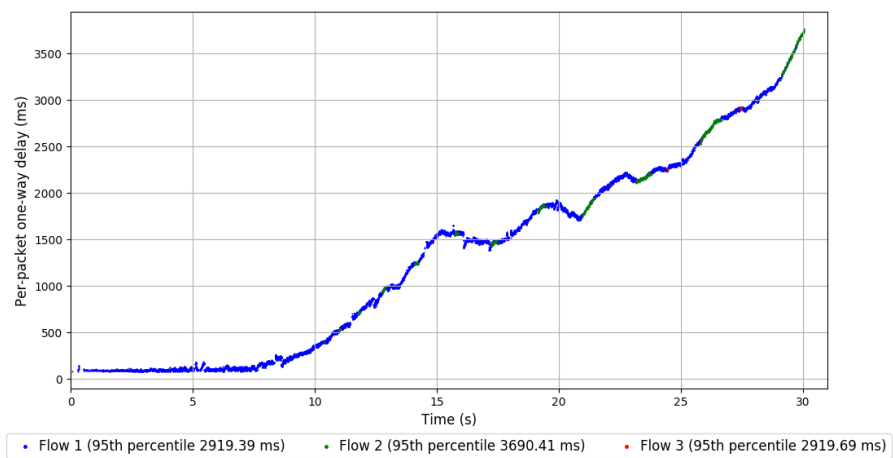
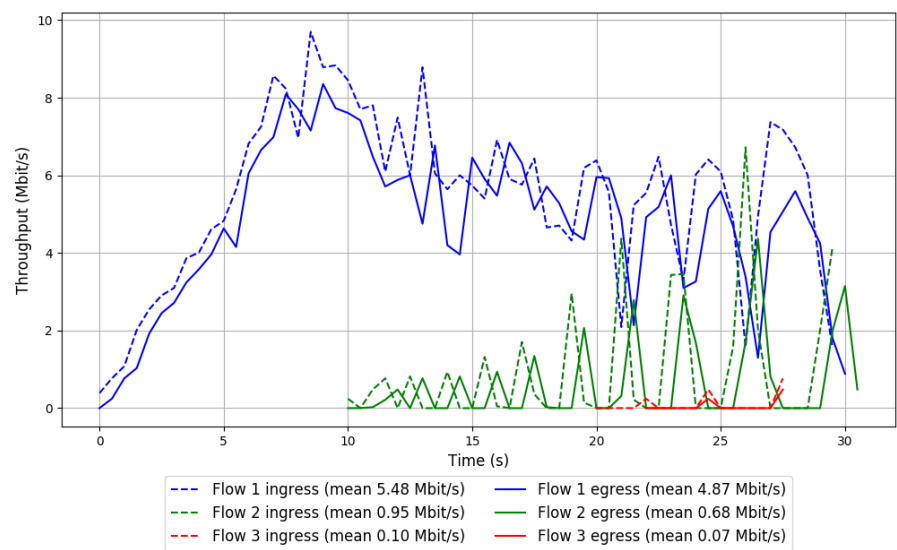
Average throughput: 0.07 Mbit/s

95th percentile per-packet one-way delay: 2919.694 ms

Loss rate: 51.41%



Run 1: Report of TCP Cubic — Data Link

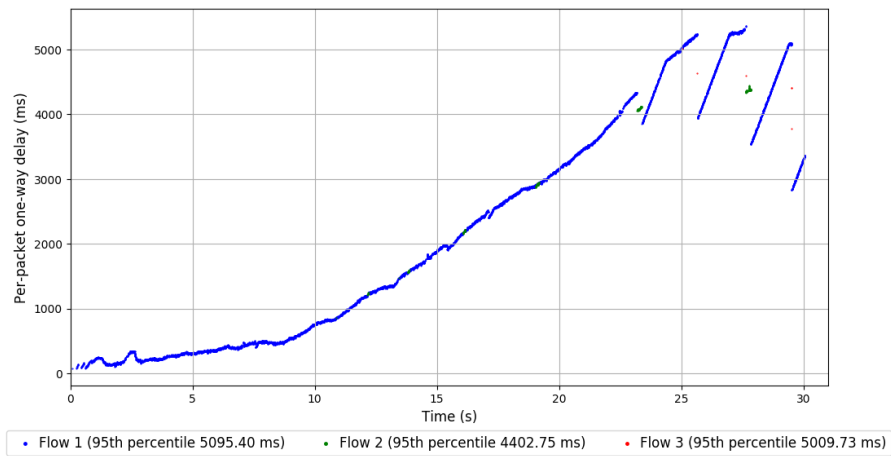
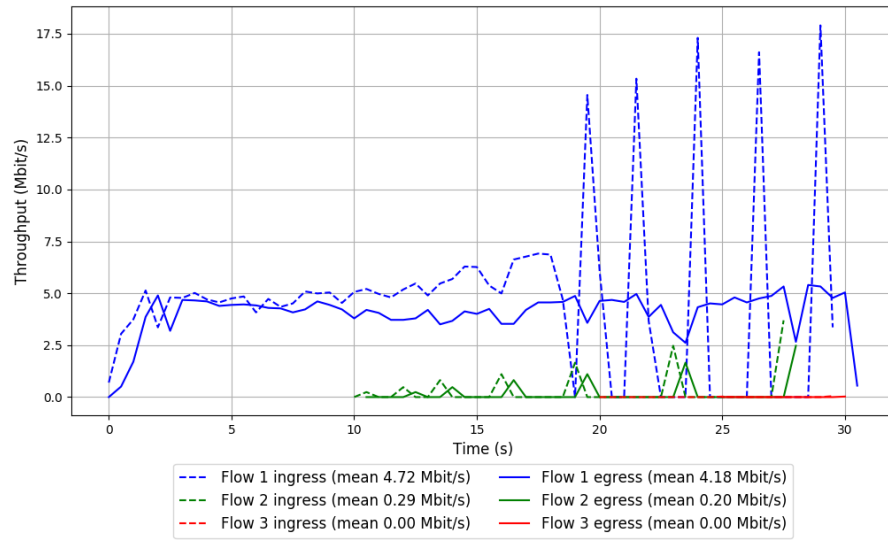


Run 2: Statistics of TCP Cubic

Start at: 2018-06-18 15:34:57  
End at: 2018-06-18 15:35:27  
Local clock offset: -1.721 ms  
Remote clock offset: -0.874 ms

# Below is generated by plot.py at 2018-06-18 16:03:27  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 4.30 Mbit/s  
95th percentile per-packet one-way delay: 5094.649 ms  
Loss rate: 12.32%  
-- Flow 1:  
Average throughput: 4.18 Mbit/s  
95th percentile per-packet one-way delay: 5095.404 ms  
Loss rate: 11.46%  
-- Flow 2:  
Average throughput: 0.20 Mbit/s  
95th percentile per-packet one-way delay: 4402.746 ms  
Loss rate: 35.30%  
-- Flow 3:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 5009.735 ms  
Loss rate: 61.79%

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



Run 3: Statistics of TCP Cubic

/home/ubuntu/pantheon/data/2018-06-18T14-53-AWS-Korea-to-China-ppp0-3-runs-3-flows/cubic\_sta

### Run 3: Report of TCP Cubic — Data Link

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Run 1: Statistics of FillP

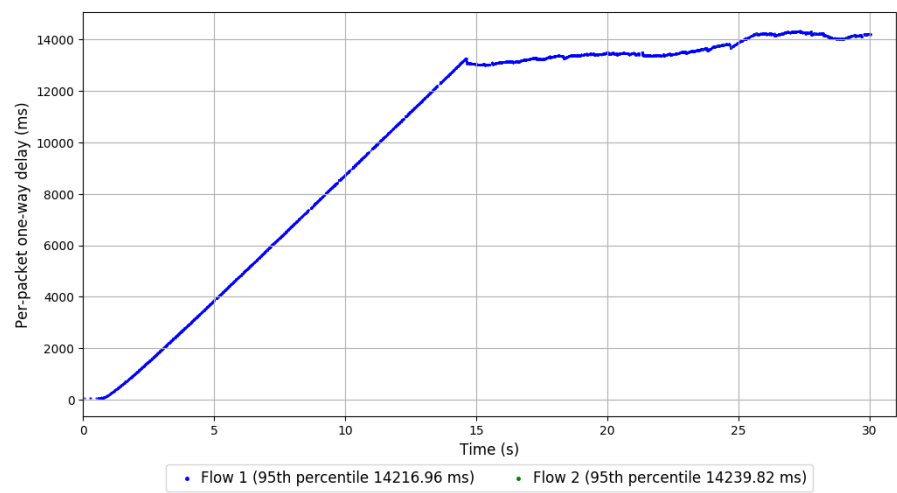
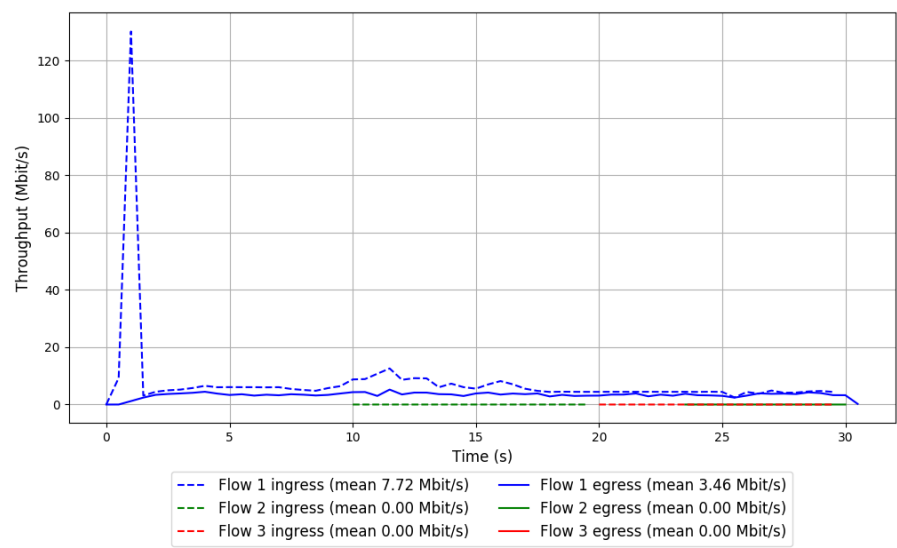
Start at: 2018-06-18 15:08:23

End at: 2018-06-18 15:08:53

Local clock offset: -1.759 ms

Remote clock offset: -1.03 ms

Run 1: Report of FillP — Data Link



Run 2: Statistics of FillP

/home/ubuntu/pantheon/data/2018-06-18T14-53-AWS-Korea-to-China-ppp0-3-runs-3-flows/fillp\_sta



Run 2: Report of FillP — Data Link

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Run 3: Statistics of FillP

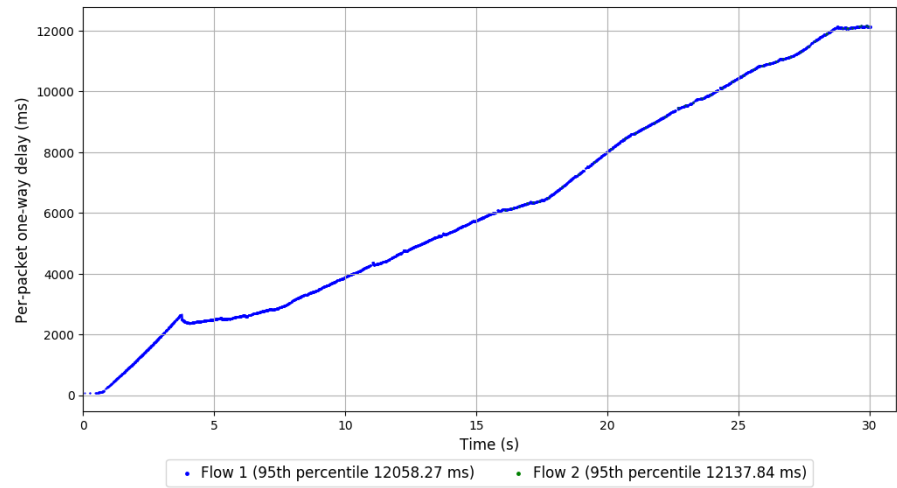
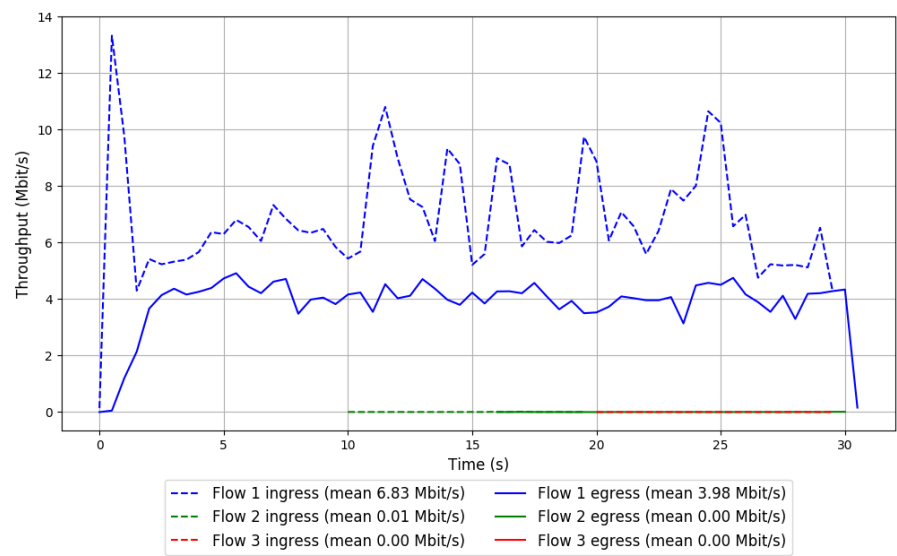
Start at: 2018-06-18 15:55:01

End at: 2018-06-18 15:55:31

Local clock offset: -4.346 ms

Remote clock offset: -0.578 ms

Run 3: Report of FillP — Data Link

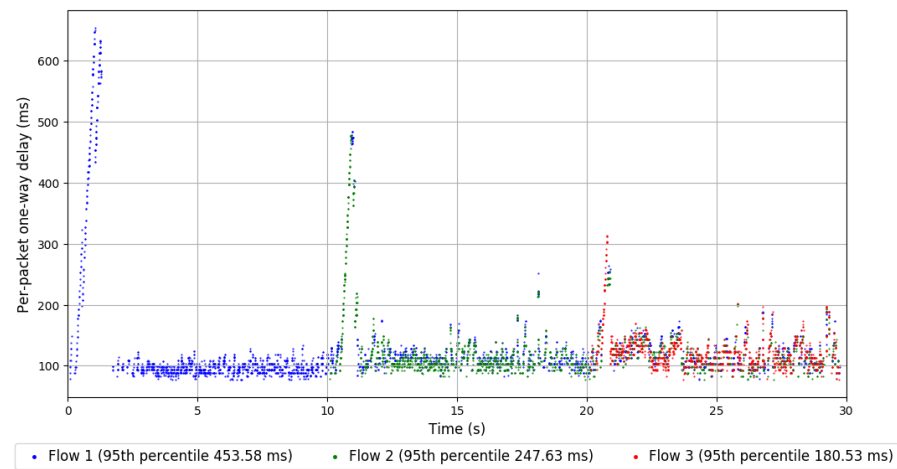
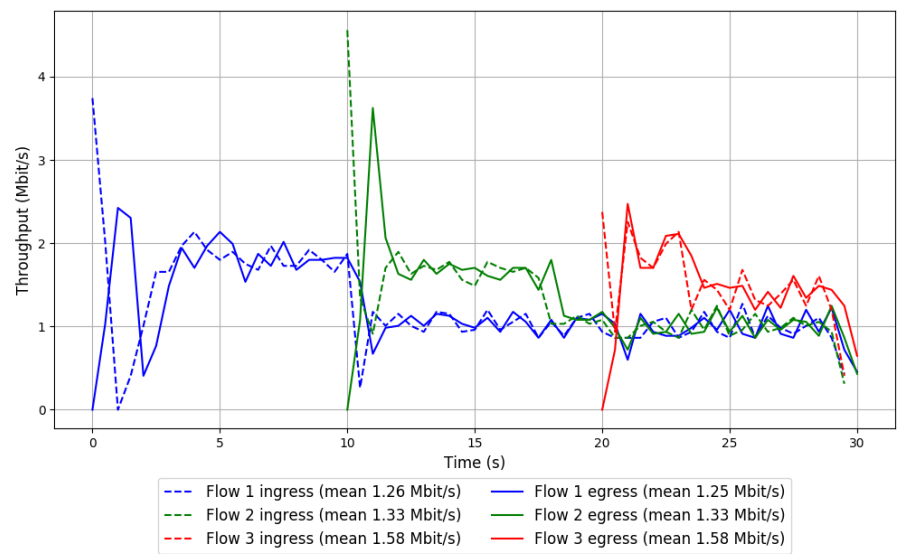


Run 1: Statistics of Indigo

Start at: 2018-06-18 15:14:16  
End at: 2018-06-18 15:14:46  
Local clock offset: -1.065 ms  
Remote clock offset: -1.178 ms

# Below is generated by plot.py at 2018-06-18 16:03:35  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.64 Mbit/s  
95th percentile per-packet one-way delay: 272.372 ms  
Loss rate: 0.24%  
-- Flow 1:  
Average throughput: 1.25 Mbit/s  
95th percentile per-packet one-way delay: 453.579 ms  
Loss rate: 0.23%  
-- Flow 2:  
Average throughput: 1.33 Mbit/s  
95th percentile per-packet one-way delay: 247.629 ms  
Loss rate: 0.23%  
-- Flow 3:  
Average throughput: 1.58 Mbit/s  
95th percentile per-packet one-way delay: 180.528 ms  
Loss rate: 0.32%

Run 1: Report of Indigo — Data Link

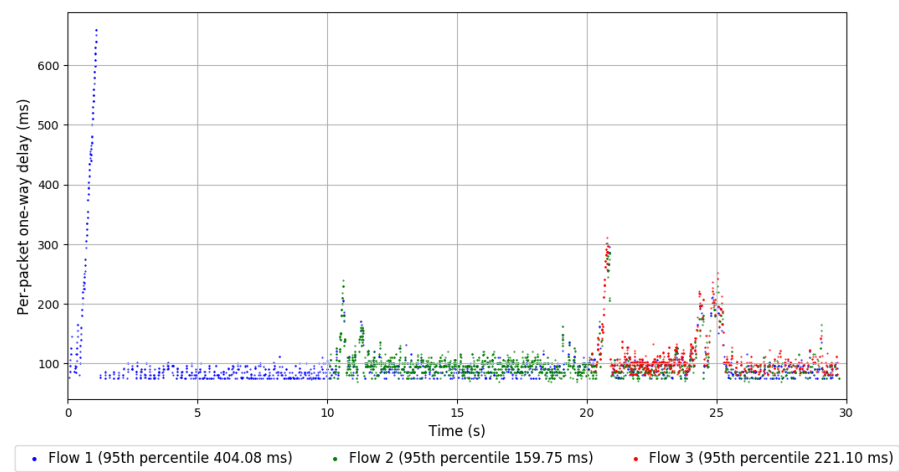
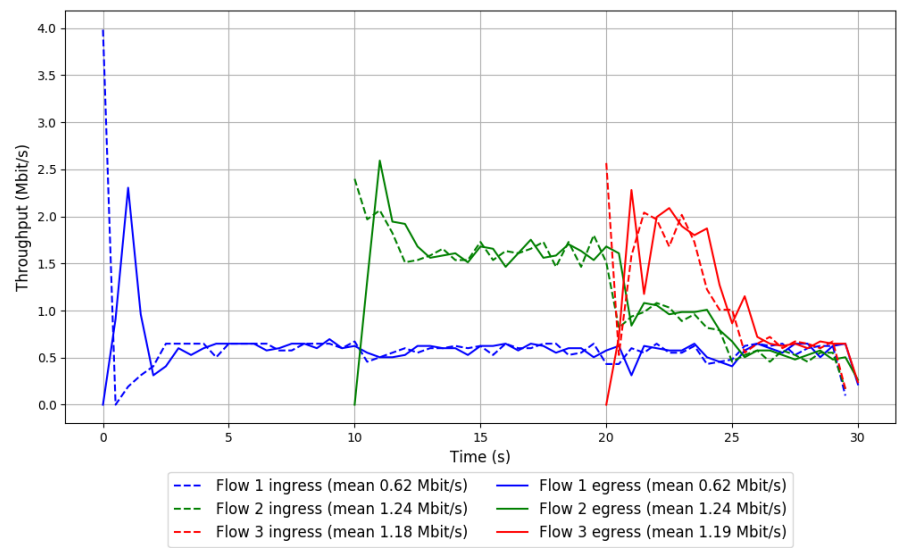


Run 2: Statistics of Indigo

Start at: 2018-06-18 15:37:51  
End at: 2018-06-18 15:38:21  
Local clock offset: -2.313 ms  
Remote clock offset: -0.742 ms

# Below is generated by plot.py at 2018-06-18 16:03:35  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.82 Mbit/s  
95th percentile per-packet one-way delay: 209.031 ms  
Loss rate: 0.11%  
-- Flow 1:  
Average throughput: 0.62 Mbit/s  
95th percentile per-packet one-way delay: 404.081 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 1.24 Mbit/s  
95th percentile per-packet one-way delay: 159.746 ms  
Loss rate: 0.10%  
-- Flow 3:  
Average throughput: 1.19 Mbit/s  
95th percentile per-packet one-way delay: 221.096 ms  
Loss rate: 0.32%

Run 2: Report of Indigo — Data Link



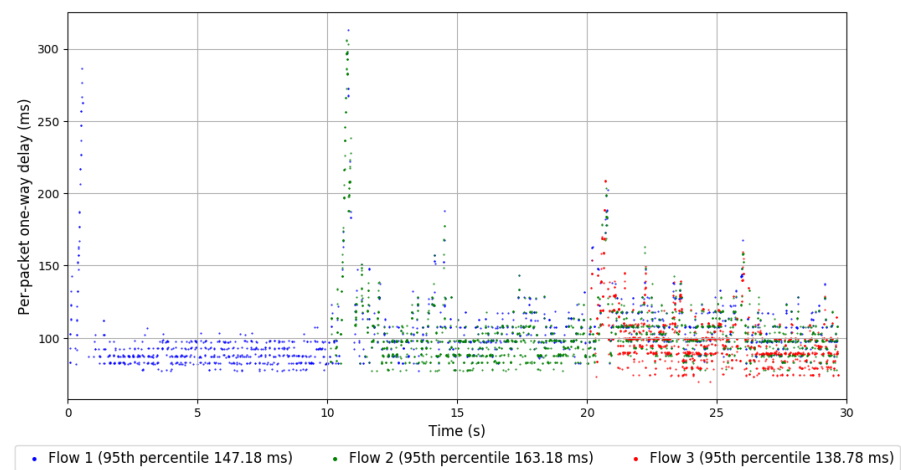
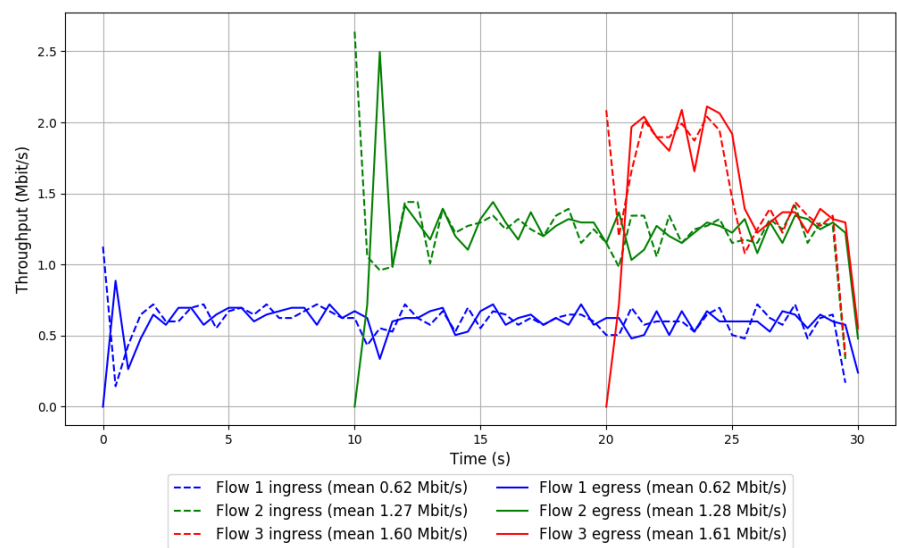
Run 3: Statistics of Indigo

Start at: 2018-06-18 16:00:56  
End at: 2018-06-18 16:01:26  
Local clock offset: -5.078 ms  
Remote clock offset: -0.681 ms

# Below is generated by plot.py at 2018-06-18 16:03:35  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.98 Mbit/s  
95th percentile per-packet one-way delay: 144.669 ms  
Loss rate: 0.25%  
-- Flow 1:  
Average throughput: 0.62 Mbit/s  
95th percentile per-packet one-way delay: 147.181 ms  
Loss rate: 0.26%  
-- Flow 2:  
Average throughput: 1.28 Mbit/s  
95th percentile per-packet one-way delay: 163.181 ms  
Loss rate: 0.24%  
-- Flow 3:  
Average throughput: 1.61 Mbit/s  
95th percentile per-packet one-way delay: 138.784 ms  
Loss rate: 0.23%



Run 3: Report of Indigo — Data Link

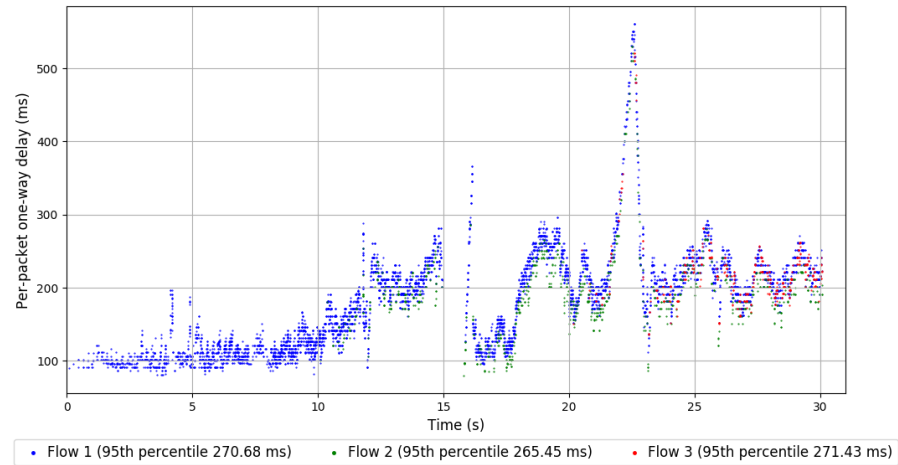
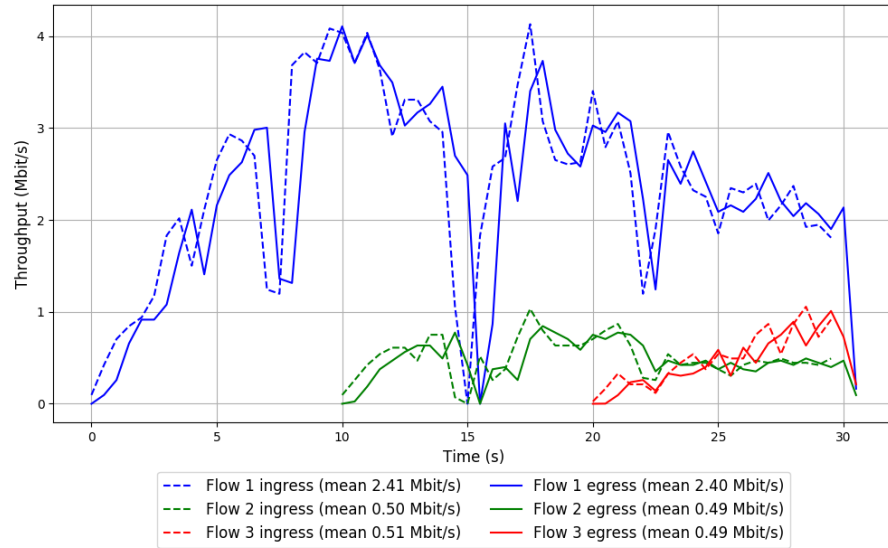


```
Run 1: Statistics of LEDBAT

Start at: 2018-06-18 15:01:26
End at: 2018-06-18 15:01:56
Local clock offset: -3.291 ms
Remote clock offset: -0.792 ms

# Below is generated by plot.py at 2018-06-18 16:03:35
# Datalink statistics
-- Total of 3 flows:
Average throughput: 2.89 Mbit/s
95th percentile per-packet one-way delay: 270.563 ms
Loss rate: 0.51%
-- Flow 1:
Average throughput: 2.40 Mbit/s
95th percentile per-packet one-way delay: 270.679 ms
Loss rate: 0.36%
-- Flow 2:
Average throughput: 0.49 Mbit/s
95th percentile per-packet one-way delay: 265.447 ms
Loss rate: 0.71%
-- Flow 3:
Average throughput: 0.49 Mbit/s
95th percentile per-packet one-way delay: 271.429 ms
Loss rate: 2.35%
```

# Run 1: Report of LEDBAT — Data Link

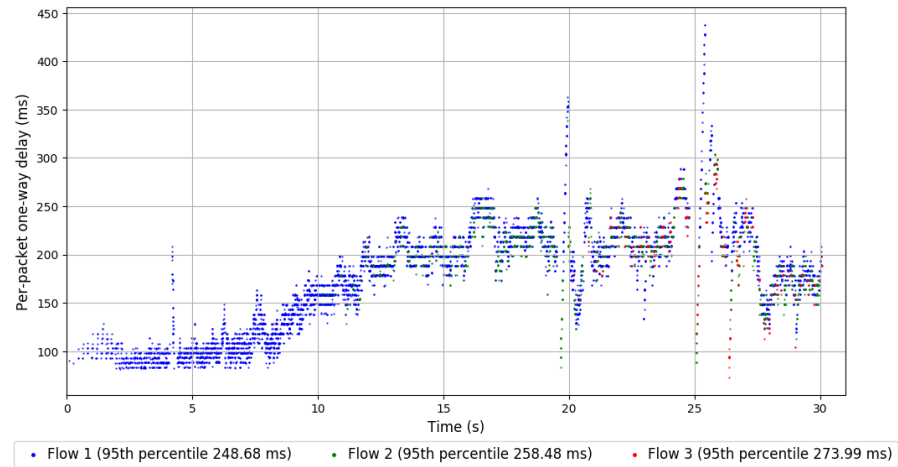
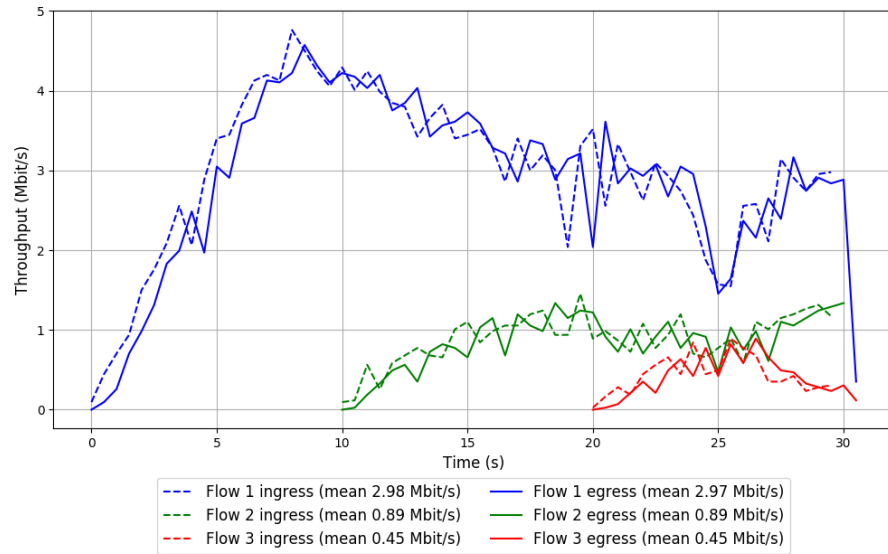


Run 2: Statistics of LEDBAT

Start at: 2018-06-18 15:24:42  
End at: 2018-06-18 15:25:12  
Local clock offset: -0.83 ms  
Remote clock offset: -1.093 ms

# Below is generated by plot.py at 2018-06-18 16:03:35  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 3.70 Mbit/s  
95th percentile per-packet one-way delay: 253.089 ms  
Loss rate: 0.53%  
-- Flow 1:  
Average throughput: 2.97 Mbit/s  
95th percentile per-packet one-way delay: 248.677 ms  
Loss rate: 0.35%  
-- Flow 2:  
Average throughput: 0.89 Mbit/s  
95th percentile per-packet one-way delay: 258.484 ms  
Loss rate: 1.39%  
-- Flow 3:  
Average throughput: 0.45 Mbit/s  
95th percentile per-packet one-way delay: 273.991 ms  
Loss rate: 0.53%

## Run 2: Report of LEDBAT — Data Link

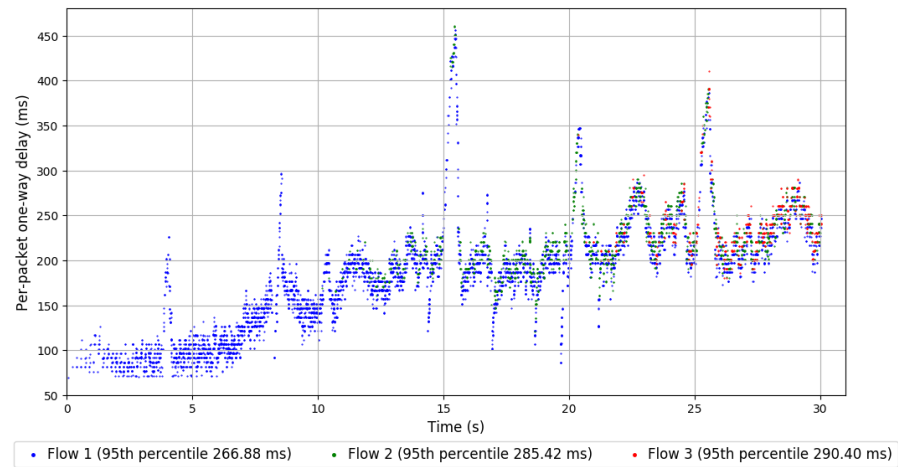
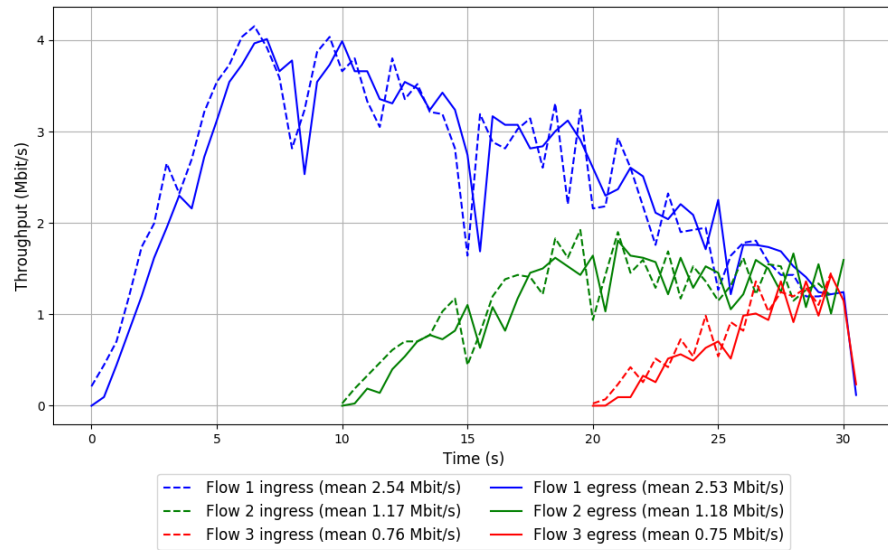


Run 3: Statistics of LEDBAT

Start at: 2018-06-18 15:48:05  
End at: 2018-06-18 15:48:35  
Local clock offset: -3.865 ms  
Remote clock offset: -0.69 ms

# Below is generated by plot.py at 2018-06-18 16:03:35  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 3.55 Mbit/s  
95th percentile per-packet one-way delay: 276.779 ms  
Loss rate: 0.62%  
-- Flow 1:  
Average throughput: 2.53 Mbit/s  
95th percentile per-packet one-way delay: 266.875 ms  
Loss rate: 0.26%  
-- Flow 2:  
Average throughput: 1.18 Mbit/s  
95th percentile per-packet one-way delay: 285.418 ms  
Loss rate: 0.75%  
-- Flow 3:  
Average throughput: 0.75 Mbit/s  
95th percentile per-packet one-way delay: 290.404 ms  
Loss rate: 3.87%

### Run 3: Report of LEDBAT — Data Link



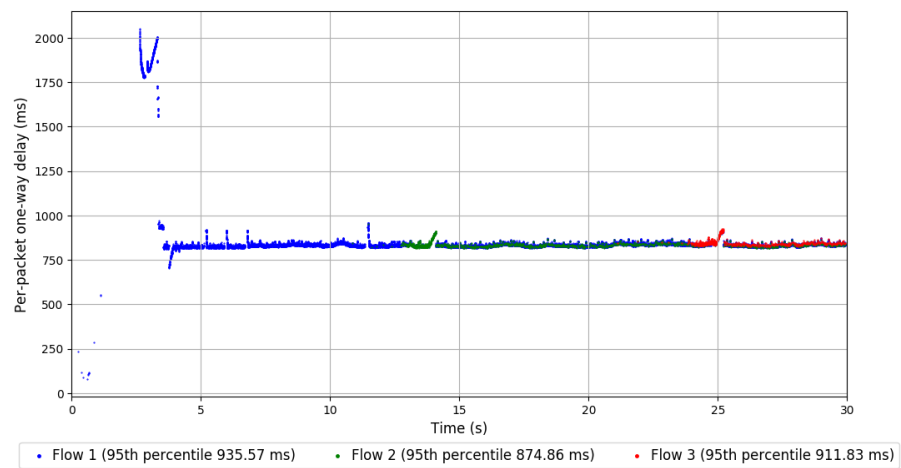
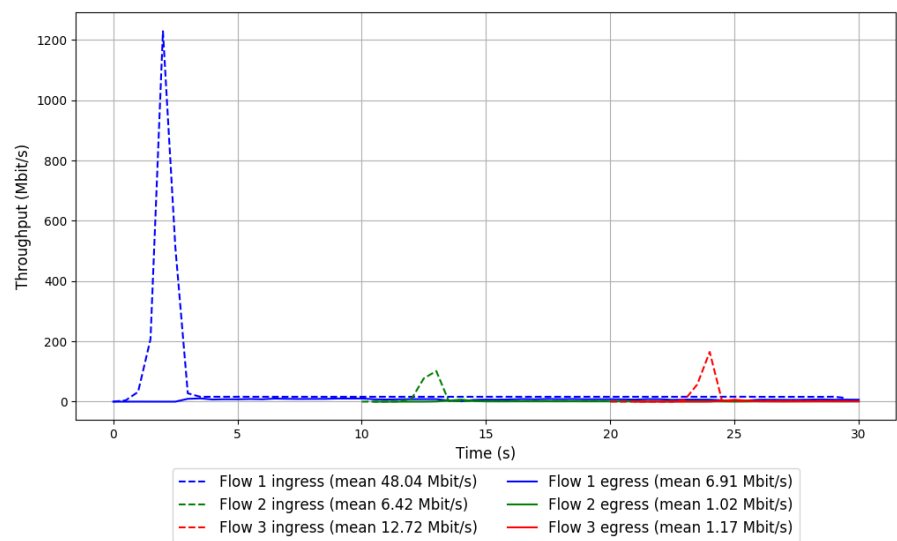
Run 1: Statistics of PCC-Allegro

Start at: 2018-06-18 15:12:46  
End at: 2018-06-18 15:13:16  
Local clock offset: -1.181 ms  
Remote clock offset: -1.115 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 7.91 Mbit/s  
95th percentile per-packet one-way delay: 913.339 ms  
Loss rate: 86.07%  
-- Flow 1:  
Average throughput: 6.91 Mbit/s  
95th percentile per-packet one-way delay: 935.573 ms  
Loss rate: 85.70%  
-- Flow 2:  
Average throughput: 1.02 Mbit/s  
95th percentile per-packet one-way delay: 874.855 ms  
Loss rate: 84.67%  
-- Flow 3:  
Average throughput: 1.17 Mbit/s  
95th percentile per-packet one-way delay: 911.826 ms  
Loss rate: 91.74%



Run 1: Report of PCC-Allegro — Data Link



Run 2: Statistics of PCC-Allegro

Start at: 2018-06-18 15:36:26

End at: 2018-06-18 15:36:56

Local clock offset: -2.025 ms

Remote clock offset: -0.81 ms

# Below is generated by plot.py at 2018-06-18 16:04:03

# Datalink statistics

-- Total of 3 flows:

Average throughput: 3.65 Mbit/s

95th percentile per-packet one-way delay: 2008.795 ms

Loss rate: 5.47%

-- Flow 1:

Average throughput: 2.21 Mbit/s

95th percentile per-packet one-way delay: 2019.190 ms

Loss rate: 4.64%

-- Flow 2:

Average throughput: 2.17 Mbit/s

95th percentile per-packet one-way delay: 1993.085 ms

Loss rate: 6.70%

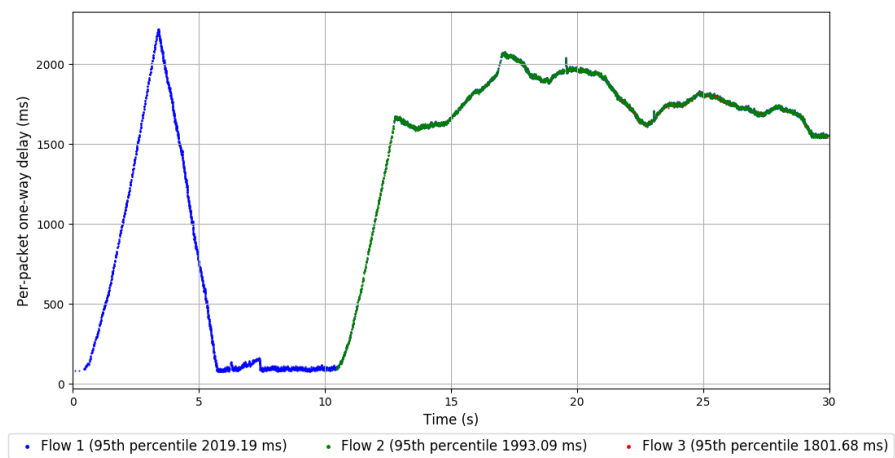
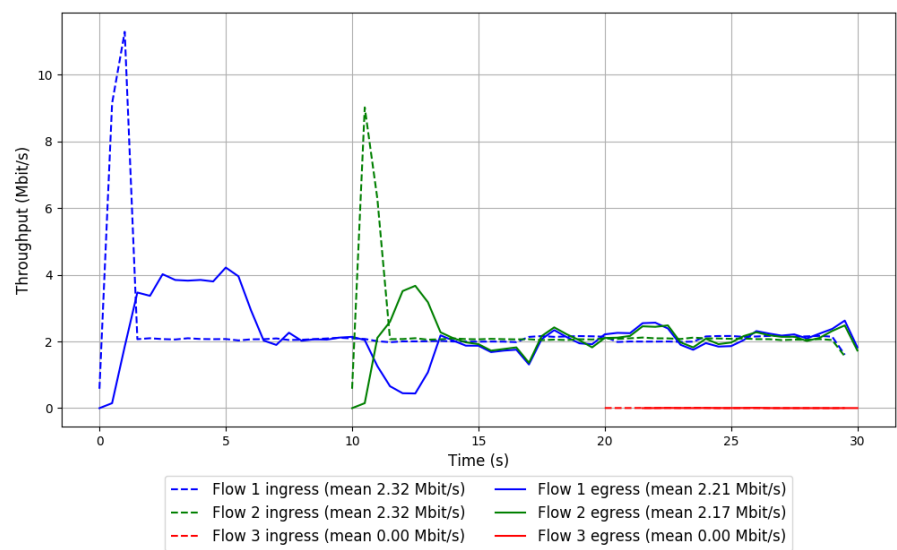
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 1801.684 ms

Loss rate: 3.80%

Run 2: Report of PCC-Allegro — Data Link



Run 3: Statistics of PCC-Allegro

Start at: 2018-06-18 15:59:33

End at: 2018-06-18 16:00:03

Local clock offset: -4.814 ms

Remote clock offset: -0.59 ms

# Below is generated by plot.py at 2018-06-18 16:04:03

# Datalink statistics

-- Total of 3 flows:

Average throughput: 2.98 Mbit/s

95th percentile per-packet one-way delay: 6422.156 ms

Loss rate: 24.64%

-- Flow 1:

Average throughput: 1.97 Mbit/s

95th percentile per-packet one-way delay: 6201.119 ms

Loss rate: 19.66%

-- Flow 2:

Average throughput: 1.53 Mbit/s

95th percentile per-packet one-way delay: 6855.132 ms

Loss rate: 32.66%

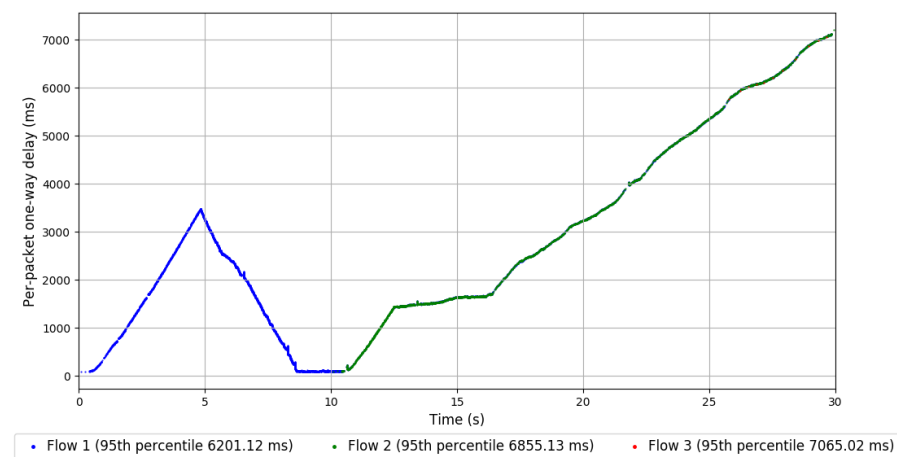
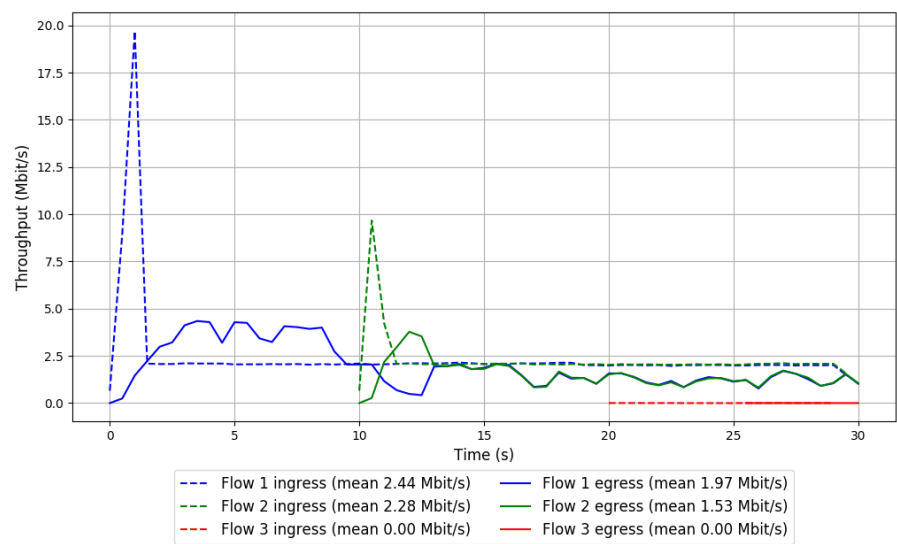
-- Flow 3:

Average throughput: 0.00 Mbit/s

95th percentile per-packet one-way delay: 7065.016 ms

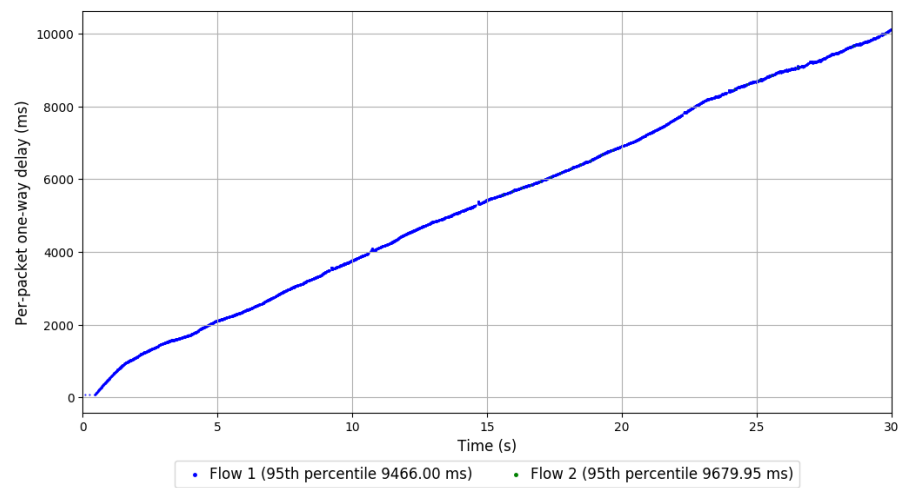
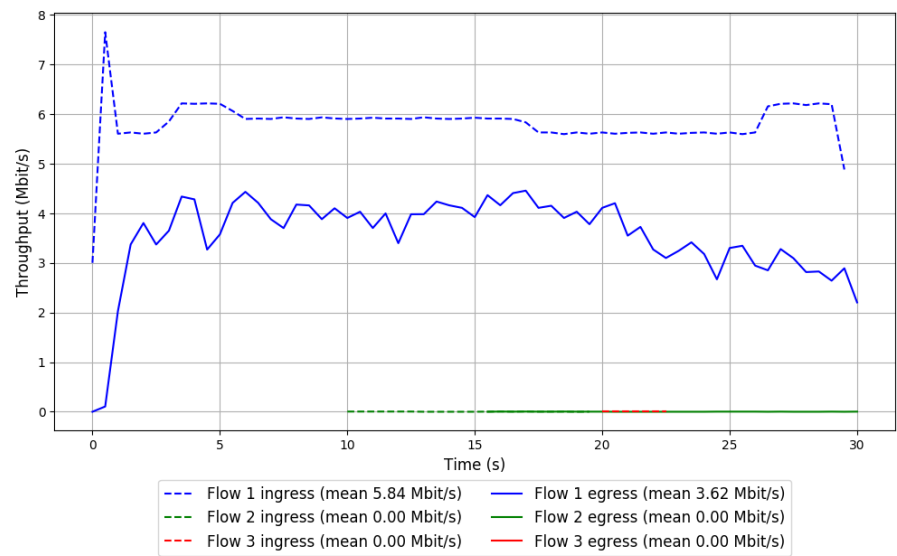
Loss rate: 52.11%

Run 3: Report of PCC-Allegro — Data Link



Run 1: Statistics of PCC-Expr  
  
Start at: 2018-06-18 14:58:32  
End at: 2018-06-18 14:59:02  
Local clock offset: -3.084 ms  
Remote clock offset: -0.549 ms

Run 1: Report of PCC-Expr — Data Link



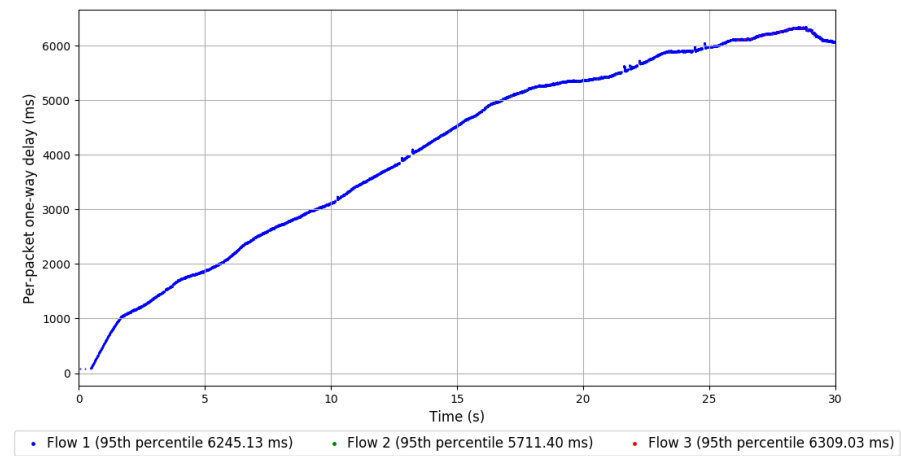
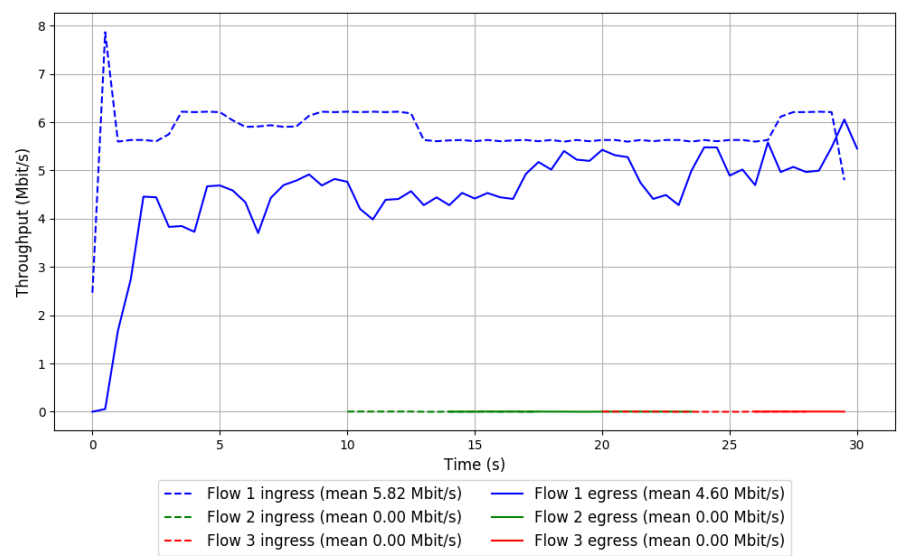
Run 2: Statistics of PCC-Expr

Start at: 2018-06-18 15:21:38  
End at: 2018-06-18 15:22:08  
Local clock offset: -0.787 ms  
Remote clock offset: -1.154 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 4.60 Mbit/s  
95th percentile per-packet one-way delay: 6245.649 ms  
Loss rate: 21.01%  
-- Flow 1:  
Average throughput: 4.60 Mbit/s  
95th percentile per-packet one-way delay: 6245.132 ms  
Loss rate: 21.01%  
-- Flow 2:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 5711.400 ms  
Loss rate: 0.00%  
-- Flow 3:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 6309.029 ms  
Loss rate: 44.83%



Run 2: Report of PCC-Expr — Data Link

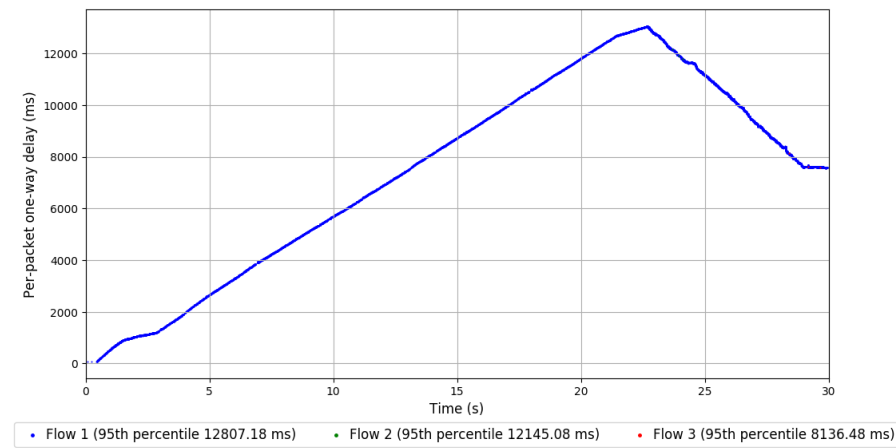
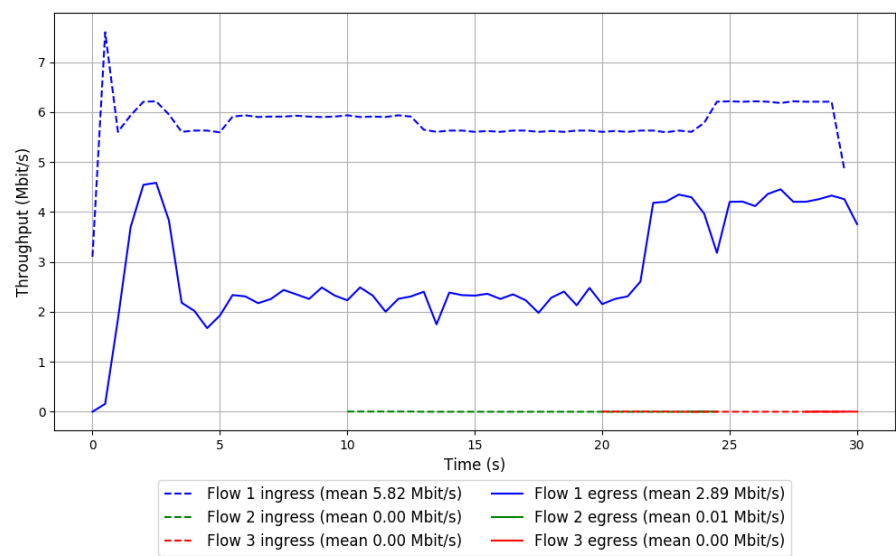


Run 3: Statistics of PCC-Expr

Start at: 2018-06-18 15:45:17  
End at: 2018-06-18 15:45:47  
Local clock offset: -3.438 ms  
Remote clock offset: -0.744 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.89 Mbit/s  
95th percentile per-packet one-way delay: 12807.181 ms  
Loss rate: 50.43%  
-- Flow 1:  
Average throughput: 2.89 Mbit/s  
95th percentile per-packet one-way delay: 12807.181 ms  
Loss rate: 50.42%  
-- Flow 2:  
Average throughput: 0.01 Mbit/s  
95th percentile per-packet one-way delay: 12145.075 ms  
Loss rate: 80.84%  
-- Flow 3:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 8136.478 ms  
Loss rate: 80.84%

Run 3: Report of PCC-Expr — Data Link

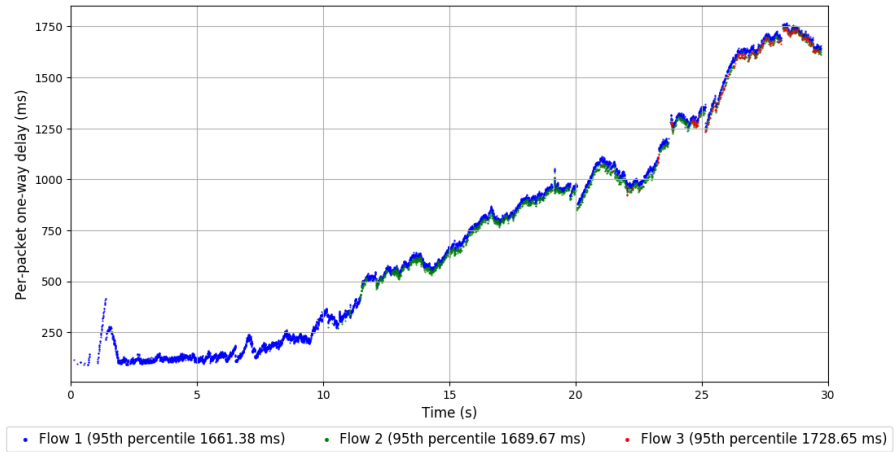
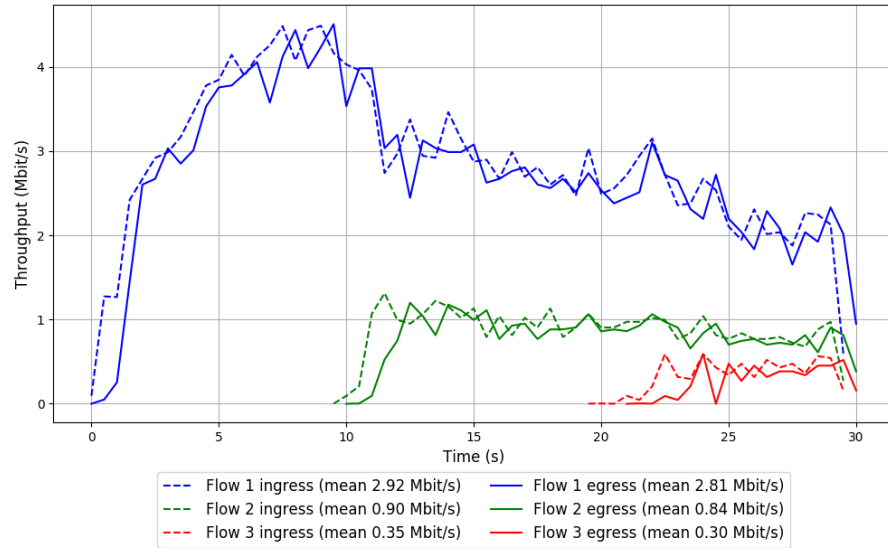


Run 1: Statistics of QUIC Cubic

Start at: 2018-06-18 15:00:02  
End at: 2018-06-18 15:00:32  
Local clock offset: -3.169 ms  
Remote clock offset: -0.676 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 3.45 Mbit/s  
95th percentile per-packet one-way delay: 1685.869 ms  
Loss rate: 5.20%  
-- Flow 1:  
Average throughput: 2.81 Mbit/s  
95th percentile per-packet one-way delay: 1661.381 ms  
Loss rate: 4.02%  
-- Flow 2:  
Average throughput: 0.84 Mbit/s  
95th percentile per-packet one-way delay: 1689.668 ms  
Loss rate: 7.42%  
-- Flow 3:  
Average throughput: 0.30 Mbit/s  
95th percentile per-packet one-way delay: 1728.655 ms  
Loss rate: 23.77%

## Run 1: Report of QUIC Cubic — Data Link

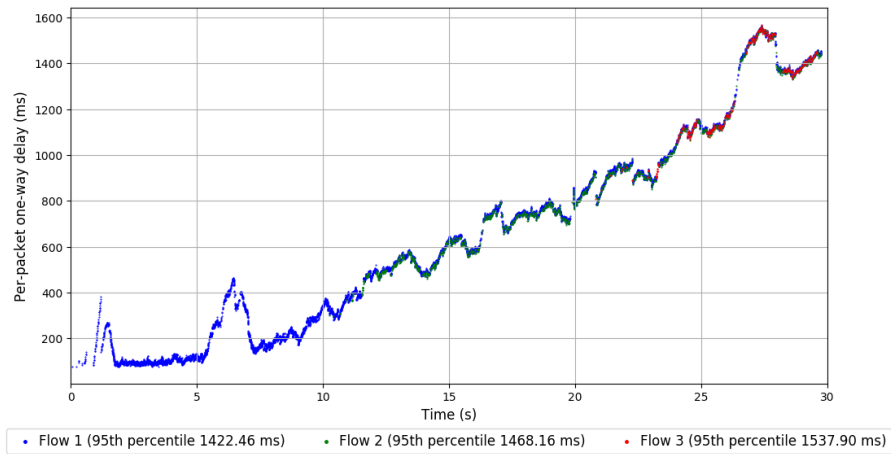
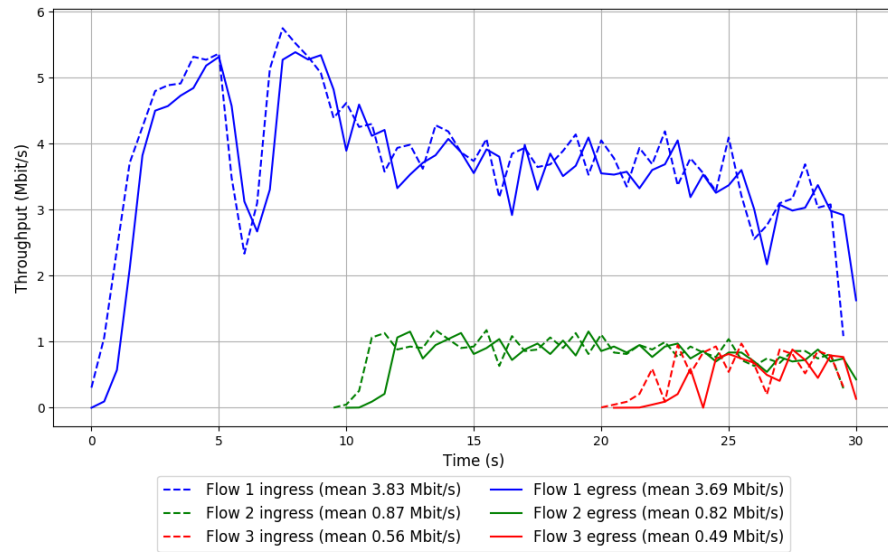


Run 2: Statistics of QUIC Cubic

Start at: 2018-06-18 15:23:15  
End at: 2018-06-18 15:23:45  
Local clock offset: -0.812 ms  
Remote clock offset: -1.198 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 4.37 Mbit/s  
95th percentile per-packet one-way delay: 1438.979 ms  
Loss rate: 4.83%  
-- Flow 1:  
Average throughput: 3.69 Mbit/s  
95th percentile per-packet one-way delay: 1422.465 ms  
Loss rate: 3.84%  
-- Flow 2:  
Average throughput: 0.82 Mbit/s  
95th percentile per-packet one-way delay: 1468.161 ms  
Loss rate: 6.37%  
-- Flow 3:  
Average throughput: 0.49 Mbit/s  
95th percentile per-packet one-way delay: 1537.905 ms  
Loss rate: 20.68%

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



Run 3: Statistics of QUIC Cubic

Start at: 2018-06-18 15:46:42

End at: 2018-06-18 15:47:12

Local clock offset: -3.713 ms

Remote clock offset: -0.702 ms



### Run 3: Report of QUIC Cubic — Data Link

Figure is missing

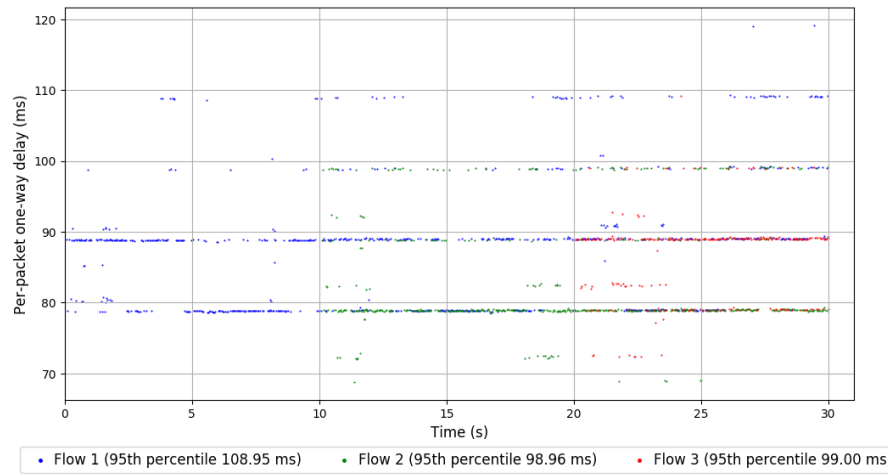
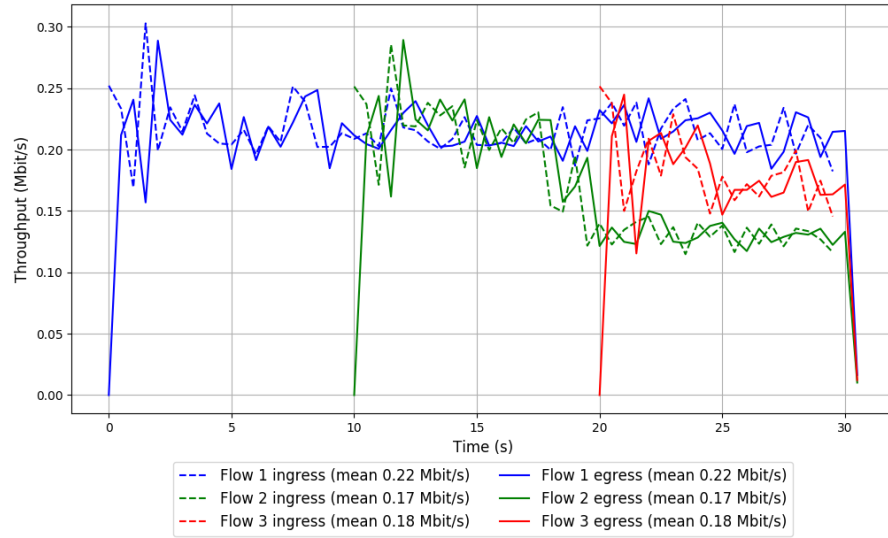
Figure is missing

Run 1: Statistics of SReAM

Start at: 2018-06-18 15:07:04  
End at: 2018-06-18 15:07:34  
Local clock offset: -1.837 ms  
Remote clock offset: -0.946 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.39 Mbit/s  
95th percentile per-packet one-way delay: 99.138 ms  
Loss rate: 0.00%  
-- Flow 1:  
Average throughput: 0.22 Mbit/s  
95th percentile per-packet one-way delay: 108.951 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 0.17 Mbit/s  
95th percentile per-packet one-way delay: 98.961 ms  
Loss rate: 0.00%  
-- Flow 3:  
Average throughput: 0.18 Mbit/s  
95th percentile per-packet one-way delay: 98.996 ms  
Loss rate: 0.00%

# Run 1: Report of SReAM — Data Link



Run 2: Statistics of SCReAM

Start at: 2018-06-18 15:30:23

End at: 2018-06-18 15:30:53

Local clock offset: -0.457 ms

Remote clock offset: -0.93 ms

# Below is generated by plot.py at 2018-06-18 16:04:03

# Datalink statistics

-- Total of 3 flows:

Average throughput: 0.07 Mbit/s

95th percentile per-packet one-way delay: 89.072 ms

Loss rate: 0.16%

-- Flow 1:

Average throughput: 0.05 Mbit/s

95th percentile per-packet one-way delay: 89.120 ms

Loss rate: 0.00%

-- Flow 2:

Average throughput: 0.01 Mbit/s

95th percentile per-packet one-way delay: 88.809 ms

Loss rate: 0.00%

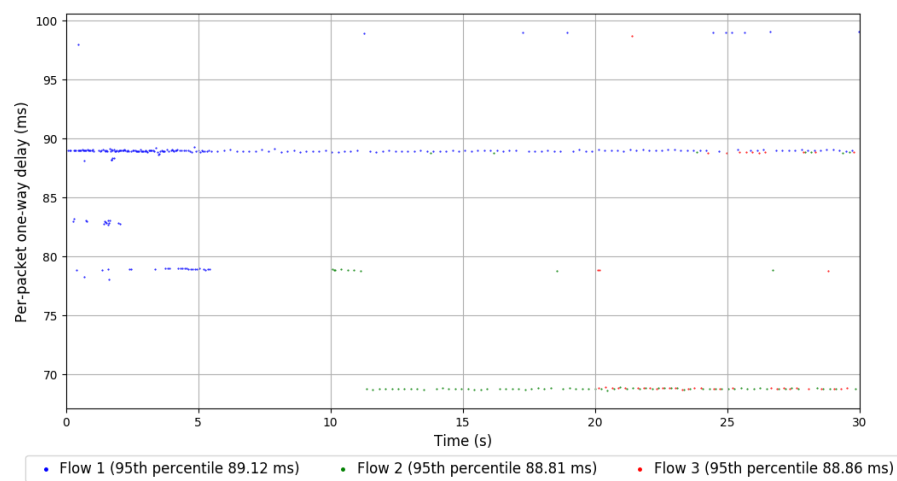
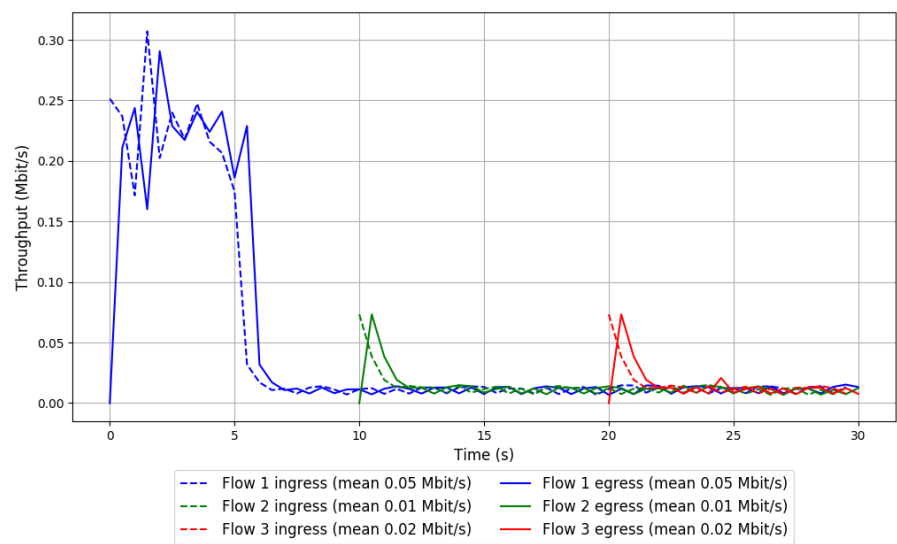
-- Flow 3:

Average throughput: 0.02 Mbit/s

95th percentile per-packet one-way delay: 88.863 ms

Loss rate: 1.91%

Run 2: Report of SReAM — Data Link

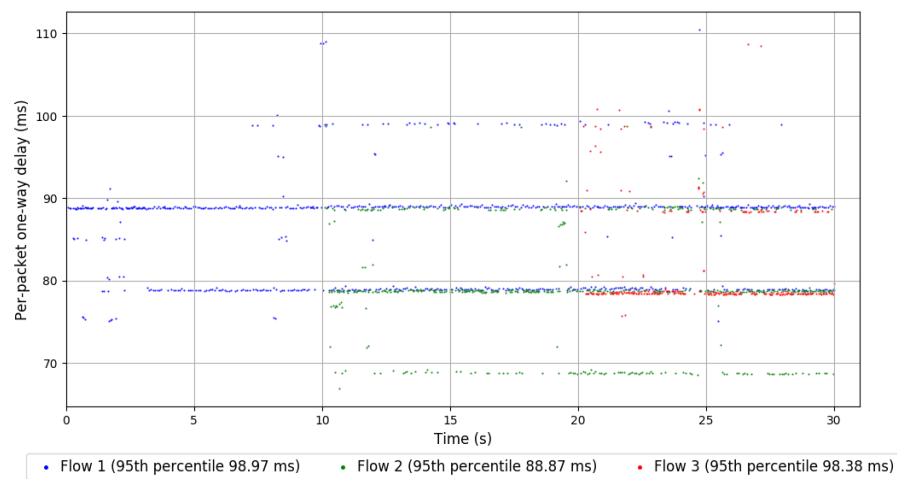
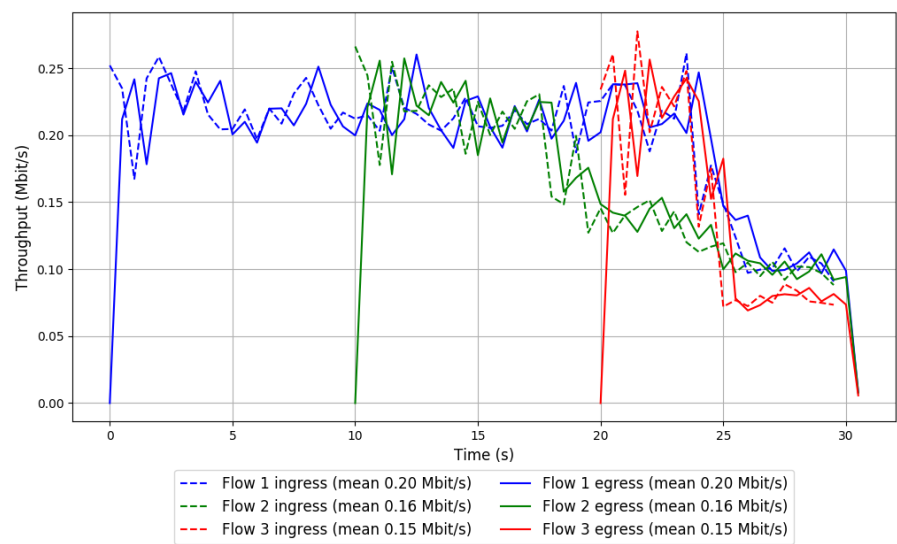


Run 3: Statistics of SCReAM

Start at: 2018-06-18 15:53:42  
End at: 2018-06-18 15:54:12  
Local clock offset: -4.255 ms  
Remote clock offset: -0.475 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.36 Mbit/s  
95th percentile per-packet one-way delay: 96.318 ms  
Loss rate: 0.00%  
-- Flow 1:  
Average throughput: 0.20 Mbit/s  
95th percentile per-packet one-way delay: 98.974 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 0.16 Mbit/s  
95th percentile per-packet one-way delay: 88.873 ms  
Loss rate: 0.00%  
-- Flow 3:  
Average throughput: 0.15 Mbit/s  
95th percentile per-packet one-way delay: 98.384 ms  
Loss rate: 0.00%

Run 3: Report of SReAM — Data Link



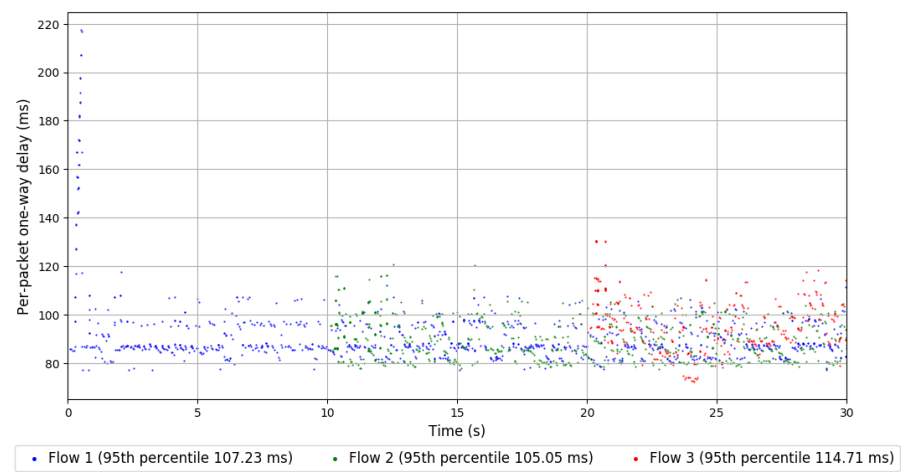
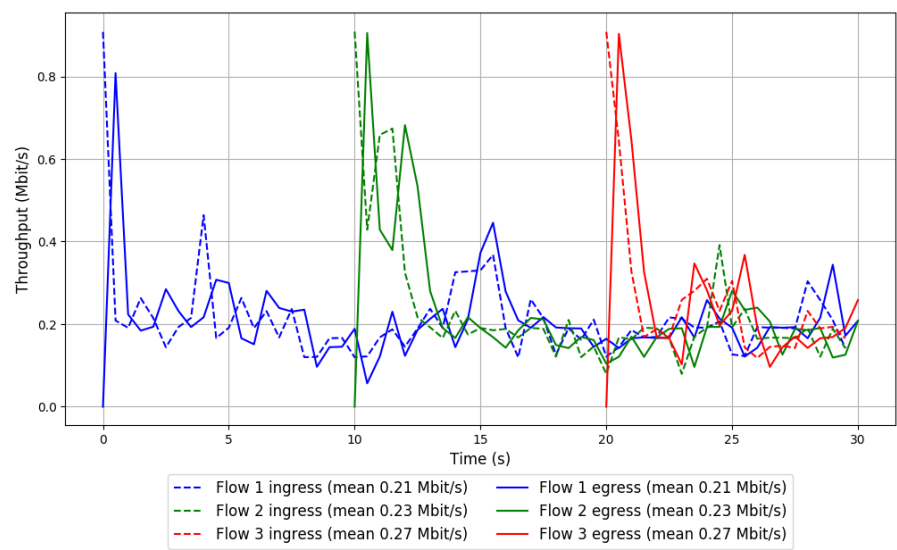
Run 1: Statistics of Sprout

Start at: 2018-06-18 15:04:15  
End at: 2018-06-18 15:04:45  
Local clock offset: -2.615 ms  
Remote clock offset: -0.909 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 0.45 Mbit/s  
95th percentile per-packet one-way delay: 109.891 ms  
Loss rate: 0.15%  
-- Flow 1:  
Average throughput: 0.21 Mbit/s  
95th percentile per-packet one-way delay: 107.233 ms  
Loss rate: 0.00%  
-- Flow 2:  
Average throughput: 0.23 Mbit/s  
95th percentile per-packet one-way delay: 105.048 ms  
Loss rate: 0.46%  
-- Flow 3:  
Average throughput: 0.27 Mbit/s  
95th percentile per-packet one-way delay: 114.708 ms  
Loss rate: 0.00%



Run 1: Report of Sprout — Data Link

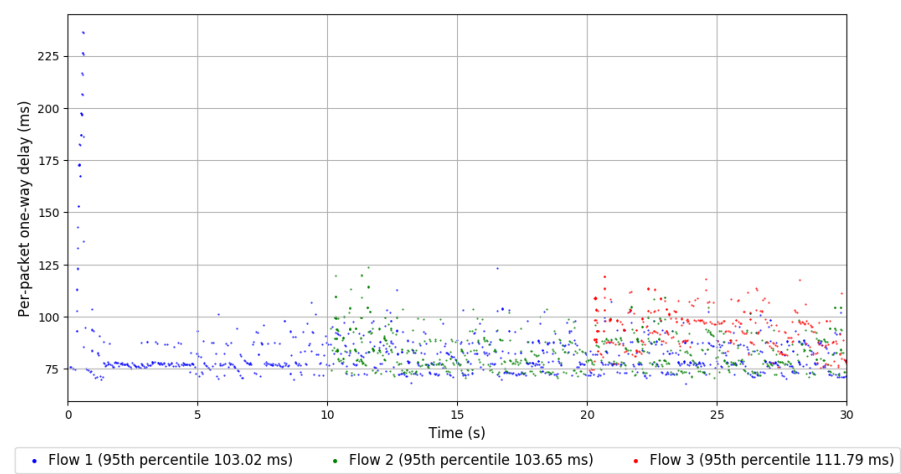
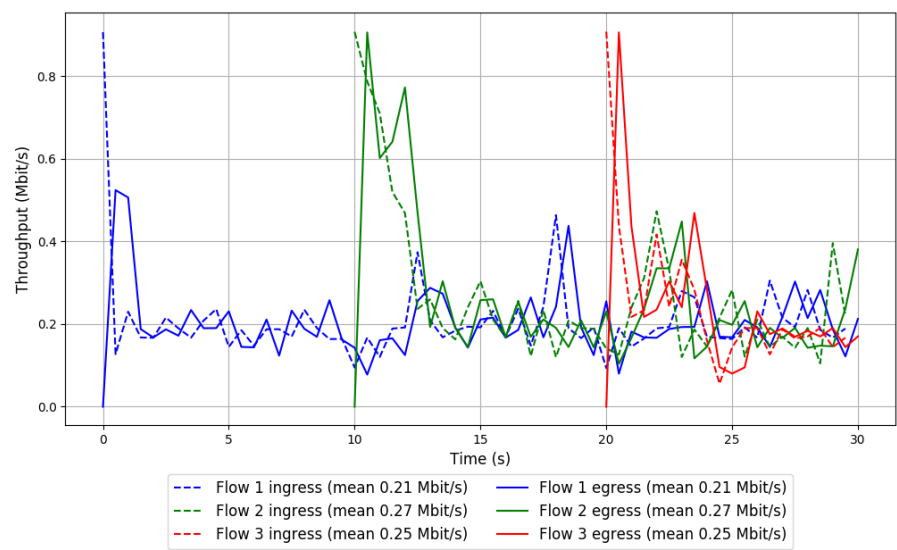


## Run 2: Statistics of Sprout

Start at: 2018-06-18 15:27:35  
End at: 2018-06-18 15:28:05  
Local clock offset: -0.488 ms  
Remote clock offset: -1.042 ms

```
# Below is generated by plot.py at 2018-06-18 16:04:03
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.47 Mbit/s
95th percentile per-packet one-way delay: 107.204 ms
Loss rate: 0.09%
-- Flow 1:
Average throughput: 0.21 Mbit/s
95th percentile per-packet one-way delay: 103.022 ms
Loss rate: 0.19%
-- Flow 2:
Average throughput: 0.27 Mbit/s
95th percentile per-packet one-way delay: 103.646 ms
Loss rate: 0.01%
-- Flow 3:
Average throughput: 0.25 Mbit/s
95th percentile per-packet one-way delay: 111.794 ms
Loss rate: 0.00%
```

Run 2: Report of Sprout — Data Link

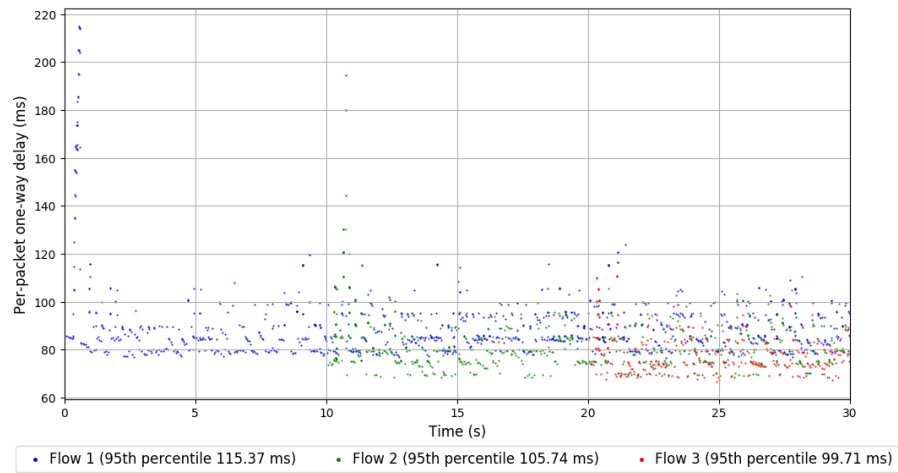
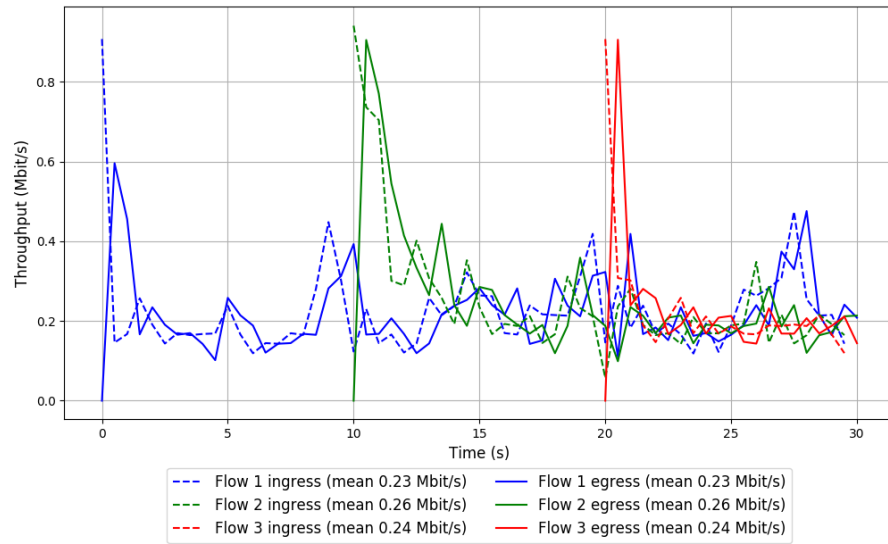


### Run 3: Statistics of Sprout

Start at: 2018-06-18 15:50:52  
End at: 2018-06-18 15:51:22  
Local clock offset: -4.046 ms  
Remote clock offset: -0.604 ms

```
# Below is generated by plot.py at 2018-06-18 16:04:03
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.48 Mbit/s
95th percentile per-packet one-way delay: 105.914 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.23 Mbit/s
95th percentile per-packet one-way delay: 115.367 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.26 Mbit/s
95th percentile per-packet one-way delay: 105.739 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.24 Mbit/s
95th percentile per-packet one-way delay: 99.713 ms
Loss rate: 0.00%
```

### Run 3: Report of Sprout — Data Link



Run 1: Statistics of TaoVA-100x

Start at: 2018-06-18 14:53:52

End at: 2018-06-18 14:54:22

Local clock offset: -2.635 ms

Remote clock offset: 0.107 ms

# Below is generated by plot.py at 2018-06-18 16:04:03

# Datalink statistics

-- Total of 3 flows:

Average throughput: 4.79 Mbit/s

95th percentile per-packet one-way delay: 433.148 ms

Loss rate: 2.05%

-- Flow 1:

Average throughput: 2.61 Mbit/s

95th percentile per-packet one-way delay: 351.722 ms

Loss rate: 2.17%

-- Flow 2:

Average throughput: 2.10 Mbit/s

95th percentile per-packet one-way delay: 518.422 ms

Loss rate: 2.84%

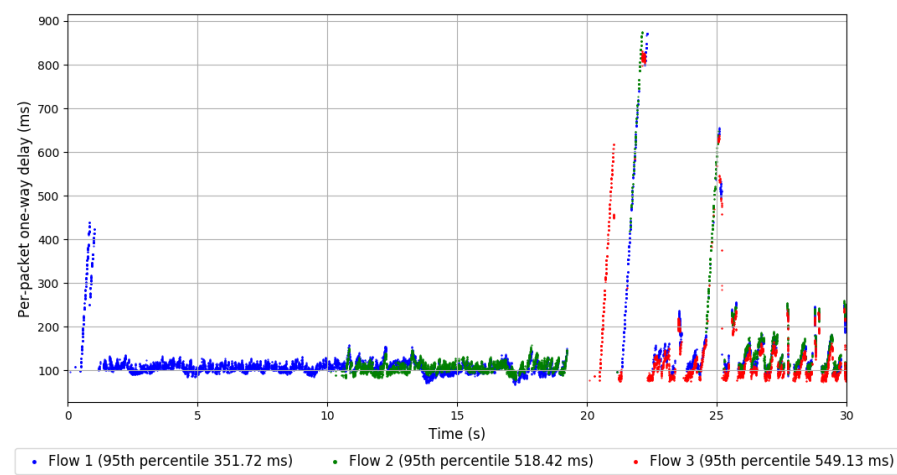
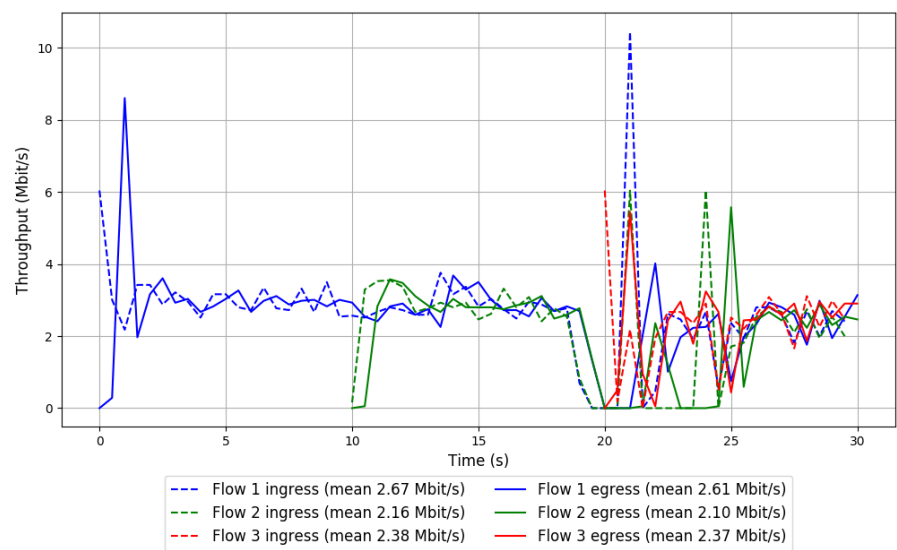
-- Flow 3:

Average throughput: 2.37 Mbit/s

95th percentile per-packet one-way delay: 549.127 ms

Loss rate: 0.22%

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



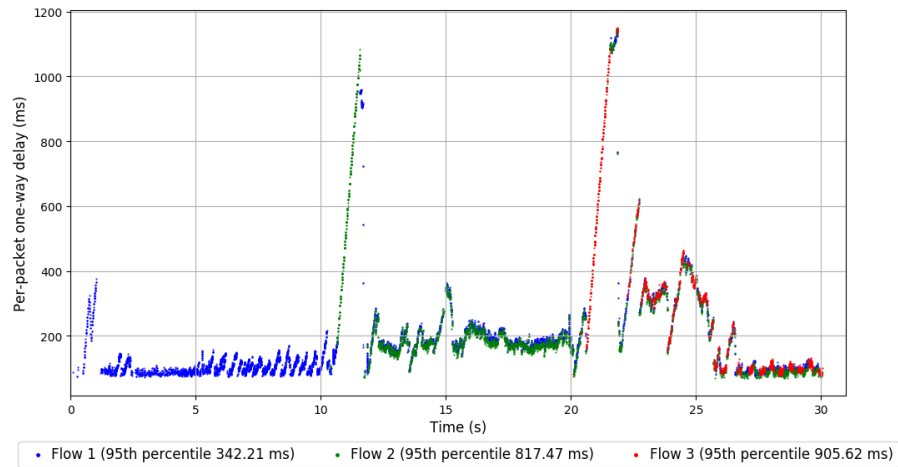
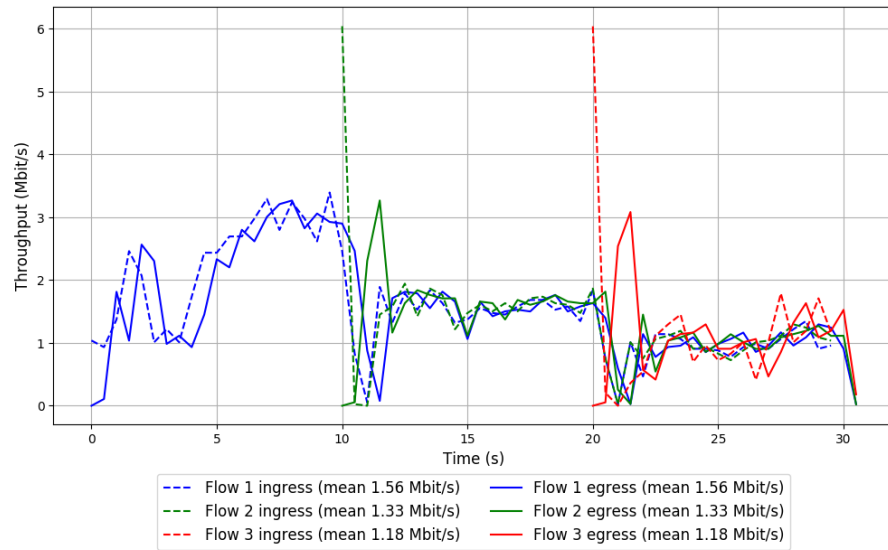
Run 2: Statistics of TaoVA-100x

Start at: 2018-06-18 15:17:09  
End at: 2018-06-18 15:17:39  
Local clock offset: -0.91 ms  
Remote clock offset: -1.229 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.84 Mbit/s  
95th percentile per-packet one-way delay: 658.139 ms  
Loss rate: 0.11%  
-- Flow 1:  
Average throughput: 1.56 Mbit/s  
95th percentile per-packet one-way delay: 342.212 ms  
Loss rate: 0.03%  
-- Flow 2:  
Average throughput: 1.33 Mbit/s  
95th percentile per-packet one-way delay: 817.472 ms  
Loss rate: 0.15%  
-- Flow 3:  
Average throughput: 1.18 Mbit/s  
95th percentile per-packet one-way delay: 905.620 ms  
Loss rate: 0.33%



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

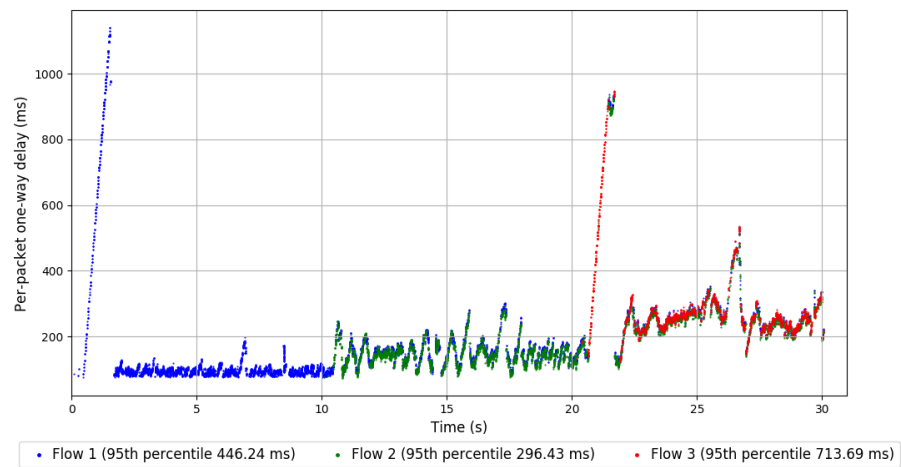
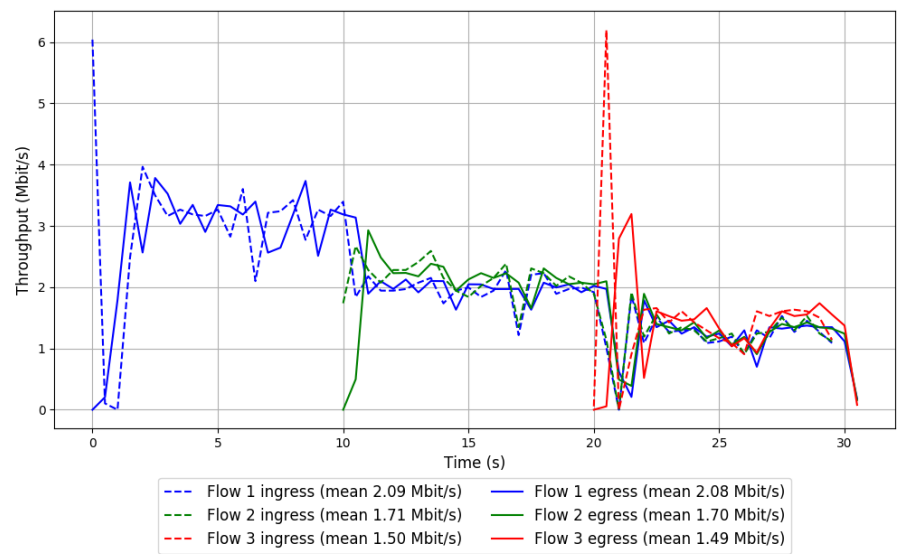


Run 3: Statistics of TaoVA-100x

Start at: 2018-06-18 15:40:43  
End at: 2018-06-18 15:41:13  
Local clock offset: -2.897 ms  
Remote clock offset: -0.773 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 3.70 Mbit/s  
95th percentile per-packet one-way delay: 465.700 ms  
Loss rate: 0.60%  
-- Flow 1:  
Average throughput: 2.08 Mbit/s  
95th percentile per-packet one-way delay: 446.237 ms  
Loss rate: 0.35%  
-- Flow 2:  
Average throughput: 1.70 Mbit/s  
95th percentile per-packet one-way delay: 296.427 ms  
Loss rate: 0.61%  
-- Flow 3:  
Average throughput: 1.49 Mbit/s  
95th percentile per-packet one-way delay: 713.691 ms  
Loss rate: 1.64%

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

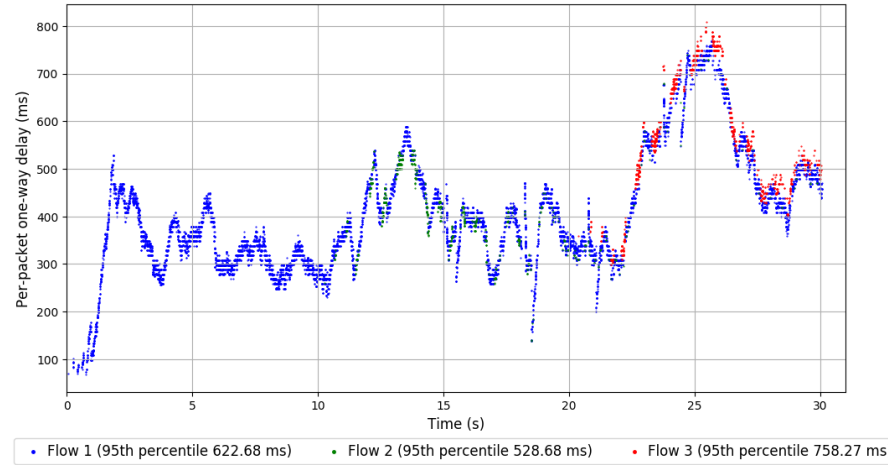
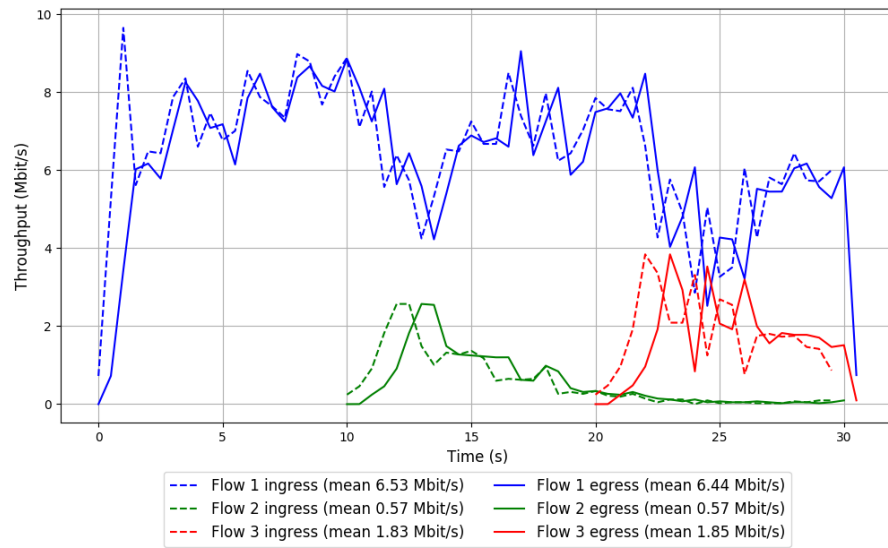


Run 1: Statistics of TCP Vegas

Start at: 2018-06-18 14:55:29  
End at: 2018-06-18 14:55:59  
Local clock offset: -2.757 ms  
Remote clock offset: -0.158 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 7.41 Mbit/s  
95th percentile per-packet one-way delay: 677.707 ms  
Loss rate: 1.31%  
-- Flow 1:  
Average throughput: 6.44 Mbit/s  
95th percentile per-packet one-way delay: 622.677 ms  
Loss rate: 1.28%  
-- Flow 2:  
Average throughput: 0.57 Mbit/s  
95th percentile per-packet one-way delay: 528.681 ms  
Loss rate: 0.74%  
-- Flow 3:  
Average throughput: 1.85 Mbit/s  
95th percentile per-packet one-way delay: 758.266 ms  
Loss rate: 1.92%

# Run 1: Report of TCP Vegas — Data Link

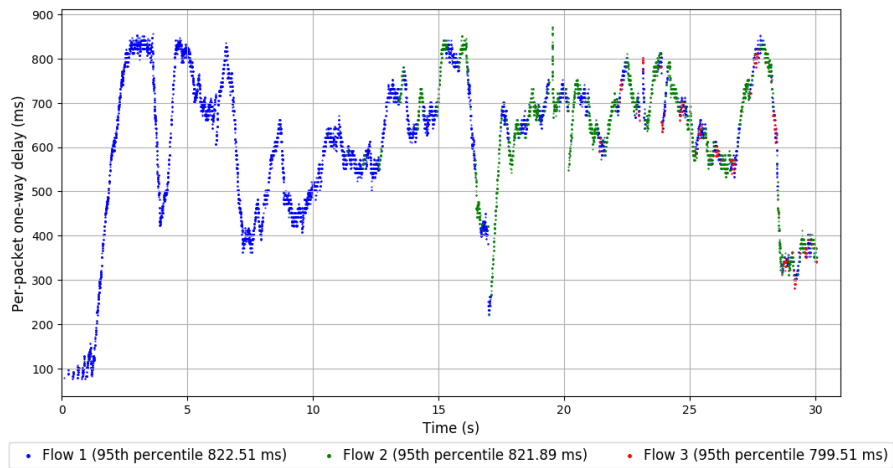
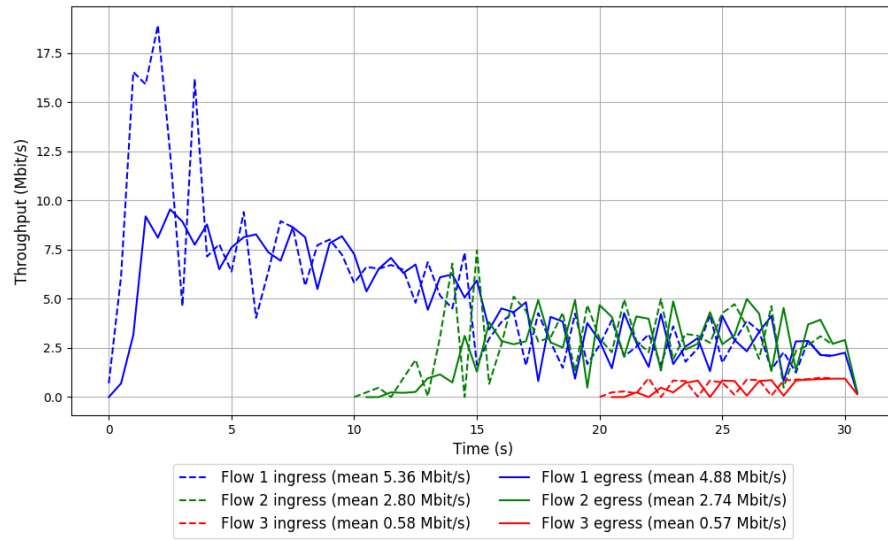


Run 2: Statistics of TCP Vegas

Start at: 2018-06-18 15:18:37  
End at: 2018-06-18 15:19:07  
Local clock offset: -0.801 ms  
Remote clock offset: -1.189 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 6.83 Mbit/s  
95th percentile per-packet one-way delay: 822.298 ms  
Loss rate: 7.69%  
-- Flow 1:  
Average throughput: 4.88 Mbit/s  
95th percentile per-packet one-way delay: 822.510 ms  
Loss rate: 8.69%  
-- Flow 2:  
Average throughput: 2.74 Mbit/s  
95th percentile per-packet one-way delay: 821.888 ms  
Loss rate: 4.90%  
-- Flow 3:  
Average throughput: 0.57 Mbit/s  
95th percentile per-packet one-way delay: 799.511 ms  
Loss rate: 7.11%

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



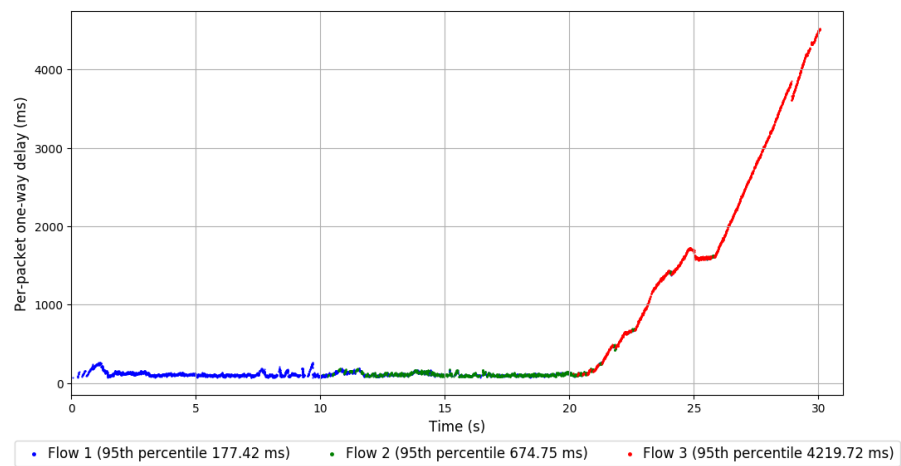
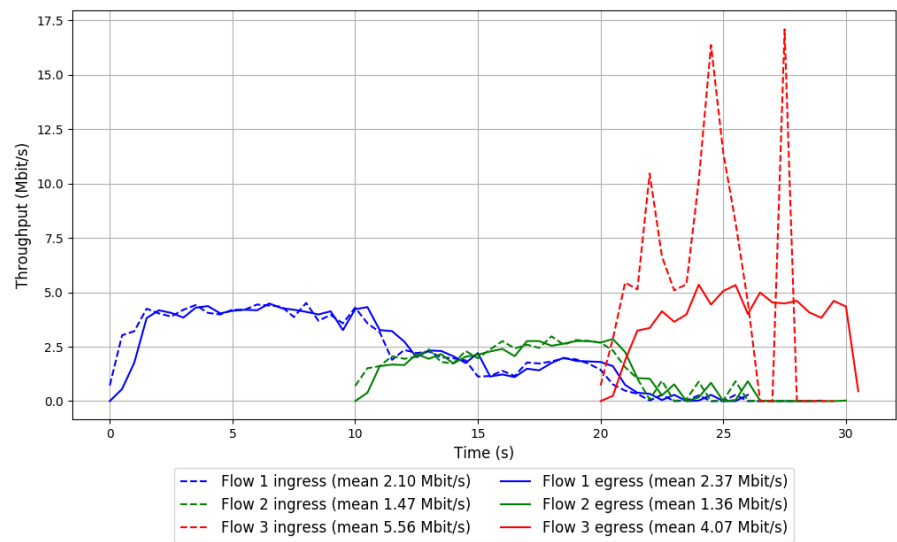
Run 3: Statistics of TCP Vegas

Start at: 2018-06-18 15:42:14  
End at: 2018-06-18 15:42:44  
Local clock offset: -3.023 ms  
Remote clock offset: -0.728 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 4.27 Mbit/s  
95th percentile per-packet one-way delay: 3597.909 ms  
Loss rate: 10.58%  
-- Flow 1:  
Average throughput: 2.37 Mbit/s  
95th percentile per-packet one-way delay: 177.418 ms  
Loss rate: 0.33%  
-- Flow 2:  
Average throughput: 1.36 Mbit/s  
95th percentile per-packet one-way delay: 674.746 ms  
Loss rate: 1.77%  
-- Flow 3:  
Average throughput: 4.07 Mbit/s  
95th percentile per-packet one-way delay: 4219.715 ms  
Loss rate: 26.39%



Run 3: Report of TCP Vegas — Data Link

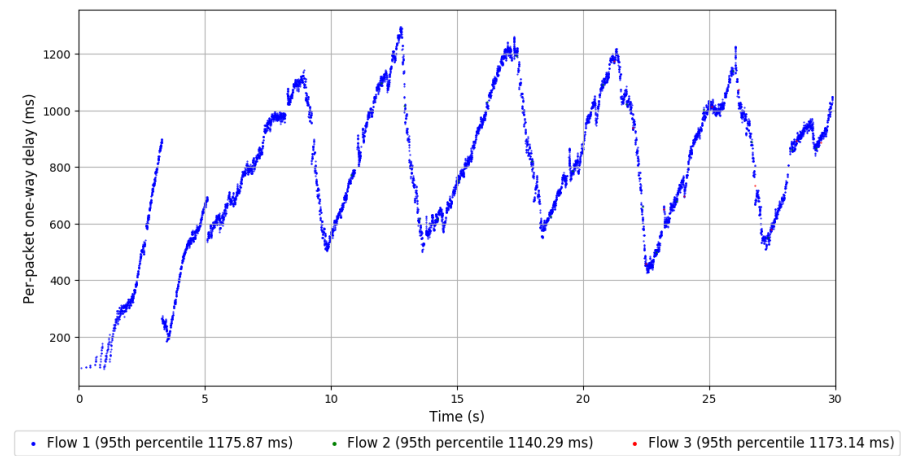
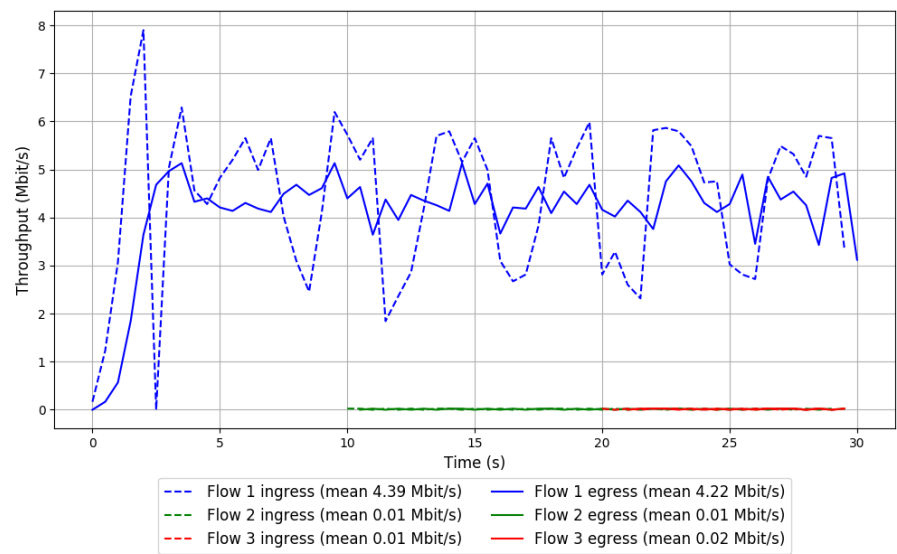


Run 1: Statistics of Verus

Start at: 2018-06-18 15:05:35  
End at: 2018-06-18 15:06:05  
Local clock offset: -2.289 ms  
Remote clock offset: -0.971 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 4.23 Mbit/s  
95th percentile per-packet one-way delay: 1175.869 ms  
Loss rate: 4.15%  
-- Flow 1:  
Average throughput: 4.22 Mbit/s  
95th percentile per-packet one-way delay: 1175.869 ms  
Loss rate: 4.14%  
-- Flow 2:  
Average throughput: 0.01 Mbit/s  
95th percentile per-packet one-way delay: 1140.294 ms  
Loss rate: 4.35%  
-- Flow 3:  
Average throughput: 0.02 Mbit/s  
95th percentile per-packet one-way delay: 1173.138 ms  
Loss rate: 8.33%

Run 1: Report of Verus — Data Link

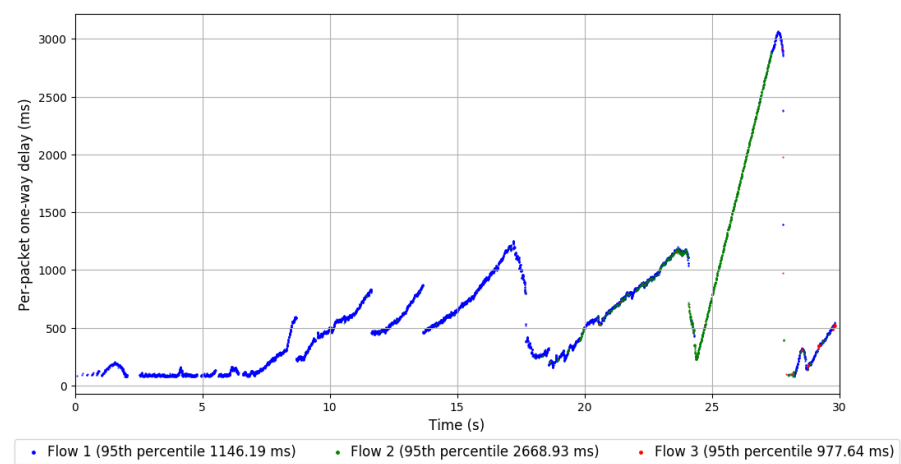
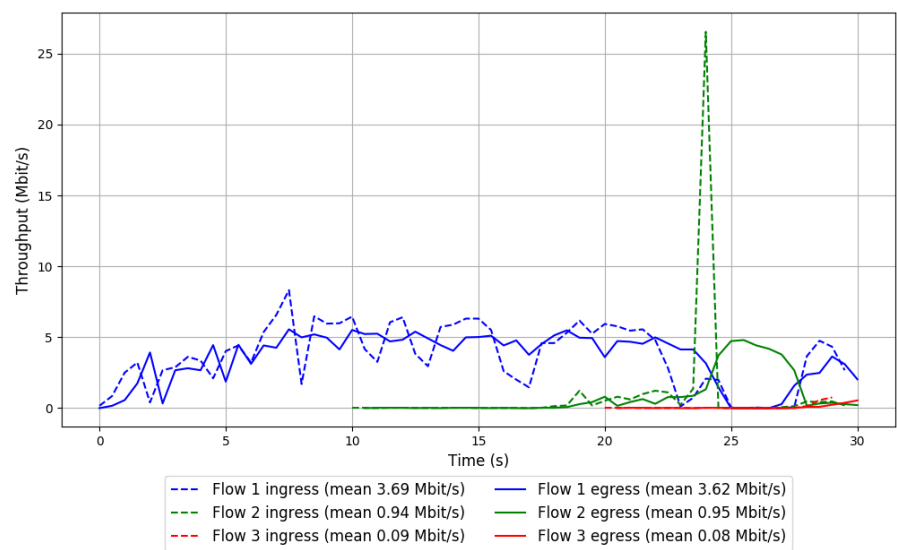


Run 2: Statistics of Verus

Start at: 2018-06-18 15:28:55  
End at: 2018-06-18 15:29:25  
Local clock offset: -0.488 ms  
Remote clock offset: -0.937 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 4.26 Mbit/s  
95th percentile per-packet one-way delay: 1900.330 ms  
Loss rate: 1.90%  
-- Flow 1:  
Average throughput: 3.62 Mbit/s  
95th percentile per-packet one-way delay: 1146.195 ms  
Loss rate: 1.96%  
-- Flow 2:  
Average throughput: 0.95 Mbit/s  
95th percentile per-packet one-way delay: 2668.934 ms  
Loss rate: 1.08%  
-- Flow 3:  
Average throughput: 0.08 Mbit/s  
95th percentile per-packet one-way delay: 977.640 ms  
Loss rate: 12.50%

Run 2: Report of Verus — Data Link

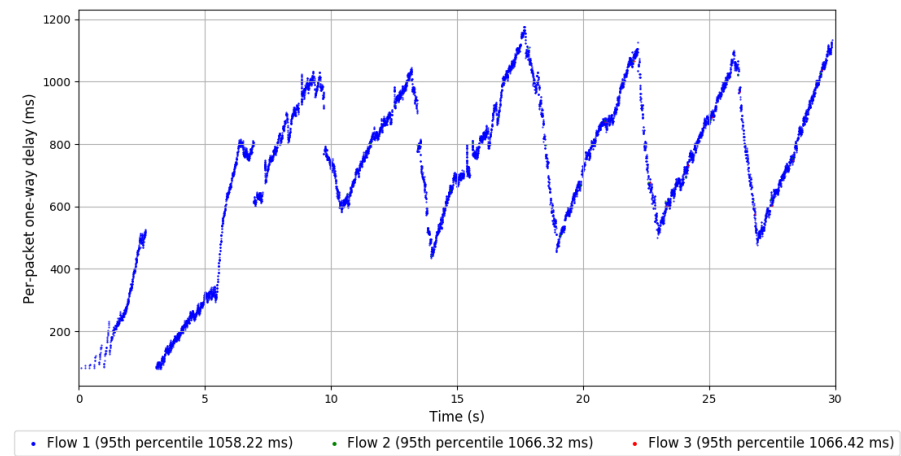
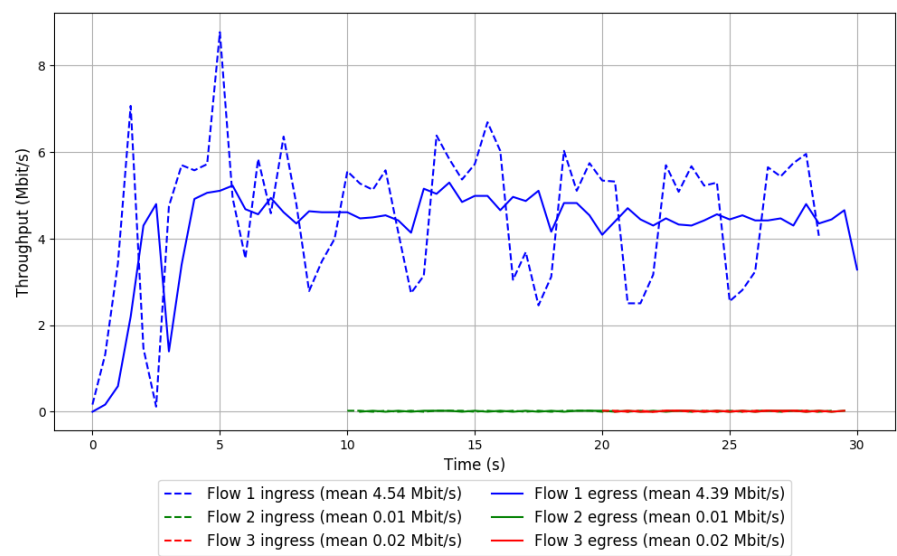


Run 3: Statistics of Verus

Start at: 2018-06-18 15:52:12  
End at: 2018-06-18 15:52:42  
Local clock offset: -4.267 ms  
Remote clock offset: -0.519 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 4.40 Mbit/s  
95th percentile per-packet one-way delay: 1058.379 ms  
Loss rate: 0.49%  
-- Flow 1:  
Average throughput: 4.39 Mbit/s  
95th percentile per-packet one-way delay: 1058.220 ms  
Loss rate: 0.48%  
-- Flow 2:  
Average throughput: 0.01 Mbit/s  
95th percentile per-packet one-way delay: 1066.320 ms  
Loss rate: 4.17%  
-- Flow 3:  
Average throughput: 0.02 Mbit/s  
95th percentile per-packet one-way delay: 1066.425 ms  
Loss rate: 8.33%

Run 3: Report of Verus — Data Link



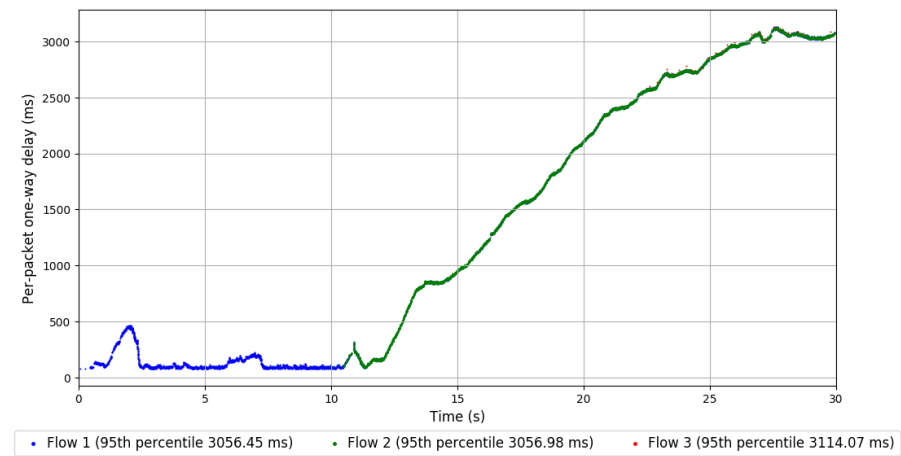
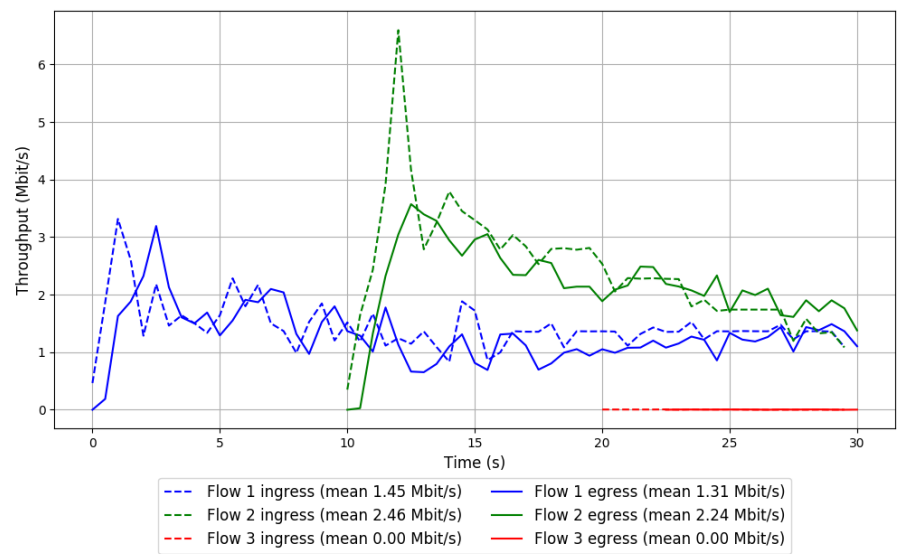
Run 1: Statistics of PCC-Vivace

Start at: 2018-06-18 14:57:05  
End at: 2018-06-18 14:57:35  
Local clock offset: -2.883 ms  
Remote clock offset: -0.398 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.81 Mbit/s  
95th percentile per-packet one-way delay: 3057.370 ms  
Loss rate: 9.20%  
-- Flow 1:  
Average throughput: 1.31 Mbit/s  
95th percentile per-packet one-way delay: 3056.453 ms  
Loss rate: 9.46%  
-- Flow 2:  
Average throughput: 2.24 Mbit/s  
95th percentile per-packet one-way delay: 3056.982 ms  
Loss rate: 8.97%  
-- Flow 3:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 3114.065 ms  
Loss rate: 10.53%



Run 1: Report of PCC-Vivace — Data Link

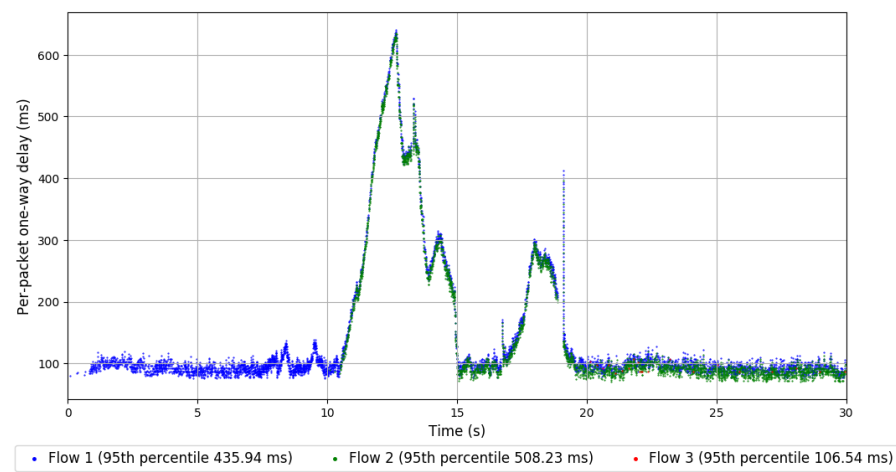
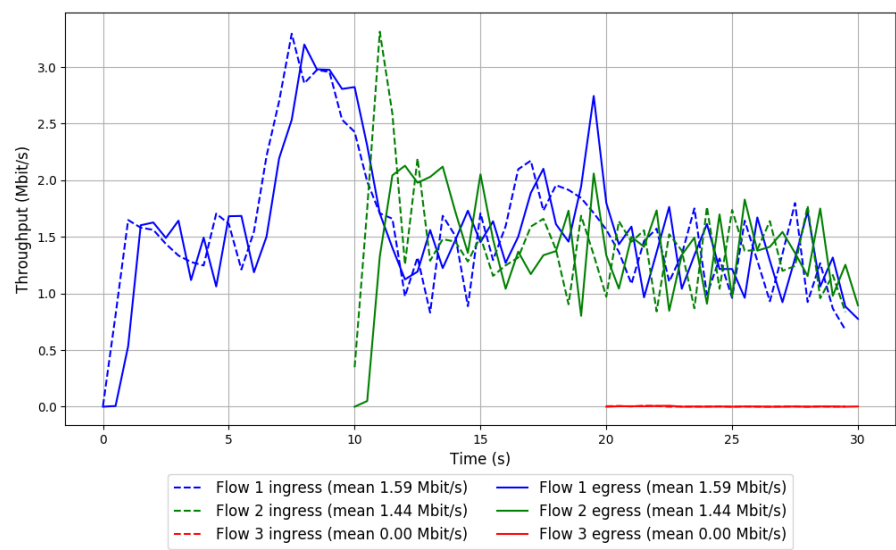


Run 2: Statistics of PCC-Vivace

Start at: 2018-06-18 15:20:11  
End at: 2018-06-18 15:20:41  
Local clock offset: -0.766 ms  
Remote clock offset: -1.207 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 2.54 Mbit/s  
95th percentile per-packet one-way delay: 461.942 ms  
Loss rate: 0.09%  
-- Flow 1:  
Average throughput: 1.59 Mbit/s  
95th percentile per-packet one-way delay: 435.942 ms  
Loss rate: 0.05%  
-- Flow 2:  
Average throughput: 1.44 Mbit/s  
95th percentile per-packet one-way delay: 508.233 ms  
Loss rate: 0.15%  
-- Flow 3:  
Average throughput: 0.00 Mbit/s  
95th percentile per-packet one-way delay: 106.539 ms  
Loss rate: 0.00%

Run 2: Report of PCC-Vivace — Data Link

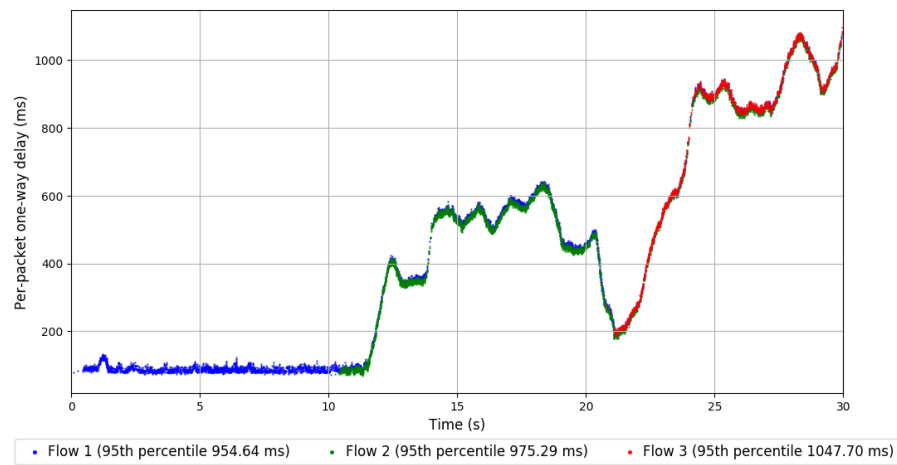
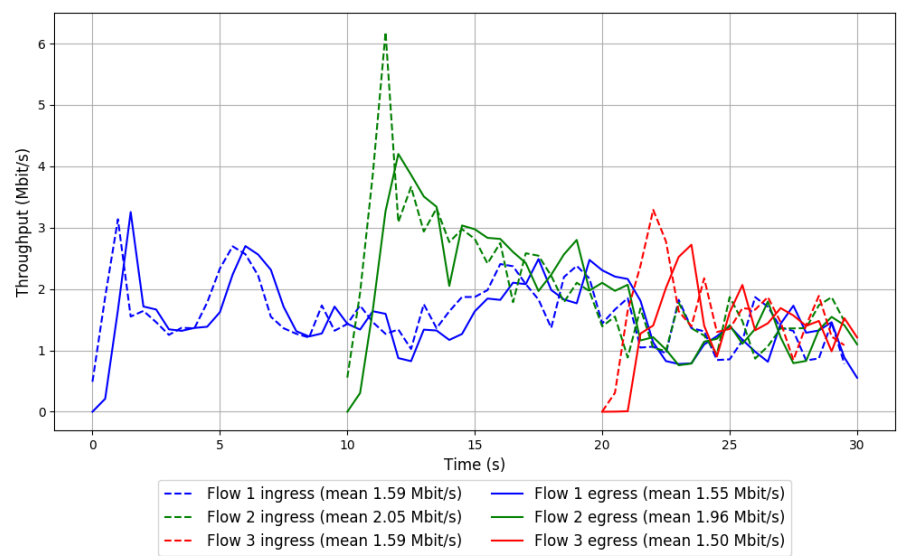


Run 3: Statistics of PCC-Vivace

Start at: 2018-06-18 15:43:45  
End at: 2018-06-18 15:44:15  
Local clock offset: -3.275 ms  
Remote clock offset: -0.769 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 3.33 Mbit/s  
95th percentile per-packet one-way delay: 991.557 ms  
Loss rate: 4.39%  
-- Flow 1:  
Average throughput: 1.55 Mbit/s  
95th percentile per-packet one-way delay: 954.636 ms  
Loss rate: 2.60%  
-- Flow 2:  
Average throughput: 1.96 Mbit/s  
95th percentile per-packet one-way delay: 975.294 ms  
Loss rate: 4.70%  
-- Flow 3:  
Average throughput: 1.50 Mbit/s  
95th percentile per-packet one-way delay: 1047.702 ms  
Loss rate: 8.99%

Run 3: Report of PCC-Vivace — Data Link

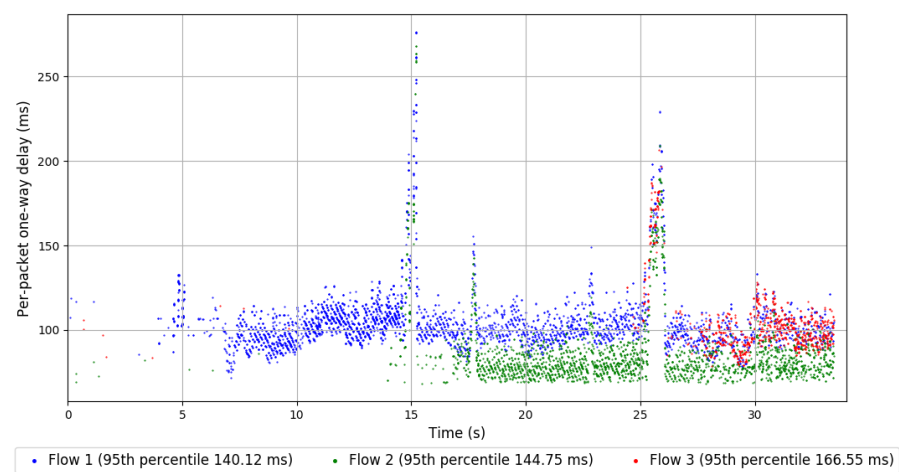
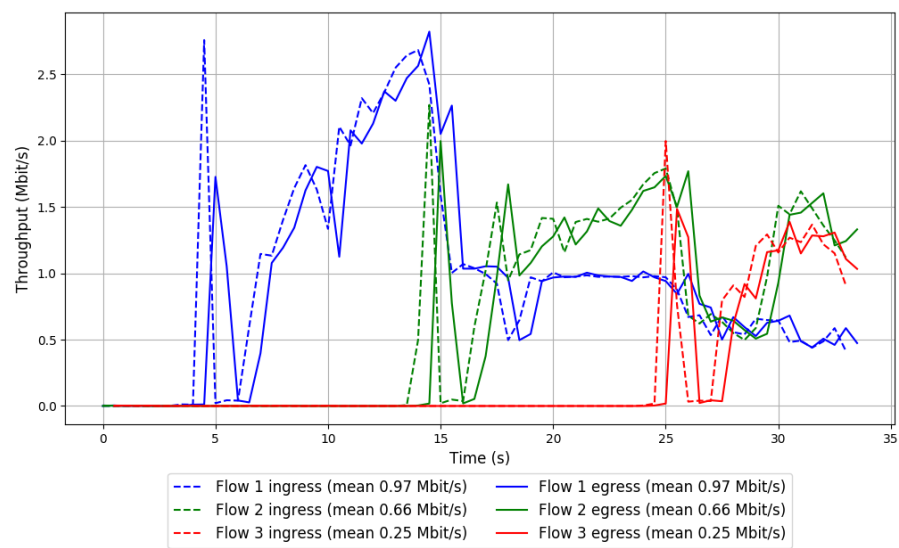


Run 1: Statistics of WebRTC media

Start at: 2018-06-18 15:02:53  
End at: 2018-06-18 15:03:23  
Local clock offset: -2.935 ms  
Remote clock offset: -0.845 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.86 Mbit/s  
95th percentile per-packet one-way delay: 150.252 ms  
Loss rate: 0.23%  
-- Flow 1:  
Average throughput: 0.97 Mbit/s  
95th percentile per-packet one-way delay: 140.120 ms  
Loss rate: 0.06%  
-- Flow 2:  
Average throughput: 0.66 Mbit/s  
95th percentile per-packet one-way delay: 144.753 ms  
Loss rate: 0.31%  
-- Flow 3:  
Average throughput: 0.25 Mbit/s  
95th percentile per-packet one-way delay: 166.552 ms  
Loss rate: 0.70%

Run 1: Report of WebRTC media — Data Link



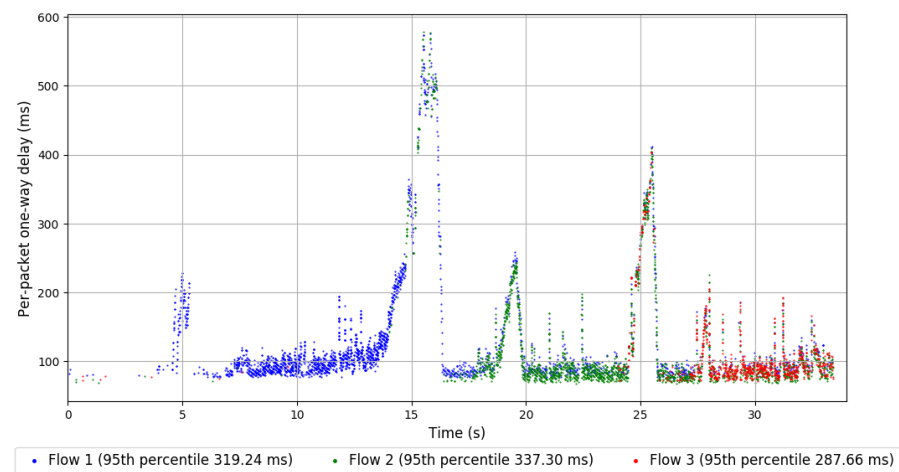
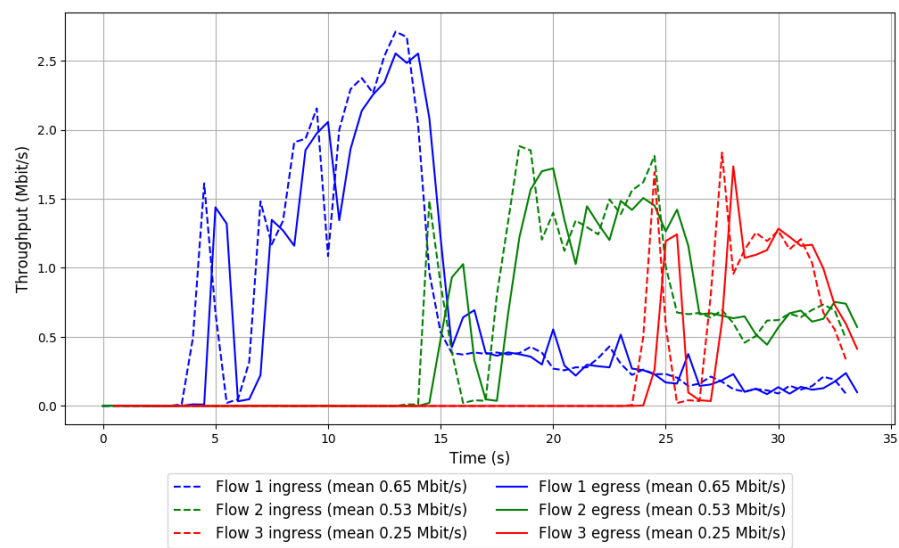
Run 2: Statistics of WebRTC media

Start at: 2018-06-18 15:26:10  
End at: 2018-06-18 15:26:40  
Local clock offset: -0.775 ms  
Remote clock offset: -1.091 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.43 Mbit/s  
95th percentile per-packet one-way delay: 322.148 ms  
Loss rate: 0.23%  
-- Flow 1:  
Average throughput: 0.65 Mbit/s  
95th percentile per-packet one-way delay: 319.243 ms  
Loss rate: 0.04%  
-- Flow 2:  
Average throughput: 0.53 Mbit/s  
95th percentile per-packet one-way delay: 337.299 ms  
Loss rate: 0.10%  
-- Flow 3:  
Average throughput: 0.25 Mbit/s  
95th percentile per-packet one-way delay: 287.661 ms  
Loss rate: 1.04%



Run 2: Report of WebRTC media — Data Link



Run 3: Statistics of WebRTC media

Start at: 2018-06-18 15:49:31  
End at: 2018-06-18 15:50:01  
Local clock offset: -3.897 ms  
Remote clock offset: -0.692 ms

# Below is generated by plot.py at 2018-06-18 16:04:03  
# Datalink statistics  
-- Total of 3 flows:  
Average throughput: 1.28 Mbit/s  
95th percentile per-packet one-way delay: 320.187 ms  
Loss rate: 0.05%  
-- Flow 1:  
Average throughput: 0.62 Mbit/s  
95th percentile per-packet one-way delay: 277.836 ms  
Loss rate: 0.02%  
-- Flow 2:  
Average throughput: 0.44 Mbit/s  
95th percentile per-packet one-way delay: 362.972 ms  
Loss rate: 0.06%  
-- Flow 3:  
Average throughput: 0.23 Mbit/s  
95th percentile per-packet one-way delay: 244.875 ms  
Loss rate: 0.11%

Run 3: Report of WebRTC media — Data Link

