





TELECOM ITALIA Group

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TIMquic & QuicGen



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User device explicit monitoring App

<https://tools.ietf.org/html/draft-cnbf-ippm-user-devices-explicit-monitoring-01>



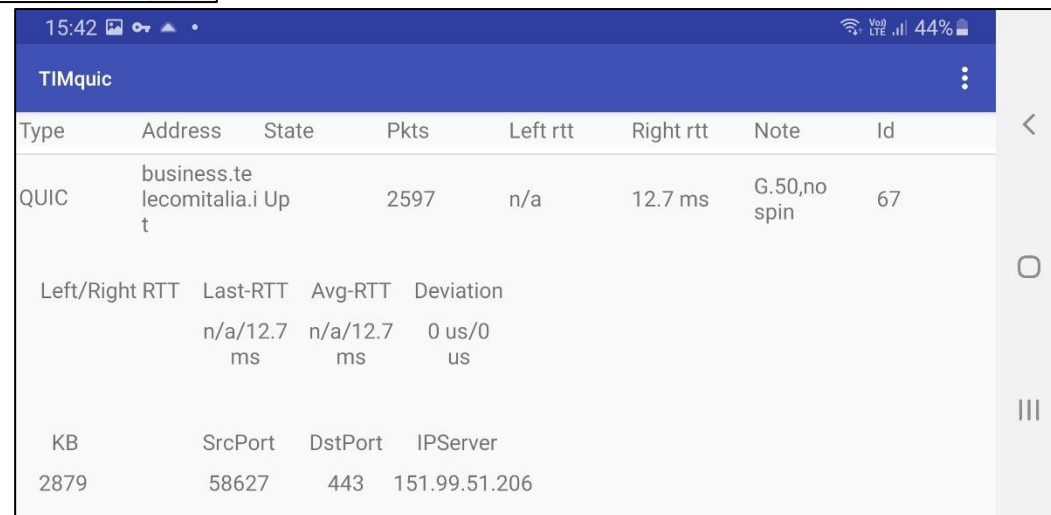
15:39 VoLTE 46%

TIMQuic

Type	Address	State	Pkts	Left rtt	Right rtt	Note	Id
QUIC	edge-star-s-hv-01-any2.facebook.com	Up	141	n/a	22.9 ms	V.fbm, no spin	63
QUIC	lhr35s11-in-f14.1e100.net	Up	37	n/a	27.9 ms	G.50, no spin	66
QUIC	business.tecomitalia.it	Up	2597	n/a	12.7 ms	G.50, no spin	67
QUIC	edge-star-s-hv-01-any2.facebook.com	Up	103	n/a	36.5 ms	V.fbm, no spin	77

Placing the Explicit Performance Observer on user devices gives many advantages

Real time mobile traffic monitoring



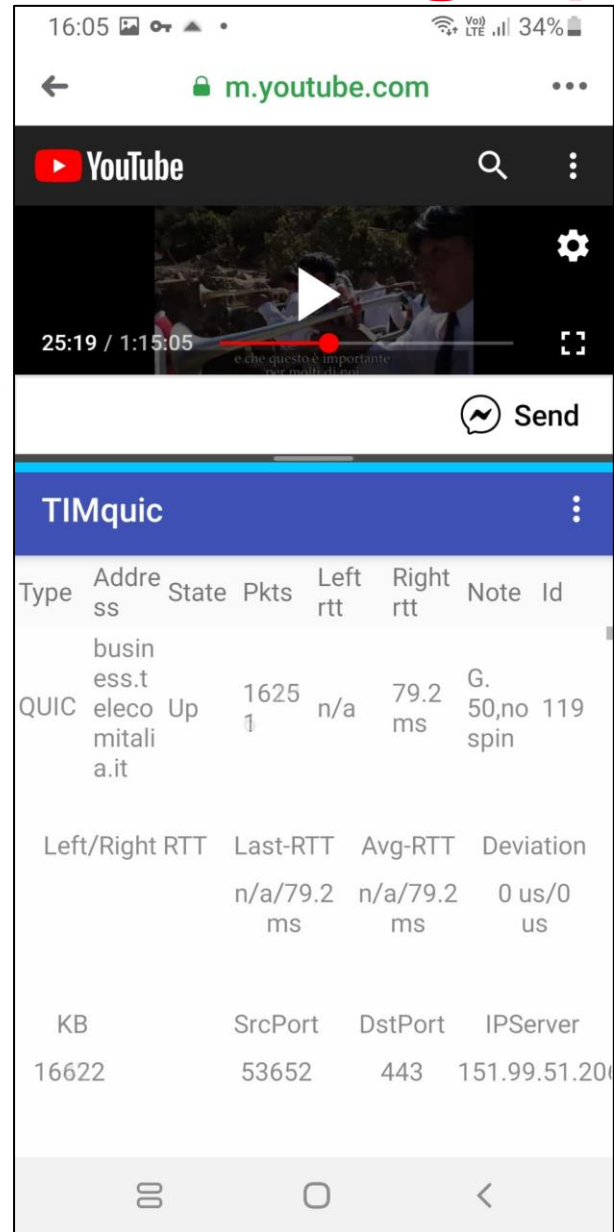
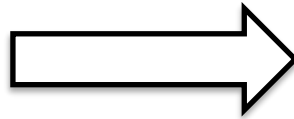
15:42 VoLTE 44%

TIMQuic

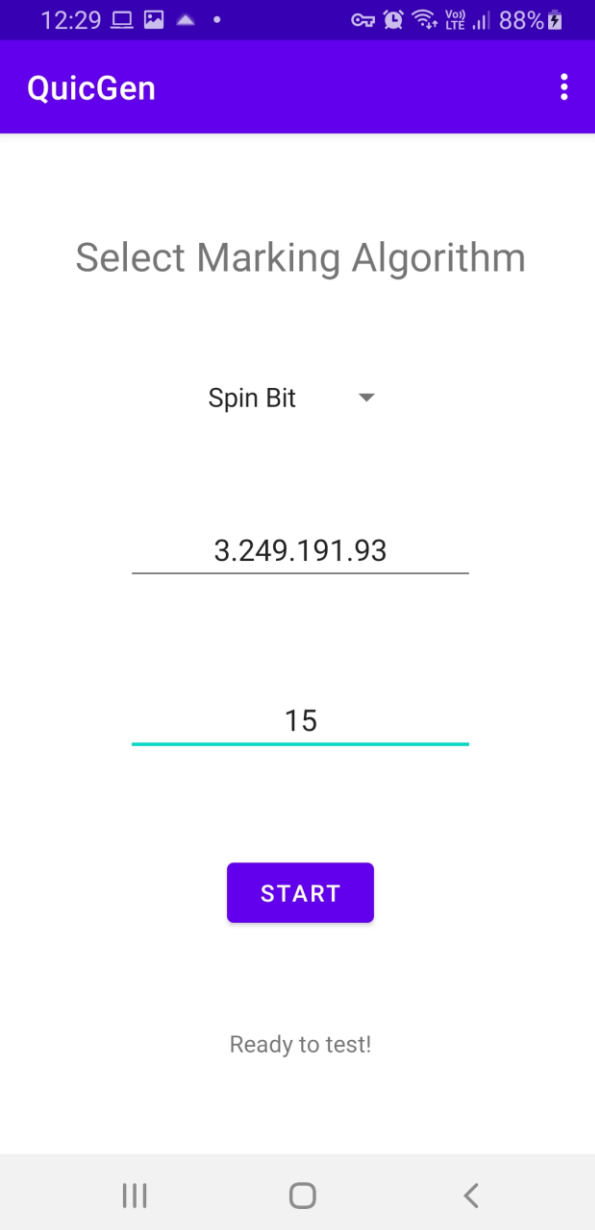
Type	Address	State	Pkts	Left rtt	Right rtt	Note	Id
QUIC	business.tecomitalia.it	Up	2597	n/a	12.7 ms	G.50, no spin	67
Left/Right RTT Last-RTT Avg-RTT Deviation							
				n/a/12.7 ms	n/a/12.7 ms	0 us/0 us	
KB	SrcPort	DstPort	IPServer				
2879	58627	443	151.99.51.206				

User device explicit monitoring App

We can see our connections performance while enjoying the service



Operators, with the customer's permission, may use this information to identify network problems and improve the customer experience

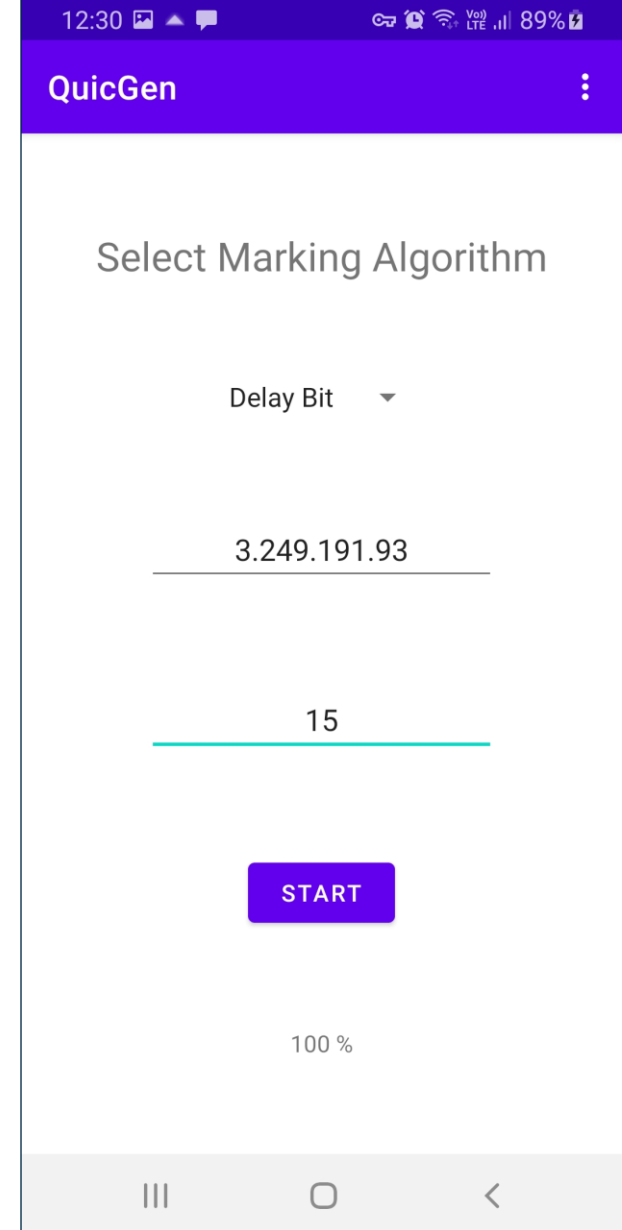


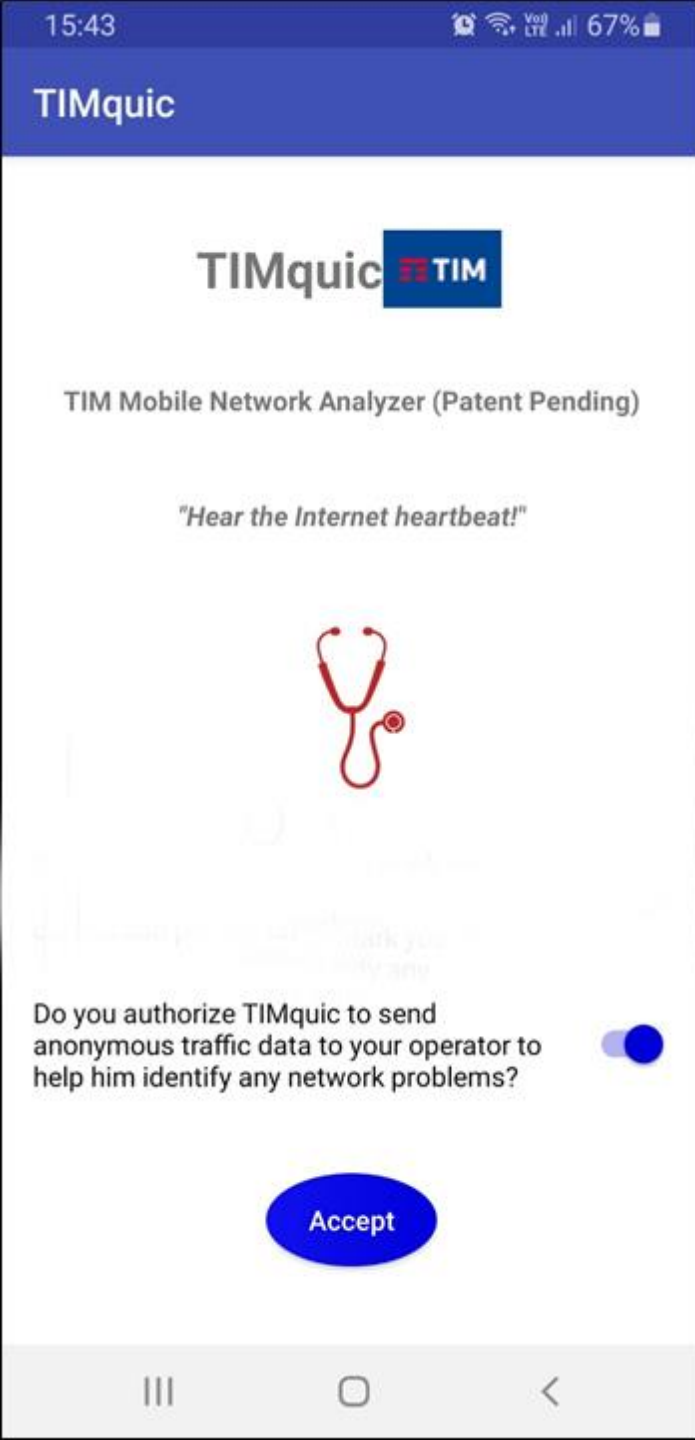
QuicGen

Quic marked traffic generation Android App.

Parameters:

- ***Marking Algorithm***
- ***Server IP address***
- ***MegaBytes to download***








TIMquic

Quic Performance Monitoring Android App

FT

12:18  VoLTE 85% 						
TIMquic 						
Type	DstDns	State	Pkts	Mov Avg RTT	Note	Id
QUIC	compute.amazonaws.com	Up	6507	46	V29,spinning	22
QUIC	compute.amazonaws.com	Up	6482	45	V.tidb,no spin	25
QUIC	instagram-p3-shv-01-any2.facebookcdn.net	Up	59	73	V.fbm v,no spin	43
QUIC	mil04s25-in-f10.1e100.net	Up	25	67	G.50,no spin	47
QUIC	instagram-p3-shv-01-any2.facebookcdn.net	Up	22	117	V.fbm v,no spin	33
QUIC	edge-star-shv-01-any2.facebook.com	Up	20	33	V.fbm v,no spin	17

12:21

VoLTE

85%

TIMquic

QUIC

instagram-p3-shv-01-any2.facebookcdn.net

Up

59

73

V.fbm v,no spin

43

Instagram

com.instagram.android

Pkts Up|Down

Meas

Avg RTT

Min RTT

41 | 18

1

73

73

Max RTT

Last RTT

MovDev RTT

Handshake RTT

73

73

0

73

KBytes Up|Down

Src|Dst Port

Src IP

37 | 9

51940 | 443

192.168.1.20


Dst IP

Src Dns

69.171.250.63


192.168.1.20

TIMquic


QUIC	compute.amazonaws.com	Up	6507	46	V29, spinning	22
	QuicGen	it.tilab.quicgen				
Pkts Up Down	Meas	Avg RTT	Min RTT			
2214 4293	58	52	35			
Max RTT	Last RTT	MovDev RTT	Handshake RTT			
242	50	5	35			
KBytes Up Down	Src Dst Port		Src IP			
133 5345	49852 6121		192.168.1.20			
Dst IP		Src Dns				
3.249.191.93		192.168.1.20				

5 MB file download **Spin bit****Delay bit** 

TIMquic

QUIC	compute.amazonaws.com	Up	6482	45	V.tid b,no spin	25
	QuicGen	it.tilab.quicgen				
Pkts Up Down	Meas	Avg RTT	Min RTT			
2194 4288	12	44	34			
Max RTT	Last RTT	MovDev RTT	Handshake RTT			
54	43	5	34			
KBytes Up Down	Src Dst Port		Src IP			
130 5345	39020 6122		192.168.1.20			
Dst IP		Src Dns				
3.249.191.93		192.168.1.20				

TIMquic


QUIC	compute.amazonaws.com	Up	12955	48	V29, spinning	6
<div></div> <div>QuicGen</div> <div>it.tilab.quicgen</div>						
Pkts Up Down	Meas	Avg RTT	Min RTT			
4383 8572	107	48	31			
Max RTT	Last RTT	MovDev RTT	Handshake RTT			
100	66	7	33			
KBytes Up Down	Src Dst Port		Src IP			
255 10695	37782 6121		192.168.1.20			
Dst IP		Src Dns				
3.249.191.93		192.168.1.20				

**10 MB
file
download**

← **Spin bit**

Delay bit →

TIMquic

QUIC	compute.amazonaws.com	Up	12978	40	V.tid b,no spin	7
<div> QuicGen it.tilab.quicgen</div>						
Pkts Up Down		Meas	Avg RTT		Min RTT	
4388 8590		52	40		0	
Max RTT		Last RTT	MovDev RTT		Handshake RTT	
49		48	10		37	
KBytes Up Down		Src Dst Port		Src IP		
254 10714		44467 6122		192.168.1.20		
Dst IP			Src Dns			
3.249.191.93			192.168.1.20			

TIMquic


QUIC	compute.amazonaws.com	Up	14261	46	V29,spinning	8
<div> QuicGen it.tilab.quicgen</div>						
Pkts Up Down	Meas	Avg RTT	Min RTT			
4821 9440	87	49	34			
Max RTT	Last RTT	MovDev RTT	Handshake RTT			
67	46	5	40			
KBytes Up Down	Src Dst Port		Src IP			
283 11778	57936 6121		192.168.1.20			
Dst IP		Src Dns				
3.249.191.93		192.168.1.20				

**11 MB
file
download**


← **Spin bit**

Delay bit →

TIMquic

QUIC	compute.amazonaws.com	Up	14317	44	V.tid b,no spin	9
<div> QuicGen it.tilab.quicgen</div>						
Pkts Up Down		Meas	Avg RTT		Min RTT	
4886 9431		44	44		37	
Max RTT		Last RTT	MovDev RTT		Handshake RTT	
53		38	3		41	
KBytes Up Down		Src Dst Port		Src IP		
283 11765		48722 6122		192.168.1.20		
Dst IP			Src Dns			
3.249.191.93			192.168.1.20			

TIMquic


QUIC	compute.amazonaws.com	Up	15633	49	V29, spinning	10
	QuicGen	it.tilab.quicgen				
Pkts Up Down	Meas	Avg RTT	Min RTT			
5323 10310	186	45	30			
Max RTT	Last RTT	MovDev RTT	Handshake RTT			
128	67	12	35			
KBytes Up Down	Src Dst Port	Src IP				
308 12857	55410 6121	192.168.1.20				
Dst IP	Src Dns					
3.249.191.93	192.168.1.20					

**12 MB
file
download**


← **Spin bit**

Delay bit →

TIMquic

QUIC	compute.amazonaws.com	Up	15548	43	V.tid b,no spin	29
		QuicGen it.tilab.quicgen				
Pkts Up Down		Meas	Avg RTT		Min RTT	
5260 10288		50	45		32	
Max RTT		Last RTT	MovDev RTT		Handshake RTT	
76		36	4		39	
KBytes Up Down		Src Dst Port		Src IP		
305 12843		58232 6122		192.168.1.20		
Dst IP			Src Dns			
3.249.191.93			192.168.1.20			

TIMquic

QUIC	compute.amazonaws.com	Up	19400	50	V29, spinning	81
<div> QuicGen it.tilab.quicgen</div>						
Pkts Up Down		Meas	Avg RTT		Min RTT	
6557 12843		100	48		39	
Max RTT		Last RTT	MovDev RTT		Handshake RTT	
73		43	7		39	
KBytes Up Down		Src Dst Port		Src IP		
387 16031		60295 6121		192.168.1.20		
Dst IP			Src Dns			
3.249.191.93			192.168.1.20			

**15 MB
file
download**

← **Spin bit**

Delay bit →

TIMquic

QUIC	compute.amazonaws.com	Up	19387	43	V.tid b,no spin	82
<div> QuicGen it.tilab.quicgen</div>						
Pkts Up Down		Meas	Avg RTT		Min RTT	
6545 12842		28	42		35	
Max RTT		Last RTT	MovDev RTT		Handshake RTT	
55		44	4		35	
KBytes Up Down		Src Dst Port		Src IP		
383 16033		37359 6122		192.168.1.20		
Dst IP			Src Dns			
3.249.191.93			192.168.1.20			

11:39

TIMquic												
QUIC	compute.amazonaws.com	Up	25982	58	V29, spinning	13						
		<div> <div>QuicGen</div> <div>it.tilab.quicgen</div> </div>										
Pkts Up Down		Meas	Avg RTT		Min RTT							
8838 17144		251	57		33							
Max RTT		Last RTT	MovDev RTT		Handshake RTT							
819		94	15		35							
KBytes Up Down		Src Dst Port			Src IP							
515 21382		46028 6121			192.168.1.20							
Dst IP				Src Dns								
3.249.191.93				192.168.1.20								

20 MB file download

← Spin bit

Delay bit →

11:37

TIMquic												
QUIC	compute.amazonaws.com	Up	25912	43	V.tid b, no spin	11						
		<div> <div>QuicGen</div> <div>it.tilab.quicgen</div> </div>										
Pkts Up Down		Meas	Avg RTT		Min RTT							
8766 17146		52	44		30							
Max RTT		Last RTT	MovDev RTT		Handshake RTT							
59		42	4		36							
KBytes Up Down		Src Dst Port			Src IP							
516 21396		34305 6122			192.168.1.20							
Dst IP				Src Dns								
3.249.191.93				192.168.1.20								



Ping



3.249.191.93 X

#

V4

ec2-3-249-191-93.eu-west-1.
compute.amazonaws.com
(3.249.191.93)

30 / 30
0% loss

44,87ms
Average

1,66ms
Std. Dev.

46,30ms
Last

42,90ms
Best

50,60ms
Worst

Some tests using Spindump on Linux

```
SPINDUMP
```

45 connections 3.4M packets 3.6G bytes (showing latest RTTs, not showing UDP, showing addresses)

TYPE	ADDRESSES	SESSION	STATE	PAKS	LEFT RTT	RIGHT RTT	NOTE
QUIC	10.1.1.28 <=> 3.122.249.200	null-0490b02a (35391:6122)	Up	252.3K	70 us	11,7 ms	V.tidb,no spin
QUIC	10.1.1.28 <=> 3.122.249.200	null-048c9625 (54314:6121)	Up	207.2K	33 us	13,8 ms	V29,spinning
QUIC	10.1.1.28 <=> 3.122.249.200	null-048af940 (46842:6122)	Up	201.7K	316 us	11,8 ms	V.tidb,no spin
QUIC	10.1.1.28 <=> 3.122.249.200	null-0493e2c4 (34860:6122)	Up	147.6K	464 us	12,8 ms	V.tidb,no spin
QUIC	10.1.1.28 <=> 3.122.249.200	null-0454b357 (46129:6122)	Up	131.2K	27 us	13,2 ms	V.tidb,no spin
QUIC	10.1.1.28 <=> 3.122.249.200	null-04cf830e (59153:6122)	Up	102.2K	68 us	12,7 ms	V.tidb,no spin
QUIC	10.1.1.28 <=> 3.122.249.200	null-04b953ac (50933:6122)	Up	100.3K	77 us	12,0 ms	V.tidb,no spin
QUIC	10.1.1.28 <=> 3.122.249.200	null-046282ac (34186:6121)	Up	100.0K	174 us	16,8 ms	V29,spinning
QUIC	10.1.1.28 <=> 3.122.249.200	null-047a09e3 (34949:6121)	Up	99.5K	36 us	11,7 ms	V29,spinning
QUIC	10.1.1.28 <=> 3.122.249.200	null-041eb103 (57732:6121)	Up	96.2K	110 us	13,0 ms	V29,spinning
QUIC	10.1.1.28 <=> 64.233.184.189	null-null (54331:443)	Starting	576	n/a	n/a	V.0xffffffff,no spin
TCP	10.1.1.28 <=> 156.54.49.52	36984:443	Up	77	14 us	15,4 ms	
TCP	10.1.1.28 <=> 52.114.104.169	53478:443	Up	52	22 us	18,8 ms	
TCP	10.1.1.28 <=> 52.114.92.67	49849:443	Up	48	54 us	31,2 ms	
TCP	10.1.1.28 <=> 140.82.114.25	54906:443	Up	29	180 us	96,4 ms	
TCP	10.1.1.28 <=> 52.114.92.151	40062:443	Up	28	29 us	30,3 ms	
TCP	10.1.1.28 <=> 162.125.19.131	49316:443	Up	24	67 us	103,9 ms	
QUIC	10.1.1.28 <=> 216.58.206.67	null-0875db4f2211c917 (41769:443)	Up	18	n/a	21,8 ms	V29,no spin
TCP	10.1.1.28 <=> 52.114.132.12	37462:443	Up	18	45 us	103,4 ms	
QUIC	10.1.1.28 <=> 216.58.206.67	null-082ed9aa8bc15189 (42863:443)	Up	16	n/a	21,6 ms	V29,no spin

Above, Spindump tracking connections carrying spinbit (V29,spinning) and delaybit (V.tidb).

Below, Spindump tracking a connection carrying QR loss bits; "tot" is the cumulative Qloss (Rloss) of specified direction.

```
fabio@fabio-XPS15:~$ sudo spindump --textual --report-qr-loss --interface wlp59s0 | grep qrloss
QUIC 192.168.1.11 <=> 3.122.249.200 null-04025c8f (53000:6123) at 1617109825591304 qrloss up avg (ref) 1.562 (0.000), tot (ref) 1.562 (0.000) (responder) packets 26 76 bytes
5236 90851 bandwidth 5236 90851 note "V.tigr,spinning"
QUIC 192.168.1.11 <=> 3.122.249.200 null-04025c8f (53000:6123) at 1617109825705264 qrloss up avg (ref) 1.562 (0.000), tot (ref) 0.337 (0.000) (responder) packets 309 3266 by
tes 23488 4392220 bandwidth 23488 4392220 note "V.tigr,spinning"
QUIC 192.168.1.11 <=> 3.122.249.200 null-04025c8f (53000:6123) at 1617109825705264 qrloss up avg (ref) 1.562 (1.406), tot (ref) 0.337 (0.361) (responder) packets 309 3266 by
tes 23488 4392220 bandwidth 23488 4392220 note "V.tigr,spinning"
QUIC 192.168.1.11 <=> 3.122.249.200 null-04025c8f (53000:6123) at 1617109825705426 qrloss up avg (ref) 1.562 (7.031), tot (ref) 0.337 (1.758) (responder) packets 314 3294 by
tes 23805 4430860 bandwidth 23805 4430860 note "V.tigr,spinning"
QUIC 192.168.1.11 <=> 3.122.249.200 null-04025c8f (53000:6123) at 1617109825705426 qrloss up avg (ref) 7.031 (7.031), tot (ref) 1.382 (1.758) (responder) packets 314 3295 by
tes 23805 4432240 bandwidth 23805 4432240 note "V.tigr,spinning"
QUIC 192.168.1.11 <=> 3.122.249.200 null-04025c8f (53000:6123) at 1617109825706550 qrloss up avg (ref) 7.031 (8.750), tot (ref) 1.382 (2.134) (responder) packets 331 3347 by
tes 25293 4504000 bandwidth 25293 4504000 note "V.tigr,spinning"
QUIC 192.168.1.11 <=> 3.122.249.200 null-04025c8f (53000:6123) at 1617109825706551 qrloss up avg (ref) 8.750 (8.750), tot (ref) 1.680 (2.134) (responder) packets 331 3348 by
tes 25293 4505380 bandwidth 25293 4505380 note "V.tigr,spinning"
QUIC 192.168.1.11 <=> 3.122.249.200 null-04025c8f (53000:6123) at 1617109825716688 qrloss up avg (ref) 0.000 (1.562), tot (ref) 0.000 (1.562) (initiator) packets 351 3853 by
tes 28586 5202280 bandwidth 28586 5202280 note "V.tigr,spinning"
```