Broadband Testing

and Quality Methodologies

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thinkbroadband.com

< me.identity != type(techie) >

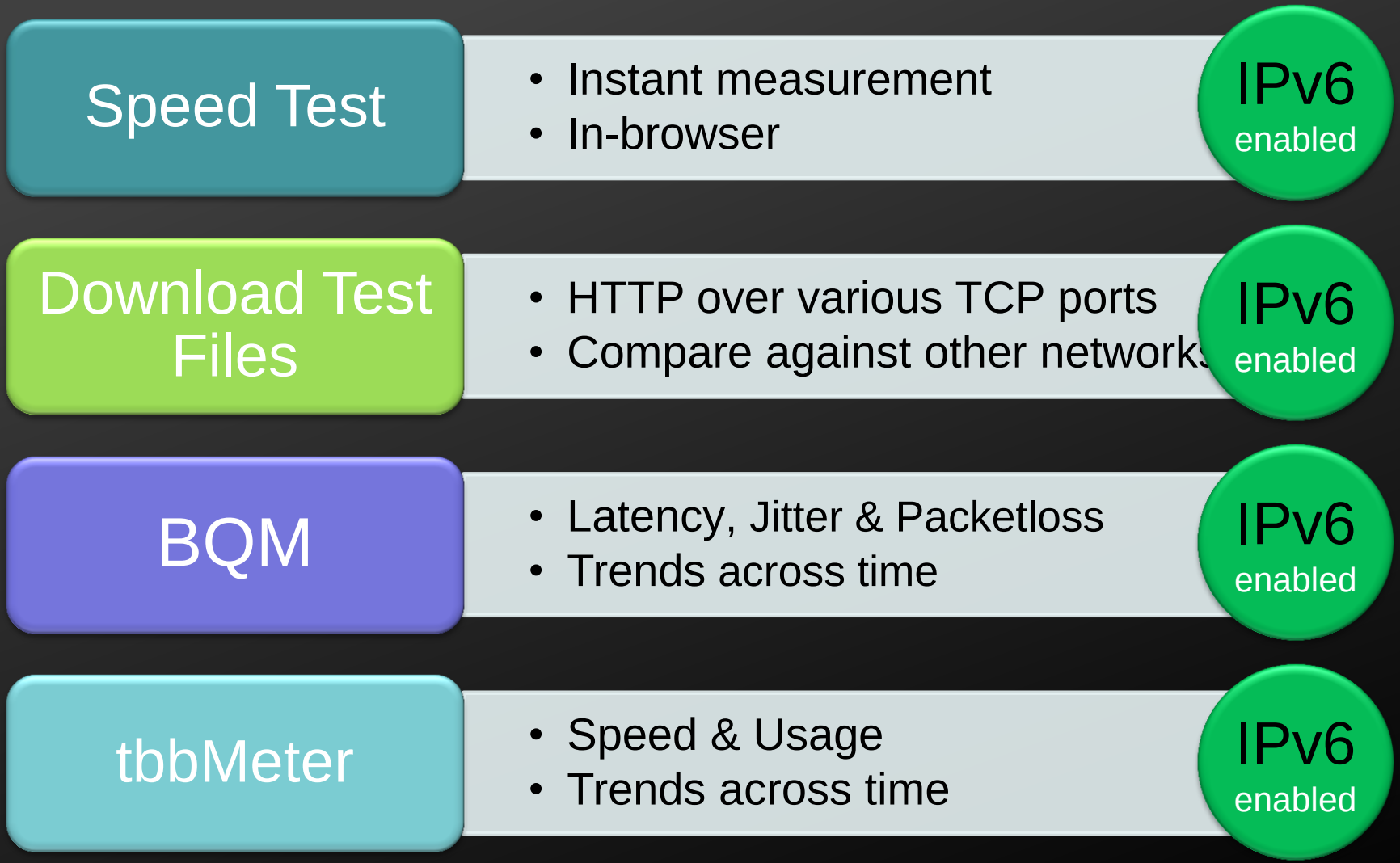
DISCLAIMER

Think back to the year 2000

Our tools

Speed Test	• Instant measurement • In-browser
Download Test Files	• HTTP over various TCP ports • Compare against other networks
BQM	• Latency, Jitter & Packetloss • Trends across time
tbbMeter	• Speed & Usage • Trends across time

Our tools


Speed Test
• Instant measurement
• In-browser
IPv6 enabled
Download Test Files
• HTTP over various TCP ports
• Compare against other networks
IPv6 enabled
BQM
• Latency, Jitter & Packetloss
• Trends across time
IPv6 enabled
tbbMeter
• Speed & Usage
• Trends across time
IPv6 enabled

< hey – it's what most people are interested in >

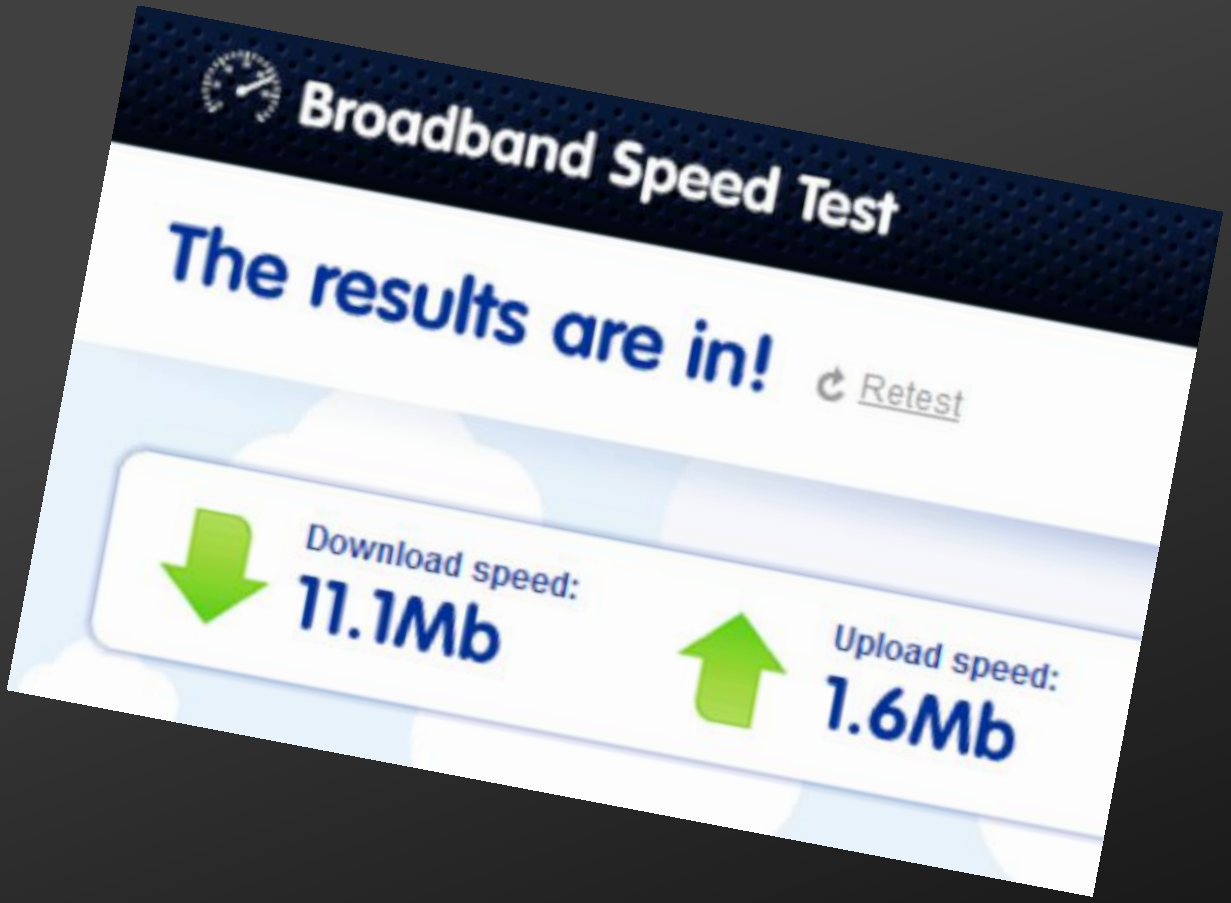
SPEED TEST

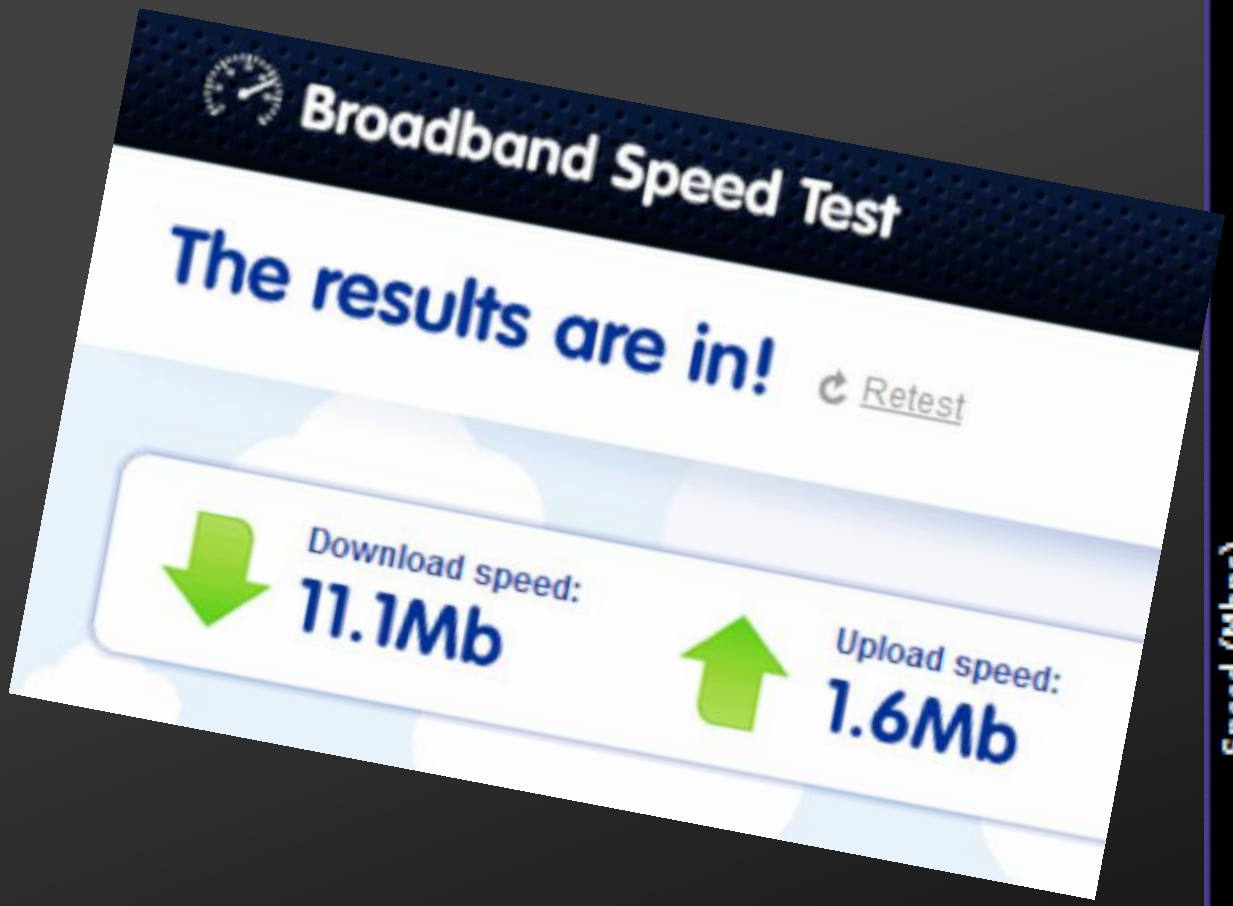

Do not use your connection until the test has finished.
Starting speed test...
Performing a quick download test: 524287 bytes (0.5 MB)
Performing a quick upload test: 524287 bytes (0.5 MB)
Performing a full download test: 19154560 bytes (18.27 MB)
20%
Detailed Output
Port 80
Stop
thinkbroadband
TESTING DOWNLOAD
7.43
Mbps
DOWNLOAD TEST
18%
COMPLETE
Do not use your connection
until the test has finished
RESULTS
DOWNLOAD
IPv4: 6.95 Mbps
IPv6: 7.35 Mbps
UPLOAD
IPv4: 1.57 Mbps
IPv6: 1.55 Mbps
thinkbroadband
Help us map UK Broadband Speeds by entering your postcode:
Your postcode: (optional)
SUBMIT
Your ISP:
-- Select ISP --
If you provide your postcode, it will only be used by thinkbroadband to map UK internet speeds.
TEST AGAIN
Post to Twitter
O2
BT
Down 5.83 Mbps 13.87 Mbps
Up 0.99 Mbps 3.64 Mbps
Tests 1 7

Differences in methodology

Software	Protocol	Threading
• Flash • Java	• HTTP • Custom	• Single • Multi

Measurement	Network	Audience
• Mean • Peak / Percentile	• AS21396 • Various	• UK • Global


Broadband Speed Test
The results are in!
Retest
Download speed:
11.1Mb
Upload speed:
1.6Mb


Broadband Speed Test
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Download speed:
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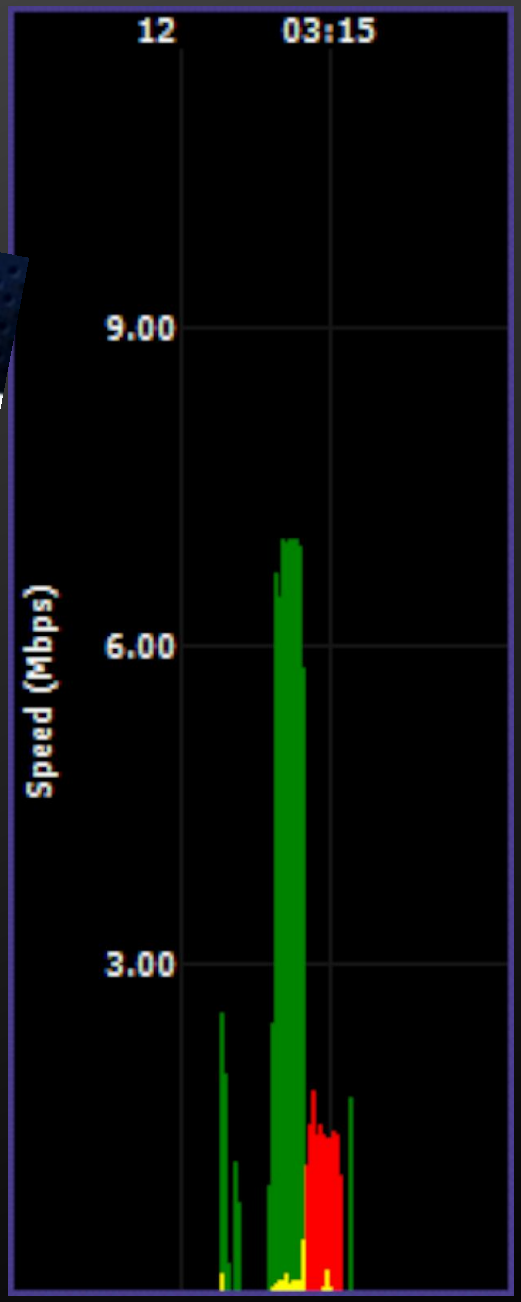
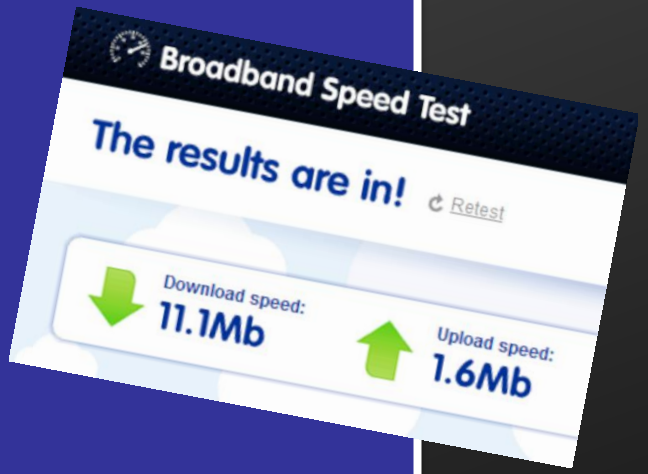
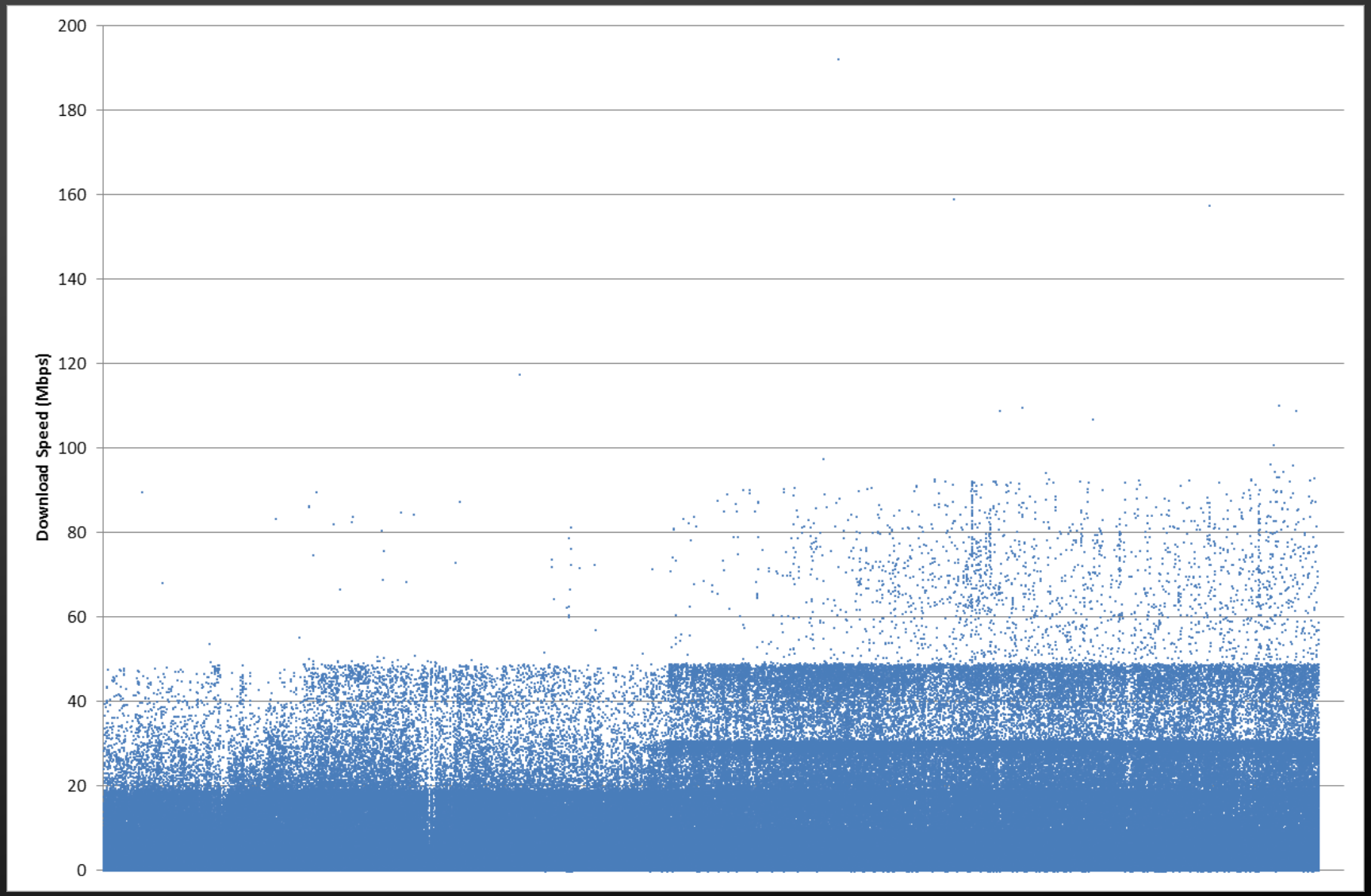
1.6Mb


12
03:15
9.00
6.00
3.00
Speed (Mbps)

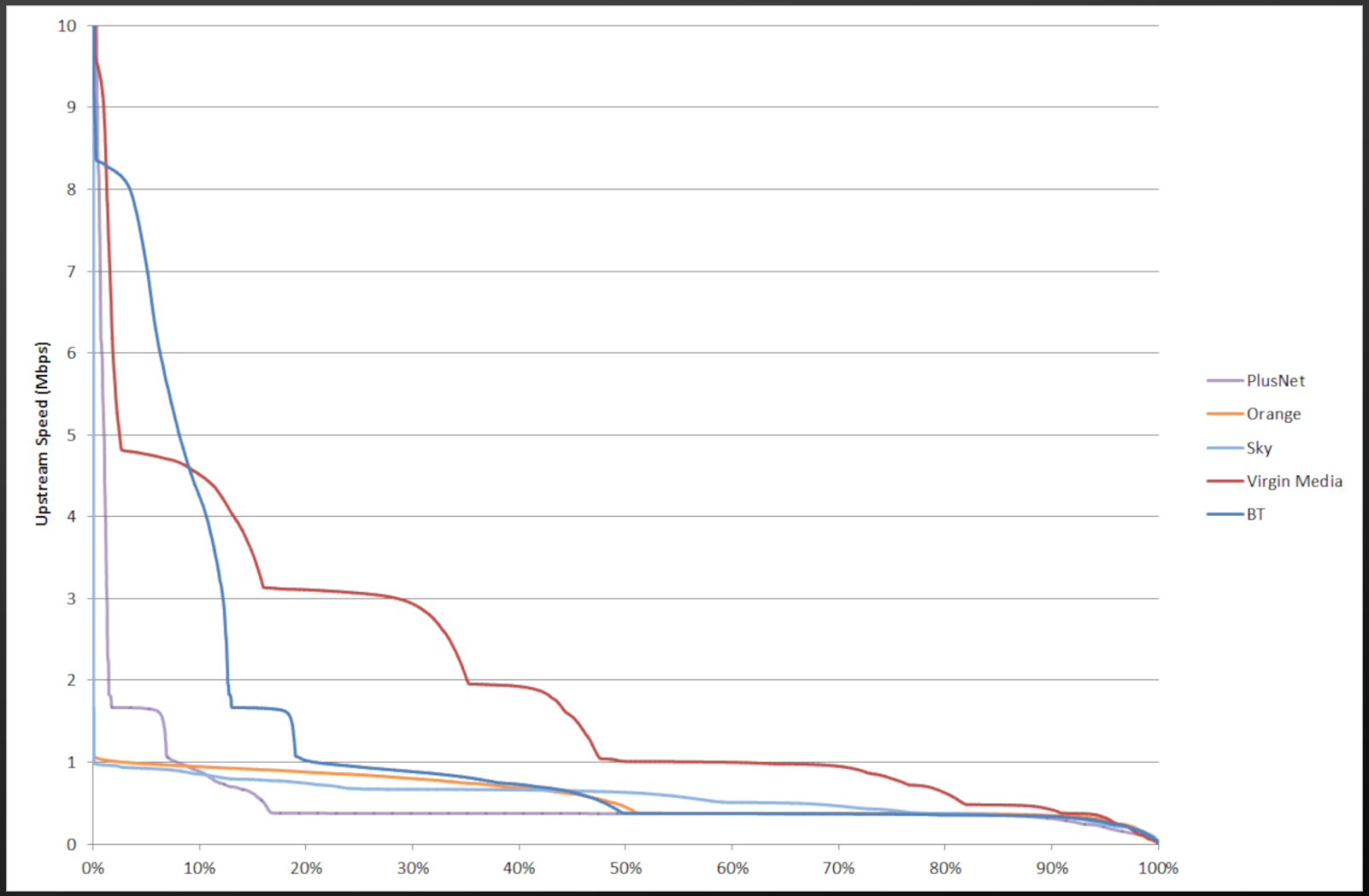
```
adsl-rt1#sh dsl int atm0
ATM0
Alcatel 20190 chipset information
                ATU-R (DS)                      ATU-C (US)
Modem Status:    Showtime (DMTDSL_SHOWTIME)
DSL Mode:        ITU G.992.5 (ADSL2+) Annex M
..
DFE BOM:         DFE3.0 Annex M (3)
Capacity Used:   100%                            100%
Noise Margin:     6.5 dB                          8.5 dB
Output Power:    19.0 dBm                        13.0 dBm
Attenuation:     34.0 dB                         23.0 dB
..

                DS Channel1      DS Channel0   US Channel1       US Channel0
Speed (kbps):             0             8959             0              1932
Cells:                    0         36183564             0         121248190
Reed-Solomon EC:          0                0             0                 0
CRC Errors:               0              641             0                 0
Header Errors:            0              340             0                 0
Total BER:              0E-0         2892E-10
Leakage Average BER:    0E-0         2999E-10
Interleave Delay:         0               48             0                57
                      ATU-R (DS)      ATU-C (US)
Bitswap:              enabled           enabled
Bitswap success:          0                 0
Bitswap failure:          0                 0

LOM Monitoring : Disabled
```



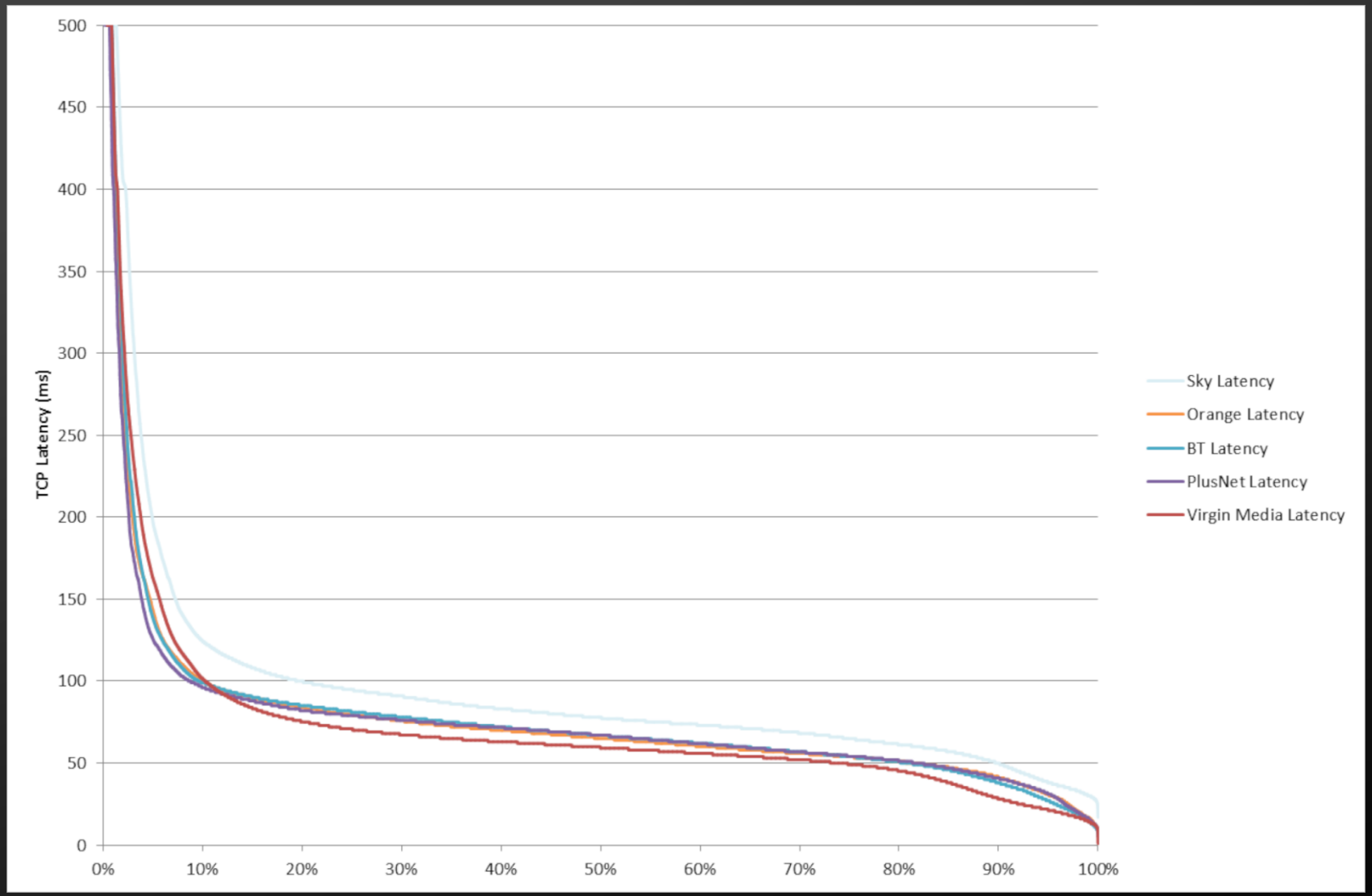
Service upgrades



Upstream Speed Differences



Latency


500
450
400
350
300
250
200
150
100
50
0
TCP Latency (ms)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Sky Latency
Orange Latency
BT Latency
PlusNet Latency
Virgin Media Latency

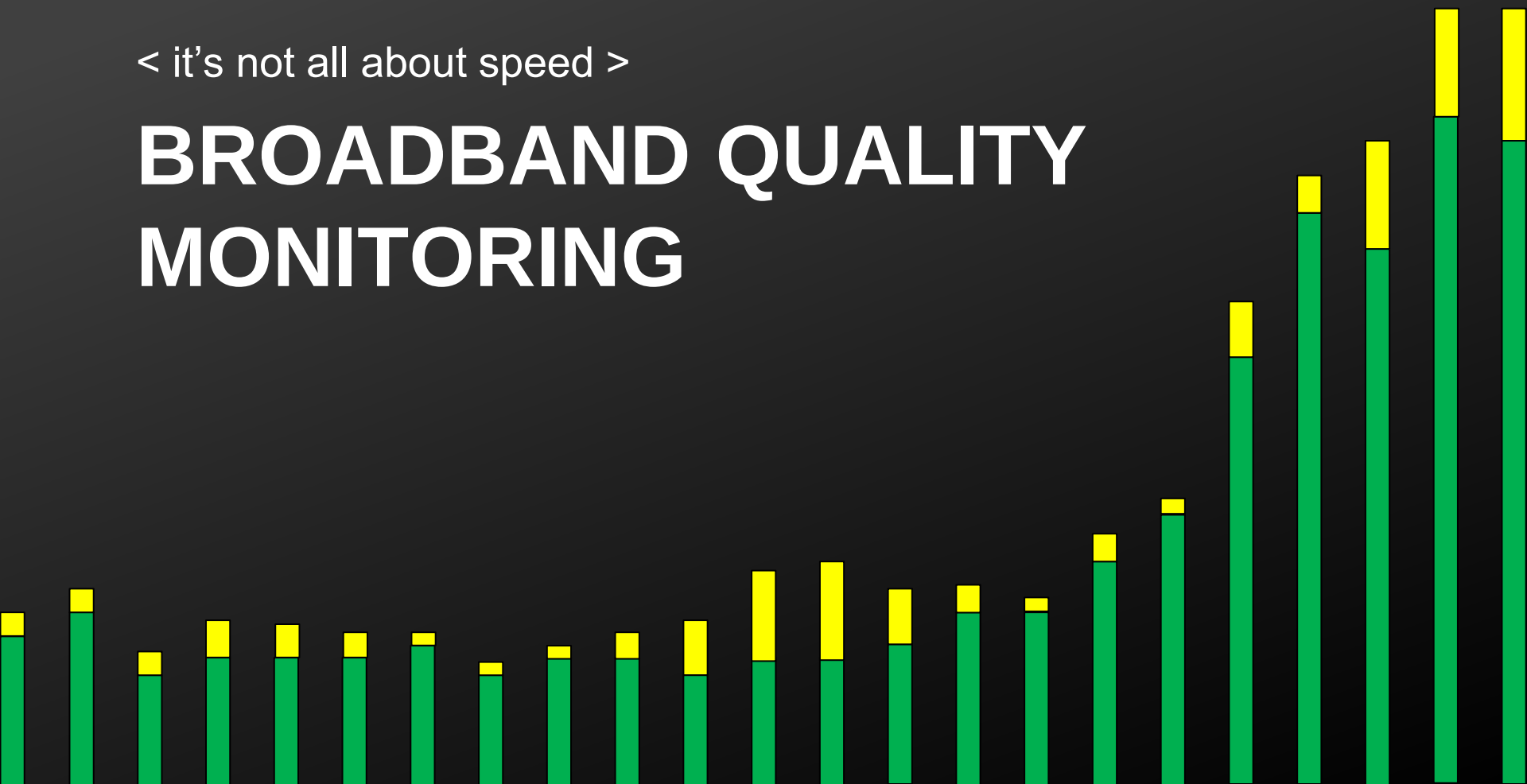
Download test files

File Size		Example / Port	Time To Download
1 GB (v. large)	Very Large File 1 GB (1,024 MB)	High-quality movie download	75mins @ 2 Mbps 19mins @ 8 Mbps 8mins @ 20 Mbps 3mins @ 50 Mbps
		IPv4 Port: 80, 81, 8080 IPv6 Port: 80, 81, 8080	
512 MB (large)	Large File 0.5 GB (512 MB)	Movie download; game demo	37mins @ 2 Mbps 9mins @ 8 Mbps 4mins @ 20 Mbps 2mins @ 50 Mbps
		IPv4 Port: 80, 81, 8080 IPv6 Port: 80, 81, 8080	
200 MB (large)	Large File 200 MB	45 minutes of TV from BBC iPlayer; large operating system update	15mins @ 2 Mbps 4mins @ 8 Mbps 2mins @ 20 Mbps 1min @ 50 Mbps
		IPv4 Port: 80, 81, 8080 IPv6 Port: 80, 81, 8080	
	dium File	High-quality MP3 audio CD download; 2 minute HD (720p) movie trailer	8mins @ 2 Mbps 2mins @ 8 Mbps 1min @ 20 Mbps 30secs @ 50 Mbps
		8080	
		Standard qu	
20 MB (small)	Small File 20 MB	IPv4 Port: 80, 81, 8080 IPv6 Port: 80, 81, 8080	1min @ 2 Mbps 15secs @ 8 Mbps 8secs @ 20 Mbps 2secs @ 50 Mbps
	Small File	A 30 second video clip	
		IPv4 Port: 80, 81, 8080	

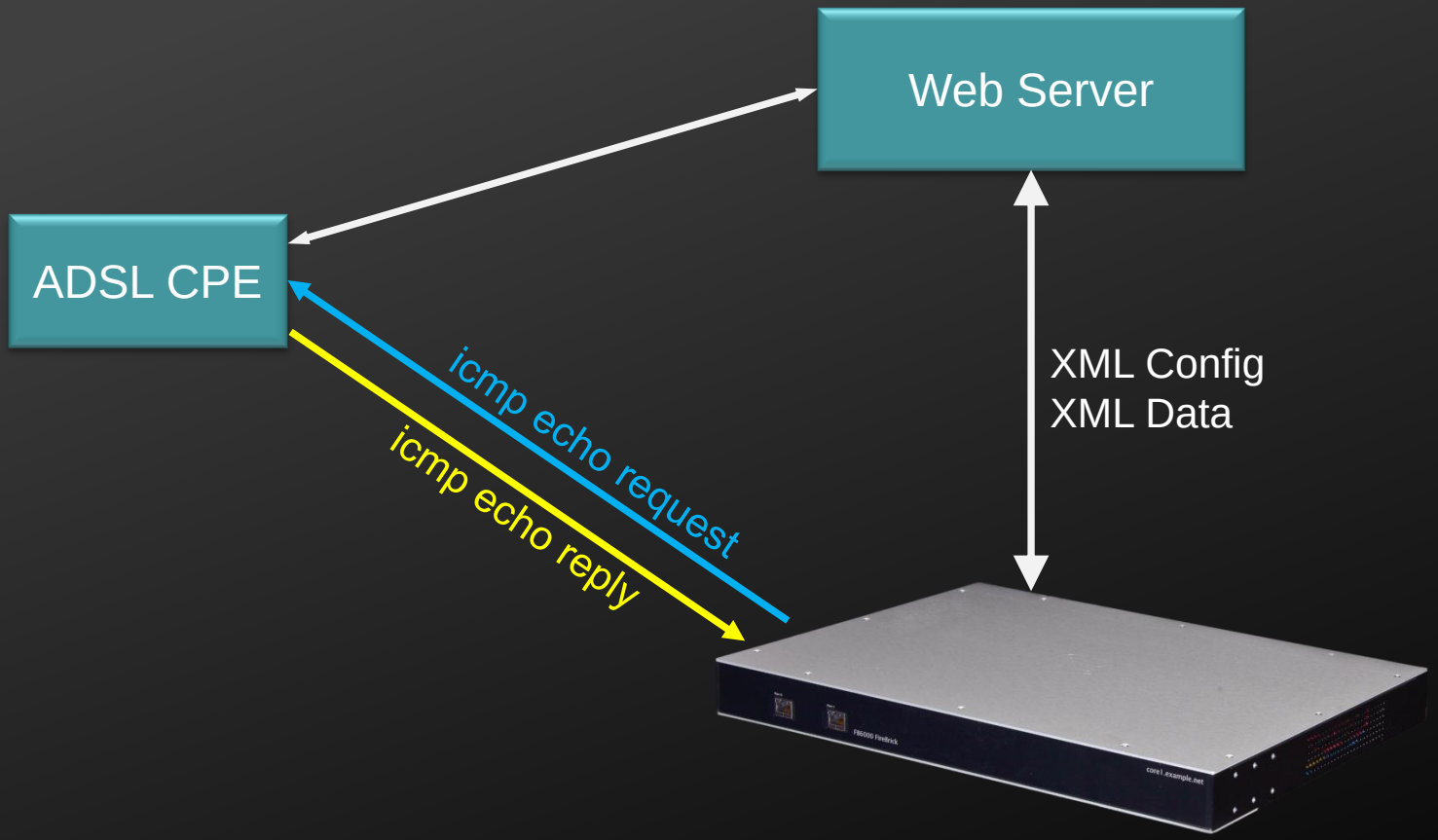
```
moon.lonap root ~ # wget -O /dev/null http://download.thinkbroadband.com/512MB.zip
--2012-01-15 03:43:32--  http://download.thinkbroadband.com/512MB.zip
Resolving download.thinkbroadband.com... 80.249.99.148
Connecting to download.thinkbroadband.com|80.249.99.148|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 536870912 (512M) [application/zip]
Saving to: `/dev/null'

48% [=========================>                                    ] 262,646,633 52.3M/s  eta 6s
```

< it’s not all about speed >

BROADBAND QUALITY MONITORING

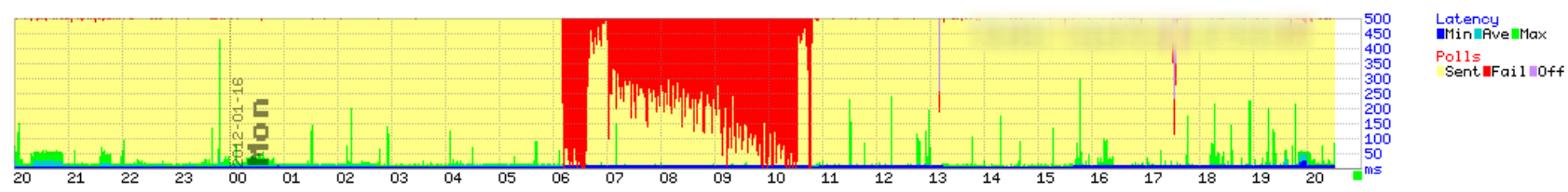


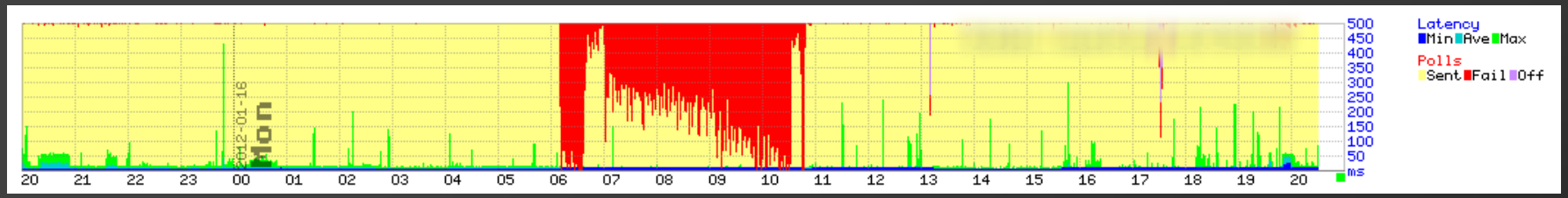
Infrastructure

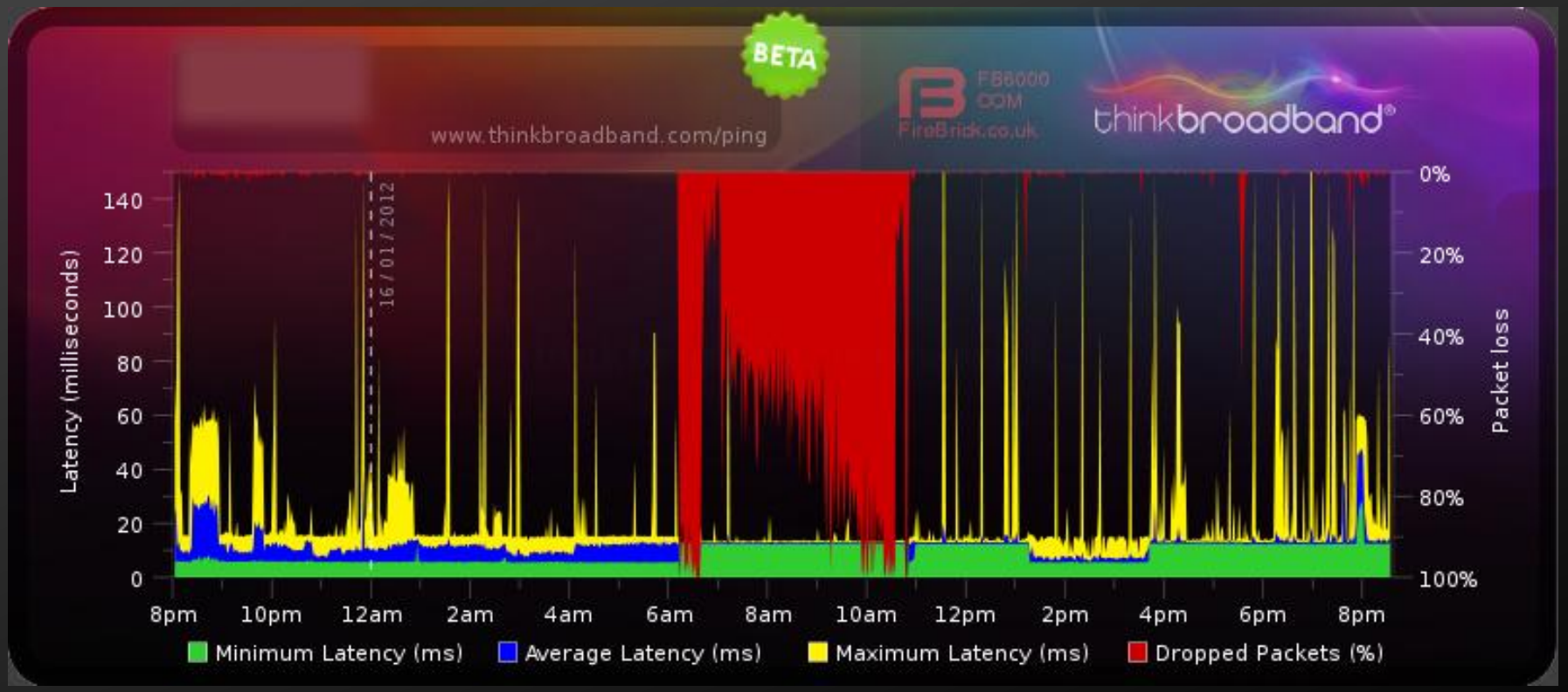


```
<?xml version="1.0" encoding="UTF-8"?>
<config patch="8882" timestamp="2011-05-03T08:39:14Z“
xsi:schemaLocation="http://firebrick.ltd.uk/xml/fb6102/
http://firebrick.ltd.uk/download/FB6010/xml/fb6102/1.06.001.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="http://firebrick.ltd.uk/xml/fb6102/">

     <user password="SHA1#XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX" name="root"/>

     <services>
          <ntp timeserver="192.168.0.2"/>
          <telnet allow="192.168.0.0/16"/>
          <http allow="192.168.0.0/16" trusted="192.168.0.0/16"/>
     </services>

     <interface name="management" port="1">
          <subnet name="management" ip="192.168.0.3/16"/>
     </interface>

     <interface name="public" port="0">
          <subnet name="public" ip="80.249.99.164/28 2a02:68:1::164/64"
          gateway="80.249.99.161 2a02:68:1::ffff"/>
     </interface>
     <cqm fblogo="transparent"/>

</config>
```

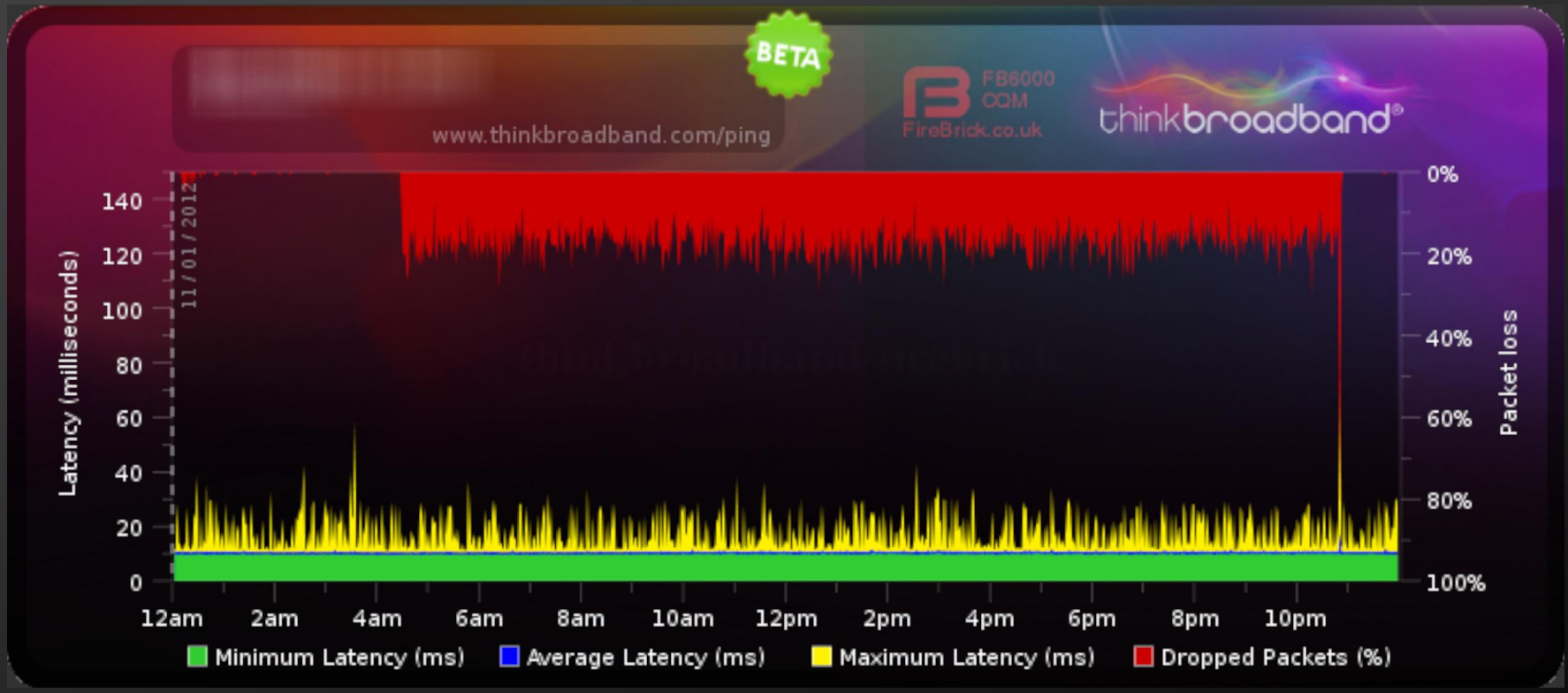
```
<cqm xmlns="http://firebrick.ltd.uk/xml/cqmv2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"xsi:schemaLocation="http://firebrick.ltd.uk/xml/cqmv2 http://firebrick.ltd.uk/xml/cqmv2.xsd" firmware-version="FB6102 Gemini (V1.06.001 2011-11-02T17:36:13)" generated="2012-01-16T20:23:22Z">

<graph name="bqm-17939" period-start="2012-01-15T20:00:00Z"
period-end="2012-01-16T21:00:00Z">

<record timestamp="2012-01-16T20:08:20Z" sent-polls="100" lost-polls="3"
min-latency-ns="15280000" ave-latency-ns="67270000" max-latency-ns="547800000" score="301"/>

<record timestamp="2012-01-16T20:10:00Z" sent-polls="100"
min-latency-ns="15460000" ave-latency-ns="23690000" max-latency-ns="56740000" score="1"/>

<record timestamp="2012-01-16T20:11:40Z" sent-polls="100"
min-latency-ns="15280000" ave-latency-ns="23230000" max-latency-ns="58190000" score="1"/>

..

<record timestamp="2012-01-16T20:20:00Z" sent-polls="100" lost-polls="1"
min-latency-ns="15070000" ave-latency-ns="22190000" max-latency-ns="58620000" score="201"/>

</graph>

</cqm>
```



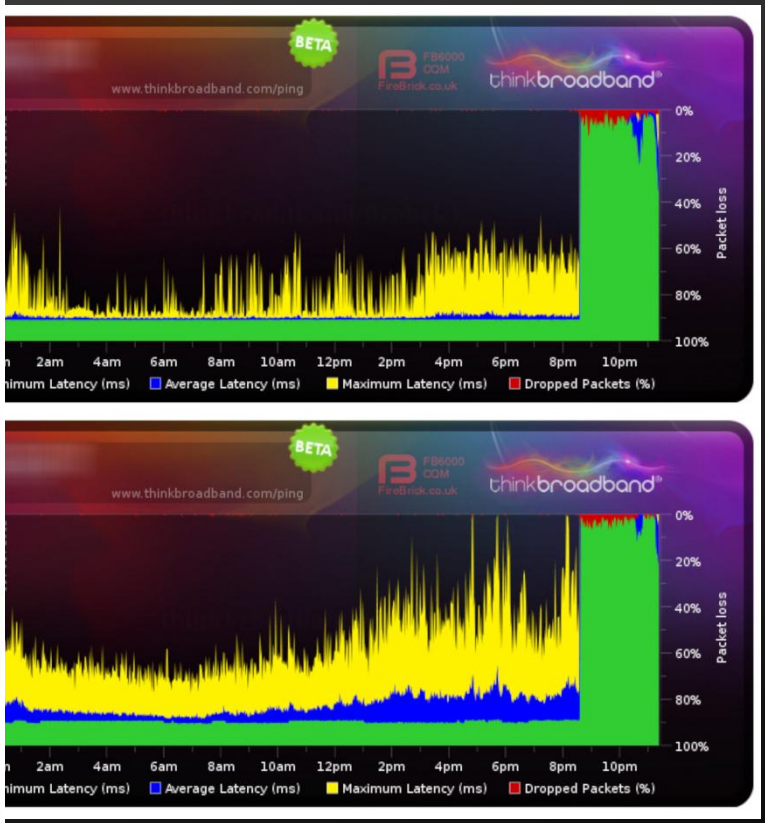

2012-01-16
Mon
20 21 22 23 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20
500 450 400 350 300 250 200 150 100 50 ms
Latency
Min Ave Max
Polls
Sent Fail Off


BETA
www.thinkbroadband.com/ping
FB6000
COM
FireBrick.co.uk
thinkbroadband®
16/01/2012
Latency (milliseconds)
140 120 100 80 60 40 20 0
0% 20% 40% 60% 80% 100%
Packet loss
8pm 10pm 12am 2am 4am 6am 8am 10am 12pm 2pm 4pm 6pm 8pm
Minimum Latency (ms)
Average Latency (ms)
Maximum Latency (ms)
Dropped Packets (%)

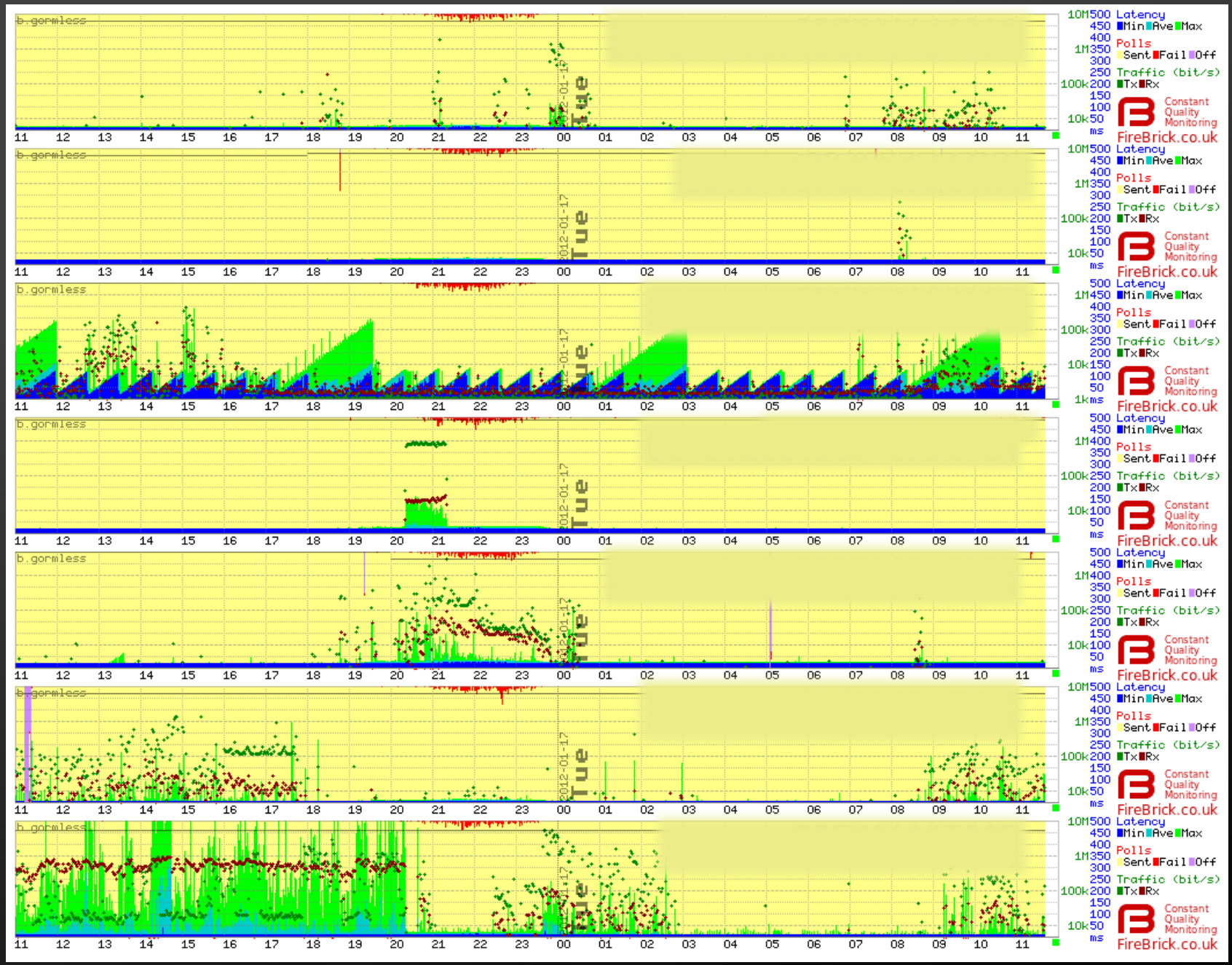
Identifying general problems..



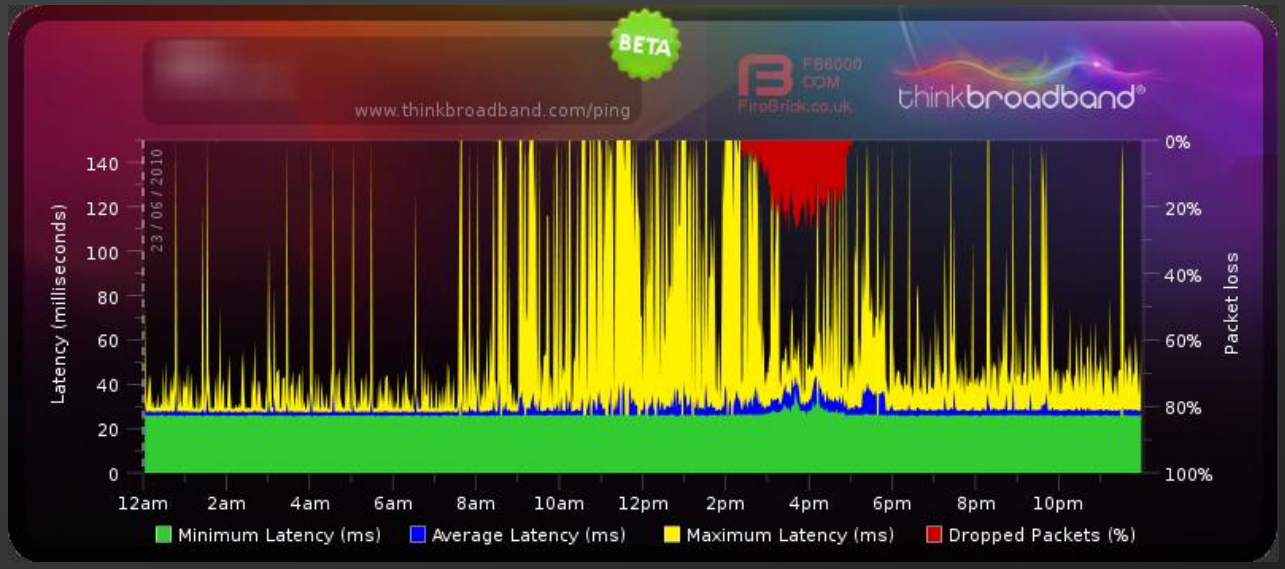

BETA
www.thinkbroadband.com/ping
thinkbroadband
Latency (milliseconds)
Packet loss
11/01/2012
0
20
40
60
80
100
120
140
0%
20%
40%
60%
80%
100%
12am
2am
4am
6am
8am
10am
12pm
2pm
4pm
6pm
8pm
10pm
Minimum Latency (ms)
Average Latency (ms)
Maximum Latency (ms)
Dropped Packets (%)

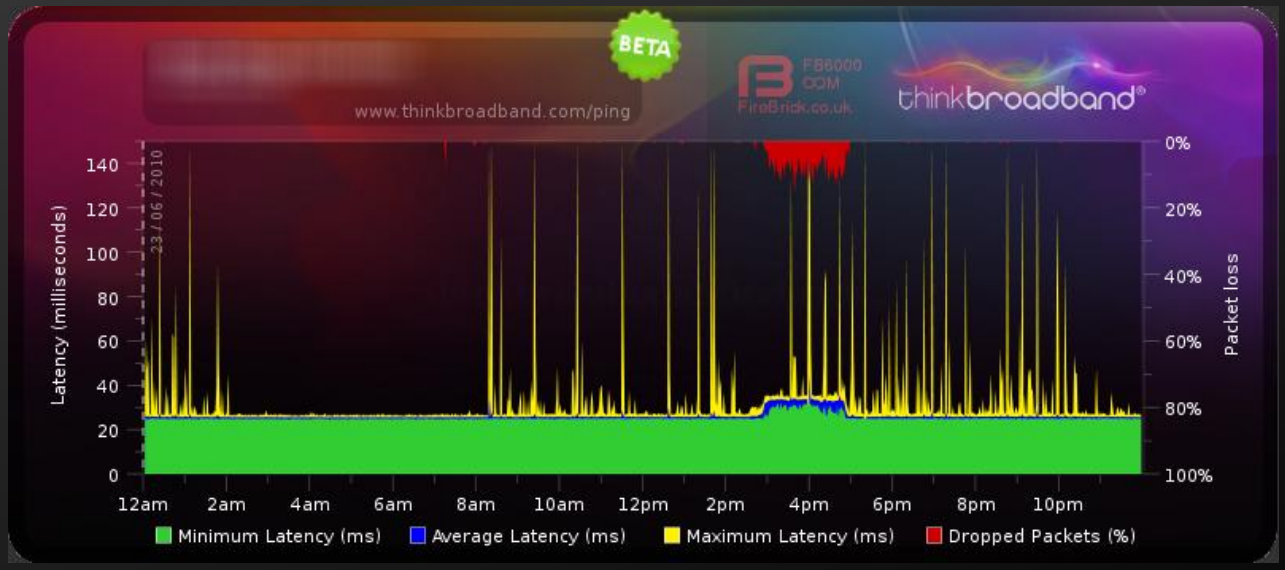

BETA
www.thinkbroadband.com/ping
thinkbroadband
Packet loss
0%
20%
40%
60%
80%
100%
2am
4am
6am
8am
10am
12pm
2pm
4pm
6pm
8pm
10pm
Average Latency (ms)
Maximum Latency (ms)
Dropped Packets (%)

```
                                                Packets               Pings
Host                                          Loss%   Snt   Last   Avg  Best  Wrst StDev
 1. ncuk-gw.core-rs1.thdo.ncuk.net             0.0%   406    1.0   0.8   0.5   6.1   0.5
 2. gi0-0-10-star1.bdr-rt1.rbsov.ncuk.net      0.0%   406    0.9   2.6   0.3 183.4  16.2
 3. gi4-47-10-star1.bdr-rt3.thdo.ncuk.net      0.0%   406    0.5   3.6   0.4 183.6  18.3
 4. [target network hop 1]                     2.0%   406  139.4 146.0 130.3 160.9   4.7
 5. [target network hop 2]                     2.7%   406  147.6 146.2 130.7 177.1   5.4
 6. [target network hop 3]                     3.4%   406  148.5 150.8 126.9 294.7  20.4
 7. [target network hop 4]                     1.2%   406  157.2 161.5 142.1 210.8  10.1
--cut--

                                                Packets               Pings
 Host                                         Loss%   Snt   Last   Avg  Best  Wrst StDev
 1. gi0-1.549-sorcerer.sov.kewlio.net.uk       0.0%    31    0.7   1.3   0.5  17.4   3.0
 2. GAME-pvtpeer-1.sov.kewlio.net.uk           0.0%    31    0.6  12.8   0.6 197.9  40.8
 3. [linx peer]                                0.0%    30    1.3   3.4   0.9  43.8   8.8
 4. [target network hop 1]                     0.0%    30  152.6 158.0 142.3 252.2  19.9
 5. [target network hop 2]                     0.0%    30  159.9 158.1 151.1 163.8   3.5
 6. [target network hop 3]                     0.0%    30  163.9 163.6 153.8 171.5   5.2
 7. [target network hop 4]                     0.0%    30  160.9 164.7 150.5 193.7   7.5
--cut--
                                                Packets               Pings
                                                Packets               Pings
 Host                                         Loss%   Snt   Last   Avg  Best  Wrst StDev
 1. bog-gw1.rbhex.ncuk.net                     0.0%    52    0.6   2.2   0.6  66.4   9.3
 2. vs0-Vl2720.thdo.bogons.net                 0.0%    52    0.8   6.5   0.7 163.6  28.1
 3. cr0-Vl2720.rbsov.bogons.net                0.0%    52    0.6  10.9   0.5 194.5  35.0
 4. cr0-G1-2.thdo.bogons.net                   0.0%    52  126.7   9.7   0.6 177.2  34.4
 5. [target network hop 1]                     3.8%    52  147.1 145.5 133.3 153.7   4.4
 6. [target network hop 2]                     0.0%    52  150.6 149.3 133.8 161.4   4.8
 7. [target network hop 3]                     0.0%    52  155.2 164.4 141.6 310.4  37.6
 8. [target network hop 4]                     3.9%    51  137.7 152.8 135.7 192.4  11.3
--cut--
```

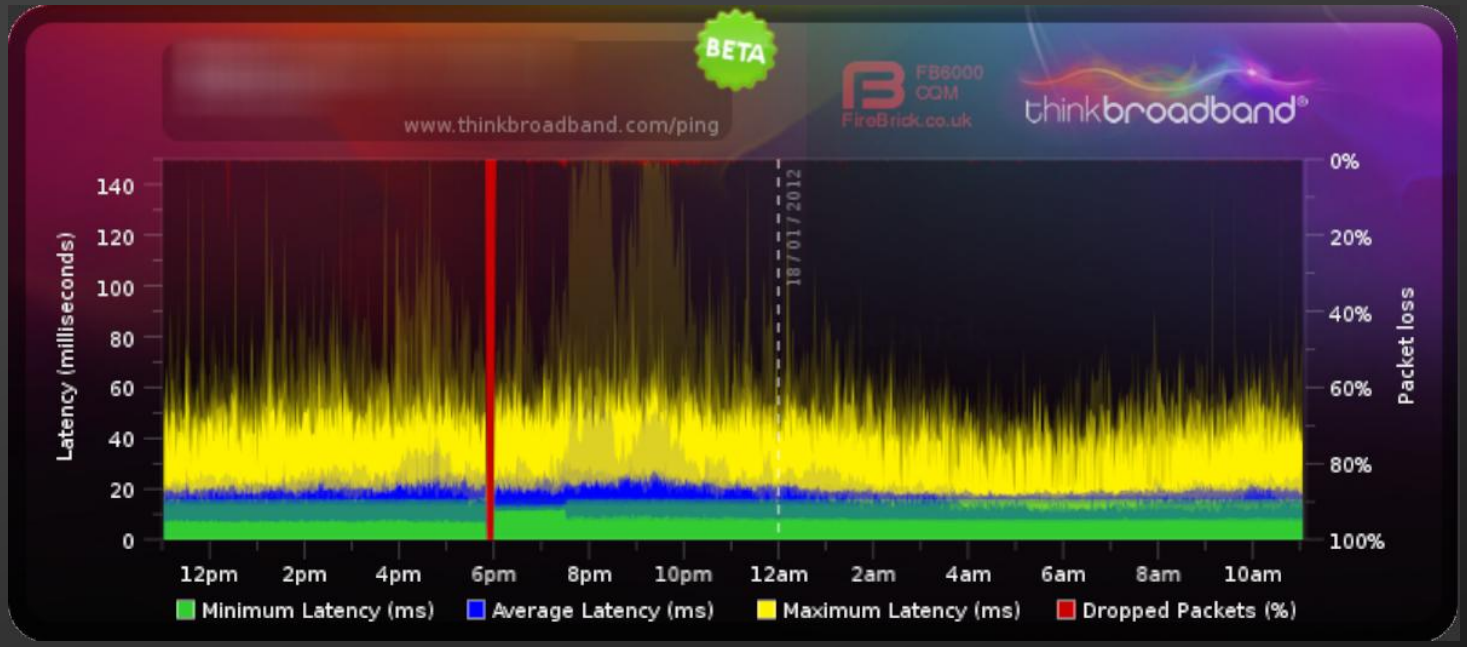

b.gormless
Tue 2012-01-17
11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07 08 09 10 11
Latency
Min Ave Max
Polls
Sent Fail Off
Traffic (bit/s)
Tx Rx
Constant Quality Monitoring
FireBrick.co.uk

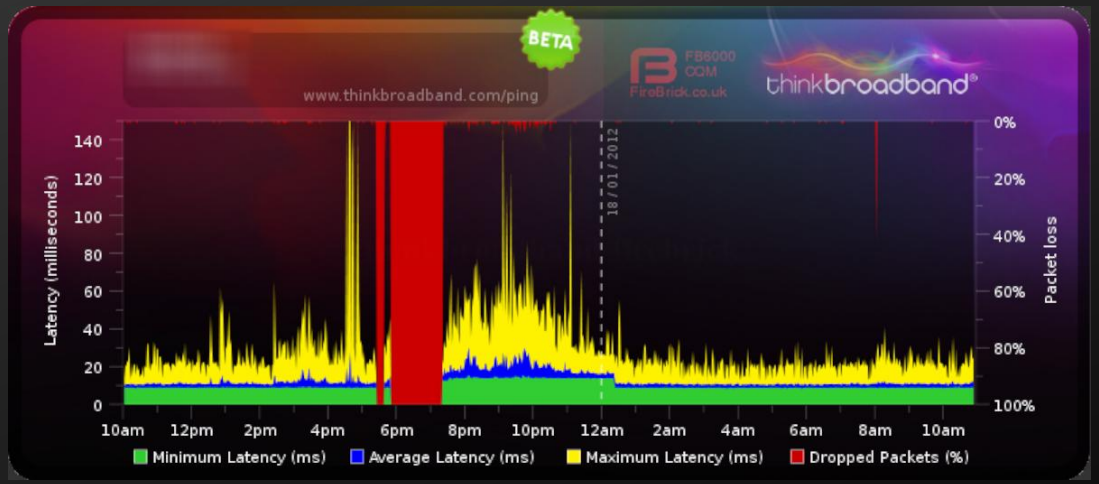
The World Cup 2010



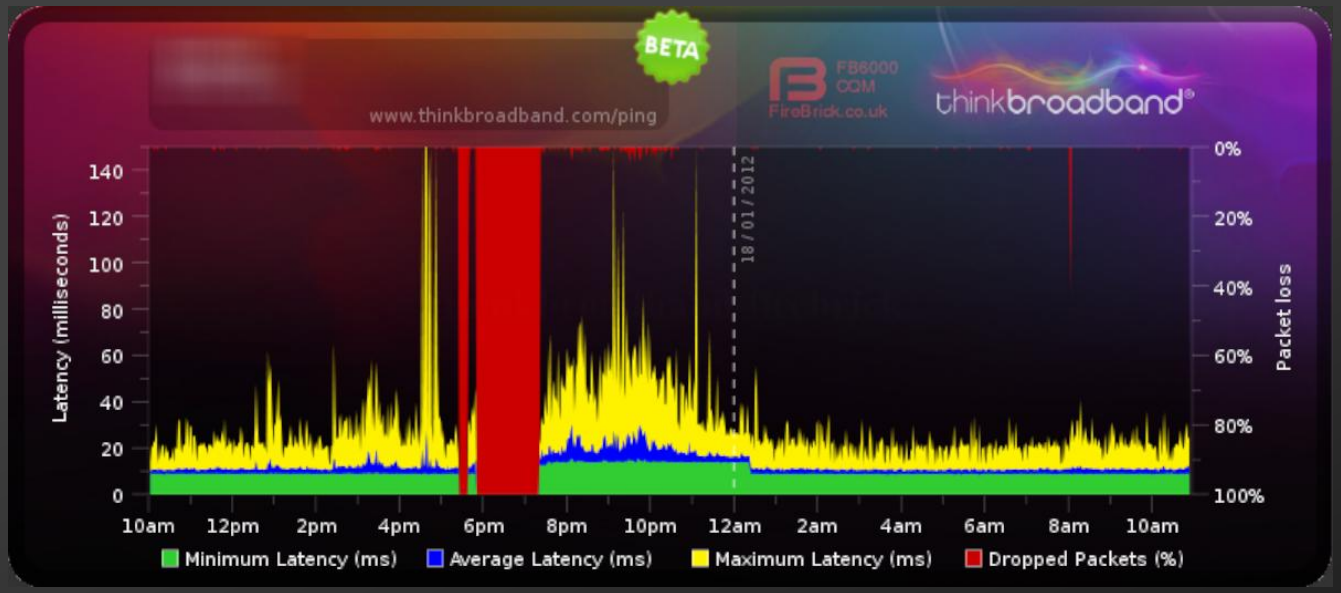


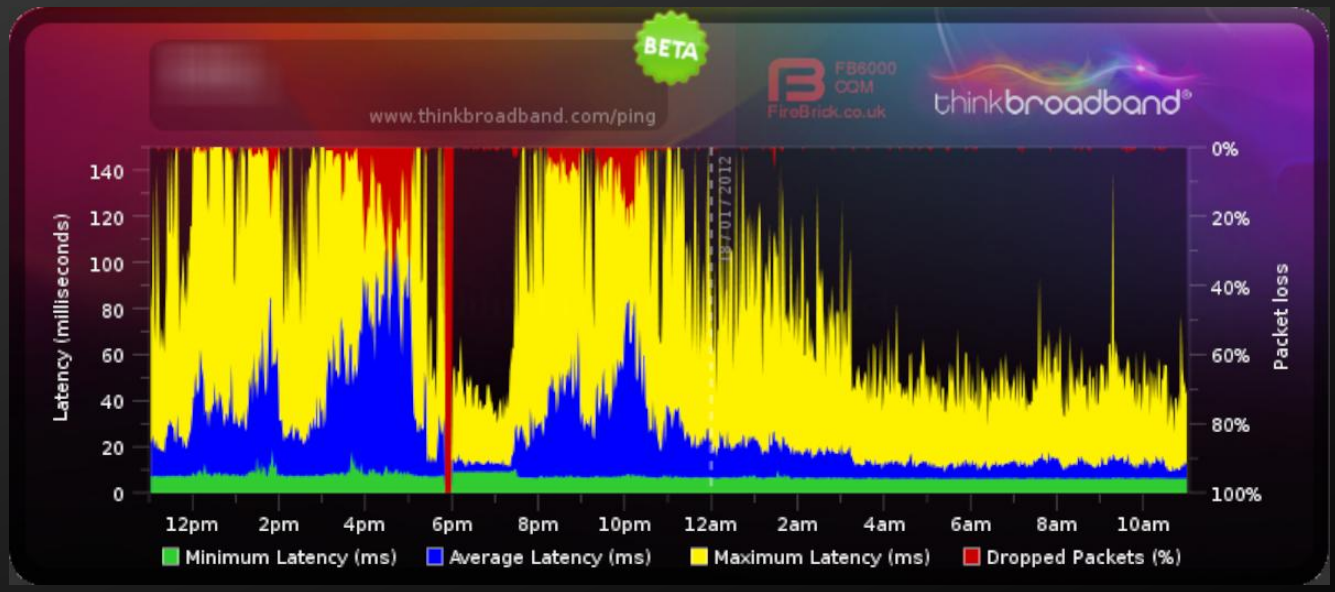
Tuesday 17/01/2012





Tuesday 17/01/2012





If you want to try it out…

www.thinkbroadband.com/ping

< where we’re going >

THE FUTURE

Future areas

- Multi-protocol testing
- Multiple networks
- Better integration / reporting across testing tools
- Aggregate reporting across ISPs / exchanges
- Intelligent analysis
- BQM Dynamic IP support

< questions ? >