هيئة تنظيم الاتصالات
Telecommunications Regulatory Authority

Fixed Broadband Analysis Report
01 October 2011 – 31 December 2011 between 00:00:00 and 24:00:00 Bahrain

Published 15 January 2012

Public Document

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Introduction

Broadband, defined as a technology that enables high speed transfer of data, is inextricably linked to the emergence of the Internet. Investment in and adoption of broadband increased exponentially around the world since the middle of the 1990s. Broadband benefit the economy of a country in different ways, direct contribution to the Gross Domestic Products (GDP), productivity gains and specific impact on the economy with the development of eCommerce.

Broadband is part of the Kingdom of Bahrain 2030 vision and it is the duty of TRA to ensure the necessary regulatory environment is in place that will pave the way to the future state of the art infrastructure and services in a healthy competitive environment for the general benefit and citizen and consumers

Whilst ISPs do provide the basic level of information required to allow customers to make decisions relating to price, expected download speed and download threshold, they do not make available information relating to the download, upload and browsing speeds experienced on average by consumers.

Via this report TRA aim at providing consumers with data relating to the actual quality of service achieved by each of the monitored ISP Services to allow consumers to make informed decisions with respect to understanding what is likely to be provided by each ISP on the specific measured packages. It is not feasible for the TRA to monitor all the available packages from all ISPs and therefore the choice has been made to focus on the 2 Mbps packages for aDSL, Fiber and WiMax Services from the following ISPs:

aDSL:	2Connect, Batelco, Etisalcom, Kalaam, Lightspeed,
Fiber:	NueTel
WiMax:	Menatelecom, Zain

Beside the difference in access technologies between aDSL, Fiber and WiMax, other important elements such as network load and dimensioning, network capacity towards the global internet and ISPs internal engineering rules based on specific commercial objectives have all an impact on end user experience.

ISPs are continuously working at optimizing their respective networks, results between two specific measurement period are subject to change however after several consecutive measurements quarters TRA is confident that industry trends have established.

Measurements Methods Overview

The primary objective of the Broadband Quality of Service monitoring platform is to conduct a pre-defined set of tests each hour of the day, 7 days a week, 52 weeks of the year using standard fixed network broadband connections supplied by each of the Kingdom's ISPs. The results of these tests are transmitted in near real time to, and stored in a centralised database server.

From each ISP two internet connections have been purchased and are monitored using the Epitiro Broadband Quality of Service monitoring platform. Standardised tests are conducted from test probes that have been deployed on each of the broadband connections under this test program . The tests involve requests being sent towards a standard specified list of public websites as well as dedicated servers located in the Kingdom of Bahrain, USA , Asia and Europe.

To ensure the accuracy of the information gathered each probe is constantly monitored and any issues identified are recorded and resolved remotely by Epitiro.

Diagram 1 provides a overview of the system that has been implemented. For the sake of simplicity only three of the nine ISPs connected to the platform and only one of the Epitiro Ltd endpoints have been illustrated.

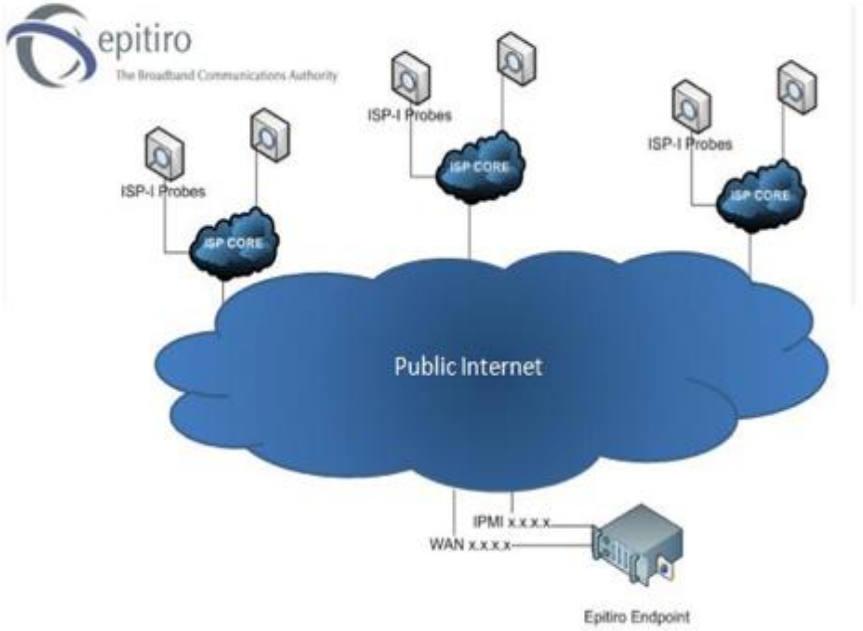


Diagram 1 - Broadband Quality of Service test platform overview

Noticeable events this Quarter

Performance of TCP download speed did again improve for aDSL services with a lower impact recorded during busy hours this quarter.

The effect of this positive evolution have been balanced with the slight degradation of TCP download performance for some other ISPs resulting in an improve TCP download industry average just reaching 1.45 Mbps (from 1.42 Mbps previous two quarters).

TCP upload speed remained stable for all packages with a particular note for Etisalcom service who jumped from 0.28 Mbps to average Industry speed at 0.41 Mbps following an internal migration.

Volatility has been recorded on HTTP download speed over the quarter with some ISPs improving performance while others appears to be slightly bellow previous quarter results. Industry average remains stable.

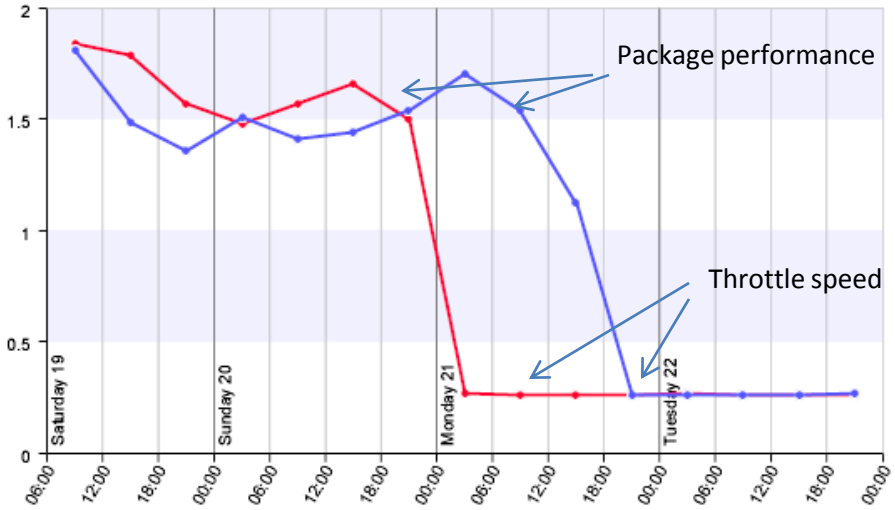
DNS and Ping time performance remained either stable or slightly improved for all ISPs.

Fair Usage Policy (FUP) was triggered for some of the packages and the following slide illustrate how FUP mechanism affect performance. Going forward FUP has been disabled for the relevant monitored broadband packages.

Highlight on Fair Usage Policy - FUP

Most Broadband packages in the Kingdom are delivered with FUP or download threshold levels, this means a fixed number of data packets, measured in Bytes (MB or GB), that can be downloaded as part of a specific data package. When the threshold is met, ISPs throttle down connection speed until the start of the next billing month. Consumer can choose to pay extra at published price to keep package performance.

The diagram illustrate FUP mechanism at work for two individual 2Mbps broadband packages being throttle at 256Kbps.



Fair Usage Policy when triggered can have a significant impact of the average performance of a service for the month.

In the example shown FUP was triggered on the 21st of the month, this represent 30% of the time.

For consumer, the presence (or absence) of Fair Usage Policy is an important element to take into account in the choice of a Broadband package. When using the service, knowing FUP consumption allow consumer to better manage download allocation and plan for upgrade to higher threshold level, if necessary, to maintain a continuous performance level throughout the month.

RESULTS

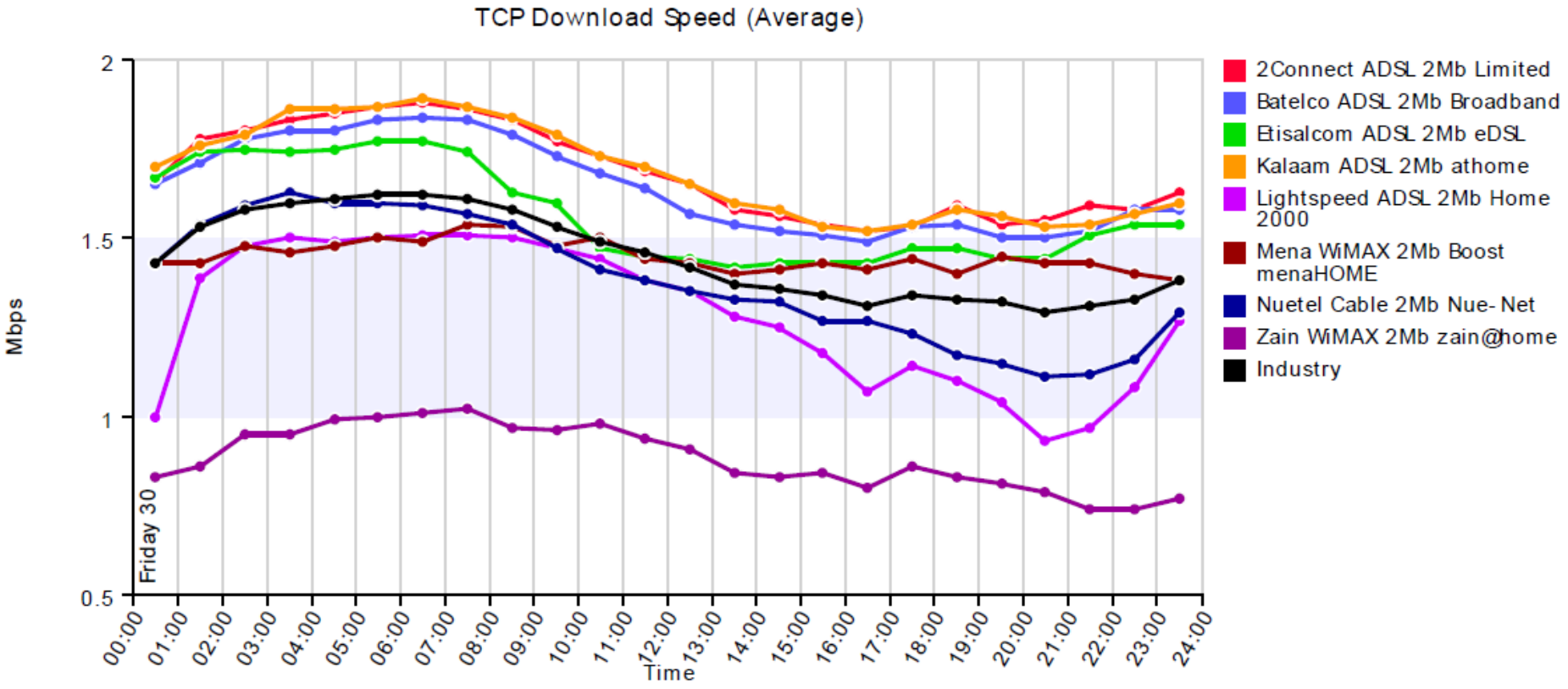
The following pages present the result of measurements taken every hour for each audited service during the period of Q4 2011, from 00:00:00 on the 1 October 2011 to 24:00:00 on the 31 December 2011.

For each ISP, one set of measurements is taken each hour, 24 hours a day. In this report, results for a given hour are then averaged to determine the average QoS in that hour over the three month period. i.e. all results recorded between 8:00 and 9:00 for an ISP are averaged and reported as one observation on the graph that provide the average performance of this specific time period over a three month period.

This method has the advantage that it can show trends over an audited period as well as show variations during a 24h period.

TCP Download Speed (Average) Line Chart (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



TCP Download Speed (Average) Line Chart Values (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
2Connect ADSL 2Mb Limited	1.66	1.78	1.80	1.83	1.85	1.87	1.88	1.86	1.83	1.77	1.73	1.69	1.65	1.58	1.56	1.54	1.52	1.53	1.59	1.54	1.55	1.59	1.58	1.63
Batelco ADSL 2Mb Broadband	1.65	1.71	1.78	1.80	1.80	1.83	1.84	1.83	1.79	1.73	1.68	1.64	1.57	1.54	1.52	1.51	1.49	1.53	1.54	1.50	1.50	1.52	1.58	1.58
Etisalcom ADSL 2Mb eDSL	1.67	1.74	1.75	1.74	1.75	1.77	1.77	1.74	1.63	1.60	1.47	1.45	1.44	1.42	1.43	1.43	1.43	1.47	1.47	1.44	1.44	1.51	1.54	1.54
Kalaam ADSL 2Mb athome	1.70	1.76	1.79	1.86	1.86	1.87	1.89	1.87	1.84	1.79	1.73	1.70	1.65	1.60	1.58	1.53	1.52	1.54	1.58	1.56	1.53	1.54	1.57	1.60
Lightspeed ADSL 2Mb Home 2000	1.00	1.39	1.48	1.50	1.49	1.50	1.51	1.51	1.50	1.47	1.44	1.38	1.35	1.28	1.25	1.18	1.07	1.14	1.10	1.04	0.93	0.97	1.08	1.27
Mena WiMAX 2Mb Boost menaHOME	1.43	1.43	1.48	1.46	1.48	1.50	1.49	1.54	1.53	1.48	1.50	1.44	1.43	1.40	1.41	1.43	1.41	1.44	1.40	1.45	1.43	1.43	1.40	1.38
Nuetel Cable 2Mb Nue-Net	1.43	1.54	1.59	1.63	1.60	1.60	1.59	1.57	1.54	1.47	1.41	1.38	1.35	1.33	1.32	1.27	1.27	1.23	1.17	1.15	1.11	1.12	1.16	1.29
Zain WiMAX 2Mb zain@home	0.83	0.86	0.95	0.95	0.99	1.00	1.01	1.02	0.97	0.96	0.98	0.94	0.91	0.84	0.83	0.84	0.80	0.86	0.83	0.81	0.79	0.74	0.74	0.77

TCP download measurements (Mbit/s)

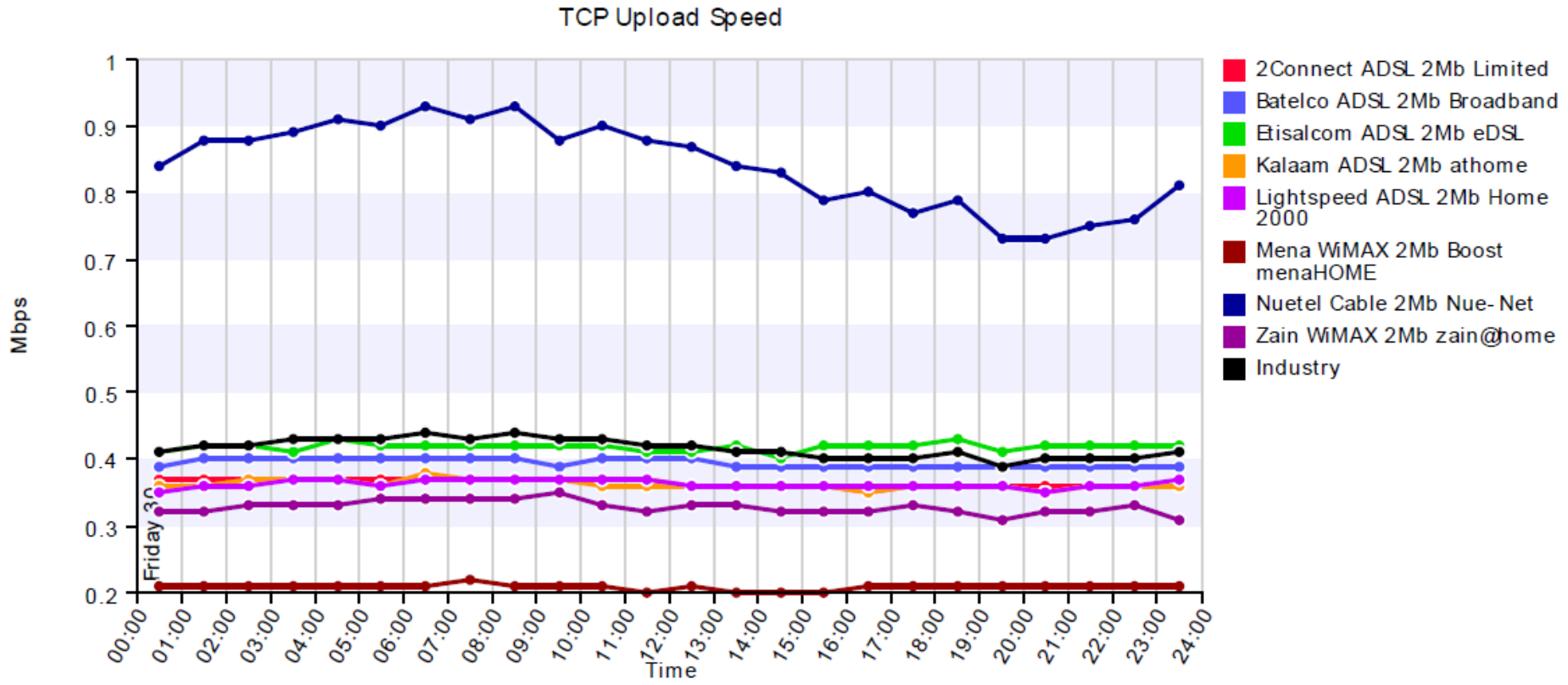
TCP (Transfer Control Protocol) throughput tests measuring download speeds are conducted at a raw socket level (a socket that allows access to the underlying transport provider (ISP) that is supported by protocols such as IPv4 and IPv6) in order to test the full capacity of the connection. The probe is configured to initiate multiple TCP sessions and simultaneously use all of the open sessions for the transmission of data. This effectively “floods” the connection and reports the throughput capacity of the line.

The test is conducted using a server endpoint running proprietary software that is hosted in a well peered data centre. Whilst the port through which the test is typically conducted is configurable, it is normal for port 80 to be used since this minimises the possibility of the traffic being managed or throttled during the test by an ISP. Once the session has been initiated standard data files are transmitted from the endpoint server to the probe and measurements taken of the download throughput of the connection. The test probe measures the time taken to transfer data and the volume of data transferred in a specific time. From these measurements the TCP download speeds can be derived.

The higher is the download speed the better is the performance.

TCP Upload Speed (Average) Line Chart (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



TCP Upload Speed (Average) Line Chart Values (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
2Connect ADSL 2Mb Limited	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.36	0.36	0.36	0.36	0.35	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Batelco ADSL 2Mb Broadband	0.39	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.39	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Etisalcom ADSL 2Mb eDSL	0.41	0.42	0.42	0.41	0.43	0.42	0.42	0.42	0.42	0.42	0.42	0.41	0.41	0.42	0.40	0.42	0.42	0.42	0.43	0.41	0.42	0.42	0.42	0.42
Kalaam ADSL 2Mb athome	0.36	0.36	0.37	0.37	0.37	0.36	0.38	0.37	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.36	0.35	0.36	0.36	0.36	0.35	0.36	0.36	0.36
Lightspeed ADSL 2Mb Home 2000	0.35	0.36	0.36	0.37	0.37	0.36	0.37	0.37	0.37	0.37	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.35	0.36	0.36	0.37
Mena WiMAX 2Mb Boost menaHOME	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.22	0.21	0.21	0.21	0.20	0.21	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Nuetel Cable 2Mb Nue-Net	0.84	0.88	0.88	0.89	0.91	0.90	0.93	0.91	0.93	0.88	0.90	0.88	0.87	0.84	0.83	0.79	0.80	0.77	0.79	0.73	0.73	0.75	0.76	0.81
Zain WiMAX 2Mb zain@home	0.32	0.32	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.35	0.33	0.32	0.33	0.33	0.32	0.32	0.32	0.33	0.32	0.31	0.32	0.32	0.33	0.31

TCP upload measurements (Mbits/s)

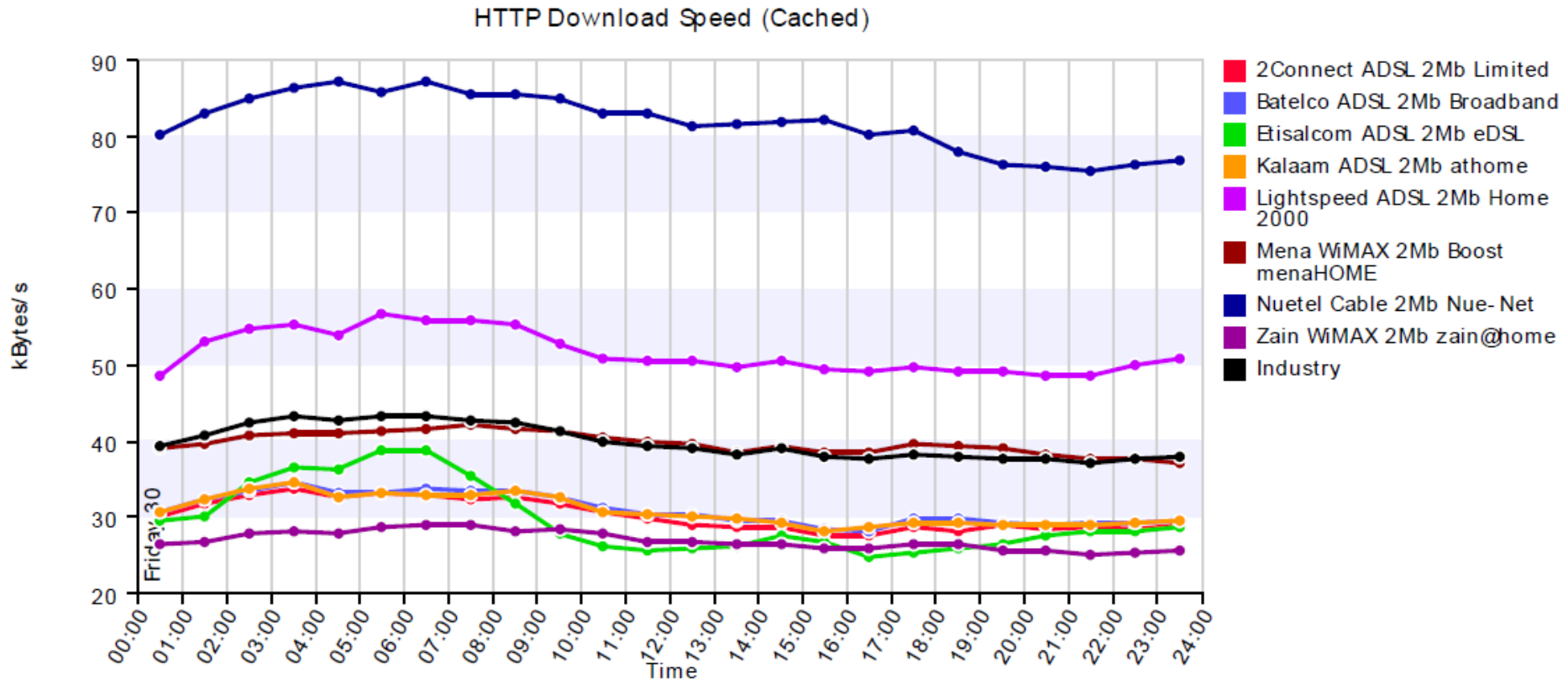
TCP (Transfer Control Protocol) throughput tests measuring upload speeds are conducted at a raw socket level (a socket that allows access to the underlying transport provider (ISP) that is supported by protocols such as IPv4 and IPv6) in order to test the full capacity of the connection. The probe is configured to initiate multiple TCP sessions and simultaneously use all of the open sessions for the transmission of data. This effectively "floods" the connection and reports the throughput capacity of the line.

The test is conducted using a server endpoint running proprietary software that is hosted in a well peered data centre. Whilst the port through which the test is typically conducted is configurable, it is normal for port 80 to be used since this minimizes the possibility of the traffic being managed or throttled during the test by an ISP. Once the session has been initiated standard data files are transmitted from the probe to the endpoint server and measurements taken of the upload throughput of the connection. The test probe measures the time taken to transfer data and the volume of data transferred in a specific time. From these measurements the TCP upload speeds can be derived.

The higher is the upload speed the better is the performance.

HTTP Download Speed (Cached) Line Chart (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



HTTP Download Speed (Cached) Line Chart Values (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
2Connect ADSL 2Mb Limited	30.19	31.66	32.90	33.79	32.68	33.09	32.78	32.43	32.47	31.76	30.62	29.87	28.88	28.76	28.80	27.53	27.67	28.62	28.19	28.87	28.32	28.62	28.54	28.93
Batelco ADSL 2Mb Broadband	30.70	32.27	33.51	34.46	33.07	33.10	33.61	33.35	33.34	32.58	31.18	30.28	30.26	29.40	29.55	28.29	28.18	29.74	29.73	29.16	29.04	29.26	29.27	29.65
Etisalcom ADSL 2Mb eDSL	29.61	30.20	34.60	36.46	36.24	38.72	38.63	35.36	31.79	27.86	26.21	25.59	26.01	26.07	27.63	26.66	24.87	25.20	25.88	26.51	27.46	28.01	28.04	28.80
Kalaam ADSL 2Mb athome	30.60	32.40	33.86	34.42	32.67	33.23	32.99	32.94	33.48	32.64	30.59	30.29	30.12	29.78	29.35	28.15	28.77	29.35	29.35	28.97	28.97	28.85	29.21	29.40
Lightspeed ADSL 2Mb Home 2000	48.54	52.96	54.78	55.30	53.74	56.64	55.86	55.98	55.18	52.86	50.88	50.57	50.62	49.69	50.44	49.32	49.15	49.58	49.09	49.09	48.68	48.59	50.06	50.88
Mena WiMAX 2Mb Boost menaHOME	39.11	39.73	40.72	41.05	40.97	41.20	41.66	42.20	41.55	41.40	40.51	39.75	39.66	38.44	39.23	38.54	38.36	39.54	39.36	38.98	38.10	37.69	37.53	37.03
Nuetel Cable 2Mb Nue-Net	80.32	82.86	85.04	86.43	87.17	85.76	87.08	85.49	85.63	85.08	82.90	82.91	81.38	81.56	81.99	82.09	80.27	80.64	78.09	76.38	75.97	75.51	76.35	76.82
Zain WiMAX 2Mb zain@home	26.57	26.78	27.81	28.16	27.73	28.75	28.86	28.86	28.17	28.50	27.82	26.86	26.84	26.52	26.46	25.86	25.90	26.30	26.36	25.70	25.71	25.13	25.26	25.61

HTTP Measurements (Download Speed - Cache) (Kbytes/s)

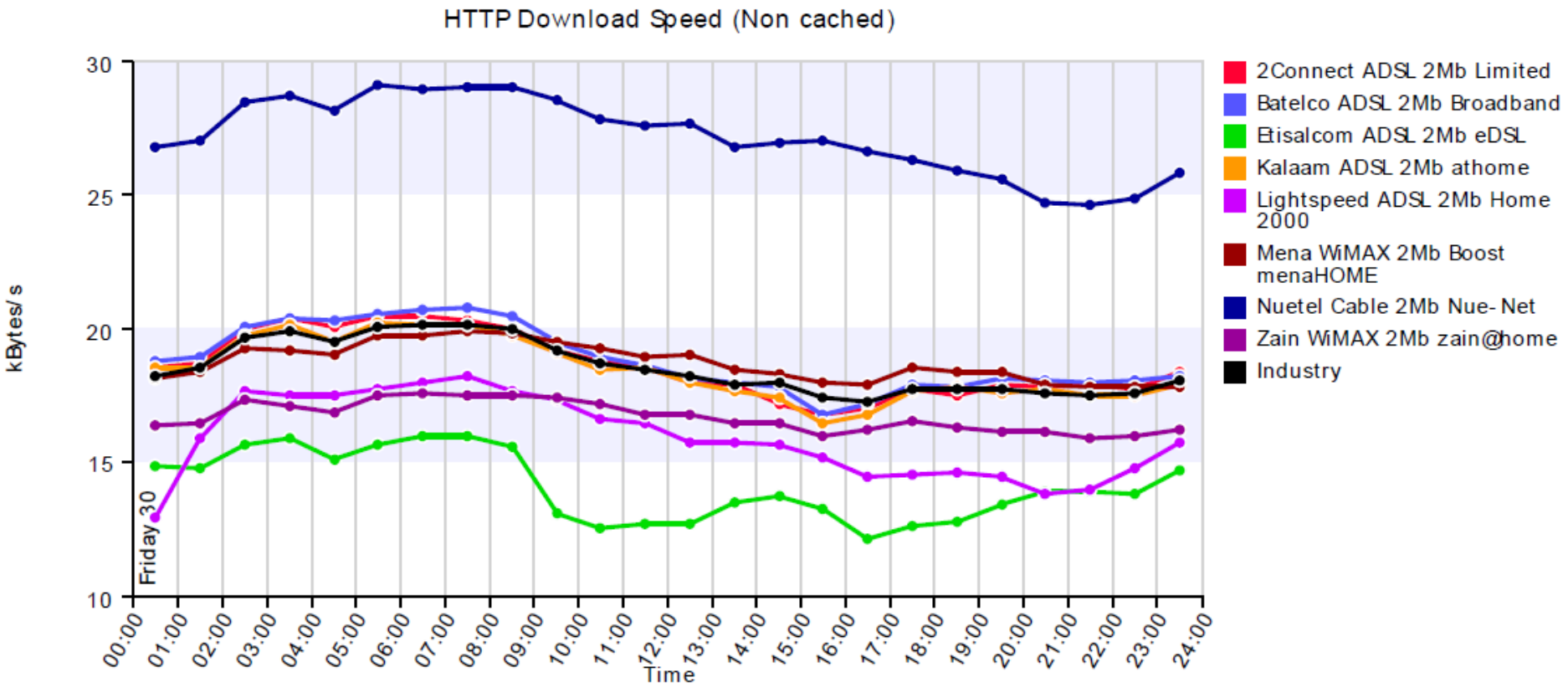
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the embedded content (e.g. images on a web page) in any HTML (HyperText Markup Language) that results from the HTTP request.

Any additional content downloaded is reflected in the captured timings and size of data downloaded. Additionally, the HTTP test can be configured to run in one of two modes of operation: cached and non-cached. When the test downloads from the specified URL in “cached” mode, the speed of the download could be impacted by any caching mechanisms implemented by the network provider.

The higher is the download speed the better is the performance.

HTTP Download Speed (Non cached) Line Chart (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



HTTP Download Speed (Non cached) Line Chart Values (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
2Connect ADSL 2Mb Limited	18.54	18.74	20.02	20.43	20.08	20.50	20.45	20.34	19.98	19.19	18.77	18.52	17.96	17.89	17.23	16.81	17.07	17.79	17.54	17.94	17.87	17.89	17.77	18.39
Batelco ADSL 2Mb Broadband	18.83	18.94	20.08	20.42	20.31	20.56	20.68	20.76	20.46	19.52	18.96	18.63	18.17	17.98	17.82	16.83	17.22	17.92	17.84	18.17	18.10	17.99	18.06	18.27
Etisalcom ADSL 2Mb eDSL	14.87	14.78	15.66	15.89	15.15	15.71	15.98	15.99	15.57	13.13	12.59	12.73	12.75	13.55	13.77	13.24	12.17	12.66	12.79	13.43	13.92	13.91	13.85	14.74
Kalaam ADSL 2Mb athome	18.58	18.53	19.73	20.12	19.56	20.25	20.15	20.12	19.78	19.09	18.47	18.53	17.98	17.66	17.43	16.47	16.84	17.69	17.81	17.63	17.75	17.48	17.54	17.90
Lightspeed ADSL 2Mb Home 2000	12.93	15.92	17.68	17.52	17.50	17.73	18.02	18.22	17.66	17.35	16.60	16.48	15.74	15.76	15.67	15.21	14.51	14.59	14.62	14.47	13.84	14.01	14.78	15.74
Mena WiMAX 2Mb Boost menaHOME	18.13	18.40	19.25	19.23	19.02	19.74	19.78	19.95	19.82	19.55	19.25	18.92	19.02	18.49	18.32	18.01	17.93	18.59	18.37	18.43	17.95	17.82	17.88	17.80
Nuetel Cable 2Mb Nue-Net	26.79	27.04	28.46	28.71	28.15	29.10	28.99	29.00	29.00	28.56	27.88	27.58	27.67	26.77	26.92	27.04	26.61	26.28	25.94	25.60	24.72	24.67	24.85	25.83
Zain WiMAX 2Mb zain@home	16.38	16.44	17.39	17.11	16.89	17.54	17.60	17.52	17.51	17.46	17.20	16.83	16.84	16.44	16.46	15.96	16.21	16.56	16.30	16.18	16.19	15.92	16.01	16.25

HTTP Measurements (Download Speed - Non Cache) (Kbytes/s)

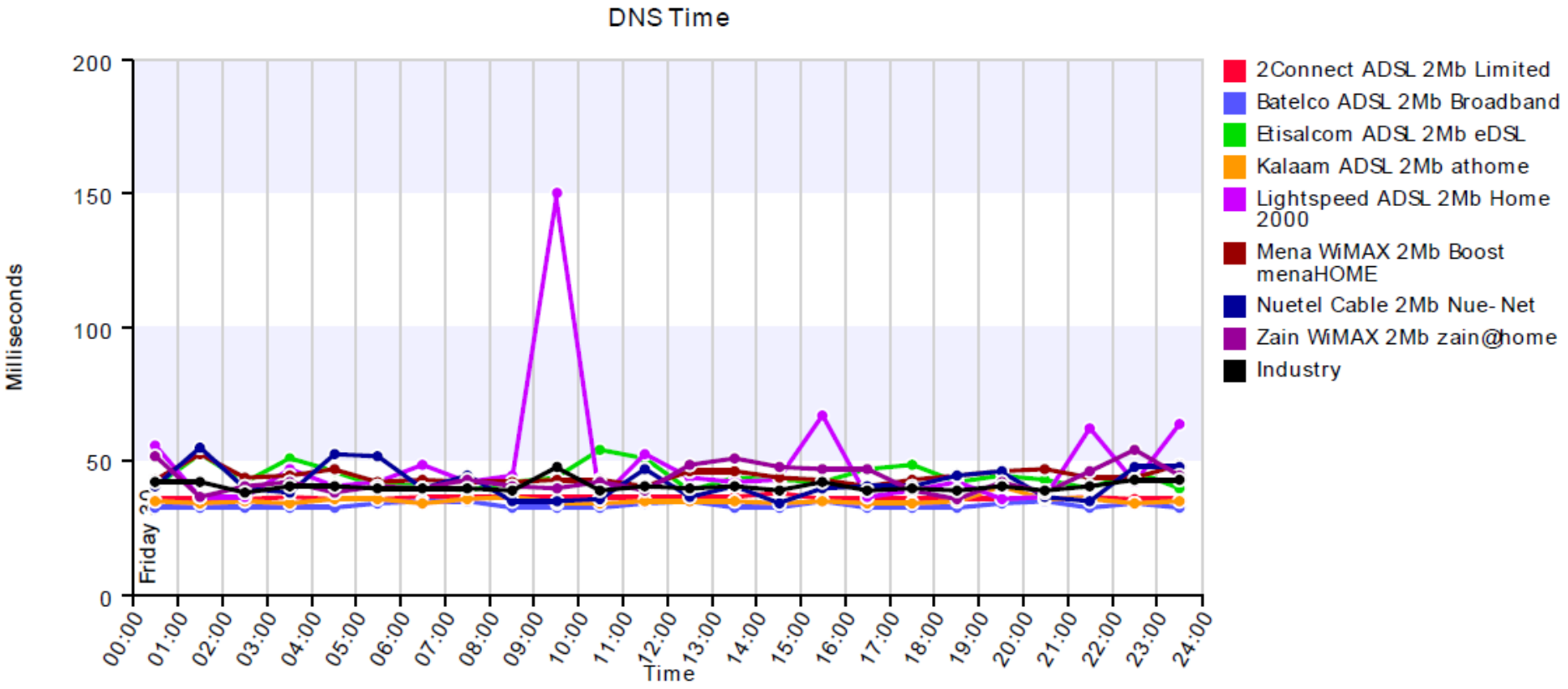
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the embedded content (e.g. images on a web page) in any HTML (HyperText Markup Language) that results from the HTTP request.

Any additional content downloaded is reflected in the captured timings and size of data downloaded. Additionally, the HTTP test can be configured to run in one of two modes of operation: cached and non-cached. When the test downloads from the specified URL in ““non-cached” mode a random query parameter is appended to the end of the URL, which will result in the request bypassing any caches present in the network, and the request will be serviced by the web server specified in the URL as opposed to any cache.

The higher is the download speed the better is the performance.

DNS Time Line Chart (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



DNS Time Line Chart Values (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
2Connect ADSL 2Mb Limited	36	36	36	37	36	36	37	37	37	37	37	37	37	37	38	36	36	36	36	36	36	37	36	36
Batelco ADSL 2Mb Broadband	33	33	33	33	33	34	35	35	33	33	33	34	35	33	33	35	33	33	33	34	35	33	34	33
Etisalcom ADSL 2Mb eDSL	41	53	42	51	46	41	41	39	42	44	54	51	39	44	43	42	47	49	42	45	43	40	46	40
Kalaam ADSL 2Mb athome	35	34	35	34	36	36	34	36	37	34	34	35	35	35	34	35	34	34	35	41	36	36	34	35
Lightspeed ADSL 2Mb Home 2000	56	37	37	47	41	42	49	42	45	150	36	53	44	42	43	67	37	39	42	36	37	62	42	64
Mena WiMAX 2Mb Boost menaHOME	43	53	44	45	47	42	43	42	42	43	43	41	46	46	44	43	41	43	45	46	47	44	44	49
Nuetel Cable 2Mb Nue-Net	41	55	40	38	53	52	40	45	35	35	36	47	37	41	34	40	41	41	45	46	37	35	48	48
Zain WiMAX 2Mb zain@home	52	37	41	42	38	41	40	43	41	40	42	39	49	51	48	47	47	39	36	42	38	46	54	45

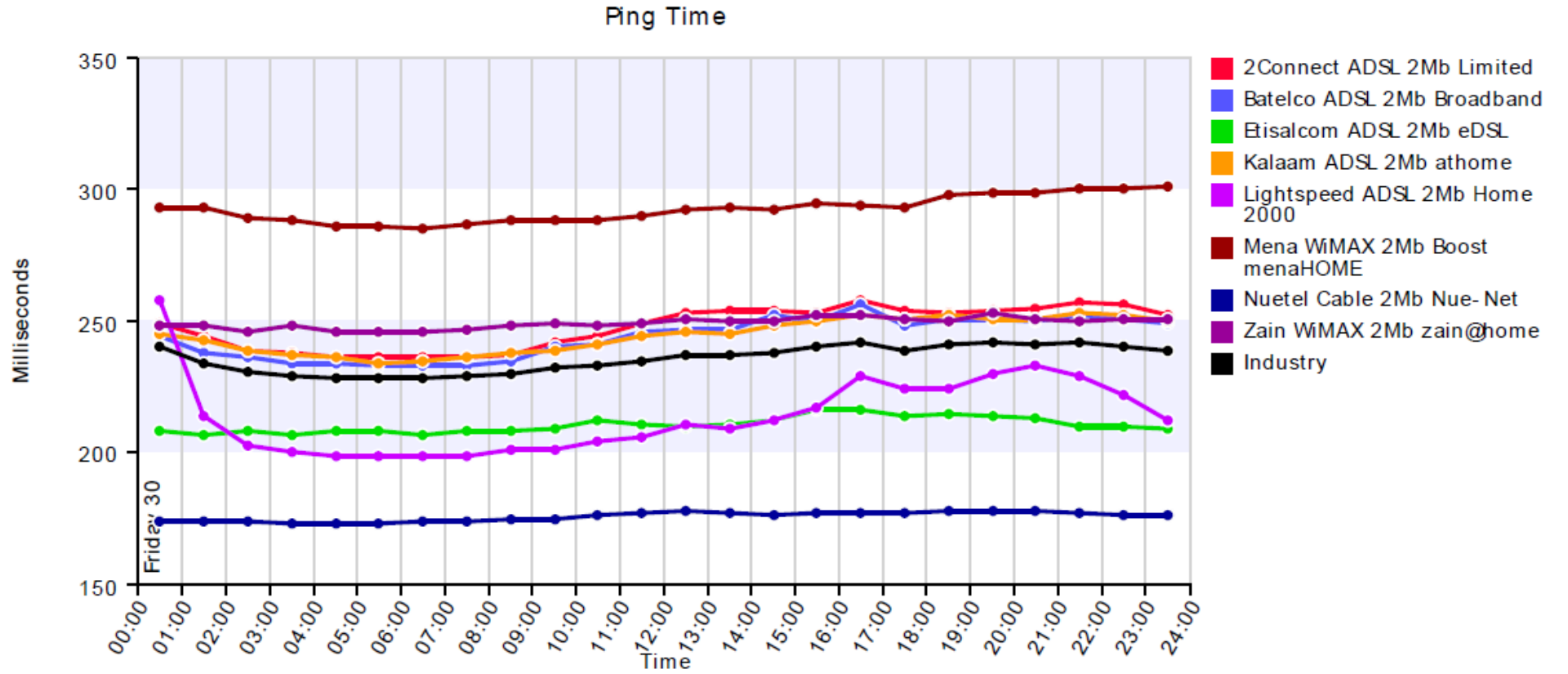
DNS Time (Domain Name System) (Milliseconds)

The DNS test records the time taken (in milliseconds) to resolve a fully qualified domain name to a corresponding IP address. The DNS servers used for the query are the DNS servers (primary and secondary) dynamically assigned by the service provider when the network connection is initiated. Alternatively a specific DNS server can be configured for use during DNS tests. The test probe disables the Windows DNS Client Service responsible for caching the results of DNS requests so that the DNS query is performed on the DNS servers, and not returned from any local cache.

The shorter the DNS resolution time is the better is the performance.

Ping Time Line Chart (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



Ping Time Line Chart Values (Peer view)

01 Oct 2011 - 31 Dec 2011, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
2Connect ADSL 2Mb Limited	249	244	239	238	236	236	236	236	237	242	244	249	253	254	254	253	258	254	253	254	255	257	256	252
Batelco ADSL 2Mb Broadband	244	238	236	234	234	233	233	233	235	240	241	246	247	247	252	250	256	248	251	251	250	252	251	249
Etisalcom ADSL 2Mb eDSL	208	207	208	207	208	208	207	208	208	209	212	211	210	211	212	216	216	214	215	214	213	210	210	209
Kalaam ADSL 2Mb athome	245	243	239	237	236	234	235	236	238	239	241	244	246	245	248	250	252	251	252	251	251	253	252	250
Lightspeed ADSL 2Mb Home 2000	258	214	203	200	199	199	199	199	201	201	204	206	211	209	212	217	229	224	224	230	233	229	222	212
Mena WiMAX 2Mb Boost menaHOME	293	293	289	288	286	286	285	287	288	288	288	290	292	293	292	295	294	293	298	299	299	300	300	301
Nuetel Cable 2Mb Nue-Net	174	174	174	173	173	173	174	174	175	175	176	177	178	177	176	177	177	177	178	178	178	177	176	176
Zain WiMAX 2Mb zain@home	248	248	246	248	246	246	246	247	248	249	248	249	251	250	250	252	252	251	250	253	251	250	251	251

Ping Time (Latency) (Milliseconds)

The Ping test measures network latency by sending an ICMP (Internet Control Message Protocol) echo request to the specified server. The time recorded by test probe is the total round trip time (in milliseconds) from the request to the echo response being received from the server.
The measurements reported are the average time for tests to servers located in Bahrain, Europe and the USA.

The shorter the Latency is the better is the performance.

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