هيئة تنظيم الاتصالات
Telecommunications Regulatory Authority

Fixed Broadband Analysis Report

01 July 2013 – 30 September 2013 between 00:00:00 and 24:00:00 Bahrain

Published 06 October 2013

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 of 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 performance 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 quarterly 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 residential 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 the contractor.

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

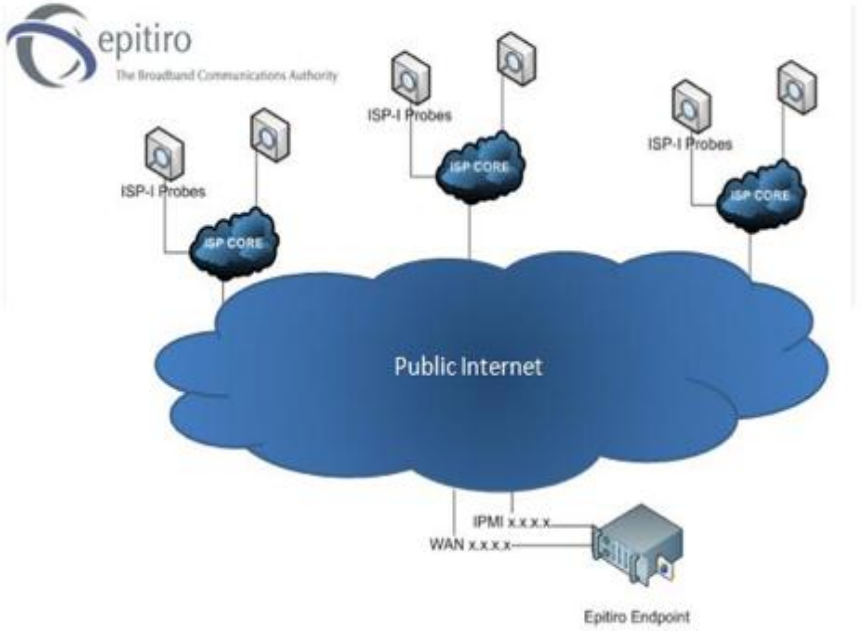


Diagram 1 - Broadband Quality of Service test platform overview

Noticeable events this Quarter

No particular event has occurred over the reporting period .

Performance of Broadband services under tests has been equivalent to the highest industry average trends observed over precedent period, and represents industry trends for 2 Mbps fixed Broadband services in the Kingdom :

Average TCP download speed at 1.57 Mbps and average TCP upload speed at 0.64 Mbps.
Average HTTP Cache download speed at 50.6 kBytes/s and non cached at 31.8 kBytes/s
Average DNS resolution time at 50 milliseconds and average Latency results at 228 milliseconds

RESULTS

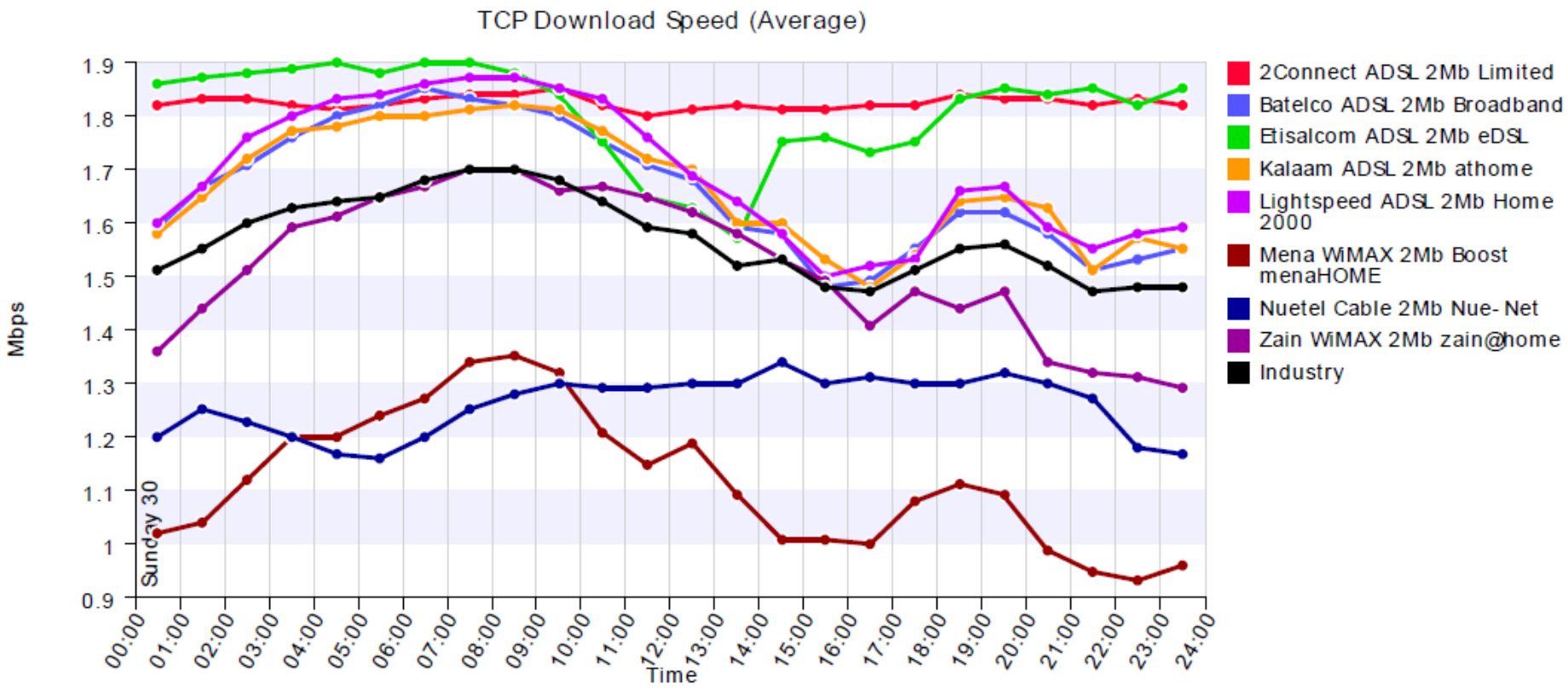
The following pages present the result of measurements taken every hour for each audited service during the period of Q3 2013, from 00:00:00 on the 1 July 2013 to 24:00:00 on the 30 September 2013.

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 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Jun	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	1.82	1.83	1.83	1.82	1.81	1.82	1.83	1.84	1.84	1.85	1.82	1.80	1.81	1.82	1.81	1.81	1.82	1.82	1.84	1.83	1.83	1.82	1.83	1.82
Batelco ADSL 2Mb Broadband	1.59	1.67	1.71	1.76	1.80	1.82	1.85	1.83	1.82	1.80	1.75	1.71	1.68	1.59	1.58	1.48	1.49	1.55	1.62	1.62	1.58	1.51	1.53	1.55
Etisalcom ADSL 2Mb eDSL	1.86	1.87	1.88	1.89	1.90	1.88	1.90	1.90	1.88	1.84	1.75	1.65	1.63	1.57	1.75	1.76	1.73	1.75	1.83	1.85	1.84	1.85	1.82	1.85
Kalaam ADSL 2Mb athome	1.58	1.65	1.72	1.77	1.78	1.80	1.80	1.81	1.82	1.81	1.77	1.72	1.70	1.60	1.60	1.53	1.48	1.54	1.64	1.65	1.63	1.51	1.57	1.55
Lightspeed ADSL 2Mb Home 2000	1.60	1.67	1.76	1.80	1.83	1.84	1.86	1.87	1.87	1.85	1.83	1.76	1.69	1.64	1.58	1.50	1.52	1.53	1.66	1.67	1.59	1.55	1.58	1.59
Mena WiMAX 2Mb Boost menaHOME	1.02	1.04	1.12	1.20	1.20	1.24	1.27	1.34	1.35	1.32	1.21	1.15	1.19	1.09	1.01	1.01	1.00	1.08	1.11	1.09	0.99	0.95	0.93	0.96
Nuetel Cable 2Mb Nue-Net	1.20	1.25	1.23	1.20	1.17	1.16	1.20	1.25	1.28	1.30	1.29	1.29	1.30	1.30	1.34	1.30	1.31	1.30	1.30	1.32	1.30	1.27	1.18	1.17
Zain WiMAX 2Mb zain@home	1.36	1.44	1.51	1.59	1.61	1.65	1.67	1.70	1.70	1.66	1.67	1.65	1.62	1.58	1.53	1.49	1.41	1.47	1.44	1.47	1.34	1.32	1.31	1.29

TCP download measurements (Mbit/s)

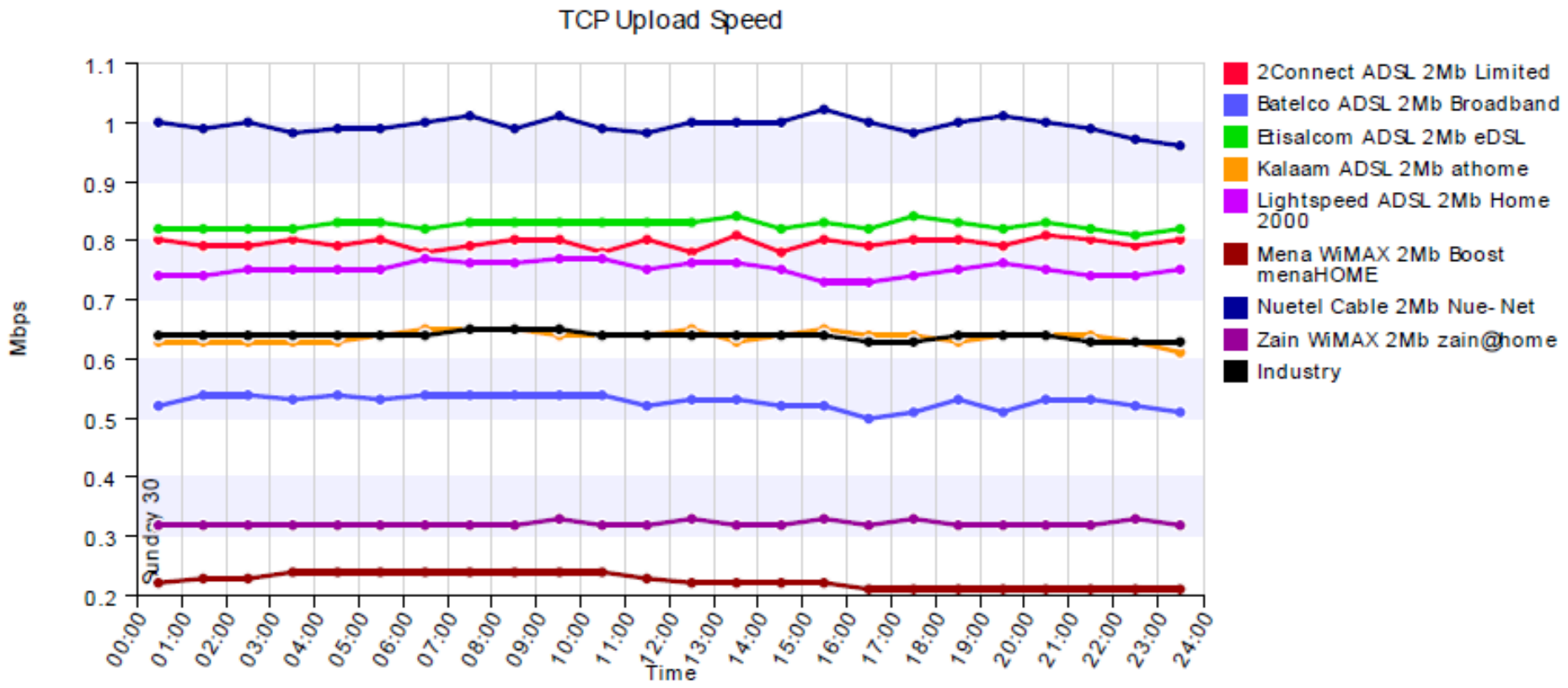
TCP (Transfer Control Protocol) throughput tests measuring download speeds are conducted at a raw socket level (a socket that allows access to the underlying transport provider (ISP) that is supported by protocols such as IPv4 and IPv6) in order to test the full capacity of the connection. The probe 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 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Jun	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	0.80	0.79	0.79	0.80	0.79	0.80	0.78	0.79	0.80	0.80	0.78	0.80	0.78	0.81	0.78	0.80	0.79	0.80	0.80	0.79	0.81	0.80	0.79	0.80
Batelco ADSL 2Mb Broadband	0.52	0.54	0.54	0.53	0.54	0.53	0.54	0.54	0.54	0.54	0.54	0.52	0.53	0.53	0.52	0.52	0.50	0.51	0.53	0.51	0.53	0.53	0.52	0.51
Etisalcom ADSL 2Mb eDSL	0.82	0.82	0.82	0.82	0.83	0.83	0.82	0.83	0.83	0.83	0.83	0.83	0.83	0.84	0.82	0.83	0.82	0.84	0.83	0.82	0.83	0.82	0.81	0.82
Kalaam ADSL 2Mb athome	0.63	0.63	0.63	0.63	0.63	0.64	0.65	0.65	0.65	0.64	0.64	0.64	0.65	0.63	0.64	0.65	0.64	0.64	0.63	0.64	0.64	0.64	0.63	0.61
Lightspeed ADSL 2Mb Home 2000	0.74	0.74	0.75	0.75	0.75	0.75	0.77	0.76	0.76	0.77	0.77	0.75	0.76	0.76	0.75	0.73	0.73	0.74	0.75	0.76	0.75	0.74	0.74	0.75
Mena WiMAX 2Mb Boost menaHOME	0.22	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.23	0.22	0.22	0.22	0.22	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Nuetel Cable 2Mb Nue-Net	1.00	0.99	1.00	0.98	0.99	0.99	1.00	1.01	0.99	1.01	0.99	0.98	1.00	1.00	1.00	1.02	1.00	0.98	1.00	1.01	1.00	0.99	0.97	0.96
Zain WiMAX 2Mb zain@home	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.32	0.32	0.33	0.32	0.32	0.33	0.32	0.33	0.32	0.32	0.32	0.32	0.33	0.32

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.

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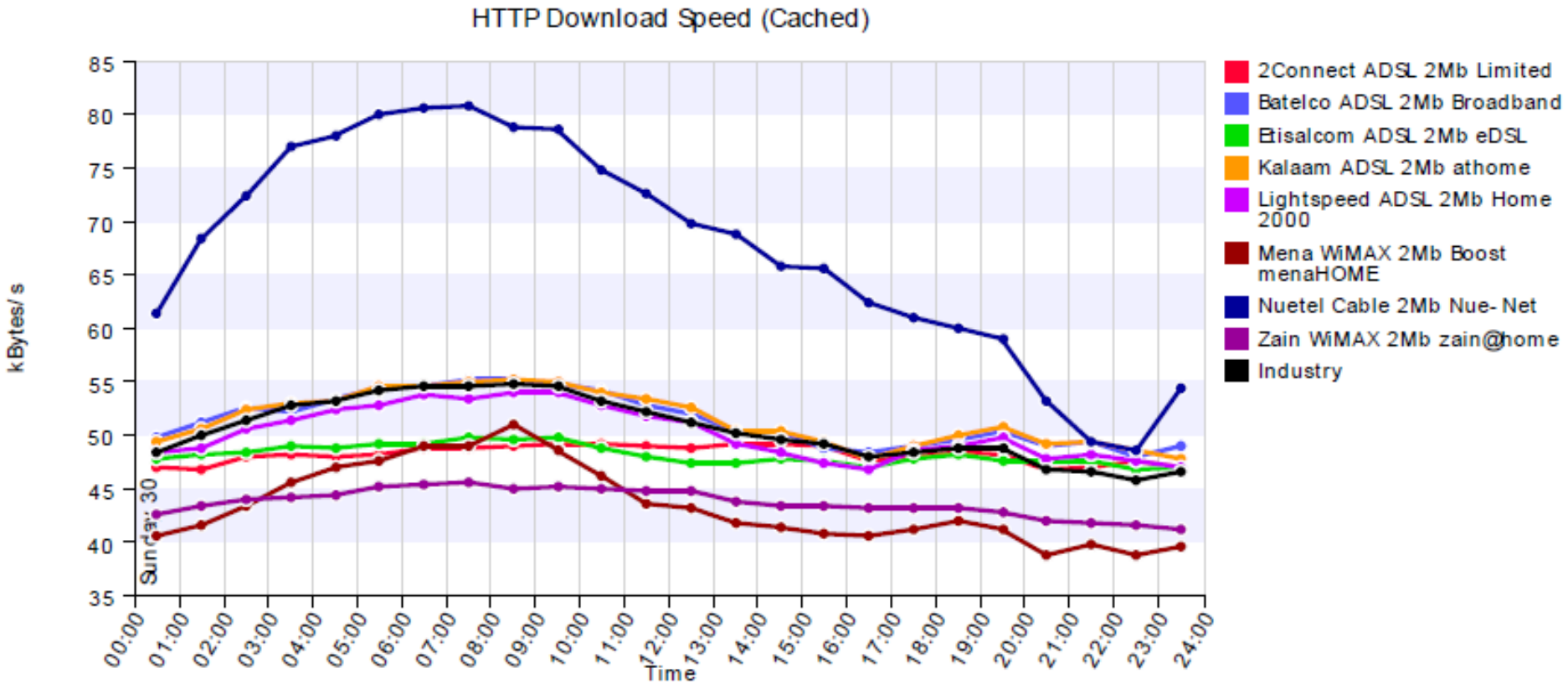
The higher is the upload speed the better is the performance.

HTTP Download Speed (Cached)

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

01 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Jun	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	47.09	46.85	48.03	48.29	47.91	48.22	48.73	48.85	49.04	49.10	49.28	49.09	48.73	49.27	49.14	48.96	47.69	47.93	48.38	48.26	46.84	47.01	47.64	47.05
Batelco ADSL 2Mb Broadband	49.83	51.24	52.50	52.25	53.38	54.39	54.59	55.25	55.16	54.78	54.16	52.89	52.01	50.49	50.40	48.89	48.48	48.96	49.59	50.42	49.04	49.41	48.04	48.99
Etisalcom ADSL 2Mb eDSL	47.73	48.24	48.36	49.09	48.83	49.27	49.28	49.82	49.65	49.78	48.71	47.95	47.45	47.46	47.83	47.64	47.02	47.75	48.18	47.54	47.52	47.67	46.82	46.91
Kalaam ADSL 2Mb athome	49.39	50.63	52.36	53.02	53.14	54.50	54.55	54.95	55.29	55.05	54.06	53.48	52.50	50.41	50.35	49.32	47.83	48.93	50.02	50.79	49.11	49.43	48.68	47.70
Lightspeed ADSL 2Mb Home 2000	48.44	48.72	50.51	51.42	52.49	52.76	53.76	53.32	53.91	53.97	52.85	51.70	51.19	49.27	48.46	47.39	46.83	48.54	49.01	49.86	47.80	48.17	47.60	46.99
Mena WiMAX 2Mb Boost menaHOME	40.51	41.50	43.32	45.50	47.08	47.53	49.04	48.98	51.08	48.53	46.22	43.66	43.22	41.79	41.41	40.88	40.66	41.15	41.95	41.29	38.83	39.90	38.89	39.50
Nuetel Cable 2Mb Nue-Net	61.47	68.49	72.46	76.91	77.90	80.05	80.51	80.87	78.71	78.61	74.74	72.62	69.71	68.80	65.77	65.67	62.42	61.05	60.08	59.09	53.29	49.36	48.52	54.34
Zain WiMAX 2Mb zain@home	42.64	43.49	44.04	44.27	44.38	45.21	45.39	45.54	44.92	45.10	45.05	44.75	44.80	43.84	43.42	43.32	43.24	43.21	43.29	42.88	42.00	41.75	41.52	41.22

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

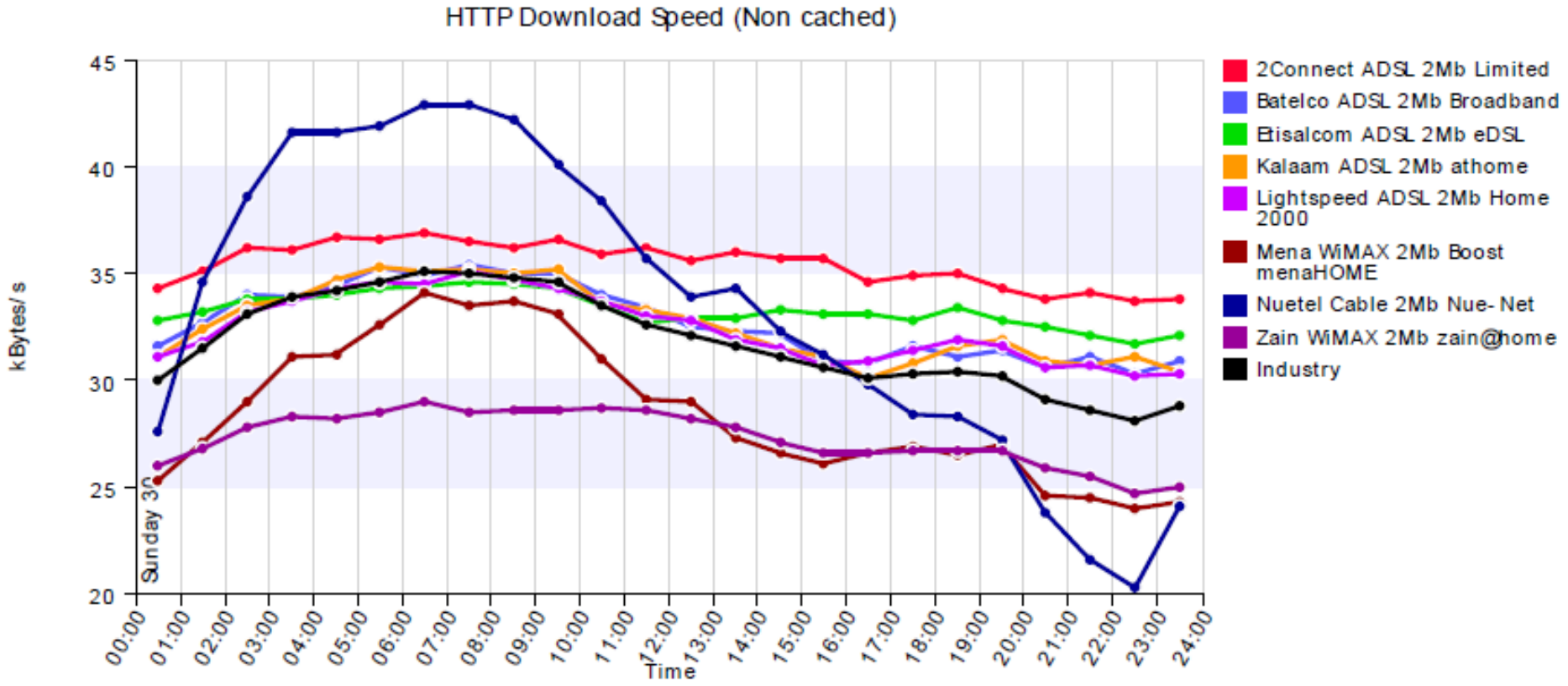
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the 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 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Jun	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	34.31	35.13	36.16	36.10	36.69	36.62	36.93	36.52	36.22	36.61	35.87	36.22	35.61	36.01	35.70	35.72	34.63	34.92	35.05	34.30	33.83	34.08	33.68	33.84
Batelco ADSL 2Mb Broadband	31.56	32.71	34.04	33.92	34.43	35.26	34.91	35.36	34.99	35.04	34.05	33.39	32.50	32.25	32.23	30.90	30.79	31.62	31.13	31.35	30.63	31.10	30.30	30.88
Etisalcom ADSL 2Mb eDSL	32.82	33.24	33.82	33.81	34.04	34.33	34.36	34.62	34.54	34.29	33.55	32.70	32.92	32.85	33.28	33.10	33.10	32.82	33.41	32.79	32.52	32.09	31.67	32.15
Kalaam ADSL 2Mb athome	31.11	32.43	33.51	33.83	34.73	35.28	35.10	35.19	35.02	35.15	33.63	33.27	32.93	32.19	31.50	31.13	30.14	30.83	31.60	31.94	30.95	30.68	31.09	30.39
Lightspeed ADSL 2Mb Home 2000	31.14	31.77	33.24	33.70	34.34	34.61	34.49	35.11	34.72	34.33	33.72	32.98	32.84	31.85	31.54	30.73	30.88	31.35	31.93	31.61	30.56	30.70	30.17	30.26
Mena WiMAX 2Mb Boost menaHOME	25.26	27.06	28.97	31.15	31.18	32.63	34.11	33.46	33.70	33.13	31.02	29.14	29.01	27.31	26.60	26.08	26.56	26.91	26.49	26.97	24.65	24.46	23.96	24.27
Nuetel Cable 2Mb Nue-Net	27.61	34.63	38.57	41.64	41.64	41.91	42.86	42.88	42.20	40.10	38.44	35.73	33.85	34.29	32.34	31.19	29.75	28.39	28.26	27.20	23.83	21.57	20.30	24.06
Zain WiMAX 2Mb zain@home	26.00	26.81	27.83	28.30	28.18	28.46	28.98	28.46	28.62	28.64	28.69	28.62	28.19	27.76	27.09	26.64	26.55	26.69	26.70	26.69	25.91	25.47	24.73	24.99

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

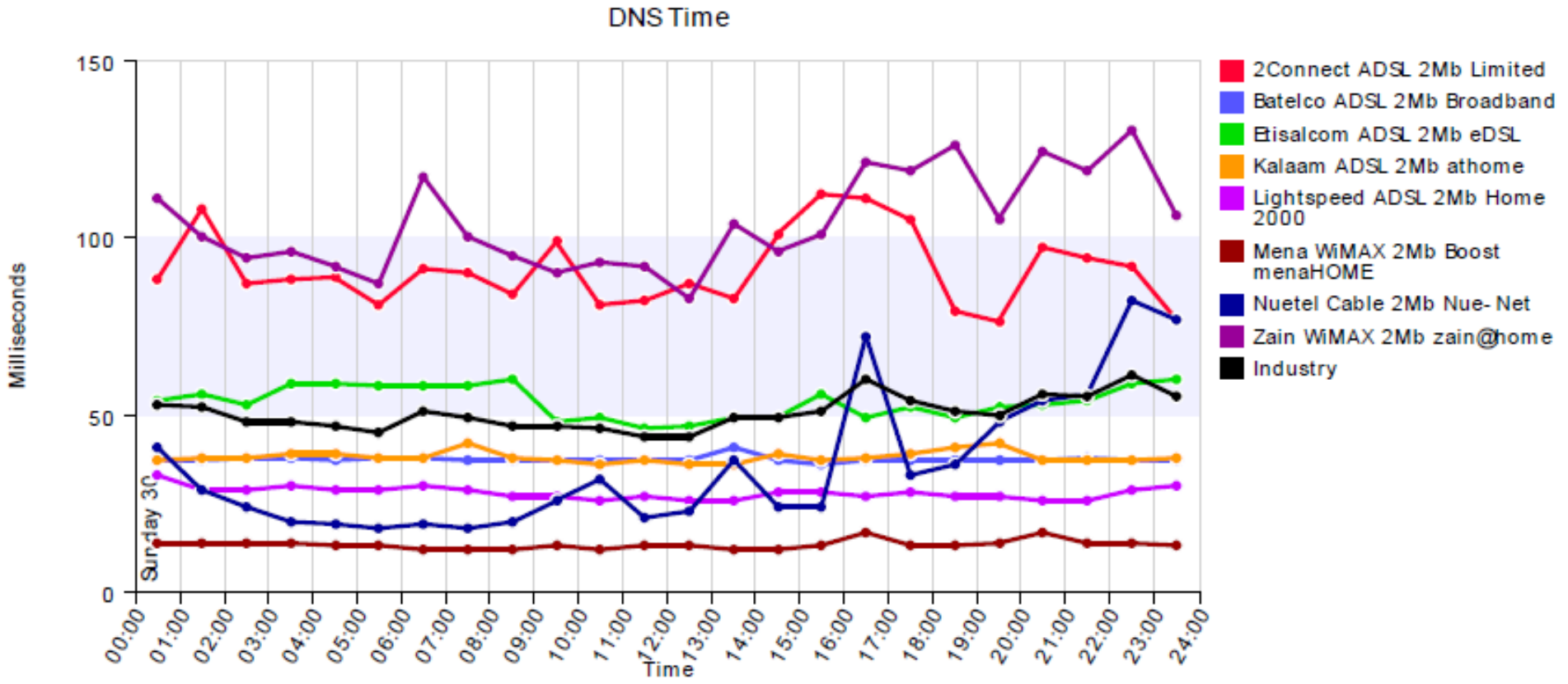
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the 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 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



DNS Time Line Chart Values (Peer view)

01 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Jun	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	88	108	87	88	89	81	91	90	84	99	81	82	87	83	101	112	111	105	79	76	97	94	92	77
Batelco ADSL 2Mb Broadband	37	37	38	38	37	38	38	37	37	37	37	37	37	41	37	36	37	37	37	37	37	38	37	37
Etisalcom ADSL 2Mb eDSL	54	56	53	59	59	58	58	58	60	48	49	46	47	49	49	56	49	52	49	52	53	54	59	60
Kalaam ADSL 2Mb athome	37	38	38	39	39	38	38	42	38	37	36	37	36	36	39	37	38	39	41	42	37	37	37	38
Lightspeed ADSL 2Mb Home 2000	33	29	29	30	29	29	30	29	27	27	26	27	26	26	28	28	27	28	27	27	26	26	29	30
Mena WiMAX 2Mb Boost menaHOME	14	14	14	14	13	13	12	12	12	13	12	13	13	12	12	13	17	13	13	14	17	14	14	13
Nuetel Cable 2Mb Nue-Net	41	29	24	20	19	18	19	18	20	26	32	21	23	37	24	24	72	33	36	48	54	56	82	77
Zain WiMAX 2Mb zain@home	111	100	94	96	92	87	117	100	95	90	93	92	83	104	96	101	121	119	126	105	124	119	130	106

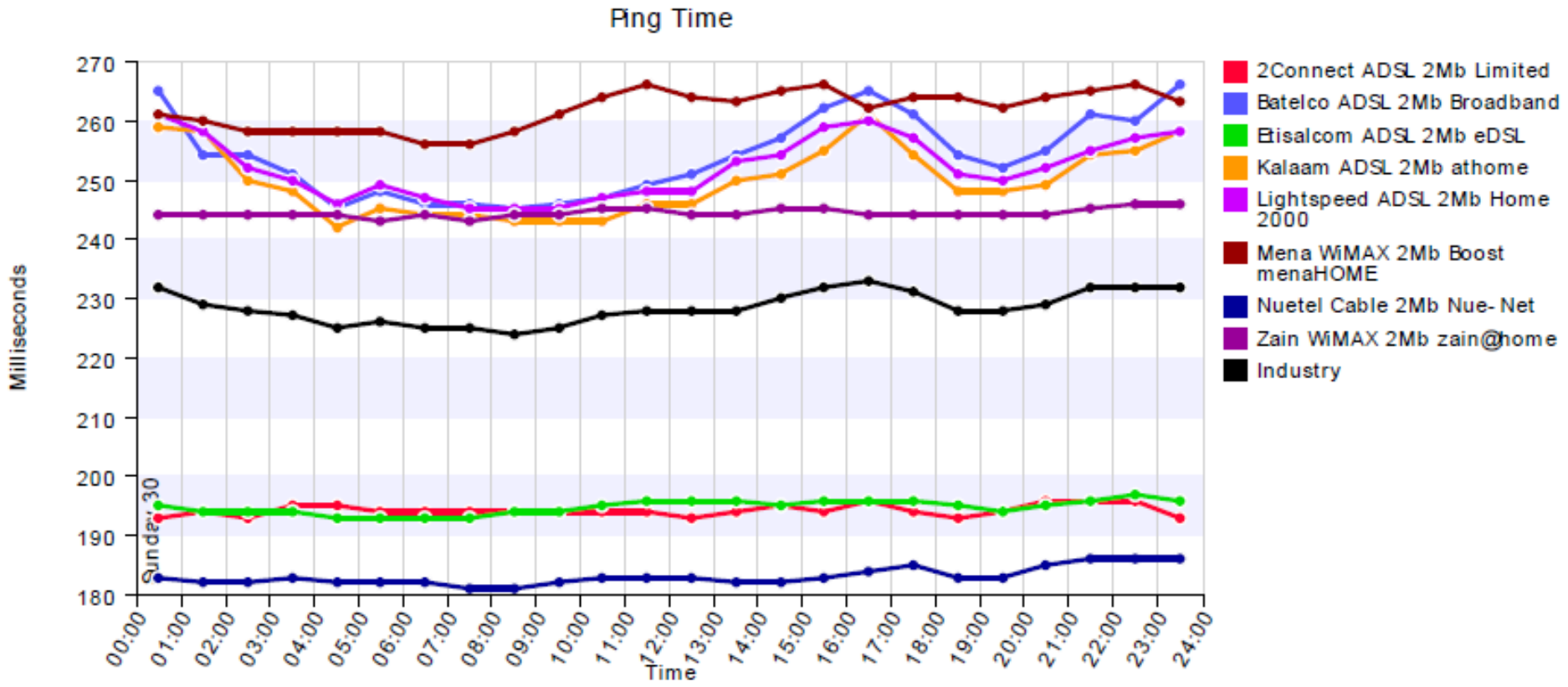
DNS Time (Domain Name System) (Milliseconds)

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 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



Ping Time Line Chart Values (Peer view)

01 Jul 2013 - 30 Sep 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Jun	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	193	194	193	195	195	194	194	194	194	194	194	194	193	194	195	194	196	194	193	194	196	196	196	193
Batelco ADSL 2Mb Broadband	265	254	254	251	245	248	246	246	245	246	247	249	251	254	257	262	265	261	254	252	255	261	260	266
Etisalcom ADSL 2Mb eDSL	195	194	194	194	193	193	193	193	194	194	195	196	196	196	195	196	196	196	195	194	195	196	197	196
Kalaam ADSL 2Mb athome	259	258	250	248	242	245	244	244	243	243	243	246	246	250	251	255	261	254	248	248	249	254	255	258
Lightspeed ADSL 2Mb Home 2000	261	258	252	250	246	249	247	245	245	245	247	248	248	253	254	259	260	257	251	250	252	255	257	258
Mena WiMAX 2Mb Boost menaHOME	261	260	258	258	258	258	256	256	258	261	264	266	264	263	265	266	262	264	264	262	264	265	266	263
Nuetel Cable 2Mb Nue-Net	183	182	182	183	182	182	182	181	181	182	183	183	183	182	182	183	184	185	183	183	185	186	186	186
Zain WiMAX 2Mb zain@home	244	244	244	244	244	243	244	243	244	244	245	245	244	244	245	245	244	244	244	244	244	245	246	246

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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