هيئة تنظيم الاتصالات
Telecommunications Regulatory Authority

Fixed Broadband Analysis Report

01 April 2013 – 30 June 2013 between 00:00:00 and 24:00:00 Bahrain

Published 08 July 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.

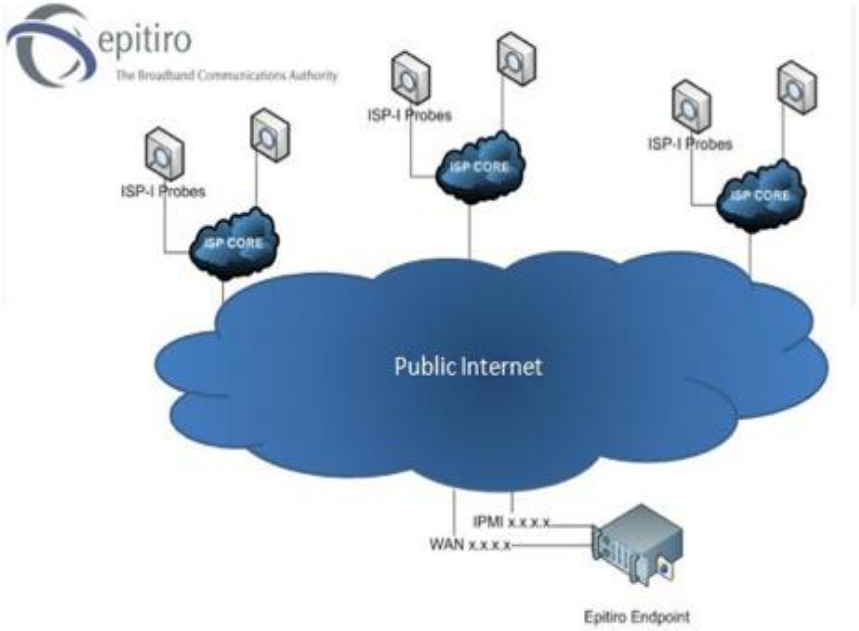


Diagram 1 - Broadband Quality of Service test platform overview

Noticeable events this Quarter

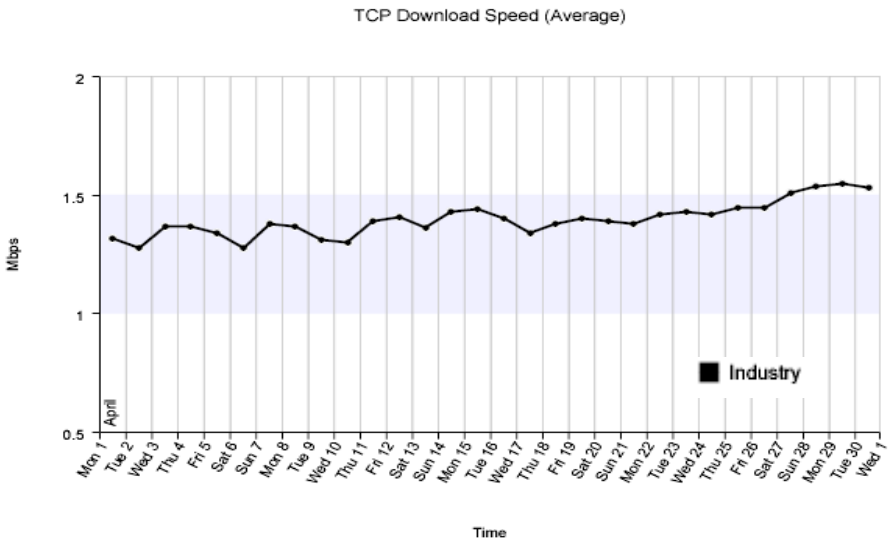
Repair of the South East Asia-Middle East-West Europe 4 (SMW4) submarine cable system linking South East Asia to Europe via the Indian Sub-Continent and Middle East initially planned for the beginning of April was only completed on 26 April 2013.

This had an effect on Broadband performance during the first month of the quarter and therefore the averaged percentage performance presented in the following pages of this report. Since different service providers use different routes, we would expect this to have had a uneven impact on the industry.

In particular observed Industry average TCP download speed is slightly bellow the usual trend, at 1.48 Mbps, however average TCP upload speed remained unaffected at 0.67 Mbps. Some volatility on latency results, visible in the graph, is also related to the cable issue.

In comparison maintenance of the FLAG- Falcon submarine cable on 20 May that took less than 24 hours remained almost unnoticed to end users.

The graph show Industry average TCP download performance evolution over the month of April.



RESULTS

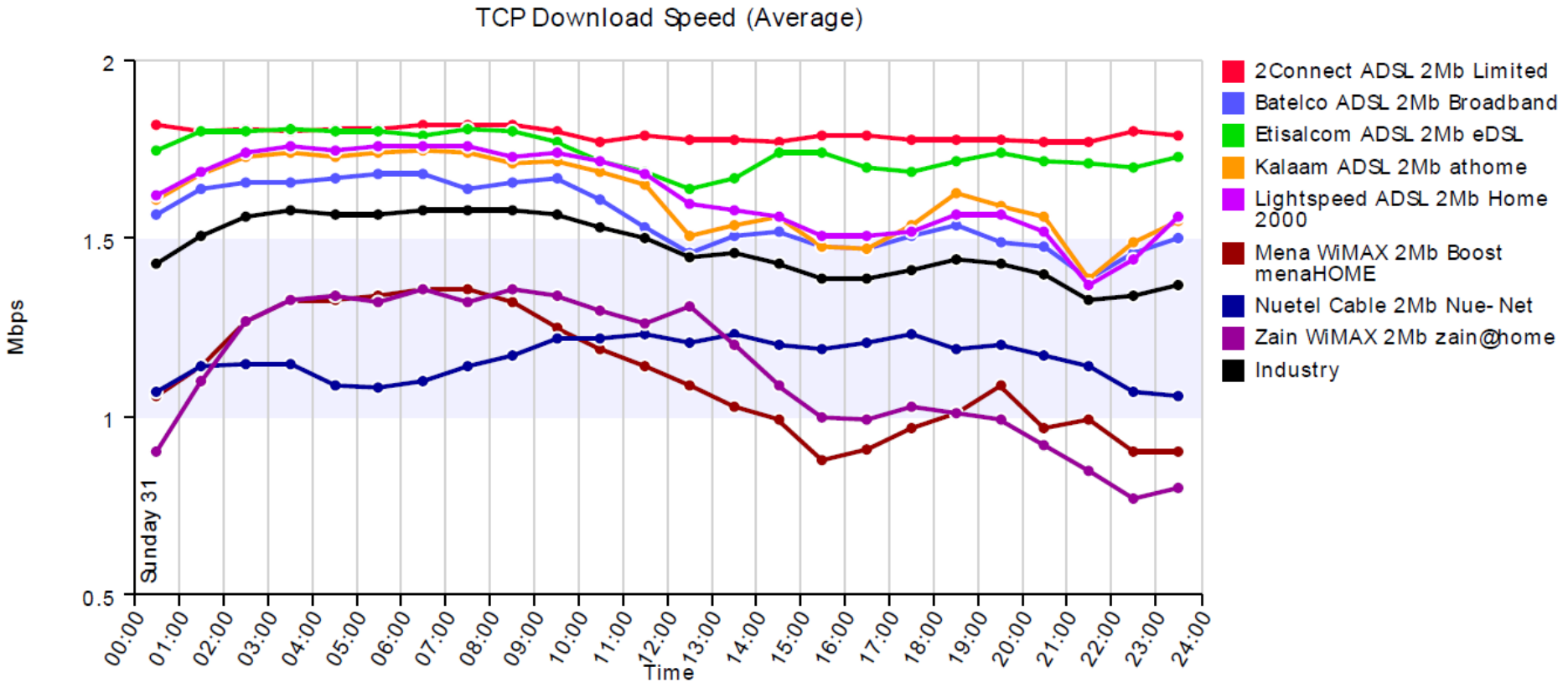
The following pages present the result of measurements taken every hour for each audited service during the period of Q2 2013, from 00:00:00 on the 1 April 2013 to 24:00:00 on the 30 June 2013.

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 Apr 2013 - 30 Jun 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Apr 2013 - 30 Jun 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Mar	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	1.80	1.81	1.80	1.81	1.81	1.82	1.82	1.82	1.80	1.77	1.79	1.78	1.78	1.77	1.79	1.79	1.78	1.78	1.78	1.77	1.77	1.80	1.79
Batelco ADSL 2Mb Broadband	1.57	1.64	1.66	1.66	1.67	1.68	1.68	1.64	1.66	1.67	1.61	1.53	1.46	1.51	1.52	1.48	1.47	1.51	1.54	1.49	1.48	1.39	1.46	1.50
Etisalcom ADSL 2Mb eDSL	1.75	1.80	1.80	1.81	1.80	1.80	1.79	1.81	1.80	1.77	1.72	1.69	1.64	1.67	1.74	1.74	1.70	1.69	1.72	1.74	1.72	1.71	1.70	1.73
Kalaam ADSL 2Mb athome	1.61	1.68	1.73	1.74	1.73	1.74	1.75	1.74	1.71	1.72	1.69	1.65	1.51	1.54	1.56	1.48	1.47	1.54	1.63	1.59	1.56	1.39	1.49	1.55
Lightspeed ADSL 2Mb Home 2000	1.62	1.69	1.74	1.76	1.75	1.76	1.76	1.76	1.73	1.74	1.72	1.68	1.60	1.58	1.56	1.51	1.51	1.52	1.57	1.57	1.52	1.37	1.44	1.56
Mena WiMAX 2Mb Boost menaHOME	1.06	1.14	1.27	1.33	1.33	1.34	1.36	1.36	1.32	1.25	1.19	1.14	1.09	1.03	0.99	0.88	0.91	0.97	1.01	1.09	0.97	0.99	0.90	0.90
Nuetel Cable 2Mb Nue-Net	1.07	1.14	1.15	1.15	1.09	1.08	1.10	1.14	1.17	1.22	1.22	1.23	1.21	1.23	1.20	1.19	1.21	1.23	1.19	1.20	1.17	1.14	1.07	1.06
Zain WiMAX 2Mb zain@home	0.90	1.10	1.27	1.33	1.34	1.32	1.36	1.32	1.36	1.34	1.30	1.26	1.31	1.20	1.09	1.00	0.99	1.03	1.01	0.99	0.92	0.85	0.77	0.80

TCP download measurements (Mbit/s)

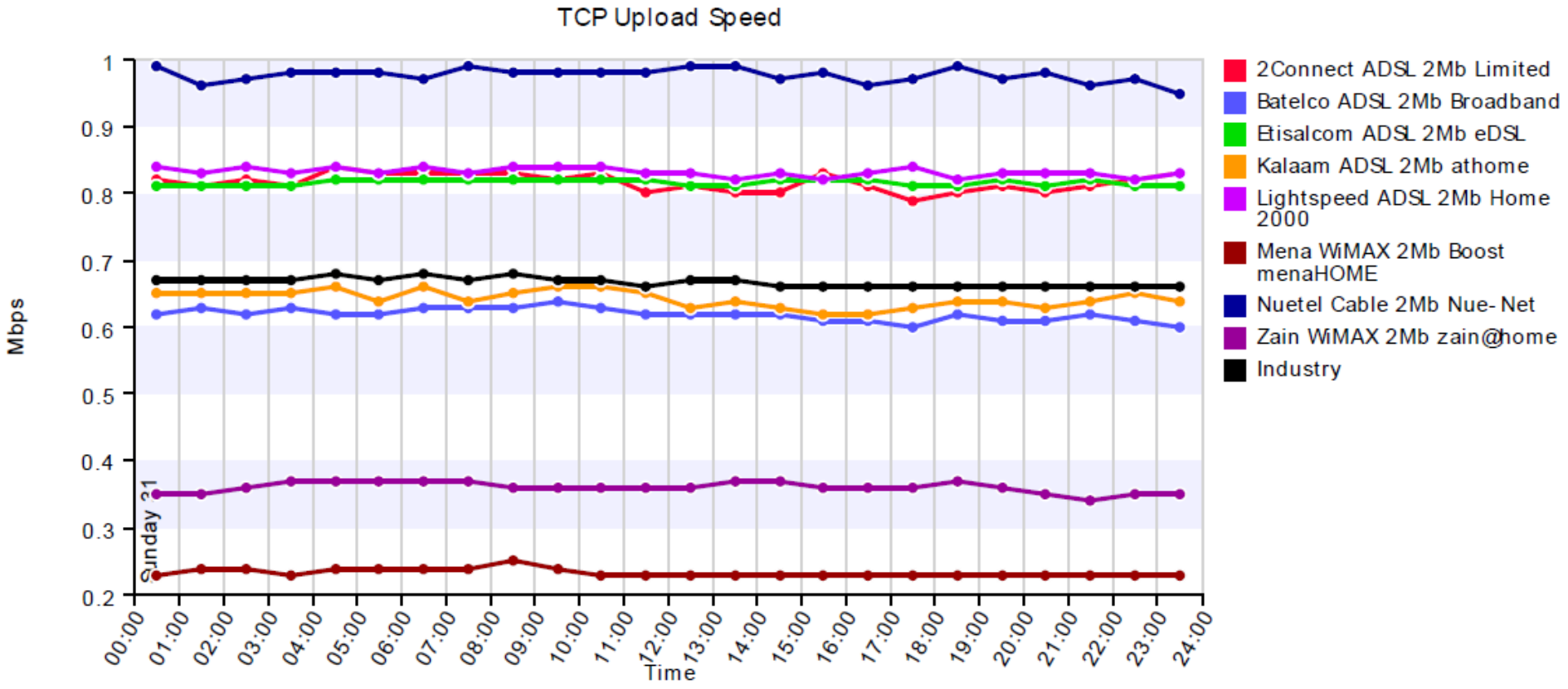
TCP (Transfer Control Protocol) throughput tests measuring download speeds are conducted at a raw socket level (a socket that allows access to the underlying transport provider (ISP) that is supported by protocols such as IPv4 and IPv6) in order to test the full capacity of the connection. The probe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



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

01 Apr 2013 - 30 Jun 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Mar	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	0.82	0.81	0.82	0.81	0.84	0.83	0.83	0.83	0.83	0.82	0.83	0.80	0.81	0.80	0.80	0.83	0.81	0.79	0.80	0.81	0.80	0.81	0.82	0.83
Batelco ADSL 2Mb Broadband	0.62	0.63	0.62	0.63	0.62	0.62	0.63	0.63	0.63	0.64	0.63	0.62	0.62	0.62	0.62	0.61	0.61	0.60	0.62	0.61	0.61	0.62	0.61	0.60
Etisalcom ADSL 2Mb eDSL	0.81	0.81	0.81	0.81	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.81	0.81	0.82	0.82	0.82	0.81	0.81	0.82	0.81	0.82	0.81	0.81
Kalaam ADSL 2Mb athome	0.65	0.65	0.65	0.65	0.66	0.64	0.66	0.64	0.65	0.66	0.66	0.65	0.63	0.64	0.63	0.62	0.62	0.63	0.64	0.64	0.63	0.64	0.65	0.64
Lightspeed ADSL 2Mb Home 2000	0.84	0.83	0.84	0.83	0.84	0.83	0.84	0.83	0.84	0.84	0.84	0.83	0.83	0.82	0.83	0.82	0.83	0.84	0.82	0.83	0.83	0.83	0.82	0.83
Mena WiMAX 2Mb Boost menaHOME	0.23	0.24	0.24	0.23	0.24	0.24	0.24	0.24	0.25	0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Nuetel Cable 2Mb Nue-Net	0.99	0.96	0.97	0.98	0.98	0.98	0.97	0.99	0.98	0.98	0.98	0.98	0.99	0.99	0.97	0.98	0.96	0.97	0.99	0.97	0.98	0.96	0.97	0.95
Zain WiMAX 2Mb zain@home	0.35	0.35	0.36	0.37	0.37	0.37	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.37	0.37	0.36	0.36	0.36	0.37	0.36	0.35	0.34	0.35	0.35

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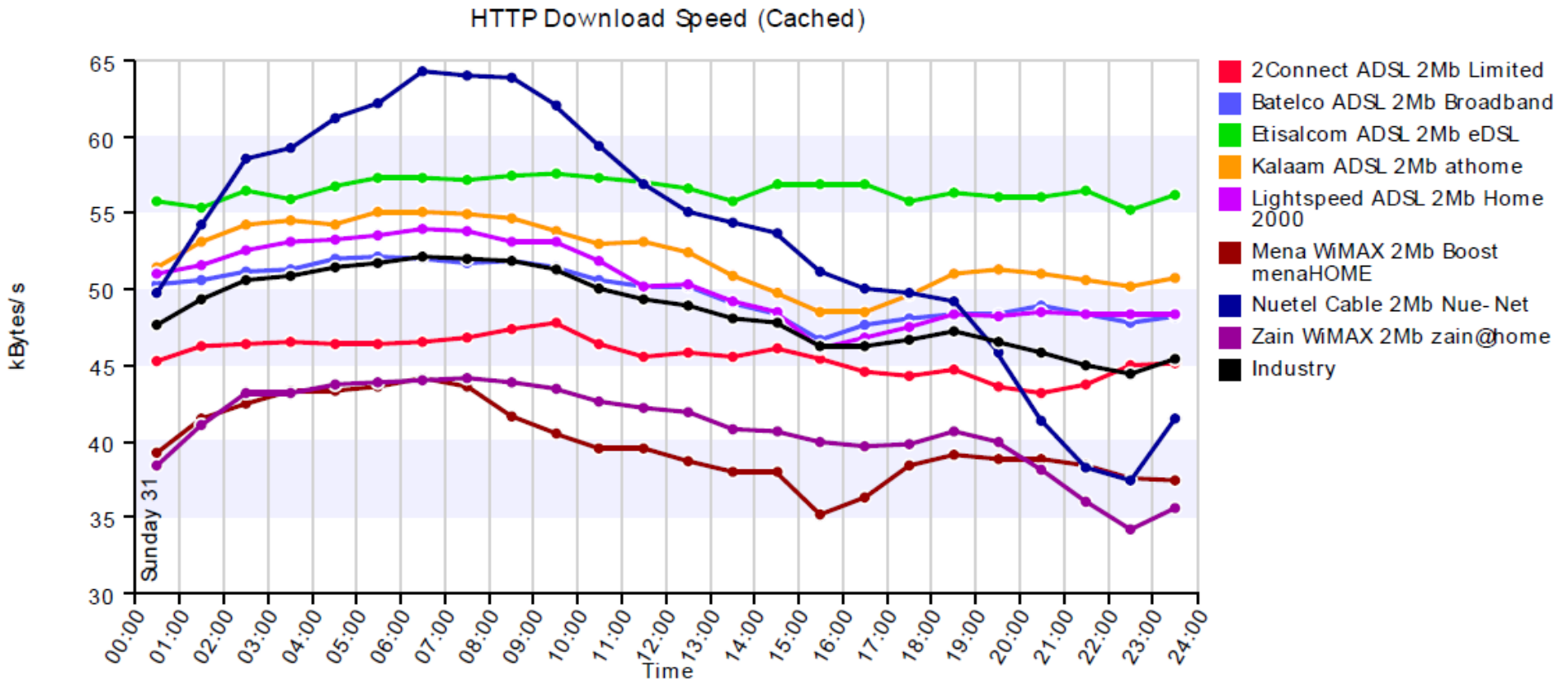
The higher is the upload speed the better is the performance.

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

01 Apr 2013 - 30 Jun 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Apr 2013 - 30 Jun 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Mar	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	45.30	46.21	46.40	46.45	46.38	46.43	46.51	46.84	47.37	47.73	46.35	45.50	45.84	45.59	46.14	45.37	44.61	44.22	44.63	43.57	43.16	43.68	45.05	45.08
Batelco ADSL 2Mb Broadband	50.26	50.61	51.10	51.28	52.04	52.15	52.04	51.72	51.79	51.45	50.60	50.10	50.15	49.04	48.40	46.69	47.58	48.09	48.37	48.40	48.93	48.41	47.74	48.22
Etisalcom ADSL 2Mb eDSL	55.73	55.35	56.39	55.96	56.77	57.26	57.37	57.16	57.45	57.55	57.26	56.97	56.53	55.76	56.90	56.94	56.85	55.82	56.33	56.02	56.07	56.43	55.21	56.21
Kalaam ADSL 2Mb athome	51.38	53.14	54.23	54.45	54.24	55.05	55.02	54.92	54.61	53.77	52.91	53.07	52.44	50.92	49.68	48.53	48.47	49.57	51.06	51.29	51.05	50.58	50.18	50.73
Lightspeed ADSL 2Mb Home 2000	50.98	51.55	52.48	53.07	53.27	53.57	53.88	53.83	53.12	53.10	51.83	50.14	50.26	49.13	48.54	46.15	46.87	47.43	48.34	48.17	48.51	48.30	48.28	48.40
Mena WiMAX 2Mb Boost menaHOME	39.26	41.43	42.39	43.36	43.30	43.52	44.18	43.55	41.63	40.55	39.45	39.50	38.67	38.01	37.96	35.14	36.28	38.40	39.07	38.86	38.88	38.37	37.55	37.44
Nuetel Cable 2Mb Nue-Net	49.78	54.23	58.60	59.26	61.27	62.23	64.26	63.95	63.89	62.07	59.35	56.91	55.02	54.35	53.66	51.10	50.01	49.72	49.17	45.86	41.34	38.25	37.47	41.43
Zain WiMAX 2Mb zain@home	38.42	41.09	43.12	43.11	43.78	43.84	44.02	44.19	43.80	43.50	42.65	42.16	41.86	40.81	40.59	40.01	39.63	39.76	40.57	39.99	38.18	35.98	34.19	35.65

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

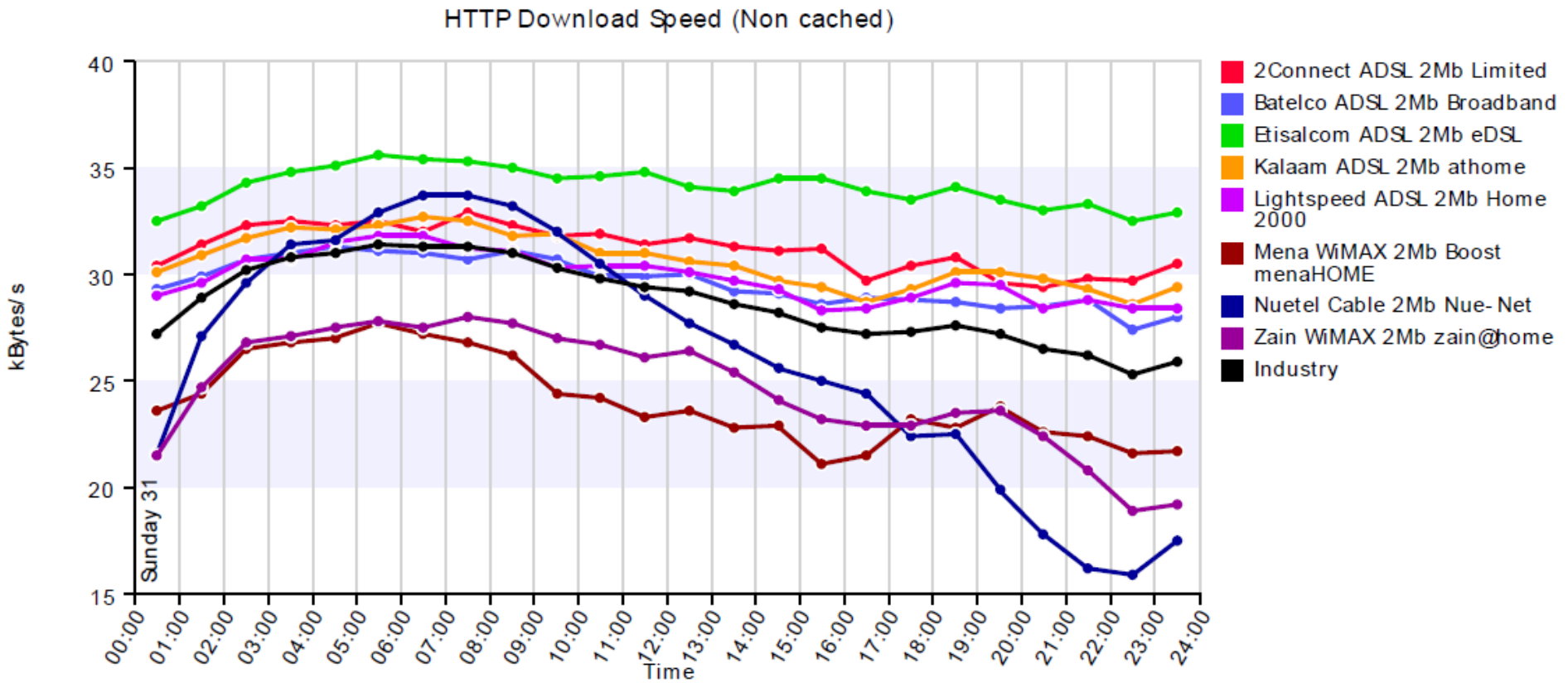
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the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



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

01 Apr 2013 - 30 Jun 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Mar	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	30.37	31.35	32.28	32.54	32.30	32.53	32.05	32.87	32.34	31.75	31.89	31.38	31.70	31.27	31.09	31.21	29.72	30.44	30.83	29.57	29.41	29.81	29.65	30.50
Batelco ADSL 2Mb Broadband	29.34	29.92	30.72	31.02	31.25	31.14	31.04	30.72	31.06	30.73	29.90	29.87	30.01	29.18	29.13	28.64	28.88	28.76	28.70	28.39	28.49	28.79	27.37	27.97
Etisalcom ADSL 2Mb eDSL	32.50	33.24	34.29	34.81	35.14	35.59	35.44	35.33	34.96	34.55	34.59	34.77	34.09	33.86	34.45	34.51	33.89	33.47	34.12	33.53	32.99	33.28	32.45	32.91
Kalaam ADSL 2Mb athome	30.13	30.89	31.66	32.21	32.13	32.31	32.68	32.53	31.79	31.93	30.95	30.96	30.65	30.36	29.68	29.42	28.71	29.28	30.06	30.13	29.75	29.33	28.63	29.37
Lightspeed ADSL 2Mb Home 2000	28.97	29.59	30.71	30.73	31.54	31.84	31.77	31.21	31.07	30.33	30.35	30.37	30.08	29.73	29.31	28.32	28.45	28.89	29.57	29.51	28.43	28.75	28.38	28.41
Mena WiMAX 2Mb Boost menaHOME	23.58	24.39	26.52	26.78	26.96	27.70	27.23	26.75	26.17	24.36	24.24	23.27	23.62	22.83	22.89	21.15	21.49	23.24	22.80	23.84	22.57	22.38	21.55	21.69
Nuetel Cable 2Mb Nue-Net	21.65	27.10	29.57	31.35	31.56	32.92	33.68	33.65	33.20	31.99	30.50	29.04	27.73	26.70	25.59	24.96	24.40	22.44	22.45	19.95	17.76	16.22	15.86	17.54
Zain WiMAX 2Mb zain@home	21.52	24.71	26.75	27.09	27.53	27.79	27.52	27.95	27.67	26.96	26.73	26.11	26.44	25.36	24.14	23.17	22.93	22.86	23.49	23.63	22.41	20.75	18.86	19.17

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

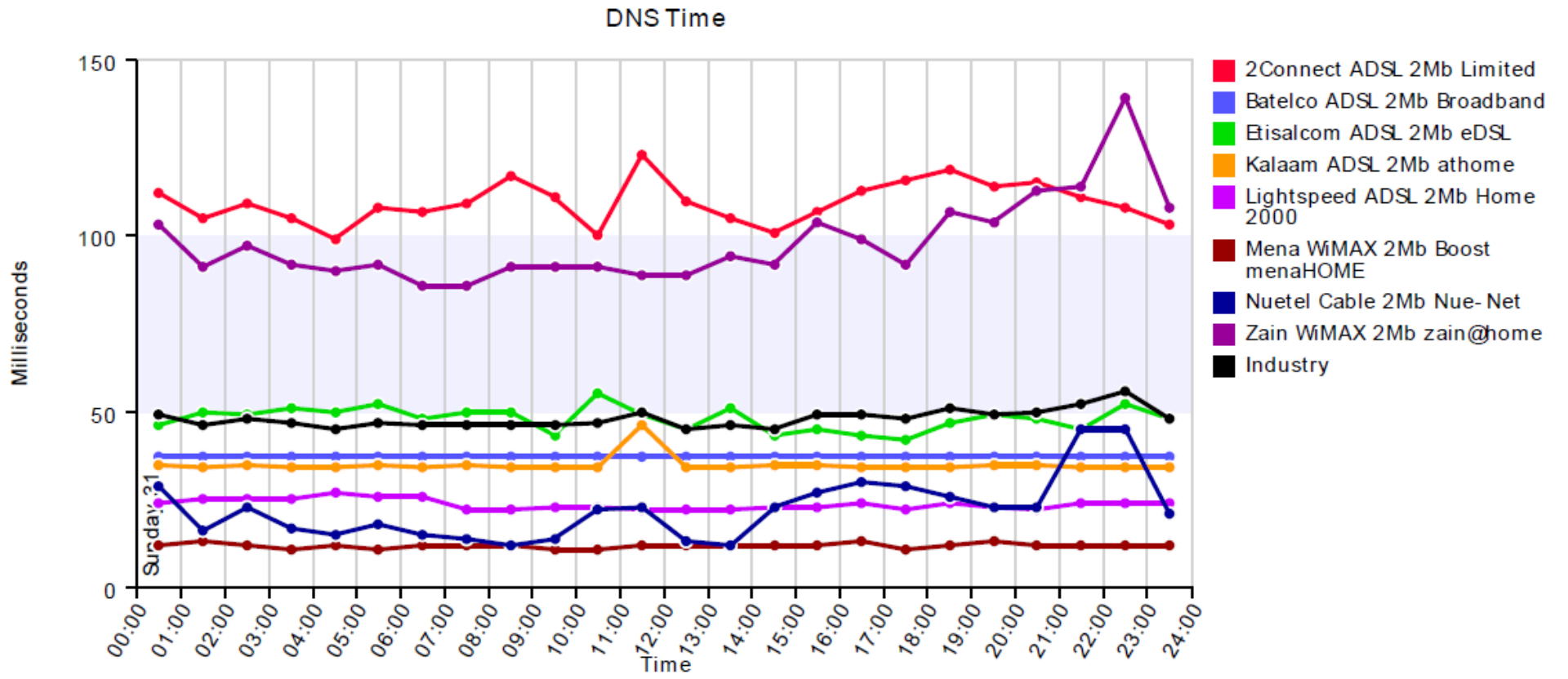
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the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



DNS Time Line Chart Values (Peer view)

01 Apr 2013 - 30 Jun 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Mar	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	112	105	109	105	99	108	107	109	117	111	100	123	110	105	101	107	113	116	119	114	115	111	108	103
Batelco ADSL 2Mb Broadband	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
Etisalcom ADSL 2Mb eDSL	46	50	49	51	50	52	48	50	50	43	55	49	45	51	43	45	43	42	47	49	48	45	52	48
Kalaam ADSL 2Mb athome	35	34	35	34	34	35	34	35	34	34	34	46	34	34	35	35	34	34	34	35	35	34	34	34
Lightspeed ADSL 2Mb Home 2000	24	25	25	25	27	26	26	22	22	23	23	22	22	22	23	23	24	22	24	23	22	24	24	24
Mena WiMAX 2Mb Boost menaHOME	12	13	12	11	12	11	12	12	12	11	11	12	12	12	12	12	13	11	12	13	12	12	12	12
Nuetel Cable 2Mb Nue-Net	29	16	23	17	15	18	15	14	12	14	22	23	13	12	23	27	30	29	26	23	23	45	45	21
Zain WiMAX 2Mb zain@home	103	91	97	92	90	92	86	86	91	91	91	89	89	94	92	104	99	92	107	104	113	114	139	108

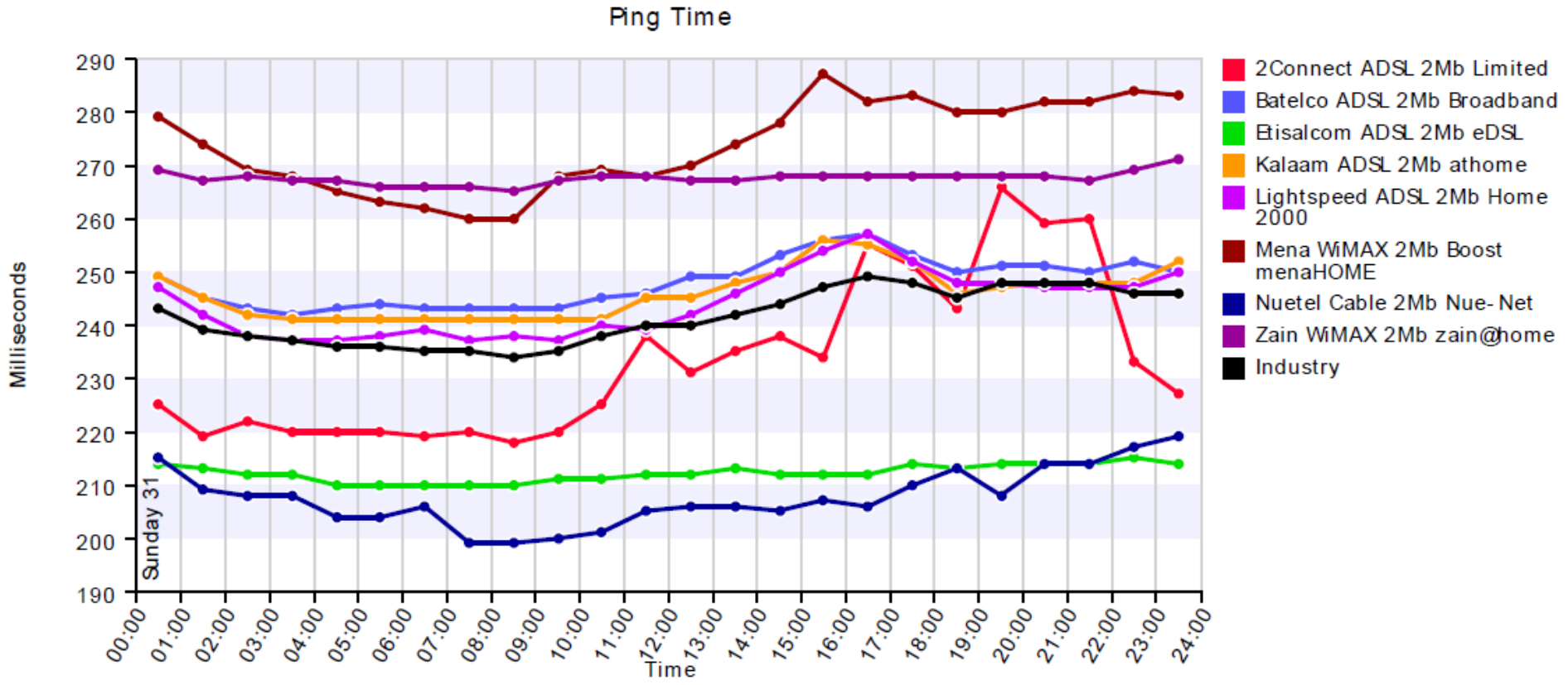
DNS Time (Domain Name System) (Milliseconds)

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 Apr 2013 - 30 Jun 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



Ping Time Line Chart Values (Peer view)

01 Apr 2013 - 30 Jun 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Mar	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	225	219	222	220	220	220	219	220	218	220	225	238	231	235	238	234	255	251	243	266	259	260	233	227
Batelco ADSL 2Mb Broadband	249	245	243	242	243	244	243	243	243	243	245	246	249	249	253	256	257	253	250	251	251	250	252	250
Etisalcom ADSL 2Mb eDSL	214	213	212	212	210	210	210	210	210	211	211	212	212	213	212	212	212	214	213	214	214	214	215	214
Kalaam ADSL 2Mb athome	249	245	242	241	241	241	241	241	241	241	241	245	245	248	250	256	255	252	246	247	248	248	248	252
Lightspeed ADSL 2Mb Home 2000	247	242	238	237	237	238	239	237	238	237	240	239	242	246	250	254	257	252	248	248	247	247	247	250
Mena WiMAX 2Mb Boost menaHOME	279	274	269	268	265	263	262	260	260	268	269	268	270	274	278	287	282	283	280	280	282	282	284	283
Nuetel Cable 2Mb Nue-Net	215	209	208	208	204	204	206	199	199	200	201	205	206	206	205	207	206	210	213	208	214	214	217	219
Zain WiMAX 2Mb zain@home	269	267	268	267	267	266	266	266	265	267	268	268	267	267	268	268	268	268	268	268	268	267	269	271

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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