هيئة تنظيم الاتصالات
Telecommunications Regulatory Authority

Fixed Broadband Analysis Report
01 April 2011 – 30 June 2011 between 00:00:00 and 24:00:00 Bahrain

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Public Document

Table of contents

Introduction

Broadband, defined as the 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 GDP, productivity gains and specific impact on the economy with the growth of eBusiness.

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 no significant service degradation has been identified and 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.

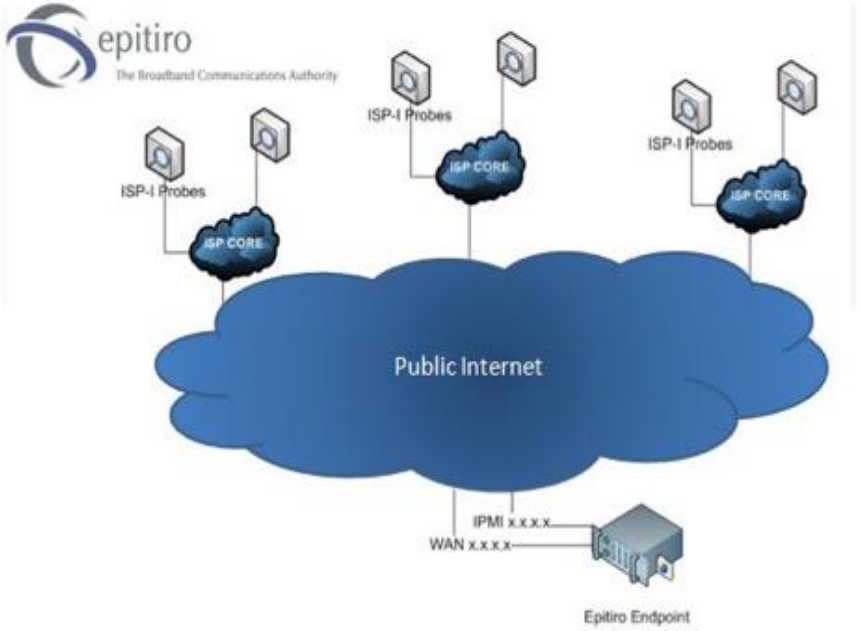


Diagram 1 - Broadband Quality of Service test platform overview

Noticeable events this Quarter

The Performance trends are now established over successive quarterly periods and readers will notice less dispersion in performance results between operators using a specific technology (such as aDSL) indicating that Broadband operators have now fine-tuned service performance for their specific technology.

Following a network upgrade, customer premise equipment for monitored Zain services have been changed resulting in performance variations. The modification took place in the middle of the quarter, results are therefore averaged over the reporting period between old and new technology. Reader can expect increased performance variations in next quarterly report for Zain service.

Menatelecom is showing significant DNS performance variation in average during the day that might have been noticed by Menatelecom customers.

Observed HTTP Cached performance results for Nuetel have slightly been improved compared to last quarter.

No significant network incident potentially affecting fixed broadband services was reported by operators over the period.

RESULTS

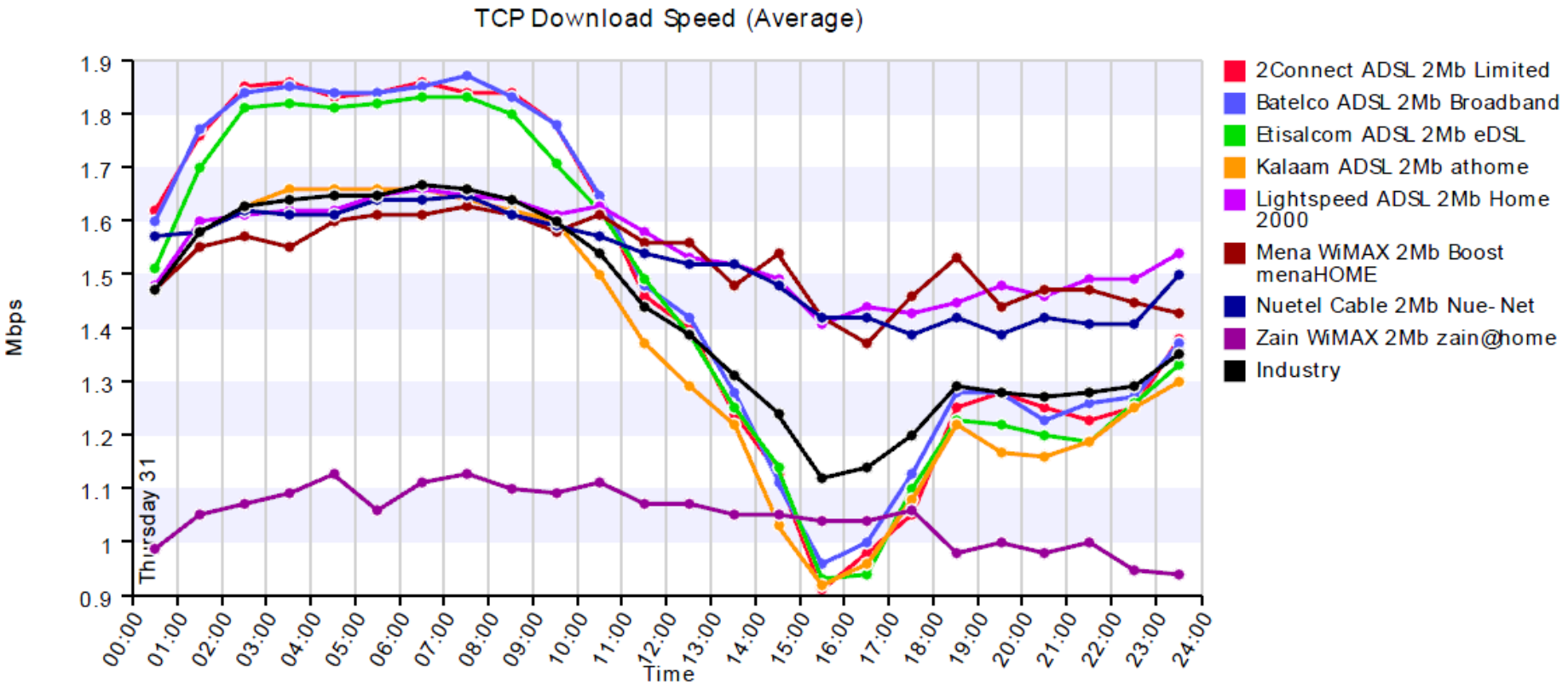
The following pages present the result of measurements taken every hour for each audited service during the period of Q2 2010, from 00:00:00 on the 1 April 2011 to 24:00:00 on the 30 June 2011.

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 Apr 2011 - 30 Jun 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Apr 2011 - 30 Jun 2011, 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	1.62	1.76	1.85	1.86	1.83	1.84	1.86	1.84	1.84	1.78	1.64	1.46	1.40	1.24	1.13	0.91	0.98	1.05	1.25	1.28	1.25	1.23	1.25	1.38
Batelco ADSL 2Mb Broadband	1.60	1.77	1.84	1.85	1.84	1.84	1.85	1.87	1.83	1.78	1.65	1.48	1.42	1.28	1.11	0.96	1.00	1.13	1.28	1.28	1.23	1.26	1.27	1.37
Etisalcom ADSL 2Mb eDSL	1.51	1.70	1.81	1.82	1.81	1.82	1.83	1.83	1.80	1.71	1.62	1.49	1.39	1.25	1.14	0.93	0.94	1.10	1.23	1.22	1.20	1.19	1.26	1.33
Kalaam ADSL 2Mb athome	1.47	1.58	1.63	1.66	1.66	1.66	1.66	1.64	1.62	1.60	1.50	1.37	1.29	1.22	1.03	0.92	0.96	1.08	1.22	1.17	1.16	1.19	1.25	1.30
Lightspeed ADSL 2Mb Home 2000	1.48	1.60	1.61	1.62	1.62	1.65	1.66	1.65	1.64	1.61	1.63	1.58	1.53	1.52	1.49	1.41	1.44	1.43	1.45	1.48	1.46	1.49	1.49	1.54
Mena WiMAX 2Mb Boost menaHOME	1.47	1.55	1.57	1.55	1.60	1.61	1.61	1.63	1.61	1.58	1.61	1.56	1.56	1.48	1.54	1.42	1.37	1.46	1.53	1.44	1.47	1.47	1.45	1.43
Nuetel Cable 2Mb Nue-Net	1.57	1.58	1.62	1.61	1.61	1.64	1.64	1.65	1.61	1.59	1.57	1.54	1.52	1.52	1.48	1.42	1.42	1.39	1.42	1.39	1.42	1.41	1.41	1.50
Zain WiMAX 2Mb zain@home	0.99	1.05	1.07	1.09	1.13	1.06	1.11	1.13	1.10	1.09	1.11	1.07	1.07	1.05	1.05	1.04	1.04	1.06	0.98	1.00	0.98	1.00	0.95	0.94

TCP download measurements (Mbit/s)

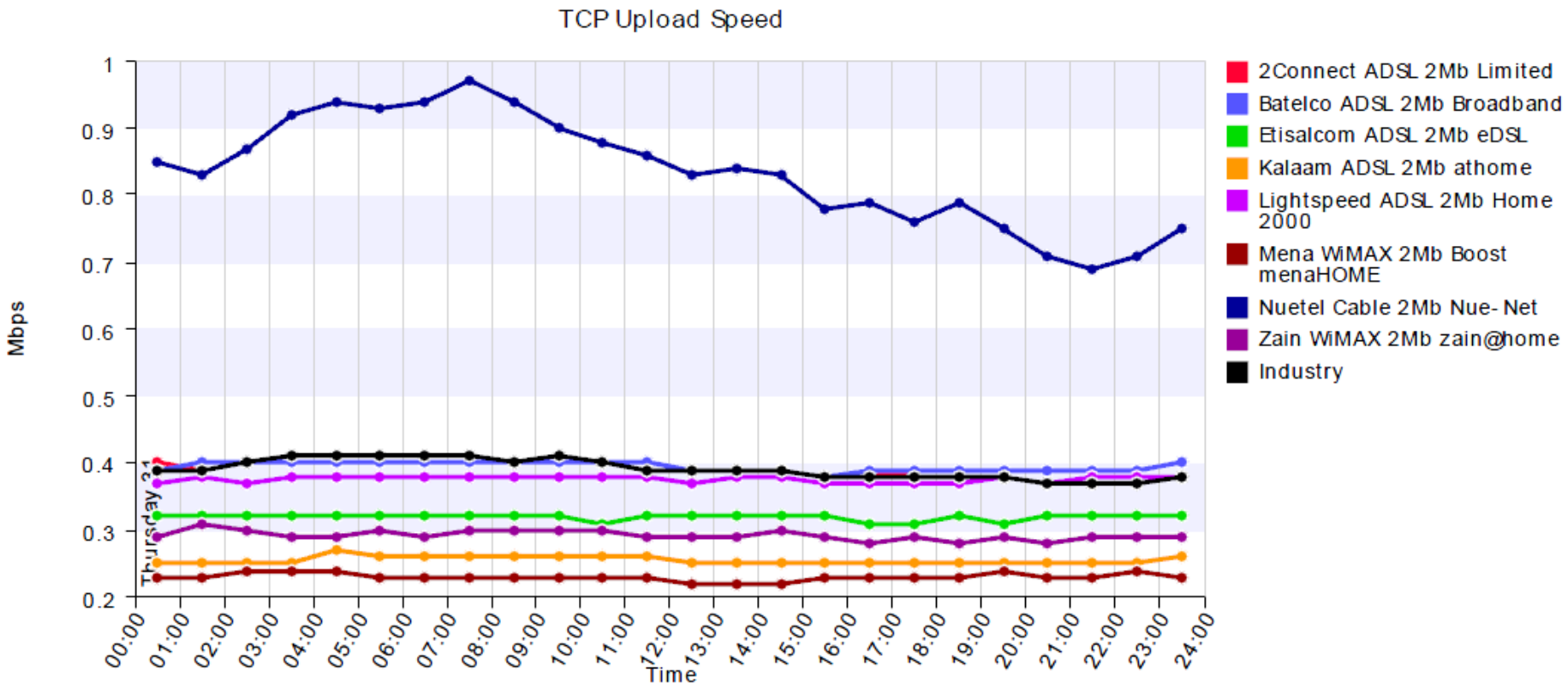
TCP (Transfer Control Protocol) throughput tests measuring download speeds are conducted at a raw socket level (a socket that allows access to the underlying transport provider (ISP) that is supported by protocols such as IPv4 and IPv6) in order to test the full capacity of the connection. The probe 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 2011 - 30 Jun 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Apr 2011 - 30 Jun 2011, 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	0.40	0.39	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.40
Batelco ADSL 2Mb Broadband	0.39	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.40
Etisalcom ADSL 2Mb eDSL	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.31	0.32	0.32	0.32	0.32	0.32	0.31	0.31	0.32	0.31	0.32	0.32	0.32	0.32
Kalaam ADSL 2Mb athome	0.25	0.25	0.25	0.25	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26
Lightspeed ADSL 2Mb Home 2000	0.37	0.38	0.37	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.37	0.38	0.38	0.37	0.37	0.37	0.37	0.38	0.37	0.38	0.38	0.38
Mena WiMAX 2Mb Boost menaHOME	0.23	0.23	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.23	0.23	0.24	0.23
Nuetel Cable 2Mb Nue-Net	0.85	0.83	0.87	0.92	0.94	0.93	0.94	0.97	0.94	0.90	0.88	0.86	0.83	0.84	0.83	0.78	0.79	0.76	0.79	0.75	0.71	0.69	0.71	0.75
Zain WiMAX 2Mb zain@home	0.29	0.31	0.30	0.29	0.29	0.30	0.29	0.30	0.30	0.30	0.30	0.29	0.29	0.29	0.30	0.29	0.28	0.29	0.28	0.29	0.28	0.29	0.29	0.29

TCP upload measurements (Mbits/s)

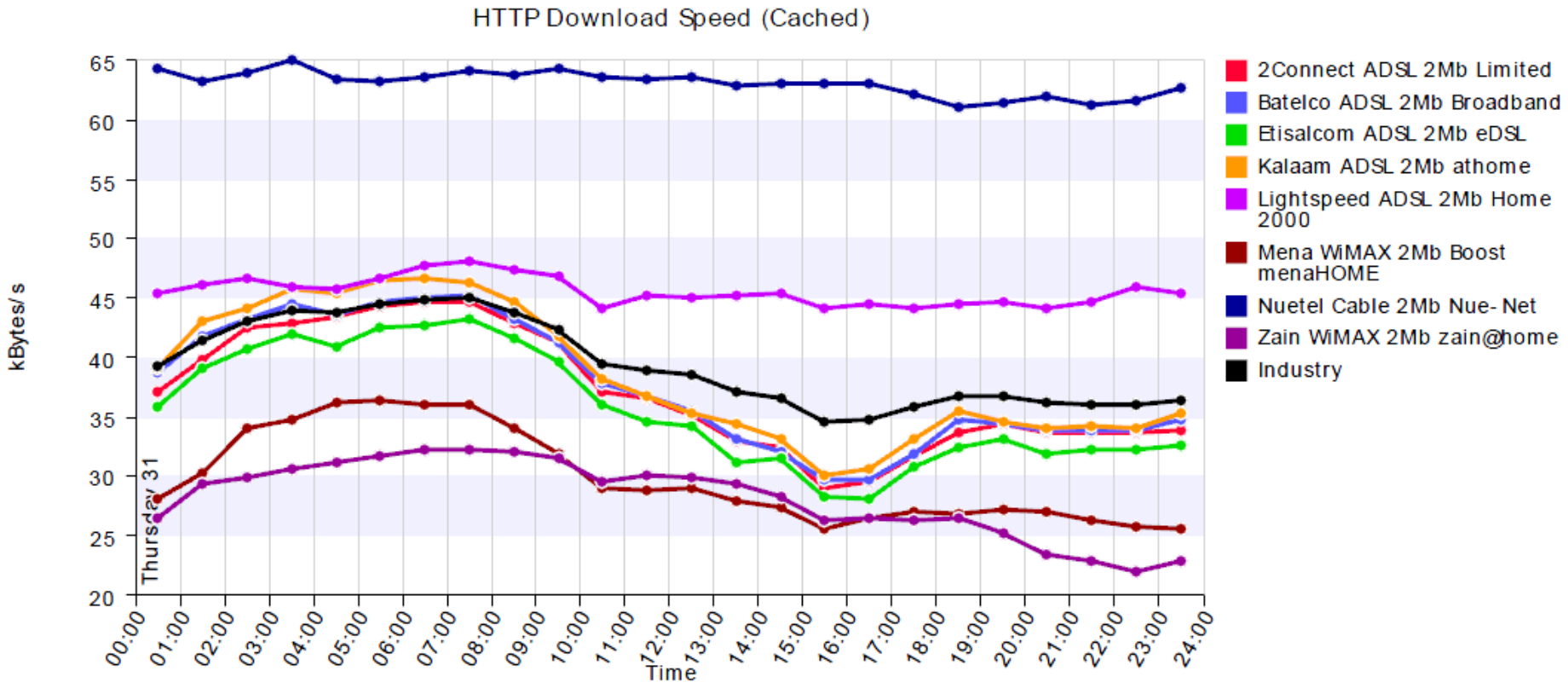
TCP (Transfer Control Protocol) throughput tests measuring upload speeds are conducted at a raw socket level (a socket that allows access to the underlying transport provider (ISP) that is supported by protocols such as IPv4 and IPv6) in order to test the full capacity of the connection. The probe is 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 Apr 2011 - 30 Jun 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Apr 2011 - 30 Jun 2011, 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	37.03	39.84	42.49	42.88	43.36	44.33	44.61	44.74	42.93	41.20	37.06	36.51	35.12	32.92	32.39	28.95	29.56	31.69	33.70	34.40	33.61	33.67	33.75	33.93
Batelco ADSL 2Mb Broadband	38.75	41.72	43.14	44.40	43.66	44.70	44.97	45.27	43.16	41.19	37.88	36.70	35.44	33.18	32.08	29.65	29.70	31.80	34.79	34.40	33.78	33.89	33.89	34.67
Etisalcom ADSL 2Mb eDSL	35.91	39.00	40.71	42.03	40.86	42.56	42.72	43.30	41.62	39.54	36.09	34.61	34.26	31.21	31.54	28.19	28.08	30.79	32.45	33.18	31.89	32.18	32.16	32.60
Kalaam ADSL 2Mb athome	39.09	42.98	44.09	45.68	45.46	46.41	46.58	46.25	44.65	41.87	38.18	36.67	35.27	34.33	33.07	30.12	30.57	33.09	35.45	34.59	34.07	34.27	34.02	35.25
Lightspeed ADSL 2Mb Home 2000	45.35	46.09	46.59	45.99	45.70	46.65	47.75	48.03	47.43	46.90	44.11	45.20	45.04	45.22	45.29	44.18	44.50	44.11	44.47	44.62	44.14	44.61	45.85	45.36
Mena WiMAX 2Mb Boost menaHOME	28.10	30.34	33.98	34.75	36.26	36.39	35.99	36.06	34.10	31.94	29.02	28.88	28.94	27.96	27.36	25.64	26.55	26.99	26.85	27.19	26.97	26.26	25.68	25.59
Nuetel Cable 2Mb Nue-Net	64.20	63.14	63.99	64.92	63.33	63.18	63.57	64.14	63.69	64.23	63.53	63.39	63.48	62.77	63.01	63.00	62.95	62.13	61.02	61.46	61.90	61.29	61.49	62.70
Zain WiMAX 2Mb zain@home	26.43	29.37	29.98	30.67	31.20	31.62	32.18	32.27	32.03	31.54	29.53	30.12	29.85	29.39	28.20	26.27	26.45	26.25	26.44	25.23	23.44	22.95	21.95	22.86

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

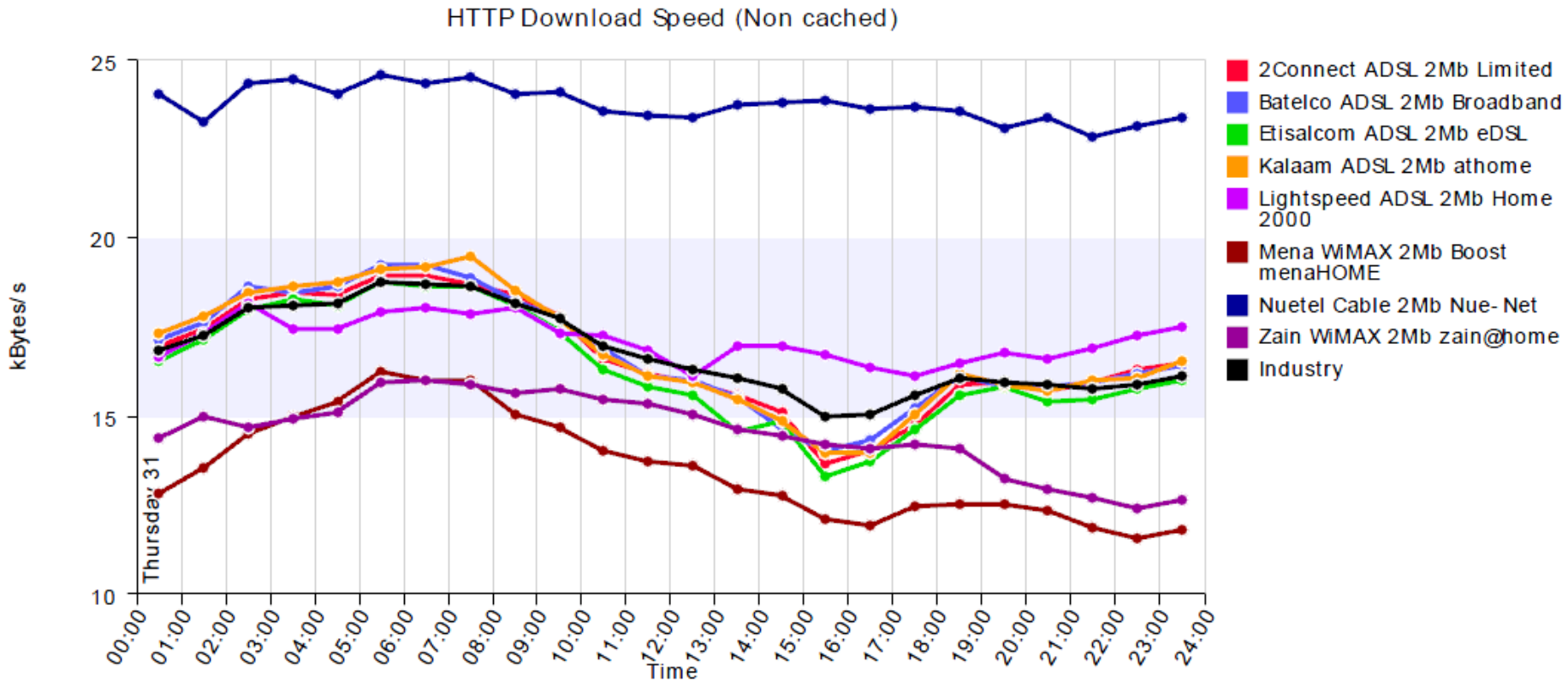
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the 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[6]" 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 2011 - 30 Jun 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Apr 2011 - 30 Jun 2011, 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	16.98	17.41	18.27	18.44	18.40	18.94	18.93	18.71	18.39	17.80	16.61	16.20	15.94	15.60	15.07	13.68	14.04	14.76	15.90	15.93	15.69	15.96	16.27	16.48
Batelco ADSL 2Mb Broadband	17.12	17.62	18.61	18.45	18.61	19.21	19.21	18.90	18.20	17.72	16.93	16.12	16.02	15.50	14.60	14.04	14.32	15.21	16.14	15.81	15.85	15.96	16.17	16.43
Etisalcom ADSL 2Mb eDSL	16.53	17.11	17.97	18.28	18.10	18.76	18.61	18.64	18.08	17.35	16.29	15.80	15.57	14.58	14.87	13.30	13.71	14.60	15.57	15.84	15.42	15.46	15.79	15.97
Kalaam ADSL 2Mb athome	17.30	17.79	18.44	18.64	18.78	19.13	19.20	19.48	18.52	17.73	16.71	16.15	15.94	15.43	14.86	13.98	13.94	15.03	16.16	15.90	15.68	15.97	16.08	16.52
Lightspeed ADSL 2Mb Home 2000	16.65	17.33	18.15	17.44	17.44	17.94	18.03	17.85	18.05	17.30	17.24	16.86	16.12	16.99	16.95	16.69	16.38	16.15	16.48	16.81	16.63	16.93	17.26	17.48
Mena WiMAX 2Mb Boost menaHOME	12.85	13.53	14.49	15.01	15.40	16.21	16.00	15.97	15.04	14.67	14.04	13.70	13.60	12.93	12.77	12.07	11.93	12.46	12.49	12.54	12.32	11.87	11.56	11.78
Nuetel Cable 2Mb Nue-Net	24.02	23.29	24.33	24.47	24.03	24.57	24.32	24.50	24.03	24.08	23.54	23.47	23.39	23.76	23.79	23.88	23.59	23.69	23.55	23.06	23.37	22.86	23.12	23.36
Zain WiMAX 2Mb zain@home	14.38	15.01	14.65	14.90	15.07	15.94	15.99	15.90	15.63	15.74	15.47	15.33	15.06	14.64	14.43	14.18	14.08	14.22	14.07	13.23	12.92	12.72	12.43	12.63

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

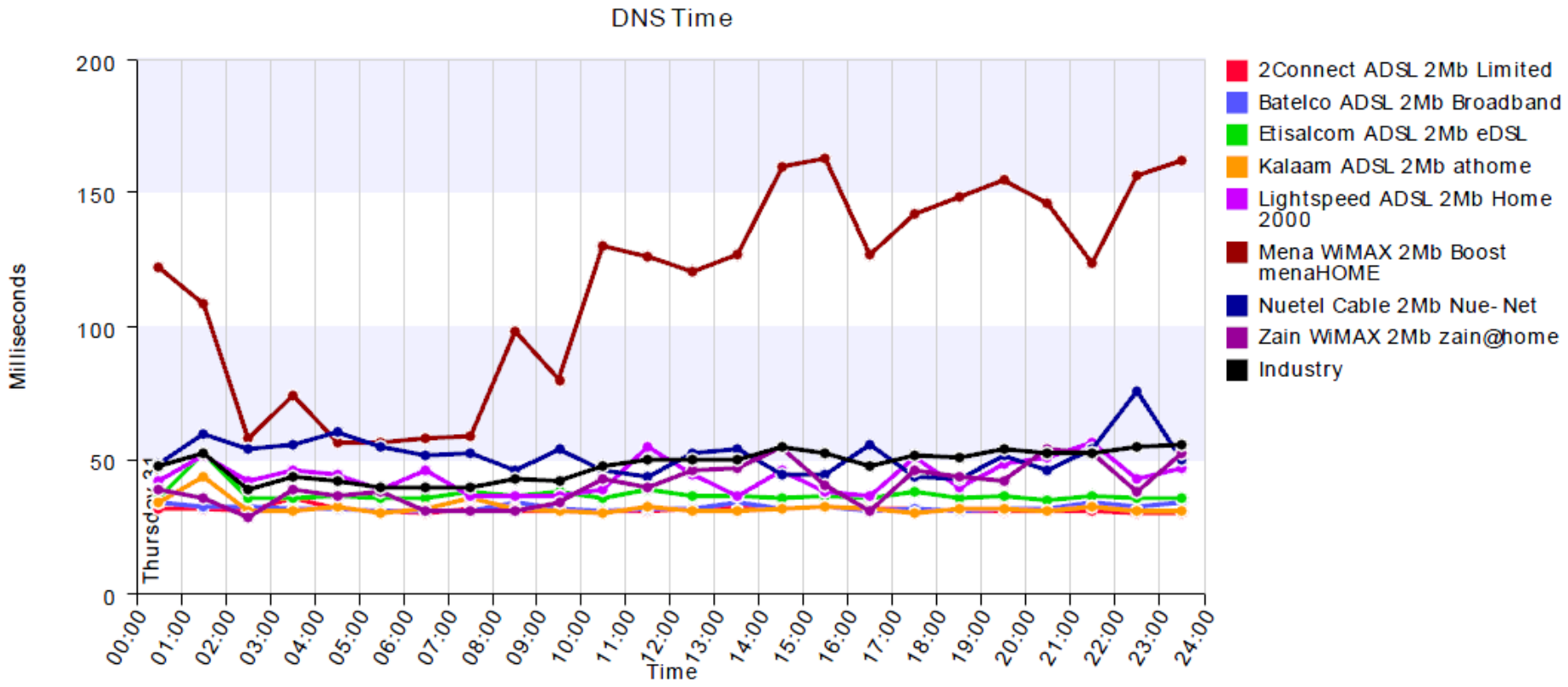
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the 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 2011 - 30 Jun 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



DNS Time Line Chart Values (Peer view)

01 Apr 2011 - 30 Jun 2011, 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	32	32	31	36	32	31	30	32	31	31	31	31	32	33	32	33	32	32	31	31	31	31	30	30
Batelco ADSL 2Mb Broadband	34	33	33	32	32	31	31	31	34	32	31	32	32	34	32	33	31	32	31	32	32	34	33	34
Etisalcom ADSL 2Mb eDSL	36	53	36	36	37	36	36	38	37	38	36	39	37	37	36	37	36	38	36	37	35	37	36	36
Kalaam ADSL 2Mb athome	34	44	31	31	33	30	32	36	32	31	30	33	31	31	32	33	32	30	32	32	31	33	31	31
Lightspeed ADSL 2Mb Home 2000	42	52	42	46	45	39	46	37	37	37	39	55	45	37	46	38	37	51	40	49	51	57	43	47
Mena WiMAX 2Mb Boost menaHOME	122	109	58	74	57	57	58	59	98	80	130	126	121	127	160	163	127	142	149	155	146	124	157	162
Nuetel Cable 2Mb Nue-Net	49	60	54	56	61	55	52	53	46	54	46	44	53	54	45	45	56	44	43	52	46	54	76	50
Zain WiMAX 2Mb zain@home	39	36	29	39	37	38	31	31	31	34	43	40	46	47	55	41	31	46	44	42	54	53	38	53

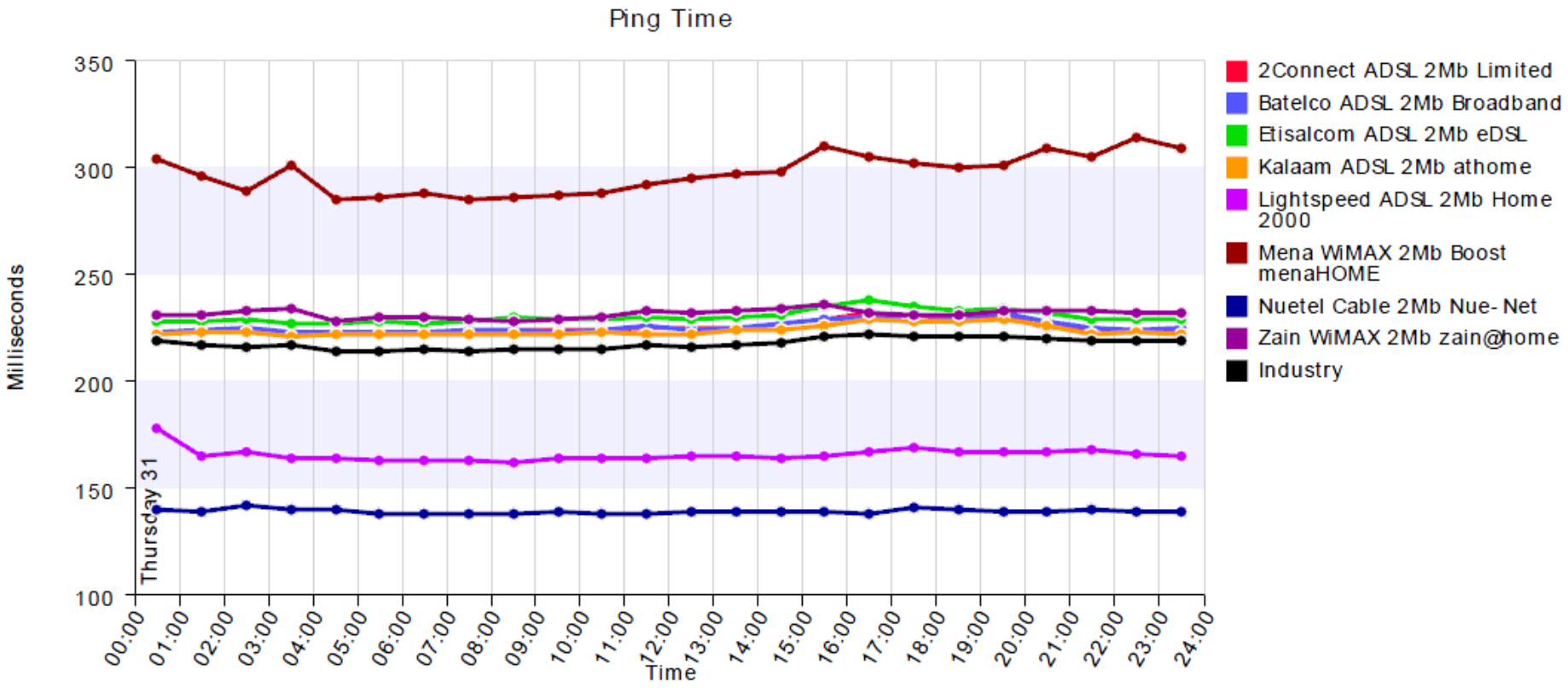
DNS Time (Domain Name System) (Milliseconds)

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 2011 - 30 Jun 2011, between 00:00:00 and 24:00:00 Asia/Bahrain



Ping Time Line Chart Values (Peer view)

01 Apr 2011 - 30 Jun 2011, 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	222	223	223	222	222	222	222	223	224	224	224	225	225	225	227	229	232	231	229	231	225	225	223	224
Batelco ADSL 2Mb Broadband	223	224	225	223	223	223	223	224	224	223	224	226	224	225	227	229	230	231	230	232	228	225	224	225
Etisalcom ADSL 2Mb eDSL	228	228	229	227	227	228	227	228	230	229	229	230	229	230	231	235	238	235	233	234	232	229	229	229
Kalaam ADSL 2Mb athome	222	223	223	221	222	222	222	222	222	222	223	222	222	224	224	226	229	228	228	229	226	222	223	222
Lightspeed ADSL 2Mb Home 2000	178	165	167	164	164	163	163	163	162	164	164	164	165	165	164	165	167	169	167	167	167	168	166	165
Mena WiMAX 2Mb Boost menaHOME	304	296	289	301	285	286	288	285	286	287	288	292	295	297	298	310	305	302	300	301	309	305	314	309
Nuetel Cable 2Mb Nue-Net	140	139	142	140	140	138	138	138	138	139	138	138	139	139	139	139	138	141	140	139	139	140	139	139
Zain WiMAX 2Mb zain@home	231	231	233	234	228	230	230	229	228	229	230	233	232	233	234	236	232	231	231	233	233	233	232	232

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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