هيئة تنظيم الاتصالات
Telecommunications Regulatory Authority

Fixed Broadband Analysis Report
01 July 2011 – 30 September 2011 between 00:00:00 and 24:00:00 Bahrain

Published 16 October 2011

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 slightly increase for aDSL services during busy hours however this evolution did not have a significant effect on the Industry average with TCP download speed remaining around 1.42 Mbps for the second consecutive quarterly period. We will see if the trend persists in next quarter report.

TCP upload speed remained stable for all packages except Zain who doubled the speed and now meets Industry average at 0.39 Mbps.

No significant evolution was recorded on HTTP download speed.

Menatelecom seem to have stabilized DNS resolution time compared to last quarter results.

Latency performance of the two WiMax operators has moderately changed with a small increase, measured via Ping time, of about 30 milliseconds for each operator. An increase of similar amplitude was noted for Nuetel and Lightspeed latency performance.

An incident affecting the international submarine cable Flag – Reliance on 26 September was reported as having no impact on Broadband end user services in the Kingdom.

RESULTS

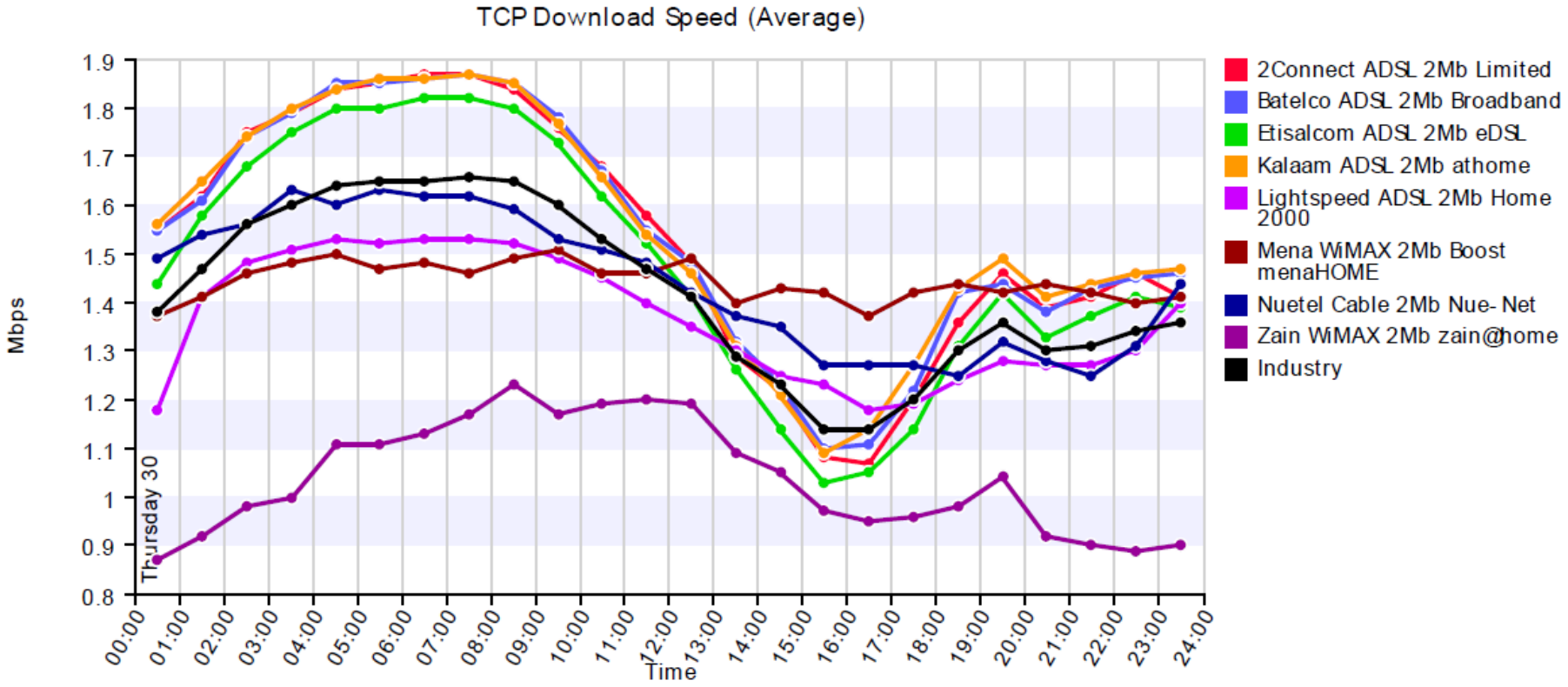
The following pages present the result of measurements taken every hour for each audited service during the period of Q3 2010, from 00:00:00 on the 1 June 2011 to 24:00:00 on the 30 September 2011.

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



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

01 Jul 2011 - 30 Sep 2011, 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	1.55	1.62	1.75	1.79	1.84	1.85	1.87	1.87	1.84	1.76	1.68	1.58	1.48	1.29	1.22	1.08	1.07	1.20	1.36	1.46	1.39	1.41	1.46	1.41
Batelco ADSL 2Mb Broadband	1.55	1.61	1.74	1.79	1.85	1.85	1.86	1.87	1.85	1.78	1.67	1.55	1.48	1.32	1.23	1.10	1.11	1.22	1.42	1.44	1.38	1.43	1.45	1.46
Etisalcom ADSL 2Mb eDSL	1.44	1.58	1.68	1.75	1.80	1.80	1.82	1.82	1.80	1.73	1.62	1.52	1.41	1.26	1.14	1.03	1.05	1.14	1.31	1.42	1.33	1.37	1.41	1.39
Kalaam ADSL 2Mb athome	1.56	1.65	1.74	1.80	1.84	1.86	1.86	1.87	1.85	1.77	1.66	1.54	1.46	1.31	1.21	1.09	1.14	1.27	1.43	1.49	1.41	1.44	1.46	1.47
Lightspeed ADSL 2Mb Home 2000	1.18	1.41	1.48	1.51	1.53	1.52	1.53	1.53	1.52	1.49	1.45	1.40	1.35	1.30	1.25	1.23	1.18	1.19	1.24	1.28	1.27	1.27	1.30	1.40
Mena WiMAX 2Mb Boost menaHOME	1.37	1.41	1.46	1.48	1.50	1.47	1.48	1.46	1.49	1.51	1.46	1.46	1.49	1.40	1.43	1.42	1.37	1.42	1.44	1.42	1.44	1.42	1.40	1.41
Nuetel Cable 2Mb Nue-Net	1.49	1.54	1.56	1.63	1.60	1.63	1.62	1.62	1.59	1.53	1.51	1.48	1.42	1.37	1.35	1.27	1.27	1.27	1.25	1.32	1.28	1.25	1.31	1.44
Zain WiMAX 2Mb zain@home	0.87	0.92	0.98	1.00	1.11	1.11	1.13	1.17	1.23	1.17	1.19	1.20	1.19	1.09	1.05	0.97	0.95	0.96	0.98	1.04	0.92	0.90	0.89	0.90

TCP download measurements (Mbit/s)

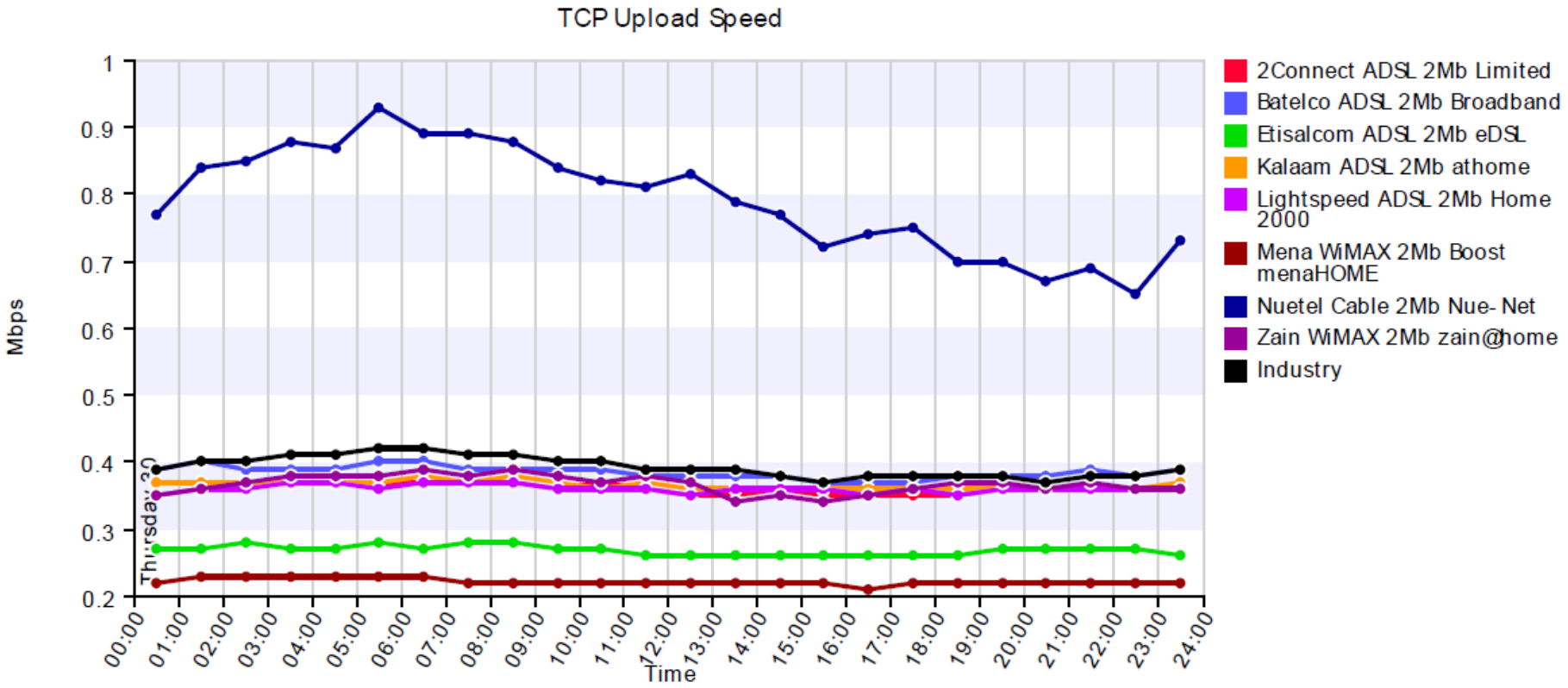
TCP (Transfer Control Protocol) throughput tests measuring download speeds are conducted at a raw socket level (a socket that allows access to the underlying transport provider (ISP) that is supported by protocols such as IPv4 and IPv6) in order to test the full capacity of the connection. The probe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



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

01 Jul 2011 - 30 Sep 2011, 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	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.36	0.37	0.36	0.35	0.35	0.36	0.35	0.35	0.35	0.35	0.36	0.36	0.36	0.36	0.36
Batelco ADSL 2Mb Broadband	0.39	0.40	0.39	0.39	0.39	0.40	0.40	0.39	0.39	0.39	0.39	0.38	0.38	0.38	0.38	0.37	0.37	0.37	0.38	0.38	0.38	0.39	0.38	0.39
Etisalcom ADSL 2Mb eDSL	0.27	0.27	0.28	0.27	0.27	0.28	0.27	0.28	0.28	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.26
Kalaam ADSL 2Mb athome	0.37	0.37	0.37	0.37	0.37	0.37	0.38	0.37	0.38	0.37	0.36	0.37	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.37
Lightspeed ADSL 2Mb Home 2000	0.35	0.36	0.36	0.37	0.37	0.36	0.37	0.37	0.37	0.36	0.36	0.36	0.35	0.36	0.36	0.36	0.35	0.36	0.35	0.36	0.36	0.36	0.36	0.36
Mena WiMAX 2Mb Boost menaHOME	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Nuetel Cable 2Mb Nue-Net	0.77	0.84	0.85	0.88	0.87	0.93	0.89	0.89	0.88	0.84	0.82	0.81	0.83	0.79	0.77	0.72	0.74	0.75	0.70	0.70	0.67	0.69	0.65	0.73
Zain WiMAX 2Mb zain@home	0.35	0.36	0.37	0.38	0.38	0.38	0.39	0.38	0.39	0.38	0.37	0.38	0.37	0.34	0.35	0.34	0.35	0.36	0.37	0.37	0.36	0.37	0.36	0.36

TCP upload measurements (Mbits/s)

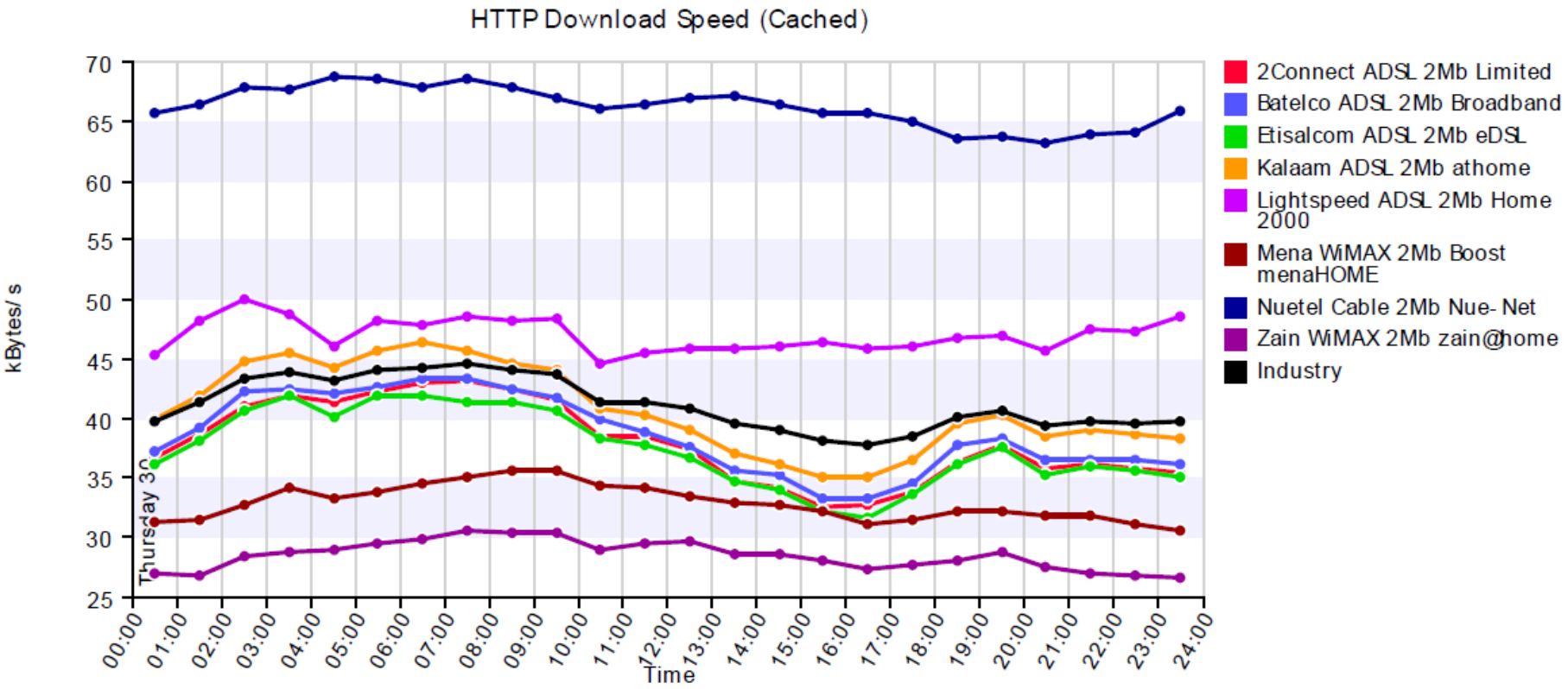
TCP (Transfer Control Protocol) throughput tests measuring upload speeds are conducted at a raw socket level (a socket that allows access to the underlying transport provider (ISP) that is supported by protocols such as IPv4 and IPv6) in order to test the full capacity of the connection. The probe is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



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

01 Jul 2011 - 30 Sep 2011, 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	36.65	38.67	41.04	41.87	41.44	42.26	43.04	43.20	42.43	41.48	38.46	38.44	37.40	34.80	34.26	32.57	32.67	33.82	36.32	37.75	35.76	36.24	35.84	35.47
Batelco ADSL 2Mb Broadband	37.17	39.30	42.29	42.53	42.15	42.60	43.35	43.40	42.50	41.77	39.87	38.78	37.67	35.58	35.19	33.29	33.22	34.61	37.74	38.31	36.45	36.47	36.56	36.23
Etisalcom ADSL 2Mb eDSL	36.10	38.20	40.65	41.87	40.17	41.95	41.99	41.37	41.38	40.63	38.31	37.86	36.72	34.80	34.06	32.26	31.67	33.71	36.20	37.62	35.24	35.94	35.68	35.12
Kalaam ADSL 2Mb athome	39.85	41.99	44.81	45.47	44.33	45.68	46.38	45.72	44.70	44.03	40.91	40.28	39.08	37.07	36.24	35.09	35.12	36.53	39.55	40.31	38.57	39.09	38.61	38.29
Lightspeed ADSL 2Mb Home 2000	45.28	48.26	49.99	48.78	46.13	48.13	47.84	48.60	48.14	48.39	44.57	45.47	45.88	45.92	46.05	46.35	45.85	46.01	46.81	47.01	45.75	47.44	47.39	48.53
Mena WiMAX 2Mb Boost menaHOME	31.21	31.50	32.77	34.13	33.30	33.84	34.59	35.11	35.56	35.54	34.40	34.18	33.49	32.88	32.78	32.18	31.16	31.50	32.28	32.27	31.86	31.86	31.18	30.58
Nuetel Cable 2Mb Nue-Net	65.69	66.43	67.75	67.62	68.80	68.47	67.85	68.60	67.78	66.98	66.01	66.33	66.86	67.03	66.39	65.60	65.75	65.03	63.43	63.78	63.21	63.90	63.98	65.79
Zain WiMAX 2Mb zain@home	27.01	26.80	28.34	28.71	28.91	29.48	29.78	30.59	30.47	30.38	28.92	29.53	29.68	28.55	28.62	28.06	27.36	27.69	27.98	28.81	27.56	27.01	26.86	26.63

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

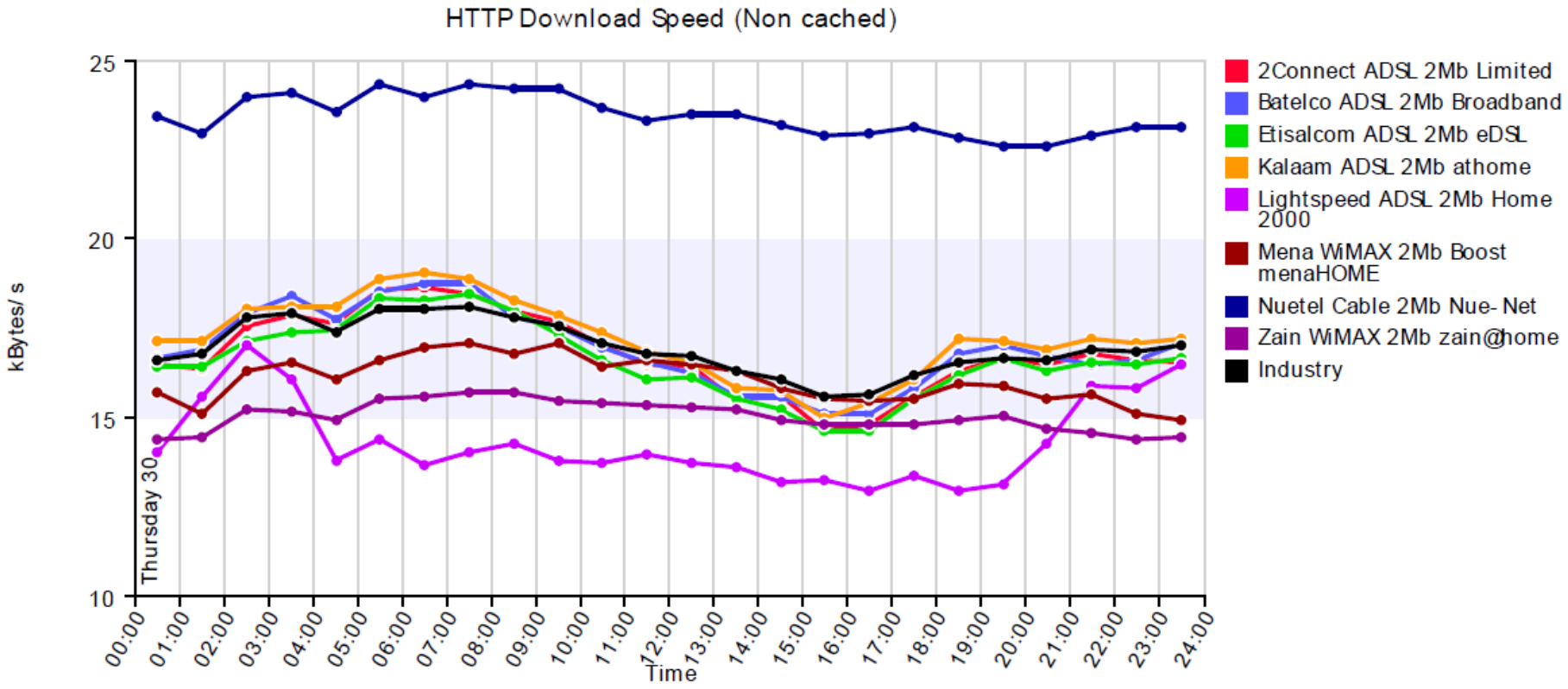
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the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



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

01 Jul 2011 - 30 Sep 2011, 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	16.47	16.36	17.57	17.84	17.65	18.57	18.65	18.48	17.96	17.69	17.02	16.50	16.42	15.46	15.63	14.64	14.81	15.60	16.32	16.67	16.49	16.75	16.59	16.53
Batelco ADSL 2Mb Broadband	16.66	16.90	17.89	18.39	17.76	18.50	18.75	18.73	17.81	17.55	16.99	16.55	16.22	15.58	15.55	15.10	15.08	15.84	16.80	17.03	16.74	16.50	16.62	17.08
Etisalcom ADSL 2Mb eDSL	16.45	16.39	17.16	17.35	17.46	18.35	18.28	18.45	17.98	17.32	16.59	16.06	16.10	15.51	15.24	14.62	14.64	15.50	16.20	16.67	16.30	16.51	16.46	16.65
Kalaam ADSL 2Mb athome	17.11	17.11	18.02	18.10	18.13	18.89	19.08	18.85	18.25	17.88	17.40	16.84	16.52	15.85	15.78	14.98	15.39	16.07	17.22	17.12	16.93	17.17	17.09	17.20
Lightspeed ADSL 2Mb Home 2000	14.03	15.56	17.00	16.04	13.76	14.40	13.65	14.01	14.28	13.80	13.73	13.96	13.72	13.62	13.16	13.26	12.96	13.38	12.96	13.10	14.27	15.86	15.83	16.50
Mena WiMAX 2Mb Boost menaHOME	15.72	15.12	16.32	16.52	16.04	16.60	16.98	17.06	16.80	17.05	16.41	16.59	16.49	16.30	15.83	15.53	15.47	15.50	15.94	15.89	15.51	15.62	15.11	14.94
Nuetel Cable 2Mb Nue-Net	23.47	22.95	23.99	24.07	23.56	24.36	23.97	24.36	24.23	24.22	23.68	23.34	23.50	23.50	23.22	22.91	22.98	23.14	22.82	22.59	22.61	22.90	23.12	23.11
Zain WiMAX 2Mb zain@home	14.37	14.43	15.19	15.16	14.92	15.49	15.56	15.68	15.68	15.43	15.38	15.35	15.26	15.23	14.94	14.79	14.80	14.81	14.89	15.02	14.67	14.58	14.40	14.44

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

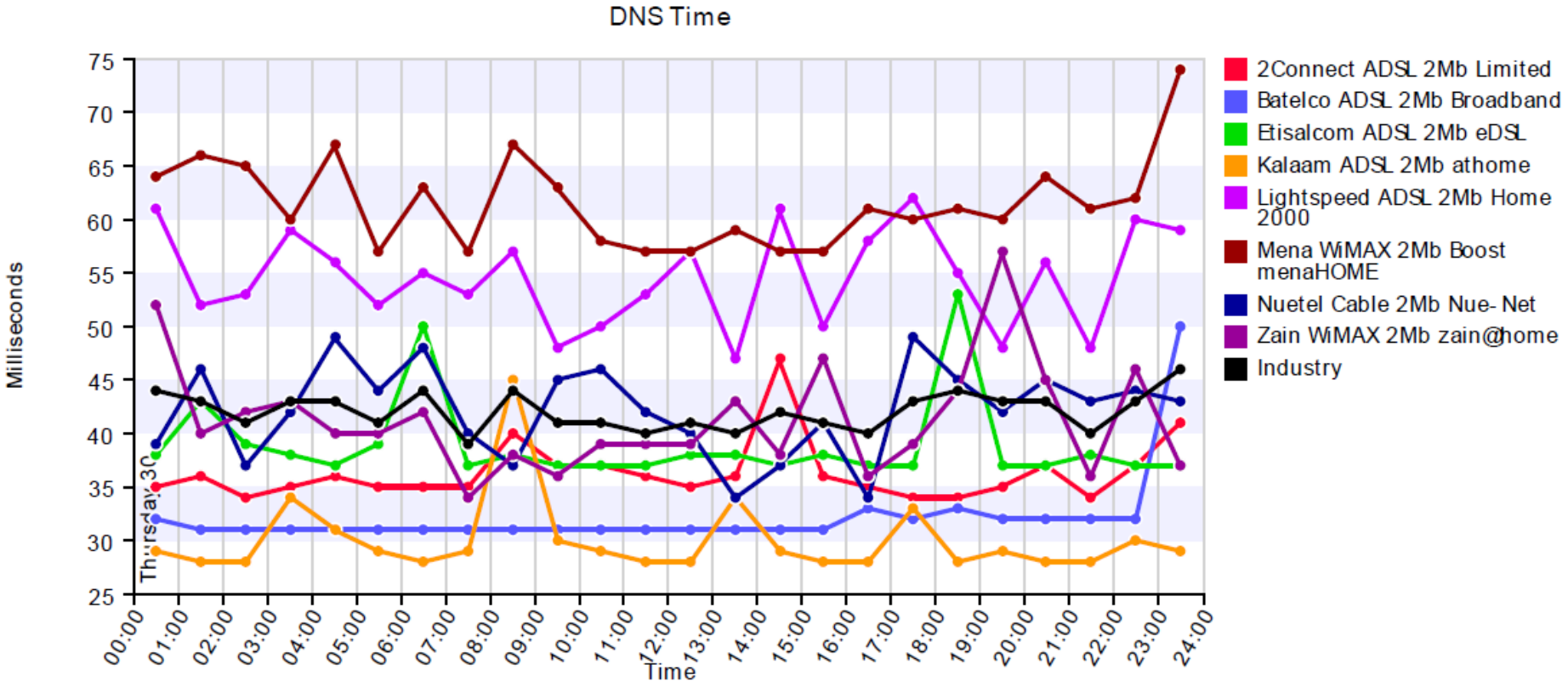
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the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



DNS Time Line Chart Values (Peer view)

01 Jul 2011 - 30 Sep 2011, 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	35	36	34	35	36	35	35	35	40	37	37	36	35	36	47	36	35	34	34	35	37	34	37	41
Batelco ADSL 2Mb Broadband	32	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	33	32	33	32	32	32	32	50
Etisalcom ADSL 2Mb eDSL	38	43	39	38	37	39	50	37	38	37	37	37	38	38	37	38	37	37	53	37	37	38	37	37
Kalaam ADSL 2Mb athome	29	28	28	34	31	29	28	29	45	30	29	28	28	34	29	28	28	33	28	29	28	28	30	29
Lightspeed ADSL 2Mb Home 2000	61	52	53	59	56	52	55	53	57	48	50	53	57	47	61	50	58	62	55	48	56	48	60	59
Mena WiMAX 2Mb Boost menaHOME	64	66	65	60	67	57	63	57	67	63	58	57	57	59	57	57	61	60	61	60	64	61	62	74
Nuetel Cable 2Mb Nue-Net	39	46	37	42	49	44	48	40	37	45	46	42	40	34	37	41	34	49	45	42	45	43	44	43
Zain WiMAX 2Mb zain@home	52	40	42	43	40	40	42	34	38	36	39	39	39	43	38	47	36	39	44	57	45	36	46	37

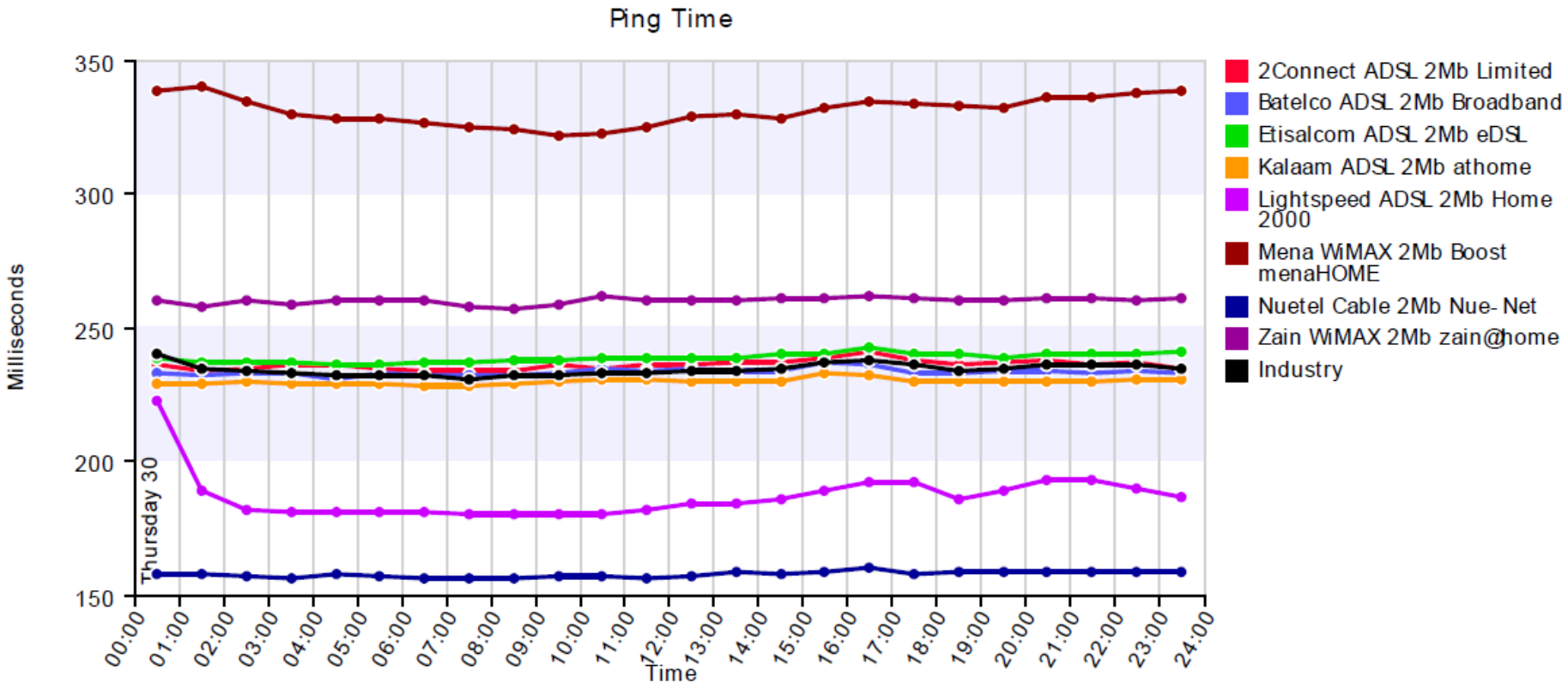
DNS Time (Domain Name System) (Milliseconds)

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



Ping Time Line Chart Values (Peer view)

01 Jul 2011 - 30 Sep 2011, 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	236	234	235	236	236	235	234	234	234	236	235	236	236	237	237	239	241	238	236	237	238	236	237	235
Batelco ADSL 2Mb Broadband	233	232	233	233	231	233	232	232	232	233	235	234	235	234	234	237	236	233	233	234	234	233	234	233
Etisalcom ADSL 2Mb eDSL	239	237	237	237	236	236	237	237	238	238	239	239	239	239	240	240	243	240	240	239	240	240	240	241
Kalaam ADSL 2Mb athome	229	229	230	229	229	229	228	228	229	230	231	231	230	230	230	233	232	230	230	230	230	230	231	231
Lightspeed ADSL 2Mb Home 2000	223	189	182	181	181	181	181	180	180	180	180	182	184	184	186	189	192	192	186	189	193	193	190	187
Mena WiMAX 2Mb Boost menaHOME	339	340	335	330	328	328	327	325	324	322	323	325	329	330	328	332	335	334	333	332	336	336	338	339
Nuetel Cable 2Mb Nue-Net	158	158	157	156	158	157	156	156	156	157	157	156	157	159	158	159	160	158	159	159	159	159	159	159
Zain WiMAX 2Mb zain@home	260	258	260	259	260	260	260	258	257	259	262	260	260	260	261	261	262	261	260	260	261	261	260	261

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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