هيئة تنظيم الاتصالات
Telecommunications Regulatory Authority

Fixed Broadband Analysis Report

01 January 2014 – 31 March 2014 between 00:00:00 and 24:00:00 Bahrain

Published 07 April 2014

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.

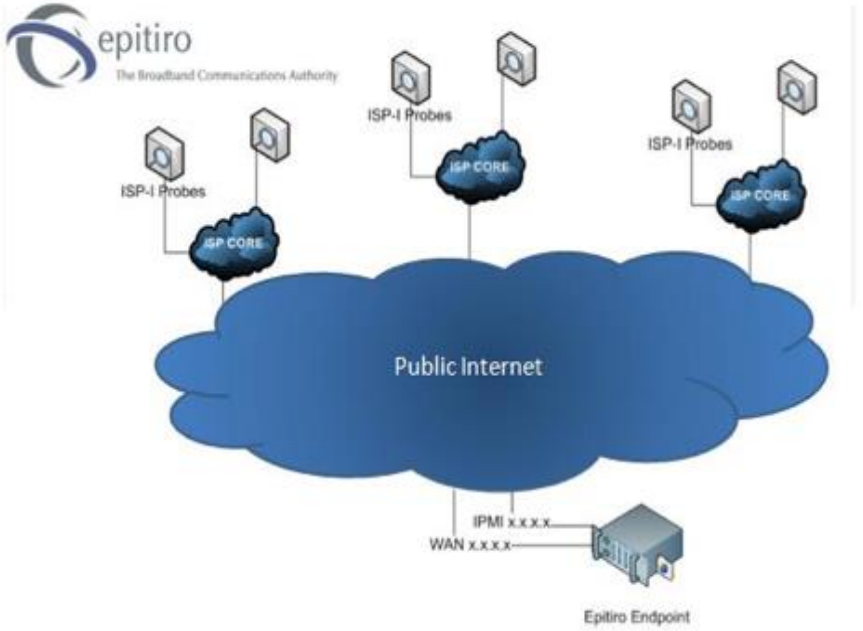


Diagram 1 - Broadband Quality of Service test platform overview

Noticeable events this Quarter

Two major events occurred over the reporting period :

Fiber Optic Gulf (FOG) submarine cable was unavailable from 02 March and until 30 March, time taken to repair a shunt. Falcon submarine cable suffered an incident on the 19 March and was repaired the following day.

Both incidents caused volatility in the performance of certain Broadband services, depending on service provider international routing options, but no service disruption has been observed.

Despite those cumulative incidents, average performance of the monitored Broadband services remained close to trends observed over precedent periods:

Average TCP download speed slightly decreased at 1.57 Mbps (from 1.62 Mbps in Q4 2013) while average TCP upload speed remained unchanged at 0.60 Mbps.

Average HTTP Cache download speed also slightly reduced at 44.01 KBytes/s (from 47.58 kBytes/s in Q4 2014) and non cached increased at 35.14 kBytes/s (from 32.64 kBytes/s in Q4 2014)

Average DNS resolution time reached 63 milliseconds (from 55 milliseconds last quarter) and average Latency remained unchanged at 222 milliseconds

RESULTS

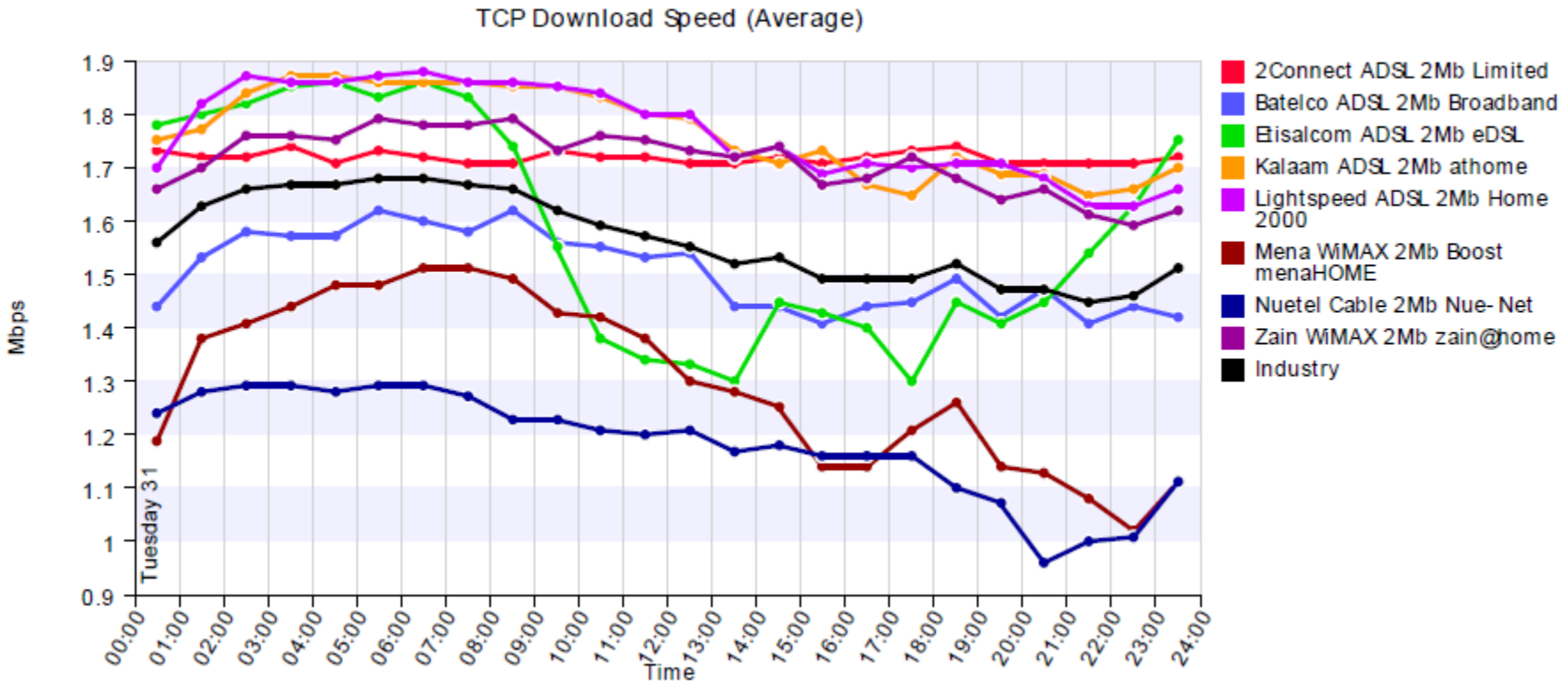
The following pages present the result of measurements taken every hour for each audited service during the period of Q1 2014, from 00:00:00 on the 1 January 2014 to 24:00:00 on the 31 March 2014.

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 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Dec	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	1.73	1.72	1.72	1.74	1.71	1.73	1.72	1.71	1.71	1.73	1.72	1.72	1.71	1.71	1.72	1.71	1.72	1.73	1.74	1.71	1.71	1.71	1.71	1.72
Batelco ADSL 2Mb Broadband	1.44	1.53	1.58	1.57	1.57	1.62	1.60	1.58	1.62	1.56	1.55	1.53	1.54	1.44	1.44	1.41	1.44	1.45	1.49	1.42	1.47	1.41	1.44	1.42
Etisalcom ADSL 2Mb eDSL	1.78	1.80	1.82	1.85	1.86	1.83	1.86	1.83	1.74	1.55	1.38	1.34	1.33	1.30	1.45	1.43	1.40	1.30	1.45	1.41	1.45	1.54	1.63	1.75
Kalaam ADSL 2Mb athome	1.75	1.77	1.84	1.87	1.87	1.86	1.86	1.86	1.85	1.85	1.83	1.80	1.79	1.73	1.71	1.73	1.67	1.65	1.72	1.69	1.69	1.65	1.66	1.70
Lightspeed ADSL 2Mb Home 2000	1.70	1.82	1.87	1.86	1.86	1.87	1.88	1.86	1.86	1.85	1.84	1.80	1.80	1.72	1.74	1.69	1.71	1.70	1.71	1.71	1.68	1.63	1.63	1.66
Mena WiMAX 2Mb Boost menaHOME	1.19	1.38	1.41	1.44	1.48	1.48	1.51	1.51	1.49	1.43	1.42	1.38	1.30	1.28	1.25	1.14	1.14	1.21	1.26	1.14	1.13	1.08	1.02	1.11
Nuetel Cable 2Mb Nue-Net	1.24	1.28	1.29	1.29	1.28	1.29	1.29	1.27	1.23	1.23	1.21	1.20	1.21	1.17	1.18	1.16	1.16	1.16	1.10	1.07	0.96	1.00	1.01	1.11
Zain WiMAX 2Mb zain@home	1.66	1.70	1.76	1.76	1.75	1.79	1.78	1.78	1.79	1.73	1.76	1.75	1.73	1.72	1.74	1.67	1.68	1.72	1.68	1.64	1.66	1.61	1.59	1.62

TCP download measurements (Mbit/s)

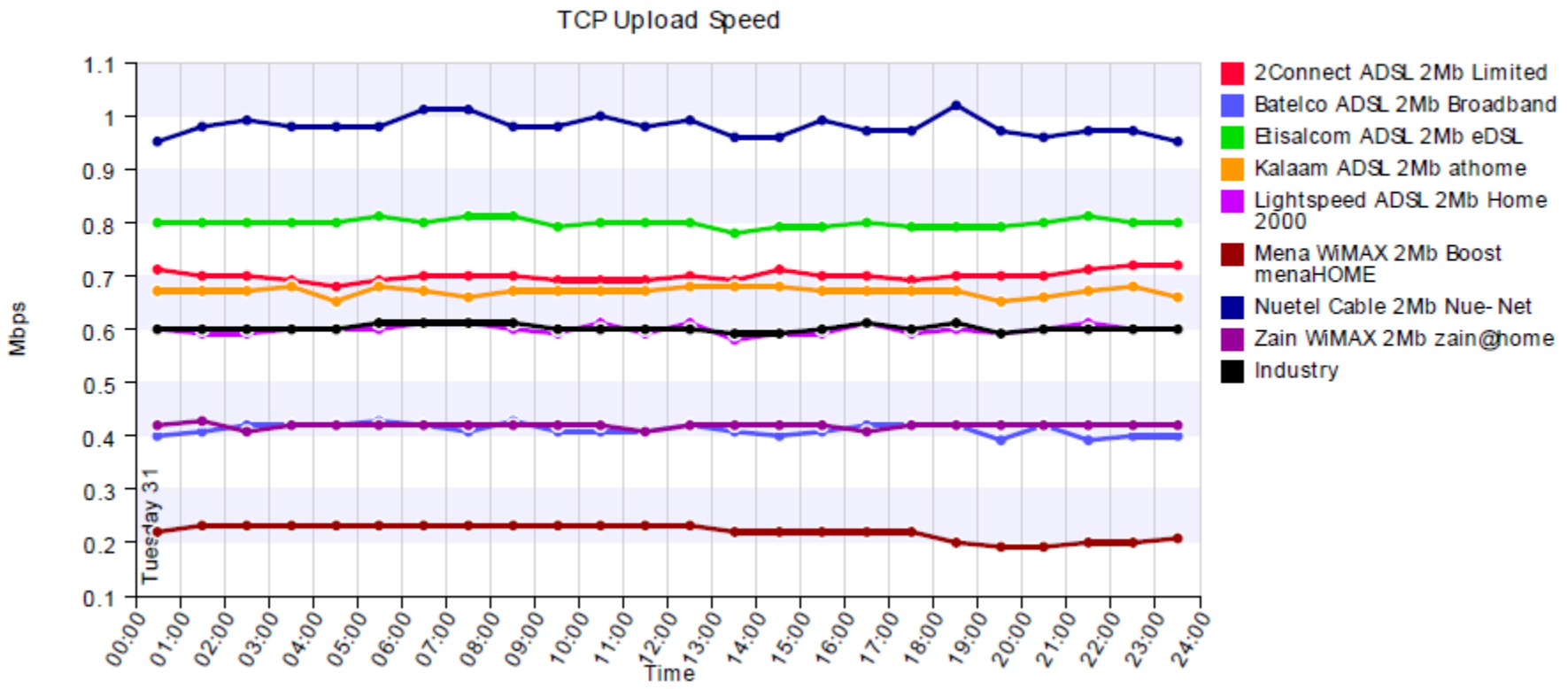
TCP (Transfer Control Protocol) throughput tests measuring download speeds are conducted at a raw socket level (a socket that allows access to the underlying transport provider (ISP) that is supported by protocols such as IPv4 and IPv6) in order to test the full capacity of the connection. The probe 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 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Dec	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	0.71	0.70	0.70	0.69	0.68	0.69	0.70	0.70	0.70	0.69	0.69	0.69	0.70	0.69	0.71	0.70	0.70	0.69	0.70	0.70	0.70	0.71	0.72	0.72
Batelco ADSL 2Mb Broadband	0.40	0.41	0.42	0.42	0.42	0.43	0.42	0.41	0.43	0.41	0.41	0.41	0.42	0.41	0.40	0.41	0.42	0.42	0.42	0.39	0.42	0.39	0.40	0.40
Etisalcom ADSL 2Mb eDSL	0.80	0.80	0.80	0.80	0.80	0.81	0.80	0.81	0.81	0.79	0.80	0.80	0.80	0.78	0.79	0.79	0.80	0.79	0.79	0.79	0.80	0.81	0.80	0.80
Kalaam ADSL 2Mb athome	0.67	0.67	0.67	0.68	0.65	0.68	0.67	0.66	0.67	0.67	0.67	0.67	0.68	0.68	0.68	0.67	0.67	0.67	0.67	0.65	0.66	0.67	0.68	0.66
Lightspeed ADSL 2Mb Home 2000	0.60	0.59	0.59	0.60	0.60	0.60	0.61	0.61	0.60	0.59	0.61	0.59	0.61	0.58	0.59	0.59	0.61	0.59	0.60	0.59	0.60	0.61	0.60	0.60
Mena WiMAX 2Mb Boost menaHOME	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.22	0.22	0.22	0.22	0.22	0.20	0.19	0.19	0.20	0.20	0.21
Nuetel Cable 2Mb Nue-Net	0.95	0.98	0.99	0.98	0.98	0.98	1.01	1.01	0.98	0.98	1.00	0.98	0.99	0.96	0.96	0.99	0.97	0.97	1.02	0.97	0.96	0.97	0.97	0.95
Zain WiMAX 2Mb zain@home	0.42	0.43	0.41	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.41	0.42	0.42	0.42	0.42	0.41	0.42	0.42	0.42	0.42	0.42	0.42	0.42

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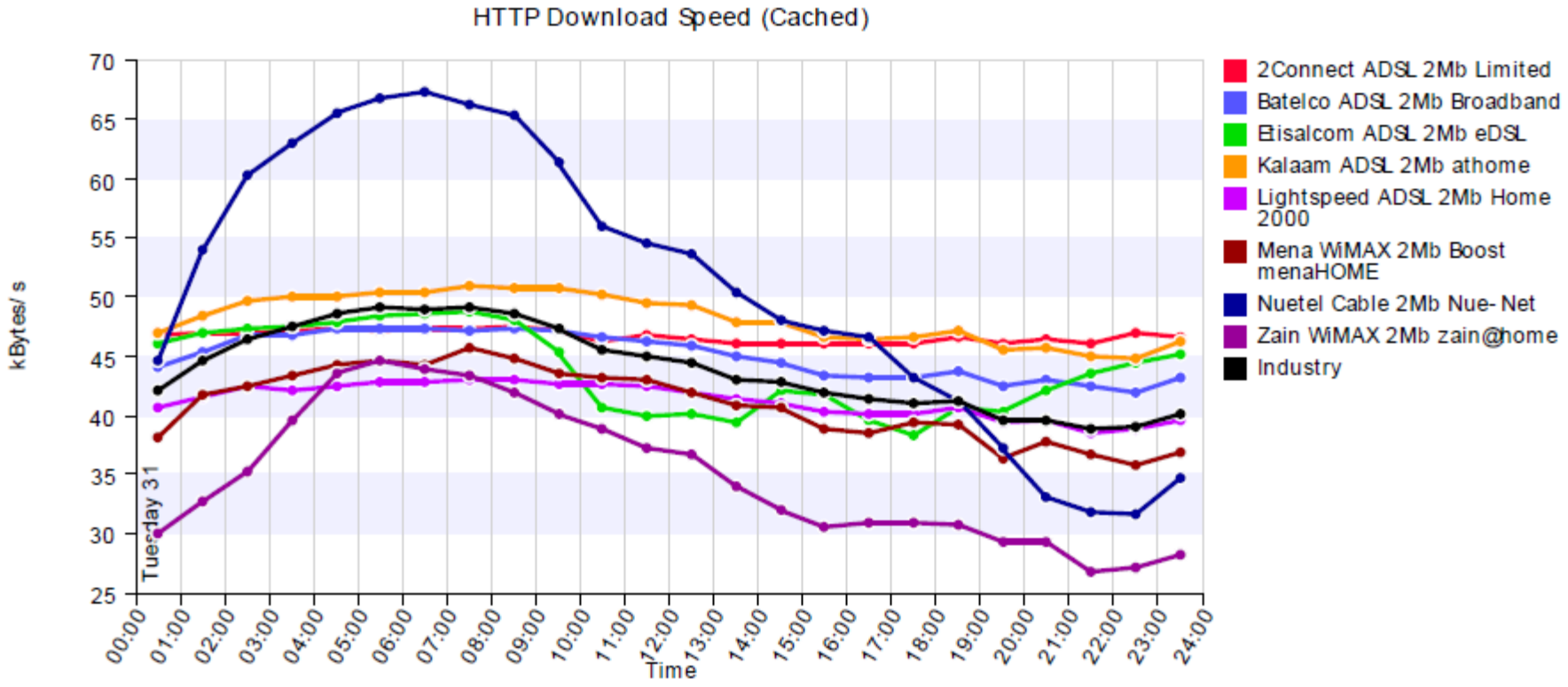
The higher is the upload speed the better is the performance.

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

01 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Dec	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	46.77	47.03	47.01	47.09	47.24	47.23	47.28	47.31	47.55	47.06	46.30	46.79	46.45	46.09	46.13	46.14	45.99	46.13	46.51	46.11	46.44	46.14	46.92	46.59
Batelco ADSL 2Mb Broadband	44.12	45.34	46.72	46.70	47.28	47.27	47.26	47.22	47.36	47.14	46.52	46.23	45.92	44.94	44.40	43.27	43.19	43.23	43.73	42.55	42.94	42.40	42.01	43.21
Etisalcom ADSL 2Mb eDSL	46.12	46.96	47.37	47.48	47.82	48.31	48.57	48.82	47.97	45.28	40.71	40.02	40.17	39.46	42.08	41.72	39.66	38.27	40.64	40.38	42.03	43.60	44.50	45.13
Kalaam ADSL 2Mb athome	46.89	48.48	49.66	49.95	50.04	50.39	50.30	50.85	50.70	50.69	50.21	49.40	49.32	47.90	47.83	46.66	46.39	46.55	47.16	45.51	45.63	44.98	44.75	46.17
Lightspeed ADSL 2Mb Home 2000	40.61	41.54	42.40	42.12	42.43	42.78	42.88	42.95	42.93	42.68	42.73	42.46	41.97	41.36	41.10	40.37	40.04	40.04	40.73	39.48	39.50	38.42	38.94	39.63
Mena WiMAX 2Mb Boost menaHOME	38.11	41.65	42.54	43.28	44.22	44.58	44.19	45.66	44.82	43.58	43.16	42.97	41.96	40.80	40.65	38.88	38.46	39.31	39.14	36.29	37.82	36.74	35.74	36.87
Nuetel Cable 2Mb Nue-Net	44.65	53.92	60.23	62.94	65.44	66.84	67.29	66.21	65.39	61.43	55.96	54.56	53.62	50.35	47.99	47.22	46.63	43.26	41.20	37.32	33.07	31.89	31.74	34.63
Zain WiMAX 2Mb zain@home	30.12	32.70	35.19	39.59	43.58	44.56	43.91	43.43	41.96	40.08	38.77	37.24	36.66	34.08	32.07	30.61	30.86	30.95	30.69	29.28	29.23	26.79	27.09	28.31

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

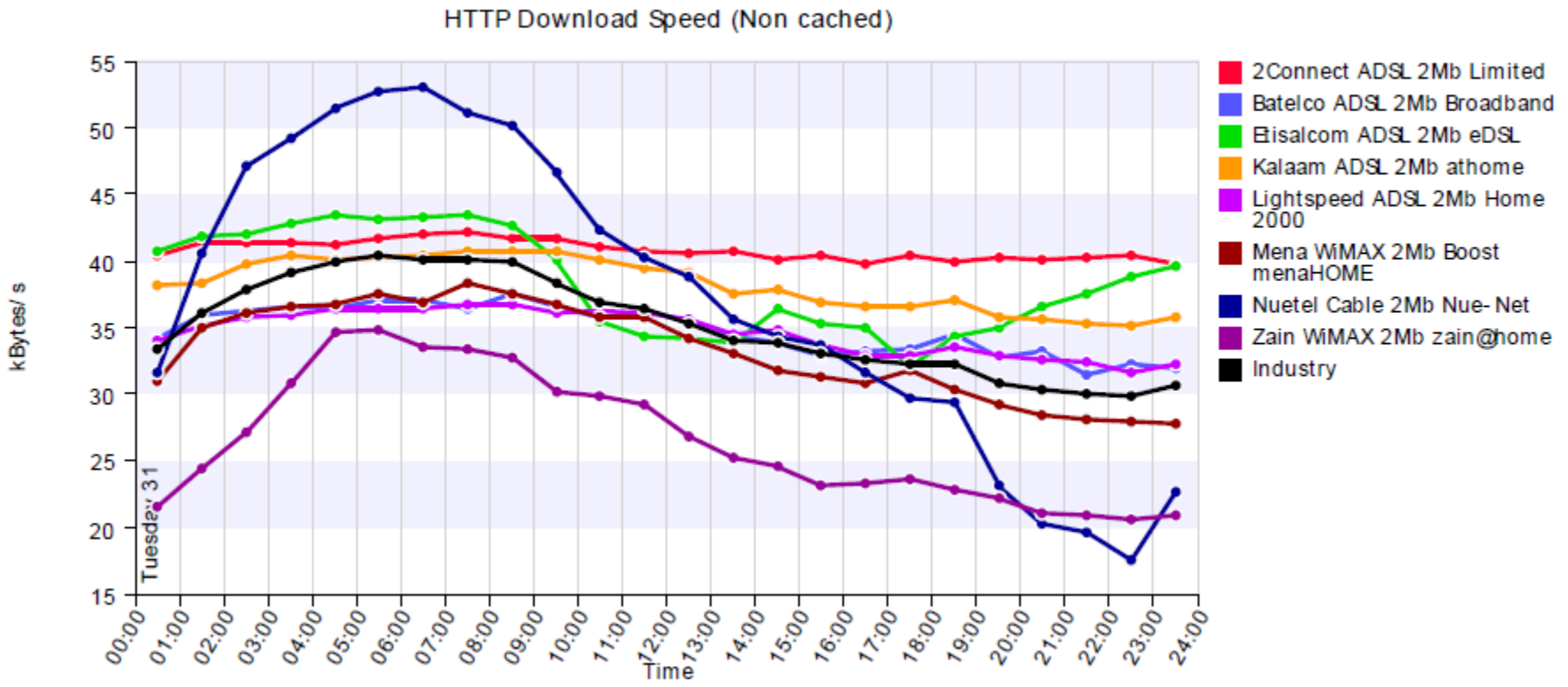
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the 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 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain



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

01 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Dec	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	40.46	41.48	41.34	41.34	41.18	41.79	42.04	42.16	41.78	41.78	41.14	40.69	40.67	40.83	40.16	40.39	39.85	40.44	39.98	40.20	40.12	40.33	40.36	39.79
Batelco ADSL 2Mb Broadband	34.21	36.02	36.20	36.58	36.40	37.02	37.12	36.40	37.61	36.62	35.81	36.26	35.52	34.33	33.88	32.99	33.29	33.37	34.45	32.70	33.18	31.40	32.24	31.95
Etisalcom ADSL 2Mb eDSL	40.79	41.90	42.10	42.81	43.49	43.23	43.25	43.45	42.62	40.05	35.40	34.34	34.13	33.87	36.42	35.37	34.95	32.12	34.44	35.03	36.56	37.52	38.79	39.69
Kalaam ADSL 2Mb athome	38.17	38.40	39.79	40.46	40.18	40.32	40.51	40.80	40.70	40.70	40.14	39.54	39.10	37.58	37.83	36.88	36.57	36.59	37.14	35.74	35.71	35.31	35.19	35.73
Lightspeed ADSL 2Mb Home 2000	34.08	35.23	35.73	35.91	36.41	36.51	36.50	36.73	36.74	36.09	36.29	36.18	35.58	34.55	34.81	33.66	32.93	32.97	33.58	32.89	32.64	32.43	31.71	32.31
Mena WiMAX 2Mb Boost menaHOME	30.93	35.04	36.05	36.59	36.76	37.51	36.91	38.40	37.57	36.75	35.85	35.82	34.24	33.08	31.81	31.32	30.77	31.75	30.39	29.20	28.52	28.15	27.95	27.88
Nuetel Cable 2Mb Nue-Net	31.66	40.52	47.21	49.24	51.46	52.76	53.08	51.17	50.25	46.66	42.32	40.31	38.87	35.62	34.33	33.76	31.70	29.66	29.44	23.14	20.30	19.62	17.62	22.68
Zain WiMAX 2Mb zain@home	21.59	24.41	27.23	30.80	34.60	34.78	33.60	33.48	32.74	30.13	29.95	29.26	26.86	25.24	24.55	23.21	23.28	23.58	22.85	22.18	21.10	20.85	20.56	20.97

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

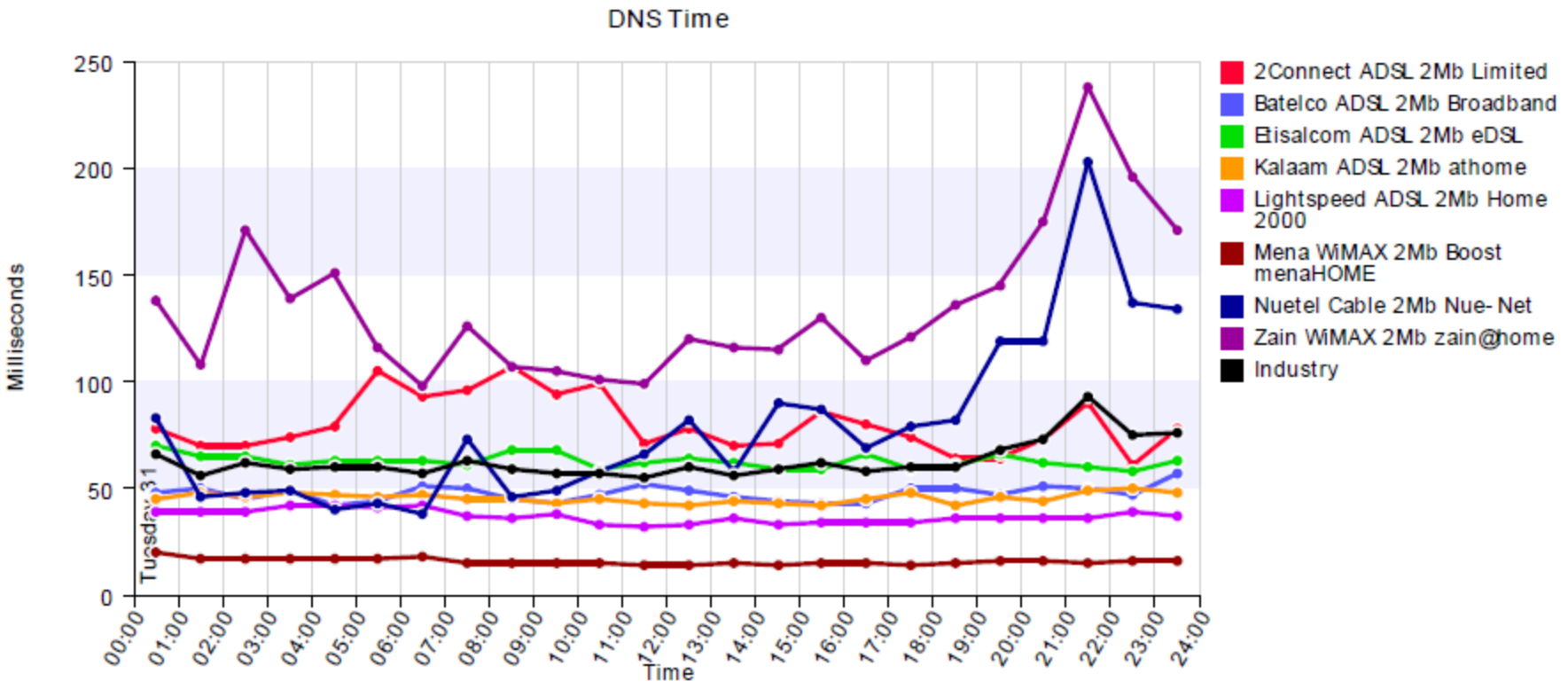
The HTTP (HyperText Transfer Protocol) test makes a request to a specified URL (Uniform Resource Locator) and records the time taken and the amount of data downloaded, from which the speed of the download is derived. Depending on the configuration of the test, test probe is also able to download the 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 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain



DNS Time Line Chart Values (Peer view)

01 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Dec	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	78	70	70	74	79	105	93	96	107	94	99	71	78	70	71	86	80	74	64	64	73	90	61	78
Batelco ADSL 2Mb Broadband	48	50	45	49	42	44	51	50	45	43	47	52	49	46	44	43	43	50	50	47	51	50	47	57
Etisalcom ADSL 2Mb eDSL	70	65	65	61	63	63	63	61	68	68	59	62	64	62	59	59	66	59	61	66	62	60	58	63
Kalaam ADSL 2Mb athome	45	48	46	48	47	46	47	45	45	43	45	43	42	44	43	42	45	48	42	46	44	49	50	48
Lightspeed ADSL 2Mb Home 2000	39	39	39	42	42	41	42	37	36	38	33	32	33	36	33	34	34	34	36	36	36	36	39	37
Mena WiMAX 2Mb Boost menaHOME	20	17	17	17	17	17	18	15	15	15	15	14	14	15	14	15	15	14	15	16	16	15	16	16
Nuetel Cable 2Mb Nue-Net	83	46	48	49	40	43	38	73	46	49	58	66	82	58	90	87	69	79	82	119	119	203	137	134
Zain WiMAX 2Mb zain@home	138	108	171	139	151	116	98	126	107	105	101	99	120	116	115	130	110	121	136	145	175	238	196	171

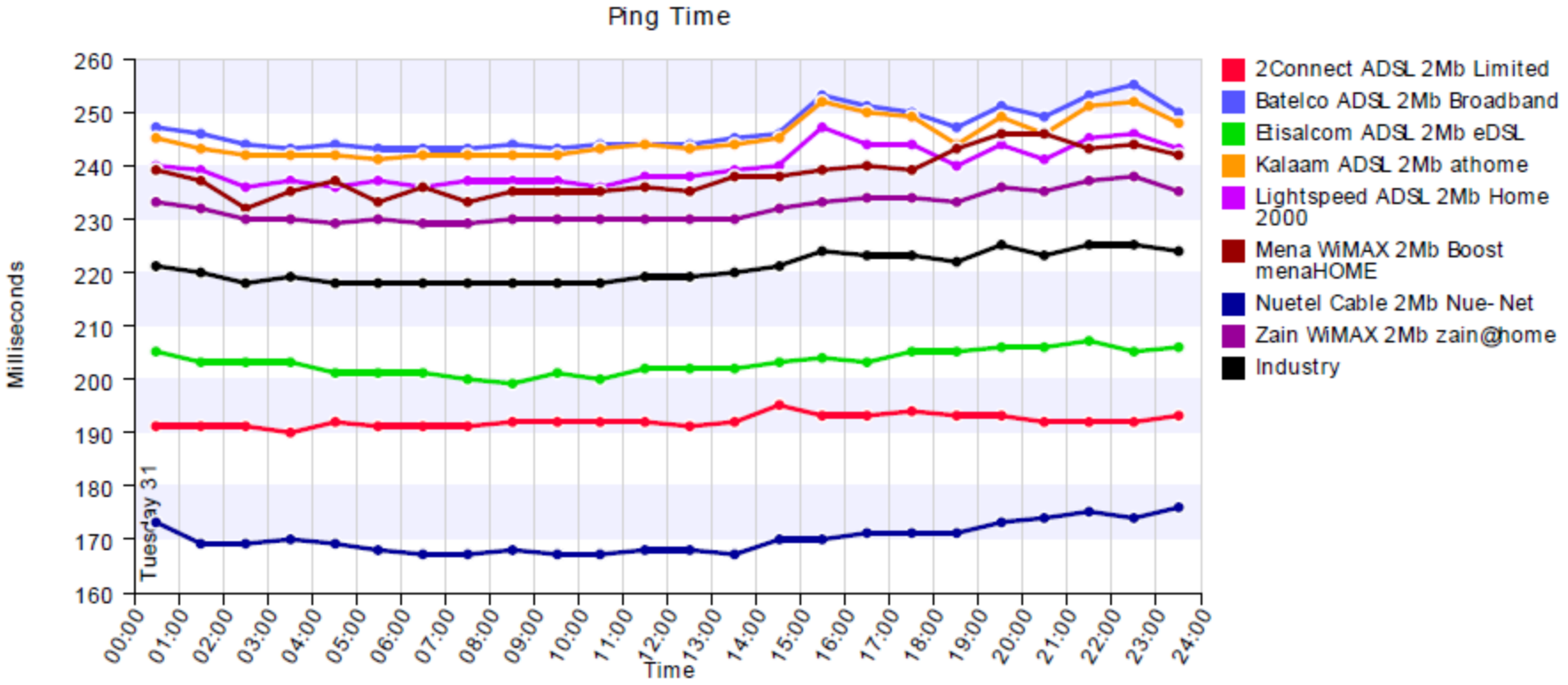
DNS Time (Domain Name System) (Milliseconds)

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 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain



Ping Time Line Chart Values (Peer view)

01 Jan 2014 - 31 Mar 2014, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 31 Dec	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	191	191	191	190	192	191	191	191	192	192	192	192	191	192	195	193	193	194	193	193	192	192	192	193
Batelco ADSL 2Mb Broadband	247	246	244	243	244	243	243	243	244	243	244	244	244	245	246	253	251	250	247	251	249	253	255	250
Etisalcom ADSL 2Mb eDSL	205	203	203	203	201	201	201	200	199	201	200	202	202	202	203	204	203	205	205	206	206	207	205	206
Kalaam ADSL 2Mb athome	245	243	242	242	242	241	242	242	242	242	243	244	243	244	245	252	250	249	244	249	246	251	252	248
Lightspeed ADSL 2Mb Home 2000	240	239	236	237	236	237	236	237	237	237	236	238	238	239	240	247	244	244	240	244	241	245	246	243
Mena WiMAX 2Mb Boost menaHOME	239	237	232	235	237	233	236	233	235	235	235	236	235	238	238	239	240	239	243	246	246	243	244	242
Nuetel Cable 2Mb Nue-Net	173	169	169	170	169	168	167	167	168	167	167	168	168	167	170	170	171	171	171	173	174	175	174	176
Zain WiMAX 2Mb zain@home	233	232	230	230	229	230	229	229	230	230	230	230	230	230	232	233	234	234	233	236	235	237	238	235

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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