



هيئة تنظيم الاتصالات  
Telecommunications Regulatory Authority

## **Fixed Broadband Analysis Report**

**01 October 2013 – 31 December 2013 between 00:00:00 and 24:00:00 Bahrain**

**Published 16 January 2014**

**Public Document**

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# TRA Fixed Broadband Analysis Report

## 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.

# TRA Fixed Broadband Analysis Report

## 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 1.62 Mbps and average TCP upload speed at 0.60 Mbps.  
Average HTTP Cache download speed at 47.58 kBytes/s and non cached at 32.64 kBytes/s  
Average DNS resolution time at 55 milliseconds and average Latency results at 220 milliseconds

## RESULTS

The following pages present the result of measurements taken every hour for each audited service during the period of Q4 2013, from 00:00:00 on the 1 October 2013 to 24:00:00 on the 31 December 2013.

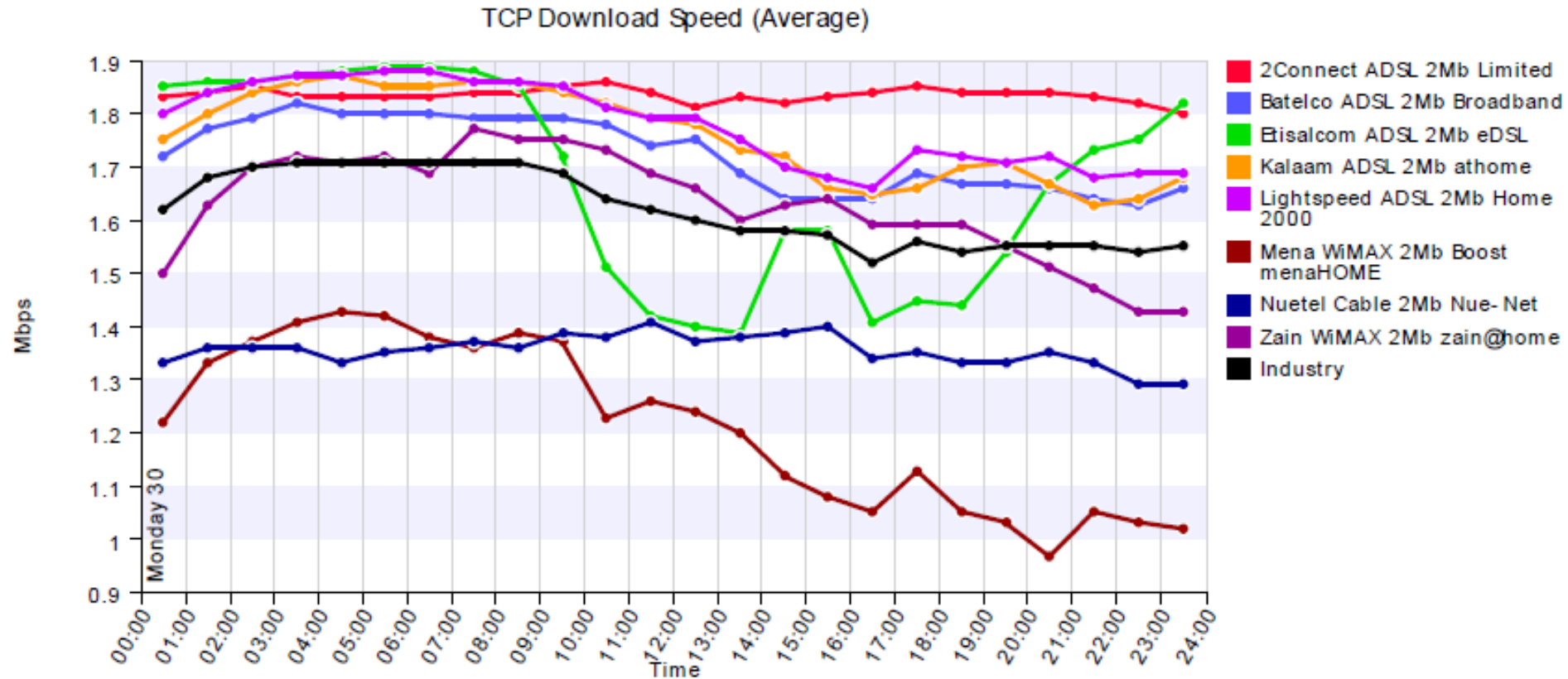
For each ISP, one set of measurements is taken each hour, 24 hours a day. In this report, results for a given hour are then averaged to determine the average QoS in that hour over the three month period. i.e. all results recorded between 8:00 and 9:00 for an ISP are averaged and reported as one observation 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.

# TRA Fixed Broadband Analysis Report

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

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



# TRA Fixed Broadband Analysis Report

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

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	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	1.83	1.84	1.85	1.83	1.83	1.83	1.83	1.84	1.84	1.85	1.86	1.84	1.81	1.83	1.82	1.83	1.84	1.85	1.84	1.84	1.84	1.83	1.82	1.80
Batelco ADSL 2Mb Broadband	1.72	1.77	1.79	1.82	1.80	1.80	1.80	1.79	1.79	1.79	1.78	1.74	1.75	1.69	1.64	1.64	1.64	1.69	1.67	1.67	1.66	1.64	1.63	1.66
Etisalcom ADSL 2Mb eDSL	1.85	1.86	1.86	1.87	1.88	1.89	1.89	1.88	1.85	1.72	1.51	1.42	1.40	1.39	1.58	1.58	1.41	1.45	1.44	1.54	1.67	1.73	1.75	1.82
Kalaam ADSL 2Mb athome	1.75	1.80	1.84	1.86	1.87	1.85	1.85	1.86	1.86	1.84	1.82	1.79	1.78	1.73	1.72	1.66	1.65	1.66	1.70	1.71	1.67	1.63	1.64	1.68
Lightspeed ADSL 2Mb Home 2000	1.80	1.84	1.86	1.87	1.87	1.88	1.88	1.86	1.86	1.85	1.81	1.79	1.79	1.75	1.70	1.68	1.66	1.73	1.72	1.71	1.72	1.68	1.69	1.69
Mena WiMAX 2Mb Boost menaHOME	1.22	1.33	1.37	1.41	1.43	1.42	1.38	1.36	1.39	1.37	1.23	1.26	1.24	1.20	1.12	1.08	1.05	1.13	1.05	1.03	0.97	1.05	1.03	1.02
Nuetel Cable 2Mb Nue-Net	1.33	1.36	1.36	1.36	1.33	1.35	1.36	1.37	1.36	1.39	1.38	1.41	1.37	1.38	1.39	1.40	1.34	1.35	1.33	1.33	1.35	1.33	1.29	1.29
Zain WiMAX 2Mb zain@home	1.50	1.63	1.70	1.72	1.71	1.72	1.69	1.77	1.75	1.75	1.73	1.69	1.66	1.60	1.63	1.64	1.59	1.59	1.59	1.55	1.51	1.47	1.43	1.43



# TRA Fixed Broadband Analysis Report

## **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.

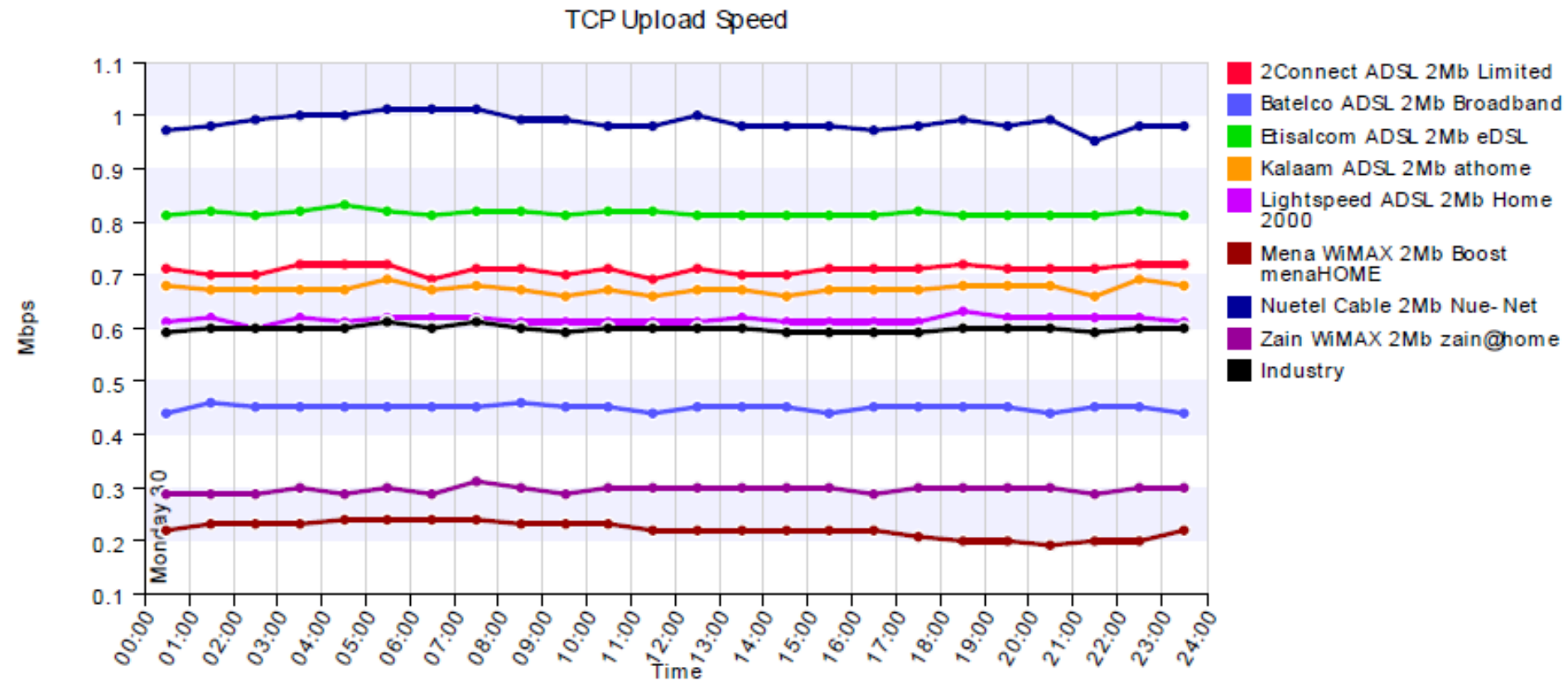
The test is conducted using a server endpoint running proprietary software that is hosted in a well peered data centre. Whilst the port through which the test is typically conducted is configurable, it is normal for port 80 to be used since this minimises the possibility of the traffic being managed 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)

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

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



# TRA Fixed Broadband Analysis Report

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

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	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	0.72	0.72	0.72	0.69	0.71	0.71	0.70	0.71	0.69	0.71	0.70	0.70	0.71	0.71	0.71	0.72	0.71	0.71	0.71	0.72	0.72	0.72
Batelco ADSL 2Mb Broadband	0.44	0.46	0.45	0.45	0.45	0.45	0.45	0.45	0.46	0.45	0.45	0.44	0.45	0.45	0.45	0.44	0.45	0.45	0.45	0.45	0.44	0.45	0.45	0.44	0.44
Etisalcom ADSL 2Mb eDSL	0.81	0.82	0.81	0.82	0.83	0.82	0.81	0.82	0.82	0.81	0.82	0.82	0.81	0.81	0.81	0.81	0.81	0.82	0.81	0.81	0.81	0.81	0.82	0.82	0.81
Kalaam ADSL 2Mb athome	0.68	0.67	0.67	0.67	0.67	0.69	0.67	0.68	0.67	0.66	0.67	0.66	0.67	0.67	0.66	0.67	0.67	0.67	0.68	0.68	0.68	0.66	0.69	0.68	0.68
Lightspeed ADSL 2Mb Home 2000	0.61	0.62	0.60	0.62	0.61	0.62	0.62	0.62	0.61	0.61	0.61	0.61	0.62	0.62	0.61	0.61	0.61	0.61	0.61	0.63	0.62	0.62	0.62	0.62	0.61
Mena WiMAX 2Mb Boost menaHOME	0.22	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.21	0.20	0.20	0.19	0.20	0.20	0.22
Nuetel Cable 2Mb Nue-Net	0.97	0.98	0.99	1.00	1.00	1.01	1.01	1.01	0.99	0.99	0.98	0.98	1.00	0.98	0.98	0.98	0.97	0.98	0.99	0.98	0.99	0.99	0.95	0.98	0.98
Zain WiMAX 2Mb zain@home	0.29	0.29	0.29	0.30	0.29	0.30	0.29	0.31	0.30	0.29	0.30	0.30	0.30	0.30	0.30	0.30	0.29	0.30	0.30	0.30	0.30	0.29	0.30	0.30	0.30

# TRA Fixed Broadband Analysis Report

## **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.

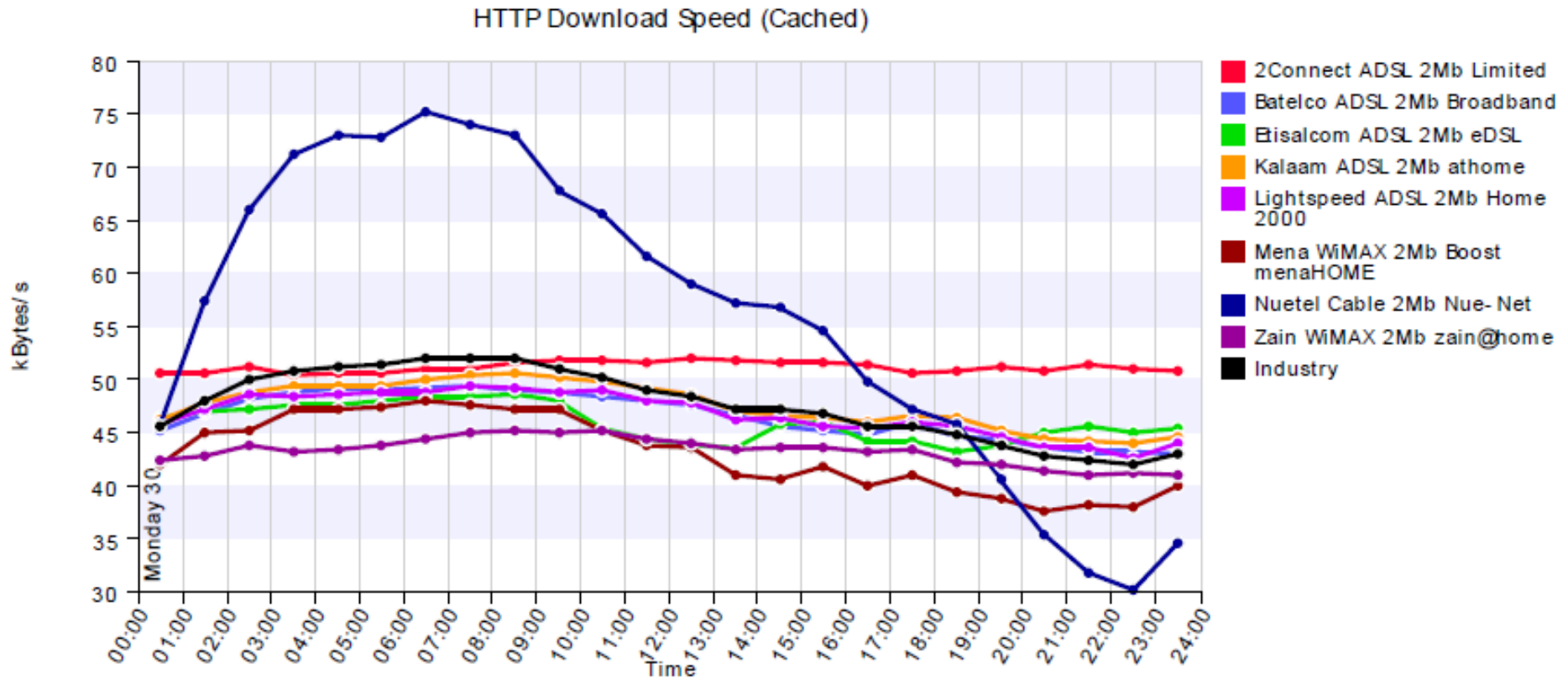
The test is conducted using a server endpoint running proprietary software that is hosted in a well peered data centre. Whilst the port through which the test is typically conducted is configurable, it is normal for port 80 to be used since this minimizes the possibility of the traffic being managed 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)

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

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



# TRA Fixed Broadband Analysis Report

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

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	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	50.67	50.52	51.11	50.31	50.57	50.68	50.93	51.03	51.63	51.85	51.71	51.68	52.05	51.71	51.63	51.63	51.47	50.52	50.76	51.22	50.85	51.43	50.96	50.80
Batelco ADSL 2Mb Broadband	45.14	46.78	48.22	48.77	49.16	48.98	49.11	49.32	49.07	48.83	48.46	47.95	47.69	46.54	45.57	45.14	44.82	46.01	44.67	44.38	43.53	43.13	43.11	42.95
Etisalcom ADSL 2Mb eDSL	46.45	46.92	47.15	47.51	47.63	47.97	48.31	48.35	48.62	48.00	45.43	44.37	43.80	43.58	45.72	45.93	44.13	44.26	43.16	43.77	45.05	45.50	44.93	45.42
Kalaam ADSL 2Mb athome	46.17	47.78	48.82	49.35	49.44	49.49	50.04	50.40	50.65	50.14	49.87	49.18	48.63	46.98	46.51	46.40	45.99	46.58	46.49	45.19	44.37	44.30	43.95	44.59
Lightspeed ADSL 2Mb Home 2000	45.74	47.13	48.53	48.33	48.68	48.75	48.86	49.37	49.17	48.82	48.96	47.95	47.86	46.27	46.31	45.53	45.38	45.93	45.67	44.67	43.64	43.60	42.64	44.02
Mena WiMAX 2Mb Boost menaHOME	42.04	45.06	45.27	47.25	47.15	47.36	48.02	47.53	47.30	47.23	45.24	43.87	43.63	41.04	40.54	41.71	39.94	40.93	39.35	38.86	37.58	38.30	37.91	40.02
Nuetel Cable 2Mb Nue-Net	45.77	57.47	65.98	71.28	72.94	72.84	75.11	74.01	73.07	67.82	65.67	61.60	58.96	57.17	56.77	54.64	49.79	47.21	45.84	40.59	35.38	31.90	30.23	34.63
Zain WiMAX 2Mb zain@home	42.47	42.76	43.78	43.17	43.48	43.82	44.39	45.04	45.28	44.99	45.11	44.46	44.01	43.34	43.51	43.59	43.16	43.32	42.15	41.91	41.41	41.07	41.24	41.06

# TRA Fixed Broadband Analysis Report

## **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.

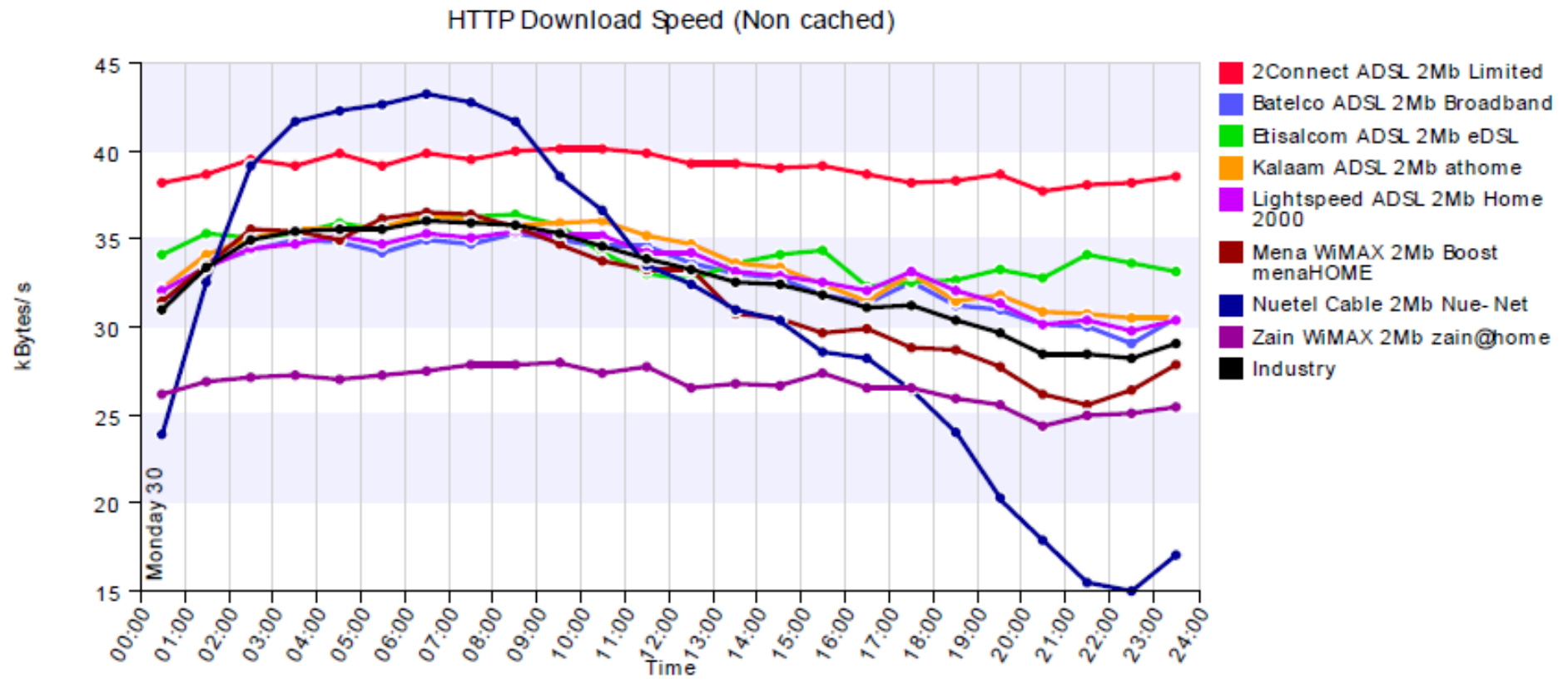
Any additional content downloaded is reflected in the captured timings and size of data downloaded. Additionally, the HTTP test can be configured to run in one of two modes of operation: cached and non-cached. When the test downloads from the specified URL in “cached” mode, the speed of the download 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)

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

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain





# TRA Fixed Broadband Analysis Report

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

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	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	38.12	38.60	39.47	39.09	39.82	39.18	39.82	39.44	40.01	40.11	40.06	39.89	39.30	39.26	39.04	39.14	38.63	38.16	38.32	38.64	37.66	38.03	38.20	38.49
Batelco ADSL 2Mb Broadband	31.32	33.47	34.30	34.96	34.81	34.23	34.94	34.72	35.23	34.94	34.50	34.61	33.64	33.03	32.70	31.80	31.26	32.47	31.23	30.93	30.16	30.05	29.04	30.49
Etisalam ADSL 2Mb eDSL	34.02	35.25	34.99	35.27	35.93	35.53	36.19	36.28	36.39	35.78	34.18	33.04	32.60	33.62	34.10	34.35	32.25	32.53	32.66	33.25	32.81	34.03	33.62	33.15
Kalaam ADSL 2Mb athome	32.10	34.12	35.07	35.56	35.49	35.60	36.40	35.97	35.80	35.90	36.00	35.18	34.73	33.55	33.32	32.42	31.46	32.96	31.49	31.75	30.85	30.71	30.42	30.53
Lightspeed ADSL 2Mb Home 2000	32.05	33.38	34.41	34.69	35.19	34.70	35.23	35.04	35.35	35.20	35.13	34.24	34.17	33.13	32.90	32.57	32.04	33.09	32.02	31.30	30.14	30.41	29.73	30.30
Mena WiMAX 2Mb Boost menaHOME	31.44	33.49	35.54	35.35	34.94	36.17	36.43	36.38	35.58	34.66	33.76	33.20	33.26	30.75	30.49	29.59	29.91	28.79	28.69	27.68	26.20	25.61	26.37	27.86
Nuetel Cable 2Mb Nue-Net	23.82	32.46	39.18	41.61	42.23	42.58	43.17	42.68	41.67	38.53	36.65	33.45	32.34	30.99	30.41	28.57	28.16	26.41	24.01	20.24	17.90	15.54	15.02	17.02
Zain WiMAX 2Mb zain@home	26.17	26.93	27.07	27.29	27.04	27.18	27.42	27.78	27.82	27.92	27.36	27.70	26.46	26.77	26.64	27.30	26.53	26.46	25.90	25.52	24.32	25.00	25.09	25.39

# TRA Fixed Broadband Analysis Report

## **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.

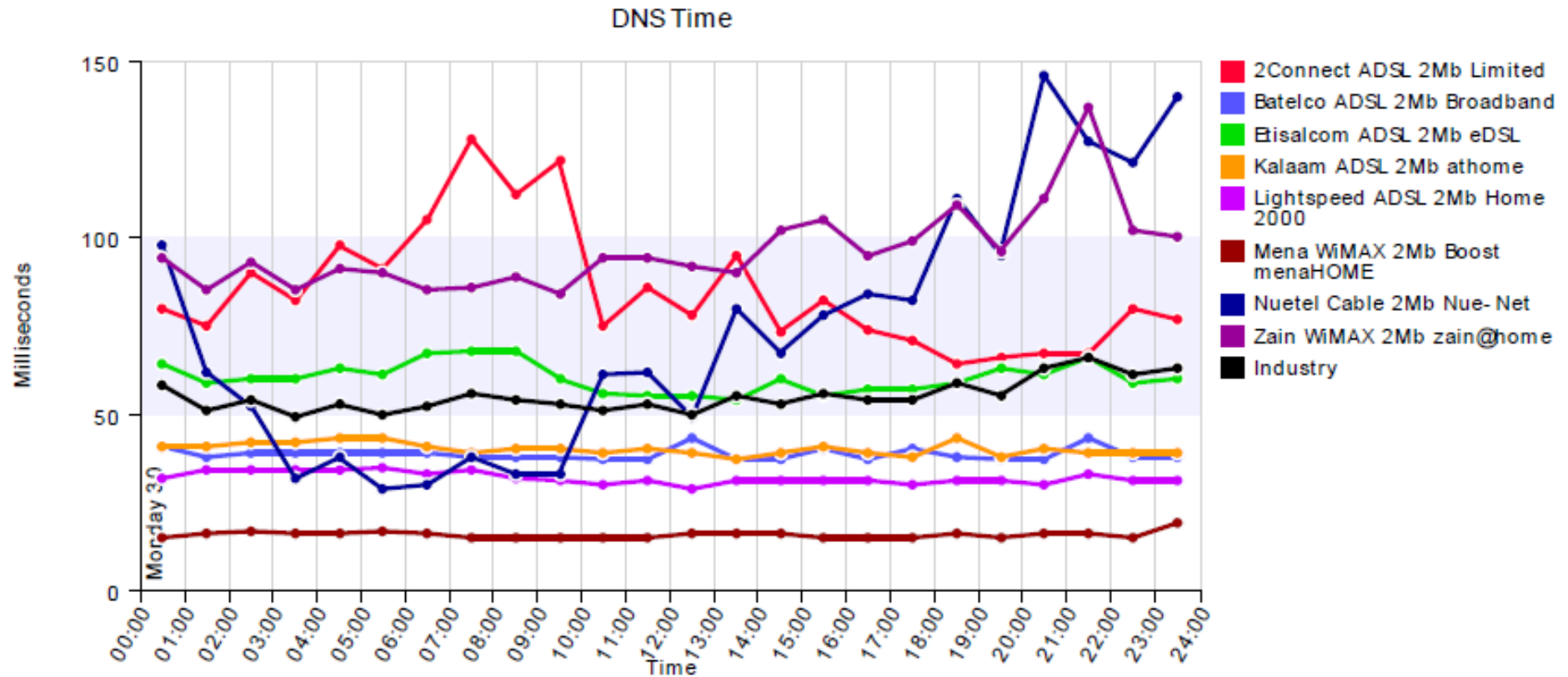
The higher is the download speed the better is the performance.

# TRA Fixed Broadband Analysis Report

## DNS Time

### DNS Time Line Chart (Peer view)

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



# TRA Fixed Broadband Analysis Report

## DNS Time Line Chart Values (Peer view)

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	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	80	75	90	82	98	91	105	128	112	122	75	86	78	95	73	82	74	71	64	66	67	67	80	77
Batelco ADSL 2Mb Broadband	41	38	39	39	39	39	39	38	38	38	37	37	43	37	37	40	37	40	38	37	37	43	38	38
Etisalcom ADSL 2Mb eDSL	64	59	60	60	63	61	67	68	68	60	56	55	55	54	60	55	57	57	59	63	61	66	59	60
Kalaam ADSL 2Mb athome	41	41	42	42	43	43	41	39	40	40	39	40	39	37	39	41	39	38	43	38	40	39	39	39
Lightspeed ADSL 2Mb Home 2000	32	34	34	34	34	35	33	34	32	31	30	31	29	31	31	31	31	30	31	31	30	33	31	31
Mena WiMAX 2Mb Boost menaHOME	15	16	17	16	16	17	16	15	15	15	15	15	16	16	16	15	15	15	16	15	16	16	15	19
Nuetel Cable 2Mb Nue-Net	98	62	52	32	38	29	30	38	33	33	61	62	49	80	67	78	84	82	111	95	146	127	121	140
Zain WiMAX 2Mb zain@home	94	85	93	85	91	90	85	86	89	84	94	94	92	90	102	105	95	99	109	96	111	137	102	100

# TRA Fixed Broadband Analysis Report

## **DNS Time** (Domain Name System) (Milliseconds)

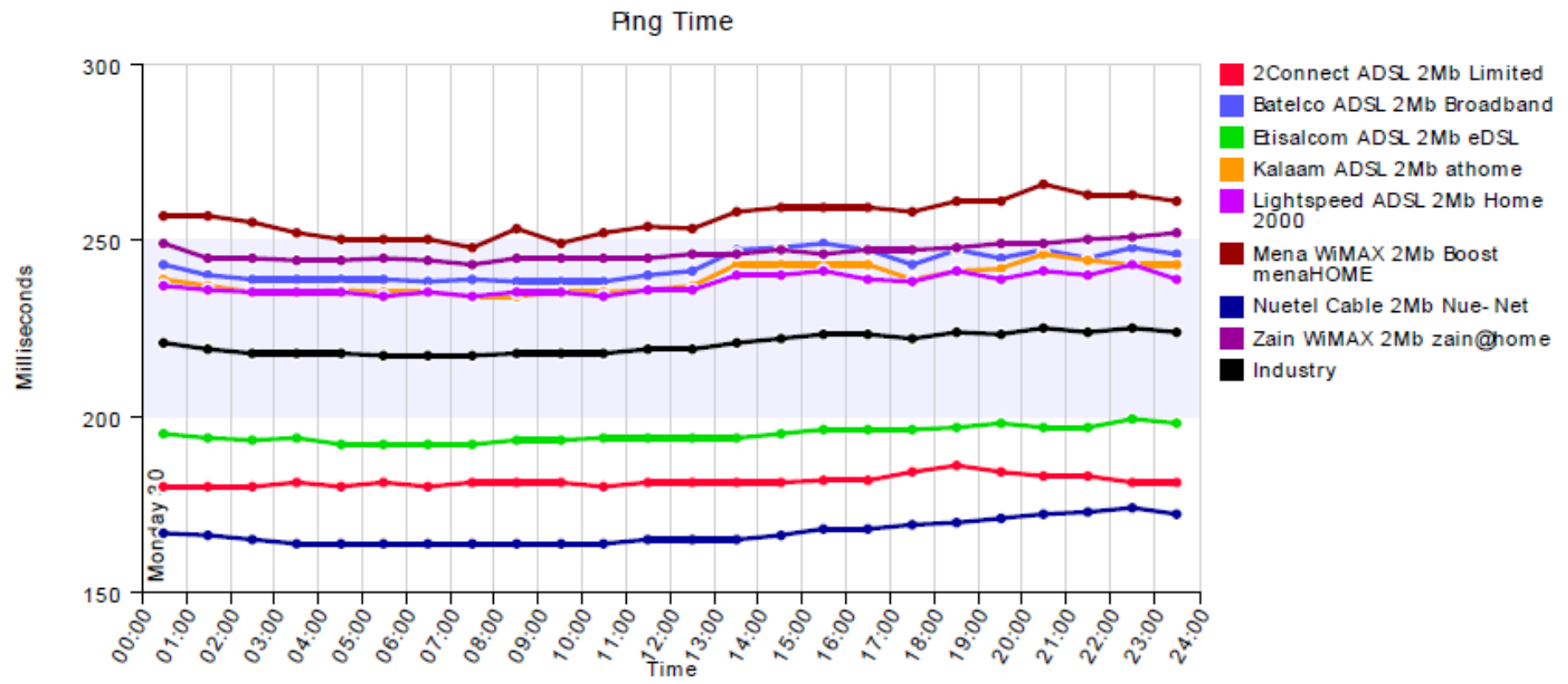
The DNS test records the time taken (in milliseconds) to resolve a fully qualified domain name to a corresponding IP address. The DNS servers used for the query are the DNS servers (primary and secondary) dynamically assigned by the service provider when the network connection is initiated. Alternatively 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.

# TRA Fixed Broadband Analysis Report

## Ping Time Line Chart (Peer view)

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain



# TRA Fixed Broadband Analysis Report

## Ping Time Line Chart Values (Peer view)

01 Oct 2013 - 31 Dec 2013, between 00:00:00 and 24:00:00 Asia/Bahrain

	00:00, 30 Sep	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	180	180	180	181	180	181	180	181	181	181	180	181	181	181	181	182	182	184	186	184	183	183	181	181
Batelco ADSL 2Mb Broadband	243	240	239	239	239	239	238	239	238	238	238	240	241	247	248	249	247	243	247	245	247	245	248	246
Etisalatcom ADSL 2Mb eDSL	195	194	193	194	192	192	192	192	193	193	194	194	194	194	195	196	196	196	197	198	197	197	199	198
Kalaam ADSL 2Mb athome	239	237	235	235	236	235	235	234	234	235	235	236	237	243	243	243	243	239	241	242	246	244	243	243
Lightspeed ADSL 2Mb Home 2000	237	236	235	235	235	234	235	234	235	235	234	236	236	240	240	241	239	238	241	239	241	240	243	239
Mena WiMAX 2Mb Boost menaHOME	257	257	255	252	250	250	250	248	253	249	252	254	253	258	259	259	259	258	261	261	266	263	263	261
Nuetel Cable 2Mb Nue-Net	167	166	165	164	164	164	164	164	164	164	164	165	165	165	166	168	168	169	170	171	172	173	174	172
Zain WiMAX 2Mb zain@home	249	245	245	244	244	245	244	243	245	245	245	245	246	246	247	246	247	247	248	249	249	250	251	252

# TRA Fixed Broadband Analysis Report

## **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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