هيئة تنظيم الاتصالات
Telecommunications Regulatory Authority
مملكة البحرين - Kingdom of Bahrain

ascom

BROADBAND QOS REPORT

QUARTER 1 REPORT – 2016

- Fixed Broadband
- Mobile Data & Voice

DISCLAIMER

This study is published in accordance with Articles 3(b)(1), 3(c)(2), 3(c)(4) and Article 54 of the Telecommunications Law. The purpose of this study is to monitor and benchmark quality levels offered by Fixed Broadband Service Providers and Mobile Network Operators in the Kingdom of Bahrain. This independent study was conducted while taking into consideration the end-user experience by Ascom Network Testing and does not represent any views of the Telecommunications Regulatory Authority of the Kingdom of Bahrain ("TRA").

The data does not allow for direct comparisons to be made between each operator. It does however provide a view of how the overall performance in the Kingdom has changed over recent years. The data is derived from simulated tests placed on each network during the period mentioned in the introductions section of the report, which presents how the services performance varies. This document does not however constitute commercial, legal or other advice however so described. The TRA excludes any warranty and, or liability, expressed or implied, as to the quality, completeness, adequacy and accuracy of the information, statements and statistics contained within this document. This document is a study and it is a non-binding document. It has no legal effect. This document does not represent an official position of the TRA, but is intended to stimulate debate in the part of stakeholders and public. It does not prejudice the form or content of any future proposal by the TRA.

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1. INTRODUCTION

MEASUREMENT METHOD OVERVIEW

The objective of measuring the performance of broadband and mobile internet is to facilitate clear understanding by consumers of the service quality in the Bahraini market. TRA has implemented a monitoring solution utilizing several probes across the Kingdom's regions that are deployed to simulate and collect samples of the customer experience. These probes conduct continuous tests of various services in order to enable the measurement of service quality around the clock, thus reflecting user experience for Internet Service Providers (ISPs) and Mobile Network Operators (MNOs).

The test results are propagated to a backend server for analysis and reporting on a real time portal, making it possible to compare the performance of several internet and mobile service packages.

Each testing location contains two testing probes, a fixed probe and a mobile probe. The fixed probe measures different internet packages from different ISPs for Broadband Internet Services, while the mobile probe measures MNO voice and data (internet) services from a stationary prospective to purely focus on the quality of each service offered.
The Mobile probes simulates a customer experience from a stationary point of view for Mobile Services. The stationary Mobile Testing Results presented in this report should not be confused with the results presented in the Annual QoS Mobile Audit Reports, which the Authority publishes on Annual basis after conducting a thorough Drive Test Audit benchmarking campaign across the kingdom.

An overview of the technical solution deployed to collect these results is presented in Figure 1 below.

The terms 'On-Net' and 'Off-Net' are used to describe different test types. For example, 'On-Net' is referred to when a call (or an internet use) originates from and terminates on a single Service provider's network. 'Off-Net' is applied when the call (or internet use) is originated to reach a subscriber (or service) on a different network than the subscriber's Service Provider network.

This report is based on data collected between January 1st, 2016 and March 31st, 2016 for Off-Net test results and 15th March 2016 to 31st March 2016 for On-Net test results. The data has been averaged according to the hours of the day.

Tested parameters that has been conducted, are:

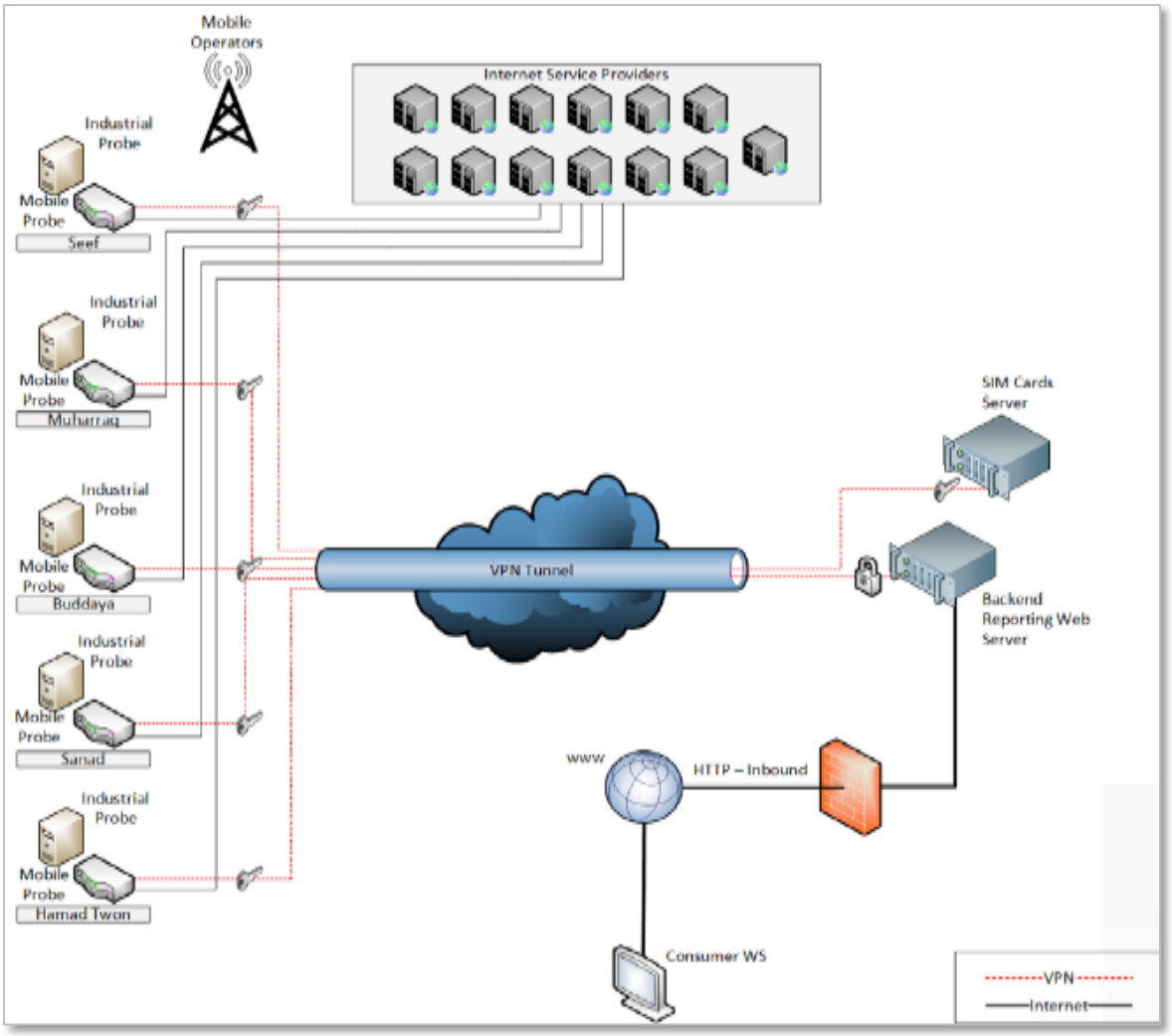
HTTP	Hypertext Transfer Protocol
PING	Packet Internet Groper
DNS	Domain Name System
Social Media Applications	Facebook, Twitter, YouTube

The Testing Lines package used are detailed in Annex 1 for the purpose of reference; these service packages have been selected to benchmark similar service offerings from the different operators in the market.

For this test, the following scenario reflects the selection process that was performed on the carefully chosen packages:

A customer in search of a provider for internet services approaches a telecom outlet retail shop and requests broadband internet service for his/her home. At this point he/she is not concerned by technology and only indicates that he/she would like a connection with a minimum download speed of 8Mbps. Depending on which service provider shop he/she is in, it is possible that the sales agent may propose any technology (ADSL, Fiber or LTE) to the consumer as long as it satisfies his/her requirement of 8mbps download speed as a minimum.

Accordingly, testing results of the download speed of the different packages, irrespective of their technology, has been selected for the purpose of this benchmark.



NOTICEABLE EVENTS FOR THIIS QUARTER

- 2Connect faced an international fiber cut incident from 15th-20th March 2016.

WHAT'S NEW TO THE REPORT

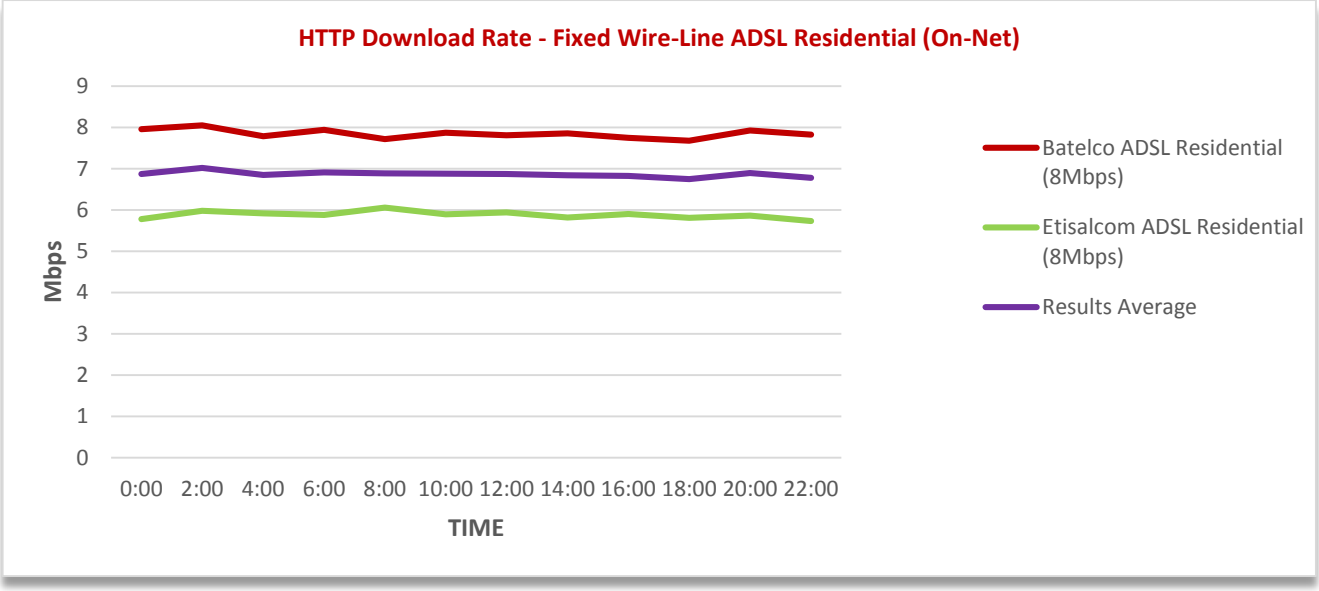
- On-Net and Off-Net performance measurements for different ISPs has been introduced.
- Results are presented to reflect the customer experience with wire-line and wire-less technologies.
- Top 5 websites browsing time, has also been newly introduced.

2. FIXED WIRE-LINE - BROADBAND INTERNET TESTING RESIDENTIAL SERVICES

2. FIXED WIRE-LINE - BROADBAND INTERNET TESTING for RESIDENTIAL SERVICES

2.1 HTTP DOWNLOAD SPEED FOR WIRE-LINE RESIDENTIAL PACKAGES

Testing HTTP download speed depends on various variables in the network that could influence the download performance. Following data is the result of downloading a file stored on a server that is hosted on the provider's own network (On-Net).



HTTP (On-Net) Download Speed - Chart View (Mbps)

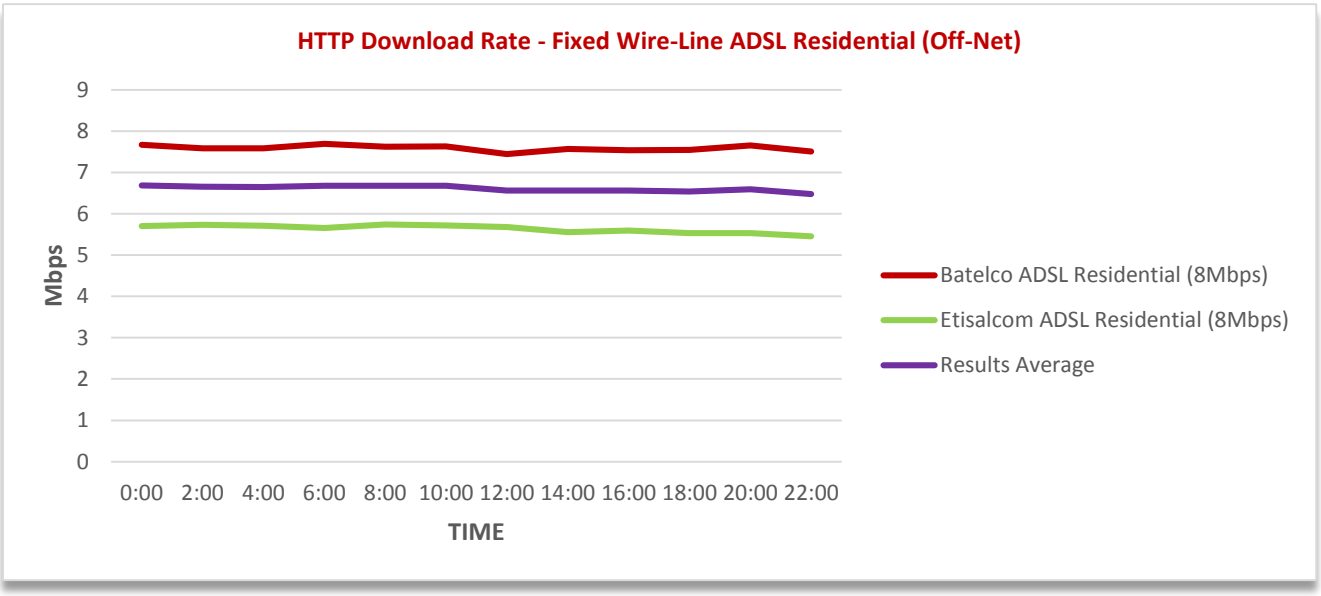
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco ADSL Residential (8Mbps)	7.95	8.05	7.78	7.94	7.71	7.87	7.81	7.86	7.74	7.68	7.92	7.83
Etisalcom ADSL Residential (8Mbps)	5.78	5.98	5.92	5.88	6.06	5.89	5.94	5.82	5.90	5.81	5.86	5.73
Results Average	6.87	7.02	6.85	6.91	6.89	6.88	6.87	6.84	6.82	6.74	6.89	6.78

HTTP (On-Net) Download Speed - Summary Table (Mbps)

HIGHLIGHT

- Results average for HTTP download speed of 6.86 Mbps has been noticed.
- Higher HTTP download value indicates higher downlink internet speed.

HTTP download speed testing depends on various variables in the network that could influence the download performance. Following data is the result of downloading a file stored on an external network from the service provider's own network (Off-Net).



HTTP (Off-Net) Download Speed - Chart View (Mbps)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco ADSL Residential (8Mbps)	7.67	7.58	7.59	7.70	7.62	7.63	7.44	7.57	7.54	7.54	7.66	7.51
Etisalcom ADSL Residential (8Mbps)	5.70	5.73	5.71	5.66	5.74	5.72	5.68	5.56	5.59	5.54	5.54	5.45
Results Average	6.69	6.66	6.65	6.68	6.68	6.68	6.56	6.56	6.57	6.54	6.60	6.48

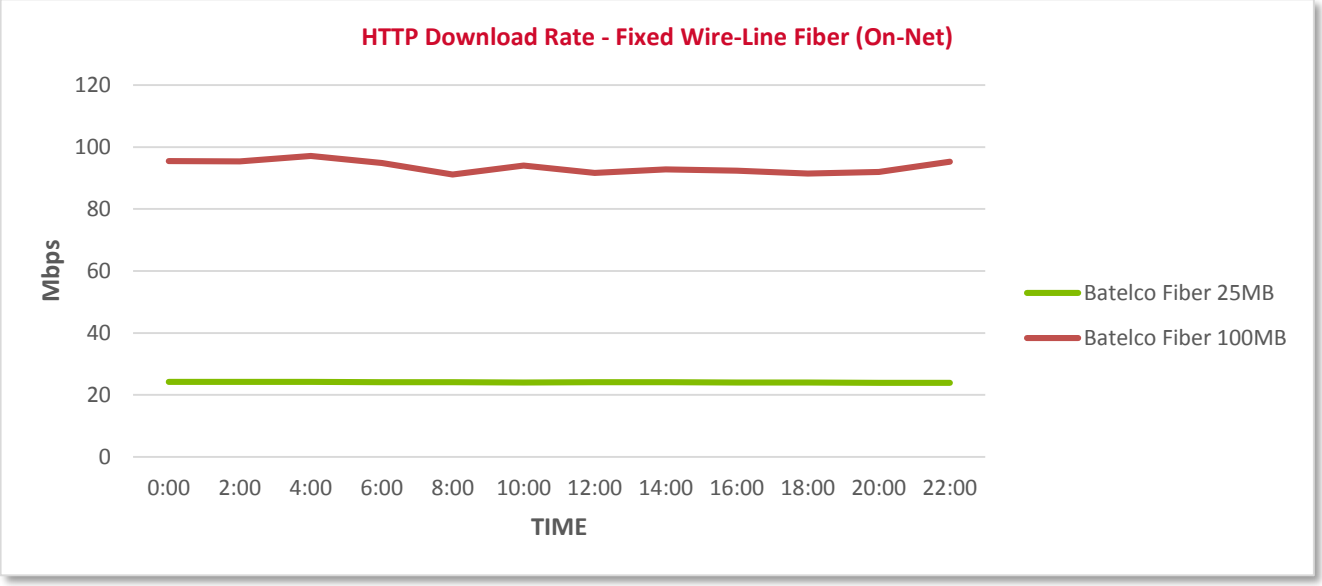
HTTP (Off-Net) Download Speed - Summary Table (Mbps)

HIGHLIGHT

- Results Average HTTP download speed of 6.6 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

2.2 HTTP DOWNLOAD SPEED FOR HIGH SPEED RESIDENTIAL PACKAGES

Testing HTTP download speed depends on various variables in the network that could influence the download performance. Following data is the result of downloading a file stored on a server that is hosted on the provider's own network (On-Net).



HTTP (On-Net) Download Speed - Chart View (Mbps)

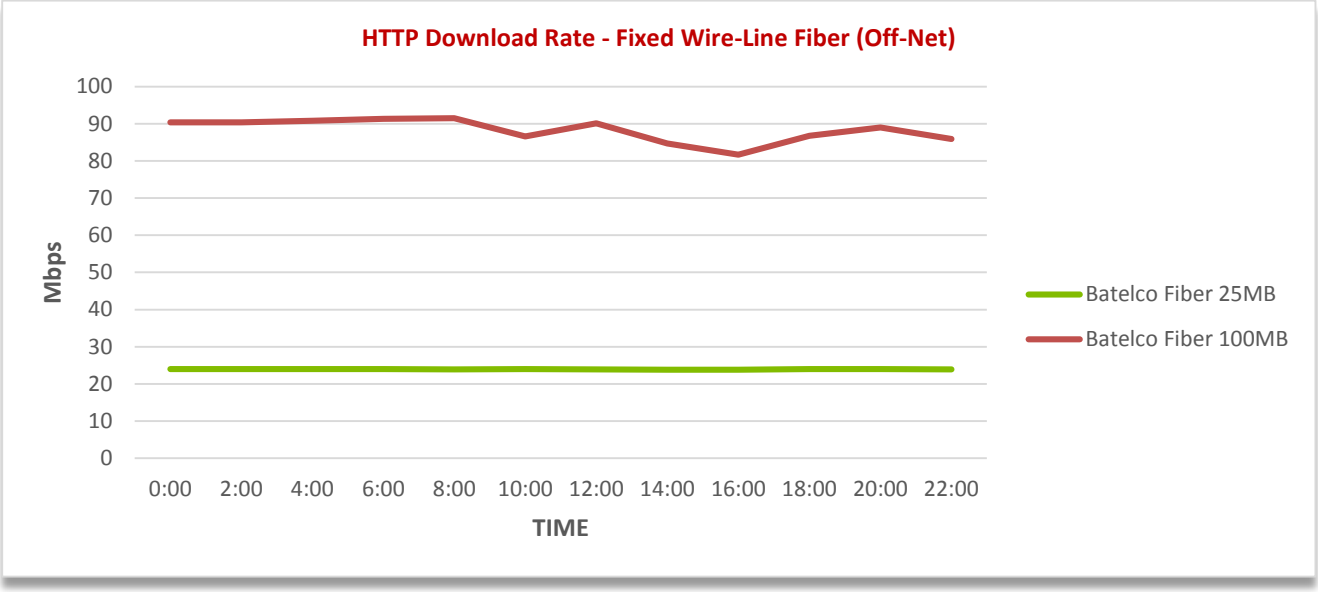
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco Fiber 25 MB	24.20	24.18	24.16	24.09	24.11	24.01	24.08	24.11	24.04	24.00	23.95	23.91
Batelco Fiber 100 MB	95.52	95.41	97.11	94.89	91.11	94.08	91.66	92.79	92.39	91.41	91.98	95.26

HTTP (On-Net) Download Speed - Summary Table (Mbps)

HIGHLIGHT

- Average HTTP download speed for the 25 Mbps package is 24.08 Mbps while for the 100Mbps package it has been recorded as 93.63 Mbps.
- Higher HTTP download value indicates higher downlink internet speed.

HTTP download speed testing depends on various variables in the network that could influence the download performance. Following data is the result of downloading a file stored on an external network from the service provider's own network (Off-Net).



HTTP (Off-Net) Download Speed - Chart View (Mbps)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco Fiber 25 MB	24.02	24.01	24.02	24.00	23.89	23.97	23.93	23.80	23.82	23.98	24.03	23.87
Batelco Fiber 100 MB	90.37	90.40	90.81	91.34	91.49	86.55	90.11	84.71	81.66	86.74	89.00	85.86

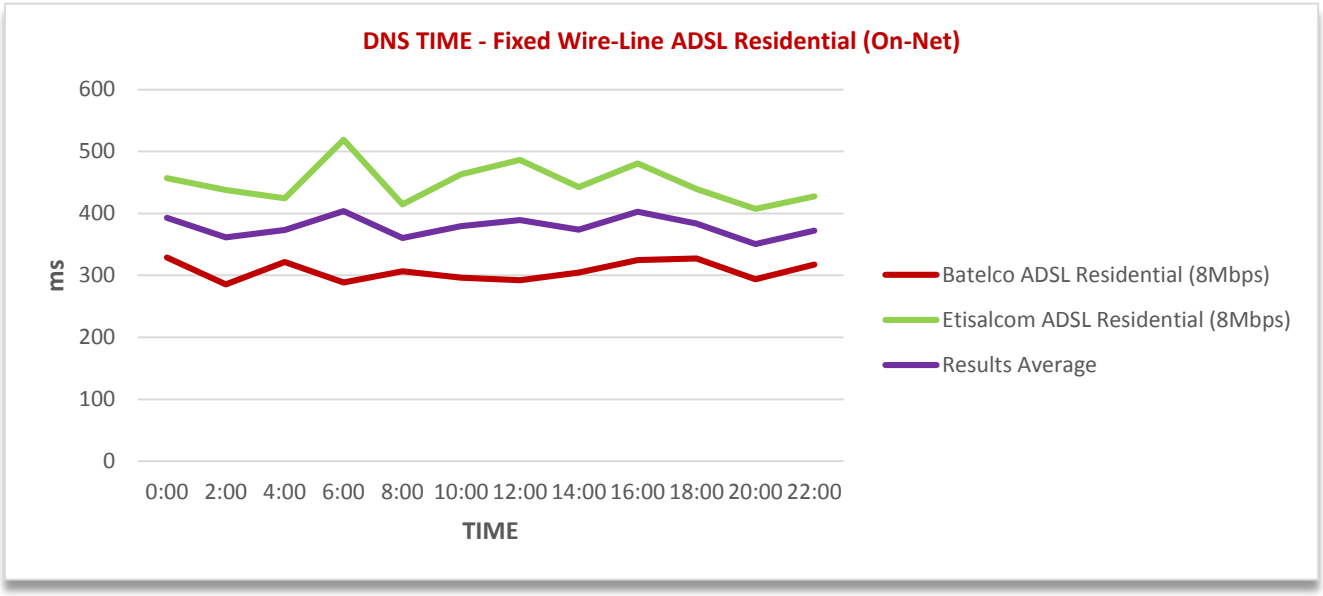
HTTP (Off-Net) Download Speed - Summary Table (Mbps)

HIGHLIGHT

- Average HTTP download speed for the 25Mbps package is 23.94 Mbps; while for the 100Mbps package it has been recorded as 88.25 Mbps.
- Higher HTTP download value indicates higher downlink internet speed.

2.3 DNS TIME FOR FIXED WIRE-LINE RESIDENTIAL PACKAGES

The DNS time test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address. The DNS servers used for the query in this section is located within the provider's own network (On-Net).



DNS Time (On-Net) Chart View (milliseconds)

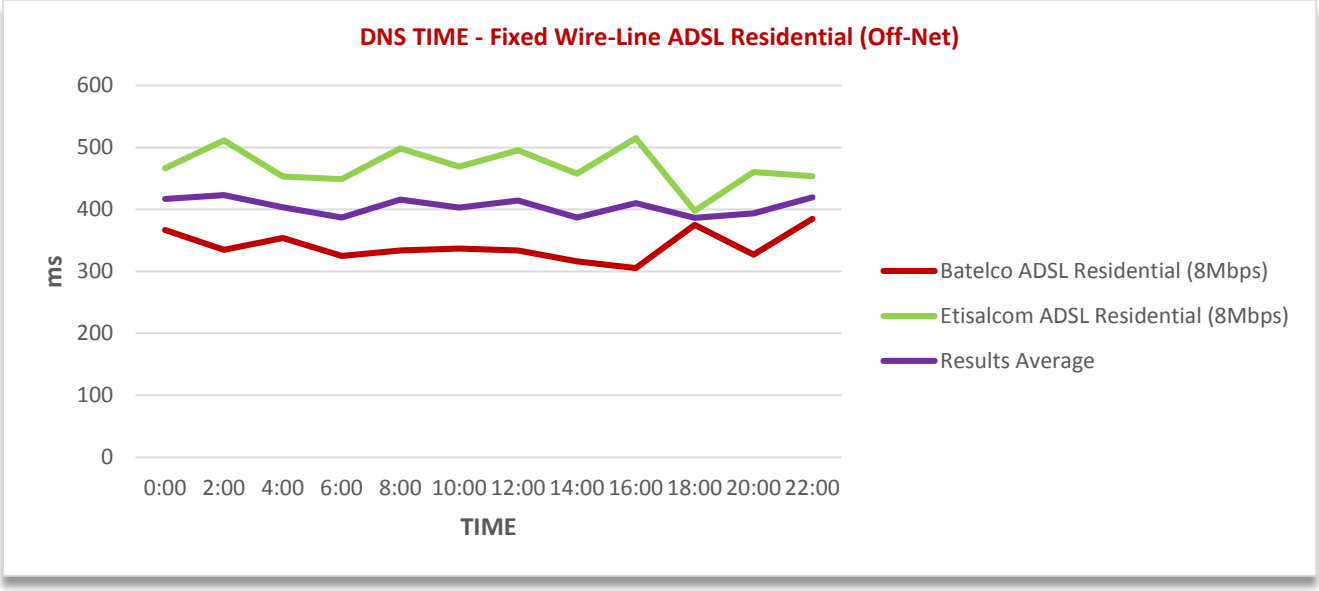
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco ADSL Residential (8Mbps)	328.67	285.33	321.82	288.40	306.64	296.13	292.34	304.68	324.78	327.53	293.87	317.30
Etisalcom ADSL Residential (8Mbps)	457.12	437.92	424.46	518.93	414.37	462.99	486.44	442.49	480.53	439.20	407.29	427.47
Results Average	392.89	361.62	373.14	403.66	360.51	379.56	389.39	373.59	402.65	383.36	350.58	372.38

DNS Time (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average DNS resolution time is 378 milliseconds.
- The lower the DNS time, the better the customer browsing experience in loading web pages.

The DNS time test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address. The DNS servers used for the query in this section is located outside the provider's network from the service provider's own network (Off-Net).



DNS Time (Off-Net) Chart View (milliseconds)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco ADSL Residential (8Mbps)	366.88	334.89	353.85	325.05	333.65	336.62	333.61	316.16	305.41	374.96	327.02	384.98
Etisalcom ADSL Residential (8Mbps)	466.75	511.42	453.06	449.11	498.55	469.08	495.37	457.84	515.07	397.70	460.53	453.62
Results Average	416.82	423.16	403.46	387.08	416.10	402.85	414.49	387.00	410.24	386.33	393.77	419.30

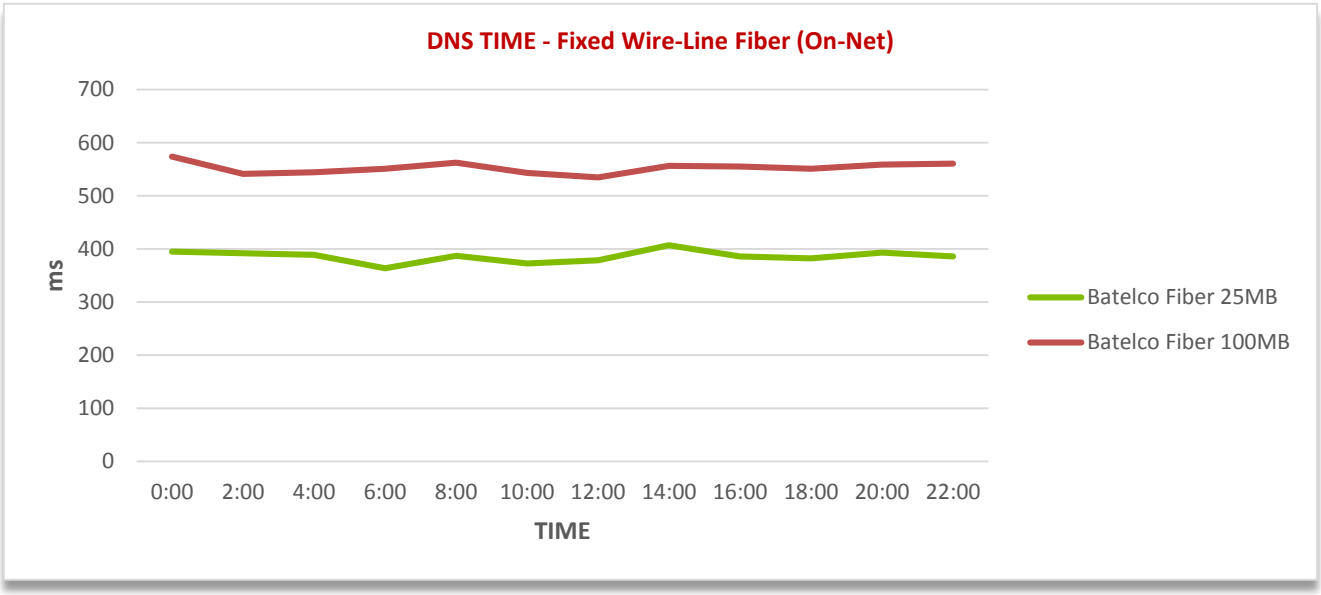
DNS Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Results average of DNS resolution time is 405 milliseconds.
- The lower the DNS time, the better the customer browsing experience in loading web pages

2.4 DNS TIME FOR HIGH SPEED RESIDENTIAL PACKAGES

The DNS time test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address. The DNS servers used for the query in this section is located within the provider's own network (On-Net).



DNS Time (On-Net) Chart View (milliseconds)

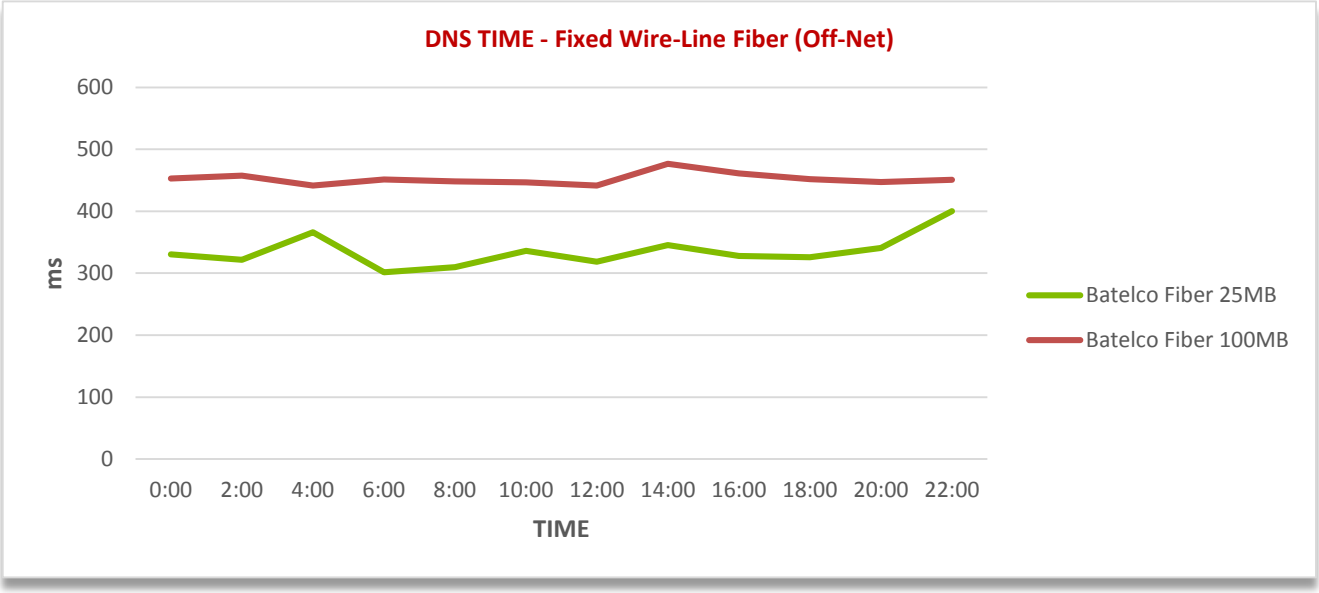
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco Fiber 25 MB	395.17	391.93	388.94	363.59	387.08	372.70	378.47	406.86	385.99	382.37	393.07	385.81
Batelco Fiber 100 MB	573.88	541.32	544.16	550.75	562.40	543.23	535.00	556.15	555.04	551.10	559.08	560.66

DNS Time (On-Net) Table View (milliseconds)

HIGHLIGHT

- The average DNS resolution time for the 25Mbps package is 386 milliseconds; while for the 100Mbps package is 552 milliseconds.
- The lower the DNS time, the better the customer browsing experience in loading web pages.

The DNS time test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address. The DNS servers used for the query in this section is located outside the provider's network from the service provider's own network (Off-Net).



DNS Time (Off-Net) Chart View (milliseconds)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco Fiber 25 MB	330.45	321.41	366.20	301.61	309.76	335.85	318.69	345.30	327.82	325.85	340.50	400.32
Batelco Fiber 100 MB	452.54	457.55	441.50	451.07	447.93	446.35	441.36	476.53	460.94	451.92	447.08	450.75

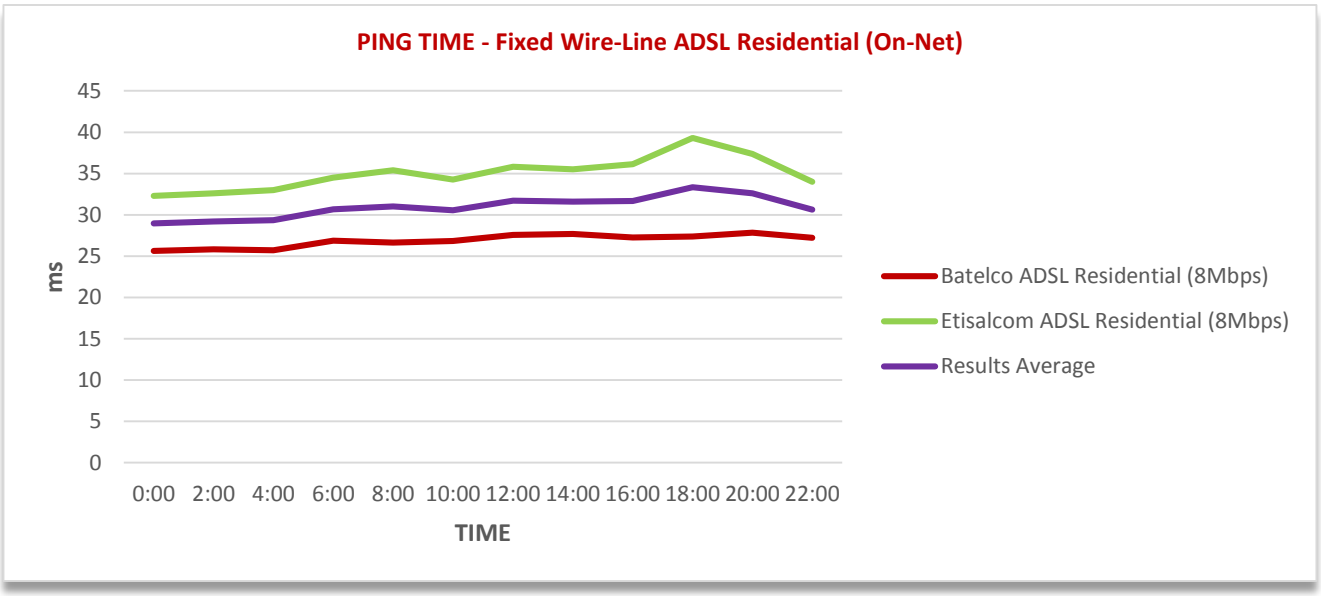
DNS Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Average DNS resolution time for the 25 Mbps package is 335 milliseconds; while for the 100Mbps package it is 452 milliseconds.
- The lower the DNS time, the better the customer browsing experience in loading web pages.

2.5 PING TIME FOR FIXED WIRE-LINE RESIDENTIAL PACKAGES

Ping time or round trip time (RTT) is a method to measure the time it takes to send a number of Bytes to a destination host and have them acknowledged. The ping test has been performed by sending five (5) packets of 32 bytes each to a server located within the provider's own network (On-Net), and measuring the response time. The higher the ping time represents higher latency, therefore lower ping time results denotes better customer experience for internet applications and websites response time.



Ping Time (On-Net) Chart View (milliseconds)

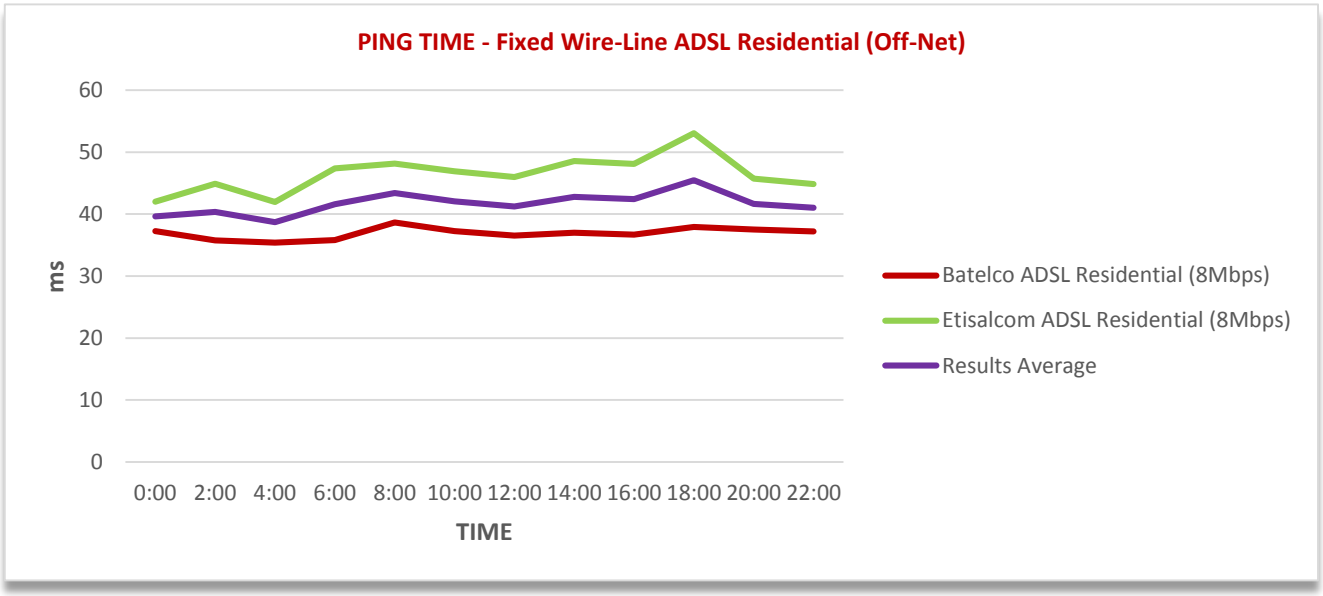
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco ADSL Residential (8Mbps)	25.64	25.81	25.69	26.86	26.64	26.81	27.56	27.66	27.25	27.36	27.84	27.21
Etisalcom ADSL Residential (8Mbps)	32.30	32.59	33.00	34.50	35.39	34.28	35.82	35.50	36.13	39.30	37.37	34.00
Results Average	28.97	29.20	29.35	30.68	31.01	30.55	31.69	31.58	31.69	33.33	32.60	30.61

Ping Time (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results average Latency is at 30.9 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

Ping time or round trip time (RTT) is a method to measure the time it takes to send a number of Bytes to a destination host and have them acknowledged. The ping test has been performed by sending five (5) packets of 32 bytes each to a server located outside the provider's own network (Off-Net), and measuring the response time. The higher the ping time represents higher latency, so lower ping time denotes better customer experience for internet applications and websites response time.



Ping Time (Off-Net) Chart View (milliseconds)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco ADSL Residential (8Mbps)	37.25	35.78	35.42	35.83	38.66	37.23	36.52	37.01	36.71	37.91	37.54	37.22
Etisalcom ADSL Residential (8Mbps)	42.01	44.92	41.95	47.40	48.15	46.91	46.00	48.57	48.10	53.05	45.75	44.85
Results Average	39.63	40.35	38.68	41.62	43.40	42.07	41.26	42.79	42.40	45.48	41.64	41.03

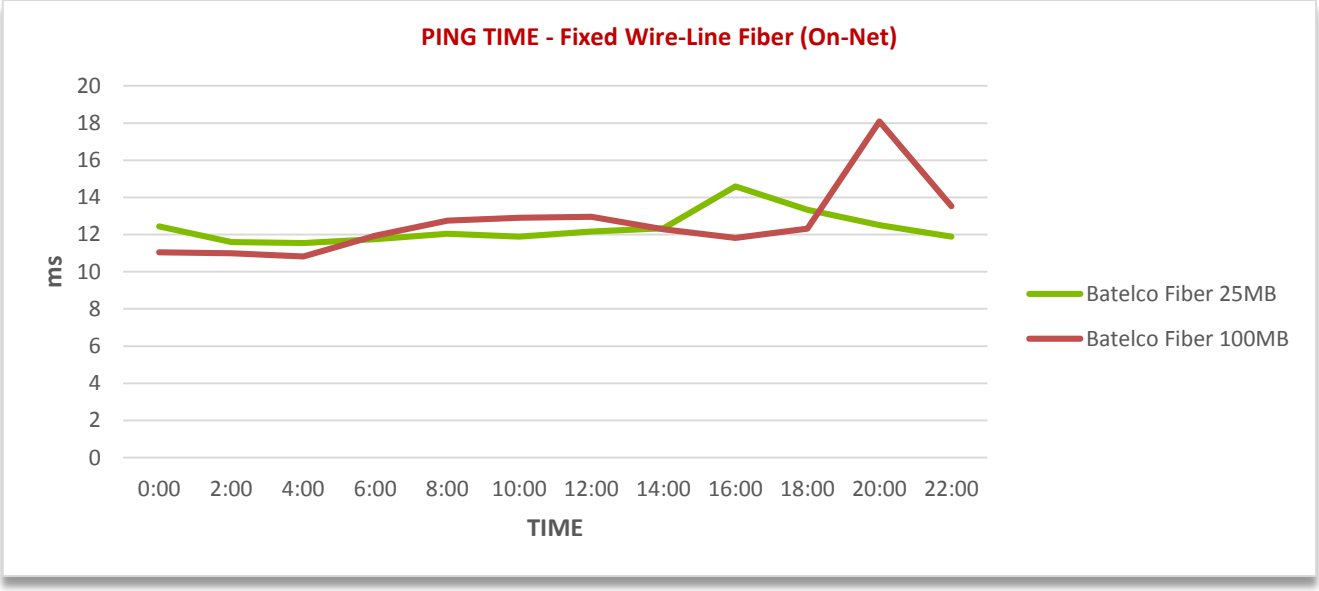
Ping Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average Latency is at 41.7 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

2.6 PING TIME FOR HIGH SEED RESIDENTIAL PACKAGES

Ping time or round trip time (RTT) is a method to measure the time it takes to send a number of Bytes to a destination host and have them acknowledged. The ping test has been performed by sending five (5) packets of 32 bytes each to a server located within the provider's own network (On-Net), and measuring the response time. The higher the ping time represents higher latency, so lower ping time denotes better customer experience for internet applications and websites response time.



Ping Time (On-Net) Chart View (milliseconds)

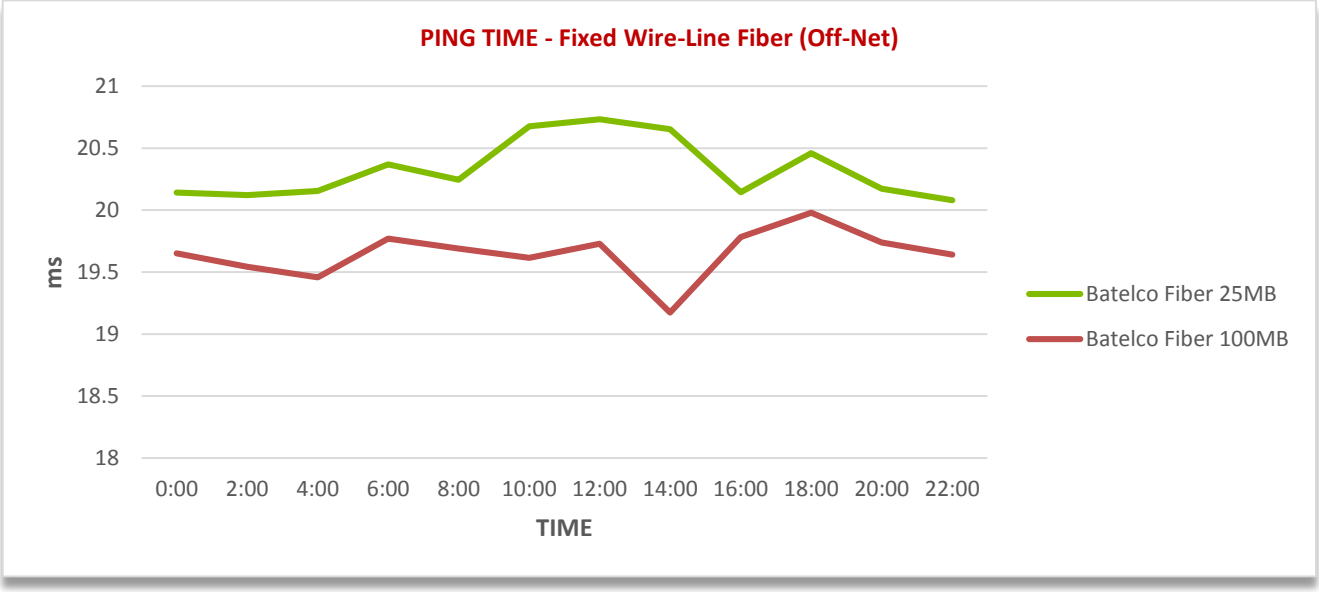
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco Fiber 25 MB	12.45	11.59	11.55	11.76	12.05	11.89	12.16	12.34	14.59	13.34	12.51	11.89
Batelco Fiber 100 MB	11.04	11.00	10.83	11.95	12.75	12.91	12.96	12.28	11.82	12.31	18.08	13.52

Ping Time Table View (milliseconds)

HIGHLIGHT

- The Average Latency for both the 25Mbps and the 100Mbps packages has reported similar results of 12 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

Ping time or round trip time (RTT) is a method to measure the time it takes to send a number of Bytes to a destination host and have them acknowledged. The ping test has been performed by sending five (5) packets of 32 bytes each to a server located outside the provider's own network (Off-Net), and measuring the response time. The higher the ping time represents higher latency, so lower ping time denotes better customer experience for internet applications and websites response time.



Ping Time (Off-Net) Chart View (milliseconds)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco Fiber 25 MB	20.14	20.12	20.15	20.37	20.24	20.68	20.73	20.65	20.14	20.46	20.17	20.08
Batelco Fiber 100 MB	19.65	19.54	19.46	19.77	19.69	19.61	19.73	19.17	19.78	19.98	19.74	19.64

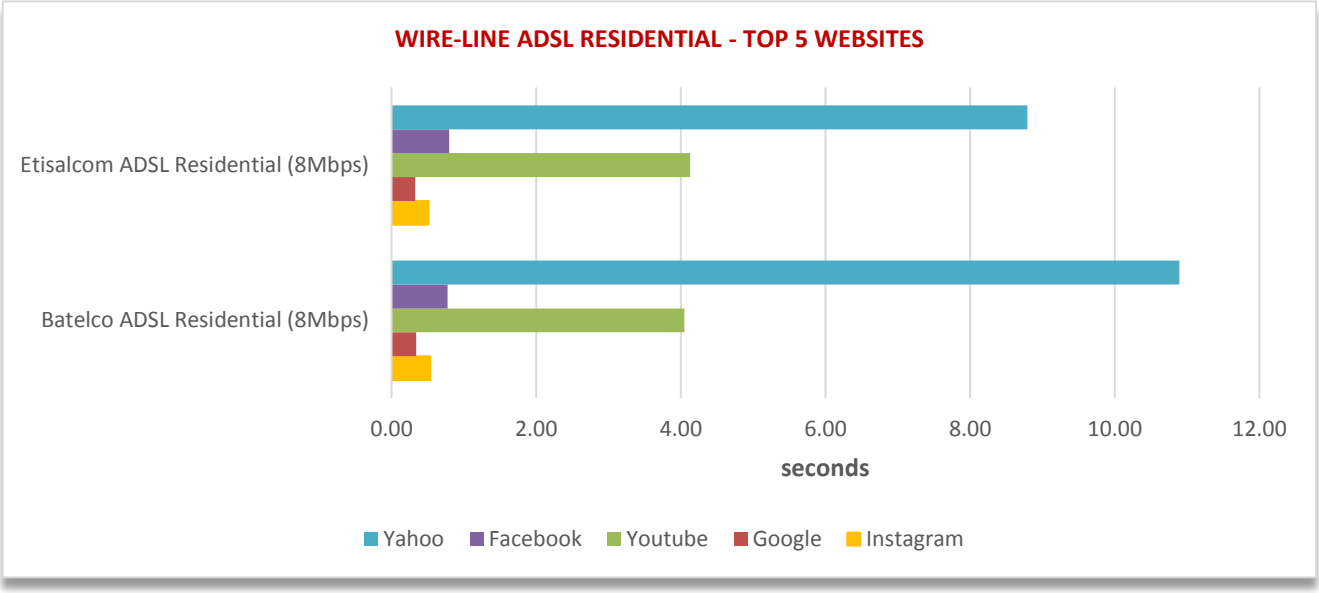
Ping Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Average Latency for the 25Mbps package is 20.33 milliseconds and for the 100Mbps package is 19.65 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

2.7 TOP 5 WEBSITES BROWSING FOR FIXED WIRE-LINE RESIDENTIAL PACKAGES

Top five (5) websites testing aims to measure the response time of using most common websites via an internet browser. Test indicates the time it takes to load the page using a browser. The lower the time it takes to load the page indicates better customer browsing experience.



Top 5 Websites Browsing Time Chart View (Seconds)

ISP Name	Instagram	Google	Youtube	Facebook	Yahoo
Batelco ADSL Residential (8Mbps)	0.54	0.34	4.05	0.77	10.89
Etisalcom ADSL Residential (8Mbps)	0.51	0.33	4.13	0.80	8.79

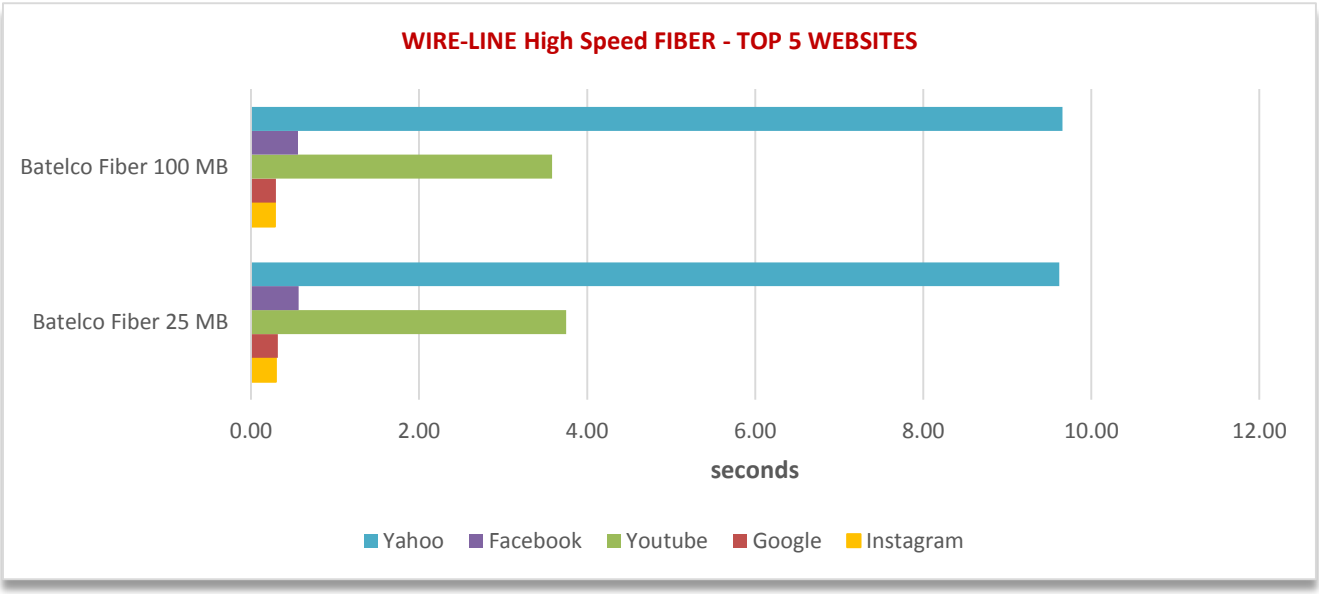
Top 5 Browsing Time Table View (Seconds)

HIGHLIGHT

- Customers on average face better browsing experience with Google and Instagram services than with Yahoo.
- Lower results value indicates better customer browsing experience.

2.8 TOP 5 WEBSITES BROWSING FOR HIGH SPEED RESIDENTIAL PACKAGES

Top five (5) websites testing aims to measure the response time of using most common websites via an internet browser. Test indicates the time it takes to load the page using a browser. The lower the time it takes to load the page indicates better customer browsing experience.



Top 5 Websites Browsing Time Chart View (Seconds)

ISP Name	Instagram	Google	Youtube	Facebook	Yahoo
Batelco Fiber 25 MB	0.30	0.32	3.75	0.57	9.62
Batelco Fiber 100 MB	0.29	0.30	3.58	0.56	9.66

Top 5 Browsing Time Table View (Seconds)

HIGHLIGHT

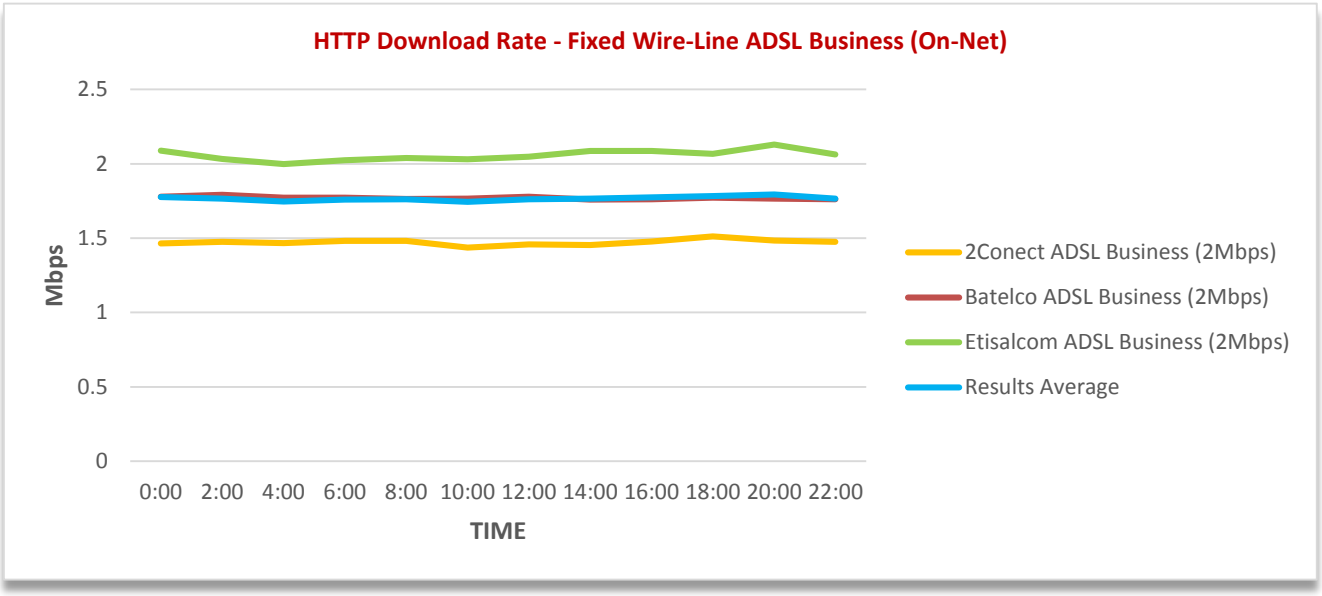
- Customers on average face better browsing experience with Google and Instagram services than with Yahoo.
- Lower results value indicates better customer browsing experience.

3. FIXED WIRE-LINE - BROADBAND INTERNET TESTING BUSINESS SERVICES

3. FIXED WIRE-LINE - BROADBAND INTERNET TESTING for BUSINESS SERVICES

3.1 HTTP DOWNLOAD SPEED FOR FIXED WIRE-LINE BUSINESS PACKAGES

Testing HTTP download speed depends on various variables in the network that could influence the download performance. Following data is the result of downloading a file stored on a server that is hosted on the provider's own network (On-Net)



HTTP (On-Net) Download Speed - Chart View (Mbps)

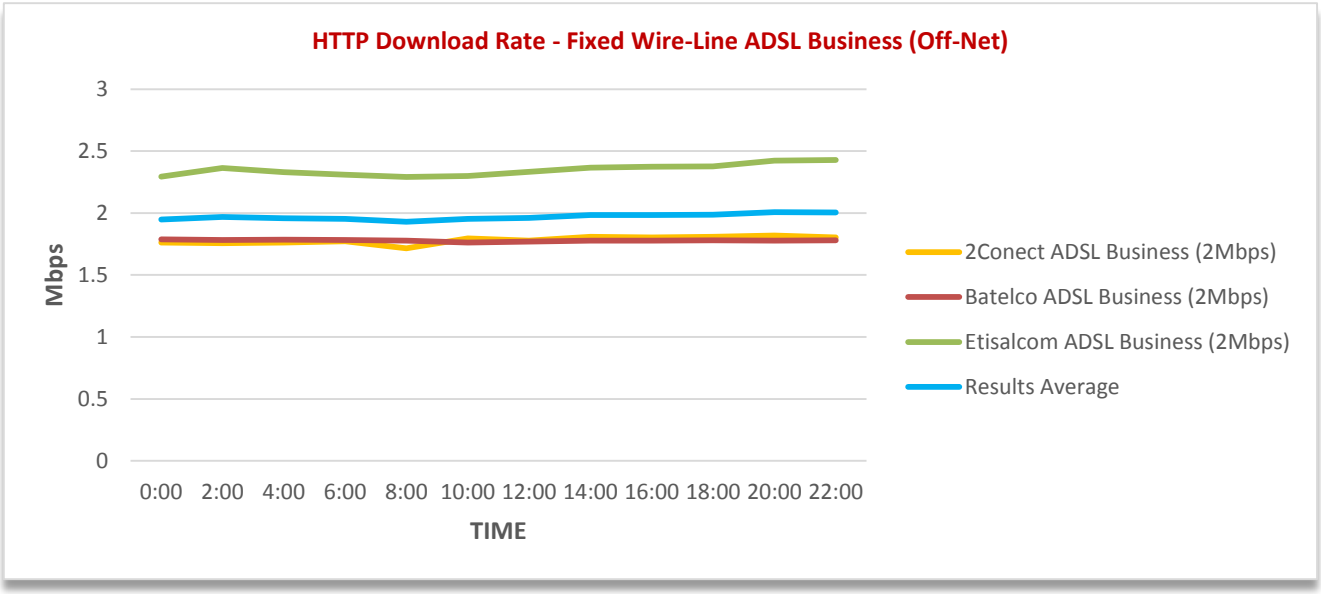
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
2Conect ADSL Business (2Mbps)	1.46	1.48	1.47	1.48	1.48	1.44	1.46	1.45	1.48	1.51	1.48	1.47
Batelco ADSL Bussiness (2Mbps)	1.78	1.79	1.77	1.77	1.76	1.77	1.78	1.76	1.76	1.77	1.77	1.76
Etisalcom ADSL Business (2Mbps)	2.09	2.03	2.00	2.02	2.04	2.03	2.05	2.09	2.09	2.07	2.13	2.06
Results Average	1.78	1.77	1.75	1.76	1.76	1.74	1.76	1.77	1.78	1.78	1.79	1.77

HTTP (On-Net) Download Speed - Summary Table (Mbps)

HIGHLIGHT

- Results average HTTP download speed of 1.8 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

HTTP download speed testing depends on various variables in the network that could influence the download performance. Following data is the result of downloading a file stored on an external network from the service provider's own network (Off-Net).



HTTP (Off-Net) Download Speed - Chart View (Mbps)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
2Conect ADSL Business (2Mbps)	1.76	1.76	1.76	1.77	1.72	1.80	1.78	1.81	1.80	1.81	1.82	1.80
Batelco ADSL Bussiness (2Mbps)	1.79	1.78	1.78	1.78	1.78	1.76	1.77	1.78	1.78	1.78	1.78	1.78
Etisalcom ADSL Business (2Mbps)	2.29	2.36	2.33	2.31	2.29	2.30	2.33	2.37	2.37	2.38	2.42	2.43
Results Average	1.95	1.97	1.96	1.95	1.93	1.95	1.96	1.98	1.98	1.99	2.01	2.00

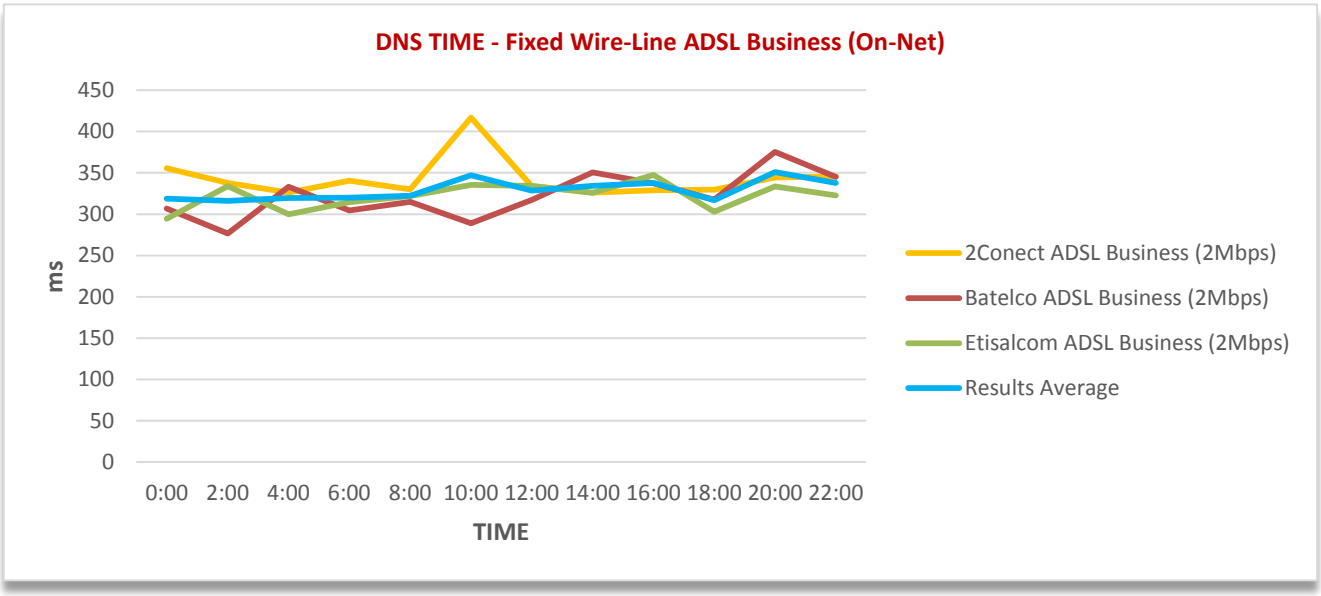
HTTP (Off-Net) Download Speed - Chart View (Mbps)

HIGHLIGHT

- Results Average HTTP download speed of 2 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

3.2 DNS TIME FOR FIXED WIRE-LINE BUSINESS PACKAGES

The DNS time test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address. The DNS servers used for the query in this section is located within the provider's own network (On-Net).



DNS Time (On-Net) Chart View (milliseconds)

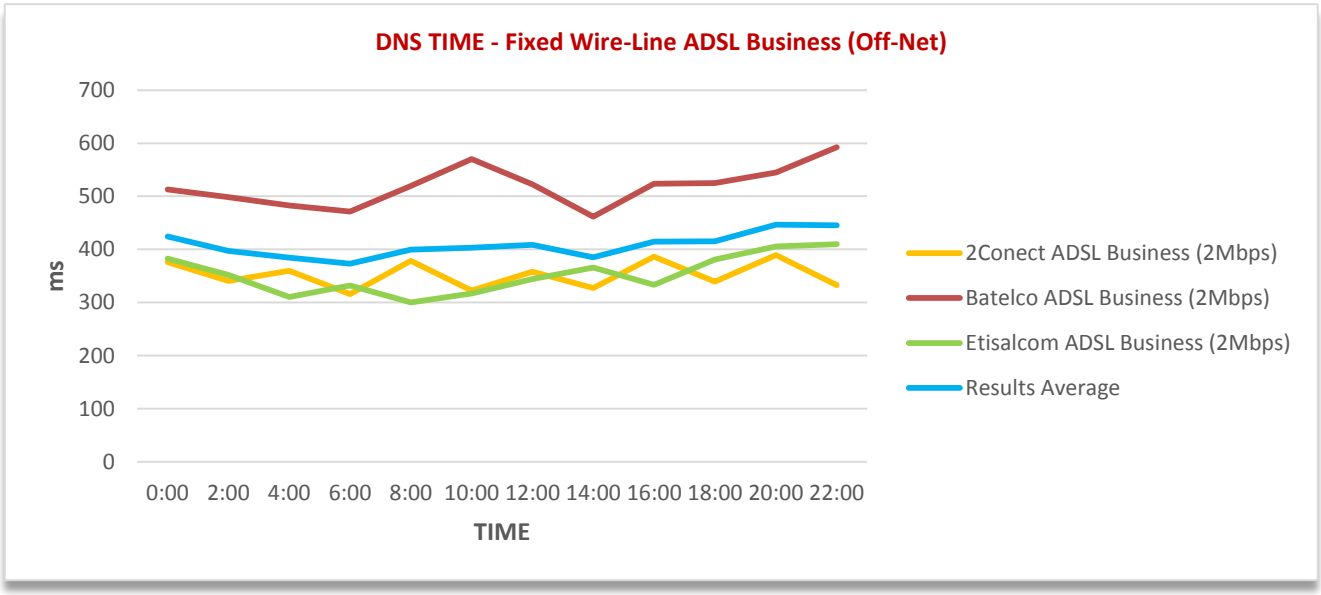
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
2Conect ADSL Business (2Mbps)	355.46	337.62	326.22	340.59	330.15	416.99	334.05	326.30	328.77	329.74	344.32	345.49
Batelco ADSL Bussiness (2Mbps)	306.69	276.41	333.06	304.62	314.98	288.99	317.42	350.59	337.38	317.81	375.27	345.07
Etisalcom ADSL Business (2Mbps)	294.52	333.91	300.00	314.61	321.76	335.31	334.39	325.61	347.35	303.00	333.57	322.69
Results Average	318.89	315.98	319.76	319.94	322.30	347.10	328.62	334.17	337.84	316.85	351.05	337.75

DNS Time (On-Net) Chart View (milliseconds)

HIGHLIGHT

- The Results Average DNS resolution time is 329 milliseconds.
- The lower the DNS time, the better the customer browsing experience will be in loading web pages.

The DNS time test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address. The DNS servers used for the query in this section is located outside the provider's network from the service provider's own network (Off-Net).



DNS Time (Off-Net) Chart View (milliseconds)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
2Conect ADSL Business (2Mbps)	376.18	340.37	359.86	315.78	378.50	322.64	358.35	327.42	386.13	339.25	389.61	333.01
Batelco ADSL Bussiness (2Mbps)	513.07	498.67	482.72	471.19	519.46	569.91	522.49	461.85	523.66	525.20	544.68	592.49
Etisalcom ADSL Business (2Mbps)	383.03	352.20	310.41	332.15	300.07	317.29	344.41	365.84	333.51	381.25	405.57	409.99
Results Average	424.09	397.08	384.33	373.04	399.34	403.28	408.42	385.04	414.44	415.23	446.62	445.16

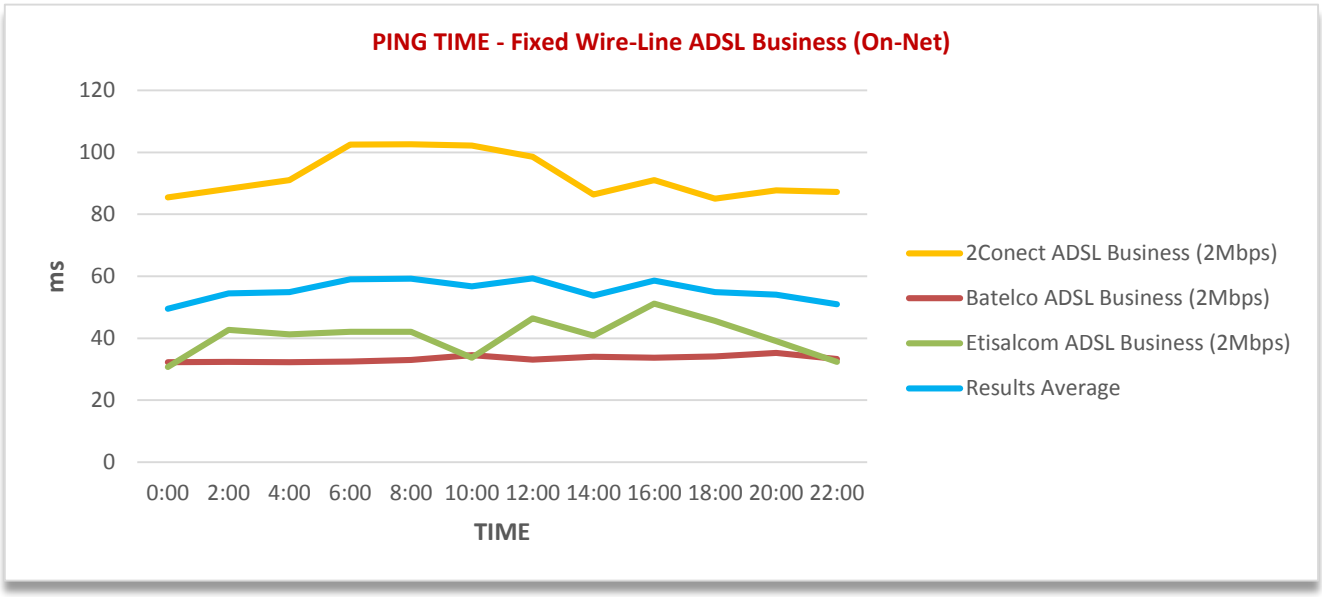
DNS Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Results average of DNS resolution time is 408 milliseconds.
- The lower the DNS time, the better the customer browsing experience in loading web pages.

3.3 PING TIME FOR FIXED WIRE-LINE BUSINESS PACKAGES

Ping time or round trip time (RTT) is a method to measure the time it takes to send a number of Bytes to a destination host and have them acknowledged. The ping test has been performed by sending five (5) packets of 32 bytes each to a server located within the provider's own network (On-Net), and measuring the response time. The higher the ping time represents higher latency, so lower ping time denotes better customer experience for internet applications and websites response time.



PING Time (On-Net) Chart View (milliseconds)

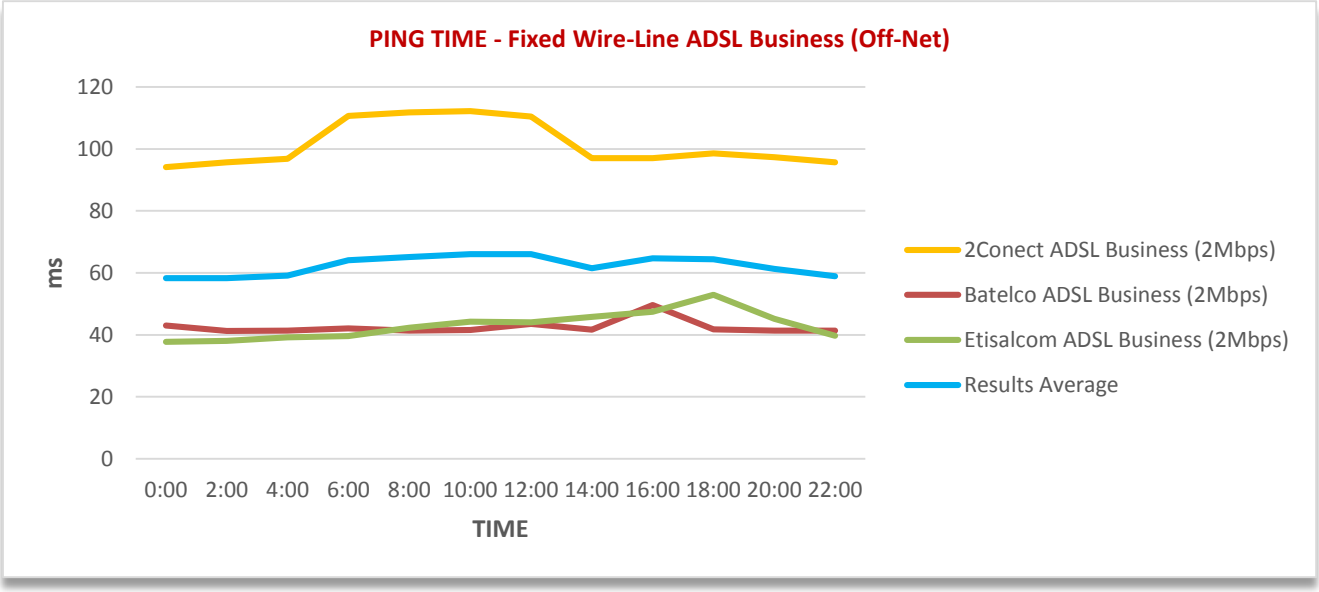
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
2Conect ADSL Business (2Mbps)	85.41	88.30	91.06	102.47	102.58	102.18	98.56	86.39	91.04	85.09	87.73	87.21
Batelco ADSL Bussiness (2Mbps)	32.30	32.36	32.30	32.46	32.99	34.51	33.08	34.06	33.68	34.11	35.29	33.28
Etisalcom ADSL Business (2Mbps)	30.68	42.65	41.23	42.06	42.03	33.66	46.38	40.84	51.22	45.54	39.10	32.42
Results Average	49.46	54.44	54.87	59.00	59.20	56.79	59.34	53.76	58.65	54.91	54.04	50.97

PING Time (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results average Latency is 55.5 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

Ping time or round trip time (RTT) is a method to measure the time it takes to send a number of Bytes to a destination host and have them acknowledged. The ping test has been performed by sending five (5) packets of 32 bytes each to a server located outside the provider's own network (Off-Net), and measuring the response time. The higher the ping time represents higher latency, so lower ping time denotes better customer experience for internet applications and websites response time.



PING Time (Off-Net) Chart View (milliseconds)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
2Conect ADSL Business (2Mbps)	94.10	95.68	96.87	110.68	111.78	112.20	110.47	96.99	97.02	98.63	97.33	95.67
Batelco ADSL Bussiness (2Mbps)	43.03	41.27	41.36	42.03	41.30	41.58	43.51	41.65	49.63	41.76	41.36	41.33
Etisalcom ADSL Business (2Mbps)	37.70	38.08	39.16	39.59	42.31	44.26	44.02	45.76	47.40	52.89	45.18	39.74
Results Average	58.28	58.34	59.13	64.10	65.13	66.01	66.00	61.47	64.68	64.43	61.29	58.91

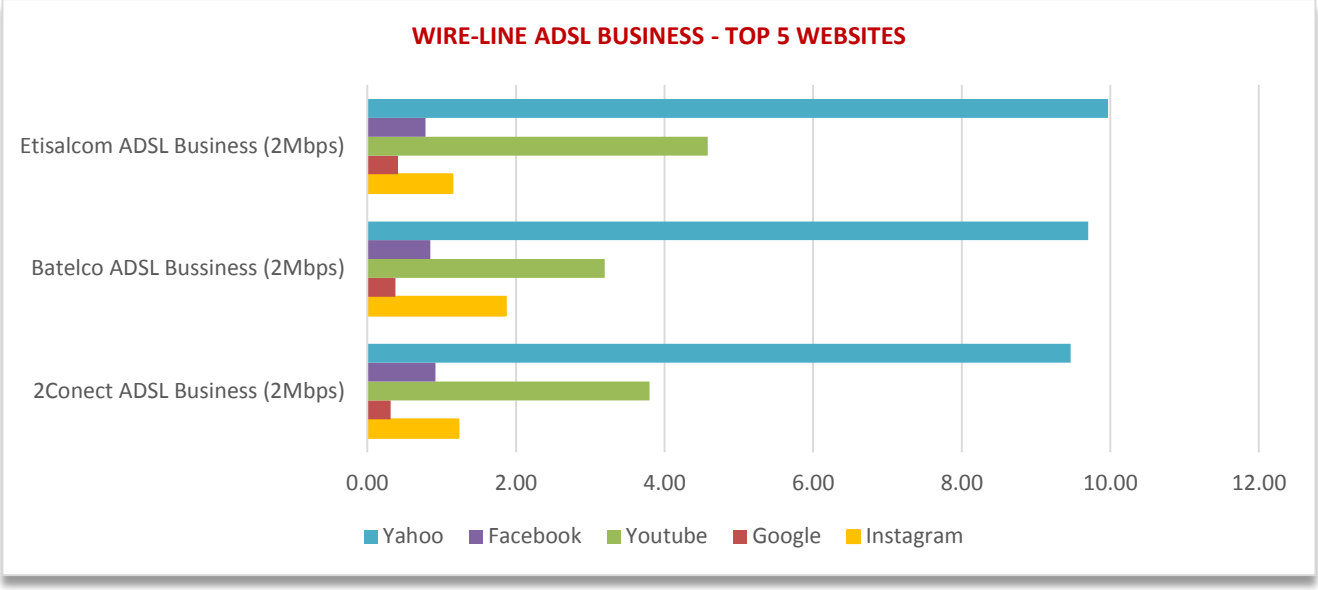
PING Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average for Latency is 62.3 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

3.4 TOP 5 WEBSITES FOR FIXED WIRE-LINE BUSINESS PACKAGES

Top five (5) websites testing aims to measure the response time of using most common websites via an internet browser. Test indicates the time it takes to load the page using a browser. The lower the time it takes to load the page indicates better customer browsing experience.



Top 5 Websites Browsing Time Chart View (Seconds)

ISP Name	Instagram	Google	Youtube	Facebook	Yahoo
2Conect ADSL Business (2Mbps)	1.23	0.31	3.80	0.92	9.47
Batelco ADSL Bussiness (2Mbps)	1.86	0.38	3.19	0.85	9.70
Etisalcom ADSL Business (2Mbps)	1.14	0.41	4.58	0.78	9.97

Top 5 Websites Browsing Time Table View (Seconds)

HIGHLIGHT

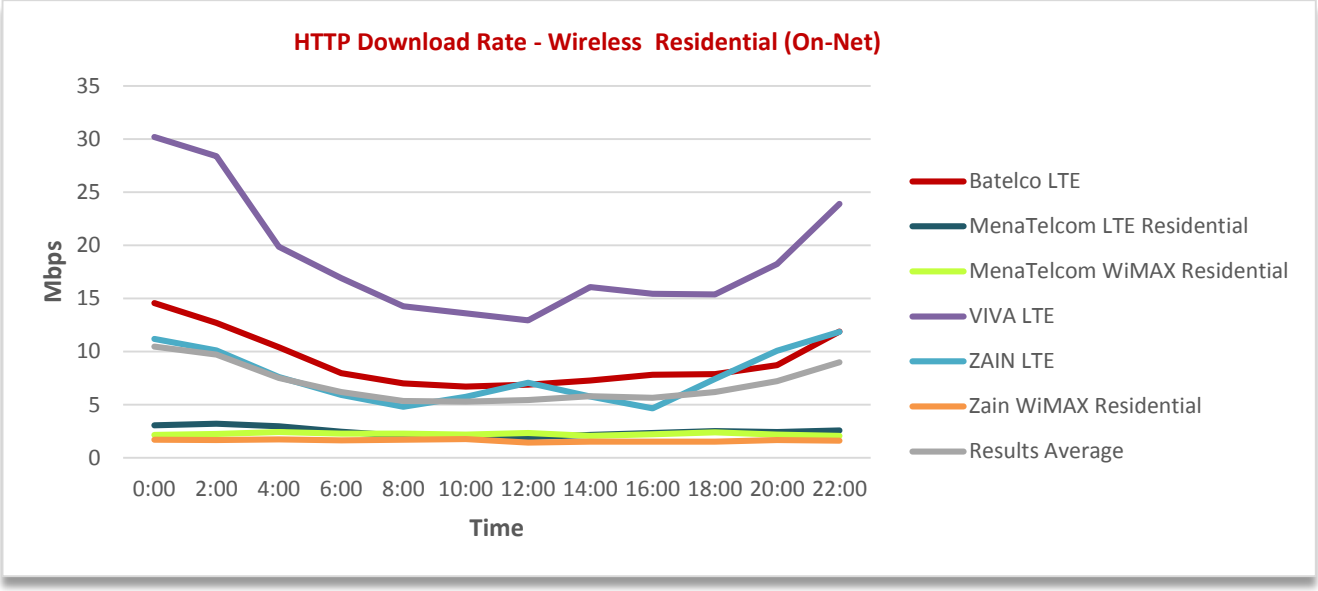
- Customers on average face better browsing experience with Google and Instagram services than with Yahoo.
- Lower results value indicates better customer browsing experience.

4. FIXED WIRLESS BROADBAND INTERNET TESTING - RESIDENTIAL SERVICES

4. FIXED WIRLESS BROADBAND INTERNET TESTING for RESIDENTIAL SERVICES

4.1 HTTP DOWNLOAD SPEED FOR WIRELESS RESIDENTIAL PACKAGES

Testing HTTP download speed depends on various variables in the network that could influence the download performance. Following data is the result of downloading a file stored on a server that is hosted on the provider's own network (On-Net).



HTTP (On-Net) Download Speed - Chart View (Mbps)

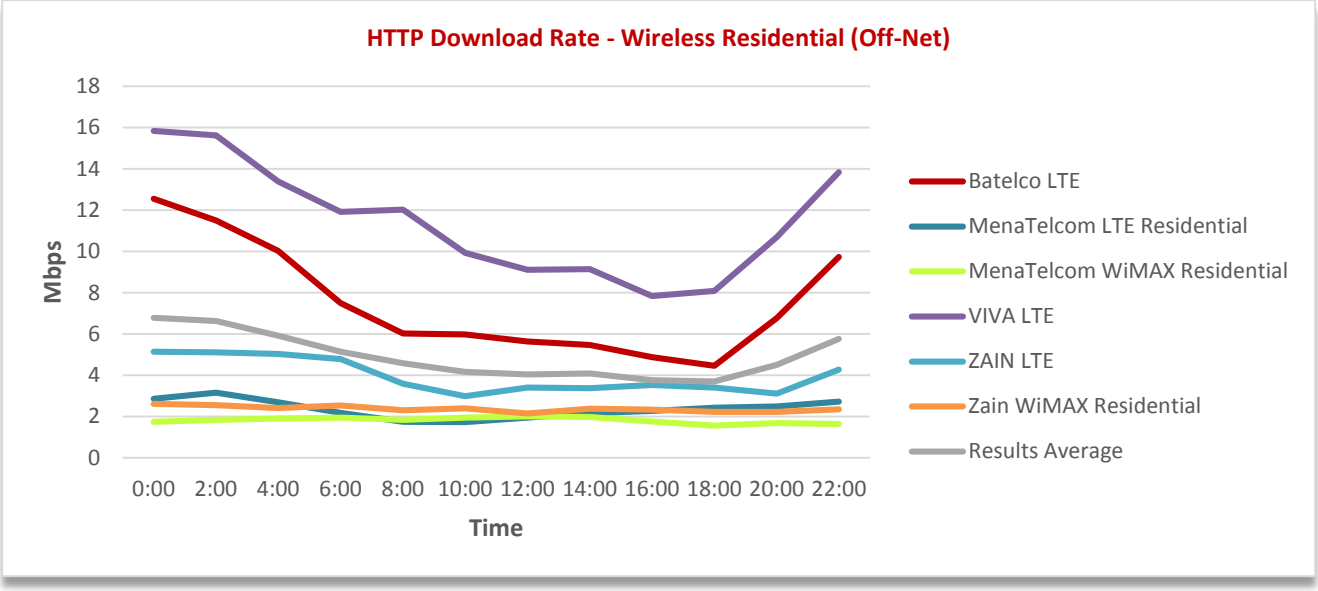
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco LTE	14.56	12.70	10.40	7.96	7.01	6.69	6.87	7.26	7.82	7.87	8.73	11.87
MenaTelcom LTE Residential	3.04	3.20	2.96	2.46	2.07	1.79	1.95	2.14	2.33	2.51	2.41	2.57
MenaTelcom WiMAX Residential	2.15	2.25	2.42	2.27	2.28	2.17	2.32	2.07	2.21	2.40	2.19	2.07
VIVA LTE	30.19	28.40	19.87	16.92	14.26	13.61	12.93	16.06	15.43	15.37	18.23	23.91
Zain LTE	11.19	10.11	7.61	5.92	4.80	5.74	7.07	5.75	4.65	7.43	10.07	11.86
Zain WiMAX Residential	1.70	1.67	1.74	1.63	1.71	1.76	1.44	1.50	1.52	1.51	1.66	1.60
Results Average	10.47	9.72	7.50	6.19	5.35	5.29	5.43	5.80	5.66	6.18	7.21	8.98

HTTP (On-Net) Download Speed – Summary Table (Mbps)

HIGHLIGHT

- Results Average HTTP download speed of 6.98 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

HTTP download speed testing depends on various variables in the network that could influence the download performance. Following data is the result of downloading a file stored on an external network from the service provider's own network (Off-Net).



HTTP (Off-Net) Download Speed - Chart View (Mbps)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco LTE	12.55	11.50	10.03	7.50	6.03	5.98	5.63	5.46	4.88	4.46	6.77	9.72
MenaTelcom LTE Residential	2.86	3.16	2.69	2.17	1.74	1.73	1.95	2.16	2.27	2.42	2.50	2.72
MenaTelcom WiMAX Residential	1.74	1.83	1.91	1.94	1.84	1.94	2.02	1.98	1.75	1.56	1.69	1.64
VIVA LTE	15.83	15.61	13.38	11.91	12.02	9.93	9.11	9.14	7.83	8.08	10.69	13.83
Zain LTE	5.14	5.12	5.03	4.79	3.59	2.99	3.40	3.37	3.52	3.41	3.12	4.27
Zain WiMAX Residential	2.62	2.55	2.42	2.54	2.30	2.40	2.15	2.38	2.34	2.22	2.23	2.36
Results Average	6.79	6.63	5.91	5.14	4.59	4.16	4.04	4.08	3.77	3.69	4.50	5.75

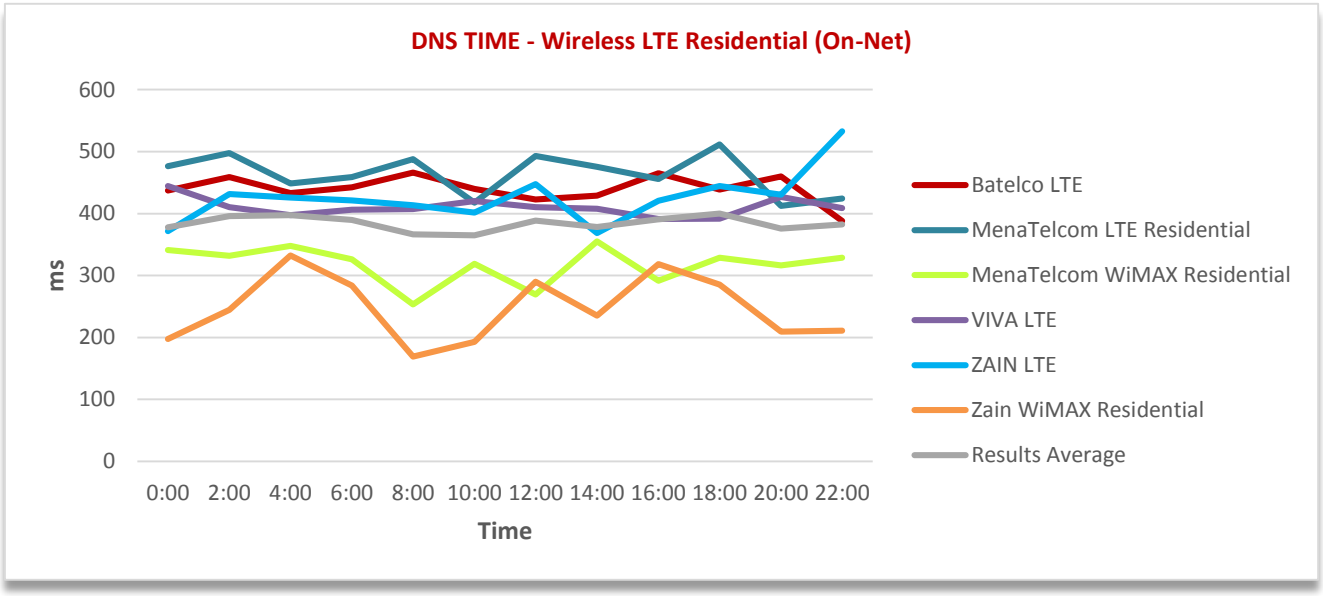
HTTP (Off-Net) Download Speed - Chart View (Mbps)

HIGHLIGHT

- Results Average HTTP download speed of 4.92 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

4.2 DNS TIME FOR WIRELESS RESIDENTIAL PACKAGES

The DNS time test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address. The DNS servers used for the query in this section is located within the provider's own network (On-Net).



DNS Time (On-Net) Chart View (milliseconds)

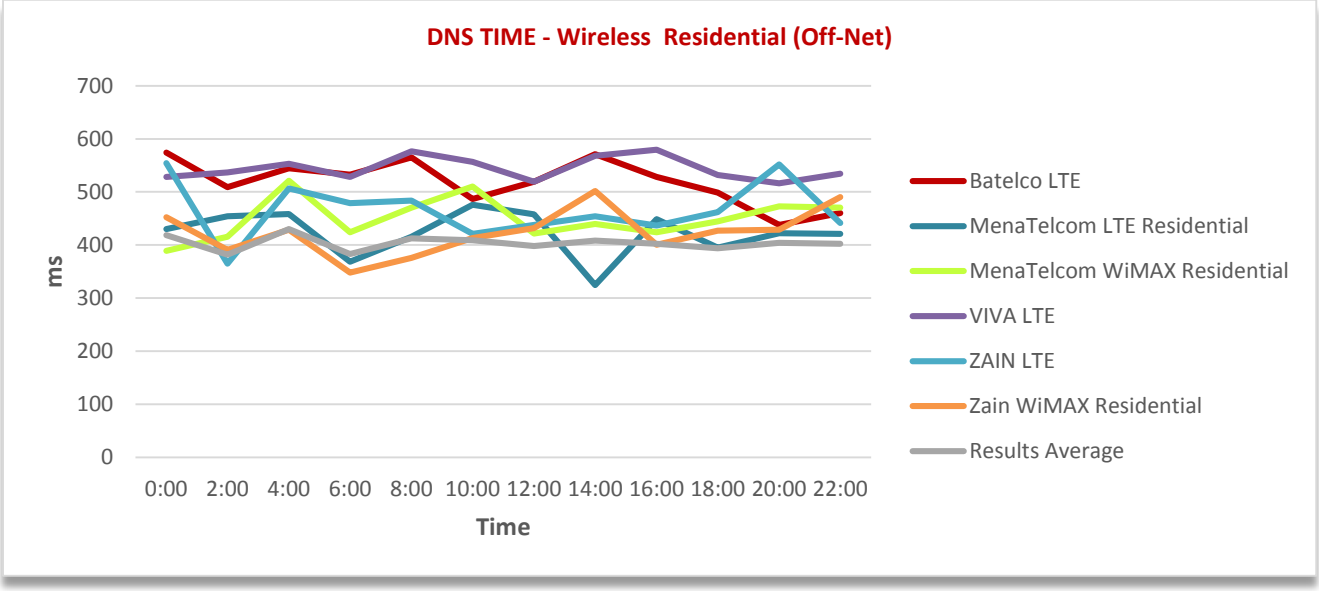
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco LTE	437.17	458.72	433.12	442.23	465.97	439.93	422.55	429.09	465.31	438.69	460.15	388.13
MenaTelcom LTE Residential	476.30	497.89	448.68	459.20	488.02	417.53	492.97	475.63	455.85	511.67	412.20	424.58
MenaTelcom WiMAX Residential	341.19	332.04	347.83	326.17	253.18	318.88	269.53	355.34	291.41	328.74	316.60	328.62
VIVA LTE	444.33	410.52	397.46	406.39	407.54	419.98	410.25	407.72	391.30	391.61	427.13	408.90
Zain LTE	371.65	431.60	426.09	421.15	413.37	401.39	447.60	368.71	420.88	444.37	430.56	532.58
Zain WiMAX Residential	197.47	244.78	332.64	283.92	169.32	192.73	289.79	235.02	318.33	285.21	209.23	210.81
Results Average	378.02	395.93	397.64	389.84	366.23	365.07	388.78	378.59	390.51	400.05	375.98	382.27

DNS Time (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results average DNS resolution time is 384 milliseconds.
- The lower the DNS time, the better the customer browsing experience in loading web pages.

The DNS time test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address. The DNS servers used for the query in this section is located outside the provider's network from the service provider's own network (Off-Net).



DNS Time (Off-Net) Chart View (milliseconds)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco LTE	574.16	509.17	544.29	532.43	565.25	486.98	519.18	571.35	528.08	498.74	438.17	460.36
MenaTelcom LTE Residential	430.18	454.08	458.45	368.86	415.54	475.64	457.85	324.69	448.71	394.82	422.15	420.88
MenaTelcom WiMAX Residential	388.89	415.52	520.87	424.17	470.40	510.11	421.84	439.41	423.78	444.29	473.08	470.50
VIVA LTE	528.53	536.92	552.99	528.15	576.80	556.68	519.15	568.32	579.32	532.04	515.98	534.20
Zain LTE	554.30	365.10	506.88	478.88	483.89	421.32	437.68	454.09	436.78	462.00	551.78	441.66
Zain WiMAX Residential	452.56	391.06	428.86	348.32	376.10	413.30	431.61	502.04	400.66	427.19	428.79	490.55
Results Average	418.37	381.69	430.33	382.97	412.57	409.15	398.19	408.56	402.48	394.16	404.28	402.59

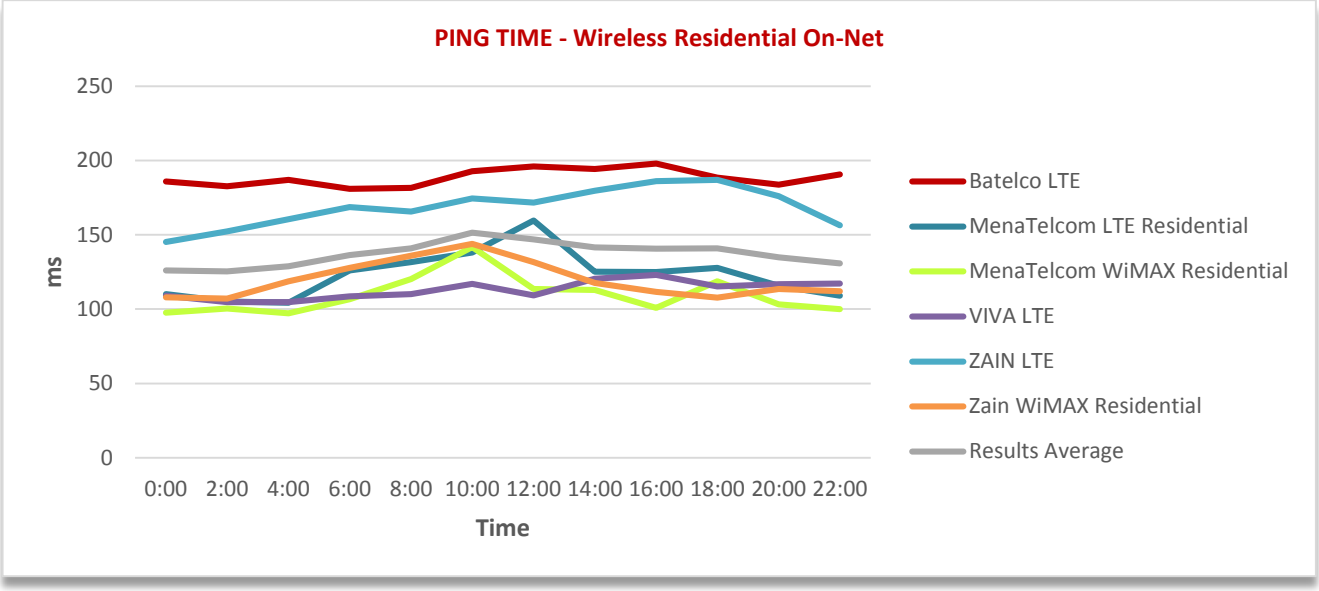
DNS Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average DNS resolution time is 403 milliseconds.
- The lower the DNS time, the better the customer browsing experience in loading web pages.

4.3 PING TIME FOR WIRELESS RESIDENTIAL PACKAGES

Ping time or round trip time (RTT) is a method to measure the time it takes to send a number of Bytes to a destination host and have them acknowledged. The ping test has been performed by sending five (5) packets of 32 bytes each to a server located within the provider's own network (On-Net), and measuring the response time. The higher the ping time represents higher latency, so lower ping time denotes better customer experience for internet applications and websites response time.



Ping Time (On-Net) Chart View (milliseconds)

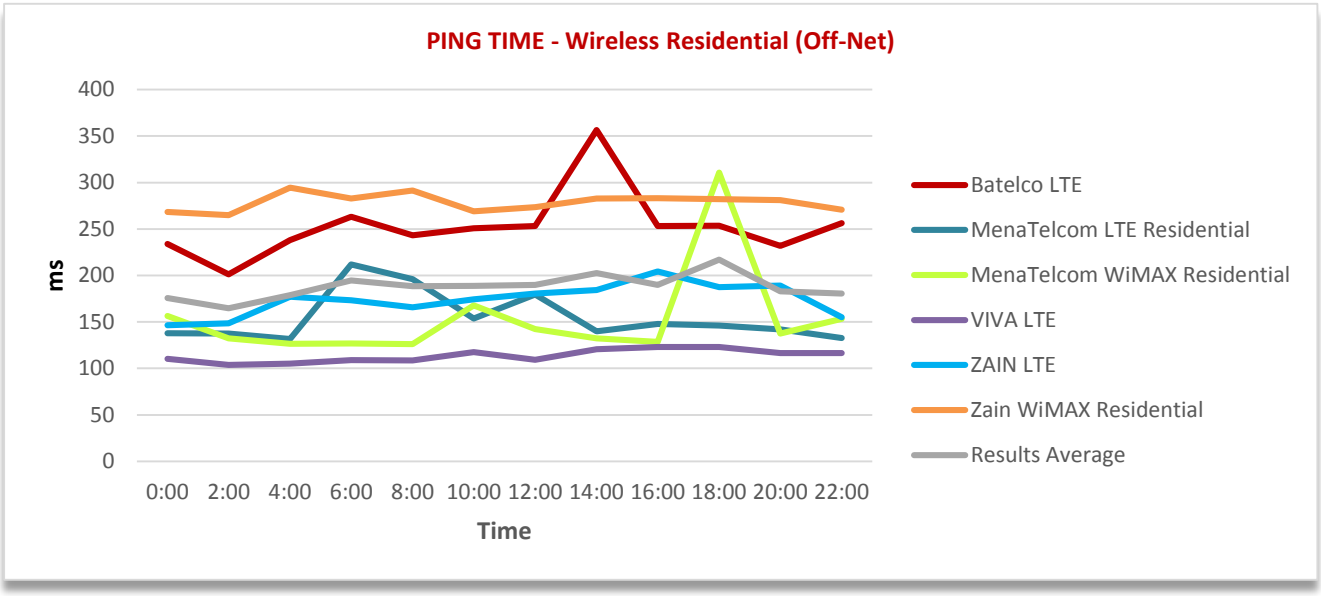
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco LTE	185.86	182.70	187.04	181.01	181.56	192.81	195.93	194.17	197.84	188.43	183.64	190.67
MenaTelcom LTE Residential	110.20	105.15	104.37	125.95	131.69	138.18	159.54	125.18	125.04	127.85	115.60	108.98
MenaTelcom WiMAX Residential	97.67	100.42	97.22	106.75	120.14	141.73	113.57	112.83	100.82	118.82	103.18	99.89
VIVA LTE	109.09	104.62	104.74	108.64	110.03	117.03	109.15	120.36	122.96	115.22	116.68	117.14
Zain LTE	145.20	152.31	160.52	168.55	165.56	174.46	171.64	179.56	186.02	186.84	175.96	156.39
Zain WiMAX Residential	107.93	107.14	118.68	127.83	135.98	143.92	131.58	117.68	111.56	107.85	113.60	112.07
Industry Average	125.99	125.39	128.76	136.45	140.83	151.35	146.90	141.63	140.70	140.83	134.78	130.86

Ping Time (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average Latency is at 137 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

Ping time or round trip time (RTT) is a method to measure the time it takes to send a number of Bytes to a destination host and have them acknowledged. The ping test has been performed by sending five (5) packets of 32 bytes each to a server located outside the provider's own network (Off-Net), and measuring the response time. The higher the ping time represents higher latency, so lower ping time denotes better customer experience for internet applications and websites response time.



Ping Time (Off-Net) Chart View (milliseconds)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Batelco LTE	233.91	201.07	238.05	263.06	243.28	250.84	253.29	356.42	253.09	253.38	231.75	256.22
MenaTelcom LTE Residential	137.83	137.52	131.74	211.93	196.05	153.82	179.42	139.89	147.67	146.02	142.07	132.81
MenaTelcom WiMAX Residential	156.53	132.33	126.37	126.90	126.01	167.68	142.22	132.24	128.49	310.60	137.63	153.26
VIVA LTE	110.14	103.85	105.05	108.85	108.66	117.48	109.20	120.45	123.07	122.98	116.43	116.44
Zain LTE	146.52	148.39	177.05	173.45	165.81	174.36	180.50	184.20	204.23	187.47	189.13	154.89
Zain WiMAX Residential	268.45	264.85	294.57	282.84	291.43	269.12	273.68	282.90	283.09	282.10	281.25	270.61
Results Average	175.56	164.67	178.80	194.51	188.54	188.88	189.72	202.68	189.94	217.09	183.04	180.71

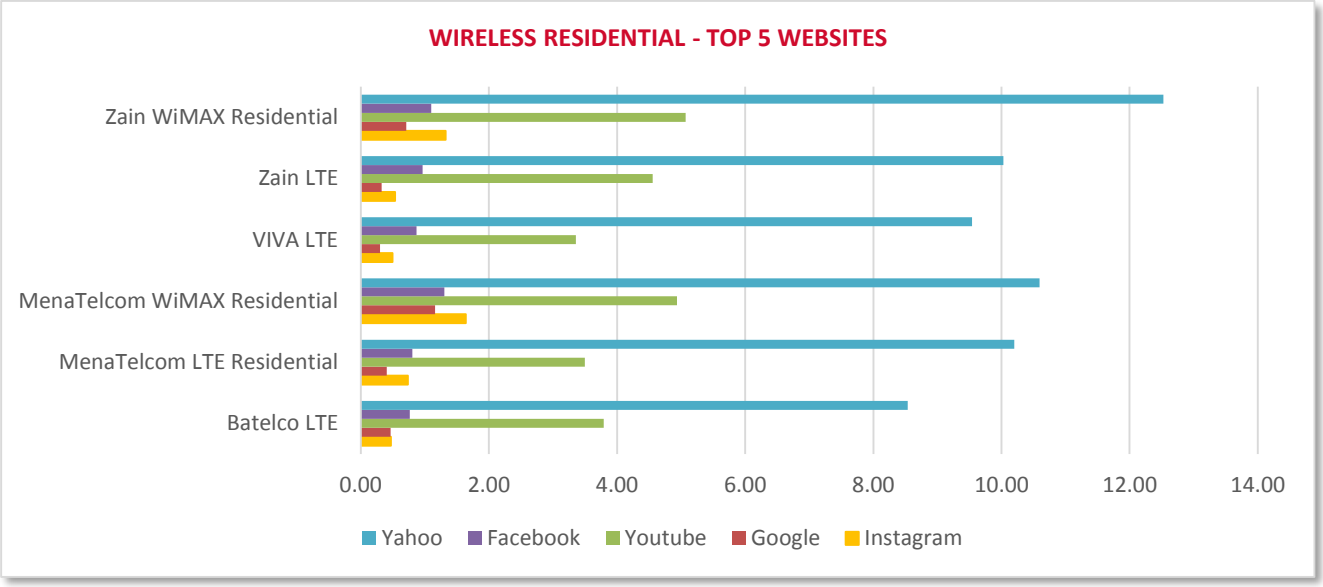
Ping Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average Latency is 187 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience

4.4 TOP 5 WEBSITES FOR WIRELESS RESIDENTIAL PACKAGES

Top five (5) websites testing aims to measure the response time of using most common websites via an internet browser. Test indicates the time it takes to load the page using a browser. The lower the time it takes to load the page indicates better customer browsing experience.



Top 5 Websites Browsing Time Chart View (Seconds)

ISP Name	Instagram	Google	Youtube	Facebook	Yahoo
Batelco LTE	0.47	0.47	3.79	0.77	8.54
MenaTelcom LTE Residential	0.74	0.40	3.50	0.80	10.20
MenaTelcom WiMAX Residential	1.64	1.16	4.94	1.31	10.60
VIVA LTE	0.50	0.30	3.36	0.87	9.54
Zain LTE	0.54	0.33	4.56	0.96	10.03
Zain WiMAX Residential	1.33	0.71	5.07	1.10	12.53

Top 5 Browsing Time Table View (Seconds)

HIGHLIGHT

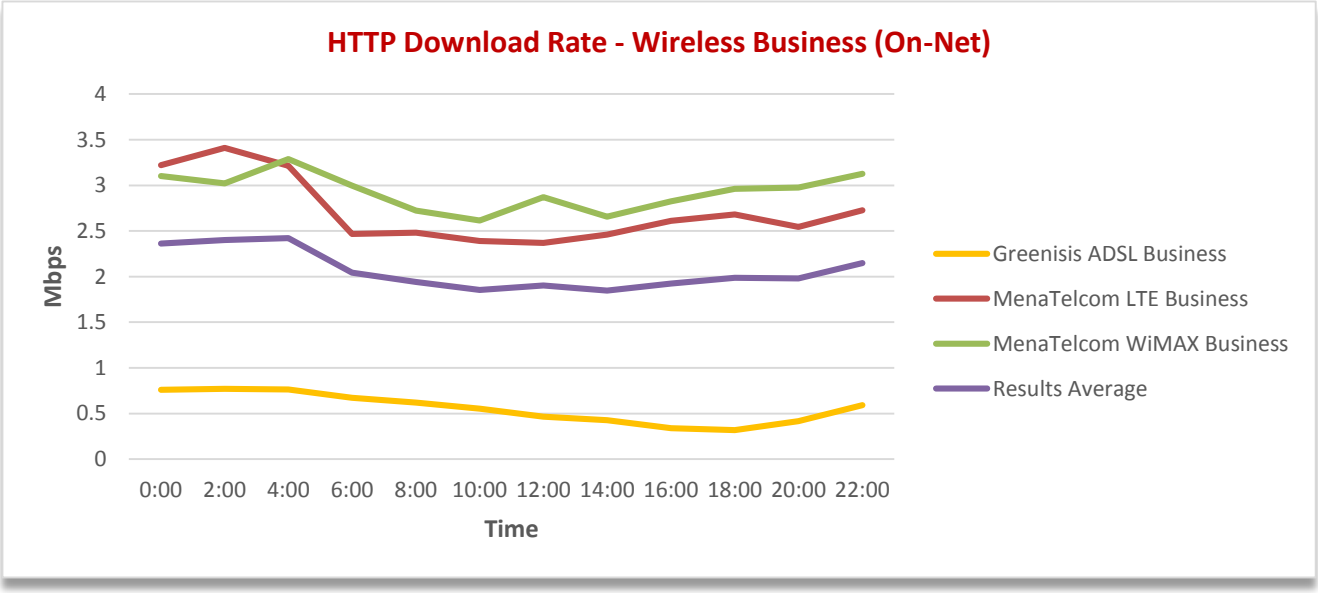
- Customers on average face better browsing experience with Google and Instagram services than with Yahoo.
- Lower results value indicates better customer browsing experience.

5. FIXED WIRELESS BROADBAND INTERNET TESTING for BUSINESS SERVICES

5. FIXED WIRELESS BROADBAND INTERNET TESTING for BUSINESS SERVICES

5.1 HTTP DOWNLOAD SPEED FOR WIRELESS BUSINESS PACKAGES

Testing HTTP download speed depends on various variables in the network that could impact the download performance. Following data is the result of downloading a file stored on a server that is hosted on the provider's network (On-Net).



HTTP (On-Net) Download Speed - Chart View (Mbps)

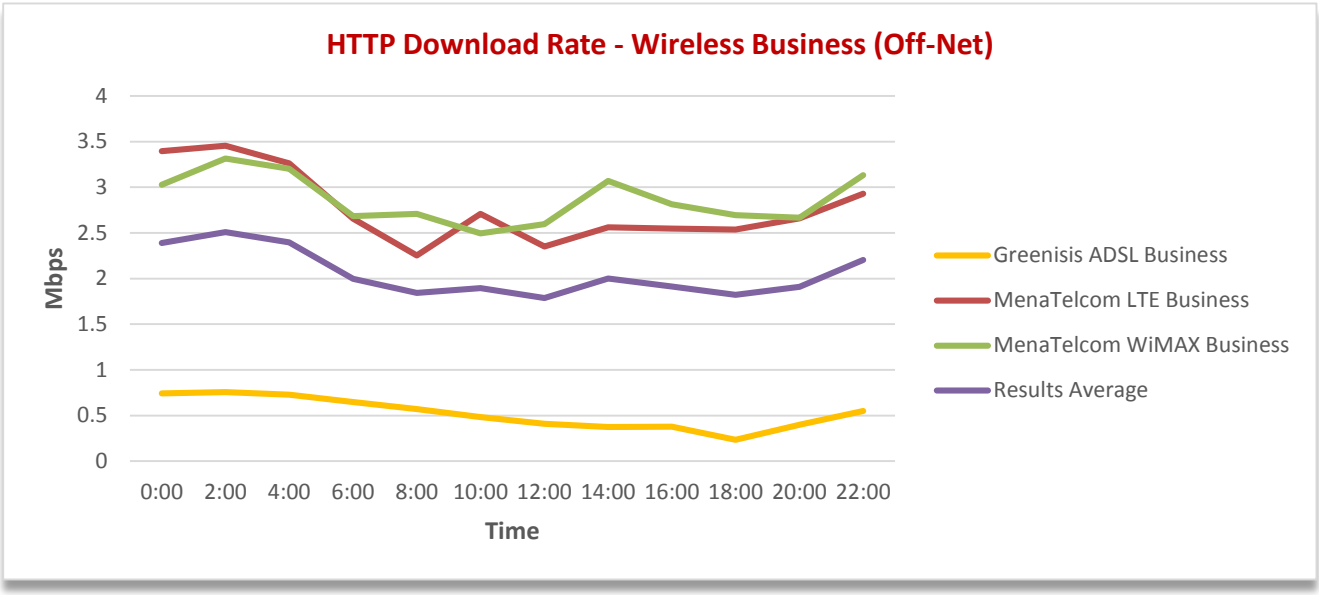
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
MenaTelcom LTE Business	3.22	3.41	3.21	2.47	2.48	2.39	2.37	2.46	2.61	2.68	2.55	2.73
MenaTelcom WiMAX Business	3.10	3.02	3.29	3.00	2.72	2.62	2.87	2.66	2.82	2.96	2.98	3.13
Greenisis ADSL Business	0.76	0.77	0.76	0.67	0.62	0.55	0.47	0.43	0.34	0.32	0.42	0.59
Results Average	2.36	2.40	2.42	2.04	1.94	1.85	1.90	1.85	1.92	1.99	1.98	2.15

HTTP (On-Net) Download Speed – Table View (Mbps)

HIGHLIGHT

- Results Average HTTP download speed of 2.07 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

HTTP download speed testing depends on various variables in the network that could influence the download performance. Following data is the result of downloading a file stored on an external network from the service provider's own network (Off-Net).



HTTP (Off-Net) Download Speed - Chart View (Mbps)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
MenaTelcom LTE Business	3.40	3.45	3.26	2.66	2.25	2.71	2.35	2.56	2.55	2.54	2.66	2.93
MenaTelcom WiMAX Business	3.03	3.31	3.20	2.69	2.71	2.49	2.60	3.07	2.81	2.69	2.67	3.13
Greenisis ADSL Business	0.74	0.76	0.73	0.65	0.57	0.48	0.41	0.37	0.38	0.23	0.40	0.55
Results Average	2.39	2.51	2.40	2.00	1.84	1.90	1.79	2.00	1.91	1.82	1.91	2.20

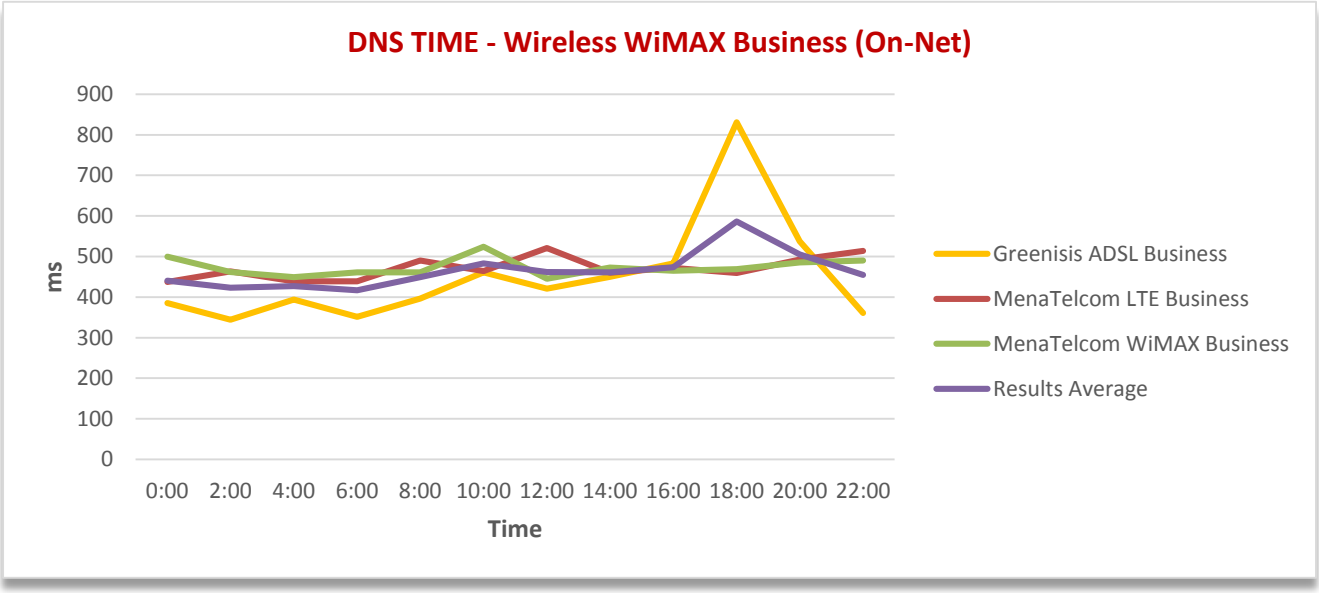
HTTP (Off-Net) Download Speed -Table View (Mbps)

HIGHLIGHT

- Results Average HTTP download speed of 2.06 Mbps has been recorded.
- Higher HTTP download value indicates better downlink internet speed.

5.2 DNS TIME FOR WIRELESS BUSINESS PACKAGES

The DNS time test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address. The DNS servers used for the query in this section is located within the provider's own network (On-Net).



DNS Time (On-Net) Chart View (milliseconds)

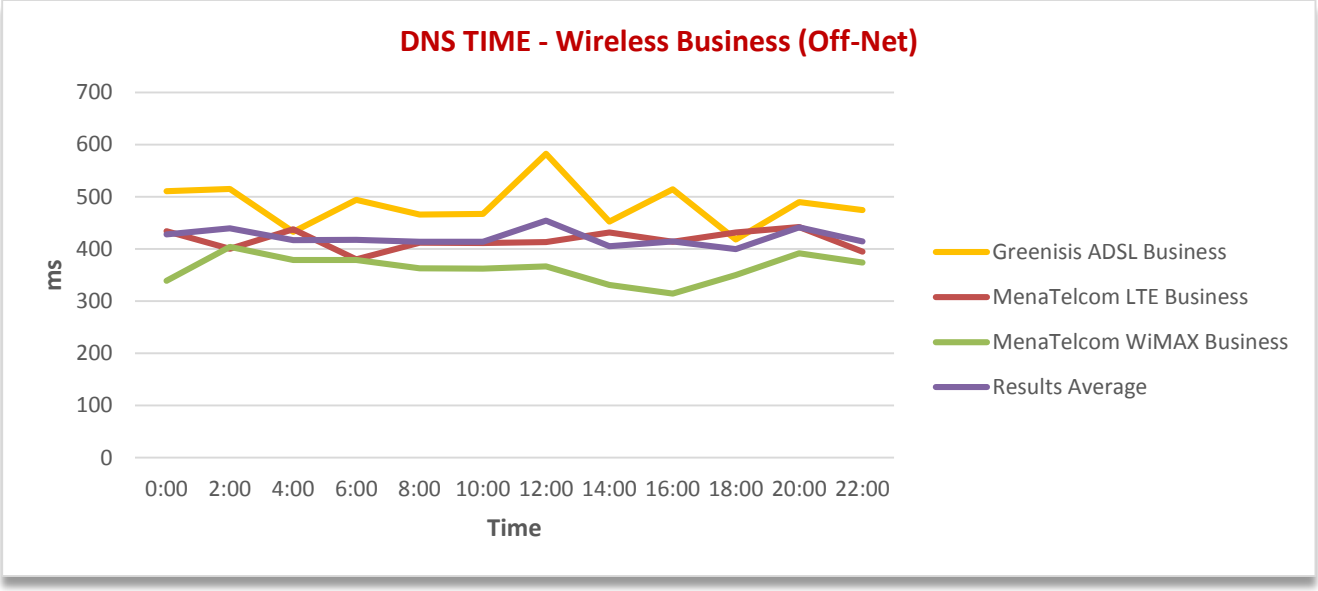
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
MenaTelcom LTE Business	437.08	463.66	438.82	438.69	490.36	463.74	520.74	459.95	472.38	459.42	492.28	513.77
MenaTelcom WiMAX Business	499.50	461.90	449.05	460.74	461.18	523.77	444.82	473.01	465.17	468.92	485.20	490.36
Greenisis ADSL Business	385.10	343.93	393.57	351.21	396.01	460.84	420.58	449.66	483.22	831.14	537.44	360.93
Results Average	440.56	423.16	427.14	416.88	449.18	482.78	462.05	460.87	473.59	586.49	504.97	455.02

DNS Time (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average DNS resolution time is 465.23 milliseconds.
- The lower the DNS time, the better the customer browsing experience in loading web pages

The DNS time test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address. The DNS servers used for the query in this section is located outside the provider's network from the service provider's own network (Off-Net).



DNS Time (Off-Net) Chart View (milliseconds)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
MenaTelcom LTE Business	434.33	400.36	438.00	379.97	411.69	411.42	413.22	431.90	413.88	431.80	442.23	394.68
MenaTelcom WiMAX Business	338.92	403.94	378.95	378.89	363.05	362.02	366.81	330.89	314.74	349.84	391.57	374.18
Greenisis ADSL Business	510.51	515.18	433.06	493.96	465.97	467.43	582.33	452.26	514.31	417.93	489.96	474.74
Results Average	427.92	439.83	416.67	417.61	413.57	413.62	454.12	405.02	414.31	399.86	441.25	414.53

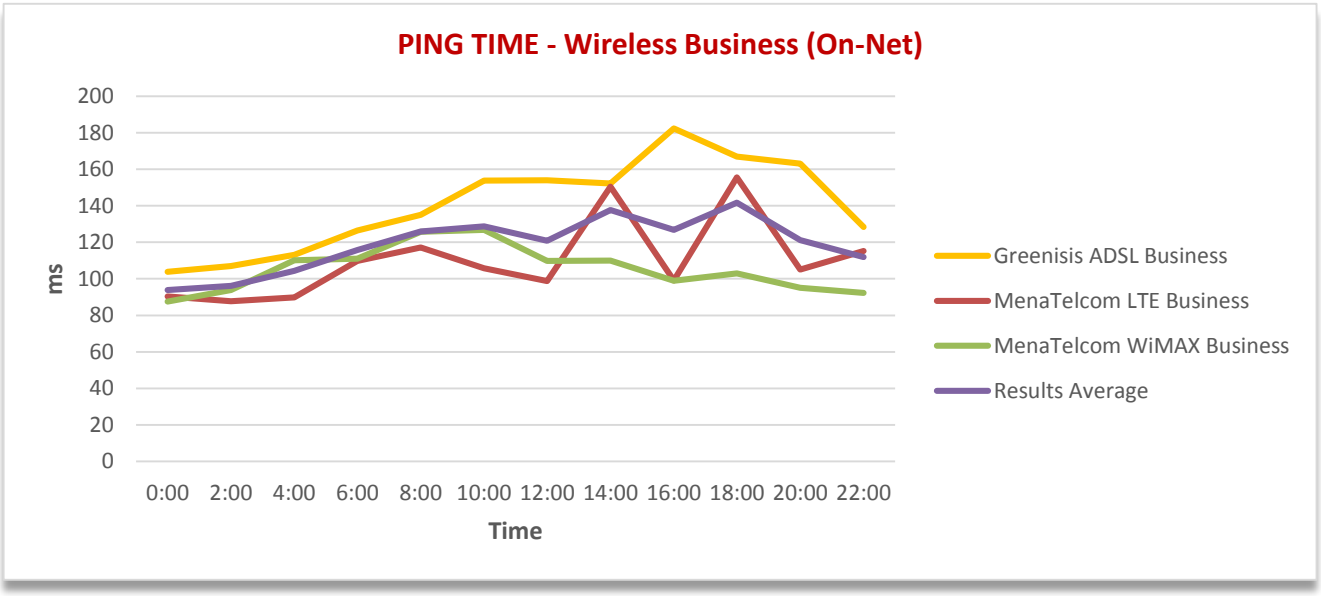
DNS Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average DNS resolution time is 421.5 milliseconds.
- The lower the DNS time, the better the customer browsing experience in loading web pages.

5.3 PING TIME FOR WIRELESS BUSINESS PACKAGES

Ping time or round trip time (RTT) is a method to measure the time it takes to send a number of Bytes to a destination host and have them acknowledged. The ping test has been performed by sending five (5) packets of 32 bytes each to a server located within the provider's own network (On-Net), and measuring the response time. The higher the ping time represents higher latency, so lower ping time denotes better customer experience for internet applications and websites response time.



Ping Time (On-Net) Chart View (milliseconds)

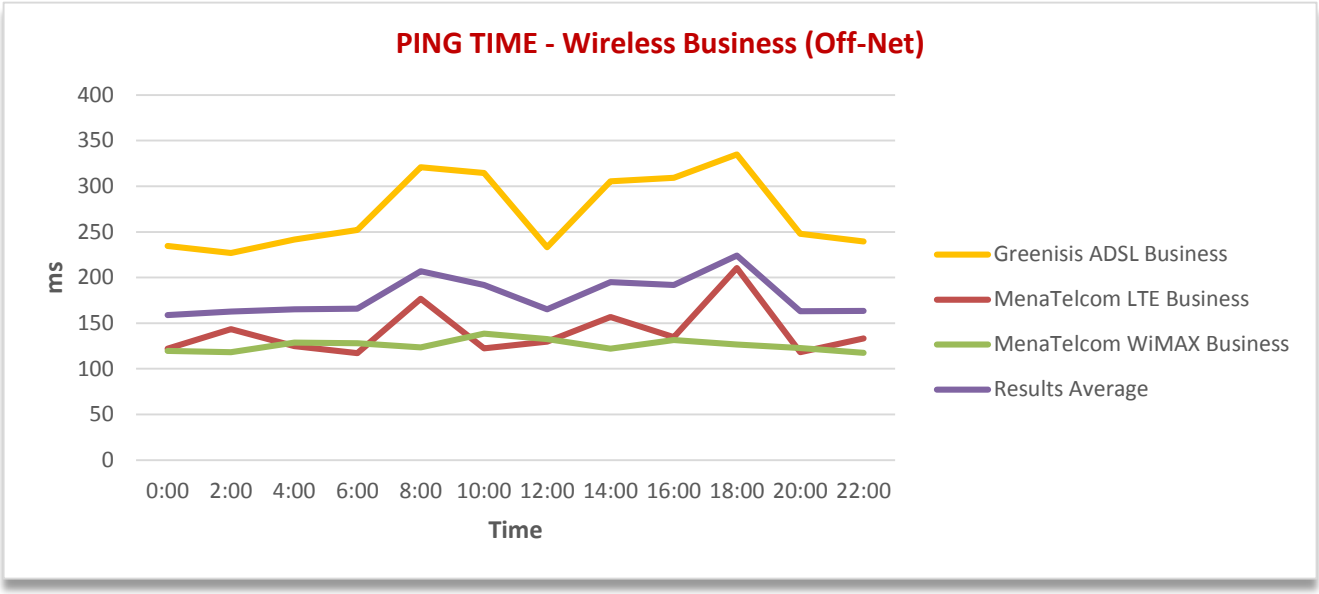
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
MenaTelcom LTE Business	90.30	87.78	89.83	109.78	117.14	105.84	98.83	150.48	99.20	155.46	105.08	115.29
MenaTelcom WiMAX Business	87.61	93.89	110.22	111.10	125.68	126.79	109.83	110.04	98.90	102.90	95.10	92.21
Greenisis ADSL Business	103.78	106.98	113.15	126.53	135.10	153.83	153.93	152.23	182.28	166.95	163.14	128.42
Results Average	93.90	96.22	104.40	115.80	125.97	128.82	120.86	137.58	126.79	141.77	121.11	111.97

Ping Time (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results average Latency is 119 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

Ping time or round trip time (RTT) is a method to measure the time it takes to send a number of Bytes to a destination host and have them acknowledged. The ping test has been performed by sending five (5) packets of 32 bytes each to a server located outside the provider's own network (Off-Net), and measuring the response time. The higher the ping time represents higher latency, so lower ping time denotes better customer experience for internet applications and websites response time.



Ping Time (Off-Net) Chart View (milliseconds)

ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
MenaTelcom LTE Business	122.20	143.36	124.87	117.25	176.76	122.30	129.73	156.91	134.83	210.30	118.13	133.40
MenaTelcom WiMAX Business	119.70	118.30	128.63	128.15	123.38	138.68	132.44	122.02	131.52	126.76	122.80	117.50
Greenisis ADSL Business	234.74	226.95	241.54	252.06	320.68	314.43	233.31	305.54	309.24	334.83	247.97	239.48
Results Average	158.88	162.87	165.01	165.82	206.94	191.80	165.16	194.82	191.86	223.97	162.97	163.46

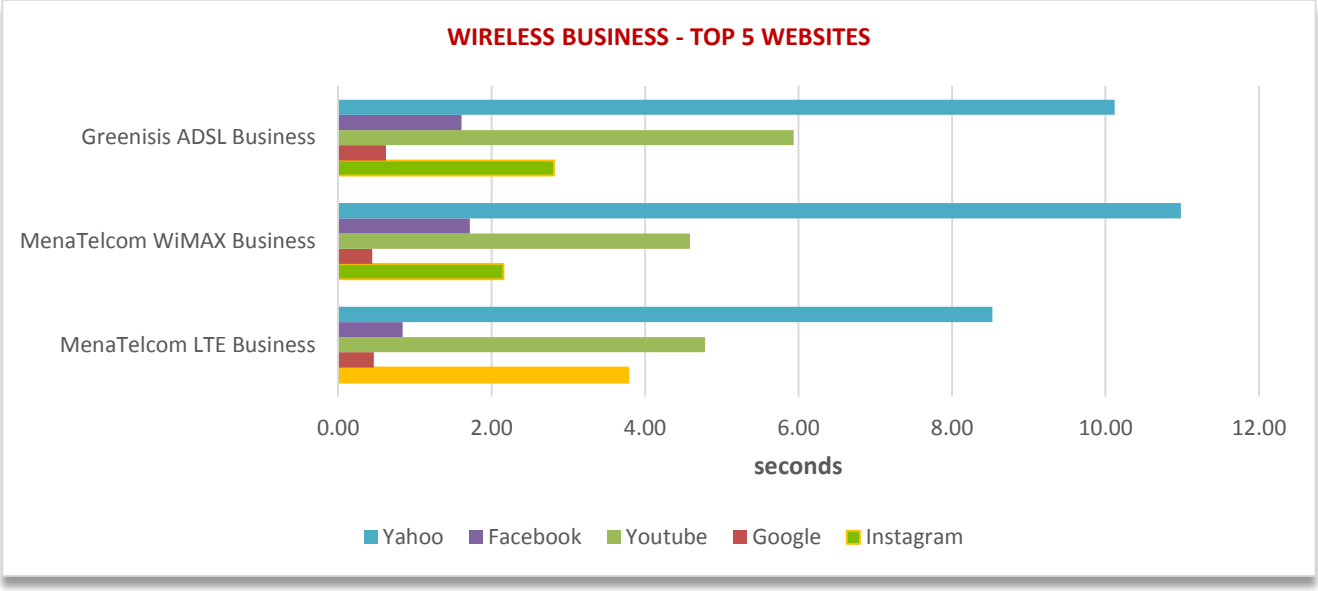
Ping Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average Latency is at 179.5 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

5.4 TOP 5 WEBSITES FOR WIRELESS BUSINESS PACKAGES

Top five (5) websites testing aims to measure the response time of using most common websites via an internet browser. Test indicates the time it takes to load the page using a browser. The lower the time it takes to load the page indicates better customer browsing experience.



Top 5 Websites Browsing Time Chart View (Seconds)

ISP Name	Instagram	Google	Youtube	Facebook	Yahoo
MenaTelcom LTE Business	3.78	0.47	4.78	0.84	8.53
MenaTelcom WiMAX Business	2.15	0.44	4.59	1.72	10.98
Greenisis ADSL Business	2.81	0.62	5.94	1.61	10.12

Top 5 Websites Browsing Time Tablet View (Seconds)

HIGHLIGHT

- Customers on average face better browsing experience with Google and Facebook services than with Yahoo.
- Lower results value indicates better customer browsing experience.

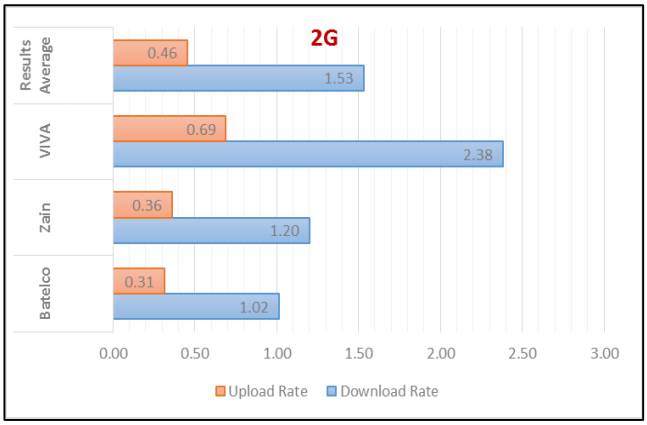
6. STATIONARY MOBILE TESTING

6. STATIONARY MOBILE TESTING

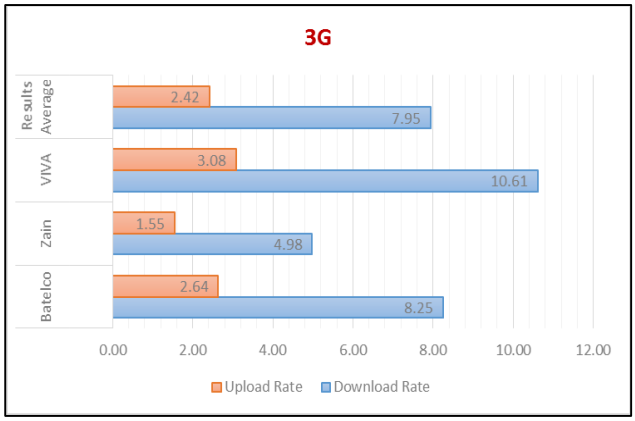
6.1 STATIONARY MOBILE DATA TESTING – HTTP

GSM (2G)

Data Download Transfer Rate is the amount of data transferred from the network to the client. In mobile data networks, the download transfer rate depends on the mobile network technology.



2G Download & Upload Transfer Rate (Mbps)



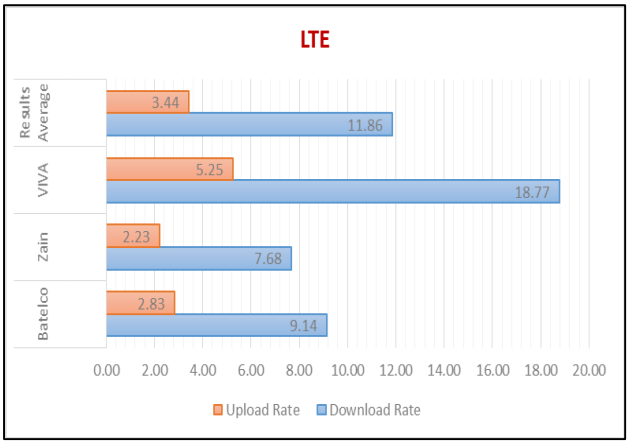
3G Download & Upload Transfer Rate (Mbps)

UMTS (3G)

There is high demand for mobile data applications, and new technologies are continuously being introduced to the market for addressing the ever increasing bandwidth requirements of these applications.

LTE (4G)

Long-Term Evolution is a new wireless standard introduced as the fourth generation mobile network technology (also known as 4G). It provides high speed data transfer for mobile phones and data terminals.



LTE Download & Upload Transfer Rate (Mbps)

6.2 STATIONARY MOBILE APPLICATION TESTING

Facebook is one of the top social networks used in the world. Most smartphones have Facebook applications that keep their users connected around the clock, sharing photos and moments with friends.
Facebook application testing reflects the end-user experience on smartphones by mimicking user routine in the Facebook mobile app.

Facebook testing methodology simulates users' activities on mobile application. The scenario starts by attaching to mobile network APN, then requesting the Facebook mobile website (http://m.facebook.com), and providing user credentials in order to access personal account activities.

The response time is then measured for each of the following activities: load news feed, change personal status, and upload a photo of 800x600 pixels.

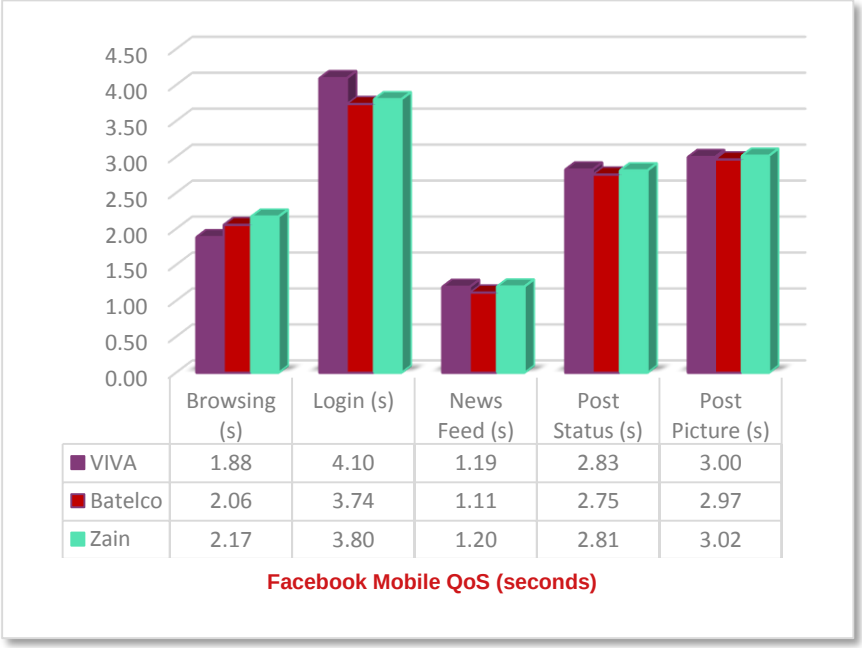
Browsing
Facebook main page Response time

Login
Response time for Facebook login

News Feed
Response time of retrieving new feed in main page

Post Status
Response time of updating personal status

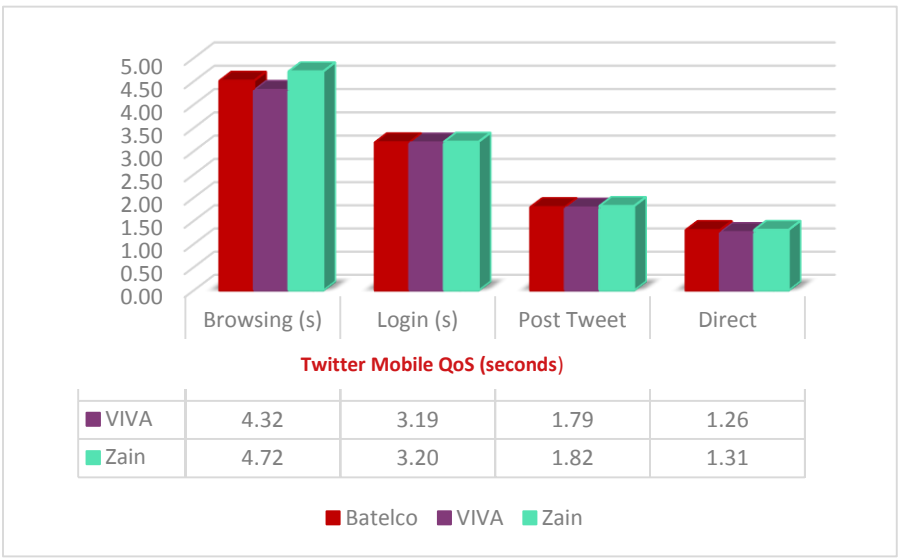
Post Picture
Response time for uploading a picture.



	Browsing (s)	Login (s)	News Feed (s)	Post Status (s)	Post Picture (s)
VIVA	1.88	4.10	1.19	2.83	3.00
Batelco	2.06	3.74	1.11	2.75	2.97
Zain	2.17	3.80	1.20	2.81	3.02

Facebook Mobile QoS (seconds)

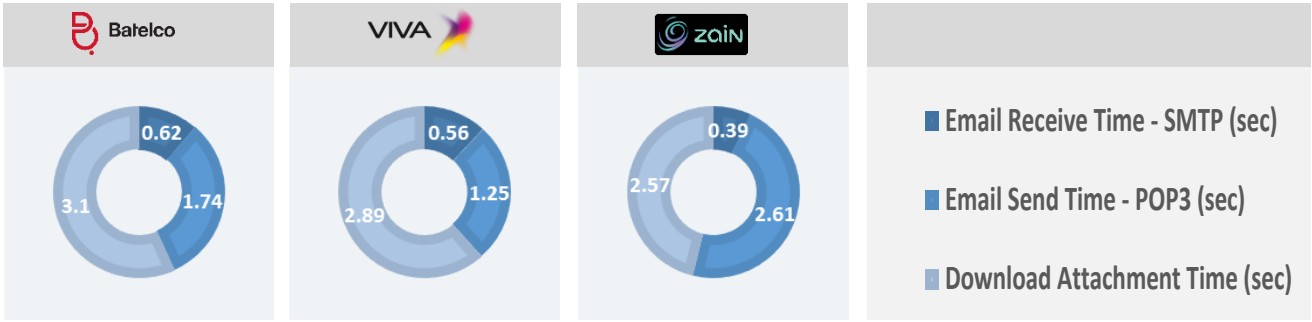
Twitter testing methodology aims to measure the experience of using the twitter mobile application. The main activities are:

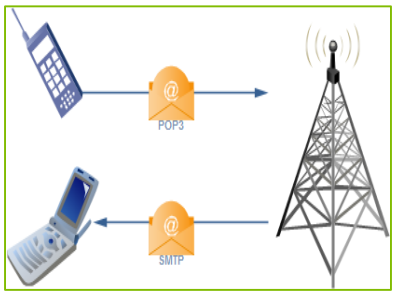


- Browse twitter mobile URL http://mobile.twitter.com
- Provide username and password
- Post a tweet
- Send direct message to a friend

There are many different email applications available on the internet and mobiles handsets such as Gmail, outlook live, yahoo, etc.

Nonetheless, these are all implemented using standard protocols for sending/ receiving emails and attachments. In email testing scenario, the methodology implemented is to use Gmail server for sending an email by POP3 protocol, to a recipient using SMTP.

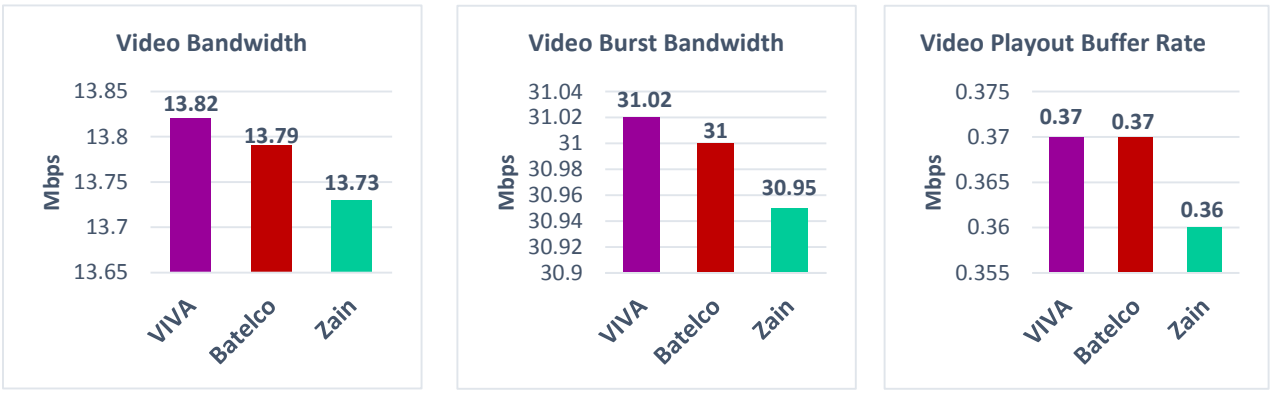




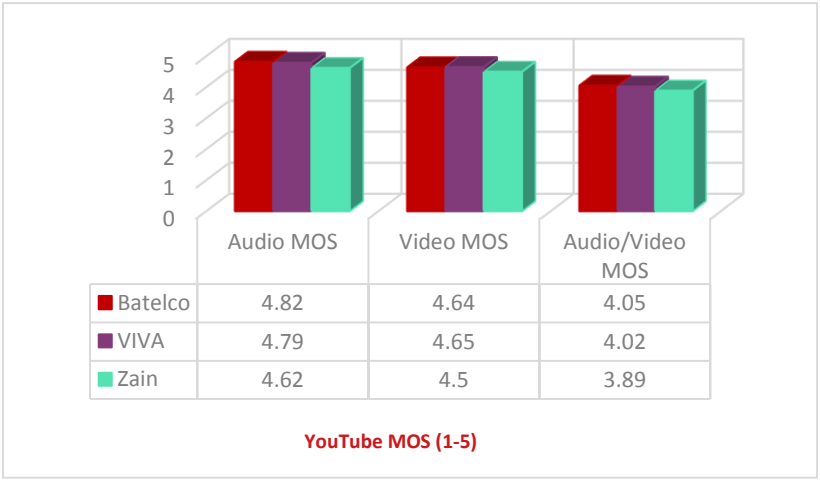
Email Methodology

- Sender logs in to pop.gmail.com
- Sender sends email with 200 KB attachment.
- Recipient logs in to smtp.gmail.com
- Recipient receives the email
- Recipient downloads the attachment

For those who stream videos from online sources, the speed at which data can be sent to their devices is critical. If your connection is not fast enough, streaming video can sometimes stall as it fills the buffer in the receiving device. Or, the content provider might send a lower-quality stream because it senses that your available speed cannot handle higher quality steams. What many refer to as "Internet speed" is actually the bandwidth available to accept data from the Internet into your device. Measured in Megabits per Second (Mbps), it is the amount of data that can be transferred from the server to your connected device in one second.



YouTube Mobile QoS (Mbps)



YouTube MOS (1-5)

Mean opinion score (MOS) is a test used in telephony networks to obtain the human user's view of the quality of the network. The MOS is the arithmetic mean of all the individual scores, and can range from 1 (Bad) to 5 (Excellent).

MOS	Quality
5	Excellent
4	Good
3	Fair
2	Poor
1	Bad

6.3 MOBILE VOICE AND SMS TESTING

MOBILE VOICE CALLS

Voice calls QoS is measured by placing voice calls from each operator for 60 seconds. Calls are done On-Net (within the operator's network) and Off-Net (to other network operators). Call setup time is the overall time taken from dialing a number until the ringing tone is played, it is measured in seconds. Voice call score is an indication of the call quality, ranged from 1 (Poor) to 5 (Excellent).

Operator	Call Setup Time (On-Net) (sec)	Call Setup Time (Off-Net) (sec)
VIVA	5.4	5.9
Batelco	4.8	5.2
Zain	4.7	5.7
Results Average	**5.0**	**5.6**

VOICE CALLS SETUP TIME (Sec)

Operator	Call Quality Score (On-Net)	Call Quality Score (Off-Net)
VIVA	4.25	4.28
Batelco	4.25	4.25
Zain	4.33	4.22
Results Average	**4.3**	**4.3**

VOICE CALLS Quality (1-5)

SMS (Short Messaging Service)

SMS (Short Messaging Service) is tested by sending Unicode text in the size of 120 bytes. The duration of sending and receiving a one-part SMS is calculated in seconds.

Operator	Send SMS Time (sec)	Receive SMS Time (sec)
VIVA	2.4	1.58
Batelco	1.85	2.53
Zain	1.72	2.47
Results Average	**2.0**	**2.2**

SMS SEND vs RECEIVE TIME (Sec)

7. ANNEX - Testing Lines package

Service Provider	Package description	Package Type	Advertised Package	Access Network Technology	Download Threshold	Download Speed	Upload Speed	Throttle Speed
Batelco	Residential	Postpaid	lue packages - Medium	ADSL	200GB	8Mbps	2Mbps	2Mbps
	Residential	Postpaid	Superfast Packages - Superior	Fiber	350GB	25Mbps	2.5Mbps	5Mbps
	Residential	Postpaid	Superfast Packages - Superior	Fiber	500GB	100 Mbps	10Mbps	15Mbps
	Business	Postpaid	Broadband Business	ADSL	Unlimited	2Mbps	1Mbps	Unlimited
	Residential/ Business	Mobile Postpaid	4G LTE Smart Packages	4G LTE	100 GB	lp to 150Mbps	Up to 150Mbps	Unlimited
	Residential	Mobile Prepaid	SimSim Super Packages	4G LTE	100 GB	lp to 150Mbps	Up to 150Mbps	Unlimited
Zain	Residential	Postpaid	Value20	WiMax	80GB	up to 20 Mbps	p to 5 Mbps	Unlimited
	Residential/ Business	Mobile Postpaid	Smart Plans	4G LTE	100 GB	lp to 150Mbps	Up to 150Mbps	Unlimited
	residential	Mobile Prepaid	Dangrous Prepaid	4G LTE	100 GB	lp to 150Mbps	Up to 150Mbps	Unlimited
lenatelecom	Residential	Postpaid	menaHome	WiMax	80GB	18Mb	1Mb	2Mb
	Business	Postpaid	nenaBusiness	WiMax	(Unlimited)	18Mb	2Mb	Unlimited
	Residential	Postpaid	menaHome	4G LTE	100 GB	lp to 150Mbps	Up to 4Mb	3Mb
	Business	Postpaid	MenaBusiness	4G LTE	150 GB	lp to 150Mbps	Up to 4Mb	3Mbps
Etisalcom	Residential	Postpaid	eDSL 8	ADSL	Unlimited	8Mbps	2 Mbps	Unlimited
	Business	Postpaid	eDSL 2	ADSL	Unlimited	2Mbps	1 Mbps	Unlimited
Greenisis (BB)	Business	Postpaid	eenisis Turbo	Mobile Broadband /ireless Access (MBWA)	Unlimited	2Mbps	768Kbps	Unlimited
2Connect	Residential	Postpaid	Internet	ADSL	100GB	2Mbps	1Mbps	Unlimited
	Business	Postpaid	Internet	ADSL	100GB	2Mbps	2Mbps	Unlimited
Viva	Residential/ Business	Mobile Postpaid	Unlimited Smart	4G LTE	100 GB	Up to 150Mbps	Up to 150Mbps	Unlimited
	Residential	Mobile Prepaid	Viva Prepaid	4G LTE	100 GB	Up to 150Mbps	Up to 150Mbps	Unlimited