



BROADBAND QOS REPORT

QUARTER 3 REPORT – 2017

- 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 InfoVista 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 July 1st, 2017 and September 30th, 2017. The data has been averaged according to the hours of the day.

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Tested parameters that has been conducted, are:

HTTP	Hypertext Transfer Protocol
FTP	File Transfer Protocol
PING	Packet Internet Groper
Time to First Byte	Domain Name System
Social Media Applications	Facebook, Twitter, YouTube

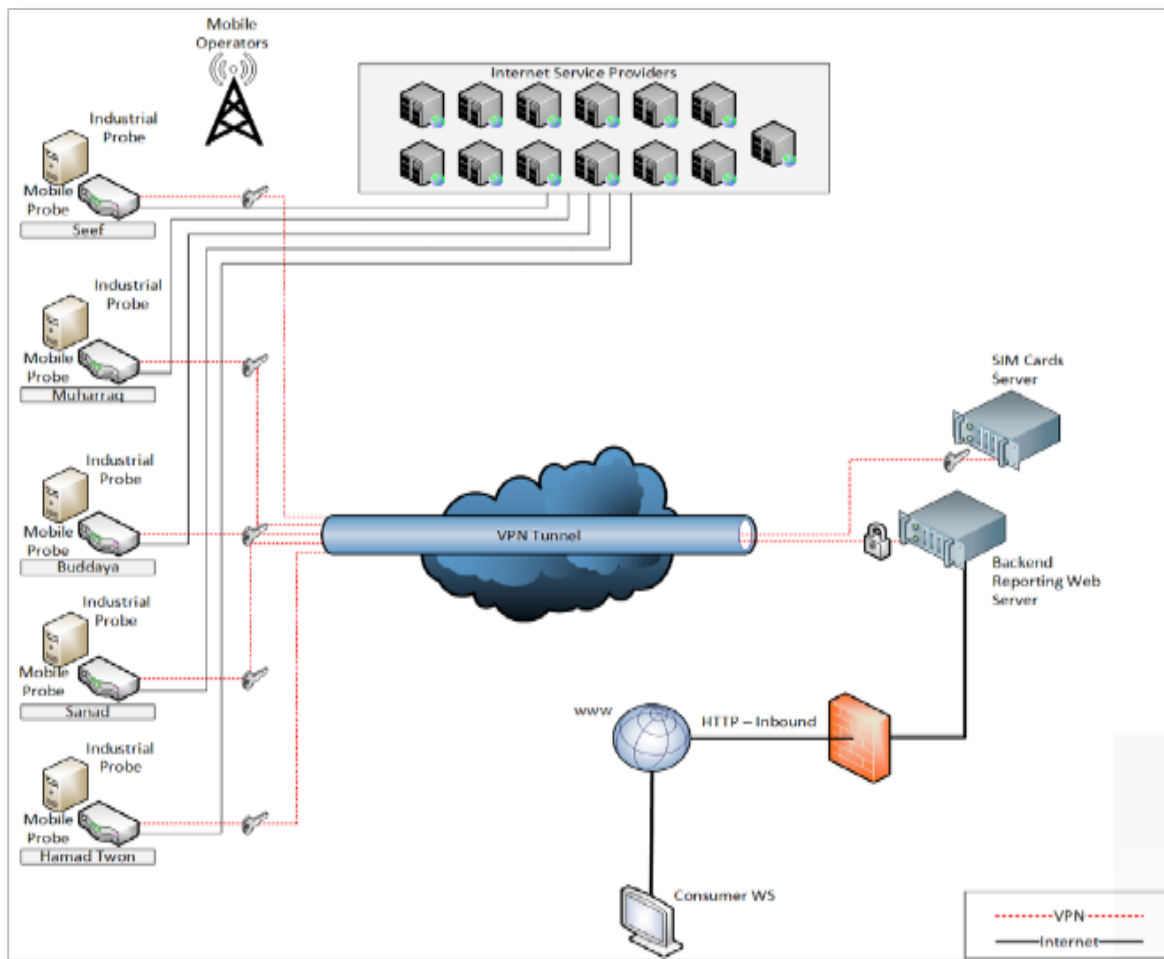
The Testing Lines package used are detailed in Annex 1 for the purpose of reference; these service packages have been selected to benchmark similar service offerings from the different operators in the market.

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.

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NOTICEABLE EVENTS FOR THIS QUARTER

- LTE Mobile network performance for HTTP in Q3 2017 18.26 Mbps has dropped compared to the average speed observed in Q2 2017 23.24 Mbps.
- Ping Results Average significantly improved for Wireless Residential ONNET in Q3 2017 (Ping Time - 43.2 ms) compared to Q2 2017 (Ping Time - 94.3 ms).

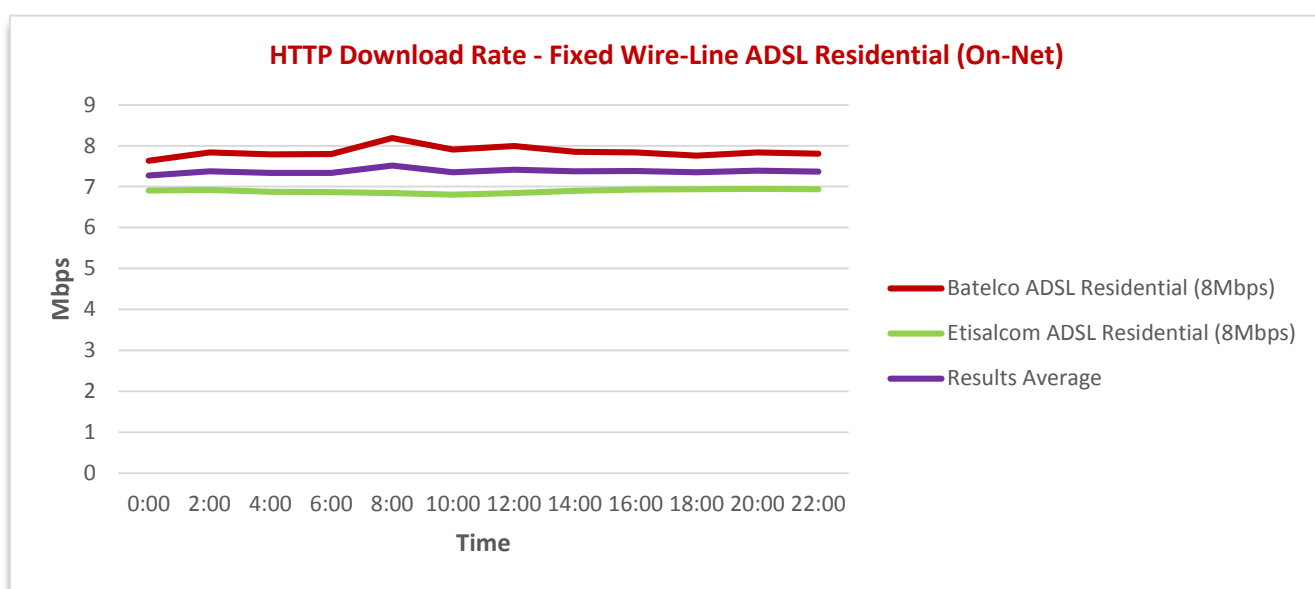
2. FIXED WIRE-LINE - BROADBAND INTERNET TESTING RESIDENTIAL SERVICES



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)	7.63	7.83	7.79	7.80	8.19	7.90	7.99	7.85	7.83	7.76	7.83	7.81
Etisalatcom ADSL Residential (8Mbps)	6.91	6.92	6.88	6.87	6.84	6.80	6.84	6.90	6.93	6.93	6.95	6.93
Industry Average	7.27	7.38	7.34	7.33	7.52	7.35	7.42	7.38	7.38	7.35	7.39	7.37

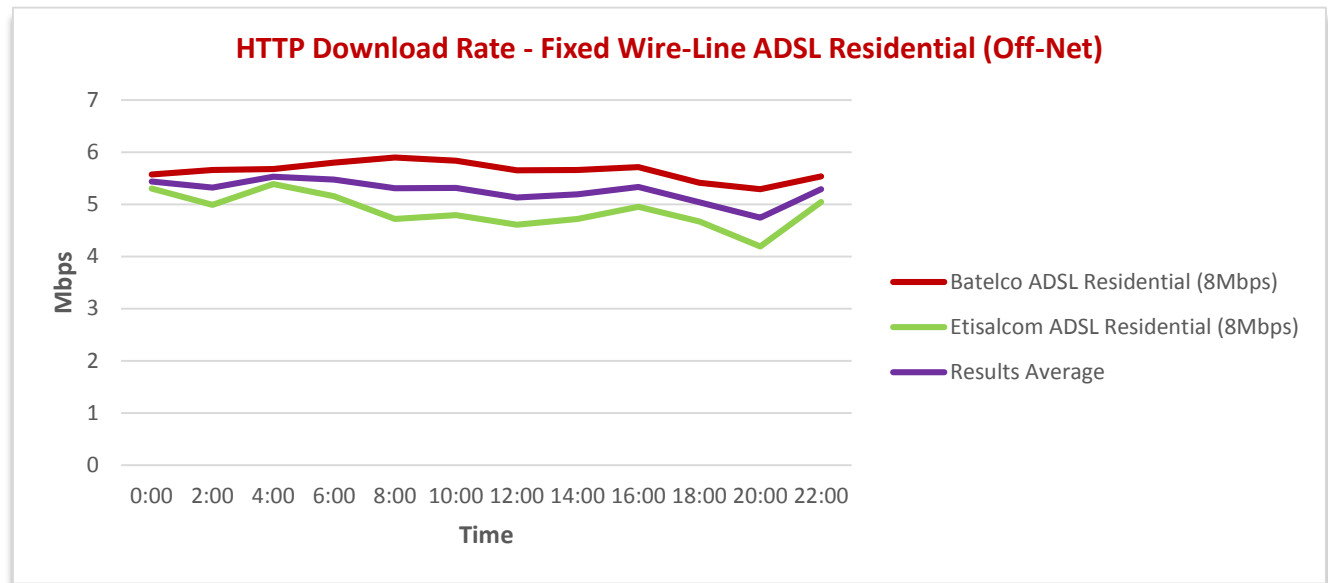
HTTP (On-Net) Download Speed - Summary Table (Mbps)

HIGHLIGHT

- Results average for HTTP download speed of 7.37 Mbps has been noticed.
- Higher HTTP download value indicates higher downlink internet speed.

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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)	5.57	5.66	5.68	5.80	5.90	5.83	5.65	5.66	5.71	5.41	5.29	5.54
Etisalatcom ADSL Residential (8Mbps)	5.30	4.99	5.38	5.15	4.72	4.79	4.61	4.72	4.95	4.67	4.19	5.05
Results Average	5.44	5.32	5.53	5.48	5.31	5.31	5.13	5.19	5.33	5.04	4.74	5.29

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

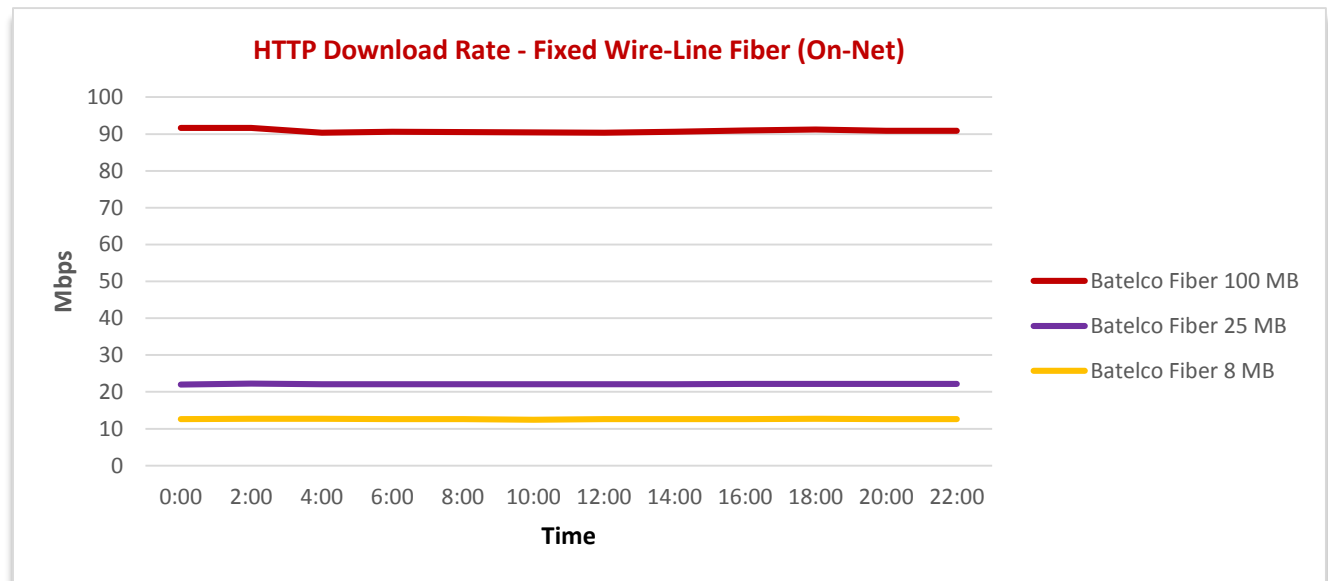
HIGHLIGHT

- Results Average HTTP download speed of 5.3 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

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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 8 MB	12.64	12.69	12.66	12.61	12.63	12.48	12.64	12.62	12.64	12.70	12.61	12.65
Batelco Fiber 25 MB	22.02	22.23	22.12	22.07	22.07	22.06	22.06	22.09	22.19	22.14	22.15	22.17
Batelco Fiber 100 MB	91.65	91.63	90.37	90.60	90.52	90.44	90.34	90.62	90.92	91.21	90.85	90.90

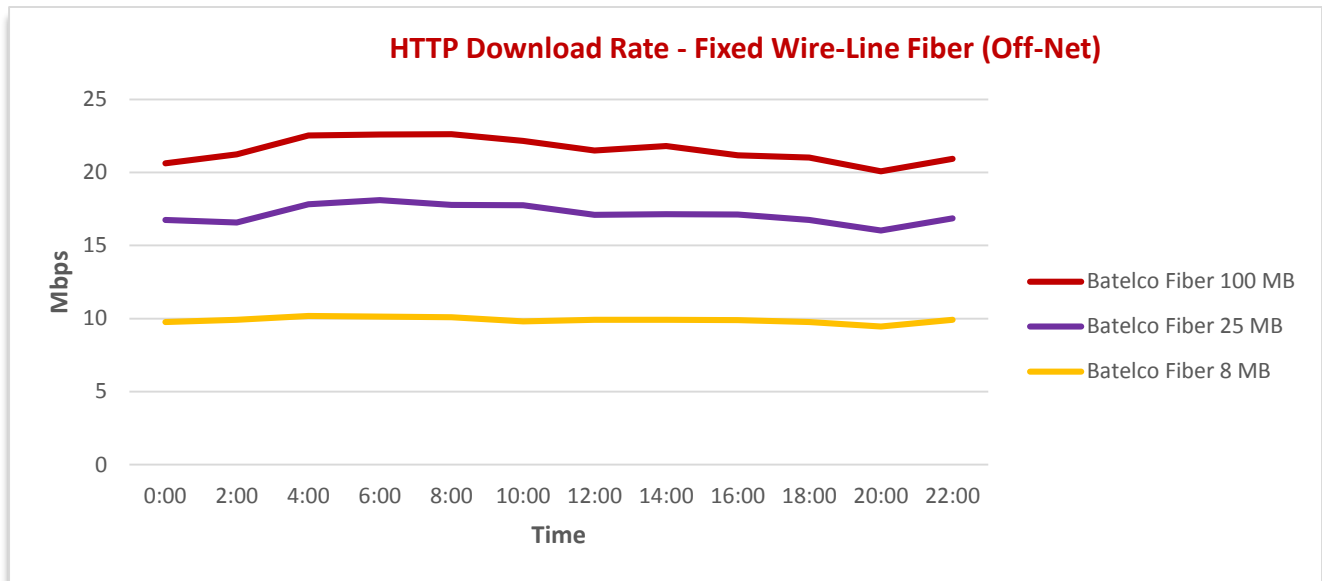
HTTP (On-Net) Download Speed - Summary Table (Mbps)

HIGHLIGHT

- Average HTTP download speed for the 8 Mbps package is 12.63, 25 Mbps package is 22.11 Mbps while for the 100Mbps package it has been recorded as 90.84 Mbps.
- Higher HTTP download value indicates higher downlink internet speed.

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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 8 MB	9.77	9.92	10.17	10.14	10.09	9.81	9.91	9.91	9.89	9.77	9.45	9.91
Batelco Fiber 25 MB	16.76	16.58	17.83	18.12	17.78	17.76	17.10	17.15	17.12	16.75	16.03	16.87
Batelco Fiber 100 MB	20.63	21.25	22.54	22.61	22.62	22.16	21.51	21.82	21.18	21.03	20.07	20.93

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

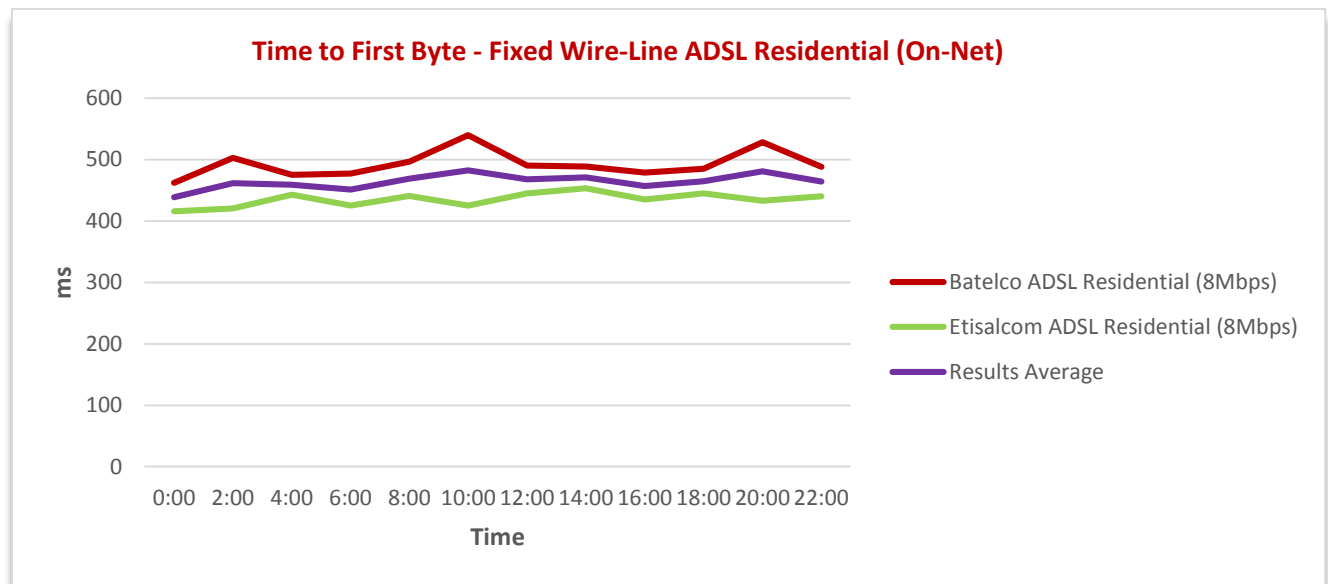
HIGHLIGHT

- Average HTTP download speed for the 8 Mbps package is 9.9 Mbps, 25Mbps package is 17.2 Mbps; while for the 100Mbps package it has been recorded as 22 Mbps.
- Higher HTTP download value indicates higher downlink internet speed.

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2.3 TIME TO FIRST BYTE FOR FIXED WIRE-LINE RESIDENTIAL PACKAGES

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



Time to First Byte (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)	462.07	502.76	475.33	477.14	496.82	539.82	490.48	488.67	479.11	484.95	528.60	488.33
Etisalatcom ADSL Residential (8Mbps)	415.61	420.68	443.06	425.08	440.66	424.97	445.14	453.53	434.98	444.98	433.25	440.41
Results Average	438.84	461.72	459.20	451.11	468.74	482.40	467.81	471.10	457.05	464.97	480.93	464.37

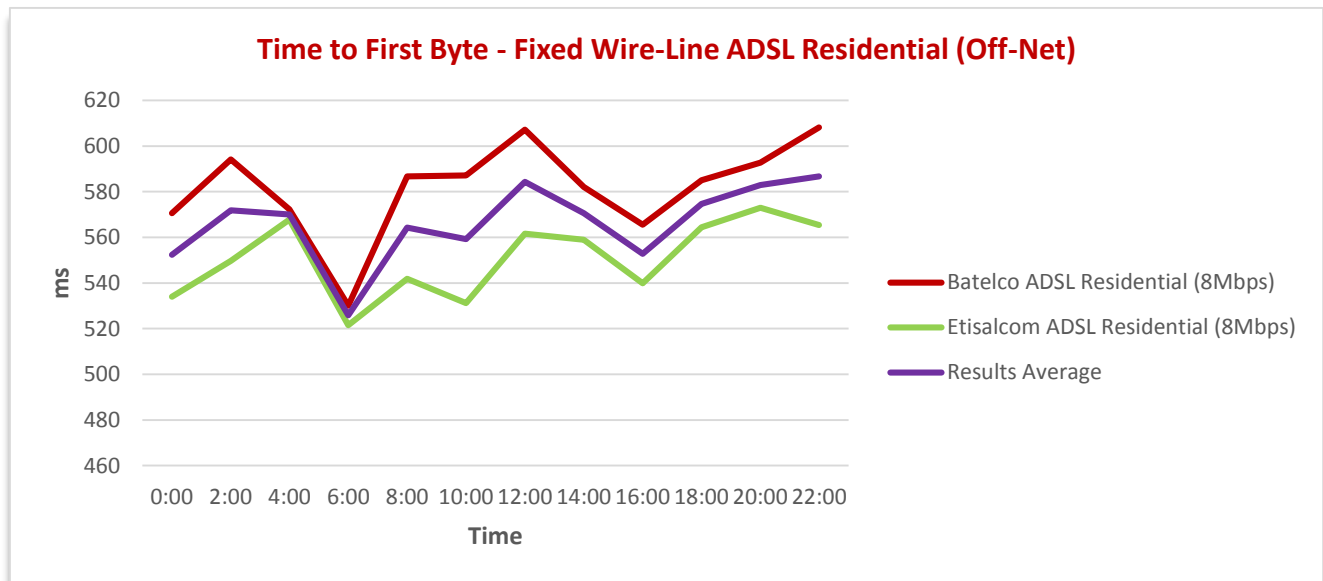
Time to First Byte (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average Time to First Byte is 464.02 milliseconds.
- The lower the Time to First Byte, the better the customer browsing experience in loading web pages.

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The Time to First Byte test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address till the HTTP page starts downloading. 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).



Time to First Byte (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)	570.66	594.10	572.26	530.13	586.72	587.18	607.16	582.14	565.62	585.04	592.77	608.12
Etisalat ADSL Residential (8Mbps)	534.04	549.71	567.83	521.59	541.85	531.25	561.60	559.03	539.87	564.39	573.04	565.37
Results Average	552.35	571.91	570.04	525.86	564.29	559.21	584.38	570.59	552.74	574.71	582.91	586.74

Time to First Byte (Off-Net) Table View (milliseconds)

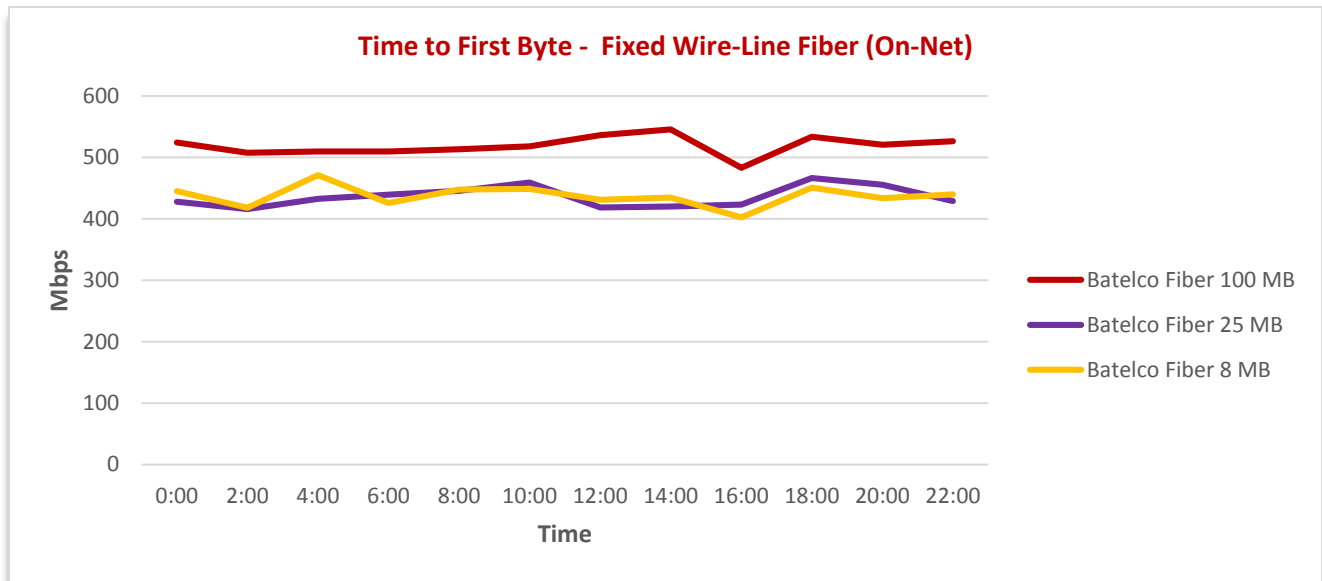
HIGHLIGHT

- The Results average of Time to First Byte is 566.3 milliseconds.
- The lower the Time to First Byte, the better the customer browsing experience in loading web pages

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2.4 TIME TO FIRST BYTE FOR HIGH SPEED RESIDENTIAL PACKAGES

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



Time to First Byte (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 8 MB	445.24	418.22	471.05	425.81	447.67	448.86	430.98	434.94	402.58	450.81	433.73	439.90
Batelco Fiber 25 MB	428.11	415.94	432.55	439.29	445.74	459.20	418.39	420.33	423.48	466.63	455.82	429.00
Batelco Fiber 100 MB	524.48	507.98	509.63	509.93	513.62	518.22	536.58	545.81	483.21	533.82	520.65	526.67

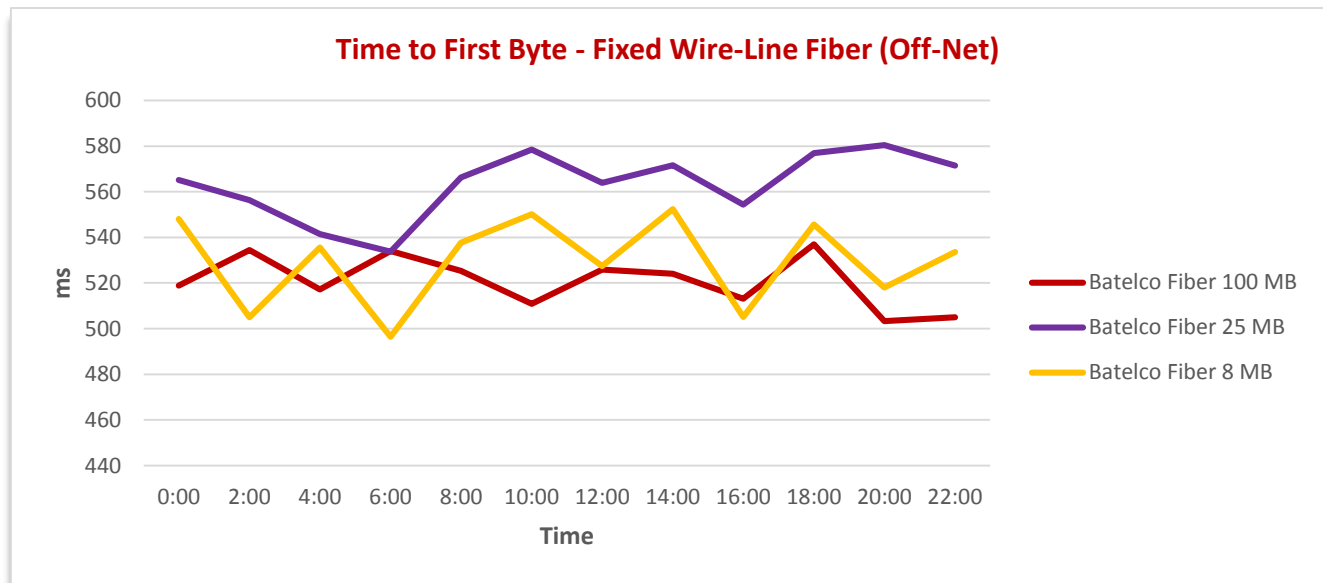
Time to First Byte (On-Net) Table View (milliseconds)

HIGHLIGHT

- The average Time to First Byte for the 8 Mbps package is 437.5 milliseconds, 25 Mbps package is 436.2 milliseconds; while for the 100Mbps package is 519.2 milliseconds.
- The lower the Time to First Byte, the better the customer browsing experience in loading web pages.

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The Time to First Byte test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address till the HTTP page starts downloading. 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).



Time to First Byte (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 8 MB	548.03	504.97	535.56	496.46	537.73	550.08	527.37	552.44	505.12	545.65	518.06	533.58
Batelco Fiber 25 MB	565.18	556.26	541.52	533.76	566.27	578.53	563.89	571.60	554.40	576.88	580.43	571.45
Batelco Fiber 100 MB	518.81	534.39	517.21	534.07	525.39	510.93	525.88	524.07	513.16	537.03	503.37	504.99

Time to First Byte (Off-Net) Table View (milliseconds)

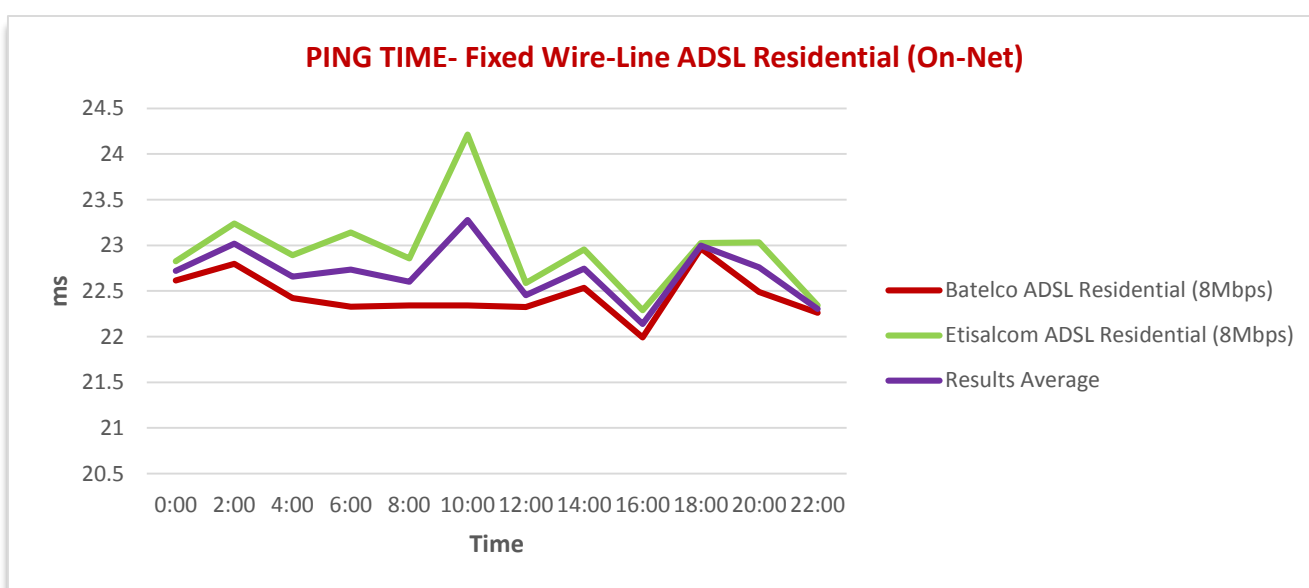
HIGHLIGHT

- The Average Time to First Byte for the 8 Mbps package is 530, 25 Mbps package is 563.3 milliseconds; while for the 100Mbps package it is 520.8 milliseconds.
- The lower the Time to First Byte, the better the customer browsing experience in loading web pages.

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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)	22.62	22.80	22.42	22.33	22.34	22.34	22.32	22.53	21.99	22.97	22.49	22.26
Etisalcom ADSL Residential (8Mbps)	22.82	23.24	22.89	23.14	22.86	24.21	22.59	22.96	22.29	23.03	23.03	22.34
Results Average	22.72	23.02	22.66	22.73	22.60	23.28	22.46	22.75	22.14	23.00	22.76	22.30

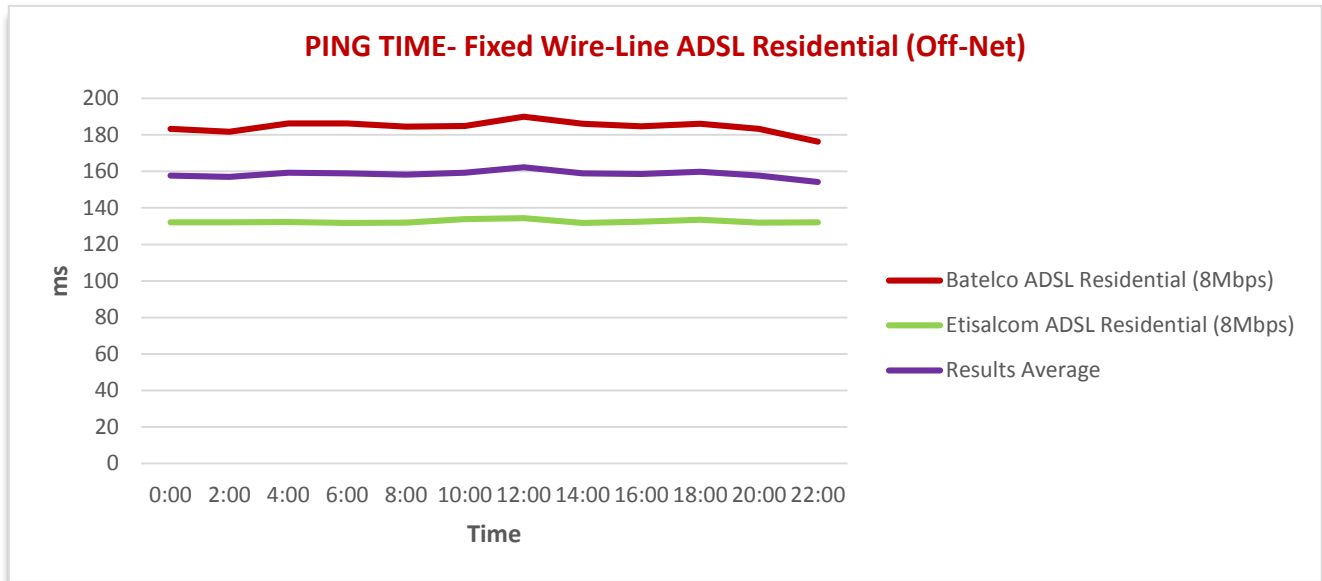
Ping Time (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results average Latency is at 22.7 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

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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)	183.36	181.74	186.34	186.25	184.52	184.92	189.99	186.14	184.63	185.99	183.36	176.33
Etisalatcom ADSL Residential (8Mbps)	132.03	132.09	132.20	131.75	131.92	133.77	134.33	131.71	132.47	133.48	132.00	132.14
Results Average	157.69	156.91	159.27	159.00	158.22	159.35	162.16	158.92	158.55	159.74	157.68	154.24

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

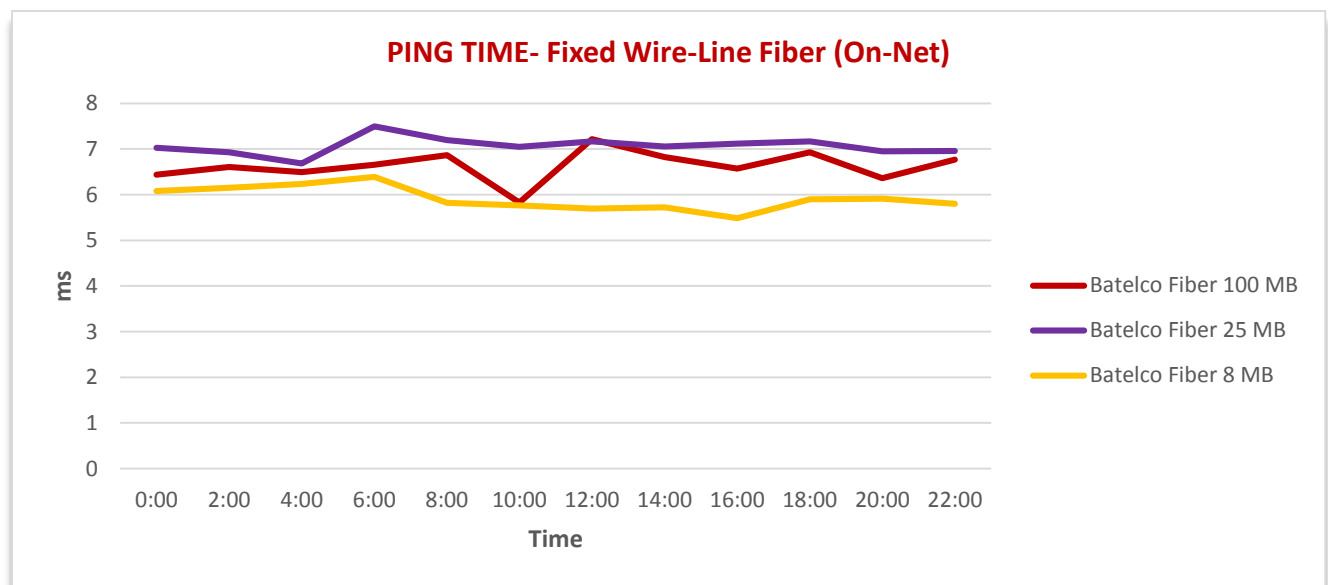
HIGHLIGHT

- The Results Average Latency is at 158.5 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

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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 8 MB	6.08	6.15	6.24	6.39	5.82	5.76	5.69	5.72	5.49	5.90	5.91	5.80
Batelco Fiber 25 MB	7.03	6.93	6.68	7.50	7.20	7.05	7.17	7.06	7.12	7.17	6.95	6.96
Batelco Fiber 100 MB	6.44	6.60	6.50	6.65	6.87	5.83	7.21	6.82	6.57	6.93	6.37	6.77

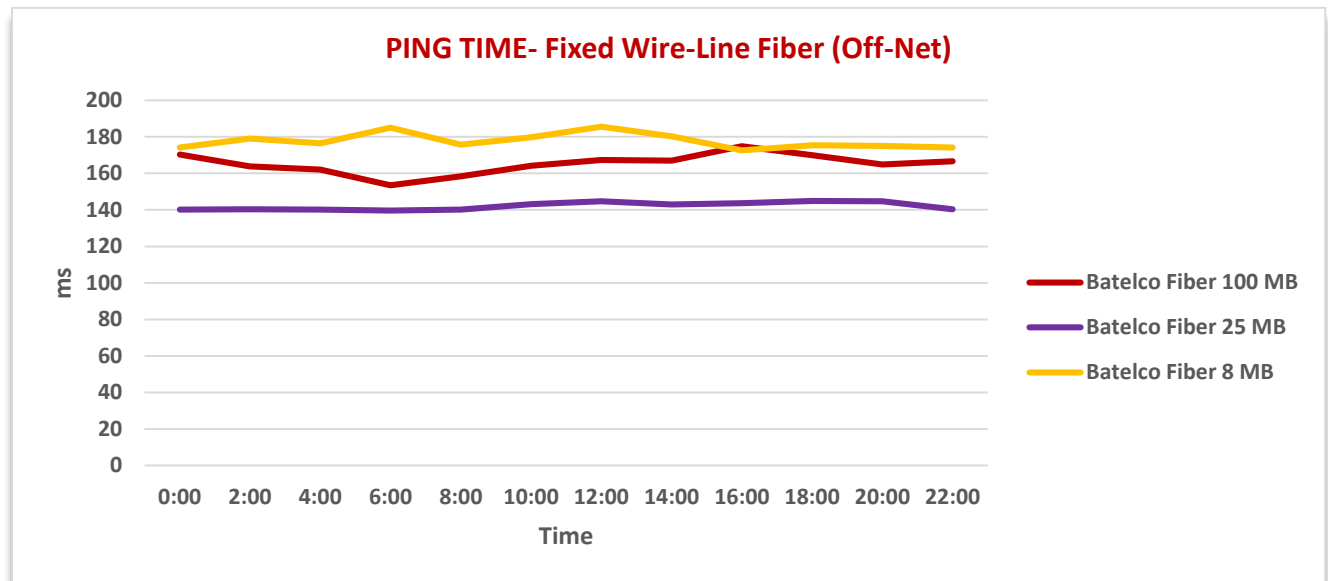
Ping Time Table View (milliseconds)

HIGHLIGHT

- The Average Latency for the 8 Mbps is 5.9 milliseconds, 25Mbps is 7 milliseconds and the 100 Mbps package is 6.62 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

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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 8 MB	174.17	179.13	176.44	185.01	175.66	179.73	185.53	180.31	172.53	175.33	175.11	174.20
Batelco Fiber 25 MB	140.20	140.33	140.08	139.64	140.10	143.19	144.74	142.93	143.69	144.90	144.70	140.25
Batelco Fiber 100 MB	170.28	163.80	162.00	153.46	158.42	164.15	167.32	166.92	174.90	170.04	164.90	166.57

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

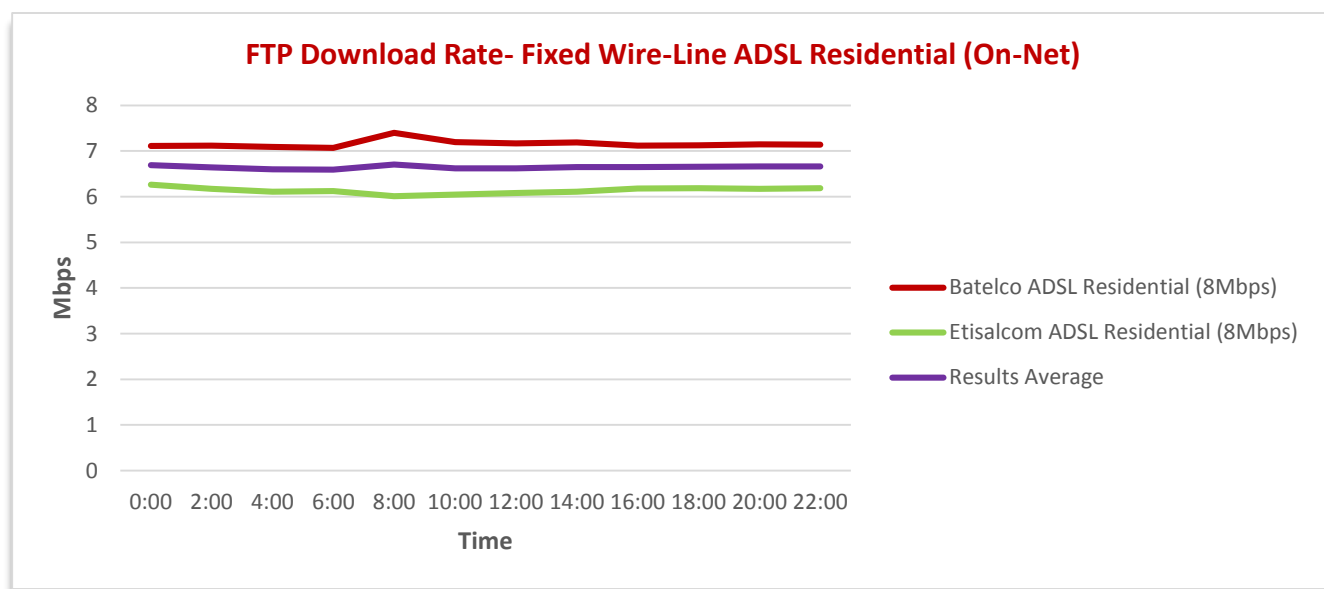
HIGHLIGHT

- The Average Latency for the 8 Mbps package is 177.7 milliseconds, 25Mbps package is 142.1 milliseconds and for the 100 Mbps package is 165.2 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

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2.7 FTP DOWNLOAD FOR FIXED WIRE-LINE RESIDENTIAL PACKAGES

File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can download a file on a server provided by the operator (On-Net).



FTP Download Rate (On-Net) 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)	7.11	7.12	7.09	7.07	7.40	7.20	7.17	7.19	7.12	7.13	7.15	7.14
Etisalcom ADSL Residential (8Mbps)	6.26	6.17	6.11	6.12	6.01	6.05	6.08	6.11	6.18	6.18	6.17	6.19
Results Average	6.69	6.65	6.60	6.60	6.71	6.62	6.62	6.65	6.65	6.66	6.66	6.66

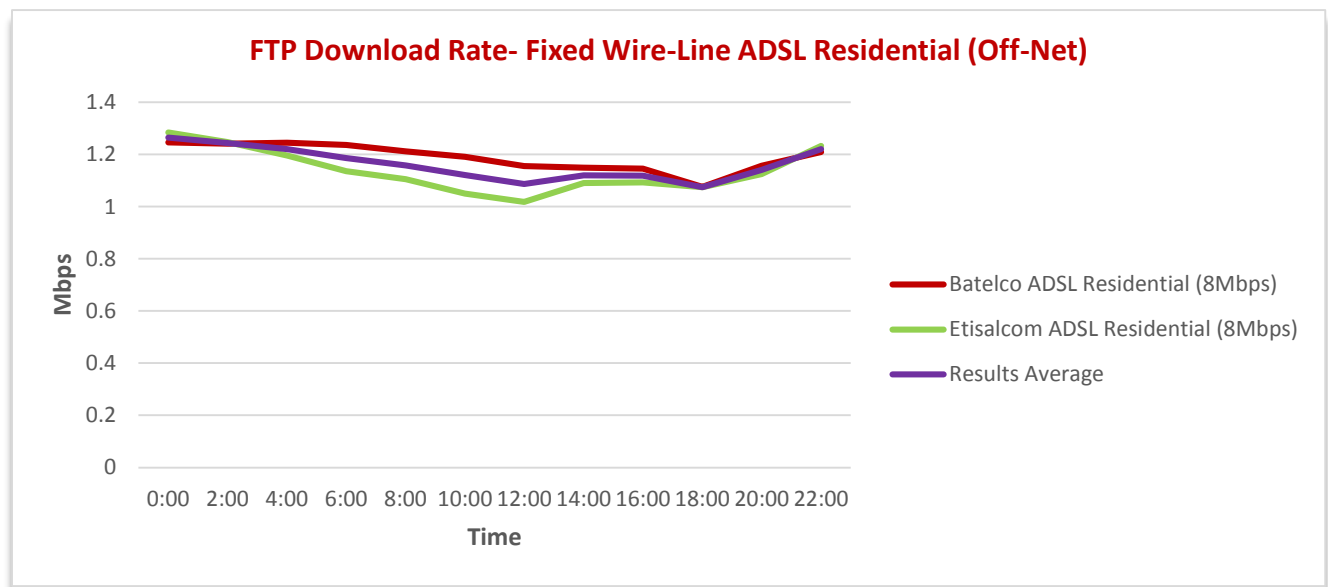
FTP Download Rate (On-Net) Table View (Mbps)

HIGHLIGHT

- The Results Average FTP Download Rate is 6.64 Mbps.
- Higher FTP download value indicates higher file download speed from the server.

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File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can download a file on a server (Off-Net).



FTP Download Rate (Off-Net) 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)	1.25	1.24	1.25	1.24	1.21	1.19	1.16	1.15	1.15	1.08	1.16	1.21
Etisalatcom ADSL Residential (8Mbps)	1.28	1.25	1.20	1.14	1.11	1.05	1.02	1.09	1.09	1.07	1.12	1.23
Results Average	1.27	1.24	1.22	1.19	1.16	1.12	1.09	1.12	1.12	1.08	1.14	1.22

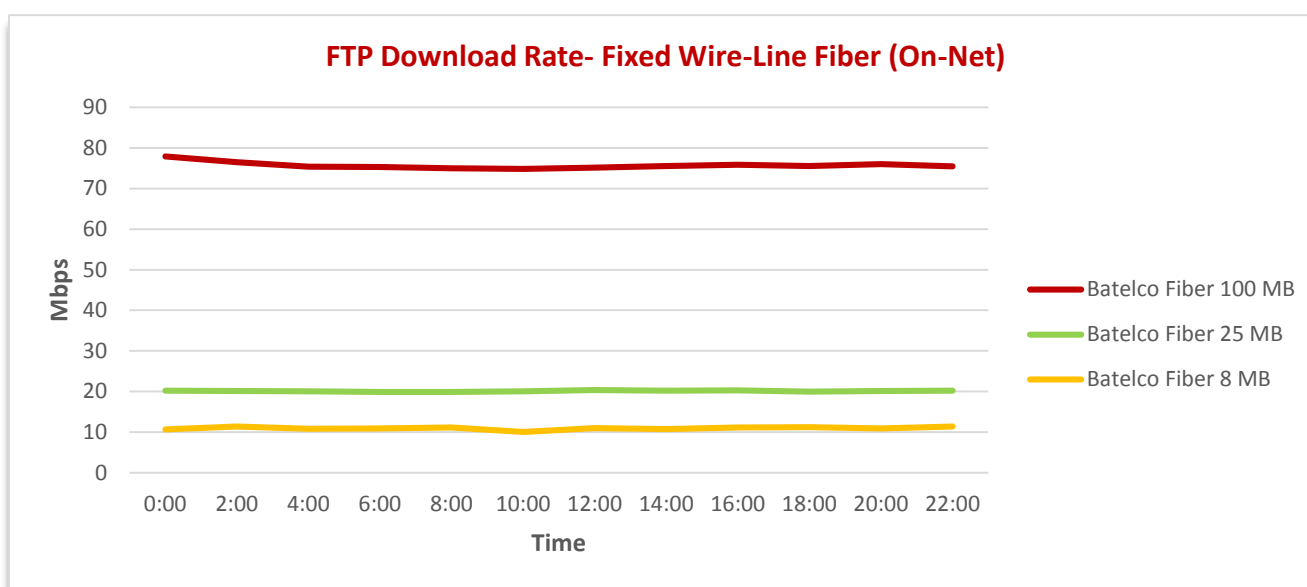
FTP Download Rate (Off-Net) Table View (Mbps)

HIGHLIGHT

- The Results Average FTP Download Rate is 1.2 Mbps.
- Higher FTP download value indicates higher file download speed from the server.

2.8 FTP DOWNLOAD FOR HIGH SPEED RESIDENTIAL PACKAGES

File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can upload a file on a server provided by the operator (On-Net).



FTP Download Rate (On-Net) 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 8 MB	10.63	11.39	10.77	10.91	11.15	10.03	10.94	10.76	11.09	11.17	10.92	11.33
Batelco Fiber 25 MB	20.21	20.08	20.04	19.85	19.92	20.06	20.33	20.21	20.26	19.98	20.11	20.20
Batelco Fiber 100 MB	77.95	76.49	75.42	75.30	75.00	74.81	75.19	75.57	75.89	75.53	76.02	75.50

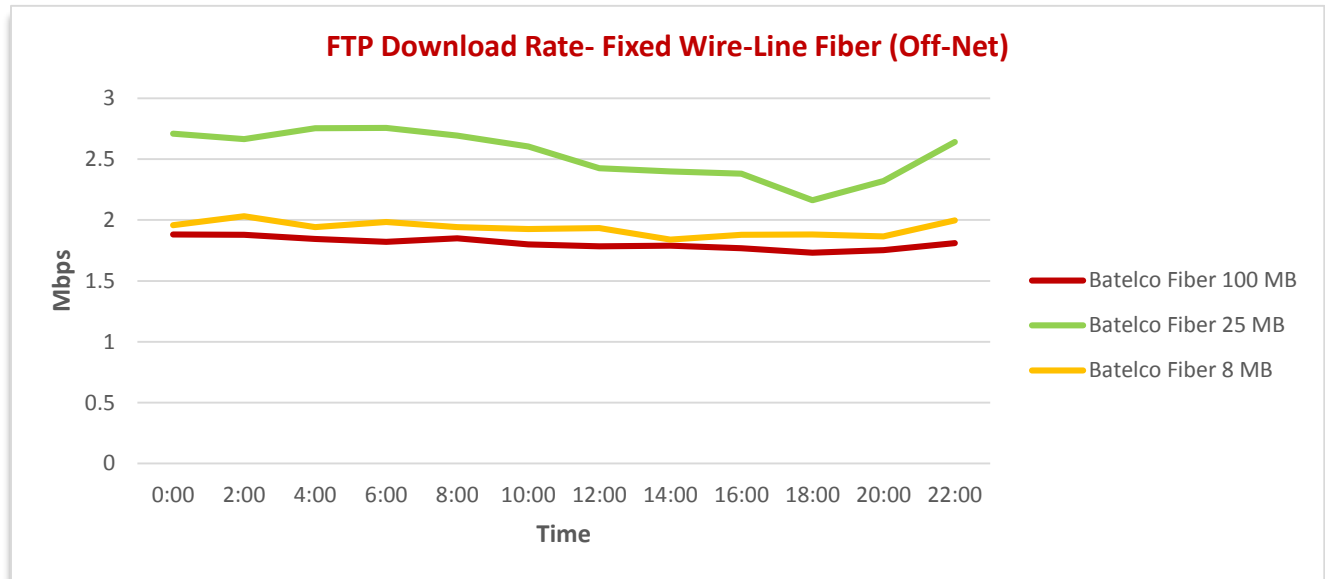
FTP Download Rate (On-Net) Table View (Mbps)

HIGHLIGHT

- The Results Average FTP Download Rate for 8 Mbps Package is 10.9 Mbps, 25 Mbps package is 20.1 Mbps and 100 Mbps package is 75.7 Mbps.
- Higher FTP download value indicates higher file download speed from the server.

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File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can download a file on a server (Off-Net).



FTP Download Rate (Off-Net) 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 8 MB	1.96	2.03	1.94	1.98	1.94	1.93	1.94	1.84	1.88	1.88	1.87	2.00
Batelco Fiber 25 MB	2.71	2.67	2.75	2.76	2.69	2.61	2.43	2.40	2.38	2.16	2.32	2.64
Batelco Fiber 100 MB	1.88	1.88	1.84	1.82	1.85	1.80	1.78	1.79	1.77	1.73	1.75	1.81

FTP Download Rate (Off-Net) Table View (Mbps)

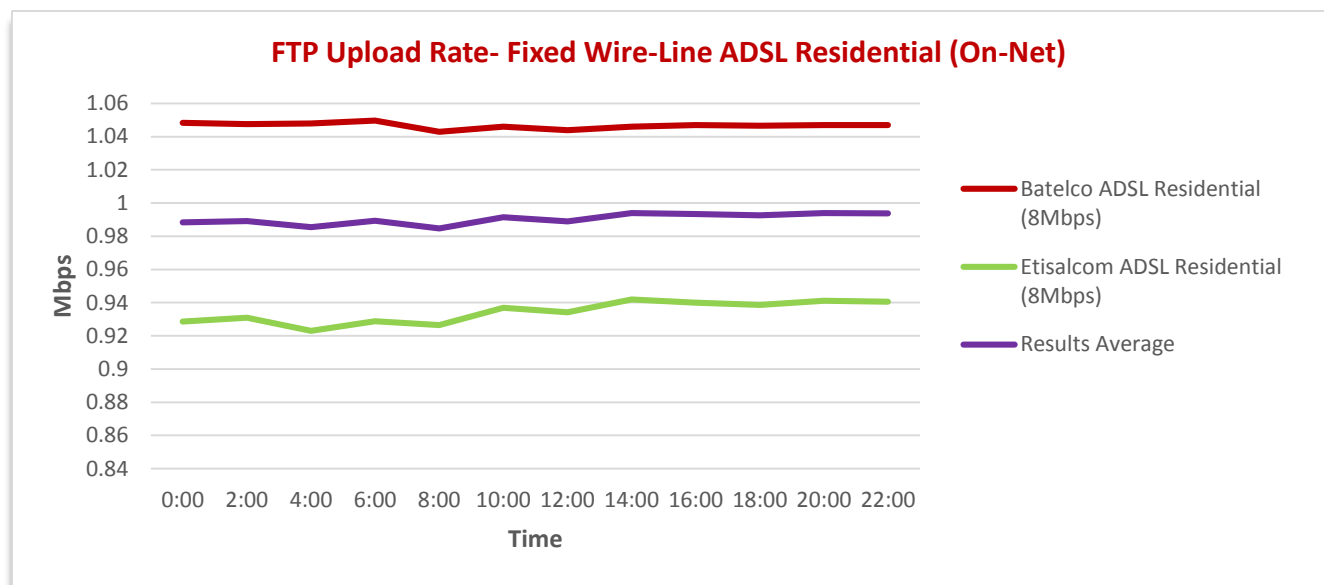
HIGHLIGHT

- The Results Average FTP Download Rate for 8 Mbps Package is 1.9 Mbps, 25 Mbps package is 2.5 Mbps and 100 Mbps package is 1.81 Mbps.
- Higher FTP download value indicates higher file download speed from the server.

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2.9 FTP UPLOAD FOR FIXED WIRE-LINE RESIDENTIAL PACKAGES

File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can upload a file on a server provided by the operator (On-Net).



FTP Upload Rate (On-Net) 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)	1.05	1.05	1.05	1.05	1.04	1.05	1.04	1.05	1.05	1.05	1.05	1.05
Etisalatcom ADSL Residential (8Mbps)	0.93	0.93	0.92	0.93	0.93	0.94	0.93	0.94	0.94	0.94	0.94	0.94
Results Average	0.99	0.99	0.99	0.99	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.99

FTP Upload Rate (On-Net) Table View (Mbps)

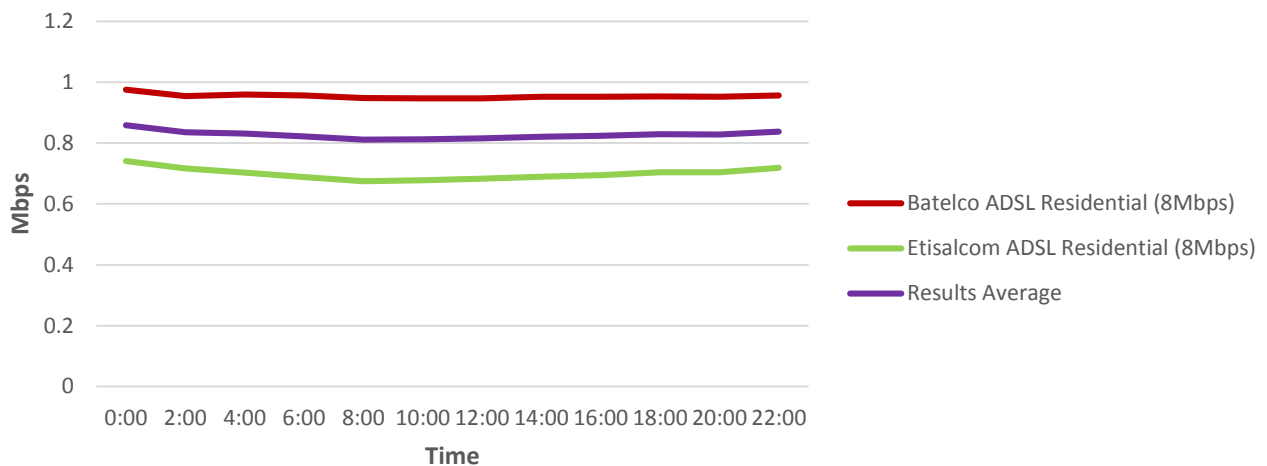
HIGHLIGHT

- The Results Average FTP Upload Rate is 0.99 Mbps.
- Higher FTP upload value indicates higher file upload speed from the device to server.

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File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can upload a file on a server (Off-Net).

FTP Upload Rate- Fixed Wire-Line ADSL Residential (Off-Net)



FTP Upload Rate (Off-Net) 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)	0.98	0.95	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.96
Etisalatcom ADSL Residential (8Mbps)	0.74	0.72	0.70	0.69	0.67	0.68	0.68	0.69	0.69	0.70	0.70	0.72
Results Average	0.86	0.84	0.83	0.82	0.81	0.81	0.82	0.82	0.82	0.83	0.83	0.84

FTP Upload Rate (Off-Net) Table View (Mbps)

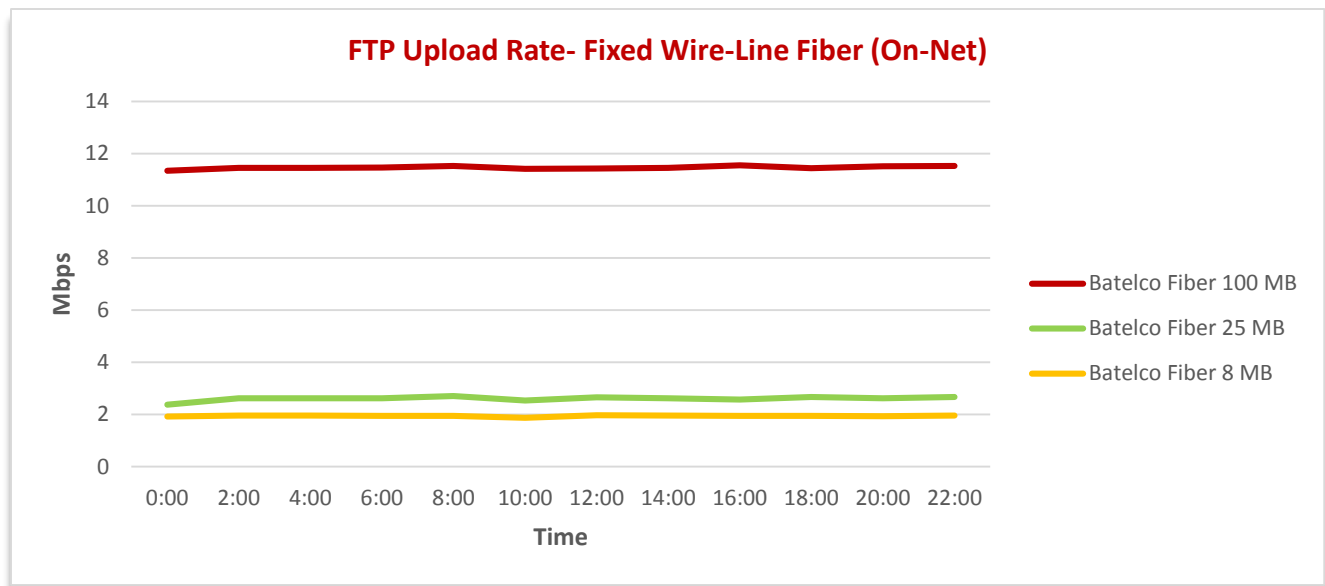
HIGHLIGHT

- The Results Average FTP Upload Rate is 0.83 Mbps.
- Higher FTP upload value indicates higher file upload speed from the device to server.

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2.10 FTP UPLOAD FOR HIGH SPEED RESIDENTIAL PACKAGES

File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can upload a file on a server provided by the operator (On-Net).



FTP Upload Rate (On-Net) 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 8 MB	1.92	1.96	1.95	1.94	1.95	1.87	1.97	1.95	1.95	1.94	1.94	1.96
Batelco Fiber 25 MB	2.37	2.61	2.62	2.62	2.71	2.54	2.65	2.62	2.58	2.66	2.62	2.67
Batelco Fiber 100 MB	11.34	11.45	11.46	11.47	11.53	11.42	11.43	11.45	11.55	11.44	11.51	11.53

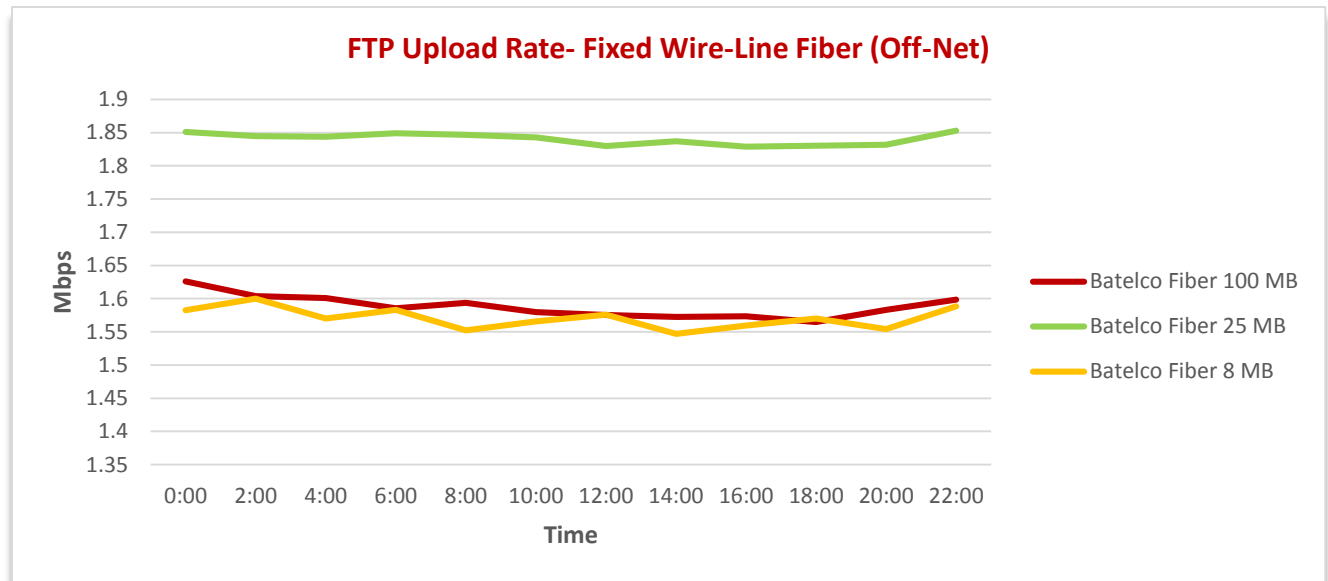
FTP Upload Rate (On-Net) Table View (Mbps)

HIGHLIGHT

- The Results Average FTP Upload Rate for 8 Mbps Package is 1.9 Mbps, 25 Mbps package is 2.6 Mbps and 100 Mbps package is 11.46 Mbps.
- Higher FTP upload value indicates higher file upload speed from the device to server.

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File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can upload a file on a server (Off-Net).



FTP Upload Rate (Off-Net) 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 8 MB	1.58	1.60	1.57	1.58	1.55	1.57	1.58	1.55	1.56	1.57	1.55	1.59
Batelco Fiber 25 MB	1.85	1.84	1.84	1.85	1.85	1.84	1.83	1.84	1.83	1.83	1.83	1.85
Batelco Fiber 100 MB	1.63	1.60	1.60	1.59	1.59	1.58	1.58	1.57	1.57	1.56	1.58	1.60

FTP Upload Rate (Off-Net) Table View (Mbps)

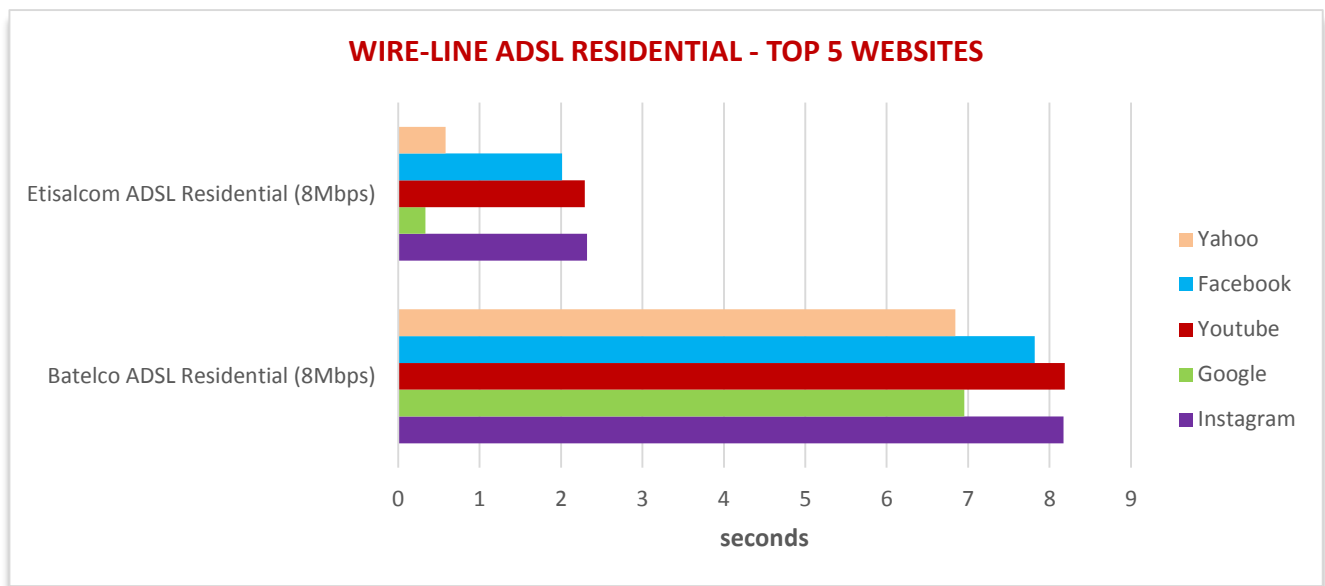
HIGHLIGHT

- The Results Average FTP Upload Rate for 8 Mbps Package is 1.6 Mbps, 25 Mbps package is 1.8 Mbps and 100 Mbps package is 1.6 Mbps.
- Higher FTP upload value indicates higher file upload speed from the device to server.
-

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2.11 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)	8.17	6.95	8.19	7.82	6.84
Etisalcom ADSL Residential (8Mbps)	2.32	0.34	2.29	2.01	0.58

Top 5 Browsing Time Table View (Seconds)

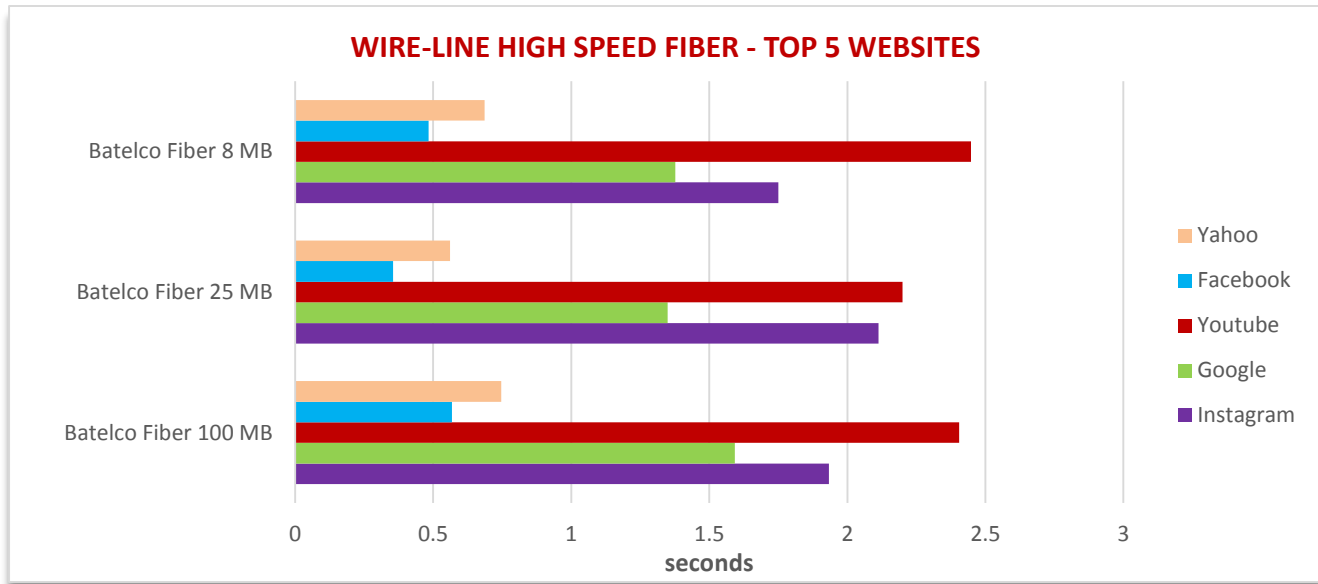
HIGHLIGHT

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

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2.12 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 8 MB	1.75	0.48	2.45	1.38	0.69
Batelco Fiber 25 MB	2.11	0.35	2.20	1.35	0.56
Batelco Fiber 100 MB	1.93	0.57	2.40	1.59	0.75

Top 5 Browsing Time Table View (Seconds)

HIGHLIGHT

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

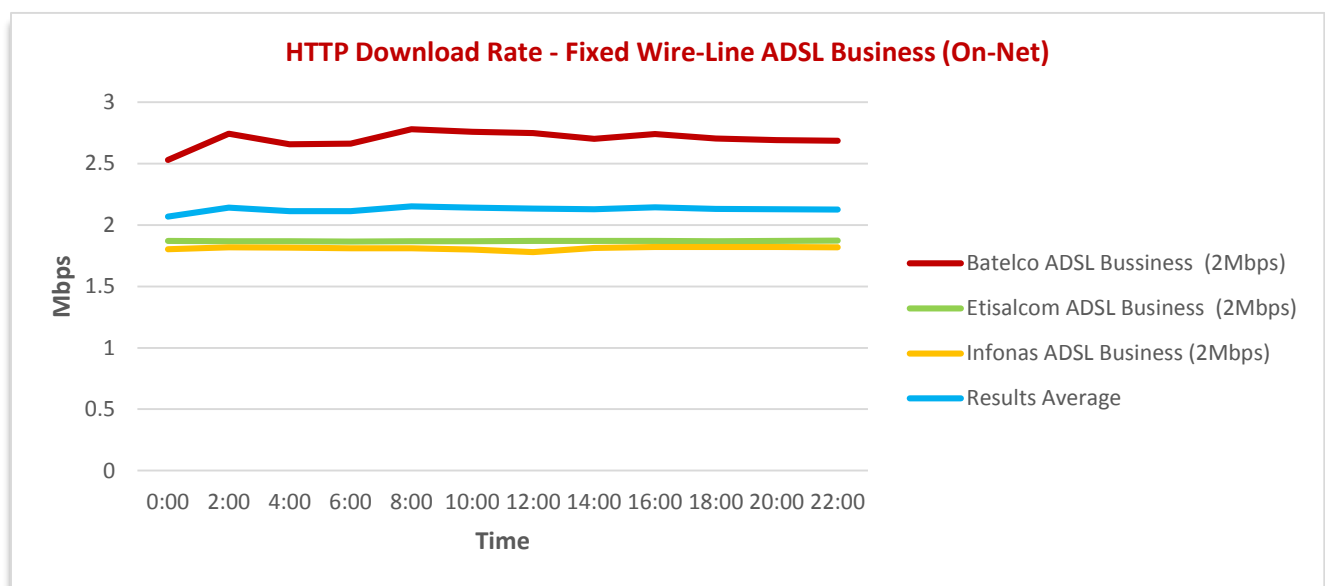
3. FIXED WIRE-LINE - BROADBAND INTERNET TESTING BUSINESS SERVICES



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
Infonias ADSL Business (2Mbps)	1.80	1.82	1.82	1.81	1.81	1.80	1.78	1.81	1.82	1.82	1.82	1.82
Batelco ADSL Bussiness (2Mbps)	2.53	2.74	2.66	2.66	2.78	2.76	2.75	2.70	2.74	2.70	2.69	2.69
Etisalatcom ADSL Business (2Mbps)	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87
Results Average	2.07	2.14	2.11	2.11	2.15	2.14	2.13	2.13	2.14	2.13	2.13	2.12

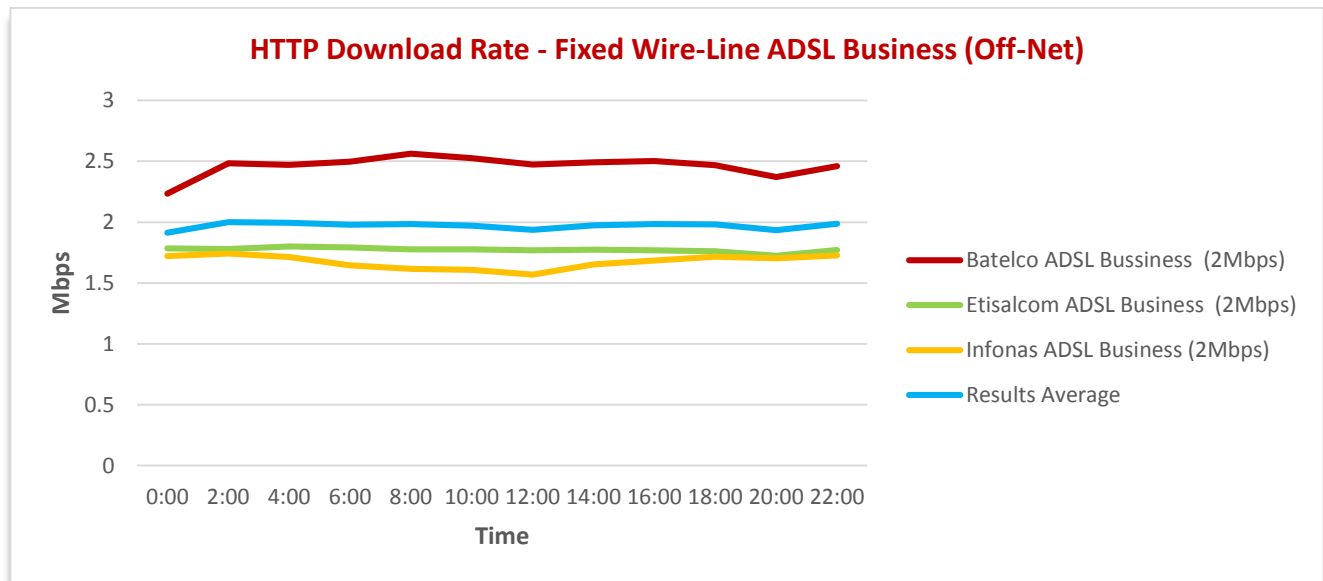
HTTP (On-Net) Download Speed - Summary Table (Mbps)

HIGHLIGHT

- Results average HTTP download speed of 2.13 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

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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
Infonias ADSL Business (2Mbps)	1.72	1.74	1.71	1.65	1.62	1.61	1.57	1.65	1.69	1.72	1.70	1.73
Batelco ADSL Bussiness (2Mbps)	2.23	2.48	2.47	2.50	2.56	2.53	2.47	2.49	2.50	2.47	2.37	2.46
Etisalatcom ADSL Business (2Mbps)	1.78	1.78	1.80	1.79	1.78	1.78	1.77	1.77	1.77	1.76	1.72	1.77
Results Average	1.91	2.00	1.99	1.98	1.99	1.97	1.94	1.97	1.99	1.98	1.93	1.99

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

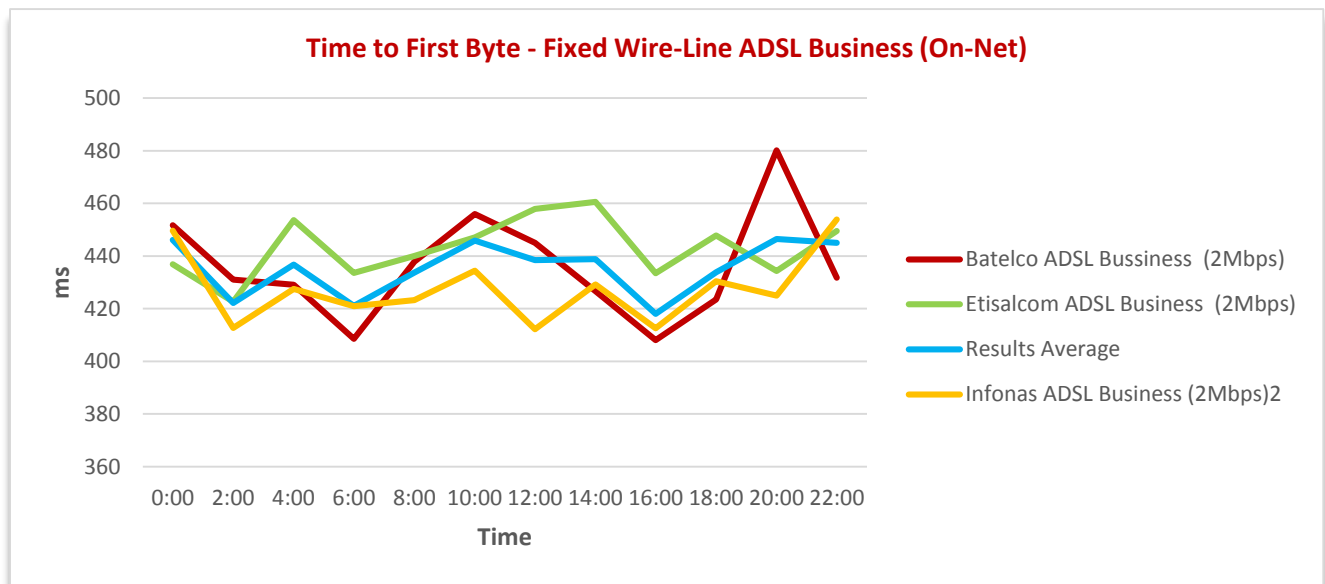
HIGHLIGHT

- Results Average HTTP download speed of 1.97 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

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3.2 TIME TO FIRST BYTE FOR FIXED WIRE-LINE BUSINESS PACKAGES

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



Time to First Byte (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
Infonias ADSL Business (2Mbps)	449.68	412.73	427.47	420.98	423.26	434.44	412.24	429.27	412.56	430.44	424.92	453.90
Batelco ADSL Bussiness (2Mbps)	451.69	431.09	429.05	408.55	437.80	455.97	445.08	426.70	408.08	423.45	480.19	431.77
Etisalatcom ADSL Business (2Mbps)	436.85	422.61	453.63	433.59	440.01	447.08	457.94	460.64	433.44	447.77	434.37	449.47
Results Average	446.07	422.14	436.72	421.04	433.69	445.83	438.42	438.87	418.03	433.89	446.49	445.05

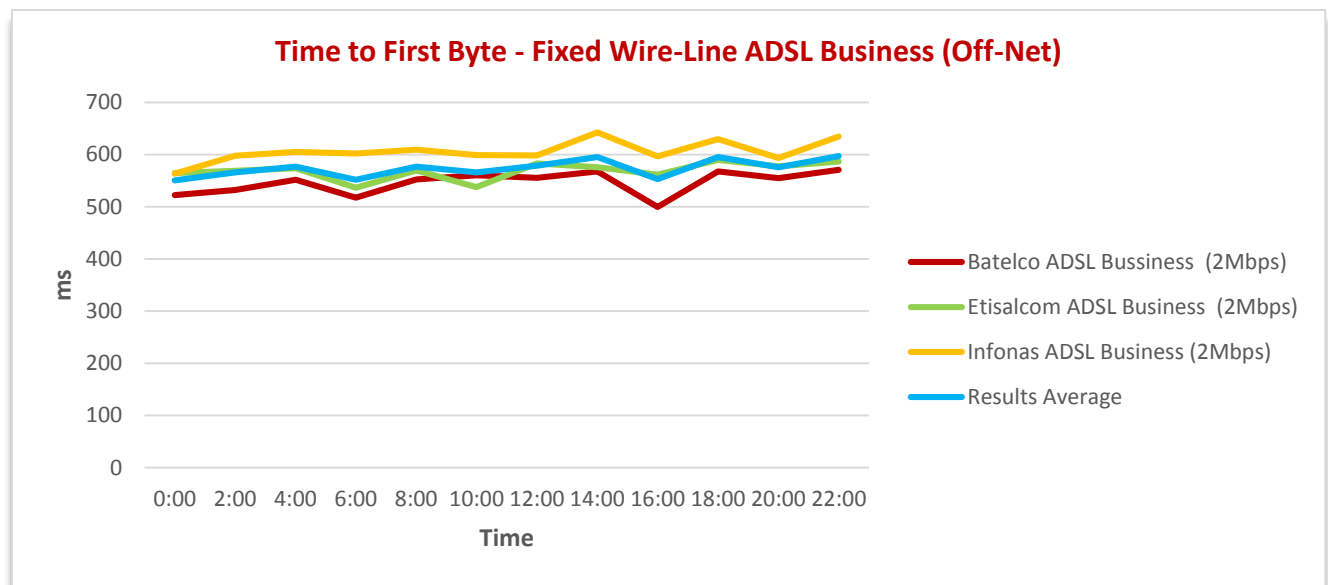
Time to First Byte (On-Net) Chart View (milliseconds)

HIGHLIGHT

- The Results Average Time to First Byte is 435.5 milliseconds.
- The lower the Time to First Byte, the better the customer browsing experience will be in loading web pages.

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The Time to First Byte test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address till the HTTP page starts downloading. 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).



Time to First Byte (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
Infonias ADSL Business (2Mbps)	563.46	597.68	605.05	601.79	609.32	599.18	598.31	642.44	596.76	629.52	593.73	634.73
Batelco ADSL Bussiness (2Mbps)	522.63	532.09	551.94	517.49	552.33	560.51	555.76	567.73	499.62	567.46	555.04	571.09
Etisalat ADSL Business (2Mbps)	564.89	568.82	574.17	536.32	569.75	537.69	583.01	575.46	561.74	589.53	577.76	586.61
Results Average	550.33	566.19	577.05	551.87	577.13	565.79	579.02	595.21	552.70	595.50	575.51	597.48

Time to First Byte (Off-Net) Table View (milliseconds)

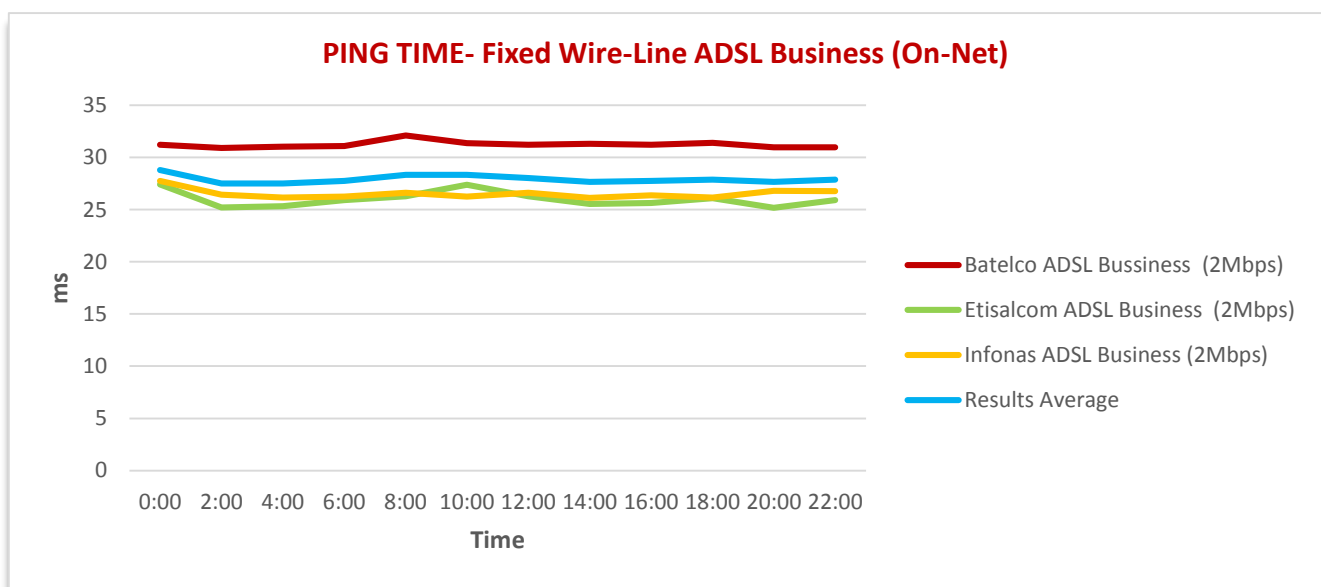
HIGHLIGHT

- The Results average of Time to First Byte is 573.65 milliseconds.
- The lower the Time to First Byte, the better the customer browsing experience in loading web pages.

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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
Infonias ADSL Business (2Mbps)	27.76	26.43	26.16	26.25	26.64	26.25	26.63	26.14	26.38	26.17	26.82	26.78
Batelco ADSL Bussiness (2Mbps)	31.22	30.92	31.04	31.09	32.10	31.36	31.21	31.31	31.21	31.40	30.98	30.97
Etisalatcom ADSL Business (2Mbps)	27.41	25.20	25.34	25.92	26.29	27.39	26.27	25.55	25.64	26.09	25.18	25.93
Results Average	28.80	27.51	27.51	27.75	28.34	28.34	28.04	27.67	27.75	27.89	27.66	27.89

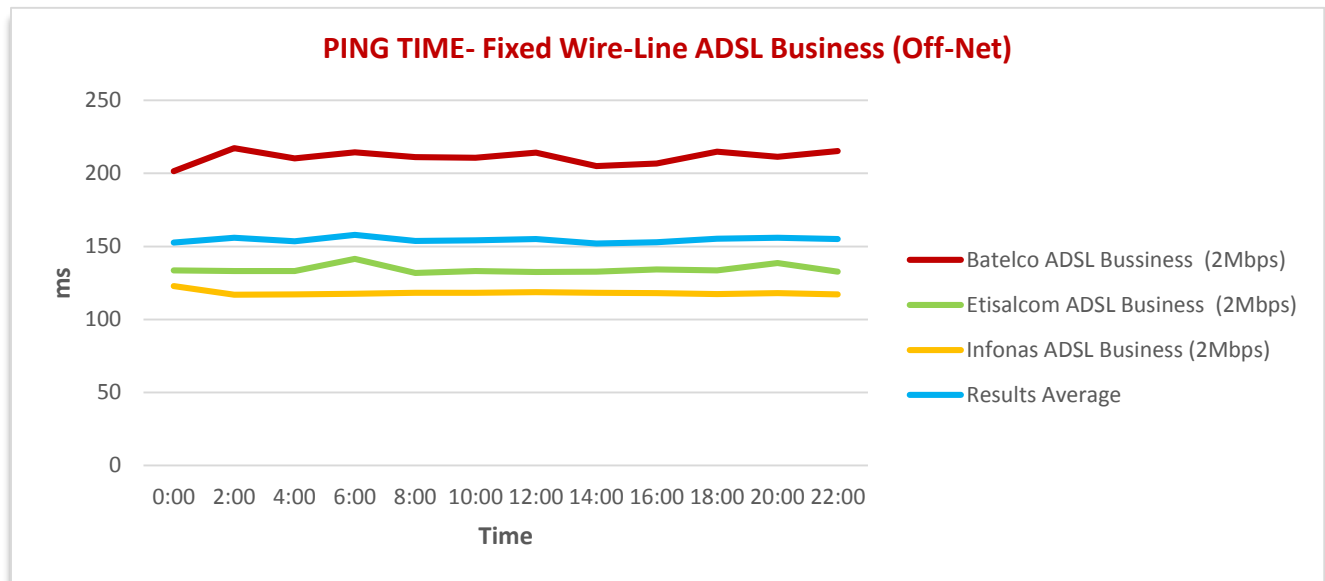
PING Time (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results average Latency is 27.9 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

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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
Infonias ADSL Business (2Mbps)	122.91	116.93	117.09	117.64	118.25	118.31	118.74	118.30	118.03	117.35	118.13	117.16
Batelco ADSL Bussiness (2Mbps)	201.60	217.36	210.15	214.47	211.10	210.77	214.13	204.95	206.70	214.84	211.41	215.33
Etisalatcom ADSL Business (2Mbps)	133.60	133.24	133.19	141.36	131.92	133.24	132.39	132.66	134.14	133.47	138.51	132.61
Results Average	152.70	155.84	153.48	157.83	153.75	154.11	155.09	151.97	152.95	155.22	156.01	155.03

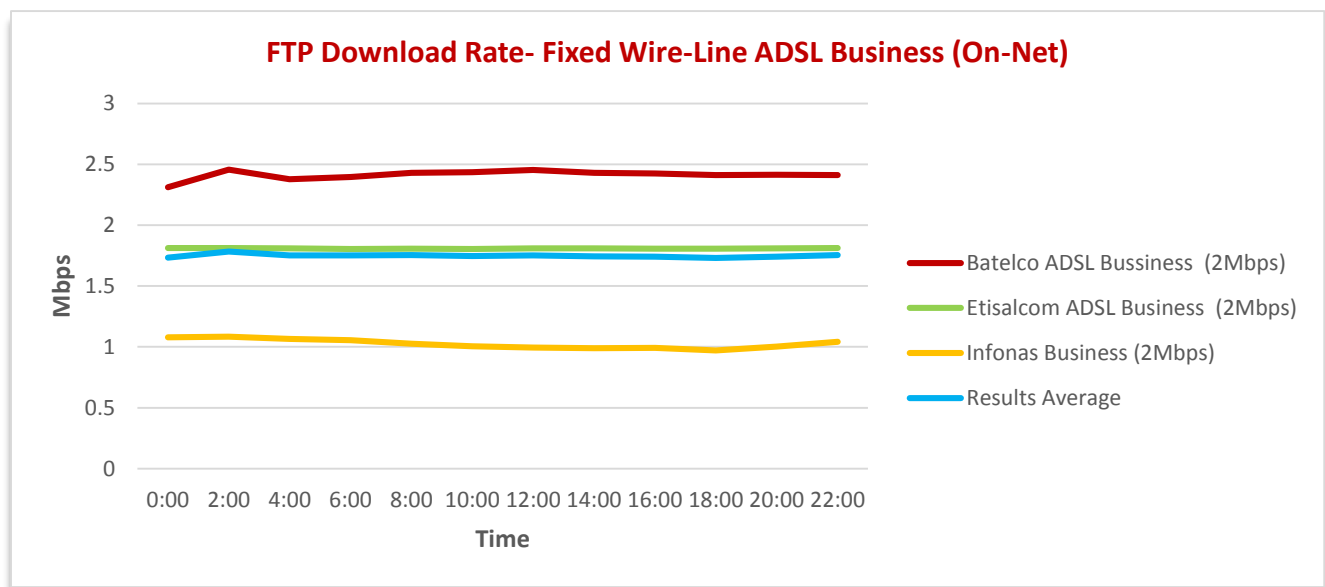
PING Time (Off-Net) Table View (milliseconds)

HIGHLIGHT

- The Results Average for Latency is 154.5 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

3.4 FTP DOWNLOAD RATE FOR FIXED WIRE-LINE BUSINESS PACKAGES

File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can download a file on a server provided by the operator (On-Net).



FTP Download Rate (On-Net) Table View (Mbps)

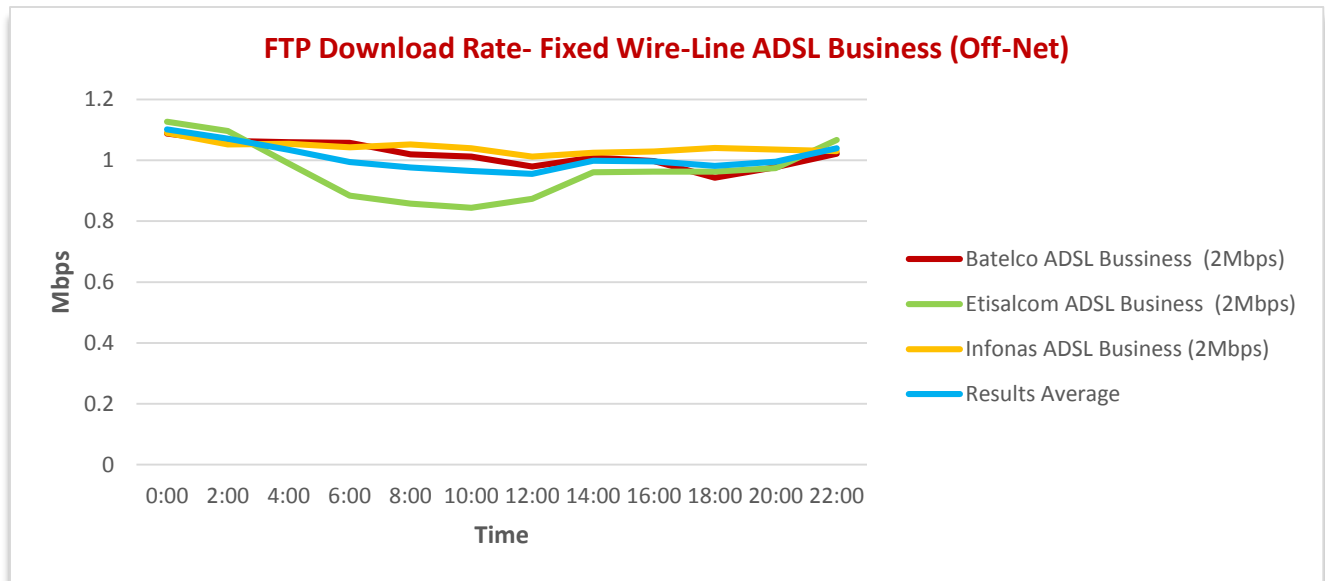
ISP Name	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
Infonias ADSL Business (2Mbps)	1.08	1.08	1.07	1.05	1.03	1.00	0.99	0.99	0.99	0.97	1.00	1.04
Batelco ADSL Bussiness (2Mbps)	2.31	2.45	2.38	2.39	2.43	2.43	2.45	2.43	2.43	2.41	2.41	2.41
Etisalatcom ADSL Business (2Mbps)	1.81	1.81	1.81	1.80	1.81	1.80	1.81	1.81	1.81	1.81	1.81	1.81
Results Average	1.73	1.78	1.75	1.75	1.75	1.75	1.75	1.74	1.74	1.73	1.74	1.75

HIGHLIGHT

- The Results Average for FTP is 1.75 Mbps.
- Higher FTP download value indicates higher file download speed from the server.

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File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can download a file on a server (Off-Net).



FTP Download Rate (Off-Net) 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
Infonias ADSL Business (2Mbps)	1.09	1.05	1.05	1.04	1.05	1.04	1.01	1.03	1.03	1.04	1.04	1.03
Batelco ADSL Bussiness (2Mbps)	1.09	1.06	1.06	1.06	1.02	1.01	0.98	1.01	1.00	0.94	0.98	1.02
Etisalatcom ADSL Business (2Mbps)	1.13	1.10	0.99	0.88	0.86	0.84	0.87	0.96	0.96	0.96	0.97	1.07
Results Average	1.10	1.07	1.03	0.99	0.98	0.97	0.96	1.00	1.00	0.98	1.00	1.04

FTP Download Rate (Off-Net) Table View (Mbps)

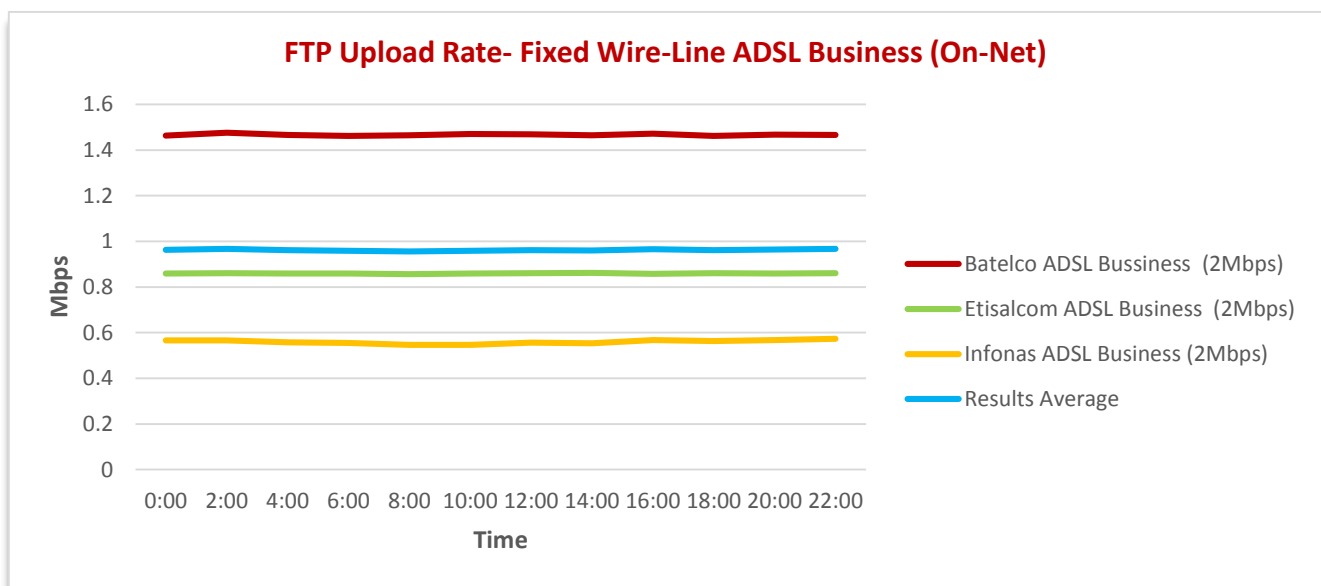
HIGHLIGHT

- The Results Average for FTP is 1.01 Mbps.
- Higher FTP download value indicates higher file download speed from the server.

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3.5 FTP UPLOAD RATE FOR FIXED WIRE-LINE BUSINESS PACKAGES

File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can upload a file on a server provided by the operator (On-Net).



FTP Upload Rate (On-Net) 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
Infonias ADSL Business (2Mbps)	0.57	0.57	0.56	0.55	0.55	0.55	0.56	0.55	0.57	0.56	0.57	0.57
Batelco ADSL Bussiness (2Mbps)	1.46	1.48	1.47	1.46	1.47	1.47	1.47	1.46	1.47	1.46	1.47	1.47
Etisalatcom ADSL Business (2Mbps)	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Results Average	0.96	0.97	0.96	0.96	0.96	0.96	0.96	0.96	0.97	0.96	0.96	0.97

FTP Upload Rate (On-Net) Table View (Mbps)

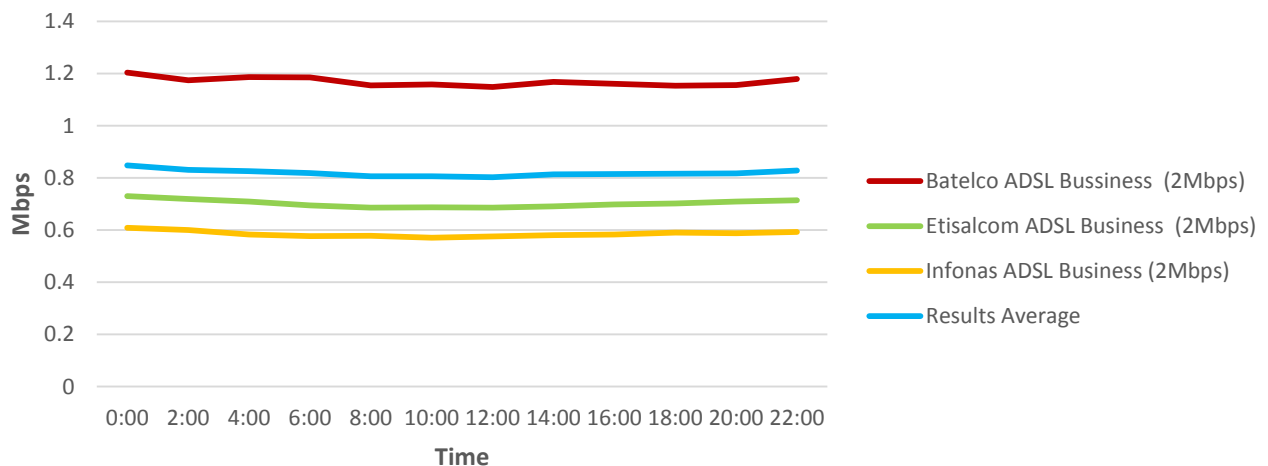
HIGHLIGHT

- The Results Average for FTP is 0.96 Mbps.
- Higher FTP upload value indicates higher file upload speed from the device to server.

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File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can upload a file on a server (Off-Net).

FTP Upload Rate- Fixed Wire-Line ADSL Business (Off-Net)



FTP Upload Rate (Off-Net) 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
Infonass ADSL Business (2Mbps)	0.61	0.60	0.58	0.58	0.58	0.57	0.58	0.58	0.58	0.59	0.59	0.59
Batelco ADSL Bussiness (2Mbps)	1.20	1.17	1.19	1.19	1.15	1.16	1.15	1.17	1.16	1.15	1.16	1.18
Etisalatcom ADSL Business (2Mbps)	0.73	0.72	0.71	0.69	0.69	0.69	0.69	0.69	0.70	0.70	0.71	0.71
Results Average	0.85	0.83	0.83	0.82	0.81	0.81	0.80	0.81	0.81	0.82	0.82	0.83

FTP Upload Rate (Off-Net) Table View (Mbps)

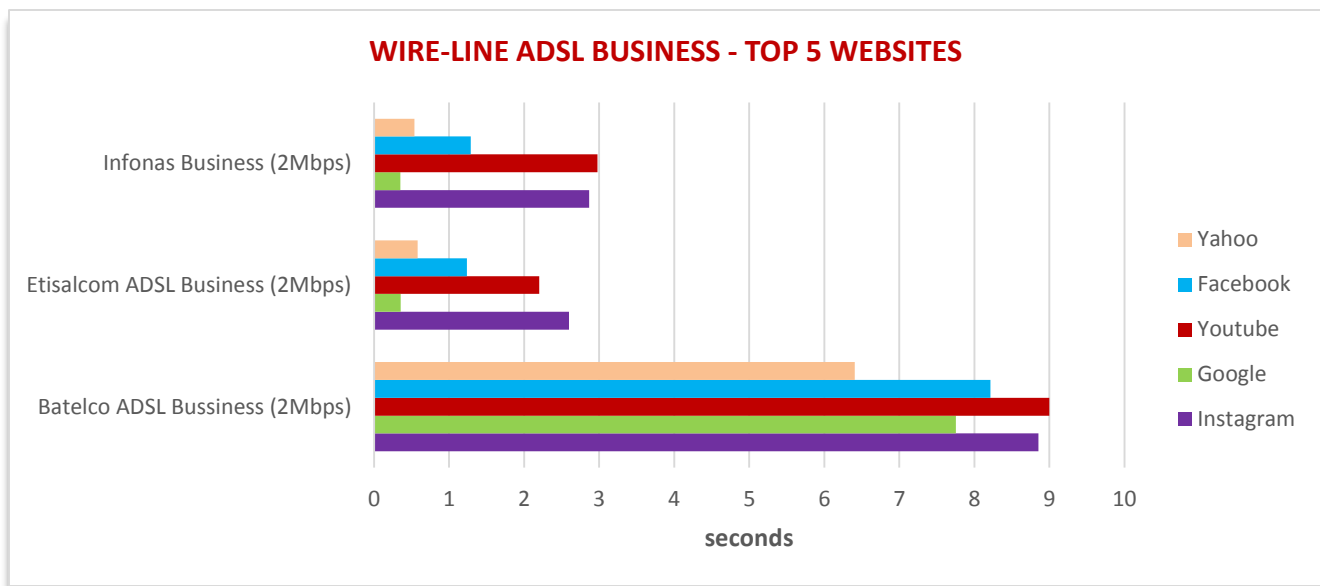
HIGHLIGHT

- The Results Average for FTP is 0.82 Mbps.
- Higher FTP upload value indicates higher file upload speed from the device to server.

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3.6 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
Batelco ADSL Bussiness (2Mbps)	8.85	7.75	9.00	8.22	6.41
Etisalcom ADSL Business (2Mbps)	2.60	0.36	2.20	1.24	0.58
Infonias Business (2Mbps)	2.87	0.35	2.98	1.29	0.54

Top 5 Websites Browsing Time Table View (Seconds)

HIGHLIGHT

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

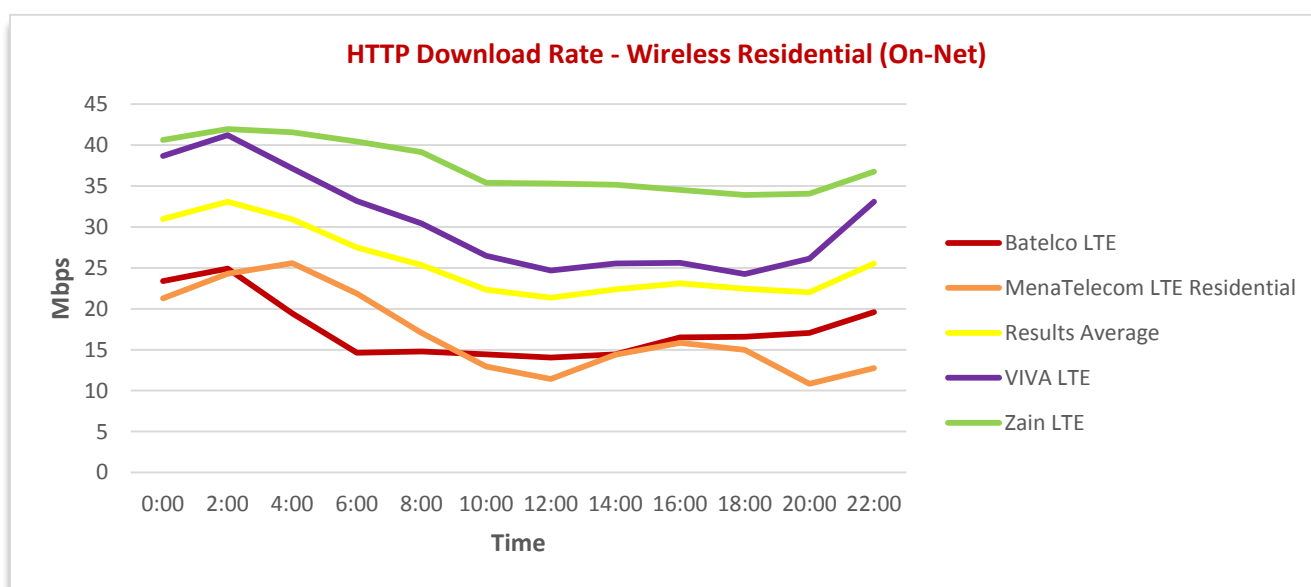
4. FIXED WIRELESS BROADBAND INTERNET TESTING - RESIDENTIAL SERVICES



4. FIXED WIRELESS 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	23.37	24.92	19.43	14.62	14.81	14.44	14.05	14.45	16.52	16.60	17.07	19.60
MenaTelecom LTE Residential	21.27	24.27	25.58	21.85	17.06	12.96	11.44	14.40	15.83	15.00	10.84	12.76
VIVA LTE	38.65	41.20	37.14	33.15	30.41	26.45	24.68	25.52	25.61	24.25	26.14	33.09
Zain LTE	40.63	41.97	41.57	40.41	39.12	35.39	35.30	35.15	34.52	33.88	34.07	36.76
Results Average	30.98	33.09	30.93	27.51	25.35	22.31	21.37	22.38	23.12	22.43	22.03	25.55

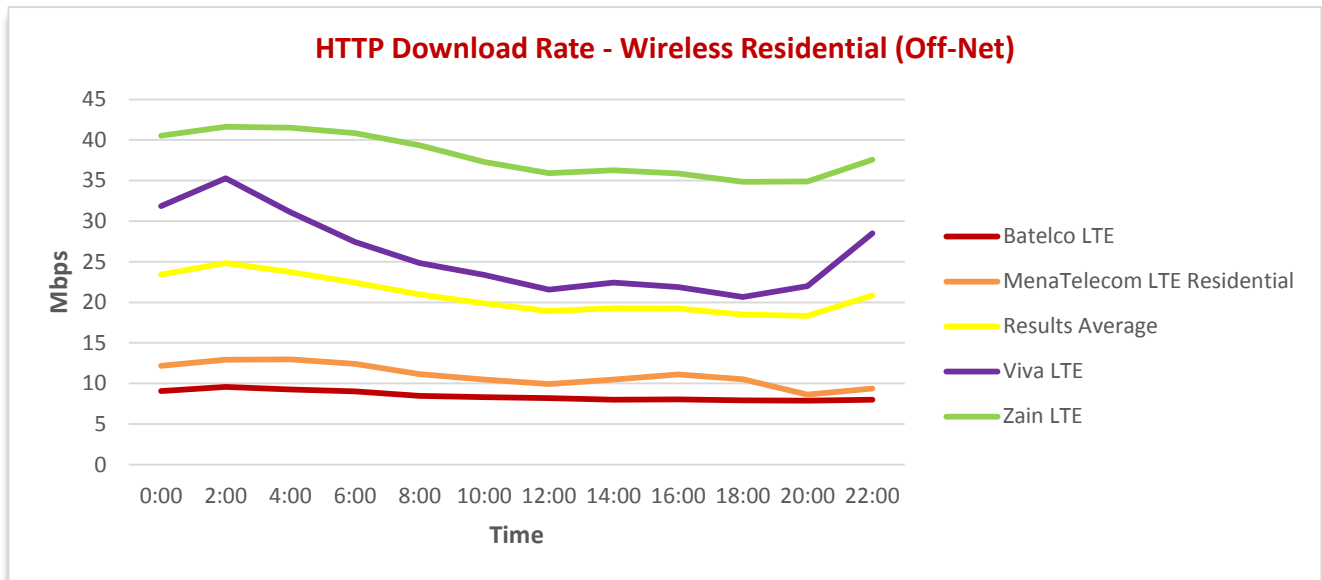
HTTP (On-Net) Download Speed – Summary Table (Mbps)

HIGHLIGHT

- Results Average HTTP download speed of 25.6 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

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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	9.05	9.57	9.27	9.04	8.49	8.33	8.21	7.99	8.04	7.92	7.88	7.99
MenaTelcom LTE Residential	12.16	12.92	12.98	12.42	11.17	10.49	9.93	10.49	11.13	10.52	8.62	9.37
Viva LTE	31.86	35.28	31.12	27.42	24.83	23.39	21.56	22.43	21.87	20.67	21.98	28.52
Zain LTE	40.53	41.64	41.52	40.86	39.34	37.31	35.94	36.25	35.86	34.85	34.91	37.58
Results Average	23.40	24.85	23.73	22.43	20.95	19.88	18.91	19.29	19.23	18.49	18.35	20.87

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

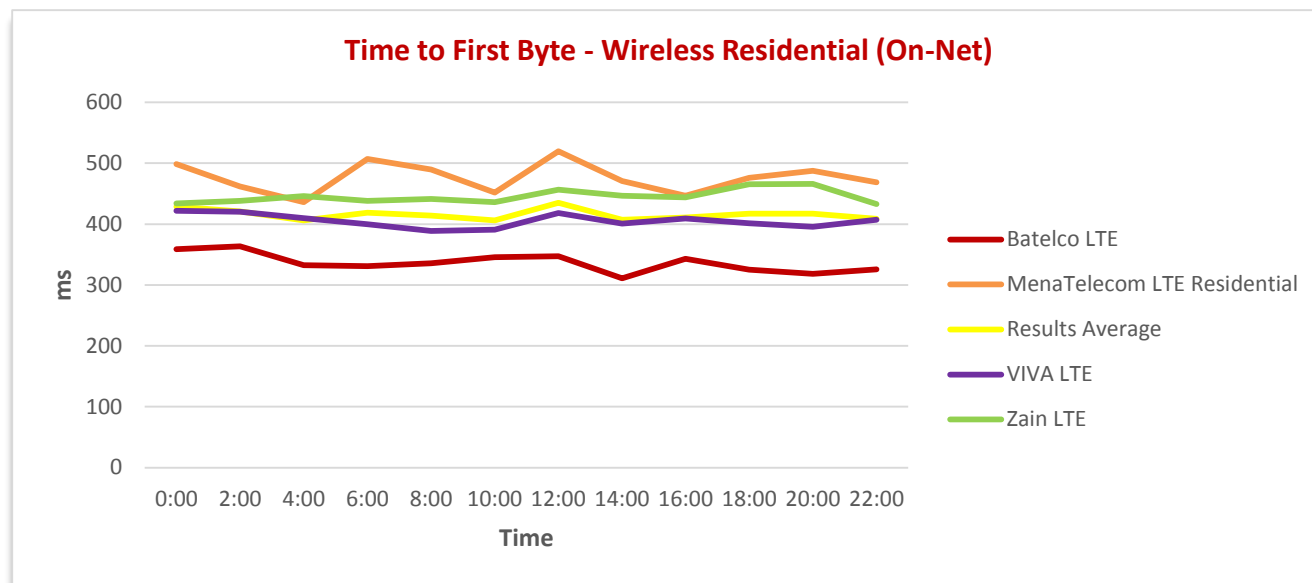
HIGHLIGHT

- Results Average HTTP download speed of 20.86 Mbps has been recorded.
- Higher HTTP download value indicates higher downlink internet speed.

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4.2 TIME TO FIRST BYTE FOR WIRELESS RESIDENTIAL PACKAGES

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



Time to First Byte (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	359.09	363.47	332.68	330.88	335.67	345.46	347.02	311.14	343.10	324.95	318.43	325.75
MenaTelcom LTE Residential	498.91	461.65	436.14	506.88	489.67	452.04	519.75	471.00	446.37	476.10	487.83	468.81
VIVA LTE	421.93	420.23	409.85	399.89	388.98	391.15	417.99	400.72	409.25	401.63	395.74	407.42
Zain LTE	434.03	438.28	445.92	438.41	441.34	436.08	456.37	446.59	444.15	465.53	465.95	433.00
Results Average	428.49	420.91	406.15	419.01	413.92	406.18	435.28	407.36	410.72	417.06	416.99	408.74

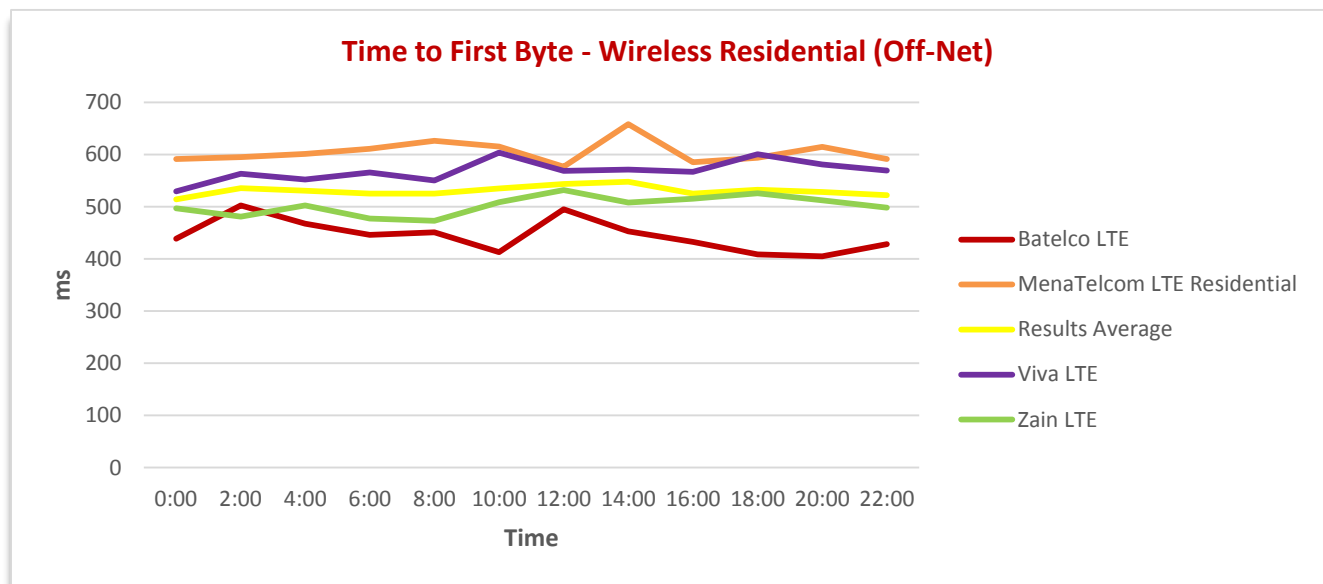
Time to First Byte (On-Net) Table View (milliseconds)

HIGHLIGHT

- The Results average Time to First Byte is 415.9 milliseconds.
- The lower the Time to First Byte, the better the customer browsing experience in loading web pages.

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The Time to First Byte test records the time taken (in milliseconds) to resolve a fully qualified domain name into a corresponding IP address till the HTTP page starts downloading. 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).



Time to First Byte (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	438.58	502.52	467.55	445.97	450.97	413.20	495.41	452.98	432.76	408.79	405.36	428.68
MenaTelecom LTE Residential	591.32	595.17	601.54	611.44	626.66	615.62	577.12	658.41	585.41	594.06	615.05	591.68
Viva LTE	529.65	563.14	552.30	565.89	550.66	603.99	569.11	571.48	567.17	600.94	581.35	569.69
Zain LTE	496.87	480.90	502.39	477.23	473.30	508.72	532.20	508.20	515.21	526.14	512.59	498.12
Results Average	514.11	535.43	530.94	525.13	525.40	535.38	543.46	547.77	525.14	532.48	528.59	522.04

Time to First Byte (Off-Net) Table View (milliseconds)

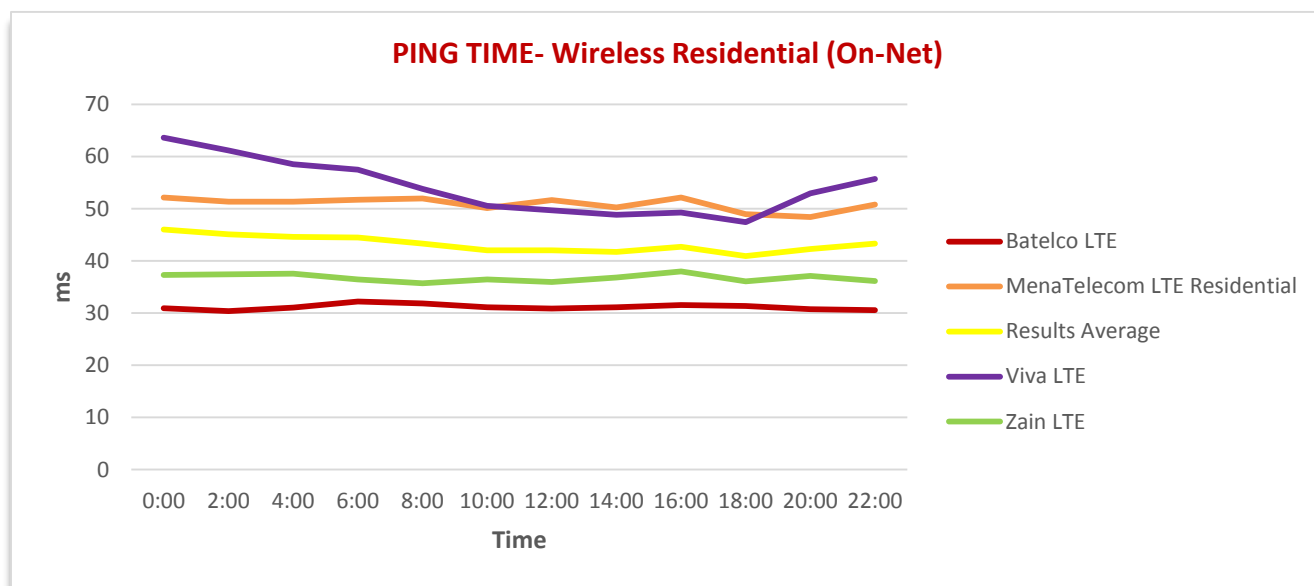
HIGHLIGHT

- The Results Average Time to First Byte is 530.4 milliseconds.
- The lower the Time to First Byte, the better the customer browsing experience in loading web pages.

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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	30.92	30.37	31.05	32.22	31.87	31.10	30.85	31.11	31.58	31.34	30.73	30.57
MenaTelecom LTE Residential	52.16	51.34	51.38	51.72	51.98	50.13	51.66	50.26	52.17	48.95	48.43	50.84
VIVA LTE	63.64	61.17	58.55	57.51	53.81	50.58	49.71	48.86	49.25	47.44	52.95	55.70
Zain LTE	37.34	37.43	37.59	36.48	35.74	36.47	35.99	36.80	37.97	36.06	37.12	36.14
Results Average	46.02	45.08	44.64	44.48	43.35	42.07	42.05	41.76	42.74	40.95	42.31	43.31

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

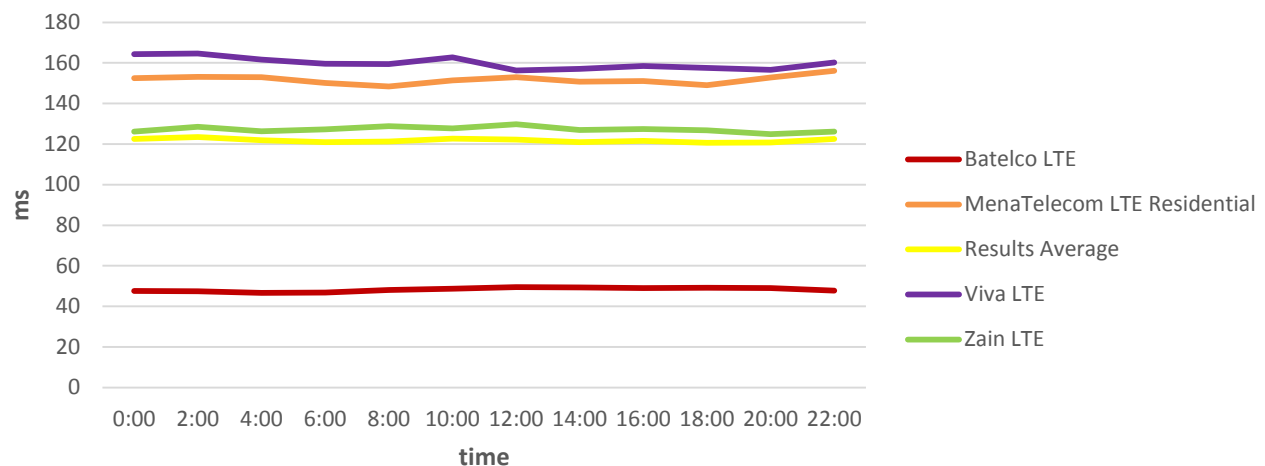
HIGHLIGHT

- The Results Average Latency is at 43.2 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience.

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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- Wireless Residential (Off-Net)



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	47.56	47.41	46.63	46.74	48.13	48.74	49.49	49.31	49.04	49.13	49.04	47.75
MenaTelecom LTE Residential	152.44	153.12	152.98	150.06	148.41	151.32	152.99	150.79	151.14	148.95	152.84	156.12
VIVA LTE	164.24	164.65	161.68	159.60	159.48	162.67	156.35	157.01	158.45	157.59	156.55	160.22
Zain LTE	126.09	128.46	126.25	127.30	128.75	127.74	129.78	126.88	127.38	126.74	124.92	126.22
Results Average	122.58	123.41	121.88	120.92	121.19	122.62	122.15	121.00	121.50	120.60	120.84	122.58

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

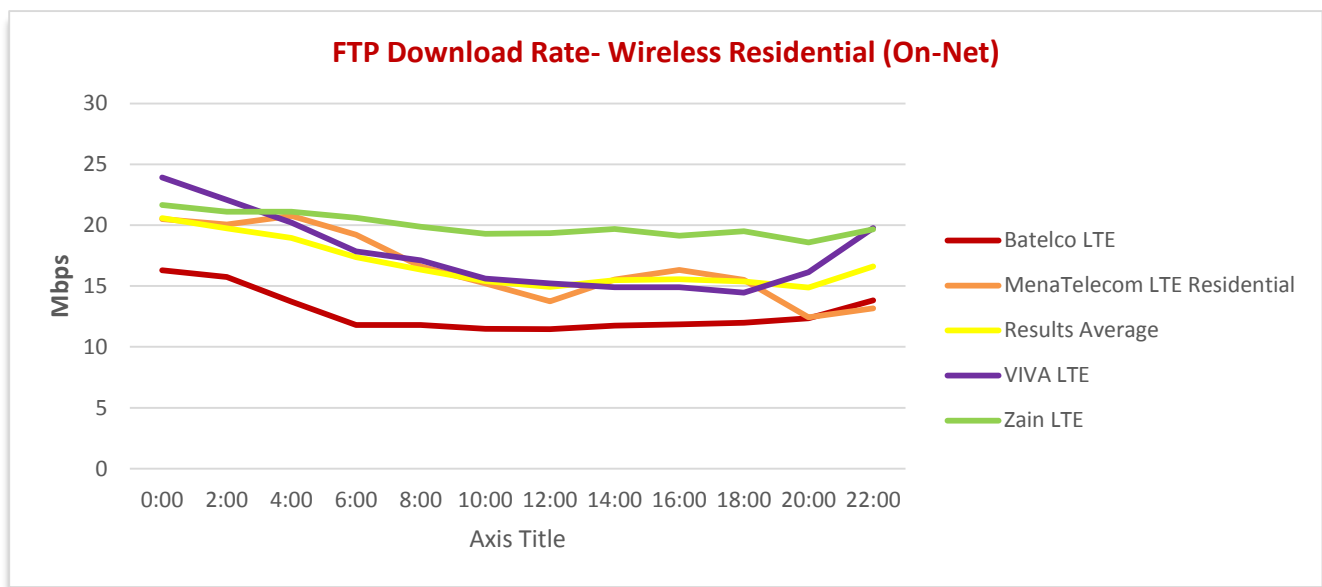
HIGHLIGHT

- The Results Average Latency is 121.7 milliseconds.
- The lower the value of the ping time, the better is the network quality that will provide a higher customer experience

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4.4 FTP DOWNLOAD RATE FOR WIRELESS RESIDENTIAL PACKAGES

File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can download a file on a server provided by the operator (On-Net).



FTP Download Rate (On-Net) 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	16.29	15.73	13.70	11.81	11.80	11.49	11.45	11.75	11.85	11.98	12.34	13.82
MenaTelecom LTE Residential	20.49	20.04	20.75	19.20	16.62	15.20	13.74	15.52	16.31	15.50	12.42	13.15
VIVA LTE	23.91	22.08	20.22	17.84	17.11	15.62	15.22	14.91	14.90	14.46	16.13	19.76
Zain LTE	21.65	21.11	21.11	20.60	19.88	19.29	19.33	19.68	19.14	19.51	18.58	19.67
Results Average	20.59	19.74	18.95	17.36	16.35	15.40	14.93	15.47	15.55	15.36	14.87	16.60

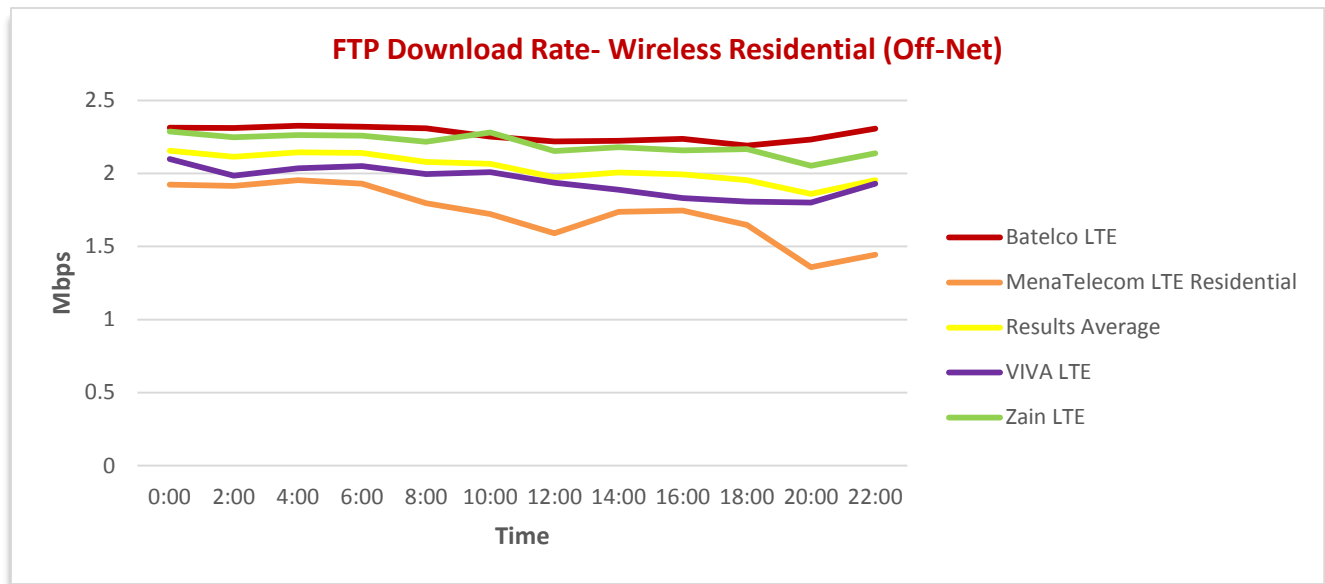
FTP Download Rate (On-Net) Table View (Mbps)

HIGHLIGHT

- The Results Average for FTP is 16.76 Mbps.
- Higher FTP download value indicates higher file download speed from the server.

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File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can download a file on a server (Off-Net).



FTP Download Rate (Off-Net) 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	2.31	2.31	2.33	2.32	2.31	2.25	2.22	2.22	2.24	2.19	2.23	2.31
MenaTelecom LTE Residential	1.92	1.92	1.95	1.93	1.80	1.72	1.59	1.74	1.75	1.65	1.36	1.44
VIVA LTE	2.10	1.98	2.03	2.05	2.00	2.01	1.94	1.89	1.83	1.81	1.80	1.93
Zain LTE	2.29	2.25	2.26	2.26	2.22	2.28	2.15	2.18	2.16	2.17	2.05	2.14
Results Average	2.16	2.11	2.14	2.14	2.08	2.07	1.97	2.01	1.99	1.95	1.86	1.95

FTP Download Rate (Off-Net) Table View (Mbps)

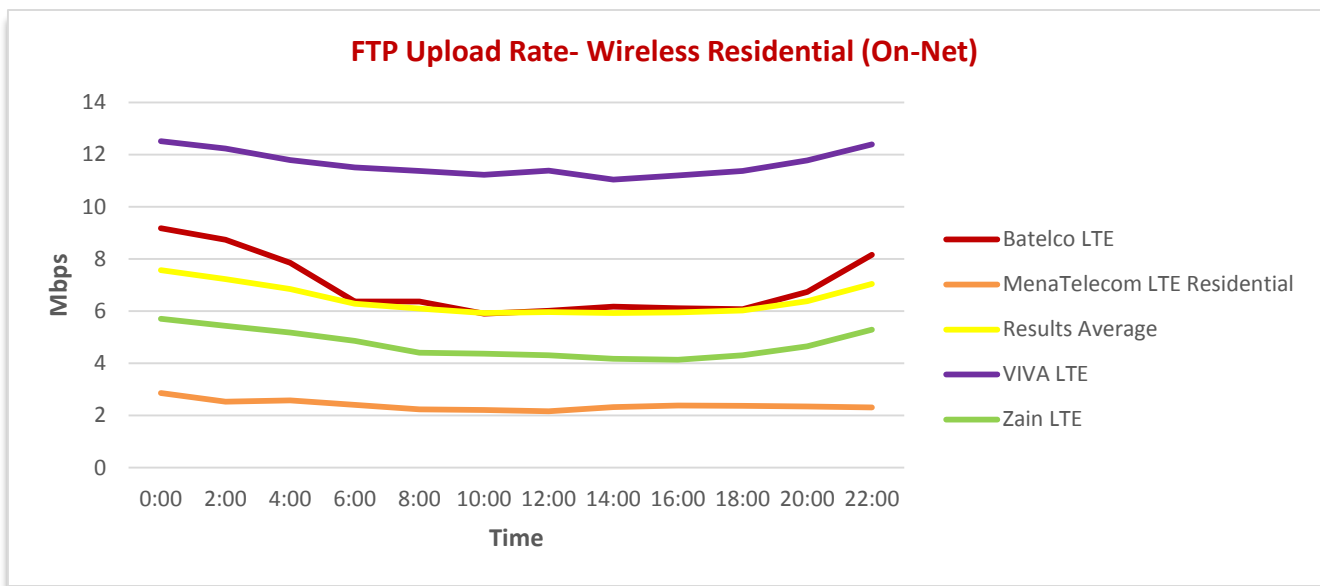
HIGHLIGHT

- The Results Average for FTP is 2.03 Mbps.
- Higher FTP download value indicates higher file download speed from the server.

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4.5 FTP UPLOAD RATE FOR WIRELESS RESIDENTIAL PACKAGES

File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can upload a file on a server provided by the operator (On-Net).



FTP Upload Rate (On-Net) 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	9.18	8.73	7.85	6.37	6.37	5.90	6.01	6.17	6.11	6.07	6.74	8.16
MenaTelecom LTE Residential	2.86	2.53	2.58	2.41	2.24	2.21	2.16	2.32	2.38	2.36	2.34	2.31
VIVA LTE	12.51	12.23	11.78	11.50	11.37	11.22	11.38	11.04	11.20	11.37	11.78	12.39
Zain LTE	5.70	5.44	5.18	4.85	4.40	4.36	4.31	4.17	4.14	4.30	4.65	5.29
Results Average	7.56	7.23	6.85	6.28	6.09	5.92	5.97	5.93	5.95	6.02	6.38	7.04

FTP Upload Rate (On-Net) Table View (Mbps)

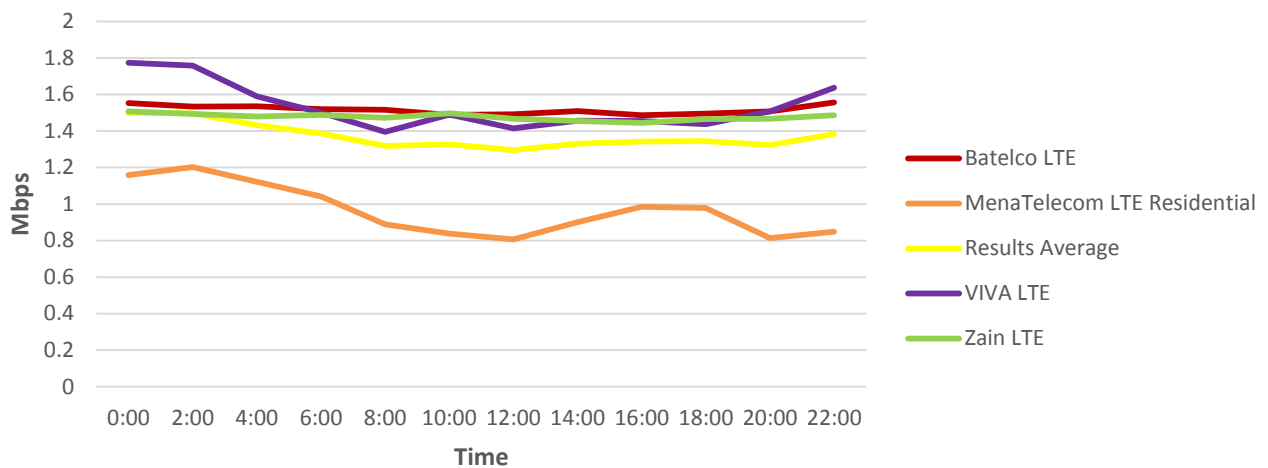
HIGHLIGHT

- The Results Average for FTP is 6.4 Mbps.
- Higher FTP upload value indicates higher file upload speed from the device to server.

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File Transfer Protocol (FTP) is a standard Internet protocol for transmitting files between computers on the Internet over TCP/IP connections. FTP is a client-server protocol that relies on two communications channels between client and server: a command channel for controlling the conversation and a data channel for transmitting file content. Clients initiate conversations with servers by requesting to download a file. Using FTP, a client can upload a file on a server (Off-Net).

FTP Upload Rate- Wireless Residential (Off-Net)



FTP Upload Rate (Off-Net) 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	1.55	1.53	1.54	1.52	1.52	1.49	1.49	1.51	1.49	1.50	1.51	1.56
MenaTelecom LTE Residential	1.16	1.20	1.12	1.04	0.89	0.84	0.81	0.90	0.99	0.98	0.81	0.85
VIVA LTE	1.77	1.76	1.59	1.50	1.40	1.49	1.42	1.46	1.45	1.44	1.51	1.64
Zain LTE	1.51	1.49	1.48	1.49	1.47	1.50	1.47	1.46	1.44	1.47	1.47	1.49
Results Average	1.50	1.50	1.43	1.39	1.32	1.33	1.30	1.33	1.34	1.34	1.32	1.38

FTP Upload Rate (Off-Net) Table View (Mbps)

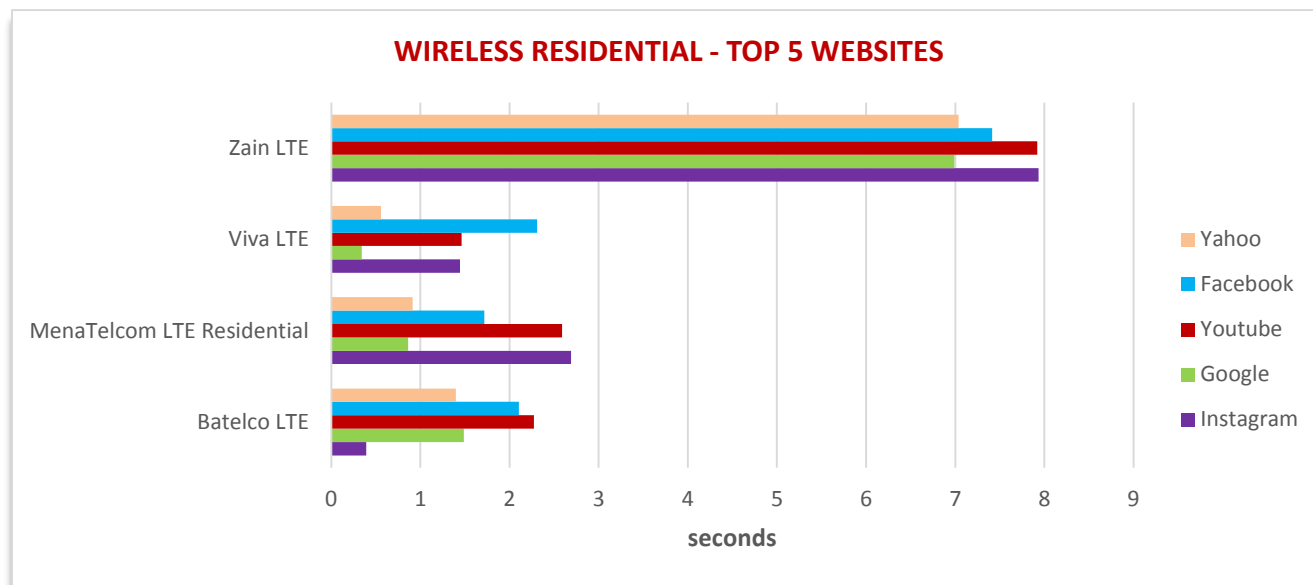
HIGHLIGHT

- The Results Average for FTP is 1.4 Mbps.
- Higher FTP upload value indicates higher file upload speed from the device to server.

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4.6 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	0.39	1.49	2.27	2.10	1.40
MenaTelcom LTE Residential	2.69	0.86	2.59	1.72	0.91
Viva LTE	1.44	0.34	1.46	2.31	0.56
Zain LTE	7.93	6.99	7.92	7.41	7.04

Top 5 Browsing Time Table View (Seconds)

HIGHLIGHT

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

5. STATIONARY MOBILE TESTING

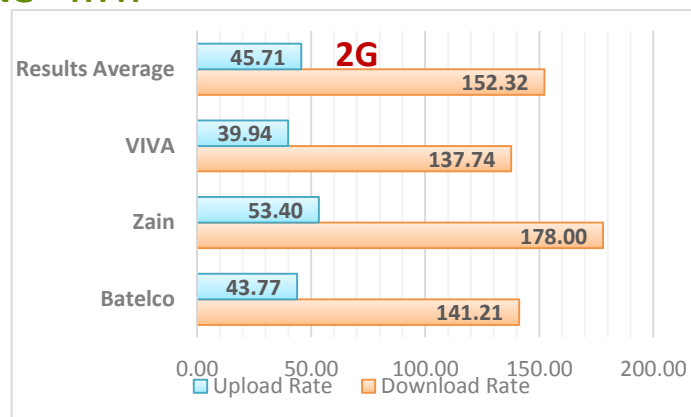


5. STATIONARY MOBILE TESTING

5.1 STATIONARY MOBILE DATA TESTING – HTTP

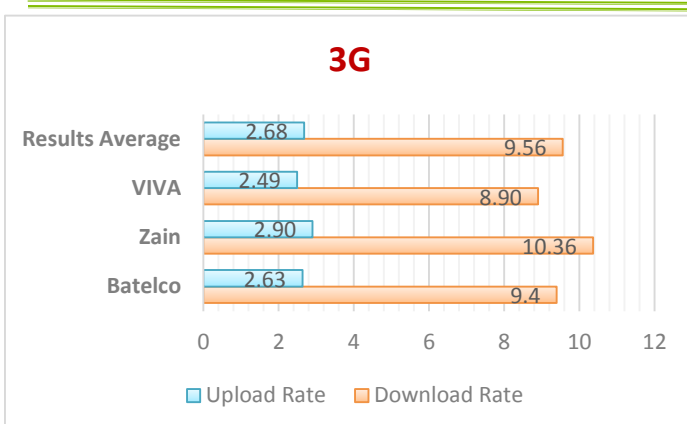
GSM (2G)

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 (Kbps)

3G



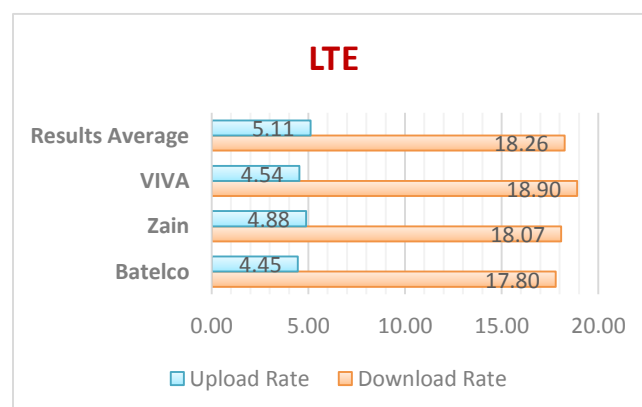
3G Download & Upload Transfer Rate (Mbps)

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.



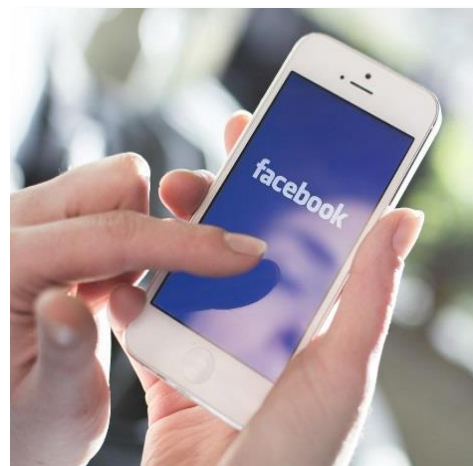
LTE Download & Upload Transfer Rate (Mbps)

5.2 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

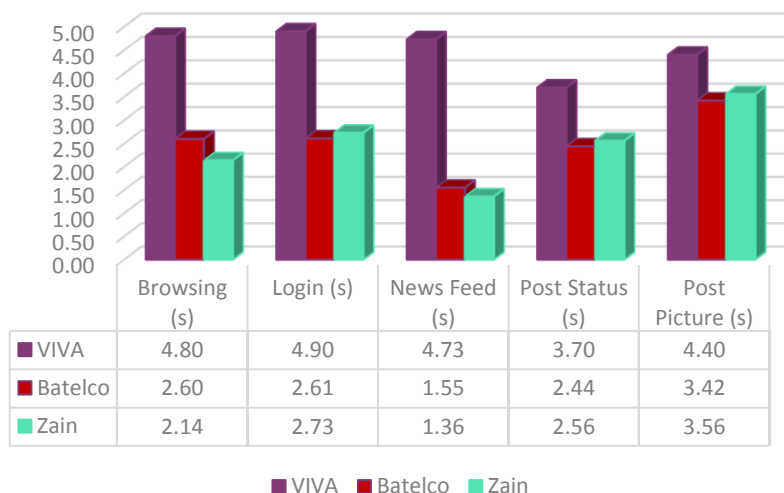
Response time of retrieving new feed in main page

Post Status

Response time of updating personal status

Post Picture

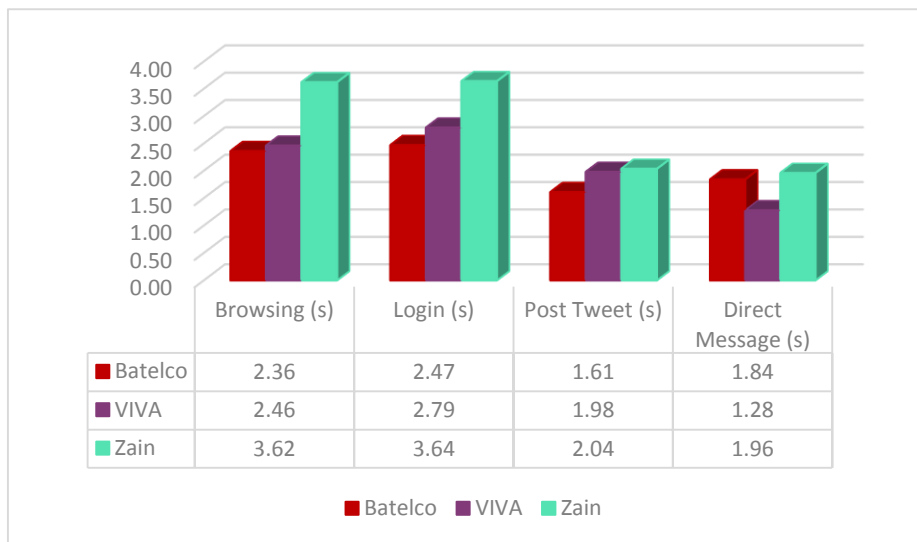
Response time for uploading a picture.



Facebook Mobile QoS (seconds)

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



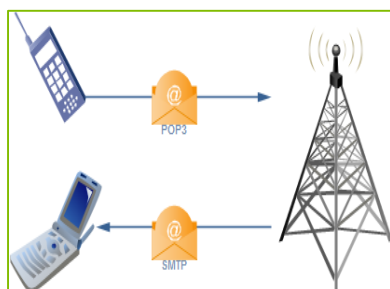
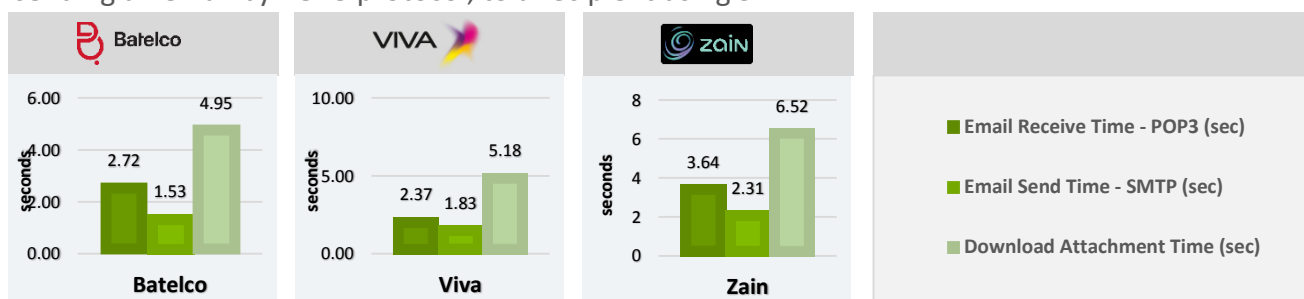
Twitter Mobile QoS (seconds)



- 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.



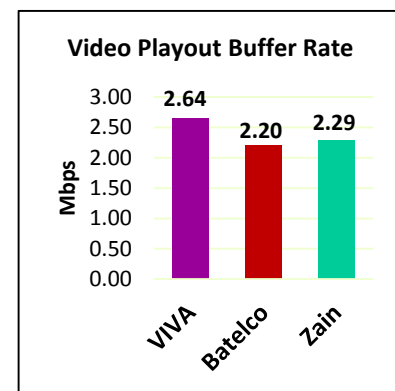
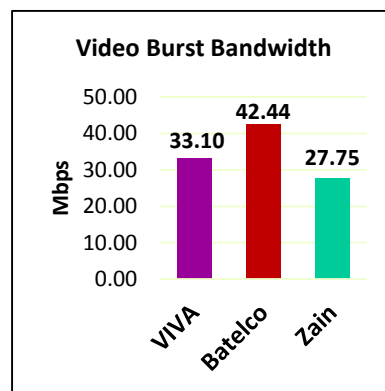
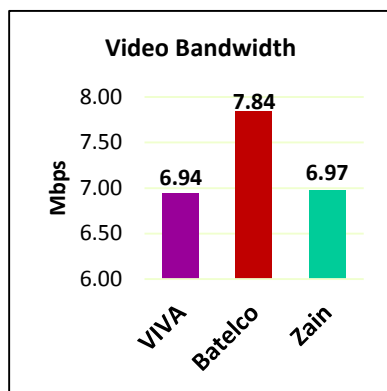
Email Methodology

- 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

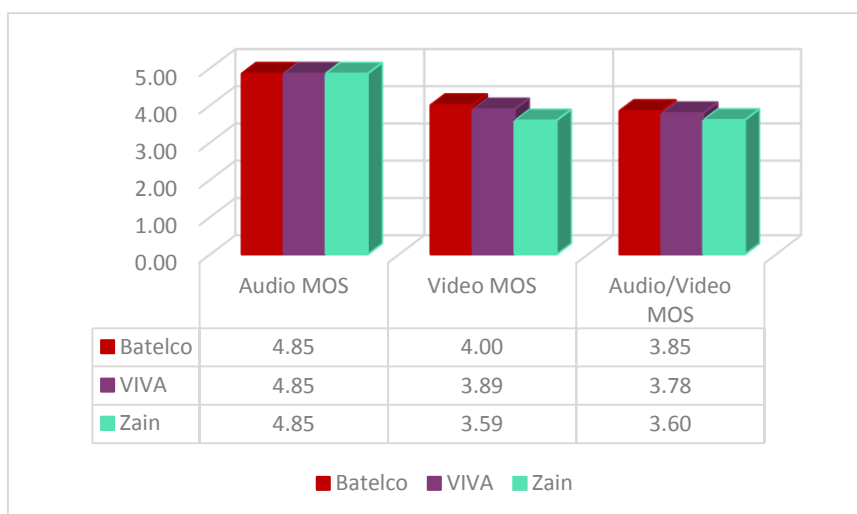
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For those who stream videos from online sources, the speed at which data can be sent to their devices is critical. If your connection is not fast enough, streaming video can sometimes stall as it fills the buffer in the receiving device. Or, the content provider might send a lower-quality stream because it senses that your available speed cannot handle higher quality streams. 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

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5.3 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	4.8	5.8
Batelco	4.8	5.8
Zain	4.3	5.4
Results Average	4.6	5.7

VOICE CALLS SETUP TIME (Sec)

Operator	Call Quality Score (On-Net)	Call Quality Score (Off-Net)
VIVA	4.42	4.21
Batelco	4.25	4.24
Zain	4.38	4.27
Results Average	4.35	4.24

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	1.30	2.07
Batelco	1.50	1.50
Zain	1.64	1.54
Results Average	1.5	1.7

SMS SEND vs RECEIVE TIME (Sec)

6. 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	Value packages - Medium	ADSL	200GB	13Mbps	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	Up to 150Mbps	Up to 150Mbps	Unlimited
	Residential	Mobile Prepaid	SimSim Super Packages	4G LTE	100 GB	Up to 150Mbps	Up to 150Mbps	Unlimited
Zain	Residential/ Business	Mobile Postpaid	Smart Plans	4G LTE	100 GB	Up to 150Mbps	Up to 150Mbps	Unlimited
	residential	Mobile Prepaid	Dangrous Prepaid	4G LTE	100 GB	Up to 150Mbps	Up to 150Mbps	Unlimited
Menatelecom	Residential	Postpaid	menaHome	4G LTE	100 GB	Up to 150Mbps	Up to 4Mb	3Mb
Etisalcom	Residential	Postpaid	eDSL 8	ADSL	Unlimited	8Mbps	2 Mbps	Unlimited
	Business	Postpaid	eDSL 2	ADSL	Unlimited	2Mbps	1 Mbps	Unlimited
Infonas	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