Commission for
Communications Regulation

Broadband Speeds Pilot Initiative

Information Notice

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Contents

1 Executive Summary

1. Broadband service providers typically advertise and sell their products on the basis of a headline speed which is generally the maximum speed that the service can reach, under optimal conditions. In addition, the terms and conditions of broadband contracts do not guarantee any minimum speed. The package names and 'up to' or headline speed claims of broadband services create an expectation regarding speed that may not be matched by the actual user experience. ComReg understands that service providers measure the speed of their products to ascertain details about network performance and to enable planning regarding network build and improvements; however no contractual information regarding speeds is made available to consumers.

2. Although ComReg does not mandate the provision of a broadband service, ComReg has responsibility for ensuring that consumers of broadband services are appropriately protected and informed. ComReg is of the preliminary view that consumers should have the appropriate information available regarding the speed for each product on the market so that they can make informed choices. Equally, ComReg is of the view that transparent information around the speed most likely to be achieved on a case by case basis should also be available to consumers before a contract is entered into.

3. ComReg engaged consultants Epitiro Ltd. to develop and pilot a tool for measuring and recording broadband speeds, across a range of broadband platforms, as experienced by consumers (The Pilot). The objective of the Pilot was to measure user experience; to gather information on actual broadband speeds being experienced and to provide ComReg with a national picture or overview of the speeds experienced across a range of platforms. With that aim in mind, the results are not normalised for variances in factors such as distance from exchange or internal and environmental factors. Normalising the data would reflect what a service provider's network could potentially deliver under more optimal line conditions, whether or not the service was actually being utilised at that time, but would not fully reflect the experience of many broadband users in Ireland when using their service. Therefore, this trial measured the actual speed experienced by a group of 470[1] panellists on their PC or laptop; it did not measure the speed delivered by a service provider to the dwelling. It is generally accepted that the user experience is heavily influenced by the conditions inside the dwelling - the internal environment at the user's home.

[1] This figure is for both fixed (419) and mobile (51) broadband panellists.

4. In Q3 2014, having carried out extensive testing, preparation and communication with industry, ComReg commenced its Pilot by engaging Red C to recruit and manage a panel of up to 1,000 broadband consumers. In Q4 2014, Red C invited members from their panel to participate by downloading the tool and leaving it to run on their PCs or laptops during a minimum of three weeks in November 2014. The process is set out in section 2.

5. ComReg has undertaken and completed, as appropriate, analysis of the data captured during the Pilot in November 2014. The measurement survey was carried out among self-selecting individuals that were part of a wider panel. Although the composition of the sample panel of respondents was broadly in line with the nationally representative sample of broadband users, the subset which provided the test data is not a weighted survey and does not purport to be representative of the wider population. In many cases the aggregated data gathered on the Pilot sample was not statistically robust due to small sample sizes of the particular test cases and therefore unable to be relied upon or published. ComReg has been able to publish only high-level insights into the broadband performance results of the Pilot, which are outlined in section 3.

6. ComReg is now considering the next steps and options available to it with respect to broadband speed.

2 Pilot Panel of Testers

7. In Q4 2014, Red C invited members from their panel of 30,000 to participate in the Pilot "Broadband Test and See" project. Users registering to participate in the study were asked to download and install the Epitiro Broadband Test Application (AT50) onto the Windows based PC or laptop from which they access their broadband service. Testing was limited to the most commonly used Windows operating systems (Win 7, XP and Vista).

8. 984 panellists registered to take part in the Pilot. Panellists that recorded less than 9 valid download tests during the period are excluded from the sample. Each panellist had to have a minimum of 9 valid tests to be included in the analysis as this is approximately 10% of the total amount of tests collected over the duration of the testing period[2]. There were also panellists who registered to participate but did not proceed to download the tool. 470 panellists' results were included in the analysis conducted by ComReg. Of this, 419 panellists' results are for fixed broadband and it is these results that are presented in this publication. The remaining 51 panellists are mobile broadband panellists and due to the small sample size, these results are not included here.

9. The Broadband Test Application software was scheduled to execute tests of network performance up to 4 times per day – during both peak and off-peak hours. The actual schedules and quantity of measurements made are dependent upon how often the panellists use their PC and access their broadband service. The software was configured to ensure that testing would only be conducted when the user was connected to the relevant broadband service and when certain conditions relating to CPU and network usage were met. This avoided any impact on results from user activity by only running tests at times when suitably minimal CPU (<25%) and network usage were observed. Users could uninstall the software at any time as per the usual method for removing programs in MS Windows.

10. The measurements executed by the Broadband Test Application included measures of download and upload speeds, network latency, web page download, and DNS resolution. **Only download speed results are included in this publication.**

11. Panellists were required to self-declare their details by selecting their service provider and broadband package when registering to use the 'Broadband Test and See" tool along with entering details of their location. Panellists

[2] The testing period was for a duration of up to 4 weeks. The schedule of testing was for three to four tests per day: 18:00pm-21:00pm, 21:00pm-23:00pm, and 23:00pm-18:00 pm (next day). Within a single day (midnight to midnight) it is possible to get 4 tests, though likely only 3 are captured.

declared whether their location was rural or urban and these selections were not validated[3]. Where anomalies were detected they were eliminated; however the panellists choose their service provider and broadband packages from a drop down list and these details were not verified with their service provider.

12. Testing was limited to broadband users in Ireland (25 counties were represented)[4] of the following ten service providers:

    - Digiweb,
    - eircom Ltd.,
    - eMobile/Meteor Mobile Communications Ltd.,
    - Imagine Telecommunications Ltd.,
    - Magnet Networks Ltd.,
    - Sky Ireland,
    - Three Ireland (Hutchison) Ltd.,
    - UPC Communications Ltd.,
    - Vodafone Ireland Ltd. (at home),
    - Vodafone Ireland Ltd. (mobile).

13. **<u>Note:</u> The sample of fixed broadband panellists who declared their location as being Rural (117) is smaller than those who declared their location as being Urban (302). None of the speeds recorded in this trial are statistically significant to the extent that they can be applied to the general population. Any results recorded during this trial are the average speeds recorded by the panellists and cannot be extrapolated to be representative of anything other than of the sample from this Pilot.**

[3] Rural is defined as an area with 1500 or less inhabitants, as per the Central Statistics Office. Panellists were asked 'do you live in a rural area? (Are there approximately less than 1500 inhabitants in your area)'. Urban is an area that has a total population of 1,500 or more. Panellists self-declared if they were rural and no validation of this registration data was carried out.

[4] County Clare was not represented as none of the residual 470 tester panellists in the sample declared their location as being Co. Clare.

3 Pilot High Level Findings

3.1 Overview

14. ComReg has gained a high-level insight into the broadband performance results of the Pilot which is set out below. Further detail based on the Pilot undertaken In November 2014 will not be available due to small sample sizes.

15. The figures contained in this report are for download speed only. The number of both fixed and mobile broadband panellists who provided test results for download speed was 470. Of this, 419 panellists had fixed a broadband service and 51 had a mobile broadband service. As the sample size for mobile broadband participants was very small no results from this subset will be published.

16. When looking at the results, care should be taken when interpreting the results, due to small sample sizes in some cases. The Margin of Error for a sample of 100 is 10%. This means that if you found, for example, that 60 out of 100 panellists (60%) were satisfied with their download speeds, then the actual proportion of the population with satisfaction in their download speeds could vary by ±10%. In other words, the actual proportion could be as low as 50% (60 - 10) and as high as 70% (60 + 10). As the sample size is increased, the margin of error reduces. A sample of 500 has a margin of error of 4.5%.

17. Faster speeds were generally achieved on fixed broadband services although the sample size for mobile broadband was very low. In addition, faster speeds tended to occur during the off peak periods for all service providers.

3.2 Urban and Rural[5]

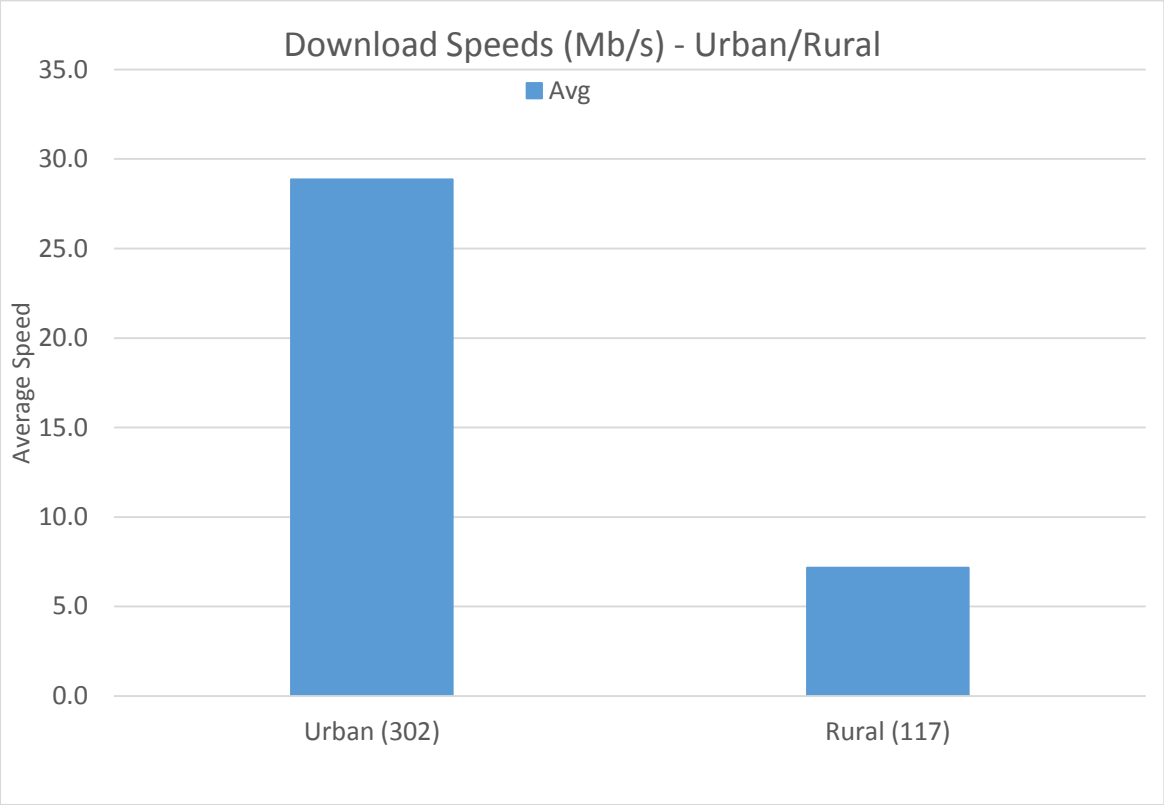


Figure 1

18. Figure 1 shows some differences observed in actual download speed results for urban and rural panellists from the sample panel of testers. Urban panellists experienced faster speeds compared to rural panellists, across all service providers. **Note, the sample size for fixed broadband urban panellists (302) was much larger than for fixed broadband rural panellists (117) and in addition, urban panellists were more likely to be on broadband packages with a higher headline speed.**

- **Fixed Broadband Total**: average download speed experienced all areas (urban and rural) on both wired and Wi-Fi was 22.57 Mb/s (419 panellists).

- **Fixed Broadband Urban**: average download speed experienced (wired and Wi-Fi) was 28.87 Mb/s (302 panellists).

- **Fixed Broadband Rural**: average download speed experienced (wired and Wi-Fi) was 7.17 Mb/s (117 panellists).

[5] Rural is defined as an area with 1500 or less inhabitants, as per the Central Statistics Office. Panellists were asked 'do you live in a rural area? (Are there approximately less than 1500 inhabitants in your area)'.Urban is an area that has a total population of 1,500 or more. Panellists self-declared if they were rural and no validation of this registration data was carried out.

3.3 Wired versus Wi-Fi

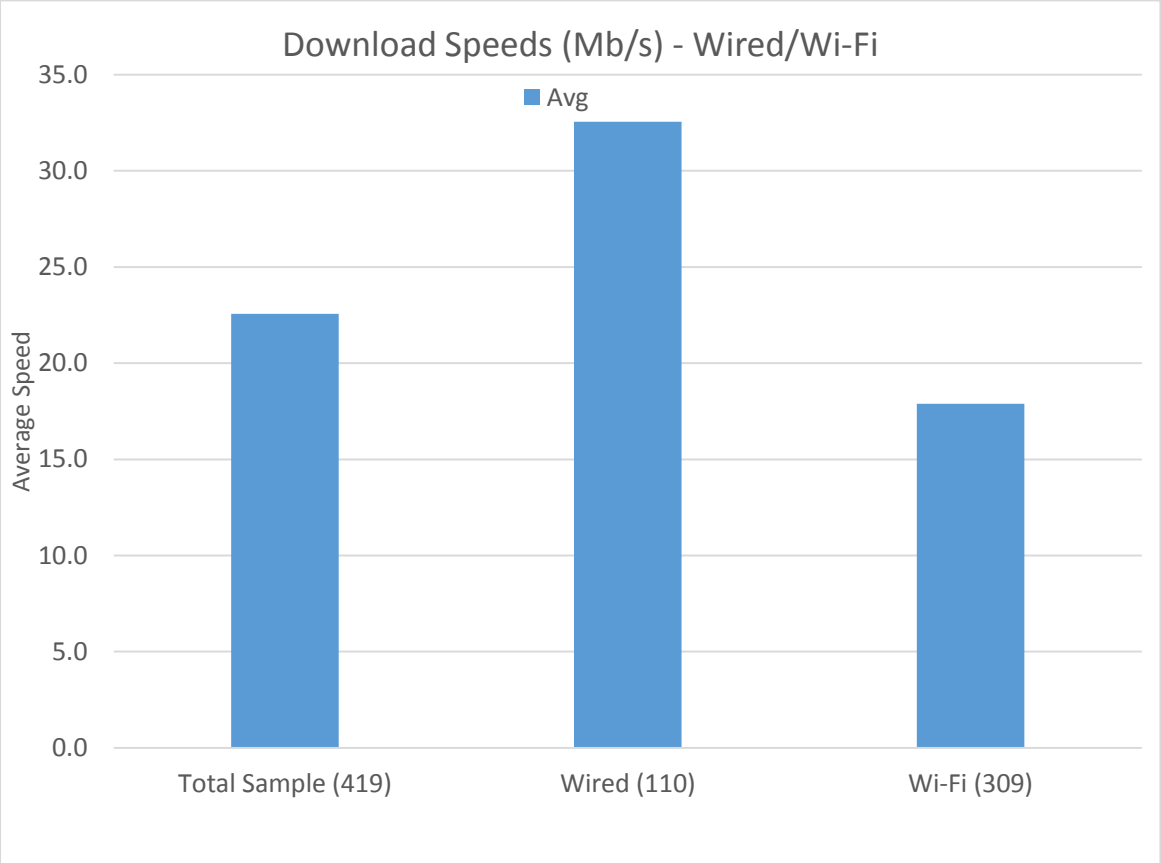


Figure 2

19. From the panel of testers, there were some differences in download speeds observed when comparing speed test results from wired and Wi-Fi connections. Wired connections are those connections that are physically connected to the modem or router with an Ethernet cable. Wi-Fi is a wireless technology that allows PCs, laptops and other devices to communicate over a wireless signal. For download speed, approximately 74% of panellists were using Wi-Fi connections. The layout of the home, the distance of the device (PC/laptop) from the router and the type of router may have an impact on broadband speed experienced. **Note, the sample size for fixed wired (110) was much smaller than the sample size for fixed Wi-Fi (309).**

    - **Fixed Total:** Average download speed across all fixed service providers on both wired and Wi-Fi was 22.57 Mb/s (419 panellists).

    - **Fixed Wired:** Average download speed across all fixed service providers for wired connections was 32.56 Mb/s (110 panellists).

    - **Fixed Wi-Fi:** Average download speed across all fixed service providers for Wi-Fi connections was 17.89 Mb/s (309 panellists).

3.4 Urban/Rural and Wired/Wi-Fi

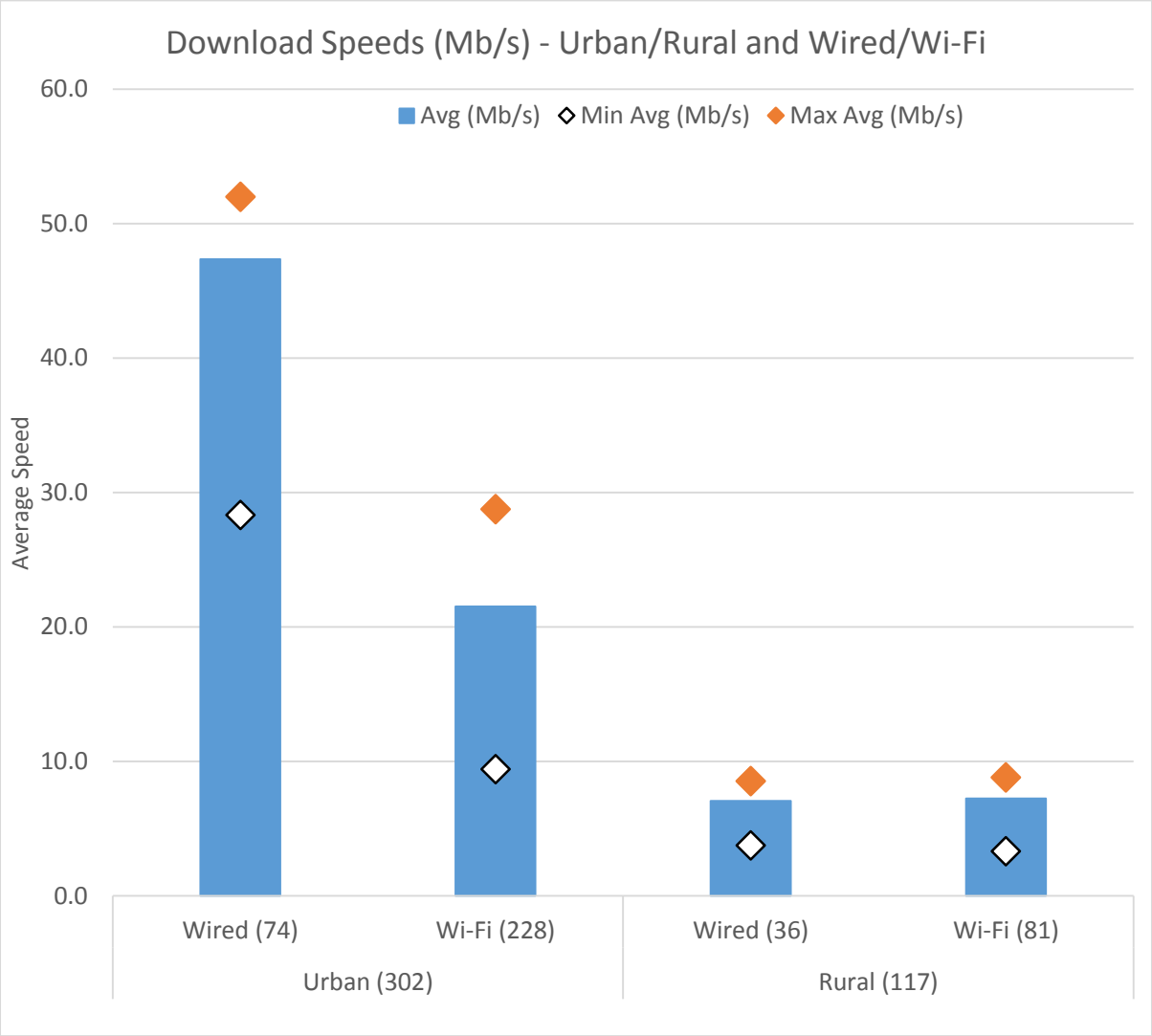


Figure 3

20. Figure 3 shows download speed results for urban panellists on wired and Wi-Fi connections.

- The average download speed for panellists on urban wired connections is higher than for panellists on urban Wi-Fi connections.

- For urban wired, rural wired and rural Wi-Fi panellists, the average download speed achieved is close to the average maximum download speed achieved.

- The sample size for rural wired (36) and rural Wi-Fi (81) is too small from which to be able to draw conclusions. In addition, panellists on rural Wi-Fi connections tended to be on broadband packages with higher headline speeds.

3.5 Satisfaction with service and speed achieved

21. The self-declared satisfaction levels of panellists whose results were included in the data analysis subset were similar to the overall satisfaction levels declared by all panellists who registered to take part (*Figure 4*). This would seem to indicate that those panellists who registered to participate, but did not have the minimum number of valid download test results to be included in the data analysis subset, were not necessarily more satisfied or dissatisfied than those panellists who had a higher number of valid speed test results.

22. 81% of all (fixed and mobile broadband) panellists included in the data analysis subset (468) were either satisfied or very satisfied with their broadband service (*Figure 5*).

    Urban panellists were more likely to indicate they were satisfied or very satisfied (85%) when compared to rural panellists (74%).

23. For fixed broadband panellists (419), 83% were either satisfied or very satisfied with their broadband service (*Figure 6*).

    Fixed urban panellists were more likely to indicate they were satisfied or very satisfied (85%) when compared to rural panellists (77%).

24. It is difficult to isolate possible drivers of satisfaction with broadband service as there can potentially be many; for example, speed, consistency of performance, download usage allowance, cost of service, customer service etc. However, from analysing the results from the 419 fixed broadband panellists surveyed, in conjunction with their speed test results, it was possible to correlate levels of satisfaction with location (urban/rural) and types of connection (wired/Wi-Fi) and with speed achieved.

All panellists who registered and declared a satisfaction rating (972)

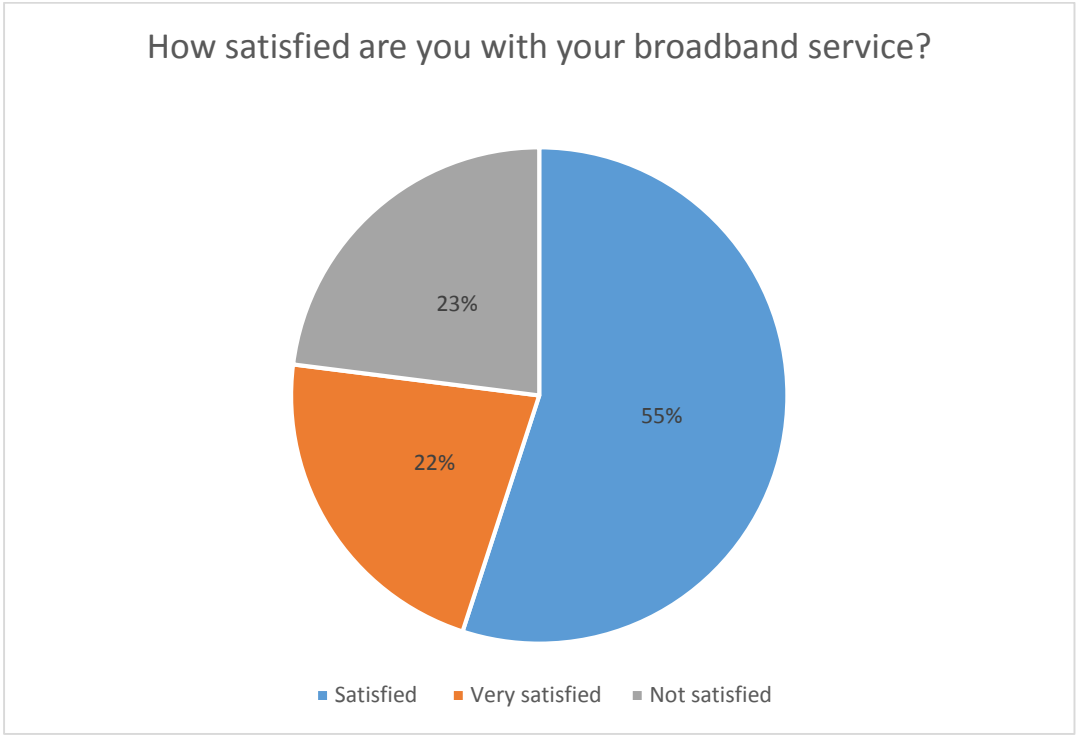


Figure 4

All fixed and mobile broadband panellists (468) who declared a satisfaction rating in data analysis subset

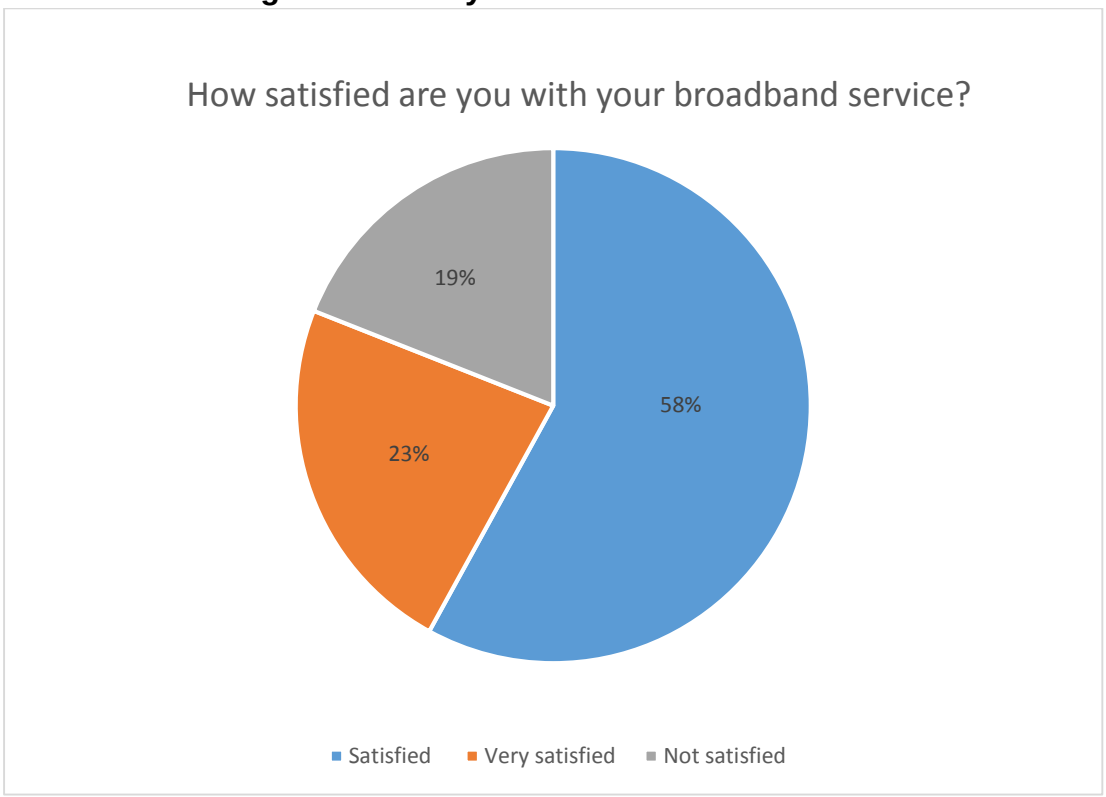


Figure 5

All fixed broadband panellists (417) who declared a satisfaction rating in data analysis subset

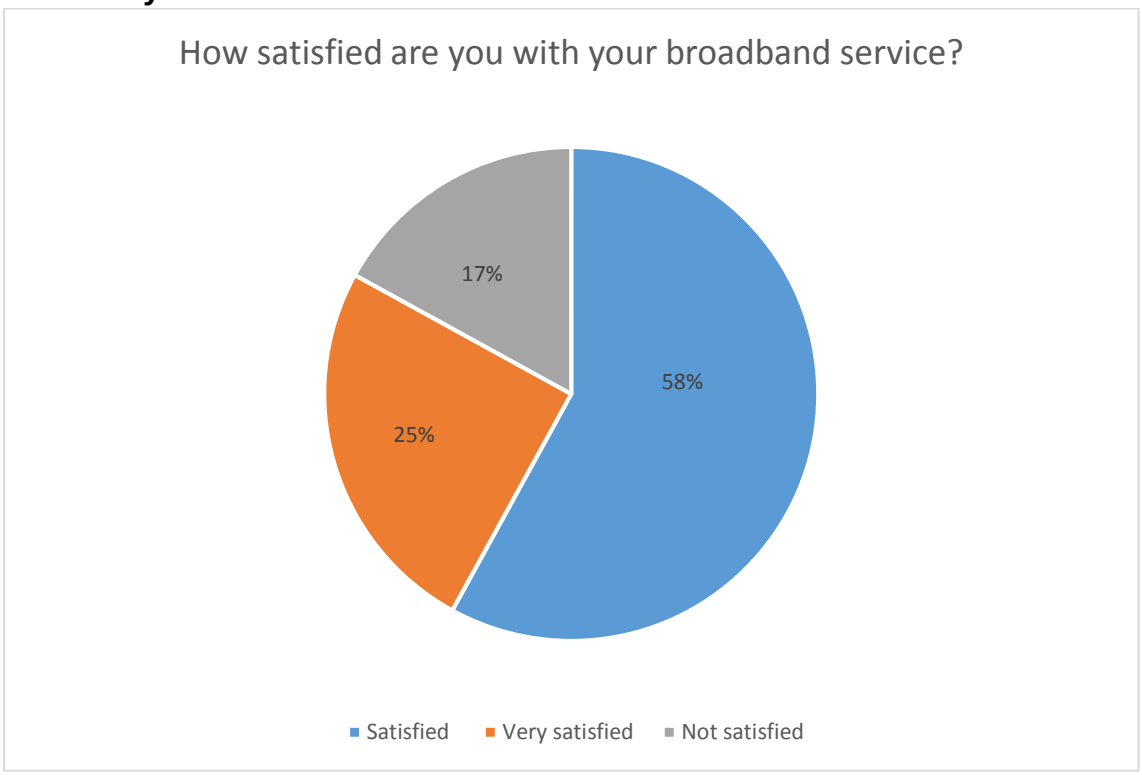
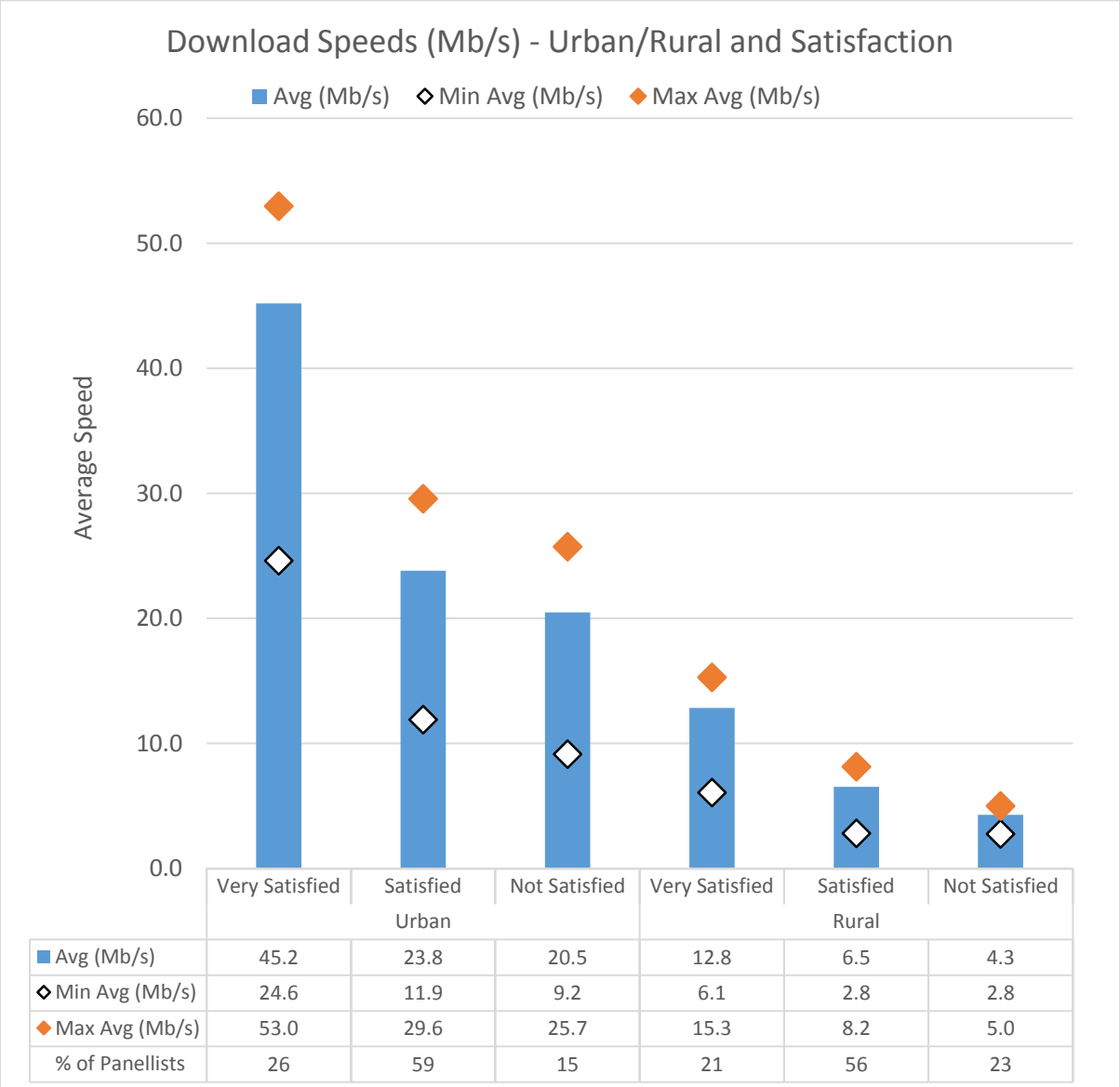


Figure 6

3.6 Urban/Rural and Satisfaction



	Urban			Rural		
	Very Satisfied	Satisfied	Not Satisfied	Very Satisfied	Satisfied	Not Satisfied
Avg (Mb/s)	45.2	23.8	20.5	12.8	6.5	4.3
Min Avg (Mb/s)	24.6	11.9	9.2	6.1	2.8	2.8
Max Avg (Mb/s)	53.0	29.6	25.7	15.3	8.2	5.0
% of Panellists	26	59	15	21	56	23

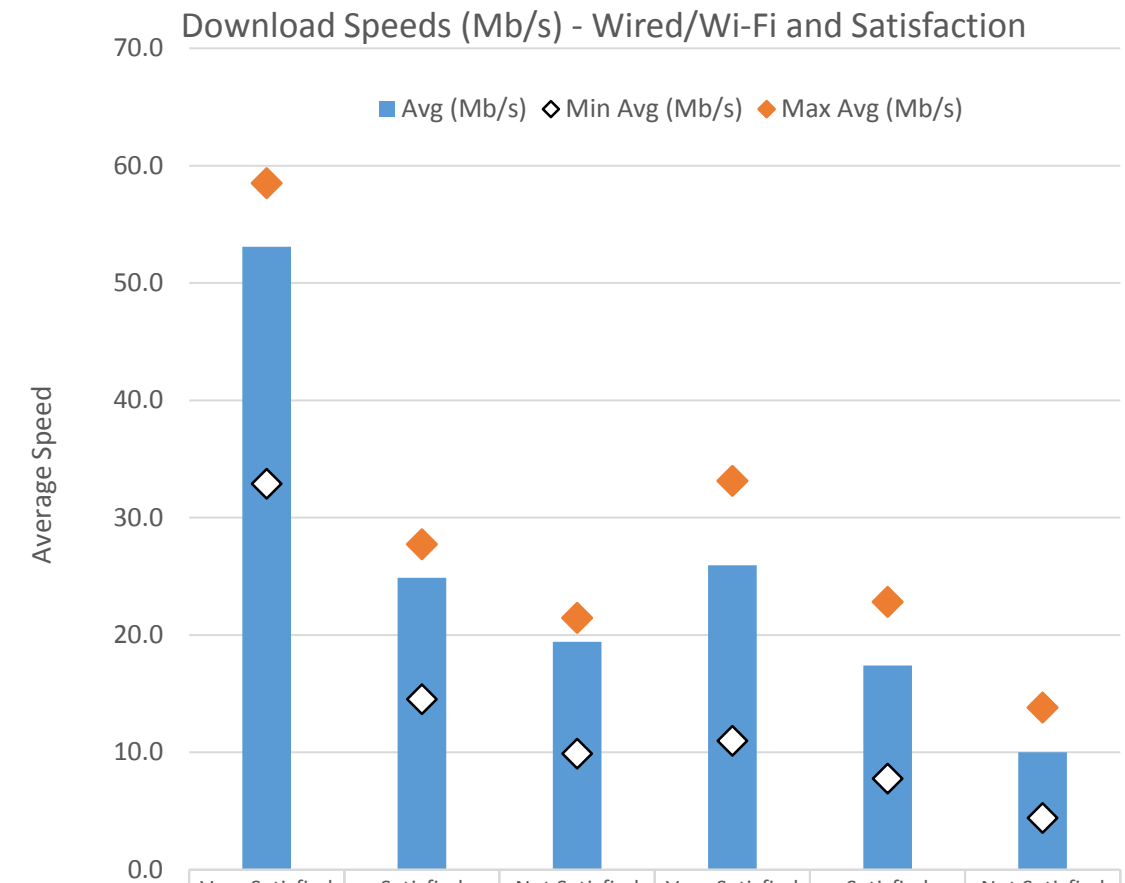
Figure 7

25. Figure 7 shows download speed results for fixed broadband urban and rural panellists in association with their self-declared levels of satisfaction. Panellists were asked to declare if they were 'satisfied', 'very satisfied' or 'not satisfied' with their broadband service.

- The sample size for this graph is as follows: urban (302), rural (117).
- From the sample, it can be seen that there is a relationship between average download speed achieved and satisfaction.
- For both urban and rural fixed broadband panellists, those who declared that they were 'very satisfied' experienced higher average download

speeds than those panellists who declared that they were ‘satisfied’. Similarly, those panellists who declared they were ‘satisfied’ experienced higher average download speeds than those who declared they were ‘not satisfied’.

3.7 Wired/Wi-Fi and Satisfaction



	Very Satisfied	Satisfied	Not Satisfied	Very Satisfied	Satisfied	Not Satisfied
	Wired			Wi-Fi		
Avg (Mb/s)	53.1	24.9	19.4	26.0	17.4	10.0
Min Avg (Mb/s)	32.9	14.5	9.9	11.0	7.8	4.4
Max Avg (Mb/s)	58.5	27.7	21.5	33.1	22.8	13.8
% of Panellists	26	55	19	24	59	17

Figure 8

26. Figure 8 shows download speed results for fixed broadband wired and Wi-Fi panellists in association with their self-declared levels of satisfaction. Panellists were asked to declare if they were 'satisfied', 'very satisfied' or 'not satisfied' with their broadband service.

- It can be observed from the sample that panellists on fixed broadband wired connections declared themselves to be more satisfied with their broadband service than those on Wi-Fi connections.

- For panellists on both fixed broadband wired and Wi-Fi connections, it can be observed that the more satisfied panellists declared themselves to be with their broadband service, the higher the average download speed experienced. In other words, panellists who

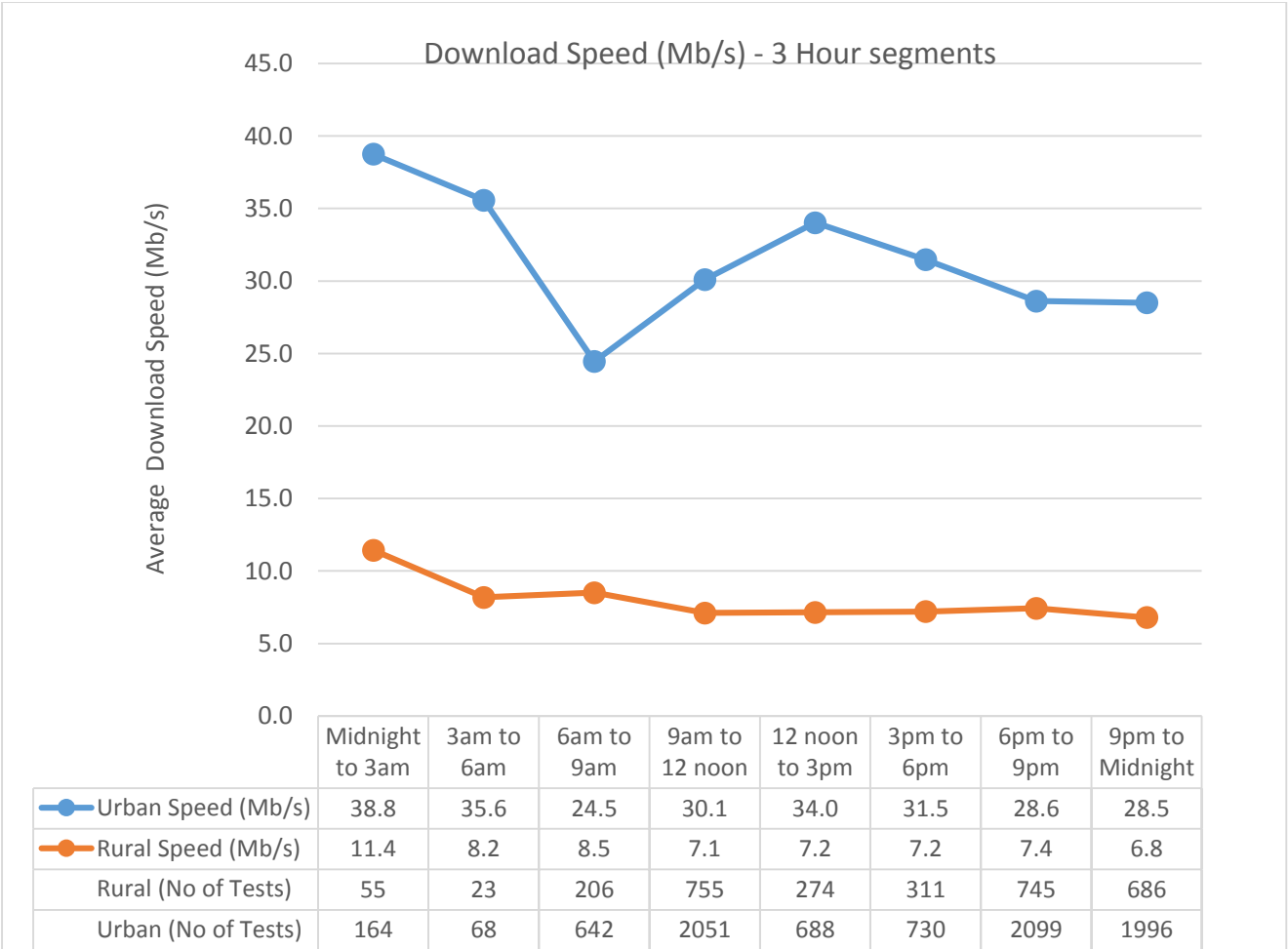
experienced higher average download speeds declared higher satisfactions levels.

3.8 Multiple Devices

27. When running a test, the software looks to identify the number of devices connected at the time of the speed test. However, the software is unable to detect if these devices are actively using the broadband connection. Devices connected could be PCs, Laptops, iPad or tablets, iPhones or TVs. Due to the very small sample size of the number of tests per panellist (and the subsequently small number of tests per panellist with differing numbers of devices connected), we are unable to draw any definitive conclusions on whether the number of devices connected impacted the download speed experienced.

3.9 By Time of Day

28. The Broadband Test Application software was scheduled to execute tests of network performance up to 4 times per day[6] – during both peak and off-peak hours. This data was recorded and analysed by average download speed by hour of the day. From the data collected from 419 fixed broadband panellists (302 Urban, 117 Rural), it could be observed that fixed broadband urban panellists received higher speeds. In addition, higher download speeds were achieved outside of peak hours and there is an indication that average download speed results during peak evening hours remained fairly consistent; however, more detailed conclusions from this analysis will not be formed due to there being an insufficient number of tests recorded for each hour period.



	Midnight to 3am	3am to 6am	6am to 9am	9am to 12 noon	12 noon to 3pm	3pm to 6pm	6pm to 9pm	9pm to Midnight
Urban Speed (Mb/s)	38.8	35.6	24.5	30.1	34.0	31.5	28.6	28.5
Rural Speed (Mb/s)	11.4	8.2	8.5	7.1	7.2	7.2	7.4	6.8
Rural (No of Tests)	55	23	206	755	274	311	745	686
Urban (No of Tests)	164	68	642	2051	688	730	2099	1996

Figure 9

[6] 18:00pm-21:00pm, 21:00pm-23:00pm, 23:00pm-18:00 pm (next day). Within a single day (midnight to midnight) it is possible to get 4 tests, though likely only 3 are captured.

Figure 9 reflects both fixed broadband Urban (302) panellists and fixed Rural (117) panellists and shows averaged download speeds for hours of the day. Averaged download speed results are presented in 3 hour segments.

Note, the sample size for fixed broadband rural (117) was much smaller than the sample size for fixed broadband urban (302).

4 Future Approach

29. ComReg has used this Pilot Initiative as an information gathering exercise to better inform its policy position with regard to the speed experienced by broadband users in Ireland. The Pilot has allowed ComReg to gain a high level insight into the actual speeds experienced across a range of platforms with a managed panel of testers at a point in time. As with any Pilot initiative, there have been many valuable learnings from this project and ComReg will use this knowledge to inform its policy development in this area.

4.1 Summary of Learnings

30. ComReg's experience from this Pilot is that it can be difficult to recruit a sufficiently large, robust and representative panel of users willing to download a software tool onto their home PCs or laptops and keep it active over a period of time necessary to gather sufficient test results.

31. There are many factors that can potentially affect broadband speed experienced and it can be difficult to isolate the factor(s) affecting any one individual's experience. Apart from external factors such as the network of the service provider and the quality of the line, there are many internal factors inside the home that could play an important role. The significance of the internal environment has to be recognised and its effect on speed test results needs to be considered. Factors such as the type of connection (wired or Wi-Fi) can significantly affect the speed experienced as indicated in the Pilot test results. Nevertheless, consumers express a high level of satisfaction with broadband services, in particular in urban areas where throughput speeds are higher[7].

4.2 Policy Considerations

32. **Transparency for Consumers**
As broadband services are general advertised with maximum headline speed or with no speed references, consumers are purchasing products and may be entering into contracts with no transparent information regarding the standard of service they can expect to receive. In this respect, consumers may also be unable to compare different broadband offers from different providers in order to make an informed choice.

33. **Consumer Education**

[7] Complaints in respect of broadband speeds are not among the top ten issues raised in customer complaints to ComReg's Consumer Help Line.

Consumers may have very little knowledge of the different quality of service metrics of broadband services. In addition it appears that there is also limited knowledge amongst consumers of the amount of data consumed by different internet activities and they may be largely unaware of the factors that may be affecting their broadband speed, both within their control and outside of it.

34. **Contractual Commitments**
Broadband contracts do not specify any minimum level of service and if guaranteed levels were to be put forward by service providers they should not be unreasonably low compared to the technical capability of the service.

35. **Market Information**
There is currently no repository of data available regarding the speeds (and other quality metrics) of broadband services in Ireland – either the speeds being delivered by service providers to the dwelling (external) or of actual speeds being experienced by users on their devices (internal).

36. **Policy Options**
With regard to policy considerations as set out above, ComReg notes it has powers with respect to transparency and in relation to contracts and minimum quality of service and will consider how best to use those powers to achieve the best outcome for consumers.

4.3 Options in respect of Broadband Speed Measurement

37. With respect to the ongoing measurement of the speed of broadband services, ComReg may decide to establish a permanent broadband speed test initiative project by tendering for a software tool for the purpose of measuring broadband speeds. This could be specified exclusively by ComReg or via a co-regulation approach with industry.

38. With respect to data collection, ComReg may decide to conduct an annual survey for a testing period of one month, (based on the learnings from the Red C managed panel Pilot initiative), and/or alternatively make available a software tool to the public at large via a public recruitment campaign to support expanded data gathering.

39. With respect to analysis, interpreting and reporting on the data gathered, ComReg could seek to use the data gathered as the agreed basis for dispute resolution between consumers and service providers in a co-regulatory approach, or publish insights on an industry basis, or if sample

size and quality permitted, and it was judged proportional, to publish the information on a service provider basis.

4.4 Next Steps

Having considered the options ComReg may consult with respect to further work in this area.

5 Glossary

Speed Tests - Speeds are a statement of line bandwidth capability, and a calculation of how much data can be transferred between two points in set period of time. As internet connections take a little time to ramp up to maximum speed after each request, the speed test calculation begins shortly after the data transfer begins. Speed test results are published in Mega or millions of bits per second (Mbps).

Download Speed - Service providers typically state a maximum 'up to' speed that their service can theoretically achieve. The Download Speed test measures the amount of data you receive from a single file, in a specified period of time. Data can take many forms ranging from relatively small email, to large media files. When downloading a single item – such as an MP3 or large photograph, a higher speed connection will reduce the waiting time. Services that provide video streaming (e.g. YouTube) and internet phone calling (e.g. Skype) often state the minimum line speed required for satisfactory service.

Upload Speed - The Upload Speed test measures the amount of data you can send in a specified period of time. Fast upload speed is useful for sending attachments like photographs and document files. Internet phone calling services (e.g. Skype) often state the minimum upload speed required for satisfactory service, though network latency is also an important factor.

Ping (Latency) - The Ping test measures the network round-trip time (latency) from your connection to various far-end destinations (servers) on the internet and presents this as an overall average. Many individual network links comprise the route between your computer and the far end. Each one of these links requires time to acknowledge and react to your request for service. The overall time taken for each of these network links to respond to requests affects applications like on-line gaming, media streaming and internet phone calling. Providers of these services will state maximum ping/latency times in millisecond (ms). As downloading a web page requires the retrieval of many individual items (and therefore many requests), higher latency times will make the connection appear 'slow', even though your Download Speed measurements may be quite good.

DNS - The DNS (Domain Name System) test measures the time taken by your ISP to translate a website name or 'domain name' into the IP address of the far end. Successful lookup time is typically completed in a fraction of a second. When you type in a website name to a browser, e.g. www.google.com, your service provider first must translate this into the numerical address of the website. This process takes time and, if not done efficiently, can lead to a slow web browsing experience.

Wi-Fi - A wireless technology that allows PCs, laptops and any other device to communicate over a wireless signal.

Wired broadband - A wired broadband connection is a connection that is physically connected to the modem or router with an Ethernet cable.

6 Annex 1 - What affects your Broadband Speed?

Consumer experience suggests that the headline or advertised speeds associated with broadband services may not be the actual speeds that they experience. There are many factors that can affect broadband speed, some of which have to do with the conditions inside your house (the internal environment at the user's home). Some factors are dependent on the technology used to deliver your connection while others affect all types of broadband connections.

Distance:

The main factor affecting a DSL fixed phone line based broadband service is the distance from the local telephone exchange to your home. Generally, the closer you are to the exchange, the higher the bandwidth speed your line can support, although bear in mind that the line routing is not always as the crow flies. Even those close to the exchange can find that their actual speed is below the headline speed because of other factors such as the number of people using the network at the same time (contention) and congestion on the wider internet. If you have a fibre broadband connection, you are less affected as the distances are shorter (from the home to the street cabinet instead of to the exchange).

Network coverage:

The performance of mobile broadband depends to a large extent on the network coverage available (i.e. the ability to gain access to the mobile network and whether it is a 3G or 4G connection). Coverage is dependent on a number of factors including distance from the base station, whether you are inside a building or outdoors, the number of people using a mobile network at the same location and whether you are stationary or on the move.

Traffic management:

Broadband service providers have traffic management policies in place which are necessary to manage congestion and to ensure that a reliable service is delivered. As per the terms and conditions of the contract, when necessary, they can control speeds for heavy users in order to ensure network quality for other users. You should check with your service provider for details on their traffic management practices.

Contention and congestion:

Your broadband speed is affected by congestion (traffic) caused by the number of people using the network simultaneously. You may notice this at busy or peak times when more people are using the service at the same time. This can have an impact on the speed of your service as the bandwidth is shared between you and a number of other users. The contention rate of your broadband service refers to the maximum amount of users that can use the service at any one time. Your broadband plan details should specify what contention rate, if any, applies to your service.

Household congestion occurs when a few people in the one house are using the service at the same time - this is the number of devices connected to, and active on, the home network. It can include PCs, laptops, smart phones, Digi TV, Digi box, Kindle, media centre, Wi-Fi printer, and iPads/tablets. In addition, if your broadband Wi-Fi service is not password protected, it is also possible that your neighbour (and their devices) are also connected!

This congestion will have a negative impact by slowing down the speed you are receiving on each device as the speed delivered to the house is split between all these connected devices.

The Internal Environment: Things in the Home

Multiple Devices:

These days many homes have a broadband service that is being used by a few users in the house, often at the same time. There may be a number of PCs, laptops, phones or iPads/tablets connected to the broadband service and this can potentially have a significant effect on the speed experienced on each of these devices (as opposed to the speed being delivered to the house). If you want to get a better idea of the speed received on one device, turn off the connection to all other devices and do a speed test on the connected one.

Wi-Fi:

The layout of your home and distance of your device (PC/laptop/iPad) from your Wi-Fi router can also have an impact on broadband performance. A Wi-Fi router works best when there is a clear space between it and your device so move it around to see where you get the best signal from and ideally keep it high up, maybe on a shelf, with nothing blocking it. Generally, wired routers tend to deliver faster, more reliable speeds. If you are using a Wi-Fi router and you want to get a better idea of the speed being delivered to your house, you may want to use an Ethernet cable to connect your device directly to the router and do a speed test using that wired connection. You can then compare the wired result with the Wi-Fi one and see the difference, if any.

You can always buy a Wi-Fi signal booster which strengthens the Wi-Fi signal in rooms where it may be weak. The booster works by creating a mini hotspot in the room in which it is plugged, so they can be very effective.

Wiring:

Poorly performing broadband can be the result of old wiring in your home. You should check first that all wires are firmly connected and secure. However, cheap, old or tangled up wires and cables can form a resistive path for electrical signals while cheap or older Wi-Fi routers and modems can lead to lower performance. Therefore, it is worth checking to see if your Wi-Fi router is out of date. For example, if you have

upgraded to a faster broadband service but are still using an old Wi-Fi router, you may not be getting as fast as signal as you would with a more up to date router. In addition, if your computer or tablet is more than a few years old, you may not be getting the maximum broadband speed you can receive. It is worth checking that your computer meets the minimum system requirements needed for your broadband service - if not, you may need to remove unused software or upgrade/replace the computer with a new one.

Tidy Up:

As you surf the net and download emails and applications, much activity occurs that ultimately clogs up the processing on your computer. Cookies, hidden programmes and viruses all find their way into the process a computer uses and these can be running in the background and slowing down the speed of the connection. Computers also tend to become clogged up with files that fill up the memory and tax the performance. These should all be removed from your computer at regular intervals. Make sure you are using an up to date browser as older ones can slow down your performance. Finally, make sure you have antivirus software from a recommended source. Even harmless viruses like pop up advertisements can slow down internet applications.

Contact your service provider:

You can contact your internet service provider (ISP) directly for information and advice on how to optimise your broadband speed. ISPs may be able to run standard checks to determine what is causing a problem and can offer suggestions on how to improve the service. Before you choose a broadband service, it is worth contacting the ISP and asking what speeds you can expect to receive given your particular circumstances.