UK Home broadband performance:

A consumer summary of fixed-line broadband performance provided to residential consumers



Published: 24 March 2016



Contents

	Page
An introduction to home broadband	1
Ofcom's home broadband research	7
	An introduction to home broadband Ofcom's home broadband research

Section 1

An introduction to home broadband

Introduction

This report summarises the findings from Ofcom's research into the performance of UK home broadband. Our report focuses on three key measures relevant to the consumer experience of broadband performance: download speeds, upload speeds and video streaming quality.

Types of home broadband

Broadband is a way of connecting to the internet. It allows information to be carried at high speed to your computer, laptop, tablet, smartphone, smart TV or other device.

This report looks at the performance of three types of broadband technology:

• **ADSL** technology delivers broadband using the standard copper telephone line.¹ The connection speed provided by ADSL will depend on which type of ADSL is available where you live and the quality and length of the line from the telephone exchange to your home (the longer the line, the slower your ADSL broadband will be).²



• **Cable** technology uses fibre-optic lines, which are made of glass or plastic, to transport data from the exchange to a point near your home (a street cabinet). From here, a form of copper-based cable (called a coaxial cable) is used to transmit data to your home. Unlike with ADSL, speeds are not lost with distance over cable connections.

¹ ADSL stands for asymmetric digital subscriber line.



• Fibre-to-the-cabinet (FTTC) technology uses fibre-optic lines to transport data to a point near your home (a street cabinet), and from here data is transmitted to you over a standard copper telephone line. This means that with FTTC there will be some loss in speed from the street cabinet to your home, but this loss is less than with ADSL.



This report focuses on these three technologies as they are used to provide most UK home broadband connections, but other types of broadband connection are available, such as fibre-to-the-premises, satellite broadband, and home broadband provided over 4G mobile networks.

Choosing a home broadband service

A wide variety of home broadband services are available, and most are sold with reference to the speed they deliver and the technology that they use.

When choosing a broadband service it is helpful to think about what you will use the internet for, and how many people will be using it, to make sure that your service meets your broadband needs.

Home broadband performance is only one of the factors you should take into account when choosing a provider. Price, quality of customer service and reliability are also relevant. For help in choosing your broadband service, see Ofcom's <u>consumer guide</u>.

Internet use and connection speed

Some online activities need faster connection speeds than others to work well. For example, streaming an HD film requires a faster speed than surfing the web or accessing emails. Similarly, as the number of connected devices (PCs, laptops, tablet computers, games consoles, mobiles etc.), and people per household increases, so will the speed required.

The speed of an internet connection is measured in megabits per second (Mbit/s). A megabit is a unit of data, so the speed of an internet connection refers to how quickly units of data can be transmitted over it. Ofcom currently states that a connected speed of at least 10Mbit/s is necessary to deliver an acceptable user experience of broadband². The diagram below shows why a household might need a broadband speed of 10Mbit/s³.



Why a household might need 10 Mbit/s

² <u>http://stakeholders.ofcom.org.uk/binaries/telecoms/policy/digital-comms-review/DCR-statement.pdf</u>, page 27.

³ <u>http://stakeholders.ofcom.org.uk/binaries/research/infrastructure/2015/downloads/Consumer-Summary.pdf</u>, page 2.

Usage limits

Some fixed-line broadband packages limit the amount of data that you can use each month. These services are often cheaper than 'unlimited' packages, but some providers will charge additional fees if you exceed your data allowance.

When choosing a package, you should think about how your household uses broadband. Activities such as web browsing and emailing generally use small amounts of data (a data cap of 20GB per month will allow you to access 10,000 2MB web pages per month), but, activities such as video calling, video streaming, and downloading large files, can use much larger amounts of data.

The amount of data that services use depends on the content viewed, listened to or accessed. However, the table below provides an approximate amount of data used by a number of popular online activities, measured in megabytes (MB) and Gigabytes (GB).

The table below shows estimates of how much data is used by completing common internet activities. These estimates were sourced from the <u>Broadband Choices</u> website⁴.

Internet activities and how much data they use

Activity	Data consumption
Download a HD film	4GB
Stream one hour of HD video	2GB
Stream one hour of standard definition video	250MB
Stream 30 minutes of YouTube	175MB
One hour of web browsing	10-25MB
Download a music track	4MB

Bundled home broadband

There are a variety of home broadband packages available from many different providers. Some broadband services are sold on their own, while others can be purchased as part of a 'bundle' of services from the same provider, e.g. together with a pay TV or mobile service.

A telephone line is needed to use almost all ADSL and fibre broadband services. This means that most people who buy ADSL or fibre broadband will have to pay a line rental fee on top of the cost of their broadband service, so you should take this into account when comparing broadband prices.

Virgin Media's cable service is currently the only widely available fixed broadband service that does not require a fixed voice telephone line of any description, although it can also be bought together with a telephone line and other services.

Home broadband packages

This report focuses on six types of broadband services:

 ADSL 2+ broadband services (usually advertised as offering 'up to' 17Mbit/s or without any reference to a connection speed);

⁴ Source: <u>http://www.broadbandchoices.co.uk/guides/broadband/guide-to-internet-data-usage</u>

- 'Up to' 50Mbit/s, 100Mbit/s and 200Mbit/s cable broadband services; and
- 'Up to' 38Mbit/s and 76Mbit/s fibre-to-the-cabinet broadband services.

The table below shows which major national providers offer which services.⁵

Summary of main fixed broadband service types and providers

	ADSL	Cable		Fibre-to-the-cabinet (FTTC)		
Main service types (Mbit/s)	17 (or speed not advertised)	50	100	200	38	76
Main national providers	BT, EE, Plusnet, Sky, Talk Talk	Virgin Media			BT, EE, Plusnet, Sky, Talk Talk	

Source: Ofcom

Note: KC is the main fixed telecoms provider in the Kingston-upon-Hull area, where it is the equivalent to BT in the rest of the UK

The Ofcom residential broadband speeds Code of Practice

As we use the internet to do more and more, such as watching TV programmes, streaming movies and playing games, fast and reliable connection speeds are essential to the quality of our experience.

To ensure you purchase a broadband service that meets your usage needs, before you commit to a contract, it is important to understand the speeds you can expect from a particular package, and your rights if a provider doesn't deliver the minimum speeds promised.

Under Ofcom's voluntary Code of Practice on broadband speeds, broadband providers agree to give clear information on broadband speeds to consumers when they consider or buy a home broadband service, and provide redress when speeds performance is poor⁶.

Some providers use technology that restricts the speeds customers can get to less than the maximum advertised speed. In these cases, during the sales process, providers:

- should give customers an individual estimate of the maximum speed they can expect to receive;
- should provide a 'line checker' on their website that estimates the maximum speed a customer can expect, and make sure this figure is clearly shown;
- must not ask the customer to give their financial details or to pay until they have been told their estimated speed; and
- should give customers the broadband speed information in writing, or in a 'My account' section on their website within seven days of the sale.

⁵ Market shares of fixed-line broadband providers can be found in p292 of Ofcom's 2015 Communications Market Report:

⁶ Ofcom and internet service providers have agreed a revised code which came into effect on 1st October 2015.

Every provider must:

- explain clearly and simply how other factors may slow down the speed that users get, including making users aware of any 'fair use' or 'traffic management' policies; and
- deal sensitively with vulnerable customers.

If a customer is not receiving the speeds they expected to receive, they should speak to their provider. Every provider commits to helping customers manage speed problems. They must have trustworthy systems to find the cause of a speed problem, take steps to fix any issue within their control, and explain to customers if they can take practical steps to improve their speeds themselves.

Under the revised Code, providers using a technology that means that customers may not get the maximum advertised speed will be required to release customers from their contract at any time if they suffer from speeds below the "minimum guaranteed access line speed" and the problems cannot be resolved. Your ISP will give you information on its "minimum guaranteed access line speed".

The Code applies to home broadband services which come to you through your normal fixed telephone line or cable. In signing up to the Code, your provider agrees to provide clear and accurate information.

The full Code and the list of signatories can be seen at: <u>http://stakeholders.ofcom.org.uk/telecoms/codes-of-practice/broadband-speeds-cop-</u> <u>2010/?a=0</u>

Tools provided by Ofcom

With <u>Ofcom's coverage checker</u>, you can find which services are available in particular locations that are important to you; your home, your work – anywhere.

With Ofcom's <u>Wi-Fi checker app</u>, you can see if your home Wi-Fi is likely to be slowing down your broadband, and it also gives useful tips on how to improve your broadband connection.

These tools are both free and available on the Ofcom website.

Section 2

Ofcom's home broadband research

How we measure home broadband performance

In order to measure home broadband performance, we use a panel of volunteers who are chosen to be broadly representative of broadband users across the UK in terms of where they live and the broadband services that they use. Panellists are sent a monitoring unit by our technical partner in the research, SamKnows, which they connect to their broadband router. This then measures the performance of their internet connection.

Tests are only carried out when a panellist's broadband connection is not in use, ensuring that our testing does not interfere with panellists' own broadband use and that our measurements are not compromised by other devices using the connection at the same time.

ADSL 2+FTTCCableBT, EE, KC, Plusnet, Sky and
TalkTalk'Up to' 38Mbit/s
BT, EE, Plusnet, Sky and TalkTalkVirgin Media 'up to' 50Mbit/s, Virgin
Media 'up to' 100Mbit/s and Virgin
Media 'up to' 200Mbit/s

We measured the performance of the following packages:

Our research provides a measure of the **'average actual speed'** that a consumer actually receives, which drives the speed at which files can be uploaded and downloaded. This differs from the **'headline speed'** or **'advertised speed'** is the speed at which broadband services are marketed, often expressed as 'up to' xMbit/s (megabits per second).

A full description of the test's methodology is provided in the technical report, which is available at: <u>http://stakeholders.ofcom.org.uk/binaries/research/broadband-research/march2016/fixed-bb-speeds-nov15-report.pdf</u>

The metrics we have used

There are many ways of measuring the performance of a fixed-line broadband connection. In this report we have chosen to focus on the following three measures as they are relevant to most popular online activities:

- **Download speed** refers to the speed at which a connection can download data from the internet to a computer, laptop, tablet or other device. Typically, this involves downloading a file from a website or app, and popular types of files that people download include music, films, pictures and applications. The unit of measurement for download speed is megabits per second (Mbit/s).
- **Upload speed** refers to the speed at which a connection can transfer data from a device to the internet. For example, to post a photo stored on a computer, laptop, table or other device to Facebook, a consumer will upload the photo to Facebook from their device. As with download speed, the unit of measurement for upload speeds is megabits per second (Mbit/s).

• Video streaming takes place when a video file is sent in a compressed form over the internet and viewed by the consumer as it arrives. Streaming is different to downloading, where a consumer saves the content to a device before viewing it. Our video streaming tests are carried out by attempting to stream Netflix, iPlayer and YouTube and seeing what proportion of the streams are able to be displayed in standard definition, high definition, and ultra-high definition, without any interruptions once the stream had started.

The results set out below provide information relating to download and upload speeds showing the average speeds each broadband package achieved over the course of 24 hours.

The ranges included on some of the images (such as those with download and upload speeds by package) show the range into which if we repeated the analysis using a different panel of respondents, we would expect the result to fall 95 times out of 100. To see whether the results are statistically significant – whether the performance differences between packages would be broadly the same if the testing was conducted on a bigger scale – please see the <u>technical report</u>.

The <u>technical report</u> gives a much more comprehensive analysis of performance, and provides results for a wider range of metrics.

The results of our research

This table provides a brief summary of some of the key results by technology type.

Cable 'up to' 100Mbit/s and 200Mbit/s services has the highest download speeds of the technologies measured, while cable 'up to' 50Mbi5t/s and 100Mbit/s upload speeds were slower than the average FTTC 'up to' 38Mbit/s and 'up to' 76Mbit/s upload speeds.

Fast facts

	ADSL 2+ services	'Up to' 50Mbit/s cable services	'Up to' 100Mbit/s cable services	'Up to' 200Mbit/s cable services	'Up to' 38Mbit/s FTTC services	'Up to' 76Mbit/s FTTC services
Average download speed (Mbit/s)	8.4	50.5	95.8	174.0	33.4	59.4
Average upload speed (Mbit/s)	0.8	3.0	6.0	12.1	7.1	16.0
Average proportion of Netflix videos delivered in UHD	13%	91%	93%	97%	94%	97%

Source: SamKnows measurement data for all panel members with a connection in November 2015

The results of our home broadband testing are set out below in more detail and show average performance over the course of a day.

The report includes performance of individual ISP packages. With the exception of KC, the incumbent provider in Kingston upon Hull, all of the ADSL2+ and FTTC packages included in the report are provided over the BT copper line from the local exchange/street cabinet to the end-user's home. This means that it is unlikely that you will see a substantial increase in the speed of your service by switching from one ADSL2+ package to another or from one FTTC package to another, unless the speed of your existing service is being limited by factors within your ISP's control, such as network congestion.

Download speeds

Download speeds matter because they determine how long you have to wait before having content on your device. Higher download speeds are particular important for downloading larger files, such as films or apps.

The infographic below shows average download speed by package type. ADSL2+ packages provided average download speeds of 8.4Mbit/s, while Cable packages with headline speeds of 200Mbit/s provided the fastest average speeds (174.0Mbit/s).

Average download speed by technology⁷



Source: SamKnows measurement data for all panel members with a connection in November 2015.

Our testing of ADSL2+ packages showed that there were no significant differences in average 24 hour download speeds achieved between the measured packages. Therefore, other factors, such as quality of customer service, price and reliability should be key considerations in deciding which ADSL2+ package to purchase.

For more information about the performance of ADSL2+ packages or to find out about other statistically significant performance differences we found in our testing, please see the <u>full</u> <u>report</u>.

⁷ There is currently a joint investigation between Ofcom, SamKnows and Virgin Media which is looking into the way that our tests perform on Virgin Media's top two service tiers ('up to 100Mbit/s and 200Mbit/s). The investigation is focussing on whether the download speed test configuration adequately stresses the line to get an accurate reading under certain line conditions and, while it is ongoing, there is a belief from Virgin Media that the tests may be underreporting the download speeds of these services. Should the investigation concede that there is an issue with the tests, it is possible that an updated version of this report will be issued.

On average, Virgin Media's 200Mbit/s package achieved the highest download speeds over the course of 24 hours.

All of the FTTC 'up to' 38Mbit/s and 'up to' 76Mbit/s packages shown below are provided over BT's network. This means that it is unlikely that you will a significant increase in speeds by changing from one of these services to another unless the speed of your service is being limited by something within your ISP's control, or if you switch from an 'up to' 38Mbit/s service to one offering 'up to' 76Mbit/s.

Average download speeds for cable and FTTC packages over 24 hours⁸



Source: SamKnows measurement data for all panel members with a connection in November 2015.

Upload speeds

Upload speeds matter because they determine how long you must wait while files can be transferred from your device to the internet. Posting photos on social media, attaching

⁸ There is currently a joint investigation between Ofcom, SamKnows and Virgin Media which is looking into the way that our tests perform on Virgin Media's top two service tiers ('up to 100Mbit/s and 200Mbit/s). The investigation is focussing on whether the download speed test configuration adequately stresses the line to get an accurate reading under certain line conditions and, while it is ongoing, there is a belief from Virgin Media that the tests may be underreporting the download speeds of these services. Should the investigation concede that there is an issue with the tests, it is possible that an updated version of this report will be issued.

documents to an email and putting a video on YouTube are all common examples of uploading activities. The technology with the fastest actual upload speeds compared to the headline download speed tended to by FTTC.

Average 24-hour upload speeds by technology



Source: SamKnows measurement data for all panel members with a connection in November 2015.

ADSL2+ upload speeds ranged between 0.8Mbit/s and 0.9Mbit/s over a 24 hour period.⁹ BT, EE and Sky's packages all achieved speeds of 0.9Mbit/s. To see package by package significant differences please see the <u>technical report</u>.

Average upload speeds on ADSL2+ packages over 24 hours



Source: SamKnows measurement data for all panel members with a connection in November 2015.

All of the FTTC 'up to' 76Mbit/s packages achieved significantly faster upload speeds than Virgin Media's cable packages.

Virgin Media's 200Mbit/s came out on top among the cable packages, achieving an average upload speed of 12.1Mbit/s.

⁹ Statistically significant differences are available in the technical report

Average upload speeds on FTTC and cable packages over 24 hours



Source: SamKnows measurement data for all panel members with a connection in November 2015.

Video streaming

Streaming videos is one of the most common internet activities, as is demonstrated by the popularity of sites such as YouTube and Netflix. When the quality of a video does not match the expectations of the viewer, this can be a source of irritation.

The results below show the proportion of Netflix video streams delivered via UHD (ultra-high definition). The higher the quality of the stream, the faster the speed that is required.

On average over a 24 hour period, for all FTTC and Cable packages, 90% or more of video streams were in ultra-high definition (UHD). 'Up to' 200Mbit/s cable services and 'up to'

76Mbit/s FTTC packages provided ultra-high definition video streams 97% of the time on average over 24 hours.

Percentage of Netflix videos reliably delivered via UHD, by technology, over 24 hours



Source: SamKnows measurement data for all panel members with a connection in November 2015.

The technical report also shows the results of BBC iPlayer and YouTube streaming tests, which show similar performance across all cable and FTTC service types, and a higher proportion of lower quality streams over ADSL2+ connections.

Results across the UK

A number of factors affect the performance of fixed-line broadband, including location.

In some parts of the UK, people can choose between ADSL, fibre-to-the-cabinet (FTTC) and cable broadband services, but in other areas, many homes have limited choice because FTTC or cable is not available to them. Rural areas are less likely than urban areas to have access to FTTC and cable services.

The distance of your home from your telephone exchange affects the speed of the ADSL services that are available to you, as does the distance from the street cabinet to your home, in the case of FTTC. For both technologies, broadband speed declines as these distances increase, meaning that the further away you live from the exchange or street cabinet, the lower your home broadband speeds will be (this is not the case for cable services).

The way we have calculated the urban and rural speeds mean that they are not directly comparable to the UK national speed.

Average UK download speeds in urban, suburban and rural areas

Because rural areas are less densely populated than urban areas, the distance between people's homes and their local exchange will be greater. In general, the performance of ADSL and FTTC broadband is better in in urban areas that rural ones. This - coupled with cable and FTTC availability being lower in rural areas - means that average rural broadband speeds tend to be lower than those in urban areas.

While the average UK download speed across the whole of the UK was 28.9Mbit/s in November 2015, there was substantial urban-rural variation in the performance of home broadband due to the factors previously mentioned.



Average UK urban, suburban and rural download speeds

Source: SamKnows measurement data for all panel members with a connection in November 2015. Note: Urban is defined as settlements with a population of more than 10,000, rural as settlements with a population of 2,000 or less and suburban as settlements with a population between these two values; due to statistical weighting carried out to calculate rural, urban and suburban speeds, these figures are not directly comparable to the UK national speed.

Average UK upload speeds in urban, suburban and rural areas

As with download speeds, upload speeds were highest in urban areas and lowest in rural areas in November 2015. This is also probably due to the wider availability of cable and fibre

broadband packages in urban areas and the greater average distance of rural homes from their local exchange.

The average upload speeds across the UK varied substantially by whether panellists lived in an urban or rural area. The overall UK average upload speed was 3.7Mbit/s, while the average upload speed in urban areas was 4.3Mbit/s, and the average upload speed in rural areas was 1.6Mbit/s. In suburban areas, the average upload speed was 3.1Mbit/s.



Average UK urban, suburban and rural upload speeds

Source: SamKnows measurement data for all panel members with a connection in November 2015. Note: due to statistical weighting carried out to calculate rural, urban and suburban speeds, these figures are not directly comparable to the UK national speed.