The broadband guide for SMEs and consumers

December 2015

Now's the time to seize the opportunities from high-speed broadband

Cambridgeshire is one of the 'best connected' counties in the the country in terms of the availability of high-speed fibre broadband. However, for businesses and consumers alike, the topic of broadband can be highly confusing. It is difficult to find clear and independent advice on which broadband services are available and which services to go for, particularly if there are so many different services on offer in your location.

The aims of this guide are to explain in clear language:

- the benefits of high-speed broadband to small and medium-sized businesses, and consumers
- what broadband is, how it works and what speeds can be achieved
- the types of high-speed broadband that may be available to you
- how to choose a broadband provider and package to best meet your needs.

Cambridgeshire is home to a significant proportion of the UK's 5.2 million Small and Medium-sized Enterprises (SMEs), which constitute 99.9% of all UK businesses. SMEs have never been more important to driving economic growth and employment. The category of 'SME' covers a diverse range of business in terms of size and function, including around 3.7 million sole traders across the UK. For them all, high-speed broadband brings huge opportunities, including geographical expansion, enhanced sales and marketing, improved productivity and reduced business costs.

For consumers, high-speed broadband also brings big opportunities, including avoiding bottlenecks when supporting an increasing number of Internet-enabled devices in the home (such as smartphones and tablets), making online services more responsive, eradicating buffering when watching online TV and video content, providing free phone calls and allowing people to work from home to improve their work-life balance.

We hope that this guide helps you better understand your available choices and embrace the clear opportunities and benefits that high-speed broadband can bring.

Seize the benefits of high-speed broadband for SMEs

High-speed broadband is a key enabler for the UK's 5.2 million SMEs to drive economic growth and employment. Surveys have shown that SMEs are already embracing the opportunities from the Internet. The widespread availability of high-speed broadband brings enormous additional opportunities for SMEs across Cambridgeshire, allowing them to expand geographically, improve sales and marketing and reduce business costs. Those not embracing the opportunities from high-speed broadband risk being left behind.

SMEs are already embracing the benefits of the Internet

The vast majority of SMEs are already using the Internet. In March 2015, the Department for Business Innovation and Skills reported the results of an SME survey, revealing that 98% of SMEs used the Internet for work purposes, with a broad range of uses, as shown in the table below.

Use of the Internet	Proportion of SMEs with employees
Emails to customers	85%
Paying taxes online	79%
Online transactions	78%
Promoting goods and services via website	68%
Advice on regulation	61%
Seeking general business advice	59%
Social media	57%
Selling goods and services through a website	33%
None of these	2%

Table: Use of the Internet by SMEs with employees [Source: BIS Small Business Survey, March 2015]

The widespread availability of high-speed broadband across Cambridgeshire is creating new opportunities for SMEs. While every business is different and, therefore, will have different uses for high-speed broadband, this chapter considers a range of business benefits that will apply to most SMEs.

It supports geographical expansion

SMEs operating in a specific geographical market have the opportunity to drive new revenue by expanding geographical reach and connecting with new customers online.

The Internet is a truly global phenomenon that knows no regional or national boundaries. For example, a local retailer in a town or village could not only generate additional revenue through online sales to its existing customer base, but could reach well beyond its traditional 'footfall'.

High-speed broadband potentially provides SMEs with the capabilities to sell and promote goods and services throughout the globe. In its 2015 Business Growth Survey, Santander found that nearly one in five SMEs were looking to expand internationally. 18% described international expansion as the ultimate aim for their business in 2015 compared with only 6% in 2014 - an increase of 12 percentage points in just one year.

It enhances sales and marketing

High-speed broadband supports the easier creation and maintenance of a company website to promote (and sell) goods and services. In its 2015 Business Growth Survey, Santander found that 77% of SMEs with employees had their own website in 2014, an increase of six percentage points from 2012.

However, SMEs (particularly the smaller ones) still have a way to go in embracing the full opportunities that exist with online sales and marketing, demonstrated by a study by Johnston Press of 960,350 SMEs in the UK in September 2014. The study found that 44% of the SMEs surveyed did not yet have a website. 95% did not have a website with a shopping cart.

A high-speed broadband connection allows businesses to more easily create and manage websites, as well as making it easier to add content to them. High-speed broadband also aids the creation and management of shopping carts for online transactions. Online retail sales are predicted to reach over £52 billion in the UK in 2015 – a 16% increase from 2014. This is equivalent to 15.2% of all retail sales in the UK.

High-speed broadband also allows SMEs to embrace the opportunities from email marketing and social media (such as Facebook, Twitter and LinkedIn). These are becoming increasingly important to reach customers and yet, compared with larger companies, many SMEs have yet to make the most of the opportunity to drive business through these 'channels'. In the September 2014 Johnston Press SME survey, only 15% of respondents were using email marketing, with just 11% sending offers via the medium. Furthermore, out of the survey respondents:

- 89% had no LinkedIn presence
- 70% had no Facebook page
- 69% had no Twitter account.

High-speed broadband provides SMEs with the ability to rapidly manage online email campaigns and upload content on a regular basis to social media sites such as Facebook.

It enables improved collaboration

High-speed broadband connectivity allows SMEs to embrace new and more effective ways to collaborate with customers and suppliers, and to enhance collaboration between employees. It opens the door to improved communications through:

- more reliable and quicker emailing (particularly for large attachments)
- voice telephony and voice conferencing (e.g. Skype)
- video telephony and video conferencing
- shared online diaries
- file sharing (e.g. Dropbox) allowing large files (including video, large documents and images) to be shared with ease
- remote access to private business networks - so-called Virtual Private Networks (VPNs).

It maximises productivity

High-speed broadband can maximise productivity by ensuring that hours are not wasted unnecessarily. Reduced productivity can be a huge hidden cost to SMEs, and is generally much more significant than the added cost of a high-speed broadband connection.

Nothing can potentially reduce productivity in a business more than sharing a low-bandwidth connection between multiple users and devices. While one person may be needlessly wasting time trying to upload a large file to customers (or a website), that file transfer may also be hogging the Internet connection for other users, bringing email, browsing and other online activities to a halt. For those working from home, the Internet use of family members may dramatically reduce the usability of a low-speed connection. Intensive services such as YouTube and game downloads can slow a connection to a snail's pace.

A high-speed broadband connection can ensure that multiple, simultaneous demands on an SME's broadband connection can all be met without slowdowns, ensuring online use remains responsive regardless of the time of day, or the activities of other users.

It gives better access to online services

The better a broadband connection, the more likely that SMEs will make use of a raft of useful online services of considerable benefit to them. High-speed broadband can better enable:

- electronic payments
- banking
- access to the latest 'cloud' applications
- undertaking online research and getting business advice
- reliable access to private business networks (VPNs)
- access to online training.

It reduces business costs

High-speed broadband is an enabler to new business processes and options that can substantially reduce other (more significant) business costs. High-speed broadband potentially allows SMEs to radically transform their businesses and reduce costs. Examples include:

- **reduced telephony costs**, through the widespread adoption of Internet telephony (for example Skype), which uses Voice over IP (VoIP) technology. There are now over 300 million Skype users worldwide, with Skype accounting for more than 40% of the entire international call market.

- **decreased travel costs**, through improved electronic communications with customers and suppliers. Through more effective communications (for example, using voice and video telephony and conferencing), trips to see customers and suppliers can be minimised, saving considerable time and money. For companies with global customers and/or suppliers, travel costs could be dramatically reduced.

- **support for home working**, minimising office costs. The availability of high-speed broadband can allow SME owners and employees to work from home, avoiding (or at least minimising) the costs of operating office buildings. Home working can also reduce the time and costs associated with unnecessary commuting, reducing traffic congestion and parking problems.

It supports business continuity with online backup

With electronic files and documents becoming increasingly important, there's nothing more guaranteed to strike fear in the minds of SME owners than the thought of losing valuable electronic data. While many would prefer not to think how devastating such an event would be, it is not uncommon for SMEs to lose business-critical data for a variety of reasons, including:

- hardware failure (for example a hard disk failure)
- accidental deletion of files
- theft (for example, office PCs)
- fire.

SMEs can take a number of actions to minimise the risk of losing valuable data, for example, by regularly backing up data to a separate drive, for example a Network Attached Storage (NAS) device. While this helps to minimise the impact of hardware failure, it may not be effective against the risk of fire or theft. A backup drive may be located in the same building or room as a PC, for example, and so a thief could steal the drive and the PC together. Similarly, a fire in the building could destroy both the PC and the backup drive.

High-speed broadband provides SMEs with an additional backup option – online backup – which would be impractical (too slow) with a basic broadband connection. Many SMEs possess a significant amount of data. An online backup service essentially creates an offsite up-to-date backup of files. A high-speed broadband connection, ideally with an upload speed of 10 Mbps or more, allows files to be backed up quickly. Online backup services are surprisingly affordable, with some costing less than £10 per month.

Seize the benefits of high-speed broadband for consumers

Just as high-speed broadband brings significant benefits for SMEs, it can also provide enormous benefits to consumers across Cambridgeshire too. While every household is different, just like every business is different, high-speed broadband can improve the lives of consumers in many different ways, including:

- supporting multiple users and devices in the home, so there are no slowdowns when people access the Internet simultaneously on different devices
- making popular Internet services highly responsive
- providing HD TV, video streaming and catch-up services that are reliable and do not suffer from buffering
- allowing next-generation Ultra HD TV content to be viewed
- providing reliable streamed music services without buffering, even with the highest-quality uncompressed music
- enabling better and cheaper voice calls than fixed phones provide, with additional video capability to keep in touch with friends and family
- improving indoor mobile coverage
- allowing online backup, to protect treasured digital content (for example, family photographs)
- providing the flexibility to work from home to improve work-life balance.

It better supports multiple users and devices

Gone are the days when a desktop PC was the principle device in most households to access the Internet. A wide range of devices – including laptops, smartphones, tablets, set-top boxes and streaming devices, DVD players, blu-ray players, games consoles and 'smart' TVs – are Internet-enabled and can connect to a home broadband connection and benefit from it. With so many devices competing to access the Internet, a broadband connection can soon become a bottleneck without high-speed connectivity – particularly as the usage from some of these 'newer' devices is higher than traditional desktop or laptop usage.

There has been strong take-up of many types of Internet-enabled device. Laptops bring the advantage of mobility over a desktop PC. They are now owned by about eight in ten adults according to a survey by Deloitte in June 2015 – up six percentage points from 2012. Tablets have experienced huge growth in take-up, with Ofcom reporting a ten percentage point increase in tablet ownership during 2014, with over half (54%) of households owning at least one tablet in early 2015.

Smartphone ownership has risen dramatically, increasing by 24 percentage points from 2012, with no signs of a slowdown. The smartphone – now owned by 76% of adults in the UK – has overtaken the laptop as the device consumers say is the most important for connecting to the Internet. Almost half of 18-24 year-olds check their smartphones within five minutes of waking up! According to Ofcom, smartphone users spent nearly two hours (114 minutes) per day using

the Internet on their mobile phone, which is nearly twice as much time as the average adult spends going online via a PC or laptop (69 minutes). Bandwidth-intensive applications such as watching video clips and streaming television programmes or films are extremely popular among smartphone users.

Over a third (35%) of broadband users accessed some form of on-demand or catch-up TV service using a set-top box at least once a month according to Ofcom.

The potential downside of this rapid expansion in the number of devices used to access the Internet is that a basic broadband connection can now be easily swamped by the demands on it. High-speed broadband ensures that every device is not slowed down by the demands of other users and devices.

It makes popular applications more responsive

Even households with relatively modest usage requirements benefit from high-speed broadband. They may not fully realise the impact that a high-speed broadband connection has on quite basic services. High-speed broadband enhances all types of online services and applications – making them more responsive and 'snappy'. These include:

- web browsing
- online shopping
- accessing services like Facebook
- uploading photographs
- messaging and emailing friends and family
- downloading books.

High-speed broadband users are often surprised that niggles that they previously put down to problems with websites (such as slowness and partial page loading) were actually caused (or accentuated) by their previous slow broadband connection.

It supports HD TV and even Ultra HD video services without buffering

High-speed broadband enables access to an increasing range of TV and video content, to complement or even replace traditional TV delivered via a rooftop aerial or satellite dish. It enables a broader choice of content, when consumers want to view it.

With conventional TV broadcasting, consumers generally have to search through Electronic Programme Guides. Wading through pages of listings can be frustrating, with no guarantee that favourite programmes will be showing at a time they want to view them. With 'on demand' content delivered via high-speed broadband, there is no need to search through channel listings or to set up a recording for a later time.

High-speed broadband also gets rid of one of the most annoying aspects of watching online TV and video content – buffering. Programmes and films will be generally available the moment you select them, and will continue reliably without any annoying pauses.

BBC's iPlayer and other catch-up services continue to grow in popularity. In December 2015, Ofcom published research showing that most UK viewers will no longer be tied to the TV schedule, with 70% (31 million) of UK adults expected to watch TV using catch-up services such as iPlayer and ITV Hub during the month of December. This puts the UK ahead of all other major European countries, the USA and Japan. High-speed broadband allows iPlayer to be

reliably viewed in its highest quality HD mode, and accessed on set-top boxes, smart TVs, smartphones, games consoles and desktop PCs.

Pay TV companies are rapidly embracing the opportunities to expand their offerings. For example, to complement the large number of live channels available via satellite, Sky has been increasingly developing its 'On Demand' service. In its 2014 Annual Report, Sky reported that On Demand downloads grew threefold over the year "as customers responded to greater flexibility and choice". By June 2014, the majority of Sky's TV customers had connected their set-top box to their broadband connection, and the "connected base" reached nearly 7 million homes by March 2015. On Demand downloads reached 300 million in the quarter ending March 2015, representing a 63% increase on the previous year. BT now offers a range of TV content, combining the functionality provided by a Personal Video Recorder (PVR) box (offering a range of HD terrestrial channels and recording capability) with delivery of additional channels and online content (e.g. sports and movies) via high-speed broadband.

High-speed broadband allows services from relatively new players such as Netflix and Amazon to be viewed with ease. US-based Netflix launched its original movie and TV streaming service in the UK in March 2012. Since its launch, Netflix has increased its subscriptions to about 4.4 million households, while about 1.2 million households now have a subscription to Amazon Prime (formerly Lovefilm).

In an Ofcom survey, 72% of people claimed to watch video clips and music videos on services such as YouTube, which are increasingly being used for entertainment and as a source of information.

Ultra HD represents the next generation of TV content, providing improved resolution over HD and making images extremely lifelike. According to BT, more than two-thirds of TVs now sold in the UK are Ultra HD-ready. High-speed broadband allows Ultra HD content to be streamed reliably. In April 2014, Netflix launched Ultra HD services in the UK, and offers a range of TV series in this new format. As part of its Amazon Prime service, Amazon introduced Ultra HD content in December 2015, offering a set of series and movies to stream, including original series. BT launched an Ultra HD channel in August 2015 called BT Sport Ultra HD, providing Ultra HD coverage of the UEFA Champions League. Sky will launch Ultra HD services in 2016.

It supports streamed radio and music services

High-speed broadband allows consumers to reliably access a broad range of streamed radio and music services. Those opting for a broadband package without usage limits can enjoy listening to radio and music services without worrying about exceeding usage allowances.

Radio continues to be very popular among consumers across the UK, with about nine in ten UK adults listening to the radio each week, and tuning in for an average of about three hours per day per listener. All radio stations broadcast in the UK can be listened to via the Internet, joined by thousands of 'Internet radio' stations from across the globe. The BBC now provides streams of all its national radio stations with significantly better sound quality than standard FM and DAB radio broadcasts.

High-speed broadband allows music to be streamed to multiple devices and users in a household. Streamed music services are seeing substantial adoption, from providers such as Spotify, Deezer, Soundcloud and, more recently, Apple Music. Spotify, which launched in 2008, had 75 million active users worldwide in June 2015 and offers more than 20 million music tracks. Apple Music – which launched in June 2015 – achieved over 15 million users by October 2015. Consumers are increasingly preferring the convenience and wide choice of songs and albums available with online services rather than investing in and building up their own CD collection. Ofcom's research has found that, among regular music listeners aged 16-24, streaming services are as popular as radio stations. Around two-fifths of regular music listeners aged 16-24 use streaming services to listen to music (39%), similar to the proportion of this age group who listen to music on the radio.

It enables better and cheaper voice calls and improved indoor mobile coverage

High-speed broadband allows consumers to reliably use Internet telephony services (so-called VoIP, which stands for Voice over IP) – which can now be accessed on a broad range of devices, including PCs, smartphones and tablets. Services such as Skype offer free calls made between Internet-enabled devices. High-speed broadband ensures excellent audio quality without the call drops that often occur with basic broadband connections. According to research by Ofcom, VoIP calls are now used by many people as part of their communications "repertoire" with family and friends. Since launching in 2003, Skype has gained over 300 million users, and now accounts for more than 40% of the entire international call market. High-quality broadband connections also allow video calls to take place reliably.

For many years, indoor mobile coverage has been a bugbear for many consumers, preventing them from using their mobile phone reliably in all rooms at home. Mobile operator EE introduced 'WiFi calling' in April 2015, with others operators following suit later in the year. With WiFi calling, a smartphone essentially bypasses the mobile network and sends SMS messages and voice calls directly – via WiFi – through the home broadband connection. High-speed broadband, therefore, completely frees consumers from the challenges of poor mobile coverage. WiFi calling is available on a range of smartphones.

It enables online backup

Over the years, many households accumulate highly-valuable electronic data such as home videos and family photographs. Many do not really consider the possibility of, or the impact of, losing their prized possessions. Some may sporadically back up files, for example to an external hard drive or USB memory stick. In many cases, backups are not performed on a regular basis and, while they may protect against a failed hard disk, for example, they may not defend against theft, accidental deletion or a fire.

High-speed broadband allows a cost-effective online backup service to be utilised, to provide up-to-date backups, protection against accidental deletion and defence against fire and theft. There are many online backup services available, including CrashPlan, iDrive and Carbonite. According to Ofcom, over a third (36%) of online adults say they already use an online (cloud) storage service.

It supports flexible working and working from home

High-speed broadband provides many people for the first time to have the realistic option of working from home – by making them at least as effective and efficient as being in 'the office'.

Across the UK, of the 30.2 million people in work in January to March 2014, 4.2 million (13.9%) were home workers, according to the Office for National Statistics. This is 1.3 million more people than in 1998. Driven by the increased availability of high-speed broadband, the number of homeworkers is predicted to carry on rising, particularly in office-related work. Many of those who work from home say they have a better work-life balance and improved job satisfaction. Through homeworking, the costs and wasted time of commuting are eliminated. The flexibility offered by homeworking can be particularly valued by those caring for family, including the elderly.

What is broadband, how does it work, and what speeds can be achieved?

The term 'broadband' simply refers to a range of technologies that allow you to connect to the Internet, to allow you to browse the web, send and receive emails, do online shopping and watch online TV, plus a whole host of other things. Basic broadband services - first launched in the UK in the year 2000 - are almost universally available (99% of UK premises). Thanks to the Connecting Cambridgeshire programme, the latest generation of broadband – called high-speed 'fibre broadband' – has been rapidly rolled out across Cambridgeshire, meaning the county is one of the best 'connected' in the country. High-speed broadband will meet the broadband needs of households and the vast majority of SMEs.

Basic broadband is available to 99% of premises

Broadband was first launched in the UK in 2000, using a technology called ADSL. Prior to this 'first generation' broadband, Internet access was achieved through very slow 'dial-up' services, which prevented the making and receiving of phone calls while connected to the Internet.

With ADSL broadband, the broadband signal is carried along the copper cables that connect your telephone to the local BT exchange, as shown in the figure below. These cables (which can be underground or carried on 'telegraph' poles) may stretch for many kilometres.

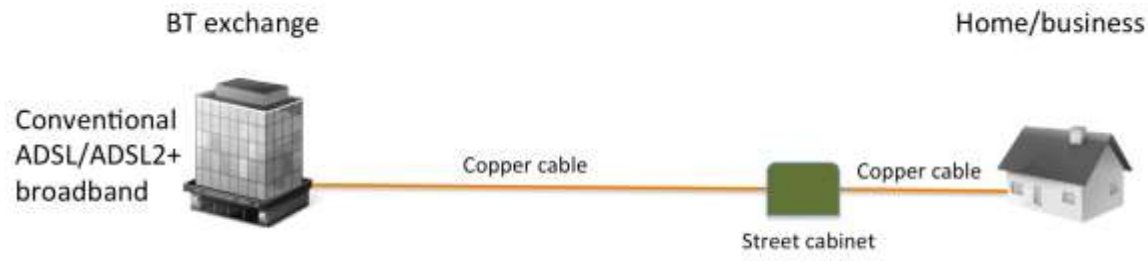

Figure: ADSL broadband is carried over copper cables between a BT exchange and premises

While ADSL is now a relatively old technology, it is widely available, with 99% of homes and businesses being able to get an ADSL connection. Since ADSL services were first launched, there have been some speed improvements. ADSL2+ is an important enhancement to 'first generation' ADSL broadband. First launched in 2009, ADSL2+ offers faster speeds for businesses and houses located relatively close to BT exchanges. Over time, ADSL equipment in BT's exchanges has been upgraded to ADSL2+, with ADSL2+ now available to over 92% of UK premises.

Nothing seems to cause more confusion among consumers and businesses than broadband speeds, in part due to the fact that most broadband providers quote the maximum speed possible. Sadly, many users will get significantly lower speeds. Ofcom has reported that dissatisfaction is highest among SMEs with ADSL services. Ofcom's research found that 42% of SME Internet users reported experiencing issues with Internet connectivity including the "ability to access the speed paid for". Ofcom's qualitative research suggests that advertising 'up to' speeds can create misunderstanding about the speeds that can actually be achieved, with its survey finding one in five SMEs were dissatisfied with their ability to access the speeds paid for.

First-generation ADSL broadband is capable of delivering a maximum download speed of 8 megabits per second (Mbps). However, this maximum download speed can only be achieved for homes and businesses situated close to the BT exchange, as shown in the figure below. This is because
broadband signals diminish in strength the further they have to travel along copper cables. ADSL download speeds fall to 5 Mbps or below for distances greater than about 3.5 km, and premises with cables lengths greater than about 4.5 km may struggle to achieve 2 Mbps.

Note that speeds are dependent on the distance of the cable from your location to the BT exchange, which may be much longer than the distance to the exchange 'as the crow flies'.

ADSL2+ can achieve significantly higher download speeds than ADSL for short distances, with a maximum speed of 24 Mbps. However, the difference between ADSL and ADSL2+ on longer lines are relatively insignificant.

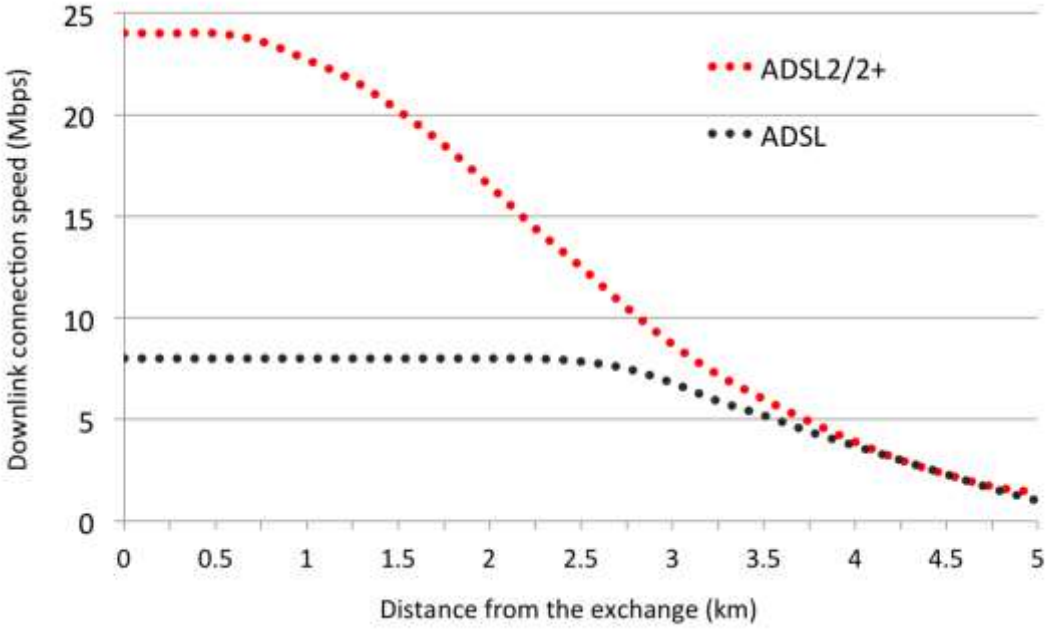

Figure 2: Relationship between estimated download speeds for ADSL and ADSL2 and the distance from the exchange [Source: Increase Broadband Speed]

Ofcom estimated that in June 2014, 24% of premises in SME-only postcodes had a maximum speed of less than 5 Mbps and 8% had maximum speeds of less than 2 Mbps – far below the maximum speeds advertised by broadband providers.

While much attention is placed by broadband providers on download speeds, upload speeds can be particularly important to SMEs. SMEs are more likely than residential broadband customers to use services that are dependent upon a high-quality uplink, such as online storage, voice telephony and video conferencing. Typically, ADSL services can deliver upload speeds of just less than 0.5 Mbps for ADSL, and about 1 Mbps for ADSL2+, although speeds can be significantly lower for large distances (> 3.5 km) from the exchange.

While basic broadband served Cambridgeshire relatively well in the early years of its life, increasing use of online services now makes it a bottleneck for many consumers and SMEs, particularly those in rural areas located a considerable distance from their BT exchange (who may suffer with download speeds of 2 Mbps or less).

High-speed fibre broadband can meet the requirements of households and most SMEs

Fibre-optic broadband (usually shortened to 'fibre broadband') is the latest broadband technology. First launched in 2010, fibre broadband utilises fibre-optic cables to deliver significantly higher download and upload speeds than basic broadband. For the vast majority of SMEs (with fewer than 50 employees), fibre broadband is likely to be sufficient to meet their needs, according to Ofcom.

Fibre broadband is delivered from new street cabinets (like the one shown below), with these cabinets connected to a BT exchange via a fibre-optic cable. Look out for a fibre broadband cabinet in your vicinity.

Figure: New fibre broadband street cabinet used to deliver fibre broadband to homes and businesses in Cambridgeshire

With fibre broadband, the broadband equipment (which is located in the BT exchange with basic broadband) is located in the street cabinet – much closer to homes and business premises than

with basic broadband. Essentially, fibre broadband cabinets are 'mini' exchanges that contain broadband equipment. Therefore, the distance that broadband signals have to travel over copper cables is generally much less than for basic broadband, as shown in the figure below, so the signals suffer less attenuation and interference. This means that significantly higher speeds than basic broadband can be delivered.

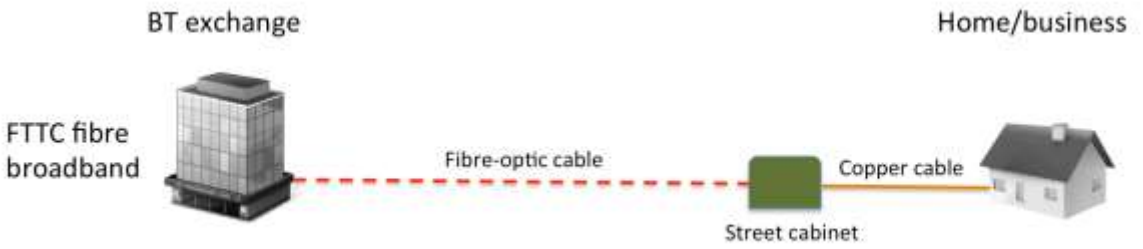

Figure: With fibre broadband, the distance that broadband signals have to travel over copper cables is substantially reduced compared with basic broadband

Connecting Cambridgeshire has undertaken a rapid roll-out of fibre broadband cabinets across Cambridgeshire and Peterborough, deploying over 550 fibre street cabinets, as shown in the figure below.

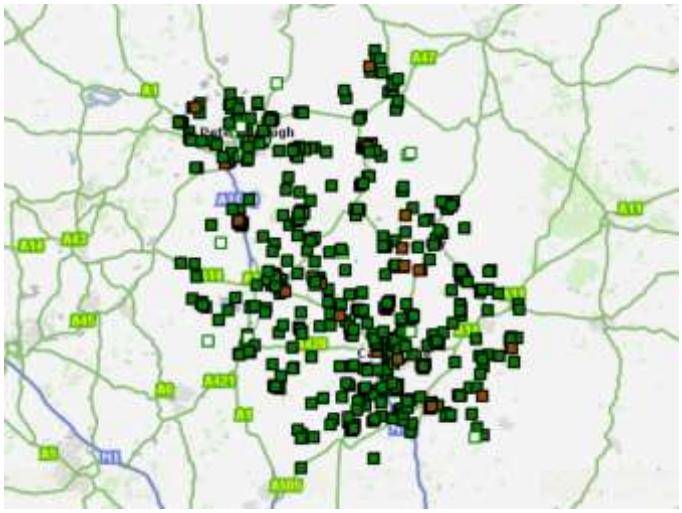

Figure: Fibre street cabinets deployed across Cambridgeshire and Peterborough as part of the Connecting Cambridgeshire roll-out programme

The roll-out programme has involved the installation of fibre street cabinets in cities, towns and villages across the county, an example of which is shown below.

Figure: Installation of a fibre street cabinet in the rural village of Spaldwick

One of the most challenging tasks of the programme has been the laying of fibre-optic cable to connect all the new fibre cabinets across the county. It has been an extremely challenging task, with partial or full road closures taking place and installation teams regularly facing blocked or collapsed ducts (for example, caused by tree roots). The photographs below show the installation in progress.

Figure: The Connecting Cambridgeshire project has involved the laying of fibre optic cables to connect more than 550 new fibre cabinets

For most premises, the distance to a fibre cabinet is substantially shorter than the distance to the BT exchange, resulting in substantially higher download and upload speeds with fibre broadband compared with basic broadband. Fibre broadband is potentially capable of delivering download speeds of up to 80 Mbps, and upload speeds of up to 20 Mbps. The many businesses and homes situated about 400 metres or less from a fibre cabinet will be able to achieve speeds close to the maximum possible.

Fibre broadband speeds are reduced for those premises situated a considerable distance from a fibre cabinet, as shown in the figure below. As fibre broadband still uses the copper cables in the connection between the fibre street cabinet and homes and business premises, broadband signals suffer degradation with distance. While premises beyond 1 km will still be able to access fibre broadband services, download speeds will typically be below 30 Mbps.

It is important to remember that premises that are situated a considerable distance from a fibre cabinet may experience extremely slow speeds (less than 2 Mbps) with basic broadband (due to being a very long distance from the exchange). Therefore, even if fibre broadband speeds are significantly lower than the maximum possible, they may still be substantially faster than basic broadband.

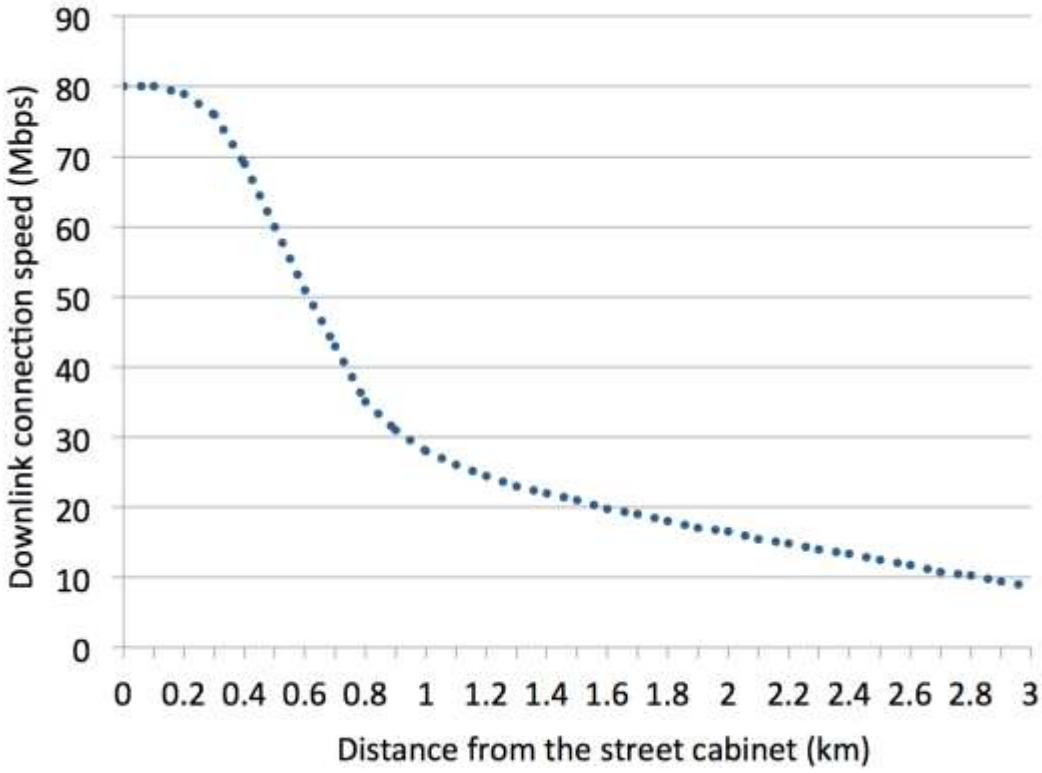

Figure: Relationship between download speed and distance from the fibre cabinet [Source: Increase Broadband Speed]

As with basic broadband, most broadband providers focus on 'up to' download speeds in their advertising, although upload speeds may be very important, particularly to SMEs. For the many premises located within about 400 m of a fibre cabinet, upload speeds close to 20 Mbps can be achieved – roughly 20 to 40 times faster than basic broadband.

Just as fibre broadband download speeds are reduced when the fibre cabinet is further away, so upload speeds are also reduced. However, upload speeds will generally be significantly greater than with basic broadband.

The location of your fibre street cabinet is not the only thing that will determine download and upload speeds. In order to provide more affordable pricing, many fibre broadband providers offer cheaper fibre broadband services where the maximum speeds have been constrained. Widely available 'up to 40 Mbps' services – where the download speed has been limited to a maximum of 40 Mbps – are proving popular with residential customers due to their affordability. Similarly, providers constrain upload speeds on their cheaper packages – usually to 10 Mbps and sometimes to 2 Mbps (TalkTalk).

While many consumers may find the speeds from 'up to 40 Mbps' packages more than acceptable – and still a significant improvement over basic broadband – SMEs should carefully consider their speed requirements, particularly with regard to their upload requirements. For example, SMEs relying on online backup may find that a 2 Mbps upload speed limit is unduly restrictive.

Fibre broadband from Virgin Media can deliver download speeds up to 200 Mbps

So far, this chapter has looked at the roll-out of high-speed fibre broadband by BT. Fibre broadband service are also available from Virgin Media, although with significantly lower geographical availability.

Fibre broadband provided by Virgin Media is in many ways similar to that provided on BT's network, although co-axial cable (used to transmit Virgin's cable TV service) is generally used to carry broadband signals instead of the copper cables used in the BT network.

Principally because of the differences between cables, Virgin Media offers greater download speeds – of up to 200 Mbps.

According to Ofcom, 44% of premises in the UK were able to access high-speed broadband from Virgin Media's cable network by May 2015. Virgin's cable network is capable of reaching about 13 million premises. As part of a £3 billion investment programme, this will be expanded by another four million in predominantly urban areas by 2020 to about 17 million premises in total.

Other broadband technologies may be available

High-speed broadband in the form of fibre broadband– which will meet the needs of subscribers and the vast majority of SMEs – is now available to the vast majority of premises in Cambridgeshire. However, other broadband options may be available if (a) fibre broadband is not yet available at your location, or (b) you have special requirements (for example, you are an SME with very high bandwidth or reliability requirements).

Available technologies could include:

- Ethernet First Mile (EFM), which is a business service that bonds up to eight copper wires together to deliver symmetrical (download and upload) speeds of up to 35 Mbps
- satellite broadband, delivering download speeds of up to 22 Mbps
- wireless and mobile broadband (e.g. 4G LTE mobile broadband services), delivering download speeds of up to about 50 Mbps
- bonded ADSL and ADSL2+, amalgamating several basic broadband connections into a single higher-speed connection so, for example, four 3 Mbps ADSL connections could form a 12 Mbps connection
- bonded fibre broadband, which combines multiple fibre broadband connections for greater speeds
- Fibre-to-the-Premises (FTTP), with download speeds of up to 330 Mbps for BT's 'FTTP on Demand' service
- Ethernet over Fibre (EoF) – also known as a 'leased line', which is a dedicated fibre connection to businesses, offering symmetrical speeds of up to 10 Gbps.

Due to the breadth and complexity of possible options available, detailed comparison of all these technologies is beyond the scope of this guide, and several are very expensive and targeted at relatively large companies. Fibre broadband can meet the vast majority of requirements and has widespread availability.

What broadband can I get?

As it can be challenging to identify which broadband services are available, this section identifies a number of websites that can provide information about the availability of fibre broadband for your location.

Check the BT Broadband Availability Checker for fibre broadband availability

Perhaps the easiest way to determine the availability of both basic broadband and high-speed fibre broadband in your location is to use the BT Broadband Availability Checker, which can be found at the following address:

https://www.dslchecker.bt.com/

A screenshot of the checker is shown below. You simply need to enter your telephone number and press 'submit'.

Figure: Screenshot of the BT Broadband Availability Checker

If fibre broadband is already available, the BT Broadband Availability Checker will return information like that shown below.

BT BROADBAND AVAILABILITY CHECKER

Telephone Number on Exchange WOOLLEY is served by Cabinet 6

Featured Products	Downstream Line Rate(Mbps)		Upstream Line Rate(Mbps)		Downstream Range(Mbps)	Availability Date
	High	Low	High	Low		
FTTC Range A (Clean)	80	78.9	20	20	--	Available
FTTC Range B (Impacted)	80	76.7	20	19	--	Available
WBC ADSL 2+	Up to 2.5		--		1.5 to 4	Available
ADSL Max	Up to 1		--		1 to 3.5	Available
WBC Fixed Rate	1		--		--	Available
Fixed Rate	1		--		--	Available
Other Offerings						
FTTP on Demand	330		30		--	Available
Fibre Multicast	--		--		--	Available
Copper Multicast	--		--		--	Available

Figure: BT Broadband Availability Checker showing the availability of fibre broadband

Rather confusingly, the availability of fibre broadband is indicated by the terms 'FTTC Range A (Clean)' and 'FTTC Range B (Impacted') with an Availability Date of 'Available'.

If fibre broadband is available, the BT checker provides an estimate of both download and upload speeds. To reflect the uncertainty in predicting likely speeds, two speed ranges are given – one for a so-called "clean" line and one for an "impacted" line. A clean line is one that is not affected by particular wiring issues or poor line conditions.

As it is not really possible to judge the quality of the line between you and the fibre cabinet, these estimates must be interpreted with caution. You will not really know your exact speeds until fibre broadband is installed at your premises, although the checker generally does provide a useful indication.

In the unlikely event that fibre broadband is not yet available in your vicinity, you may get information like that shown below. In the case shown, basic ADSL broadband (indicated as "ADSL Max") and ADSL2+ broadband (indicated as "WBC ADSL 2+") are available. The checker also provides an estimate of the download speed for basic broadband, with a range of speeds shown. Estimated speeds provided by this checker tend to be quite conservative for basic broadband.

BT BROADBAND AVAILABILITY CHECKER

Telephone Number on Exchange KIMBOLTON is served by Cabinet 6

Featured Products	Downstream Line Rate(Mbps)	Upstream Line Rate(Mbps)	Downstream Range(Mbps)	Availability Date
WBC ADSL 2+	Up to 3	--	2 to 4	Available
ADSL Max	Up to 3	--	2 to 4	Available
WBC Fixed Rate	2	--	--	Available
Fixed Rate	2	--	--	Available
Other Offerings				
Copper Multicast	--	--	--	Available

Figure: BT Broadband Availability Checker showing the availability of basic broadband

If your telephone service is provided by TalkTalk or Sky (or some other provider), your telephone number may not be accepted. If this is the case, you have the option to enter your postcode in the Postcode Checker, as shown below.

BT BROADBAND AVAILABILITY CHECKER

Welcome to the Broadband Availability checker. This will provide a provisional check of your ability to receive reliable Broadband services.

Please enter your postcode.

POSTCODE:

submit

For a more accurate qualification, please select the **Telephone Number Checker** or the **Address Checker**

By submitting a query into this checker you accept **Terms of Use** for this checker.

Figure: Screenshot of the postcode checker in the BT Broadband Availability Checker

In some cases, the postcode checker does not work properly and will give a false indication for fibre broadband availability. It may indicate that fibre broadband is not available when it actually is. If fibre broadband is not indicated, we advise entering the telephone number of a neighbour, if you know it.

Check if fibre broadband is available from Virgin Media

You can check to see if fibre broadband from Virgin Media is available to you using the following site:

http://store.virginmedia.com/check-your-postcode

Check if fibre broadband will become available in the future

The BT Broadband Availability Checker (discussed previously) will only indicate that fibre broadband is available when the service can be ordered. Therefore, it will not indicate that:

- a fibre broadband cabinet has already been installed in your location but has not yet been made fully operational
- future broadband is planned for your area.

Local information and future plans are provided on the Connecting Cambridgeshire website: http://www.connectingcambridgeshire.co.uk

The Connecting Cambridgeshire site contains 'my area' pages that are designed to help you find out how your areas fits into the Connecting Cambridgeshire broadband roll-out programme as it progresses:

http://www.connectingcambridgeshire.co.uk/my-area/

Information is provided for every town and village in Cambridgeshire with an A to Z list.

Green	Yellow	White	Grey
Fibre broadband cabinets are live in your area.	Work is taking place in your area. Check your 'my area' page for timescales.	Better broadband in on the way and planning is in progress.	Superfast broadband is or will be made available through commercial providers, so this is not part of the intervention programme.
Phase 1-6	**Phase 7**	**Phase 8 and 9**	
Roll-out complete.	September to December 2015.	Spring 2016 to Summer 2017	

Figure: Phases for Connecting Cambridgeshire roll-out programme

You can also check future fibre broadband availability using the BT Openreach Checker at: http://www.superfast-openreach.co.uk/where-and-when/

You can enter your landline telephone number or address. The Openreach checker will provide you with fibre broadband status in your area, as shown in the figure below.

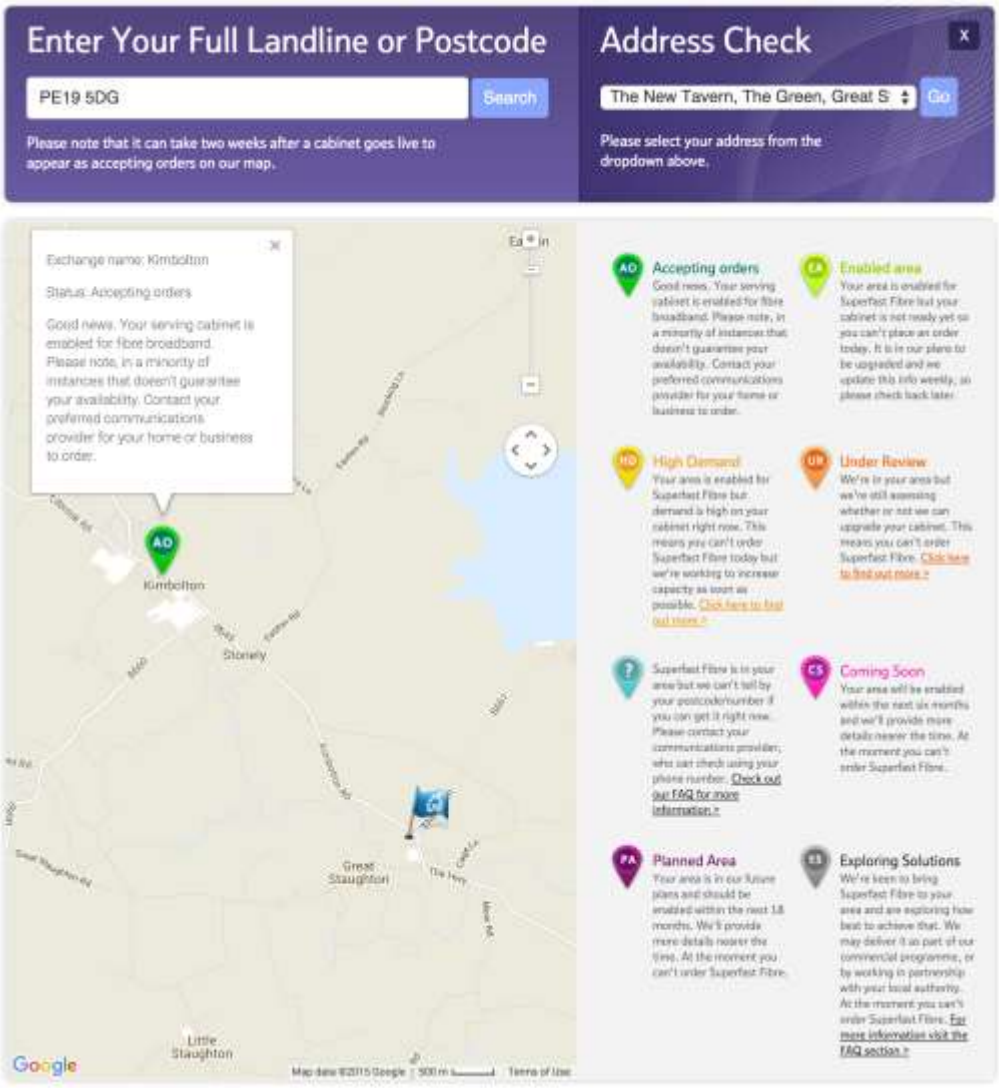

Figure: Fibre broadband status shown by the BT Openreach Checker

How do I choose my broadband provider and package?

If fibre broadband is available in your area, you will generally have a broad range of providers and packages to choose from, and you may also have fibre broadband from Virgin Media available. With so much choice, it can be difficult to identify the most appropriate service for your needs. While many SMEs may find consumer fibre broadband packages perfectly suited to their requirements, it is important to consider a range of aspects to help decide on the best option. To help you, we have identified a number of factors you should consider. You can expect to pay a premium over basic broadband of about £10 per month (depending on the service you choose) for a typical consumer fibre broadband package, although services targeted specifically at businesses may be more expensive (but provide greater speeds and improved resilience and service guarantees).

Fibre broadband is available from many different providers

Fibre broadband is delivered using BT's network, although BT is required, by government regulation, to open its network up to other providers. So, while fibre broadband services are available from BT (aimed at both the consumer and, through BT Business, at businesses), it is important to emphasise that fibre broadband services are also available from a wide range of broadband providers that use BT's fibre broadband network.

You may also have cable broadband available in your area, adding to the choice of providers.

You do not have to opt for a business line or business broadband package if you are a business

You do not have to opt for a 'business line' or a 'business' broadband package just because you are a business. Many businesses happily operate using fibre broadband packages that are targeted at consumers, and often these are cheaper than business options. Equally, consumers can choose from broadband and phone packages targeted at businesses.

You may find that some packages that are targeted specifically at businesses offer special features over consumer packages, for example more responsible telephone and email support and/or speedier fault resolution times. These may or may not be important to you.

What speeds do you need – download and upload?

Not all fibre broadband services are the same even if they are delivered via BT's fibre broadband cabinets. Broadband providers generally offer two fibre broadband service types with different maximum speeds:

- 'up to 80 Mbps' download, and 'up to 20 Mbps' upload
- 'up to 40 Mbps' download, and 'up to 10 Mbps' **or** 'up to 2 Mbps' upload

While the top speeds of an 'up to 40 Mbps' package may seem more than ample for an individual, you should consider the cumulative impact of supporting several users. For SMEs, simultaneous connection to multiple users and devices may be essential, or there may be a need to work from home, alongside others members of a household. Consumers in multi-user households where multiple devices may be used simultaneously (including smartphones, laptops, tablets, set-top boxes and games consoles) high speeds may be desirable. It may be easy to imagine the scenario of one family member watching catch-up TV in the living room while browsing the Internet on a tablet, while another member of the family is working from home in the study. At the same time, one child could be watching YouTube in the kitchen, while another is talking to a friend on Skype.

While slower broadband connections may be appealing in terms of pricing, choosing lower speeds may restrict the use of certain services that require relatively high broadband speeds, such as TV and video services. TV and video services can place intense demands on a broadband connection. For example, Netflix recommends a download speed of 5 Mbps for its video-on-demand service in HD quality, and a "steady" 25 Mbps for Ultra HD quality.

If you are an SME, you should think carefully about upload speed requirements too, particularly if you use (or intend to use) upload-intensive services, such online storage and backup, video telephony and conferencing, or perform regular uploading of videos, photos and website pages. SMEs are more likely than residential customers to use services that require a high-quality uplink, such as online backup, cloud-based applications and video conferencing, according to Ofcom.

With online storage as an example, the slower your upload speed, the longer it will take to upload or backup your files. Let us assume that you use an online backup service to back up files totalling 500 GB, say. As shown in the table below, full back of files would be achieved in about two days with an upload speed of 20 Mbps. This would take over three weeks with an upload speed of 2 Mbps.

Upload speed	Maximum data upload	Time to upload 500 GB of files
2 Mbps	0.88 GB per hour	24 days
10 Mbps	4.39 GB per hour	5 days
20 Mbps	8.79 GB per hour	2 days

Table: Time taken to back up 500 GB of files to an online backup service for different upload speeds

What type of installation should you opt for?

Currently, fibre broadband providers offer two types of installation:

- installation by an engineer
- a so-called "self install", where the modem router and microfilters (just as with basic broadband) are provided by courier or through the post.

An engineer installation involves an engineer visiting your home or workplace to install a filtered mastersocket and a new modem router. As part of the installation, the engineer will measure the performance of the line, identifying any problems that exist. Furthermore, the use of a filtered mastersocket (rather than self-installed microfilters) will ensure the very highest speeds possible for a line.

Figure: An engineer installation involves an engineer visiting your premises

With a self-install, a new modem router and several microfilters are sent by post. Broadband users are then expected to install the microfilters on all their telephone extensions (as with basic broadband).

An engineer installation incurs a significant cost for broadband providers so many providers limit the home installation option to their premium 'up to 80 Mbps' packages, with the self-install option provided for their cheaper 'up to 40 Mbps' packages. However, opting for an engineer installation (by selecting an 'up to 80 Mbps' package) may deliver significantly improved performance. A filtered mastersocket usually performs better than microfilters and tests carried out by the engineer could identify a previously-unidentified wiring problem or line fault.

What is your expected usage?

You should consider your expected broadband usage, bearing in mind that future usage with fibre broadband may be substantially higher than your past usage with basic broadband because:

- you may be connecting a greater number of devices (including smartphones, tablets and set-top boxes)
- faster speeds and improved responsiveness may encourage greater use of online services
- you may increasingly use usage-intensive services (such as catch-up TV)
- you may use (for the first time) services that are only practical with fibre broadband (such as online backup).

Some of the cheaper fibre broadband services offered by providers limit monthly usage. While packages with restricted usage can be suitable for certain types of households, for example single-person households with relatively low Internet usage, they can be unduly restrictive to others. You may be surprised just how large your usage is if you regularly use bandwidth-intensive services, such as streamed TV and video, or voice and video telephony/conferencing. Usage could be significantly higher than expected if your broadband connection is shared between multiple users and/or devices, for example with teenagers viewing YouTube on their mobile phones!

What service guarantees and level of resilience do you require?

Many consumers and SMEs should consider the impact that a broadband outage would have on them, to ensure that their broadband service is fit for their needs. SMEs often have lower tolerance for outages than residential consumers, as they rely on communications networks for business-critical services.

While many broadband lines operate without a problem, SMEs need to carefully consider the possibility of a broadband fault and the impact that this could have on them. In the case of a fault, SMEs could potentially be faced with:

- delays in successfully identifying and reporting the fault (which could be hindered by poor customer service or telephone support)
- significant downtime when waiting for the fault to be diagnosed and repaired.

When choosing between broadband providers, you should consider the quality of customer care that the provider offers rather than just considering price.

Many broadband providers offer enhanced customer care options that are targeted at business users, which guarantee faster fault reporting and resolution than basic consumer packages. For a typical monthly fee of about £10-15 per month, broadband users can be offered fast fault response times (for example, one working hour) and rapid fault resolution times (for example, within 24 hours).

With a single fibre broadband connection, you should consider the extent to which you would be able to cope if your connection suffered an outage or fault, even if you subscribe to an additional enhanced customer care option. If you deem that the impact of an outage would be too high, you should consider making your broadband connection more 'resilient' by having an additional means of connectivity as a 'back up', which could be:

- a mobile broadband connection (for example, using a USB dongle)
- an additional basic broadband connection (for example, with a second phone line).

With the increasing availability of high-speed 4G mobile broadband connections, mobile services can provide an alternative to fixed broadband services for many SMEs in the case of an outage. For example, mobile operators offer a range of USB dongles available on 'pay monthly' and 'pay as you go' basis. Mobile broadband services can be surprisingly fast, with 4G LTE services potentially able to rival fixed high-speed broadband with download speeds of about 40 Mbps. However, limited mobile usage allowances tend to be much more restrictive than fixed broadband offerings, making them best suited as a backup solution rather than a realistic all-year-round alternative to high-speed fibre broadband. 3, Vodafone, EE and O2 aimed to achieve 98% UK population coverage for their 4G networks by the end of 2015.

Benefit from high-speed broadband

Over the last few years, the broadband landscape in Cambridgeshire has been radically transformed, with high-speed fibre broadband being made available to the vast majority of SMEs and consumers in the county. With fibre broadband availability higher than many other counties in the country, Cambridgeshire's businesses and consumers have an unrivalled opportunity to seize the huge benefits offered by reliable and high-speed broadband connectivity. We have shown that fibre broadband has the power to transform businesses, increasing revenues and opening up new markets worldwide. It also has the power to transform people's lives, by broadening the range of online services that can be accessed and providing the flexibility to work from home to improve work-life balance.

We hope that this guide has dispelled much of the complexity and confusion that surrounds the subject of broadband – so that you can benefit from high-speed broadband now!