

Connected Nations 2019 Scotland report



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Overview

This annual report measures progress in broadband and mobile services in Scotland and sets out the role Ofcom plays in helping to further improve them.

Alongside this report, we also provide an <u>interactive dashboard</u>, allowing people to see data for different areas, services and coverage levels. This includes coverage data for all Scottish local authority areas, Westminster and Holyrood constituencies. Further reports are available at a <u>UK-wide level</u> and for the other <u>Nations of the UK</u>.

We are also making it easier for people to access our data, so they can create their own interactive services. We have two application programming interfaces (APIs), which allow others to use our data creatively to develop services, such as apps and widgets to benefit consumers and businesses. More than 50 organisations are now looking to exploit this capability.

This report highlights the work Ofcom is doing, alongside the UK Government, Scottish Government and communications companies, to improve the availability of fixed and mobile services across Scotland. Ofcom wants people in Scotland, and the rest of the UK, to be able to easily access good broadband and mobile connections wherever they live, work and travel.

What we have found:

- The number of homes in Scotland with access to superfast (at least 30 Mbit/s) broadband has increased by over 89,000 since last year. As existing publicly funded schemes have matured, the pace of rollout across the UK has slowed from a few years ago, so overall superfast coverage in Scotland remains around 92%. In areas where at least superfast broadband is available, just under half (48%) of those properties use superfast or ultrafast (at least 300 Mbit/s) services.
- Over 200,000 homes and businesses in Scotland (8%) now have access to full-fibre broadband connections; 150,000 more premises than last year. These connections can deliver much higher download speeds, of up to 1 Gbit/s and are also much more reliable than older, copper-based broadband.
- The deployment of wireless home broadband from BT/EE on its mobile network further reduces the number of premises that cannot get a decent broadband service (i.e one that delivers a download speed of at least 10 Mbit/s and an upload speed of at least 1 Mbit/s). We now estimate that 40,000 homes in Scotland are unable to access a decent broadband service, subject to confirmation of individual premises coverage. From March, those homes unable to get a decent connection will may be able to request one from BT¹ (subject to <u>eligibility criteria</u>)
- 5G services have been launched by all four mobile network operators over the past year and are now operating in over 40 towns and cities across the UK, including Edinburgh and Glasgow.
- 4G coverage from all four operators now extends to 42% of Scotland's landmass (up from 38% last year). However, now 80% of Scotland can receive 4G coverage from at least one operator.
- Twenty-percent of Scotland has no good 4G coverage from any operator, predominately in rural areas (so called 'not spots').
- Almost eight in ten homes and businesses in Scotland (79%) have access to good indoor 4G mobile coverage from all network operators.
- We estimate that around 12,300 premises in Scotland cannot access either a decent fixed broadband service or get good 4G coverage indoors (from any operator).

Work continues to improve service availability

Ofcom initiatives

Ofcom supports investment in full-fibre networks to make sure the needs of consumers and businesses continue to be met. We support this through measures designed to encourage investment from Openreach and make it cheaper and easier for other providers to build their own

¹ Or KCOM in the Kingston-upon-Hull area.

networks. This has helped to support faster growth in full fibre over the past year. We will publish proposals on this as part of our forthcoming consultation on the Telecoms Access Review, which will also include several other regulatory measures to encourage new network investment. We have also worked to encourage early investment in 5G mobile networks, and this is already bearing fruit.

Working with the UK Government and Scottish Government

Alongside the work we do as a regulator, there will continue to be a role for governments across the UK to help improve access to mobile and broadband, including by investing public money in networks in areas which are unlikely to be covered commercially. We will work closely with the UK Government as it develops plans to invest £5bn in full fibre and gigabit capable broadband and as it works towards an agreement with the mobile operators on a Shared Rural Network (SRN). We will also continue to work closely with the Scottish Government on its digital connectivity ambitions. This includes infrastructure initiatives such the 'Reaching 100%' (R100) programme, which seeks to deliver superfast speeds at 30 Mbit/s to 100% of premises in Scotland, as well as the 'Scottish 4G Infill' (SG4i) programme.

Ofcom is also releasing the <u>International Broadband Scorecard 2019</u>. This compares the UK's recent position on broadband availability with a number of other European nations. Over the last few years, the availability and take-up of superfast and ultrafast broadband, and the coverage and take-up of 4G mobile services have dramatically increased. As the Scorecard shows, the UK leads other large European countries for the highest availability of superfast services. The UK also holds a leading position on current 4G mobile network coverage.

Fixed broadband services

In this report, we also focus on the availability of services for decent (10 Mbit/s and above), superfast (30 Mbit/s and above), ultrafast (300 Mbit/s and above) and full-fibre broadband, which can offer speeds of 1 Gbit/s. Our report shows that coverage of faster broadband networks, particularly full-fibre networks, is increasing, and consumers are increasingly taking up the faster broadband services.

Decent broadband coverage is improving but more remains to be done

Coverage from conventional fixed line networks continues to improve but around 98,000 homes and businesses in Scotland are still unable to receive a decent broadband service. Increased coverage from fixed wireless networks, including those of the mobile operators, provides an alternative to a fixed line connection but we estimate this still leaves around 40,000 premises in Scotland without any decent broadband service at all.

In March 2018, the UK Government introduced legislation for a Broadband Universal Service Obligation (USO), which will give eligible homes and businesses the right to request (<u>subject to</u> <u>eligibility criteria</u>) a connection that delivers a decent broadband service of at least 10 Mbit/s download speed and 1 Mbit/s upload speed. Ofcom is implementing this, and it will come into force in March 2020. Although we have no formal role delivering the R100 programme, we will continue to work with the Scottish Government on the interaction of the two schemes, providing technical and regulatory advice where required.

Superfast and ultrafast broadband rollout continues

In addition to full-fibre rollout, superfast and ultrafast broadband deployment continues across the UK, but at a generally lower pace than previously reported. This is because large parts of the UK now have access to superfast broadband as a result of commercial investment and publicly-funded interventions, such as the Digital Scotland Superfast Broadband (DSSB) and Building Digital UK (BDUK) programmes.

The total number of premises in Scotland able to get superfast broadband has risen by around 89,000 and stands at 92% of residential premises. Although we have observed an increase in coverage, this figure is the same as the one quoted last year due to changes in the way that we identify premises, discussed further in our <u>methodology annex</u>.

As noted above, the Scottish Government has committed to extending superfast broadband access to 100% of premises in Scotland as part of its its R100 programme. Contracts for the £600m programme are being finalised, with BT Group plc named as the preferred bidder for all three geographical lots across Scotland. Deployment through the <u>Digital Scotland Superfast Broadband</u> <u>programme</u> will continue into 2020.

Superfast coverage for all business premises, both large and small, is at 83%. This may be due in part to lower availability in business parks, due to the costs involved in rolling out the relevant technology to these areas and the alternative use of "leased lines" for data networking, particularly by larger enterprises.

Coverage of ultrafast broadband in Scotland has increased from 43% to 44% of homes over the year. Ultrafast coverage of commercial premises is considerably lower at just 27%.

Mobile services

Mobile coverage across Scotland is gradually improving but large parts still struggle to get a good mobile connection. The more urban areas of Scotland are relatively well served by 4G networks but those in rural areas, particularly in the Highlands and Islands, continue to experience poor levels of 4G coverage. This tends to reflect the challenges involved in building mobile networks in sparsely populated areas, where the commercial incentives to provide coverage are lower.

Good reception is easier to achieve outdoors than inside because mobile signals are weakened by obstacles such as walls and the glass used in cars and trains. Because of this, we report separately on outdoor (i.e. geographic) and indoor coverage. We also report on in-car and out-of-car coverage on major roads in Scotland.

Coverage can vary between operators. Ofcom's <u>online coverage checker and app</u> enables people to identify which operators predict a good connection in the locations that matter most to them. People can then choose the operator that best meets their needs.

Mobile coverage

Indoor 4G coverage from all four operators is available to 79% of premises in Scotland, up from 75% in 2018 and 57% in 2017. Both Vodafone and O2 provide good 4G indoor coverage to 95% of premises, EE 92% and Three 88%. Good indoor 4G coverage from all operators is available to 49% of rural premises in Scotland (up from 44% last year). Geographic 4G coverage from at least one operator now stands at 80%. However, geographic 4G coverage from all four operators has improved slightly to 42% (up from 38% last year). Twenty-percent of Scotland still has no good 4G coverage from any operator, predominately in rural areas (so called 'not spots').

Outdoors, voice coverage is available from all four operators to 58% of Scotland, up from 54% a year ago. Both Vodafone and O2 provide geographic voice coverage to 80% of Scotland, EE 72% and Three 68%. The vast majority of premises in Scotland (92%) are covered by voice services from all operators but premises in rural Scotland are less well served (71%).

There are a small number of premises that do not have a decent fixed line or good 4G mobile network connection

This report focuses on coverage of decent fixed (at least 10Mbit/s download speed) and good 4G mobile broadband services. However, we estimate that around 12,300 (0.2% of Scottish premises) are unable to access either. As with last year, more premises currently have good indoor 4G coverage from at least one operator than a decent fixed broadband service.

A combination of ongoing commercial deployment, regulatory interventions and publicly-funded infrastructure investment should reduce the number of premises that are unable to receive either a decent fixed or good mobile service. However, some premises may still require an alternative technology solution.

5G

As of October 2019 EE, O2, Three and Vodafone were offering mobile and/or fixed 5G services. They have launched 5G in more than 40 cities and towns in the UK. Initial offerings are focused on densely populated areas, including Edinburgh and Glasgow in Scotland.

As well as providing improved broadband services for consumers via public networks, future 5G networks could provide specialist services to organisations and businesses. We expect our new spectrum sharing framework announced in July to provide support for organisations and businesses to deploy such private wireless networks. We intend to hold a wireless spectrum sharing event in Edinburgh in early 2020 which will promote measures introduced by Ofcom which make it easier for third party organisations to lease radio spectrum from mobile network operators.

Network security and resilience

As people and businesses become more reliant on fixed and mobile networks, and the threat from cybersecurity risks increase, companies must manage security risks and safeguard the availability of their services. We are working closely with the UK Government and its agencies to improve security and resilience, for example by contributing to the work initiated by the <u>Supply Chain Review</u> being led by DCMS. The Scottish Government has also acknowledged the importance of cyber security in its *Programme for Government 2019-20* and has announced £1 million to drive growth in the cyber security industry, alongside ScotlandIS.

In previous Connected Nations publications, we reported on the significant incidents that we have been informed about by fixed and mobile phone companies. Additional information about this can be found in our UK report. In summary, this year we have found:

- Network problems and outages continue to occur with roughly the same frequency, root causes and level of impact.
- Fixed telephone networks tend to be the most reliable, with the worst being unavailable for five hours during the year. Fixed broadband networks reported up to 24 hours of unavailability. Mobile networks tended to perform somewhat worse with reported unavailability ranging from seven hours to two days.
- The few large-scale outages that do occur can have a major impact on users.

Ofcom is increasingly focused on how networks could be designed and operated to minimise the risk of widespread failures and mitigate their impact. We are working with industry, the UK Government and the Scottish Government to achieve this.

We are also continuing with our increased focus on cyber security through our Security and Resilience Assurance Scheme, with initiatives such as a penetration testing programme. We will work with the UK Government and the National Cyber Security Centre (NCSC) on a set of technical security requirements for the telecoms sector.

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Fixed broadband and voice

Introduction

A key priority for Ofcom is to encourage <u>investment in full-fibre</u>, which provides greater speed and reliability than copperbased telecoms networks. Both the UK Government and Scottish Government are also supporting the move to improved connectivity for the country.

For this report, we have expanded the number of companies contributing data to our analysis, incorporating coverage information from fixed wireless access providers and smaller full-fibre network providers.

In our <u>Connected Nations UK report</u>, we also highlight some of the developments in the preparation for migrating voice services to be delivered over fibre broadband connections.

A full list of the providers who contributed coverage data can be found in our <u>Methodology Annex</u>.

Key highlights:

- Superfast broadband coverage to residential properties stands at 92%. This relates to the availability of fixed broadband with a download speed of at least 30 Mbit/s.
- Around 200,000 premises now have access to a full-fibre connection, capable of delivering much higher download and upload speeds.
- Coverage of ultrafast broadband in Scotland has increased from 43% to 44% of homes over the year
- Including improvements from BT/EE's Fixed Wireless Access (FWA), around 40,000 homes and businesses in Scotland are still unable to access a fixed broadband service that delivers a decent broadband connection, that is one that delivers a download speed of at least 10 Mbit/s and an upload speed of at least 1 Mbit/s.

Summary of fixed line broadband coverage across the UK

UK Unable to get decent (all properties) 2% Superfast (residential) 95% Ultrafast (residential) 53% Full fibre (residential) 10%

Scotland

Unable to get decent (all properties) 4% Superfast (residential) 92% Ultrafast (residential) 45% Full fibre (residential) 8%

Northern Ireland

Unable to get decent (all properties) 6% Superfast (residential) 89% Ultrafast (residential) 49% Full fibre (residential) 31%

Wales

Unable to get decent (all properties) 3% Superfast (residential) 93% Ultrafast (residential) 31% Full fibre (residential) 12%

England

Unable to get decent (all properties) 2% Superfast (residential) 95% Ultrafast (residential) 55% Full fibre (residential) 10%

Fixed broadband coverage in Scotland

There has been continued investment in fixed networks in Scotland resulting in improvements in the availability of superfast, ultrafast and full-fibre broadband. Consequently, the number of premises that do not receive decent broadband has also declined.

Access to a superfast broadband service continues to increase

Ofcom defines superfast broadband as a service which delivers a minimum download speed of at least 30 Mbit/s.²

The coverage of superfast broadband to residential homes across Scotland has increased by 89,000 over the past year, standing at 92%. Although we have observed an increase in coverage, this figure is the same as the one quoted last year due to changes in the way that we identify premises, discussed further in our <u>methodology annex</u>.

Figure 1: Residential premises able to receive a superfast broadband service by UK nation

Nation	% of homes (total)
Scotland	92% (2.3m)
England	95% (23.1m)
Wales	93% (1.3m)
Northern Ireland	89% (670k)

Superfast availability for Scottish business or commercial properties is somewhat lower at 83% (around 139,000 premises) than for residential premises. This may be due in part to lower availability in business parks, due to the costs involved in rolling out technology these areas and the higher use of business broadband services to such areas (such as private lines).

There is also a significant difference between the availability of superfast broadband in urban and rural areas of Scotland, with 97% of residential premises in urban areas having access to superfast broadband compared to just 69% in rural areas.

Local authorities in the Highlands and Islands of Scotland have seen some of the largest increases in superfast broadband availability in the UK in recent years. However, almost a third of premises in areas such as Orkney and the Outer Hebrides remain unable to access superfast speeds. Figure 2 below shows the proportion of premises that can access fixed broadband speeds of at least 30 Mbit/s in selected Scottish local authority areas.

² The Scottish Government also uses this definition for its "Reaching 100%" programme.

Figure 2: Superfast residential broadband coverage by selected Scottish local authority area

Local authority	% of premises ≥ 30 Mbit/s
Orkney Islands	62%
Comhairle nan Eilean Siar	72%
Shetland Islands	69%
Highland	80%
Argyll and Bute	78%
Aberdeenshire	81%
Dumfries and Galloway	85%
Perth and Kinross	85%
Moray	84%
Scottish Borders	85%

We expect superfast broadband coverage to continue to increase through various publicly-funded interventions:

- The Scottish Government has committed £600m to extending superfast broadband at speeds of 30 Mbit/s to 100% of premises in Scotland through its R100 programme.
- As part of the Autumn 2018 Budget, the UK Government announced that £200m would be made available to pilot innovative approaches to the deployment of full-fibre via the Rural Gigabit Connectivity Programme. The programme aims to deliver gigabit capable connections to key public and business buildings, including schools, as well as encouraging broadband providers to create additional connections to local homes.
- Building Digital UK (BDUK) has extended 24Mbit/s coverage to 95% of the UK, and estimates that by 2020 this coverage will be extended to at least a further 2% of UK homes and businesses. As part of this, the Digital Scotland Superfast Broadband Programme (DSSB) will continue to deploy into 2020.
- The Local Full Fibre Networks Programme ('LFFN') is allocating £200m to local projects to incentivise and accelerate commercial investment in full-fibre broadband. As part of the LFFN programme, a £67m Gigabit Broadband Voucher Scheme was launched to help small businesses and the local communities around them to contribute to the installation cost of faster connections using gigabit-capable infrastructure.

Ultrafast broadband deployment continues to increase

Ultrafast services are defined as being able to deliver broadband speeds that are greater than or equal to 300 Mbit/s. This definition includes G.fast³, cable networks and full-fibre technologies. G.fast services deliver very high speeds over very short telephone lines, so only premises close to the serving cabinet will be able to receive ultrafast broadband.

Figure 3: Residential ultrafast coverage by nation

Nations	% of premises
England	54%
Northern Ireland	48%
Wales	31%
Scotland	44%
(Scotland Urban)	52%
(Scotland Rural)	8%

Source: Ofcom analysis of operator data

Ultrafast broadband coverage in Scotland now stands at 44%. Virgin Media has continued to upgrade its network, increasing its fastest residential broadband service to 300 Mbit/s for the majority of its network. This has predominately focused on more urban areas of Scotland, with 52% coverage here compared to 8% in rural Scotland. However, earlier this year Virgin Media announced plans to deploy ultrafast services in East Lothian and Inverclyde. In addition Openreach has deployed G.fast technology in many areas. We also expect ultrafast coverage to increase as a result of growth in full-fibre networks. Although we have observed an increase in ultrafast coverage due to these factors, this figure is lower than the one quoted in our summer update due to changes in the way that we identify premises, discussed further in our <u>methodology annex</u>.

Full-fibre investment and roll out continues to increase

In a 'Full-fibre' or Fibre-to-the-Premises network, fibre optic cables are connected all the way from the local exchange to the home or small business, and can reliably deliver speeds of 1 Gbit/s or more.⁴ This contrasts with technologies that are a combination of fibre and copper, like Fibre to the Cabinet, where the quality and distance of the copper to the premises can impact on both the reliability and speed of the service.

Over 200,000 residential premises in Scotland now have access to a full-fibre connection, which is an increase of 150,000 premises compared to last year and represents 8% of Scottish premises. Coverage of commercial properties with "full-fibre" broadband access services⁵ stands at 4%.

A full list of the providers who contributed coverage data can be found in our <u>Methodology Annex</u>.

⁴ We define full-fibre coverage as where the network has been rolled out to a "lead-in" that will serve the consumer end premise and where the customer would expect to pay a standard installation charge for that connection. ⁵ "Full-fibre" broadband access services are those delivered to the mass market primarily to deliver internet connectivity and have some degree of contention in the network. Uncontended "leased line" services over fibre are also available at higher price points for corporate networks and other applications.

³ G.fast is a fixed line technology that reuses the existing copper connection to a cabinet and makes use of a greater frequency range to deliver faster services than current fibre to the cabinet services that use VDSL technology.

To encourage investment in building full-fibre networks and to provide investors and companies with long term regulatory certainty, Ofcom has proposed several changes in <u>our regulatory and policy</u> <u>approach</u>. They include:

- Allowing competing companies to use Openreach's ducts and poles for both people and businesses. In June this year, we set out our decision on regulation to allow all telecoms providers to access the ducts and poles operated by Openreach to promote competition and make it easier to build high-capacity connections to homes and businesses.
- A flexible approach to regulation by deregulating in areas where there are competing fibre providers.
- Increasing the periods between major reviews of the telecoms market from 3 to 5 years.

Ofcom collected data from telecoms providers relating to their full-fibre network roll-out from 1 April 2019 using both Openreach's PIA (Physical Infrastructure Access) product and their own-build deployments. Opening up Openreach's ducts and poles to other telecoms providers was a remedy put forward in Ofcom's Digital Communications Review (2016) to promote competition in the telecoms access network. We found that telecoms providers were beginning to use this product, however, at the time of data collection (September 2019) volumes were low as this was a relatively new product and responses were provided in a way that we were unable to report take-up in a comparable manner. We expect these issues to be resolved allowing us to report on total FTTP network and PIA volumes in the Connected Nations 2020 report.

The number of premises unable to access decent broadband has fallen

While superfast coverage continues to improve, there remain premises that do not have access to decent broadband.

The number of premises in Scotland (homes and businesses) that were unable to access a decent fixed-line broadband service fell again this year to 98,000 (remaining at around 4%).

Differences in decent broadband availability remain between urban and rural areas of Scotland. The number of rural premises not able to receive decent broadband stands at 89,000 (19%) compared with just 9,000 properties in urban areas.

Coverage of decent broadband also varies across the nations in both rural and urban areas. The following table highlights the differences between the nations of the UK.

Figure 4: Homes and businesses unable to receive decent broadband from a fixed line by nation by rurality

Nations	All	Rural	Urban
England	2%	9%	1%
	(412,000)	(274,000)	(138,000)
Northern	6%	19%	1%
Ireland	(50,000)	(44,000)	(6,000)
Scotland	4%	19%	0%
	(98,000)	(89,000)	(9,000)
Wales	3%	12%	1%
	(50,000)	(42,000)	(8,000)
UK	2%	10%	1%
	(610,000)	(449,000)	(161,000)

Source: Ofcom analysis of operator data

Direct comparison with previous years' figures is not possible given the changes in address matching described above.

The launch and substantial expansion of 4G fixed wireless services has meant that a decent broadband service can be delivered over a wireless connection (see further detail below). Even taking account of this increased

wireless coverage, we estimate that around 40,000 premises in Scotland remain unable to receive any decent broadband connection at all.

Some of these premises may be eligible for the broadband USO, which is intended to help fill the gap left by existing broadband rollout programmes. It will act as an important digital safety net for people who might otherwise get left behind by ensuring households and businesses will have the right to request a decent broadband connection and service.

Ofcom is responsible for implementing the Broadband USO and although we have no formal role delivering the R100 programme, we will continue to work with the Scottish Government on the interaction of the two schemes, providing technical and regulatory advice where required.

We have designated BT as the broadband Universal Service Provider and from March 2020 consumers can start to request USO connections, subject to the eligibility criteria.

We will be working with the Universal Service Provider, public bodies and the Scottish Government to raise consumer awareness of the options available through the USO and R100 programme.

Ofcom will also continue to analyse the coverage and performance of wireless providers to ensure that they are robust and likely to give homes and businesses the decent connections they need.

Fixed Wireless Access as a means of delivering broadband

Fixed Wireless Access (FWA) networks use a wireless link for the final connection to a home or business, avoiding the installation of a line into the building. The capacity in the wireless access network is shared between multiple users. The service needs to be managed appropriately to ensure there is sufficient capacity to meet user needs, especially in areas with capacity constraints.

FWA services can be delivered on networks that only serve customers at a fixed location, by Wireless Internet Service Providers (WISPs). In the UK, these networks most commonly use licence exempt or light licensed spectrum such as the 5 GHz band. They can also be delivered on mobile networks, where the capacity of the network is shared with mobile users, using 4G and 5G technologies.

This section initially focuses on the FWA services provided by licence exempt or light licensed systems offered by WISPs and then considers the FWA service delivered by mobile networks.

Fixed Wireless Access by WISPs





The majority of these services are delivered over wireless networks that communicate via a wireless link between a provider's mast site and an external antenna fixed to a customer's premises. The speeds and services delivered will depend on a number of factors including, but not limited to: the number of premises being served from the same transmitter, the location of the premises, line-of-sight issues, consumer equipment and available network capacity.

Ofcom's work with WISPs

We have applied a modelling method to data we have received from a number of providers in order to predict the number of unique premises that have coverage from these providers via existing infrastructure. The modelling method provides an estimate only and does not account for network capacity constraints, interference or other external factors.⁶ We would note that, for all coverage estimates based on such predictive modelling tools, localised issues may mean that particular premises may not be able to receive an adequate service despite being predicted to do so.

We estimate that up around 33,000 premises in Scotland could receive decent wireless broadband on licence exempt or light licensed spectrum. Of these, around 3,000 currently do not have access to a decent fixed broadband service.

Figure 6 below shows the total number of premises covered by one or more WISP networks. It also shows the number of premises which are unable to access a decent broadband service but can be covered by a WISP. This is labelled WISP USO in the table below. Figure 6: Number of premises which can receive decent broadband from WISP by nation

Nation	WISP	WISP USO
	coverage	
UK	1,588,000	53,000 ⁷
England	1,126,000	39,000
Northern Ireland	26,000	6,000
Scotland	33,000	3,000
Wales	403,000	6,000

Source: Ofcom analysis of operator data

Figure 7 below shows the total number of premises in Scotland covered by one or more WISP networks able to provide a superfast broadband service at speeds of 30 Mbit/s. This does not include FWA coverage from mobile network operators.

Figure 7: Number of premises which can receive superfast broadband from WISP

	Number of premises
Scotland	16,800
(Scotland Urban)	11,790
(Scotland Rural)	5,020

Source: Ofcom analysis of operator data

There are many more WISPs who have not given us their coverage data, so coverage from these providers could be higher. We intend to continue to collate and analyse data from these providers and monitor changes to the sector.

In July this year, we announced our decision to introduce a new local licensing approach to provide localised access to spectrum bands. We have already issued a license for access to licensed mobile spectrum and we have

next section so we estimate that only around 10,000 of this total could be uniquely served by WISPs.

⁶ More detail on the methodology used to determine WISP coverage can be found in Annex A.

⁷ Many of these are likely also to be covered by the mobile network FWA services described in the

recently opened up <u>access to the shared</u> <u>spectrum bands</u>. We expect this could help extend the provision of FWA networks in hard to reach places. We intend to hold a wireless spectrum sharing event in Edinburgh in early 2020 which will promote measures introduced by Ofcom which make it easier for third party organisations to lease radio spectrum from mobile network operators.

Fixed Wireless Access via mobile technologies

As noted above, over the past year, mobile network operators have launched new FWA services, in some case making use of the increased capacity of their 5G networks. Some mobile network operators (MNOs) have also continued to offer FWA services on their 4G networks. Of the four MNOs, only O2 does not currently offer 4G or 5G FWA services.

Mobile FWA Services are mainly delivered directly to an indoor router. For areas with poor indoor coverage, EE offers an external antenna for its 4G FWA service. Three offers an external antenna to customers of its 4G FWA service in parts of Swindon. There are currently no providers offering an external antenna for their 5G FWA service. We intend to carry out more research into the performance of these services.

Satellite

There remains 8% of premises in Scotland that are unable to access superfast broadband coverage from a fixed network, of which 4% are unable to access decent fixed broadband. For the premises which do not have suitable coverage from a mobile network, broadband services may be provided using satellite broadband.

Until now, the most common of these are services from geostationary satellites. These offer broadband packages with speeds up to 30Mbit/s but, unlike fixed broadband services, have data caps to manage the demand on the network.

In the past few years, there has been a renewed interest in Low Earth Orbit (LEO) satellite constellations. These satellites are deployed at an orbit much closer to the Earth and means they can provide lower latency services. This option may be less costly than the total costs of a installing a fixed or wireless connection in hard-to-reach premises.

Take-up of fixed services

The benefits of increased coverage of highspeed broadband networks cannot be realised if consumers do not take advantage of these services when they are available.

'Coverage' is used to refer to the maximum broadband speed available at a property while 'take-up' is defined based on the package the customer subscribes to and the measured speed that is delivered on that line.

Figure 8 below shows that, although 92% of premises in Scotland have access to superfast broadband, only 48% of premises have actually signed up to them.

Figure 8: Take up of superfast broadband services by nation

Nations	% take up
England	49%
Northern Ireland	48%
Wales	43%
Scotland	48%

Source: Ofcom analysis of operator data

Mobile voice and data

Introduction

People expect to be able to make calls and get online where they live, work and travel. In this chapter we provide an update on coverage both outside and inside premises, across Scotland and the UK's landmass as well as on roads.

We also describe the measurements we are making available to policy makers, train operators and others to improve their understanding of the coverage available along selected railways in England, Wales and Scotland.

'Internet-of-Things' services are also becoming increasingly important and we discuss this in more detail in our <u>main UK</u> <u>report</u>.

Key highlights:

- All four MNOs have launched 5G services in the UK, predominately focused on more densely poplulated cities.
- The commercial rollout of 4G continues, with both indoor coverage and outdoor geographic coverage in Scotland showing small improvements.
- Coverage of Scotland's landmass remains patchy, especially in rural areas. 4G geographic coverage from all operators now stands at 42% but this rises to 80% when considering coverage from at least one operator. This leaves 20% of Scotland without good 4G coverage from any operator, predominately in rural areas (so called 'not spots').
- Almost eight in ten homes and businesses in Scotland (79%) have access to good indoor 4G mobile coverage from all network operators.

Summary of mobile coverage across the UK

UK

4G indoor all operators 80% 4G geographic all operators 66% 4G geographic not spots 9% Voice and text geographic all operators 79% Voice and text not spots 5%

Scotland

4G indoor all operators 79%

4G geographic all operators 42%

4G geographic not spots 20%

Voice and text geographic all operators 58% Voice and text not spots 12%

Northern Ireland

- 4G indoor all operators 61%
- 4G geographic all operators 75%
- 4G geographic not spots 3% Voice and text geographic all operators 86%
 - Voice and text not spots 1%

Wales

4G indoor all operators 73% 4G geographic all operators 58% 4G geographic not spots 11% Voice and text geographic all operators 77% Voice and text not spots 5%

England

4G indoor all operators 81%

4G geographic all operators 81%

4G geographic not spots 3%

Voice and text geographic all operators 91%

Voice and text not spots 1%

5G rollout has started

This year marked the launch of 5G in the UK. The UK is a 5G leader in Europe, because it is one of the first countries where all the Mobile Network Operators (MNOs) have started 5G deployment.

These initial 5G networks target mobile broadband services, providing several enhancements over 4G networks, including higher speeds and the capability to deliver extra capacity where needed, such as in urban areas or sports stadiums. Future evolutions of these initial 5G networks will enable additional services that rely on a near instantaneous network response (a latency of the order of only a few milliseconds) and need high reliability, with applications in sectors such as manufacturing, logistics, agriculture, transport/automotive, energy, media & entertainment, and healthcare. Examples of applications include controlling vehicles at distance, e.g. in mines, or enabling robots in automated factories to communicate with each other.

The Scottish Government has said it wants Scotland to be a leading 5G digital nation and earlier this year published its '<u>5G: A strategy</u> for Scotland" report. The report sets out its plans for developing 5G use cases, facilitating the sharing of publicly-owned assets and existing infrastructure as well as highlighting its assessment of the potential benefits to the Scottish economy from 5G technology.

All UK MNOs have launched 5G this year

EE, O2, Three and Vodafone are offering 5G in some form in more than 40 UK cities and towns in the UK, from Plymouth to Edinburgh and from Lisburn to Norwich. Rollout has so far focused on areas with higher populations, where capacity demands are likely to be greatest. In the near term, operators are likely to continue rollout in areas where 5G will deliver significant quality of service improvements needed to meet consumer demand. All four network operators have either started deploying, or intend to do so in 2020, in selected cities in Scotland such as Glasgow and Edinburgh.

5G will also benefit organisations and businesses

Public mobile networks, in addition to providing broadband services for consumers, could also be used to provide specialist services to organisations and businesses.

Organisations and businesses could also decide to access 5G services via a local private 5G network, either self-deployed or deployed by a third party. This option guarantees a high level of security and full control on data ownership. In February 2019 we outlined a range of technological approaches and business models to support organisations and businesses in developing their digital infrastructure. We expect the new spectrum sharing framework to provide support for organisations and businesses interested in deploying wireless services via private solutions using 4G or 5G. From December 2019, it has been possible to apply for a local licence.

Methodology

In this section we report on both indoor premises and geographic coverage as well as coverage along roads.⁸ We report on the availability of voice services, via either 2G, 3G or 4G, and on the availability of 4G data connections. Our definition of 4G coverage reflects a level of service that supports nearly all 90-second telephone calls being completed without interruption and data connections that deliver a connection speed of at least 2 Mbit/s (fast enough to browse the internet and watch glitch-free mobile video).

The mobile coverage figures provided in this report rely on the accuracy of coverage prediction data supplied by the mobile operators. We note that operators continue to update and improve their prediction models, which is welcome. The data used in this report includes predictions provided to us by EE using a newly developed coverage prediction model, which has seen some changes in the coverage it predicts for landmass and premises. EE has provided us with information on the validation work it has undertaken to date.

We take the accuracy of the data supplied to us seriously given its importance to policy making and to ensuring people are well informed about available coverage. We will continue to monitor, through drive testing, the accuracy of all operators' coverage predictions.

4G coverage continues to improve but growth has been slowing

During 2017 and 2018 we saw significant growth in 4G rollout as network operators deployed 4G by upgrading existing infrastructure, spurred on by the coverage obligations that fell in December 2018. Since then, 4G coverage has continued to improve, but at a lower rate than in previous years. Generally, MNOs focus has more recently been on targeted rollout and capacity enhancement to deliver key improvements to meet consumer demand.

Geographic 4G coverage

Mobile 4G coverage is still worse in Northern Ireland, Scotland and Wales than it is in England. Geographic coverage varies considerably among mobile operators and remains poor in many places, with only 42% of Scotland (up from 38% last year) able to receive 4G data services from all operators. This is in comparison with 66% UK-wide.

Figure 9 below shows the differences in geographic 4G coverage from all operators in Scotland, Wales, Northern Ireland and England.

Nations All Rural Urban 81% 78% 97% England Northern 75% 73% 90% Ireland Scotland 42% 41% 96% 58% 54% Wales 90%

Figure 9: 4G Geographic coverage from all operators by nation and rurality

Source: Ofcom analysis of operator data

⁸ We also report on a separate metric of outdoor premise coverage in our main UK report.

At least one operator provides 4G services across 80% of Scotland (up from 78% last year), compared with 89% in Wales, 97% in Northern Ireland, 97% in England and 91% across the UK. This still leaves almost a fifth of Scotland's landmass without access to a good 4G mobile service but represents a significant improvement from 51% in 2017.

Figure 10: 4G Geographic coverage from at least one operator by rurality

% of landmass covered by at least one	
	operator
Scotland	80%
Urban	100%
Rural	80%

Source: Ofcom analysis of operator data

Figure 11 below shows the areas of the UK that have outdoor 4G coverage from all operators, the areas that have coverage from some operators (partial not spots) and the areas that have no coverage at all (not spots).

Figure 11: Complete and partial 4G 'not-spots'



Source: Ofcom analysis of operator data

Twenty-percent of Scotland is without good 4G coverage from any operator (down from 22% last year). Urban areas of Scotland are relatively well served by 4G networks but those in rural areas, particularly in the western Highlands and Islands, continue to experience poor levels of 4G geographic coverage. This reflects the difficulties involved in building mobile networks in areas of challenging terrain and with lower population density.

Indoor 4G coverage

The coverage people receive indoors depends on a range of factors including: the thickness of walls, building materials used in construction and where in the building you are. Due to these factors, in some premises there may be differences between our predicted indoor coverage data and the actual coverage available. Our online coverage checker provides additional information on the likelihood of there being indoor coverage in buildings in different locations, which takes into account some of the factors that can affect a mobile signal.

79% of premises in Scotland now receive 4G services indoors from all operators (up from 75% last year), while in 99% of Scottish premises 4G services are available indoors from at least one operator.

Figure 12: Indoor 4G coverage from all operators by nation

Nations	% of premises
England	81%
Northern Ireland	61%
Wales	72%
Scotland	79%
(Scotland Urban)	87%
(Scotland Rural)	49%

Source: Ofcom analysis of operator data

Indoor 4G coverage remains poor in many rural areas of Scotland. For example, in urban areas mobile services are available from all operators in 87% of premises (up from 82% last year) while in rural areas services are available from all operators in only 49% of premises (up from 44% last year).

Voice coverage

The geographic area of Scotland covered by all operators for telephone calls has increased to 58% (up from 54% last year). There are significant differences between voice coverage in urban (99%) and rural (57%) areas of Scotland.

Figure 13: Geographic voice coverage from all operators by nation

Nations	% of premises
England	91%
Northern Ireland	86%
Wales	77%
Scotland	58%
(Scotland Urban)	99%
(Scotland Rural)	57%

Source: Ofcom analysis of operator data

Some 92% of Scottish premises have indoor telephone call coverage from all four mobile networks, up from 91% in 2018.

Figure 14: Indoor voice coverage from all operators by nation

Nations	% of premises
England	93%
Northern Ireland	80%
Wales	90%
Scotland	92%
(Scotland Urban)	97%
(Scotland Rural)	71%

Source: Ofcom analysis of operator data

Publicly-funded interventions aim to improve rural network coverage

Proposed Shared Rural Network

Following detailed discussions between the MNOs and the UK Government (supported by Ofcom), in October 2019 the UK Government announced in-principle support to fund the MNOs' proposed 'Shared Rural Network'. The Shared Rural Network would expand each operator's outdoor 4G coverage to 92% of the UK landmass by 2025, with specified increases in each of the UK nations (including 85% in Scotland). 4G outdoor coverage from at least one MNO is expected to increase to 95% in the UK by the same date. The Shared Rural Network proposal is subject to final agreement by the mobile operators and the UK Government. The UK Government's intention is to reach a formal agreement in early 2020.

Should final agreement be reached, these promised improvements will make a real difference to mobile customers across the UK, enabling consumers to get a continuous coverage experience in areas where there is at least one provider, but, as of today, not their provider of choice. Operators have committed to entering into legally binding licence variations which will allow Ofcom to hold them to these commitments. We will monitor and report on the MNOs' progress in achieving better coverage via our Connected Nations reports.

The key elements of the shared rural network agreement

The proposal has three key elements:

- Existing masts would be shared in areas where some, but not all, MNOs have coverage.
- Mobile infrastructure built as part of the Government-owned Emergency Services Network would be made available to all four operators, delivering additional coverage, in some of the most remote, rural locations.
- New sites would be built in areas where there is no coverage from any operator. These sites would host all MNOs and would be funded by the UK Government.

Scottish 4G Infill programme

The Scottish Government is investing up to £25 million in the Scottish 4G Infill Programme (S4GI) to provide 4G infrastructure and services in selected notspots. The Scottish Government does not expect the S4GI to not resolve every notspot in Scotland but it is seeking to deliver to up to 49 sites currently in the programme.⁹

The Scottish Government has also welcomed the UK Government's in-principle announcement regarding the Shared Rural Network (SRN), which could, if final agreement is reached, deliver an improvement to the availability of 4G across Scotland's rural and island communities. The Scottish Government has said it will look for opportunities for alignment of S4GI with SRN and that it intends to work with the UK Government and the MNOs on its implementation plans.

Emergency calls

Mobile phones can use signals from other mobile networks to make emergency calls. As the mobile networks have slightly different coverage footprints this means that 95% of the UK geographic area, and almost all premises indoors, are covered for mobile emergency calls. This is in line with last year.

Premises that do not have a decent fixed or a 4G mobile network connection

Premises are considered to have access to a decent fixed connection if the broadband speed is above a download speed of at least 10 Mbit/s and an upload speed of at least 1 Mbit/s and to have access to an indoor 4G mobile service if a connection speed of at least 2 Mbit/s is available. We estimate that 12,300 premises in Scotland are unable to access either.

As with last year, it is rural areas in Scotland (3%) that have the highest percentage of properties that have neither decent fixed nor (indoor) 4G mobile services. Premises in the Scottish Highlands and Islands as well as rural areas of Wales are most likely to be unable to access either a decent fixed or a 4G mobile service available.

⁹ This is subject to firm commitments from at least one mobile operator (MNO) to use a site.

Coverage on the roads

Mobile coverage on roads has remained stable over the last year. Some 66% of major roads in Scotland have voice coverage from all four operators, with only 2% of roads not covered by voice service from any operator. Forty-eight per cent of major roads in Scotland have good in-car 4G coverage from all operators with 6% not covered from any operator.¹⁰

Figure 15: Major roads mobile coverage in Scotland

	% of major roads covered by all operators	No coverage from any operator
4G	48%	6%
Voice	66%	2%

Source: Ofcom analysis of operator data

Connectivity on the railways

Most rail passengers want to be able to make calls, text, email and use other data services while travelling, but the services available on trains are not currently meeting consumers' expectations.

Ofcom has been collecting mobile network signal measurements at the carriage rooftop level of Network Rail Engineering Trains since October 2017. This data can help the rail and telecoms industry – and policy makers - to better understand mobile signal availability along rail corridors and the solutions that may improve connectivity. More information about measures to improve rail connectivity can be found in our main UK report.

¹⁰ A more detailed analysis of coverage on Motorways, A and B roads can be found in the main UK report.

Glossary

2G Second generation of mobile telephony systems. Uses digital transmission to deliver: voice, text services and very low-speed data services.

3G Third generation of mobile systems. It can be used to deliver: voice, text and lower speed data services. It supports multi-media applications such as video, audio and internet access, alongside conventional voice services.

4G Fourth generation of mobile systems. It can provide download speeds of over 10 Mbit/s, and is used to deliver: voice, text and higher speed data services.

5G will be the fifth generation of mobile technology. It is expected to deliver faster, lower latency mobile broadband, and to enable more revolutionary uses in sectors such as manufacturing, transport and healthcare.

Access network An electronic communications network which connects end-users to a service provider; running from the end-user's premises to a local access node and supporting the provision of access-based services. It is sometimes referred to as the 'local loop' or the 'last mile'.

ADSL Asymmetric Digital Subscriber Line. A digital technology that allows the use of a standard telephone line to provide high-speed data communications. Allows higher speeds in one direction ('downstream' towards the customer) than the other.

Backhaul The part of the communications network which connects the local exchange to the ISP's core network

Base station This is the active equipment installed at a mobile transmitter site. The equipment installed determines the types of access technology that are used at that site.

Decent Broadband A data service that provides download speeds of at least 10 Mbit/s and upload speeds of at least 1 Mbit/s.

Broadband A data service or connection generally defined as being 'always on' and providing a bandwidth greater than narrowband connections.

Broadband USO Broadband Universal Service Obligation. This will give consumers and businesses the right to request a broadband connection capable of delivering a download sync speed of 10Mbit/s and an upload sync speed of 1Mbit/s.

Core network The central part of any network aggregating traffic from multiple backhaul and access networks.

DOCSIS Data Over Cable Service Interface Specification. It is a standard for the high speed transmission of data over cable networks.

DSL Digital Subscriber Line. A family of technologies generally referred to as DSL, or xDSL, capable of transforming ordinary phone lines (also known as 'twisted copper pairs') into high-speed digital lines, capable of supporting advanced services such as fast internet access and video on demand. ADSL and VDSL (very high speed digital subscriber line) are variants of xDSL).

FTTC Fibre to the Cabinet. Access network consisting of optical fibre extending from the access node to the street cabinet. The street cabinet is usually located only a few hundred metres from the subscribers' premises. The remaining segment of the access network from the cabinet to the customer is usually a copper pair.

FTTP Fibre to the Premises. A form of fibre optic communication delivery in which the optical signal reaches the end user's home or office. Also known as full-fibre broadband.

FTIR Future Telecoms Infrastructure Review. This document sets out the government's ambition for digital connectivity published in July 2018.

Full-fibre coverage Where the network has been rolled out to a "lead-in" that will serve the consumer end premise and where the customer would expect to pay a standard installation charge for that connection

HD or **HDTV** High-definition television. A technology that provides viewers with better quality, high resolution pictures.

IP Internet Protocol. This is the packet data protocol used for routing and carrying data across the internet and similar networks.

IOT Internet of Things. Embedded connectivity in everyday things, enabling them to send and receive data.

LTE Long Term Evolution. This is 4G technology which is designed to provide faster upload and download speeds for data on mobile networks.

M2M Machine to Machine. Wired and wireless technologies that allow systems to communicate with each other.

MNO Mobile Network Operator, a provider who owns a cellular mobile network.

Not-spot An area which is not covered by fixed or mobile networks.

PSTN Public Switched Telephone Network. The network that manages circuit switched fixed line telephone systems.

SIM Subscriber Identity Module. A SIM is a small flat electronic chip that identifies a mobile customer and the mobile operator. A mobile phone must have a SIM before it can be used.

Smartphone A mobile phone that offers more advanced computing ability and connectivity than a contemporary basic 'feature' phone.

Superfast broadband A data service that delivers download speeds of at least 30 Mbit/s.

UHD Ultra High Definition television, providing a resolution of 3840 x 2160 pixels (4K).

Ultrafast broadband A data service that delivers download speeds of greater than 300 Mbit/s.

Usage cap Monthly limit on the amount of data that users can download, imposed by fixed and mobile operators for some of their packages.

VDSL Very High Speed DSL. A high speed variant of DSL technology, which provides a high headline speed through reducing the length of the access line copper by connecting to fibre at the cabinet.

VoIP Voice over Internet Protocol. A technology that allows users to send calls using internet protocol, using either the public internet or private IP networks.

wifi A short range wireless access technology that allows devices to connect to a network through using any of the 802.11 standards. These technologies allow an over-the-air connection between a wireless client and a base station or between two wireless clients.

xDSL The generic term for the Digital Subscriber Line (DSL) family of technologies used to provide broadband services over a copper telephone line.