

Connected Nations 2020

Wales report



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Overview – Wales

This is our annual Connected Nations report, which measures progress in the availability and capability of broadband and mobile services in Wales. It also highlights the work Ofcom is doing, alongside UK and devolved governments and communications companies, to improve the services people up and down the country use every day.

Alongside this Wales report, we publish a [UK report](#), as well as reports for [Scotland](#), [Northern Ireland](#) and [England](#). We also provide an [interactive dashboard](#), allowing people to see data for different areas, services and coverage levels. We are also releasing the [International Broadband Scorecard 2020](#), which compares the UK's recent position on broadband availability with a number of other European nations.

Given its topography and population distribution, the cost of constructing communications networks in Wales is significantly higher than the UK average. As a result, the availability of superfast broadband and mobile services is below the UK average and has been one of the most significant issues for consumers and elected representatives in Wales since Ofcom's creation.

In 2013 Ofcom published a report entitled "The Availability of Communications Services in the UK". The aim was to better understand why communications services were not universally available and concluded with the following observation:

"Areas that have not previously benefited from commercial rollout are more likely to experience market shortfalls in the future. Consequently, public bodies that have intervened to extend availability in the past may expect to face the same pressures to do so again in the future. If this can be successfully anticipated, it may be possible to plan interventions at a sufficiently early stage that those areas do not always have to play catch-up with the rest of the UK."

It was a reasonable ambition, but one that has yet to be realised and in its absence, public and political pressure for universally available communications service continues.

Our aim is to support investment in gigabit-capable networks. From April 2021, we will have in place a longer-term regulatory framework for competition and investment for the five years to March 2026, with the aim of supporting investment in full fibre and other gigabit-capable services.

We are also supporting the rollout of new wireless services, including 5G - for people and industry to use. This includes making sure a diverse range of companies can access the spectrum they need to develop innovative new services, bring a better mobile experience to consumers and deliver economic benefits for the UK.

Ofcom is also working with UK and Nations governments to help improve access to mobile and broadband across the UK.

What we have found in Wales:

- The UK's fixed and mobile networks have generally coped well despite the increased demands placed on them by Covid-19. A shift to more people being at home more drove increased demand on broadband networks during the day, although the peak remained in the evening. Mobile networks also experienced increases in voice traffic.
- 19% (265,400) of homes in Wales have access to full-fibre connections – an increase of 7 % points since 2019 and higher than the UK average. 265,400 homes have access to a gigabit-capable broadband connection– able to deliver download speeds of up to 1 Gbit/s as well as faster upload speeds, and are more reliable than older broadband technologies. Of these, 60,205 are in rural areas.
- Superfast broadband coverage has increased to 94% of homes up from 93% last year.
- The number of premises without access to at least decent broadband remains small. Factoring in coverage from both fixed and fixed-wireless networks, we estimate that around 18,000 premises are still without a decent broadband connection and may be eligible to receive one under the universal broadband service.
- The number of mobile base stations providing 5G services has risen ten-fold, to around 3,000 across the UK. Just over 8% of urban mobile sites have been upgraded to include a 5G service. 3% of 5G sites are located in Wales and another 3% in Northern Ireland, with 7% in Scotland and 87% in England. This split broadly reflects the national distribution of all mobile traffic across the UK.
- Mobile coverage is generally stable. 90% of Wales has access to good 4G geographic coverage from at least one of the mobile operators and 60% has coverage from all 4 operators.
- Voice and text services from all four operators are available across 78% of Wales' landmass. Voice and text total notspots account for 5% of Wales' landmass. The Shared Rural Network programme agreed in March 2020 will extend coverage beyond this by 2025.
- We estimate that 0.6% (9,000) of premises cannot access either a decent fixed broadband service or get good 4G coverage indoors, with almost all of these in rural areas.



Fixed broadband services in Wales

We want everyone to be able to access fast and reliable voice and broadband services, wherever they live and work. These communications services have never been more important than in 2020. The Covid-19 pandemic has highlighted the importance of connectivity for UK consumers as a vital part of how businesses and people communicate and consume information and entertainment.

The steps taken by the UK and devolved Governments in response to Covid-19 meant that, during 2020, people relied even more than before on fast, reliable broadband connections in their homes.

Fixed broadband networks coped well with increased demand during 2020. While peak data usage continued to occur in the evening, usage during the day and upload usage grew significantly as many people worked from home rather than going into offices and as education moved online.

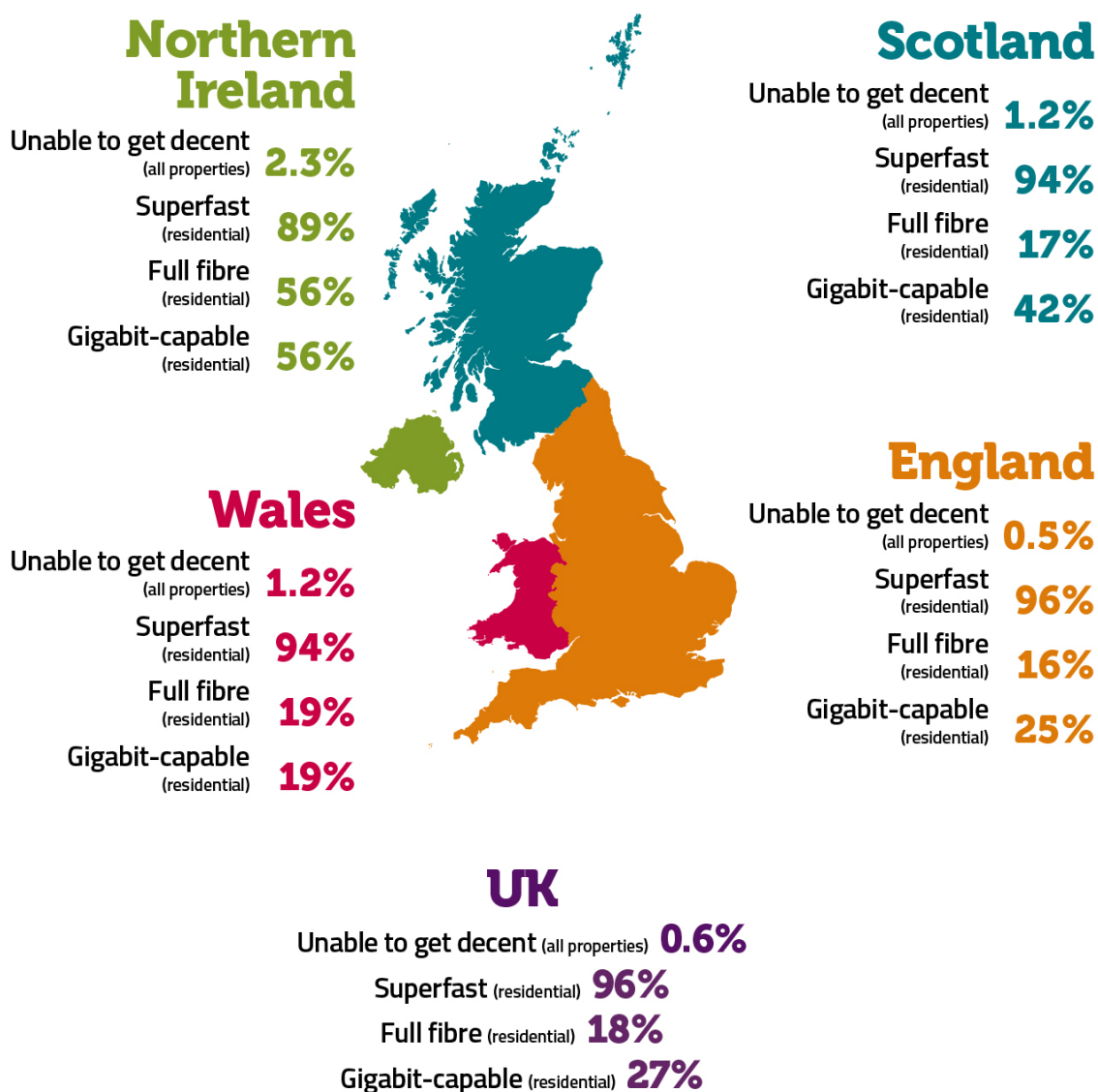
Connectivity in Wales continues to improve, as existing networks are being upgraded and new fixed infrastructure is being built. We support the investment in gigabit-capable and full fibre networks – as do the UK and devolved governments – which give people fast, reliable and future-proofed connections. We report on gigabit-capable coverage for the first time this year.

Key highlights: for Wales:

- Full-fibre coverage in Wales has increased to 19% / 265,400 premises from 12% since our 2019 report, one percentage point above the UK average of 18%.
- Gigabit-capable coverage is at 19%/ 265,400 premises.
- Ultrafast coverage in Wales has increased from 31% to 37% (59% UK)
- Superfast coverage has increased to 94% (96% UK)
- 97% of premises in Wales have access to a decent fixed broadband connection. ¹ Those premises without access to decent broadband remains at 1.2% / 18,000 (0.6% / 190,000 (UK).

¹ Unless otherwise specified, coverage figures for decent broadband count all UK premises (residential and commercial). Coverage for all other speed tiers counts residential premises only, unless otherwise specified.

Type of broadband	Wales Percentage Premises (residential)	Number of premises	UK Percentage Premises (residential)	Number of premises
Gigabit Capable	19%	265,400	27%	7.9m
Full fibre	19%	265,400	18%	5.1m
Ultrafast broadband ≥ 300 Mbit/s	37%	521,300	59%	17.2m
Superfast broadband ≥ 30 Mbit/s	94%	1,338,500	96%	27.8m
Unable to get decent broadband < 10 Mbit/s downstream or < 1 Mbit/s upstream	3%	44,800	2%	470,000
Rural	12%	40,000		
Urban	0%	5,000		



The map shows overall UK fixed broadband coverage, by speeds, and the relevant figures for each Nation of the UK.

A variety of fixed broadband networks and services are available in the UK

Fixed broadband in the UK is available at a variety of speeds, delivered over different technologies

Different technologies used to deliver fixed broadband connections

Copper (ADSL) - Copper from the exchange to the premises (also known as 'standard broadband'). Maximum download speed is up to 24 Mbit/s. Actual speeds delivered by copper connections diminish with distance. Copper can also be affected by weather. Since the copper network is old, it can be susceptible to faults. ²

Fibre to the cabinet (FTTC) - Fibre to the cabinet, with copper used to connect from the cabinet to the premises. Maximum download speed is up to 80 Mbit/s (except for G.fast). ³ As with ADSL, actual speeds diminish with distance, and the network can be affected by weather and is susceptible to faults.

Hybrid fibre coaxial cable (HFC) – The cable TV network. ⁴ It uses fibre to a street cabinet and coaxial cable from the street cabinet to the premises. There is decreased signal loss which means co-axial cables are capable of delivering much higher speeds than copper wires. Broadband is supported using the DOCSIS standard, which shares the capacity downstream and upstream between multiple customers. ⁵ The latest standard of cable technology, DOCSIS 3.1, is capable of delivering download speeds of up to 10Gbit/s and upload speeds of up to 1Gbit/s, although in practice speeds average out significantly below this – and since capacity is shared among users, it may not be the case that each user can simultaneously receive gigabit speeds. Depending on the configuration of the access network in any particular area, this can lead to localised congestion. This may be particularly acute in the upstream direction where total capacity is more limited.

Full fibre or 'fibre to the premises' (FTTP) – The connection from the exchange to the premises is provided entirely over optical fibre. Generally, distance to the premises does not affect the speed delivered. Full fibre is less susceptible to faults and is not usually impacted by weather. Most full fibre implementations utilise Passive Optical Network (PON) approaches where capacity in the downstream and upstream direction is shared. ⁶ Congestion can more easily be avoided on this shared network by limiting the number of customers connected to each shared PON and by managing the maximum guaranteed throughput provided to each customer. PON technology has an upgrade path that allows for speed to increase from a shared 2.5 Gbit/s down/1 Gbit/s up to 10 Gbit/s in both directions, and future generations will expand this further. This allows for services offering 1 Gbit/s both download and upload, with customers choosing a speed package to suit them.

² ADSL: Asymmetric Digital Subscriber Line.

³ Openreach deploys G.fast at some cabinets. It uses fibre to the cabinet, and copper from the cabinet to the customer. By using a higher frequency signal on the connection to the customer, G.fast can offer higher speeds than normal FTTC deployment, with Openreach offering wholesale services at up to 330 Mbit/s. But the signal degrades more quickly so the customers able to get ultrafast speeds are limited to those closest to the cabinet.

⁴ Most cable broadband in the UK is provided by Virgin Media.

⁵ DOCSIS: Data Over Cable Service Interface Specification.

⁶ Virgin Media is also deploying some full fibre networks as part of its network expansion. Currently this uses a technology called Radio Frequency Over Glass (RFOG) which allows the DOCSIS signals to be carried over fibre end to end. This deployment is capable of also supporting PON technologies.

Figure 1: Summary of characteristics of different types of broadband

Type of broadband	Speed	Use cases
Decent ⁷	10 Mbit/s download; 1 Mbit/s upload	Making a high definition video call using applications like Zoom, Teams, WhatsApp or Facetime. Download a 1 hour HD TV episode (1GB in almost a quarter of an hour).
Superfast	At least 30 Mbit/s download, up to 300 Mbit/s	One person streaming 4K/UHD video; downloading 1 hour HD TV episode in under 4 and half minutes. Several devices working simultaneously.
Ultrafast	At least 300 Mbit/s download, up to 1 Gbit/s	Multiple people streaming UHD video; downloading an HD TV episode in just over 20 seconds. Improved upload speeds better for internet gaming and video conferencing.
Gigabit	1 Gbit/s and above download	Provides quicker downloading than most ultrafast packages (and may offer greater upload speeds). May be delivered over technologies that give greater reliability and that are future proofed as more high demand services are developed.

Figure 2: Technologies that can deliver different types of broadband

Type of broadband	Copper (ADSL)	Fibre to the Cabinet	Hybrid fibre coaxial cable	Fibre to the Premises
Decent	Yes	Yes	Yes	Yes
Superfast	No	Yes	Yes	Yes
Ultrafast	No	No ⁸	Yes - DOCSIS ⁹ 3.0 can provide ultrafast speeds.	Yes
Gigabit	No	No	Yes - Cable that has been upgraded to DOCSIS 3.1 can deliver gigabit speeds.	Yes

⁷ The UK government defines a decent broadband service as one that delivers at least 10 Mbit/s download speed and 1 Mbit/s upload speed. This is the level of connection deemed necessary for consumers to participate in a digital society.

⁸ Openreach deploys G.fast at some cabinets. It uses fibre to the cabinet, and copper from the cabinet to the customer. By using a higher frequency signal on the connection to the customer, G.fast can offer higher speeds than normal FTTC deployment, with Openreach offering wholesale services at up to 330Mbit/s. But the signal degrades more quickly so the customers able to get ultrafast speeds are limited to those closest to the cabinet.

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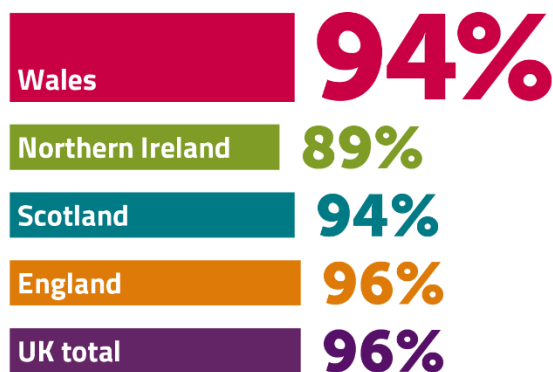
Broadband to fixed locations can also be delivered wirelessly, providing an alternative to wired connections

Some premises may be served by broadband provided over a wireless network (known as fixed wireless access, or FWA), using either a mobile network or a dedicated network. As the capacity in the wireless access network is shared between multiple users, the service needs to be managed appropriately to meet user demand, particularly in areas with capacity constraints. As coverage predictions are based on predictive modelling tools, localised issues may mean that particular premises may not be able to receive a service despite being predicted to do so.

Fixed wireless access on mobile networks is offered on licensed 4G and 5G networks, usually to an indoor router. These services share the network capacity with mobile users, meaning that the capacity of the network has to be carefully managed between the demands of existing mobile users and FWA customers. There may be areas of high mobile demand where a reliable FWA service cannot be offered.

Broadband services to a fixed location are also provided by Wireless Internet Service Providers (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 premise. These networks generally use license exempt or light licensed spectrum. Due to the frequencies where this spectrum is available, performance may be limited by line of sight issues.

Superfast broadband coverage across the UK



Superfast broadband is available to **94%** of homes in Wales

19% have full fibre and **19%** have a gigabit-capable connection

1.2% are unable to get decent broadband



Fixed broadband coverage has continued to increase in Wales

Gigabit-capable broadband is now available to 19% / 265,400 residential premises including 19% full fibre connections

Full fibre (FTTP) broadband is now available at 19% / 265,400 premises

Our data shows that 19% (265,400) residential premises in Wales are now served by full fibre connections – an increase of 7 percentage points or 100,000 premises in the past year. This increase is largely due to the continued investment in the rollout of fibre networks in Wales from providers such as BT and Virgin Media. However, we are now including coverage data from many more,

predominantly smaller, fibre network providers, which do not significantly alter the national figures, are important when considering full fibre coverage at the local level.

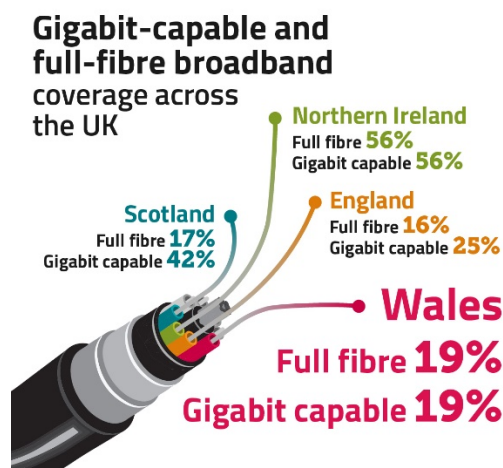
Gigabit-capable broadband is now available at 19% / 265,400 premises

We are reporting on gigabit capable broadband for the first time in this report. The UK Government has set a target of at least 85% gigabit coverage by 2025, alongside an ambition to get as close to 100% as possible. When all technologies are combined, our data shows that 19% / 265,400 premises residential premises now have access to gigabit-capable broadband. Some of these premises have access to more than one gigabit-capable network.

In Wales and Northern Ireland, all gigabit-capable services live at the time of collecting this data use full fibre as their underlying technology, which means coverage is the same in urban and rural areas. In December 2020, Virgin Media announced that it had made gigabit-capable cable services available in Cardiff, as well as surrounding areas including Adamstown, Ely, Grangetown, Lisvane, Pentwyn, Rumney, Saint Mellons, Thornhill and Whitchurch.

Figure 3: Residential gigabit-capable and full-fibre coverage

	Full fibre	Urban	Rural	Gigabit-capable	Urban	Rural
Wales	19%	19%	19%	19%	19%	19%
Scotland	17%	18%	12%	42%	47%	13%
Northern Ireland	56%	71%	17%	56%	71%	17%
England	16%	16%	17%	25%	26%	18%
UK	18%	18%	17%	27%	29%	17%



Rollout of full fibre and gigabit-capable networks

Full fibre and gigabit-capable networks are still at a relatively early stage of rollout. Different providers are taking different approaches to their business models for deploying these networks:

- Openreach is the incumbent wholesale infrastructure provider for almost all of the UK¹⁰. It has the largest network and connects the most premises.
- Virgin Media has targeted bringing 'gigabit speeds' to close to 15 million premises by the end of 2021.¹¹ Between the time of data collection for this year's report (September 2020) and the time of writing, Virgin Media has enabled further areas with gigabit capable services.¹²

Full-fibre broadband is available to **19%** of premises in Wales



Openreach's Full-Fibre programme

Openreach has committed £12 billion of its own money to bring full-fibre broadband to 20 million properties across the UK by the mid-to late 2020's - bringing with it access to some of the fastest and most reliable broadband speeds in Europe. In addition to Cardiff and Swansea this next generation infrastructure is being rolled out across more than 100 Welsh market towns and villages including Abergavenny, Llanelli, Aberystwyth and Bangor.

¹⁰ KCOM is the incumbent in and around the city of Kingston upon Hull. They committed to a full fibre deployment a number of years ago and availability is approaching 100%. KCOM are planning to extend their full fibre footprint beyond their traditional area of operation.

¹¹ Virgin Media, [Virgin Media to bring next-generation gigabit internet to millions of homes across the UK](#), 25 July 2019

¹² [Virgin Media brings gigabit broadband to its entire Northern Ireland network | Virgin Media.](#)

Openreach Community Fibre Partnerships

Openreach's Community Fibre Partnership (CFP) programme has been working with around 300 communities in Wales to bring fibre broadband to some of the most challenging areas of Wales. It is designed to help people living and working in rural communities that are not included in any current roll-out plans. By working with Openreach to co-fund the installation, communities across Wales have been able to bring fast and reliable broadband to their local area, despite the commercial challenges. The village of Paradwys on Anglesey, Brynmenyn near Aberkenfig and Llancarfan in the Vales of Glamorgan have all benefited from the Community Fibre Partnership.

The cost of the CFP is covered by investment from both Openreach and the residents themselves who are often able to fully cover their contribution by accessing the Welsh Government's top-up to the UK Government's Rural Gigabit Voucher scheme. Once Openreach has installed the infrastructure, residents can place an order for the new faster services with an Internet service provider of their choice.

The Welsh Government has launched a top-up voucher scheme under the UK Government's £200m Rural Gigabit Connectivity (RGC) programme (due to run until March 2021), which normally offers up to £3,500 for small rural businesses and up to £1,500 for homes to get a gigabit-capable connection. But this will now be doubled for rural Wales.¹⁴

Llanymawddwy and Cwm Cywarch

The community of Llanymawddwy and Cwm Cywarch in Gwynedd will be able to access gigabit speeds as a result of Openreach's Community Fibre Partnership. In order to build this full fibre network Openreach engineers replaced and erected a total of 36 new telephone poles to carry more than 15 miles of fibre cable from the telephone exchange in Dolgellau to the residents of Llanymawddwy.

By working with Openreach to co-fund the installation, 70 properties in Llanymawddwy will benefit from the infrastructure build. The cost of the Llanymawddwy CFP is covered by investment from both Openreach and the residents themselves who were able to access the Welsh Government's top-up to the UK Government's Rural Gigabit Voucher scheme.

Customers (residential) in Wales can increasingly choose ultrafast connections

- 37% of residential customers in Wales can now choose an ultrafast connection – an increase of 6 percentage points since 2019.
- The increased coverage of ultrafast broadband has been driven by the roll-out of full fibre and gigabit capable networks as set out in the previous section, as well as Openreach's deployment of G.fast. Openreach has now paused its G.fast deployments as it focuses on full fibre build.^{12F13}

¹³ ISP Review, [Openreach Confirm G.fast Broadband Rollout Paused Until 2021 UPDATE - ISPReview UK](#) [accessed 20 November 2020]

The £55 million Digital Infrastructure programme being part-funded by the Swansea Bay City Deal will benefit existing residents and businesses across Neath Port Talbot, Swansea, Pembrokeshire and Carmarthenshire. The Carmarthenshire County Council-led programme, which is estimated to be worth £318 million to the regional economy in coming years, is split into three projects

1. **Connected Places:** Ensuring the region's towns, cities and development zones have access to world class, full-fibre digital infrastructure. This will include improving the quality of public service delivery by ensuring all public buildings are digitally connected.
2. **Rural:** Enabling equality of access to broadband services across the region to ensure the needs of digitally underserved communities are met. This will help enhance social cohesion and inclusion across the region to sustain its communities.
3. **Next Generation Wireless:** Ensuring that the region is at the forefront of 5G and Internet of Things (IoT) investment and innovation.

Similarly, in North Wales, one of the key programmes of the North Wales Economic Ambition Board is the Digital Connectivity Project which includes the following four elements:

1. Gigabit capable connectivity to 28 key business sites across North Wales.
2. Accelerate the development of Connected Campuses at 19 key regional economic sites. It is estimated some 2,600 business premises will have access to high bandwidth 5G and low power Wi-Fi services once complete.
3. Road and rail corridor across North Wales will be connected to 5G/Low Power Wireless Access Networks.
4. Connecting the last few: the project targets universal superfast coverage across North Wales. Up to 10,100 residential and 4,300 business premises will have access to superfast broadband once complete.

Most homes in Wales have access to at least a superfast broadband connection

Coverage of superfast broadband in Wales has nearly doubled since 2013 (48%) as a result of the Welsh Government's Superfast Cymru programme. This year's report shows that superfast broadband is now available to 94% of premises in Wales.

Figure 4: Residential superfast coverage

	Superfast	Urban	Rural
Wales	94%	98%	78%

¹⁴ <https://gigabitvoucher.culture.gov.uk/wales/>

Scotland	94%	98%	72%
Northern Ireland	89%	99%	66%
England	96%	98%	84%
UK	96%	98%	81%

Investment in superfast broadband networks will continue into the future. This is likely to predominantly be due to publicly funded rollout under a number of schemes.

Superfast Cymru delivered superfast broadband to around 733,000 homes and businesses in Wales (at >24Mbit/s), of which 717,000 can achieve speeds of at least 30Mbit/s. The project was delivered with a public sector investment of over £220m. The technology rolled out by Openreach was primarily Fibre to the Cabinet with some full fibre. This roll-out finished in 2018.

The Welsh Government awarded its Superfast Cymru successor scheme contract to BT, which is expected to provide full fibre to 26,000 premises, in three lots across Wales by March 2021. This will be achieved with £26m of public subsidy from the Welsh Government and EU funding.

In July 2020, the Welsh Government extended the number of properties that would benefit from the Superfast Cymru successor scheme from 26,000 to reach 39,000 premises. The extension will be funded by £30m in total from the Welsh Government and European Union, with additional investment from Openreach, and is due to be completed in three years' time. This contract is already known to have completed 8,283 premises from its target. The Phase 2 contract is focused on tackling premises in the final 4% of Wales that can't yet access speeds of 30Mbit/s.

In addition, the Welsh Government has published the final outcome of its latest Open Market Review (OMR) which, after factoring in the above contract and other commercial developments, has found that a total of 79,000 properties "do not have access to superfast broadband and are not in any plans to be given access in the next two years."

The findings of the OMR demonstrate that there remain homes and businesses in Wales that aren't being served by the market or with public funding. The Welsh Government announced an additional £10 million Local Broadband Fund to deliver innovative ways of connecting whole communities working with local government and social enterprise.

The scheme is intended to provide a mechanism to bid for funding to deliver interventions that provide or support the provision of fast reliable broadband to premises that remain underserved. The fund is planned to span an initial three-year period. The initial phase was impacted by Covid -19 with public sector resources being temporarily moved to roles to assist local businesses and the ability to develop plans with suppliers also impacted. However, the scheme is now underway, and the second tranche of bidding launched in November. All technologies and innovative approaches are welcomed, and the only speed criteria would be that solutions would need to provide at least 30Mbit/s.

Decent broadband over a fixed connection is available to almost all homes and businesses

Taking into account all fixed line connections, 97% of homes and businesses in Wales have access to at least decent broadband, the same percentage as in 2019. Around 52,000 homes do not have access to decent broadband via a fixed connection.

Figure 5: Homes unable to receive decent broadband from a fixed line

	Total	Rural	Urban
Wales	3% (52,000)	13% (45,000)	1% (8,000)
Scotland	3% (95,000)	17% (85,000)	<1% (10,000)
Northern Ireland	6% (49,000)	19% (43,000)	1% (6,000)
England	1% (387,000)	7% (240,000)	1% (146,000)
UK	2% (583,000)	10% (413,000)	1% (170,000)

Broadband delivered wirelessly to fixed locations can meet the needs of some people, including those in areas without access to decent broadband over wired connections

Fixed Wireless Access on mobile networks

Of the four MNOs in the UK, only O2 does not currently offer FWA services. For areas with poor indoor coverage, EE offers an external antenna for its FWA services.

Based on the MNOs' claimed coverage, we estimate that 91% of premises in Wales have access to an MNO FWA service. EE FWA claims an average download speed of 31Mbit/s for customers on their 4G FWA service¹⁴ and 150Mbit/s on its 5G FWA service.¹⁵ Vodafone claims to have made its FWA product available at all properties where a mobile signal is available.¹⁶ However, as we explain above, the end users' experience of the service could be affected by where they place the router, their indoor mobile coverage and the capacity available in the wireless access network and in the backhaul.¹⁷

¹⁴EE, 4GEE Home Router 2, <https://shop.ee.co.uk/dongles/pay-monthly-mobile-broadband/4gee-home-router-2/details> [accessed 23 November 2020]

¹⁵ EE, Pay Monthly Mobile Broadband Devices, <https://shop.ee.co.uk/dongles/pay-monthly-mobile-broadband/huawei-5g-cpe-pro/details> [accessed 23 November 2020]

¹⁶ Although we do not have data on what performance can be delivered on their network.

¹⁷ Backhaul here refers to the bandwidth available between the cell site and the mobile network core.

Figure 6: Coverage of MNO and WISP FWA networks

	MNO FWA	WISP FWA
Wales	91%	33%
Scotland	94%	1%
Northern Ireland	83%	3%
England	95%	3%
UK	95%	5%

Fixed wireless access from WISPs

For this year's report, we have taken a new approach to collecting WISP coverage data, asking operators to provide their own estimate of coverage, factoring in network capacity constraints, interference and other external factors.¹⁸ Based on providers' estimate, around 500,000 homes and businesses in Wales could have coverage from a WISP network.

Wales has a high percentage (33%) of WISP Fixed Wireless Access coverage as a result of Airband's presence in Wales which includes a contract with the Welsh Government to provide high speed wireless broadband to business premises in a number of business parks and industrial estates.

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.¹⁹

FWA and the impact on the availability of decent broadband in Wales

If the networks are managed well, both MNO and WISPs can deliver a decent broadband service and are an alternative network technology for consumers who cannot receive a decent broadband connection from their fixed network.

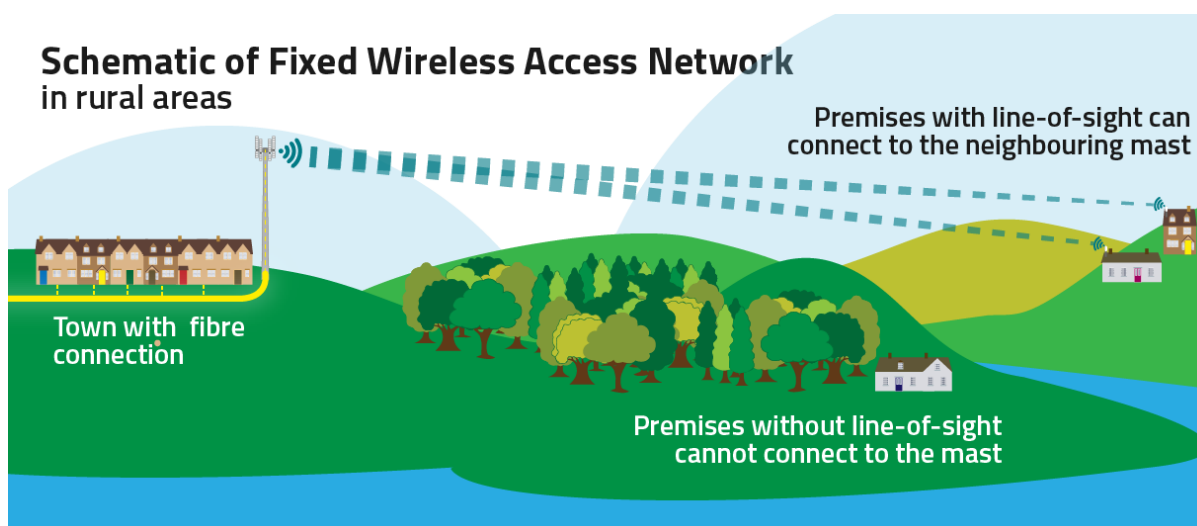
Based on the coverage estimates provided by FWA providers, we estimate that 35,000 premises in Wales that do not have access to a decent broadband service from a fixed network could have access via an FWA network. This provides an additional 2.3% of decent broadband service coverage to Wales. 6,000 premises have access to a decent broadband service from a WISP network. A further 29,000 premises have access to a decent broadband service from an MNO FWA service. Some premises that can get decent broadband on a WISP network may also be covered by an MNO FWA service. Over the next year, we plan to work with FWA providers to understand how they manage the capacity of their network to ensure that a reliable service can be provided to their customers.

¹⁸ Ofcom, September 2020. [Technical Guidance for WISPs](#)

¹⁹ If WISPs would like to provide information as per the technical guidance, they can get in touch via the mailbox connectednationsreport@ofcom.org.uk

Figure 7: Access to a decent broadband service by different types of technology

	Has no access to decent broadband from a fixed network	Has access to decent broadband from a FWA network	Remaining premises without access to decent broadband
Wales	52,000	35,000	18,000
Scotland	95,000	60,000	34,000
Northern Ireland	49,000	30,000	19,000
England	387,000	268,000	119,000
UK	583,000	393,000	190,000



Some people are still struggling to get connected

A small– but significant number of premises in Wales still cannot access decent broadband

Our latest estimate is that 1.2% / 18,000 premises in Wales still do not have access to a decent broadband service via either a fixed or fixed wireless network. This figure has stayed consistent with our estimate last year. These premises may be able to get a service under the broadband Universal Service Obligation (USO).



The Broadband Universal Service Obligation (USO)

The USO provides everybody with the right to request a broadband connection with the following technical characteristics:

- a download sync speed of at least 10 Mbit/s;
- an upload sync speed of at least 1 Mbit/s;
- a contention ratio of no more than 50:1;
- latency which is capable of allowing the end user to make and receive voice calls effectively; and
- the capability to allow data usage of at least 100GB per month.

Where an affordable service with the above characteristics is not available, or due to be available in twelve months under a publicly funded scheme, the customer is eligible for the USO if the costs of providing the connection are below £3,400 or, where the costs are above £3,400, the customer agrees to pay the excess.²⁰ In calculating whether the costs are below or above £3,400, the Universal Service Provider (USP) must take into account where costs could be shared by several USO eligible premises. This is known as demand aggregation and to implement this, the USP is required to assume a take-up of 70% of premises.²¹

Following a process of requesting expressions of interest from providers interested in being a USP, we designated BT as the USP for the UK (excluding Hull), and KCOM for the Hull Area, requiring them to provide the USO and to report at six monthly intervals on their implementation.

The broadband USO launched on 20 March 2020, very soon after the UK entered lockdown due to the Covid-19 pandemic.

BT's delivery of the broadband USO

Due to the Covid-19 pandemic, we agreed to a soft launch of the USO in order to manage demand on:

- BT's call centres, which were newly trained to support the USO;
- Openreach's employees that design and cost the network; and
- Openreach's engineers that ultimately build the network.

²⁰ In [our statement of 6 June 2019](#) (para 5.1), we decided that an affordable service was one that cost £45 per month, rising annually by CPI. When the USO launched, this figure was £46.10.

²¹ The conditions we imposed in our statement of 6 June 2019 require the USP to use a forecast of 70%, or actual demand if it is higher.

This meant that BT did not initially promote the USO in accordance with its obligations. However, it commenced promotional activities during the summer and has been writing to all potentially eligible premises. We expect these communications to be largely complete by the end of 2020.

BT is required to report on its delivery against the USO. It published its first report covering the first six months of availability in October 2020.²²

In the first six months, BT received 9,168 requests to its helpdesk. Of these, just over half (5,131) were deemed ineligible as there was already a service that meets the USO specification available (either from BT (3,190 requests) or another provider (1,739 requests)), or publicly funded schemes would provide a service in the next 12 months (202 requests).

Of the remaining requests, 512 orders were placed. These network builds will cover over 4,000 premises 420 of which are in Wales.²³ As of September, 7 premises had been connected under the USO schemes including one in Tregeiriog, North Wales.

During this initial period of implementation, several issues have received attention:

- the clarity of information being provided to customers; and
- customers receiving very high quotes.

On the first of these, BT is working to improve its communications to customers, including to provide more information on alternatives to customers and to set out the costs of building the network to the customer more clearly.²⁴

On the second of these, we understand that in some cases the costs to connect premises will be very high so that many customers are likely to receive quotes above the £3,400 threshold. In our statement in May 2020, we reported that BT estimated it would only be able to connect up to 16k premises below the £3,400 reasonable cost threshold.²⁵ Those premises that are more expensive to connect may need alternative solutions.

However, we are concerned that BT may not be complying with the regulatory conditions correctly where it assesses excess costs for a given connection. This could result in some customers' quote for a connection being higher than necessary. This could in turn lead to fewer people taking advantage of the USO. As such, we have opened an investigation into BT's approach to calculating quotes for excess costs.²⁶

Premises without a decent connection from any means

It is not surprising that nine of the ten local authorities in Wales with the highest number of premises unable to receive a decent broadband service of any kind are predominantly rural with

²² BT report on progress against the Broadband USO, October 2020. <https://www.bt.com/about/bt/policy-and-regulation/keeping-the-uk-connected/a-universal-service-obligation> [accessed 23 November 2020]

²³ As infrastructure can often be shared, each individual order could mean network is put in place that can serve multiple premises.

²⁴ See BT's October 2020 report.

²⁵ Ofcom, 22 May 2020. [Statement: Compensating providers delivering universal services - Ofcom](#)

²⁶ Ofcom, [Investigation into BT's compliance with its obligations as a broadband universal service provider](#)

Carmarthenshire and Ceredigion each with over 1,000 properties and Powys with almost 3,000. The one exception is Wrexham, which despite being predominantly urban, has 210 properties without decent broadband as shown in the following table.

Figure 8: Ten Local Authorities in Wales with the highest (in descending order) number of premises which are unable to receive decent broadband from either 4G, Fixed connection or WISP

Local Authority	Premises without Mobile – Fixed – WISP	
Powys	2,912	4%
Carmarthenshire	1,173	1%
Ceredigion	1,096	3%
Gwynedd	925	1%
Monmouth	787	2%
Pembrokeshire	611	1%
Conwy	444	1%
Denbighshire	276	1%
Wrexham	209	0%
Anglesey	114	0%

Broadband service take-up

This report collects and reports on the performance of active lines and not the products that consumers are signed up to and, as such, is only indicative of take-up. Our analysis suggests that in September 2020, 52% of premises in Wales with superfast broadband availability had a superfast service (≥ 30 Mbit/s) or above.

Figure 9: Take-up of superfast broadband (as a percentage of total broadband coverage)

Nation	Superfast and above
UK	57%
Wales	52%
England	58%
Scotland	53%
Northern Ireland	58%

Source: Ofcom analysis of operator data.

When looking only at areas where full-fibre is available, some 22% of premises were taking a full-fibre service.

Figure 10: Take-up of broadband service by speed (as a percentage of premises where those services are available)

Nation	Superfast and above	Full-fibre
UK	60%	25%
Wales	55%	22%
England	61%	27%
Scotland	57%	25%
Northern Ireland	65%	11%

Source: Ofcom analysis of operator data.

Increasing demand during Covid-19

During 2020, the UK's fixed access networks have seen significantly increased demand from users, as the lockdown due to the Covid-19 pandemic saw significantly more people using their home broadband connections for work, for keeping in touch with friends and family, for accessing essential services, and for leisure. Networks generally had the capacity to meet user demands.

Data usage during Covid-19

We gathered data (covering the period from February to July) from a range of network operators to understand how traffic on fixed broadband networks from residential and business customers changed during this time before and after lockdown.

Overall, the networks coped well. For major networks, peak traffic increased during the early phase of the first lockdown in late March and April although generally remained below the spikes in peak traffic seen immediately prior to lockdown when major gaming releases coincided with the peak times. After this initial increase, peak traffic remained largely constant on average, meaning traffic levels remained higher than prior to lockdown, though this varied across different networks. Further detail and analysis can be found in the main [UK Connected Nations 2020 report](#).

The UK's traditional telephone network is also being replaced

It is not only the UK's fixed broadband networks that are changing – traditional landline services are also undergoing a substantial transition. Network operators such as BT, Virgin Media and KCOM, that offer traditional telephony services (referred to as the Public Switched Telephone Network, or 'PSTN'), are in the process of retiring their legacy systems and replacing them with modern systems.²⁷ In particular, BT plans to retire its PSTN network by the end of 2025, with fixed voice services delivered to customer homes or business premises delivered over broadband connections instead. Before the PSTN switch off in 2025, all fixed voice services will need to migrate to alternative voice services over broadband.

Last year we estimated that only around 1% of voice lines were being provided over broadband, reflecting the early stages of migration. This year, analysis of operator data shows that around 8% of fixed voices lines are delivered over broadband, as the larger communications providers begin to offer these alternative voice services to their customers. We anticipate that adoption of these services will increase rapidly in the next few years and are working with providers to address any issues that might arise with this migration to ensure consumers are protected and disruption is minimised.

²⁷ In the case of BT, PSTN services are provided by Openreach in terms of access connectivity and BT for calls services. [Openreach's WLR withdrawal site](#) gives more information.

The introduction of new voice services and platforms brings associated opportunities and challenges. Consequently, we are looking into how the telephone numbering scheme may evolve and considering other numbering related issues – such as call routing, number portability and trusted caller line identification.²⁸ The migration from the legacy telephone network also brings challenges in terms of the reliability of services, and the devices that take advantage of the traditional telephone network’s line powering and voiceband data transfer capabilities (like telecare alarms, and telemetry and monitoring applications within critical national infrastructure). We discuss these in more detail in the Security and Resilience chapter of the UK report.

²⁸ [First consultation: Promoting trust in telephone numbers - Ofcom](#)



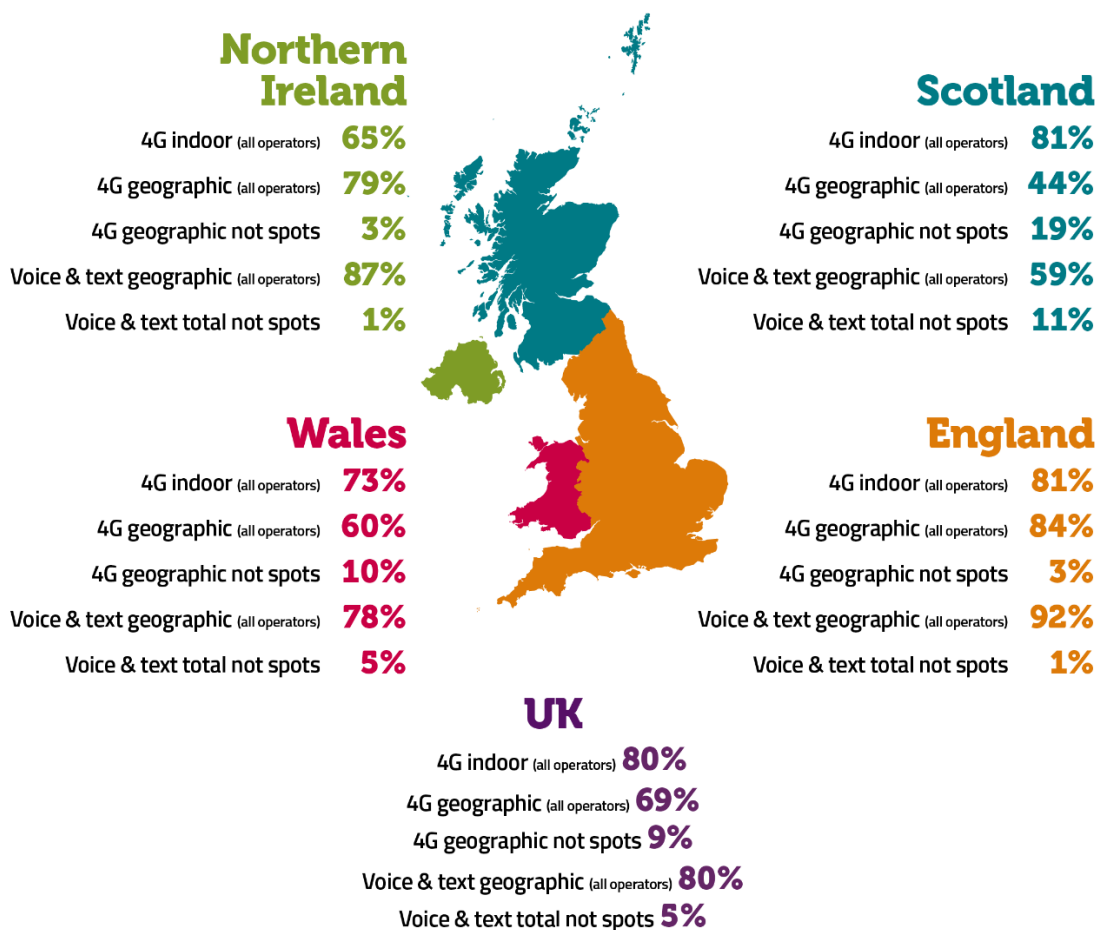
Mobile services in Wales

Mobile services are an important part of people's daily lives. The experiences of the Covid-19 pandemic over the course of this year have further emphasised the reliance society and business places on access to good mobile services, and the key role these services play in helping people communicate and stay in touch.

Key highlights for Wales

- There has been a slight increase in 4G geographic coverage in Wales with coverage from all operators increasing to 60%; 4G indoor coverage from all operators in Wales remains unchanged at 73% with coverage in rural areas having increased to 43% compared to 83% in urban areas.
- 4G geographic coverage from at least one operator in Wales has increased by one percentage point from last year to 90% with nearly all premises in urban areas having good coverage at 99% (rural area coverage 88%).
- The Mobile Network Operators have now moved into a detailed planning phase for the implementation of the Shared Rural Network programme. Wales will see significant benefits from the programme. 4G coverage from all four operators will rise to a minimum of 80% of landmass, up from 60% today, and coverage from at least one MNO will increase to 95%, up from 90%.
- Voice services from all four operators are available outdoor to 78% of Wales' landmass.
- All four mobile network operators (MNOs) have continued to rollout 5G services with initial deployments in urban areas to provide additional capacity. Locations in Wales include Cardiff, Swansea, Newport, Porthcawl and Llandudno.

Summary of mobile coverage across the UK and Nations



Progress with 5G continues despite the pandemic

Since the initial roll out of 5G networks last year, UK MNOs have continued to deploy 5G, largely on existing mobile infrastructure. The main focus of this activity has remained largely in urban areas where such deployments provide additional capacity in areas of high demand, although wider deployments have taken place. This is in line with our expectations, with current 5G deployments for consumers largely focusing on delivering mobile broadband, particularly in areas of existing high demand. The potential of 5G networks to deliver other benefits particularly those depending on its ultra-low latency capabilities are increasingly being explored by businesses. For example, MNOs have been collaborating with various industries to [monitor and maintain critical assets](#) and [accelerate the digital transformation of these industries](#). Over time we expect a range of models will contribute to meeting different types of demand from both consumers and businesses, with private networks playing an increasing role in providing mobile connectivity.

Take up remains a relatively small proportion of overall users, with about 800K active 5G devices across all mobile operator networks in the UK (as of early September 2020). This represents just over

1% of all active devices. As new services emerge, and more 5G handsets become available, take up is likely to increase across the UK.

Across the UK, 5G is now carried on around 3,000 mobile base stations (around a ten-fold increase in base stations reported to us last year), with 87% of these base stations in England, 7% in Scotland and 3% in both Wales and Northern Ireland.²⁹ These deployments mean 5G is available on just over 8% of all urban mobile base stations, and around 1.5% of all suburban mobile base stations.³⁰ 5G sites in Wales includes Cardiff, Swansea, Newport, Llandudno and Porthcawl.

We have found that the majority of current 5G deployments are in already busy areas and are providing capacity enhancements to other mobile generations i.e. 4G.

Approximately 50% of all 5G deployments have occurred within the 5,000 busiest sites (in terms of total traffic carried) across the existing UK mobile grid, emphasising that in many cases – but not exclusively – 5G is being deployed in high demand areas.

Availability of 2G, 3G and 4G mobile technologies and services

Methodology

In this section we report on coverage both outside and inside premises and on geographic coverage in Wales. We report on the availability of voice services, via either 2G, 3G or 4G, and on the availability of 4G data connections.³¹

The mobile coverage figures provided in this report are based on predictions which the MNOs supply to Ofcom, with Ofcom undertaking regular testing to ensure the predictions provided are suitable for national and regional reporting. We take the accuracy of the data supplied to us seriously and we continue to monitor, through drive testing, the accuracy of all operators' coverage predictions. We note that operators continue to update and improve their prediction models, and we welcome this. The data used in the report includes predictions provided to us by O2 using a newly developed coverage prediction model, and which are still subject to Ofcom's validation process. In light of our own drive testing, we are continuing further discussions and work with O2.

Indoor coverage

The coverage people receive indoors will depend on a range of factors including: the thickness of walls, building materials used in construction and where in a building people are using their phones. 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

²⁹ Note that for the purposes of this report, the reported tally of 5G base stations represents a tally of all individual MNO deployments, and should two MNOs have added 5G services on the same physical structure, we regard this as 2 sites.

³⁰ We note that the data indicating around 3,000 base stations carrying 5G is based on the most recent information available from MNOs in September 2020. More detailed analysis on the distribution across existing busy sites, and across rural and urban areas, comes from a slightly earlier, but more detailed dataset based on the situation as of June 2020.

³¹ 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)

likelihood of there being indoor coverage in buildings at different locations, which takes into account some of the factors that can affect a mobile signal.

We estimate³² the availability of indoor mobile coverage for calls to have remained unchanged from last year. While almost all premises have indoor coverage for voice calls from at least one operator, voice calls are only possible indoors at 90% of premises from all operators.

The number of premises in Wales that receive 4G data services indoors from all operators has remained stable at 73%, while 98% of premises have indoor 4G coverage from at least one operator.

Indoor coverage remains poor in many rural areas. Only 70% of rural premises in Wales have voice coverage from all operators – which is in line with the UK average. In comparison, indoor coverage in urban premises remains available at 96% of premises from all operators. While mobile call services are available from at least one operator in 96% of rural premises.

There are considerable variations between the coverage provided by the individual operators in Wales.

Figure 11: 4G coverage of mobile services in Wales by network operator September 2020

	O2	Vodafone	EE	Three
Indoor voice premises	98%	97%	95%	94%
Indoor 4G premises	91%	89%	92%	85%
Geographic voice	91%	88%	85%	87%
Geographic 4G	72%	72%	83%	77%

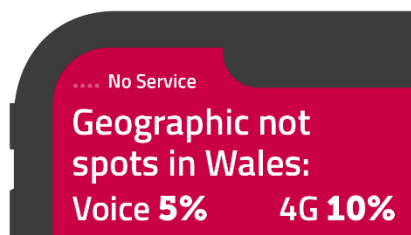
Only 43% of premises in rural areas have indoor 4G data coverage from all operators- an increase of 5 percentage points. In urban premises, indoor 4G data coverage has remained broadly similar to last year at between 82% and 83%. As with last year, indoor 4G data services are available from at least one operator in 92% of rural premises and in almost all urban premises.

³² We determine indoor coverage by applying an average building entry loss of 10dB across buildings. We acknowledge that this approach provides only a simplified view of what levels of indoor coverage might be, with the real experience in a building depending heavily on the types of building material and insulation in a given premises. Ofcom is engaging with mobile operators to determine if and how a more granular estimate can be developed.

4G is available indoors
on all operators to

73%
in Wales

With **60%** of
Wales covered by
4G geographically
for all operators



Geographic coverage in Wales

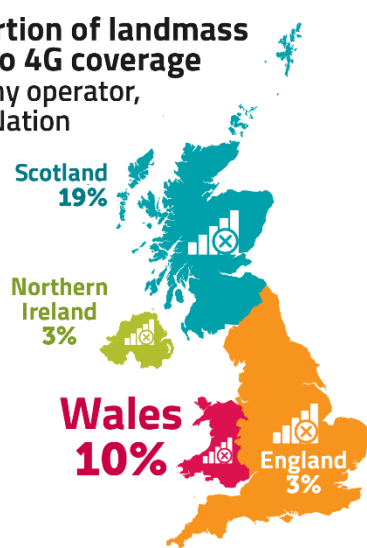
We noted in last year's Connected Nations report that the growth in 4G geographic coverage had begun to plateau, with small increases in individual operator coverage, but no substantial changes overall. There is still considerable difference between the coverage offered by individual operators, with good consumer experience limited by the presence of enduring 'partial not spots' (i.e. areas not covered by all operators), predominantly in rural areas. The announcement of the Shared Rural Network in March 2020 should see around £1billion of public and private funds invested in addressing these problems and improving rural coverage for the UK. However, there has only been limited coverage gains over the course of this year, as the SRN completes detailed planning work before shifting focus to delivery.

As with last year, mobile call services are available across 78% of the Wales' geographic area from all four operators. Similarly, 95% of Wales' geographic area is covered by at least one operator for mobile calls with a maximum difference of about 6% points between the operators.

This year, 4G data services are available from all 4 operators across 60% of Wales' geographic area and is available from at least one operator in 90% of geographic areas. Consequently around 10% of the geography in Wales remains without any good 4G coverage.

As with last year, there are significant differences between the operators. The operator with the most extensive 4G coverage in Wales (EE) increased its 4G coverage in Wales by 1 percentage point to 83%, whereas the operators with the least coverage in Wales (Vodafone and O2) both provide coverage to 72% of the geographic landmass.

Proportion of landmass with no 4G coverage from any operator, by UK Nation



There continues to be differences in coverage between urban and rural areas in Wales. Mobile calls are available from all operators in 97% of urban areas but in only 76% of rural areas (geographic voice coverage from all operators). Similarly, mobile voice call services remain available in 95% of Wales' rural areas from at least one operator.

In urban areas, 4G data services from all operators remain available in 90% of Wales' urban landmass. Although availability in rural areas increased by 3 percentage points, it is only available in 57% of Wales' rural landmass. As with last year, 4G data coverage is available from at least one operator in 88% of rural areas and in almost all urban areas.

10% of the landmass does not have outdoor 4G coverage from any operator, down from 11% last year

Differences across the nations

Mobile data coverage remains significantly better in England and Northern Ireland than it is in Scotland and Wales. Furthermore, 4G data coverage varies considerably among mobile operators and remains poor in many places.

Today only 60% of Wales and 44% of Scotland can receive 4G data services from all MNOs. In comparison, these services are available from all MNOs in 79% of geographic areas in Northern Ireland and 84% in England.

Figure 12: 4G geographic coverage in the nations

	% of landmass served by all perators (2019)	% of landmass served by all operators (2020)	Percentage point coverage change
Wales	58%	60%	+2
Scotland	42%	44%	+2

	% of landmass served by all perators (2019)	% of landmass served by all operators (2020)	Percentage point coverage change
Northern Ireland	75%	79%	+4
England	81%	84%	+3
UK	66%	69%	+3

The challenges in Wales

The topography and the density of the population poses particular challenges in improving mobile coverage in Wales. Providing comparable levels of coverage with other nations of the UK will inevitably require the construction of more masts and in many cases the height of those masts will have a beneficial effect on the coverage levels achieved.

National Infrastructure Commission for Wales

At the beginning of December, The National Infrastructure Commission for Wales published its [Digital communications infrastructure in Wales report](#). The NICW recommends that The Welsh Government should replace the existing all Wales Digital Infrastructure Group with a new ‘barrier busting’ taskforce, led by a senior official, with clear objectives and deadlines in which to achieve them. The following are also included in the report’s recommendations on mobile infrastructure: -

1. The planning regime for telecommunication in Wales should be brought into line with that currently being proposed for England (and likely to be replicated in Scotland) as a matter of urgency. This should be accompanied by the wholesale revision of the TAN19 guidance to local authorities, as well as revisions to the Code of Practice on Mobile Phone Network Development, both of which are now over 15 years old.
2. We recommend the Welsh Government undertake a small project to obtain better data on existing levels of mobile coverage and performance in Wales. This should be used to inform data already produced by Ofcom and the assumptions made by both the Welsh and UK Governments when developing policy or enforcing targets.
3. We recommend that the Welsh Government explore, with industry and in parallel with the implementation of recommendation (i), the extent to which further 4G coverage and accelerated 5G delivery could be achieved in Wales within the next 5 years, likely using the 700 MHz spectrum that will be available from 2021, if:

- a. The Welsh Government were to adopt further amendments to the planning regime in Wales above and beyond those currently proposed by the UK Government for England, to further facilitate the deployment of mobile infrastructure.
 - b. The Welsh Government were to provide additional public funding, above and beyond that in the existing SRN agreement, in order to further extend mobile coverage in some parts of Wales.
4. We recommend that the Welsh Government ask the UK Government to consider introducing 5G coverage and performance targets (alongside those already adopted for 4G) into the existing Shared Rural Network arrangements. If this is not supported, and if progress is made with the UK mobile operators, then the Welsh Government should pursue a separate agreement with the mobile operators which would incorporate such targets.

Differences across Local Authorities and Senedd Cymru constituencies in Wales

4G geographic coverage in local authorities and Senedd constituencies varies considerably between those in urban and rural parts of Wales. Gwynedd and Conwy have the lowest levels of coverage from all operators with 46%, followed by Powys (49%) and Ceredigion (53%). Likewise, the Senedd constituencies of Dwyfor Meirionnydd has the lowest availability with 42% and is followed by Clwyd West (46%), Brecon and Radnorshire and Montgomeryshire (49%). But even predominantly urban constituencies such as Cynon Valley and Neath are included in the 10 constituencies with the lowest levels of availability.

Figures 13.1 and 13.2: difference in 4G geographic coverage by Welsh Local Authority and Devolved Constituency

Local Authority Wales	% Coverage
Gwynedd	46
Conwy	46
Powys	49
Ceredigion	53
Monmouthshire	57
Carmarthenshire	61
Neath Port Talbot	68
Denbighshire	68
Anglesey	72
Pembrokeshire	74

Devolved Constituency Wales	% Coverage
Dwyfor Meirionnydd	42
Clwyd West	46
Brecon and Radnorshire	49
Montgomeryshire	49
Ceredigion	53
Aberconwy	54
Monmouth	56
Carmarthen East & Dinefwr	59
Cynon Valley	64
Neath	66

The Shared Rural Network (SRN) and other public policy interventions.

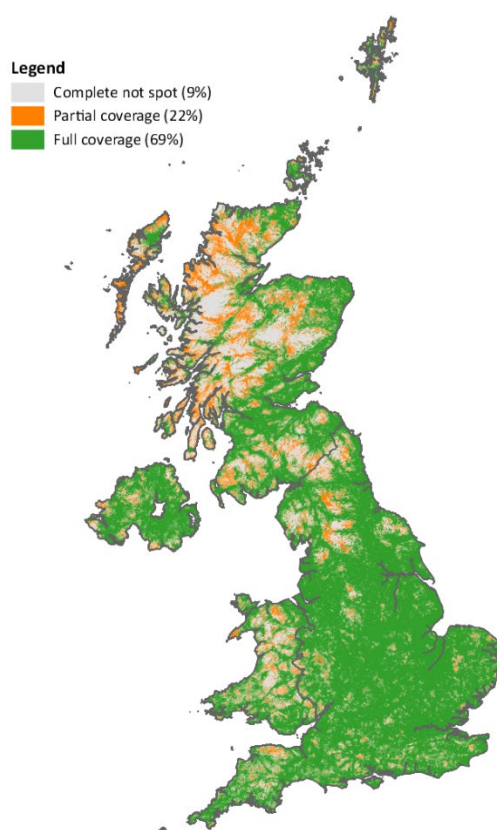
Ofcom is committed to reporting on progress made by the operators towards the legally binding commitments entered into their licences as part of the SRN. Under the agreement, each MNO is committed to reaching 88% coverage of UK landmass by 2024, and 90% of UK landmass within 6 years from 2020 (subject to certain conditions), with an expectation that this will see the ‘at least one operator’ footprint (i.e. the area where there is mobile coverage available, but not always from the same MNO) reach 95% of UK landmass by 2025.

As noted above, MNOs have now moved into the detailed planning phase. In November, Ofcom wrote to the MNOs to confirm that in our view, the updated plans they have developed would, if delivered, meet the licence commitments.³³ As of today, only one operator (Vodafone in the villages of Longnor and Devauden in the Wye Valley) has informed us it has added 4G coverage through the

³³ <https://www.gov.uk/government/news/shared-rural-network>

programme³⁴. An important initial focus for the SRN is the provision of new coverage in partial not spots, as part of the initial commitment for each MNO to reach 88% coverage by 2024 (including commitments to individually cover 82%-83% of Wales by this time). The potential impact of this can be seen from the current location of partial not spots in the UK today, as seen in figure 14 below.

Figure 14: full coverage, partial coverage and complete not spots in the UK



We expect to report on more significant progress as the programme moves into the delivery phase in the year ahead. We note that as well as the SRN, other public policy interventions continue to support the rollout of growth in rural mobile coverage.

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

As with last year, this report continues to examine those premises unable to get a decent fixed or 4G mobile broadband service. Premises are considered to have access to a decent fixed connection if the broadband connection has a speed of 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.

³⁴ <https://srn.org.uk/news/>

We estimate that 63% of premises in Wales can receive both decent fixed and good indoor 4G coverage, while about 9,000 (0.6% of premises) are unable to access either³⁵ with almost all of these being in rural areas. As with last year, rural areas of Wales have the highest percentage of properties that have neither decent fixed nor (indoor) 4G mobile services at 3%.

Mobile networks coped with increased traffic demands and changes in consumption patterns during Covid-19

Data usage during Covid-19

Mobile operators in the UK successfully coped with the increased demands and changes in data and voice traffic as people began working from home and schools were shut during the Covid-19 spring lockdown. The operators reported that peaks occurred just before or during the week lockdown measures were first introduced across the UK in March 2020. Although these peaks generally reduced with the gradual easing of lockdown, they have remained higher than periods before (in line with the historical trend for incremental growth in data consumption).

Mobile hotspots shifted from urban areas to suburban areas during lockdown

Mobile traffic patterns (voice and data) shifted from the city centres (urban areas) to more residential areas (suburbs) during the period, particularly as people began working from home. Further detail and analysis of mobile network usage patterns can be found in the main UK Connected Nations 2021 report.

Internet of Things (IoT)

The Internet of Things (IoT) refers to a network of devices and sensors which provide actionable insight from data they collect and share between themselves or with humans. IoT has applications across a wide range of sectors such as healthcare, utilities, manufacturing, consumer electronics, and smart cities among others.

As with last year, we continue to provide qualitative and quantitative insights into public and private wide-area IoT networks in the UK. ³⁶

IoT Connectivity available from Mobile Network Operators

IoT connectivity is available from UK MNOs through a mix of cellular and Low Power Wide-Area-Network (LPWAN) technologies. Commercial IoT connectivity is available from all four UK MNOs through 2G, 3G, 4G cellular technologies. Within the past year, Vodafone has increased the coverage of its NB-IoT network extending coverage to eastern parts of the UK. Whilst O2 has also deployed

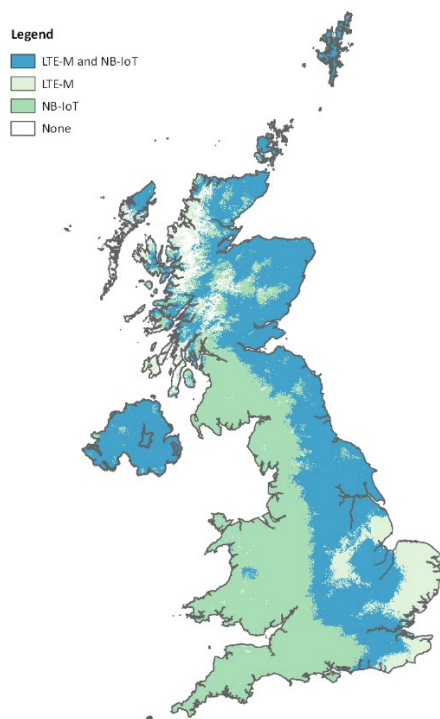
³⁵ This includes premises that are unable to receive services from other providers such as Wireless Internet Providers (WISPs)

³⁶ We have found that mobile network operators generally do not differentiate between M2M and IoT from the connectivity point of view and have therefore included M2M data in our IoT analysis.

LTE-M at various locations across the UK, it is yet to commercialise services using this technology. Three and EE continue to explore proof-of-concept deployments using NB-IoT, LTE-M and 5G.

This year, the number of active IoT connections on MNO networks increased by 30% to 6.3 million. However, at 810TB, the overall volume of IoT data traffic across all UK MNOs remains less than 1% of their overall data traffic. We note that this represents a snapshot of all IoT traffic, much of which is carried over Wi-Fi in indoor settings.

Figure 15: Map of the UK showing LTE-M and NB-IoT Coverage



OpenRAN technology in Builth Wells, Powys

Vodafone has launched its first Open Radio Access Network (OpenRAN) 4G site around the Royal Welsh Agricultural Showground in Builth Wells, Powys. OpenRAN technology enables faster roll-out of remote rural mobile coverage using alternative technology partners. Instead of being reliant on hardware available from a limited number of providers, the capabilities of the mobile site are hosted as software in the cloud, with readily available, low-cost hardware at the site. The approach reduces cost, increases flexibility and enables new suppliers to support the roll-out of mobile networks across the UK and can make a real difference in improving connectivity in rural communities.

IoT Connectivity available from non-mobile network operators

Sigfox

Within the past year, WND UK, the sole Sigfox network operator in the UK increased the number of its base stations from 1,900 to about 2,000. These improvements have focused on the provision of coverage overlays and densification of its urban footprints as well as deploying indoor solutions at locations not covered by the public network.

The network supports very low bandwidth applications with infrequent transmissions such as device telemetry, metering, asset tracking, gas and water leak detection.

LoRaWAN

In the UK, LoRaWAN connectivity is provided through public community and private deployments. The public community networks, which are open-source and free to use, allow users to connect devices to existing gateways (base station) or add new gateways to increase overall coverage.³⁷ ³⁸ These networks are collaborative and driven by the user community. The private networks offer managed carrier-grade services with guaranteed availability, on a paid basis.

³⁷ They are usually bound by fair use policies which restrict data rates, packet sizes, transmit time, number of gateways/devices, etc

³⁸ The network servers are hosted by not for profit institutions like the Digital Catapult (UK) or companies which also offer private networks

LoRaWAN in Wales

Providers of public LoRaWANs allow users to connect freely (public 'open') or at minimal charges (public 'closed') thereby supporting developers, small/medium businesses and enterprises (particularly for Proof-of-Concept), government and public initiatives across local authorities in Wales.

Ceredigion & Carmarthenshire County Council are at the final stages of beginning to deploy a county wide LoRaWAN network, which will enable innovation, and allow both the public and private sector to deploy IoT sensors such as road surface temperature monitoring, salt bin level monitoring, flood monitoring, coastal erosion monitoring and an almost unlimited number of applications now possible through low power, long range, sensors.

An IoT specialist from Penffordd in Pembrokeshire has developed an anti-social behaviour detection device, that uses LoRaWAN – trials to date have been in Cardigan and has also generated interest in other areas of Wales. The same specialist has also developed a real time monitoring system for dairy farms. The system monitors the milk in the tank to ensure the quality of the milk, and also alerts the farmer of issues, for example if the tank has not been cleaned properly.

Dragon WiFi in Haverfordwest, Pembrokeshire has installed LoRaWAN Gateways on its existing Wireless Broadband Towers, and is offering new Internet of Things services, using the LoRaWAN protocol. Capestone Organic Poultry, one of Dargon WIFI's customers is using LoRaWAN to monitor temperature and humidity of their poultry sheds, water consumption monitoring, along with the monitoring of their fridges and freezers for optimum operation, and quality control on the farm.

The company also provides a water flow monitoring service to another customer, which again utilises LoRaWAN. This enables the proactive monitoring of the customers private water supply and take early action ahead of any damage or issues that may take place. Without LoRaWAN, this would have been a difficult and costly task.

Getting connected in Wales

Publicly funded schemes providing financial assistance to those without access to broadband have existed for many years in Wales. However public understanding of what solutions are available and what help can be got to contribute to the cost of installation is perhaps lower than would be expected. The following schemes are currently in operation:

Gigabit Broadband Voucher Scheme

UK Government (with Welsh Government top up)

Rural residents and businesses in Wales with broadband speeds of less than 30 Mbit/s may be eligible for vouchers from both UK and Welsh Government towards the cost of installing gigabit-capable broadband to their premises when part of a group project.

The Gigabit Broadband Voucher Scheme is a UK-wide, supplier-led scheme offering vouchers used as part of a group project, to pay towards the cost of installing gigabit-capable broadband to premises, i.e., homes and businesses, providing speeds of over 1,000 Mbit/s or 1 Gbit/s. Beneficiaries do not have to take those speeds and pay only for what they want to use, knowing they can increase them over time.

Anyone who is interested uses a postcode checker to find registered suppliers in their area. Their chosen supplier will guide them through the application. <https://gigabitvoucher.culture.gov.uk/>.

Residents in Wales can be eligible to claim up to £3,000 while small to medium sized businesses can claim up to £7,000 to upgrade to gigabit broadband to help meet the costs of a Community Fibre Partnership (see below). Once Openreach has installed the infrastructure, residents can place an order for the new faster services with an Internet Service Provider of their choice.

Access Broadband Cymru Scheme

Welsh Government

This scheme provides grants to fund (or part-fund) the installation costs of new broadband connections for homes and businesses in Wales. It does not include monthly rental costs. New connections through this scheme must deliver a step change in speed - with at least double your current download speeds e.g. a current connection of 10Mbit/s must improve to at least 20Mbit/s.

The scheme is open to individuals, businesses and third sectors premises in Wales where the broadband connection (if available) cannot deliver a step change in service provision of at least twice the current download speed. The proposed new service must ensure an absolute minimum download speed of at least 10Mbit/s. Applications requesting step change speeds that result in download speeds lower than 10Mbit/s will not be supported by the scheme.

The Access Broadband Cymru scheme offers two levels of grant funding, that are dependent on the speed of the new connection:

- £400 ABC voucher for 10Mbit/s and 20Mbit/s service.
- £800 ABC voucher for a superfast 30Mbit/s service.

Community Fibre Partnership

Openreach

The Community Fibre Partnerships scheme is designed to help people in places not included in any current roll-out plans to bring fibre broadband to their local area, working with Openreach to co-fund the installation. The scheme involves the company splitting the cost of installing faster broadband with the local community. In many cases, the local contribution can be entirely covered by broadband vouchers, such as the Welsh Government's ABC voucher scheme or the UK Government's Rural Gigabit Connectivity Programme. Examples in Wales include – Llanymawddwy, Llancarfan, Nantgwynant, Pumpsaint, and Paradvys.

Full fibre commercial roll out

Openreach

Openreach has committed £12 billion of its own money to bring full-fibre broadband to an additional 20 million properties across the UK by the mid-to late 2020s. In addition to Cardiff and Swansea this infrastructure is being rolled out across more than 100 Welsh market towns and villages. To view the full list of market towns and villages included in this phase of build, please visit -

<https://www.openreach.com/fibre-broadband/>.

Local broadband fund

Welsh Government

The Welsh Government has made £10 million available to support local authorities and social enterprises to deliver broadband projects locally. Local authorities and social enterprises can deliver innovative broadband solutions to communities and parts of Wales which do not currently have access to 30Mbit/s broadband speeds with the fund.

Activities that will be considered for funding include:

- the delivery of fast, reliable broadband to those part of Wales currently without access
- the creation of new broadband infrastructure including backhaul facilities
- upgrading existing broadband infrastructure

Alternative technologies

Many properties use a fibre based broadband connection but there are other ways available to connect to broadband. Some of these technologies include:

Fixed wireless connection: An antenna is used to pick up a broadband signal from a mast to deliver broadband to your property, eliminating the need for cable or phone lines.

Mobile/4G broadband solution: A broadband router can be installed to connect your property to broadband via a 4G mobile network. It doesn't mean using a mobile phone and you don't need cables or a phone line. An external antenna can be attached to the side of your property in areas where a 4G signal might not be strong indoors.

Satellite connection: A satellite transfers data to and from a dish attached to your property to bring you broadband.

Community broadband solution: This enables properties to fund a superfast broadband solution as part of a group project. Information about setting up a community broadband project can be found on our community led broadband page