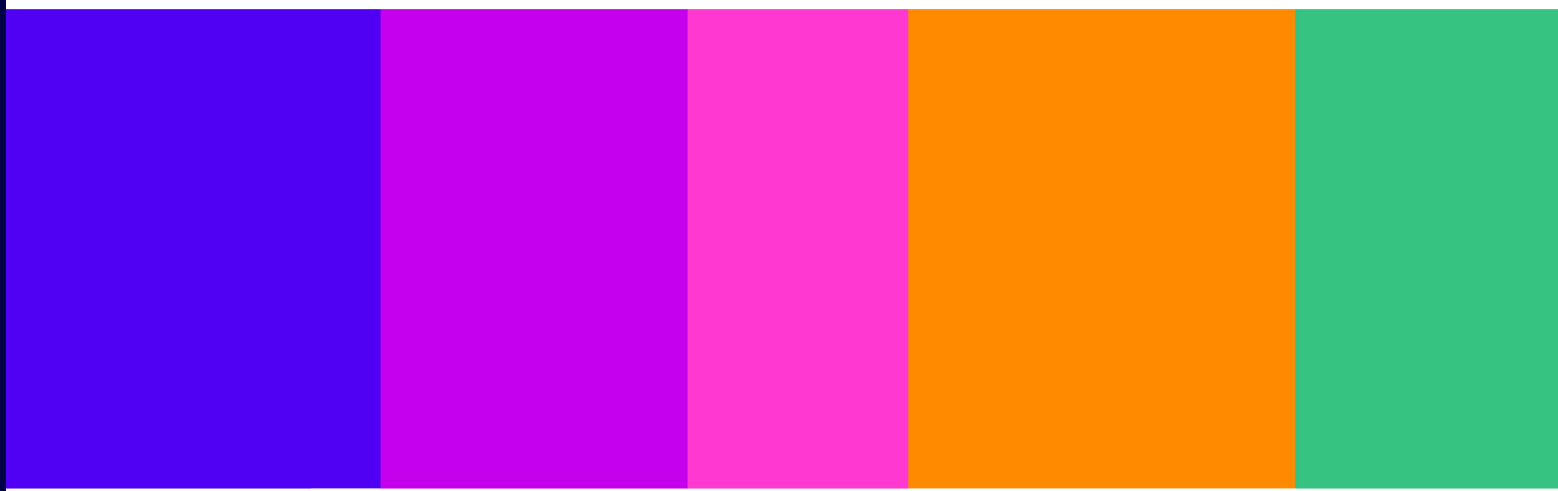


Connected Nations 2024

Methodology Annex

Published 5 December 2024



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A1 – Methodology

1. This annex explains our approach to obtaining and analysing information from operators for the purposes of our Connected Nations reporting.
2. The report uses data gathered from the providers in each sector (see Section A2), as well as information already held by Ofcom.

Calculating the ‘premise base’

3. This section explains how we identify, include, and categorise properties. In summary:
 - We use property information from the Ordnance Survey’s AddressBase® database including both Royal Mail postal addresses and additional property details from Local Authority sources. This ensures our ‘premise base’ is comprehensive and allows us to measure how network expansion is affecting all sections of the UK.
 - We consider the sub-properties within a building regardless of the number of postal delivery points serving them. This ensures our overall report, as well as our published maps and apps, better reflect coverage at individual premises across the UK and are consistent with coverage information from providers.
4. We use the AddressBase® Premium and Islands products to provide the base dataset used to assess broadband and mobile coverage for residential and commercial premises. For the annual Connected Nations 2024 report we used¹:
 - Epoch 111 for fixed broadband
 - Epoch 113 for mobile coverage
5. AddressBase® includes information about 44 million addresses, properties, and land areas where services are provided, by combining three datasets:
 - Local Government National Land and Property Gazetteer (NLPG)
 - Ordnance Survey MasterMap address layer
 - Royal Mail Postal Address File (PAF)
6. Each record in AddressBase® refers to a Basic Land and Property Unit (BLPU) and is defined in the British Standard for Addressing (BS7666) as “area of land in uniform property rights or, in the absence of such ownership evidence or where required for administration purposes, inferred from physical features, occupation or use”.
7. Each BLPU has a Unique Property Reference Number (UPRN), a spatial reference and one or more Land and Property Identifiers (LPI).
8. We combine AddressBase® data with additional geographic classifications from the ONS [National Statistics Postcode Lookup](#) (2021 Census May 2024 for fixed broadband and August 2024 for mobile coverage), and Urban and Rural categories derived from the [Locale classification](#) (see A1.72).

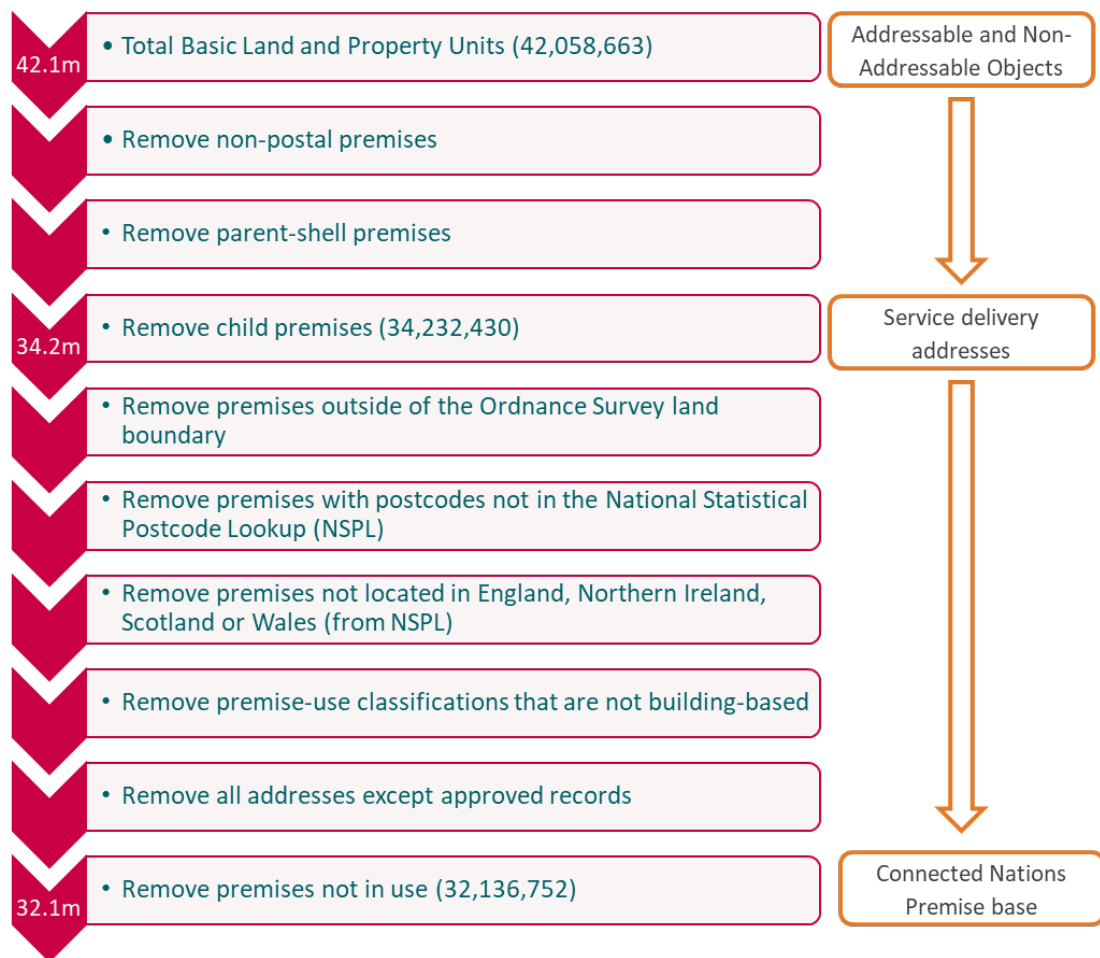
¹ <https://docs.os.uk/os-downloads/addressing-and-location/addressbase-core-principles/release-notes>

Method

9. Our approach to identifying the 'premise base' includes three stages:
 - Identifying 'Service delivery addresses': the address locations that are indicative of where a service would be provided.
 - Data cleansing: for use in reporting, the premise list is linked to other attributes to identify statistical or administrative geographic units, or rurality categories. Timing of data may impact on how many records may be linked.
 - Reporting definition: the inclusion of all records based on property classification or status may change dependent on the specific focus of a report.
10. A Service delivery address can be defined as a premises that:
 - Is able to receive mail either directly or indirectly (via a parent, sibling or holding address).
 - Is not a 'parent-shell' address.
 - Does not have a parent address OR parent address is classified as a 'parent-shell'.²
11. For the identification of all UPRNs that are considered valid for analysis the following source tables are used:
 - [AB BLPU Table] AddressBase® Basic Land and Parcel Unit Table
 - [AB Classification Table] AddressBase® Classification Table
 - [NSPL Postcode Table] National Statistics Postcode Lookup Table
12. Figure 1 shows the conceptual steps used to build the premise base.

² In the Methodology Annex of our [Connected Nations 2019 report](#) we provided a number of examples of how a Service delivery address is defined.

Figure 1: Conceptual steps to calculating the premise base (Epoch 111 counts)



13. The following SQL code is used to construct the premise base. A separate process is undertaken to link operator data to individual addresses.

```

SELECT
    * -- all fields
FROM
    [AB BLPU Table] b
    LEFT JOIN [NSPL Postcode Table] n ON UPPER(replace(b.postcode_locator, ' ', '')) =
    UPPER(n.postcode) -- join to NSPL on postcode
    LEFT JOIN [NSPL Country Table] nc using (ctry) -- join to the country lookup
    LEFT JOIN [AB Classification Table] c ON b.uprn = c.uprn --join to classifications on
    uprn
    LEFT JOIN [AB Classification Table] cp ON b.parent_uprn = cp.uprn --join to
    classifications on parent_uprn
WHERE
    b.addressbase_postal IN ('D','C','L') -- is an addressable object (postal address)
AND
    left(c.classification_code,1) != 'P' --not a parent shell
AND
    (
    b.parent_uprn is null --does not have a parent
    OR
  
```

```

        left(cp.classification_code,1) = 'P' --has a parent, but that parent is a parent-shell
    )
    AND
        b.country != 'J' --uprn is within Ordnance Survey Land Boundary
    AND
        n.postcode is not null --postcode exists in NSPL
    AND
        UPPER(nc.country_name) IN ('ENGLAND', 'NI', 'SCOTLAND', 'WALES') --UPRN in
    Eng,NI,Scot,Wal (excludes Channel Islands and Isle of Man)
    AND
        (
            left(c.classification_code,1)='C' -- Commercial
            OR left(c.classification_code,1)='R' -- Residential
            OR left(c.classification_code,1)='X' -- Dual Use
            OR left(c.classification_code,2)='ZS' -- Object of Interest->Stately Home
            OR left(c.classification_code,2)='ZW' -- Object of Interest->Place of Worship
            OR c.classification_code = 'OR04' -- Additional Mail / Packet Addressee
        )
    AND
        b.logical_status = 1 --approved addresses only
    AND
        (
            b.blpu_state IS NULL
            OR
            b.blpu_state = 2
        ) --in use premises

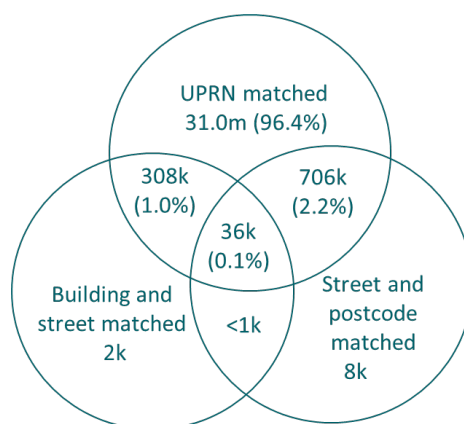
```

Data matching for fixed coverage

14. The availability of address-level data allows us to create a comprehensive data set describing the characteristics of all available services and operators present at premises across the UK. Many providers include a UPRN, a common identifier available for use in the UK. Other providers give address information that needs to be processed and linked to our premise base.
15. For Connected Nations 2024 we received over 116 million records on fixed broadband availability at individual premises. Almost all premises (99.7%) in our uniquely identified premise base, which forms the basis of our reporting on fixed coverage, could be matched to at least one operator using the UPRN or building address reference.
16. Our approach to address matching involves comparing records using:
 - Direct matches based on the UPRN hierarchy.
 - Confident matches using addresses that have an identified building number or name, street address and postcode.
 - Approximate matches using addresses that have a street address and postcode.
17. Figure 2 shows that nearly 31 million premises (96.4%) were matched to operator records using only the UPRN. Some premises were matched to multiple records using different methods, but

99.7% of the premise base could be matched against at least one record using the UPRN. Just over 11,000 premises were matched using address information only.

Figure 2: Address matching of fixed network operator records to the July 2024 premise base



18. Of the remaining 103,000 (0.3%) of premises not initially matched by UPRN or building address information, nearly 17,000 could be subsequently linked to a property via the UPRN parent-child relationship, leaving a net total of 86,000 premises in the July 2024 premise base where no confident match could be used.
19. Across the 116 million records received from all fixed network operators, 152,000 records (0.13%) could only be matched to a postcode and 12,000 could not be assigned to any geographic location. These records have not been used in our analysis.
20. As the number of used records is small, and operator overlaps reduce the number of premises for which no information is available to 0.3% of the premise base, we have not used any postcode-based estimates to ensure that we are reporting as accurately as possible at the address level.

Fixed broadband networks

Coverage

21. Our data on fixed coverage was collected from 55 network providers (see the list in Section A2). Operators were asked to submit data for each address where a service was provided or available to be provided, with a reference date of 1 July 2024.
22. Fixed broadband availability is calculated against the Connected Nations premise base discussed above. The premise base for July 2024 consists of 32.1 million premises, of which 30.1 million are classified as residential, and was derived from the AddressBase® Premium and Islands Epoch 111 products.
23. The AddressBase® data was combined with additional geographic classifications from the ONS 2021 Census National Statistics Postcode Lookup from May 2024, and Urban and Rural categories derived from the Locale classification (see A1.72).
24. In our reporting on fixed broadband coverage, we normally focus on coverage figures for residential properties. We will also highlight distinctions between residential and commercial premises where appropriate.

Calculating availability

25. Each operator provides information on the technology available together with predictions of download and upload speeds. After the address matching process, these characteristics are assigned to each premise to enable further analysis to be undertaken. For coverage we use the maximum predicted download speed available at a premise to determine in which broadband speed category a premise is represented:
 - Since the first Connected Nations report in 2011, we have tracked the progress of superfast broadband rollout. We use 30 Mbit/s download speeds as the threshold for defining superfast services.
 - Since 2021 we have reported on the availability of gigabit-capable networks, which can deliver download speeds of 1 Gbit/s.
26. We also monitor the proportion of premises that do not have access to a decent broadband service, defined as a service capable of delivering a download speed of at least 10 Mbit/s and an upload speed of 1 Mbit/s. Our reporting includes premises that could not be matched to any operator record.
27. For full fibre availability, providers were asked to only include a property if
 - fibre is deployed in close proximity, so only a dedicated fibre connection to the property would be necessary to provide (end-to-end) fibre connectivity, and
 - the end user would expect to pay only a published pre-agreed connection charge, if one was to be imposed.

Coverage for business enterprises

28. Where we report on the availability of broadband services for small and medium enterprises (SMEs), we have used an address match process to link our Connected Nations premise base to a business classification system, the Dun and Bradstreet Business Universe. This data set provides 3.7 million records across classes of business, including agricultural, construction, financial, food, clothing, footwear, hotels, restaurants, pubs, local service, manufacturer, recreation, cultural, sporting activity, transport, motor, fuel, and wholesale business locations. The data set is used subject to the following attributions:
 - © Dun & Bradstreet Inc., 2024. All Rights Reserved
 - © Crown copyright. All rights reserved. Licence number 10002057
 - © CACI 2024
29. We linked 2.9 million (80%) records from this data set using building, or street, and postcode identification to records in the AddressBase® Premium and Islands Epoch 111 products to identify the Unique Property Reference Number (UPRN) for each business record. A further 570,000 (16%) could only be matched to postcodes, and 150,000 (4%) records could not be matched.
30. Due to the reliance on building, or street, and postcode identification, there is ambiguity in the matching process. We undertook further analysis to remove business records where we were not confident in the matching result. Finally, we constrained the analysis to the 2.2 million records that were within our Connected Nations premise base.
31. The definition of small and medium enterprises is based on the number of employees at the specific site. The categories of SME are:
 - Micro: Sole trader or fewer than 10 employees.

- Small: 10 to fewer than 50 employees.
- Medium: 50 to fewer than 250 employees.

32. It should be noted that for Connected Nations we only collect data on the availability of broadband products. Many businesses, particularly medium-sized ones, will be able to get good connectivity via dedicated leased lines, which are not included in our coverage data.

Take-up of fixed broadband services, line speeds, and data usage

33. We collected data from 60 fixed network and internet service providers (ISPs) on their active lines, i.e. connections that provide an active broadband service to residential or business customers, as a snapshot for July 2024. We asked for information per connection, including upload and download speeds, for both retail services and services provided to other ISPs as a wholesale service.

Estimating take-up

34. Take-up is estimated from the reported active lines against the coverage data from July 2024 to ensure consistency. Table 2.5 in the main Connected Nations report was derived from examining all premises with a full-fibre broadband service in July and identifying when full fibre was first reported to us as being available to the property.

35. For superfast take-up we included all lines where the maximum reported speed was at least 30 Mbit/s.

Measured line speeds

36. We asked providers to submit the maximum download and upload speed recorded on each line and, for all technologies other than full fibre, the average download and upload speed as well. Speeds could be as measured or, when no measurements were available, as configured for the broadband service.

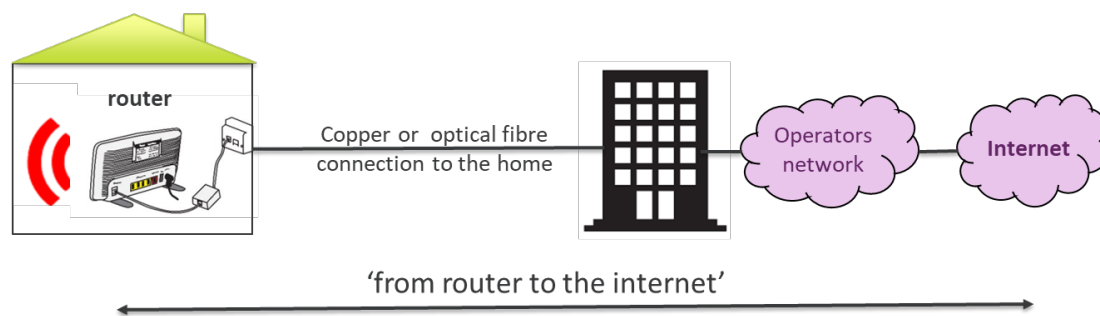
37. For consistency across technologies, our analysis of active broadband speeds is based on the per-line maximum download and upload as reported by the ISPs. Note that previous reports used average line speeds, hence those figures are not directly comparable with the ones provided this year.

38. Only lines that could be assigned to a geographic location at postcode level and with a reported speed greater than zero were used in the analysis. These criteria were met by 12.8 million records out of c.27 million lines reported to us. Calculation of average speeds uses the data meeting the criteria, which is then weighted to reflect the actual number of active lines (as reported).

Time of day speed measurements

39. Our reporting on time of day download and upload speeds is based on March 2024 anonymised 'embedded' data provided by the UK's four largest broadband providers. BT, Sky, TalkTalk and Virgin Media O2 have test firmware embedded into some of their customers' routers which is used to provide the data.

40. Our analysis uses the speeds measured by the ISPs 'from router to internet' (see diagram below). Test data is sent from the router to and through the operators backhaul and core network, and on to a test server (computer) located in the internet. This allows speed measurements to be made and recorded for different times of the day.



41. In practice, speeds as experienced by the customer may be slower than the 'router to internet' measured speeds due to other limitations such as a device's capabilities (mobile phone, PC), performance of connections to the router within the home (Wifi or in-house wiring), the application being used, or capacity limitations at the application service provider (such as a streaming service).
42. Only panellists who provided a minimum of five valid measurements across the month within the peak time of 8pm to 10pm for both download and upload speeds were included. There were around 430,000 customers with valid results used in the analysis to measure the mean maximum download and upload speeds across 24 hours and the peak time of 8pm to 10pm. A trimmed mean was used because, for a small proportion of respondents, the occasional test result was far more than what was achievable on the line. The top and bottom 1% of results per respondents did not count towards the average.
43. We have used statistical techniques to adjust our results to ensure that they are representative of the overall UK broadband population. This includes weighting the results from our panel by geographic market definition, technology, and broadband provider. Testing principles included ensuring that the tests did not form part of a user's data allowance or interfere with traffic as to impact the performance experienced by the user.

Data usage

44. Our estimates of the average monthly data usage per customer connection (across all technologies and for full fibre only) are based on aggregated data traffic measured at the Optical Line Terminal (OLT) or headend. In addition to the volumes of data uploaded and downloaded over July 2024, we gathered information on the number of connected lines for each OLT or headend to derive the average usage per connection.
45. Until last year we collected data usage on a per line basis, hence the monthly averages reported this year are not directly comparable with those in previous reports.
46. We also asked the providers for the location of their OLTs/headends. Our estimates of average data usage at nation and local authority level are derived from the data usage measured at the OLTs/headends in the location.

Fixed Wireless Access

47. Fixed Wireless Access (FWA) services can be provided on a mobile network by Mobile Network Operators (MNOs), where the capacity is shared with mobile users, or on a dedicated wireless network by Wireless Internet Service Providers (WISPs).
48. We asked both MNOs and WISPs for a list of the properties that could be served with FWA by their network without the installation of new access points, and to specify whether this service is

at least a decent broadband service. An explanation of the use of FWA to deliver a decent broadband service is available in our [statement on Delivering the Broadband Universal Service](#).

49. Our analysis of FWA coverage uses data based on the providers' modelling of their network as of May 2024. The MNOs and WISPs included in our analysis are listed in the section on Data collection.
50. The data from both MNOs and WISPs was matched against the same premise base used for fixed broadband coverage.

Satellite coverage

51. Our analysis of the satellite coverage in the UK is currently limited to a single provider that offers Low Earth Orbit (LEO) satellite broadband services directly to the consumer.
52. LEO satellite constellations have the capacity to deliver coverage and broadband services to all parts of the UK. We have focused our analysis on the take-up of these services and their geographic distribution.
53. We have mapped geographical coordinates of customer premise equipment (latitude and longitude) to the nearest UPRN and compared these locations against other network technologies that are available at those locations.

Fixed voice services

54. We also gathered supplemental data from seven of the largest providers of fixed voice services to assess changes to the take-up and delivery of these services in the last year.
55. We asked the providers to share a breakdown of the technology used to delivery voice services to residential customers with a collection date of 30 June 2024.
56. We also asked about the number of residential customers that migrated from a PSTN-based voice service to a Voice over Broadband service in the 12 months up to the collection date, and the number of customers that had moved to a broadband-only service during the same period.
57. Finally, we asked for a breakdown of the number of residential customers that had taken a Voice over Broadband service with respect to those that were new customers to the provider, existing customers that had initiated the change (for example, through a service or package upgrade) and those for which that the change was initiated by the provider.

Mobile

Coverage

58. Our data on the coverage of mobile networks was collected from the four mobile network operators (BT/EE, Three, Virgin Media O2 and Vodafone) as 100m x 100m pixels referenced against the Ordnance Survey Great Britain (OSGB) grid system.³ Coverage for all networks was as of 1 September 2024.

³ <https://www.ordnancesurvey.co.uk/documents/resources/guide-coordinate-systems-great-britain.pdf>

59. Premises coverage is calculated against the Connected Nations premise base for September 2024, derived from AddressBase® Premium and Islands Epoch 113 as discussed at the beginning of this section.
60. AddressBase® data was combined with additional geographic classifications from the ONS 2021 Census National Statistics Postcode Lookup from August 2024, and Urban and Rural categories derived from the Locale classification (see A1.72).
61. Roads' data is taken from [Ordnance Survey](#) and Northern Ireland Land & Property Services open data sources.
62. We apply technology-specific thresholds to each of 100m x 100m pixels to determine whether a sufficiently strong signal is available to successfully make a phone call or send or receive data. These pixels are aggregated to provide an estimate of either the landmass or the number of premises that are covered by the corresponding mobile technology.
63. In 2018 measurement work was undertaken by Ofcom to identify the minimum coverage level (the technology-specific threshold) required to deliver a good quality of experience to consumers on the 4G network. We also identified minimum coverage levels for 2G and 3G networks, which allows us to present a consistent view of coverage on all these networks to consumers.
64. For 2G, 3G and 4G networks, we define coverage based on the minimum signal strength required to at a minimum deliver a 98% probability of making a 90-second voice call successfully. In the case of 4G specifically, our definition also delivers a 95% chance of getting a download speed of at least 2 Mbit/s. We use the signal strength thresholds shown in Table 1 when estimating coverage.

Table 1: Mobile strength thresholds

Service	Metric ⁴	Outdoor	Indoor and in-car ⁵
2G	RxLev	-81dBm	-71dBm
3G	RSCP CPiCH	-100dBm	-90dBm
4G	RSRP	-105dBm	-95dBm
Voice	2G	RxLev	-81dBm
	3G	RSCP CPiCH	-100dBm
	4G	RSRP	-105dBm
Data	3G	RSCP CPiCH	-100dBm

⁴ **RxLev**: the Received Signal Level in 2G networks.

RSCP CPiCH: the Received Signal Code Power on the primary Common Pilot Channel for 3G networks.

RSRP: the Reference Signal Received Power in 4G networks.

SS-RSRP: the Synchronization Signal reference signal received power in 5G networks.

⁵ Ofcom determines indoor coverage by applying an average building entry loss of 10dB across buildings. We acknowledge this approach provides only a simplified view of indoor coverage and that the real experience depends heavily on the types of building material and insulation in a specific building.

Service		Metric ⁴	Outdoor	Indoor and in-car ⁵
	4G	RSRP	-115dBm	-105dBm
5G high confidence		SS-RSRP	-110dBm	N/A
5G very high confidence		SS-RSRP	-100dbm	N/A

65. For 5G networks, we define availability of coverage based on the minimum signal strength (SS-RSRP) required for devices to establish a reliable 5G connection. This definition supports a reporting framework suitable for different variants of 5G in low, mid, and high frequency bands, without inferring a typical service or performance (although where a reliable connection is established, we would expect core data services to be supported, subject to available capacity).
66. We provide a view of outdoor 5G coverage availability across a range that provides increasing confidence of a reliable 5G connection, from high confidence (where a signal strength of -110dBm or better is predicted) to very high confidence (where a signal strength of -100dBm or better is predicted). We associate the High Confidence level with at least an 80% probability of coverage being present in the predicted location, and the Very High Confidence level with a probability of around 95%.
67. Noting that operators supply predictions to Ofcom based on a 50% confidence level across a pixel, to establish these higher confidence levels we have worked back from the on-the-ground thresholds typically used as the limit for maintaining a 5G connection. We have then accounted for the overall effectiveness of operators' 5G predictions (prediction error statistics) and local level variability, as well factoring in the differences between handset performance. The consequential combined standard deviation across these effects (which we have taken to be in the region of 12dB), enabled us to establish signal strengths at which predictions supplied to us on a 50% reliability basis from a reasonable prediction model were likely to align with high confidence (-110dBm @80%) and very high confidence (-100dBm @95%) of coverage in a given location.

Mobile prediction models

68. 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.
69. 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.
70. We are aware that operators continue to work on refining their predictions and Ofcom will continue to engage and encourage operators to focus on an approach that provides consumers with confidence in coverage being reliably available where it is predicted.

Mobile data traffic

71. This data was collected in July 2024 and included information on the data volumes uploaded and downloaded in each mobile cell in these networks. The geography of data traffic is defined by the location of the associated mobile cell base station.

Urban and rural classifications

72. We have used the [Locale classification](#) to identify premises as being in an urban or rural area. Locale is a third-party data source based on the analysis of census output areas. Each output area is assigned to one of seven Locale Groups using a combination of Government conurbation definitions, population density at the output area and postcode sector levels, urban sprawl boundaries, OS roadmaps and additional visual inspection.

73. We assign the Locale classifications to either Urban or Rural as follows:

- Urban: Groups A to E
- Rural: Groups F and G

74. For fixed broadband analysis, every premises is assigned to an output area via its postcode. For mobile analysis, each pixel is assigned to an output area through a spatial comparison of the pixel OSGB⁶ coordinates to the corresponding output area polygon. The Locale urban and rural classification is then matched to these records via the output area.

Geographic boundary changes

75. Our analysis and reports use the new Westminster constituency boundaries introduced at the 2024 UK general election.⁷ The number of constituencies has remained the same at 650, but only around 10% of constituencies had no change to their boundaries. Hence for most constituencies the 2024 Connected Nations data cannot be compared with previous years.

76. We also use the 2023 Local Authority boundaries for the first time. The 2023 changes affected 19 Local Authorities in England, which were replaced by four new ones (Cumberland, Westmorland and Furness, North Yorkshire, and Somerset).⁸ This reduced the number of Local Authorities in England from 309 to 296 and the UK total from 374 to 361. The number (and boundaries) of Local Authorities in the other nations remained the same: 11 in Northern Ireland, 32 in Scotland, and 18 in Wales.

⁶ **OSBG:** Ordnance Survey Great Britain – see <https://www.ordnancesurvey.co.uk/documents/resources/guide-coordinate-systems-great-britain.pdf>

⁷ <https://www.parliament.uk/about/how/elections-and-voting/constituencies/>

⁸ <https://blog.planningportal.co.uk/2023/03/24/local-authority-changes-from-1-april-2023/>

A2 – Data collection from providers

Ofcom requested data from communication providers using our powers under section 135 of the Communications Act 2003 and Regulation 17 of the Statutory Instrument 2016/607.

Under section 134A of the [Act](#), Ofcom is required to prepare a report for “each relevant period” as defined in section 134A(4) of the Act; the matters on which we need to report are listed in section 134B of the Act.

Fixed network operators and service providers

The data for fixed networks and fixed broadband and voice services was obtained, or continued to be used, from the following providers:

- 1310
- 4th Utility
- Airband
- AllPoints Fibre
- Ask4
- Atlas Communications
- B4RN
- Bogons
- Box Broadband
- Brsk
- BT
- CityFibre
- Community Fibre
- Connect Fibre
- Connexin
- Country Connect
- County Broadband
- F&W Networks
- FibreNest
- FibreSpeed
- Fibrus
- Freedom Fibre
- Full Fibre
- Fusion Fibre Group
- G.Network
- Gigaclear
- Glide Business
- GoFibre
- Grayshott Gigabit
- Hampshire Broadband
- Hyperoptic
- ITS Technology Group
- KCOM
- LightSpeed
- Lothian Broadband Networks
- MS3
- Michaelston y Fedw Internet
- Netomnia
- nexfibre
- OFNL
- Ogi
- Openreach
- Orbital Net
- Quickline Communications
- Sky
- TalkTalk Communications
- TalkTalk Telecom
- Technological Services
- Telcom Infrastructure
- toob
- Trooli
- Truespeed
- Virgin Media O2
- Vodafone
- Voneus
- Wessex Internet
- WightFibre
- Wildanet
- York Data Services
- Zen
- Zzoomm

Fixed wireless access operators

The data for fixed wireless access networks was obtained, or continued to be used, from the following providers:

Wireless internet service providers

- Airband
- Connexin
- County Broadband
- Cromarty Firth Wireless
- Fram Broadband
- GoFibre
- Highland Community Broadband
- Highland Wireless & IT Solutions
- InTouch Systems
- IX Wireless
- Kencomp
- Lothian Broadband Networks
- Net1
- Orbital Net
- Quickline Communications (including Boundless Networks)
- Stix Internet
- Voneus
- Wifi Scotland
- WildaNet

WISPs are removed from the list if we do not get new data or confirmation that previous data remains unchanged.

Mobile network operators

- BT/EE
- Three

Satellite providers

- Starlink

Mobile network operators

The following mobile network operators supplied data for use in this report:

- BT/EE
- Three
- Virgin Media O2
- Vodafone

A3 – Glossary

2G: Second generation of mobile telephony systems and the first digital mobile technology, launched in the UK in 1992. Uses digital transmission to support voice, very low-speed data communications, and short messaging services.

3G: Third generation of mobile systems, launched in the UK in 2003. Provides low-speed data transmission and supports multi-media applications such as video, audio and internet access, alongside conventional voice services.

4G: Fourth generation of mobile systems, launched in the UK in 2012. It is designed to provide faster data download and upload speeds on mobile networks and can also support VoIP services.

5G: Fifth generation of mobile technology standards, launched in the UK in 2020 and used to deliver higher speed data services.

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'.

All roads: Motorways, A and B roads.

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.

Data (mobile): The combination of 3G with lower speed 4G data services where either are likely to provide a connection speed of at least 200 kbit/s for nearly all connections. These connections are likely to be sufficient to support lower speed data services such as web-browsing, as opposed to higher resolution video.

Decent broadband over a fixed or fixed wireless connection: A data service that provides download speeds of at least 10 Mbit/s and upload speeds of at least 1 Mbit/s.

Fibre to the cabinet (FTTC): A fixed access network technology that consists of a fibre optic cable from the exchange to a street cabinet, with copper cables used to connect the cabinet to the premises.

Fixed wireless access (FWA): A fixed broadband access technology that supports broadband services via a wireless network – either via a mobile network operator (MNOs) or wireless internet service provider (WISP).

Full fibre, also known as fibre to the premises (FTTP): A fixed access network technology that consists of a fibre optic cable from the exchange to the end user's home or office.

Gigabit capable: Broadband services that can deliver 1 Gbit/s download speeds.

Hybrid fibre coaxial (HFC) cable: A fixed access network technology that consists of a fibre optic cable to a street cabinet and coaxial cable from the street cabinet to the premises.

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

Low Earth Orbit (LEO) satellites: satellite constellations that orbit at below 2,000 km and deliver satellite communications services, including lower latency broadband.

Major roads: Motorways and A Roads.

Mobile network operator (MNO): A provider which owns a cellular mobile network.

Mobile not-spot: An area which is not covered by mobile networks.

Public Switched Telephone Network (PSTN): the UK's legacy landline network.

Superfast broadband: A data service or connection that can deliver download speeds of at least 30 Mbit/s.

Voice (mobile): Mobile voice services that are managed by the mobile network (as opposed to a third-party voice App on a handset). The criteria for the availability of mobile voice services are given in Table 1 in the Methodology section (A1.64).

VoBB (Voice over Broadband) A technology that allows users to make and receive calls using internet protocol, for which the quality of service is managed by the broadband provider.

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 (e.g. VoBB).

Wholesale services: Products and services made available to third party communications providers on a wholesale basis and which act as inputs to their Services.

Wireless Internet Service Provider (WISP): Broadband service providers using a wireless link between a provider's mast site and an external antenna fixed to a customer's premise. These are dedicated networks for broadband customers only. These networks mostly use spectrum under licence exemption or light licence authorisation.