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for everyone

Connected Nations 2019

Annex A: Methodology

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Contents

Annex

A1. Methodology

A1.1 This annex explains our approach to obtaining and analysing information from operators for the purposes of our Connected Nations report.

A1.2 The report uses data gathered from the communication operators in each sector, as well as information already held by Ofcom.

Calculating the 'premise base'

A1.3 This section explains how we are improving the way 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, from this point on, additional property details from Local Authority sources. This ensures our 'premises base' is comprehensive and allows us to measure how network expansion is affecting all sections of the UK
- We now 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 provided by operators
- In the report we will normally focus on coverage figures for residential properties as this provides closer comparison to previous reports. We will also highlight distinctions between residential and commercial premises where appropriate.

A1.4 The AddressBase data set used in the annual Connected Nations report for 2019 is Epoch 70 released in Sept 2019 and the AddressBase Islands product released on 10 Sept 2019. The latest source data currency for both products is August 2019.

A1.5 Since the last full Connected Nations report in December 2018, we have provided two additional updates, which used:

- OS AddressBase® Premium and Islands October 2018, Epoch 62 for the Spring Update[1]
- OS AddressBase® Premium and Islands May 2019, Epoch 67 for the Summer Update[2]

A1.6 Ofcom uses the Ordnance Survey AddressBase® Premium product to provide the base dataset used to assess broadband coverage for residential and commercial premises.

A1.7 AddressBase® includes information about 44million addresses, properties and land areas where services are provided, by combining 3 datasets:

- Local Government National Land and Property Gazetteer (NLPG),
- Ordnance Survey MasterMap address layer, and

[1] https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-update-spring-2019
[2] https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-update-summer-2019

- Royal Mail Postal Address File (PAF).

A1.8 Each record in AddressBase® refers to a Basic Land and Property Unit (BLPU) and is defined in the British Standard for Addressing (BS7666) as an:

- 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

A1.9 Each BLPU has a Unique Property Reference Number (UPRN), a spatial reference and one or more Land and Property Identifiers (LPI).

Method

A1.10 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

A1.11 A Service delivery address can be defined as a premise 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".

A1.12 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 (BLPU) Table
- [AB Classification Table] AddressBase® Classification Table
- [NSPL Postcode Table] National Statistics Postcode Lookup table at the postcode level[3]

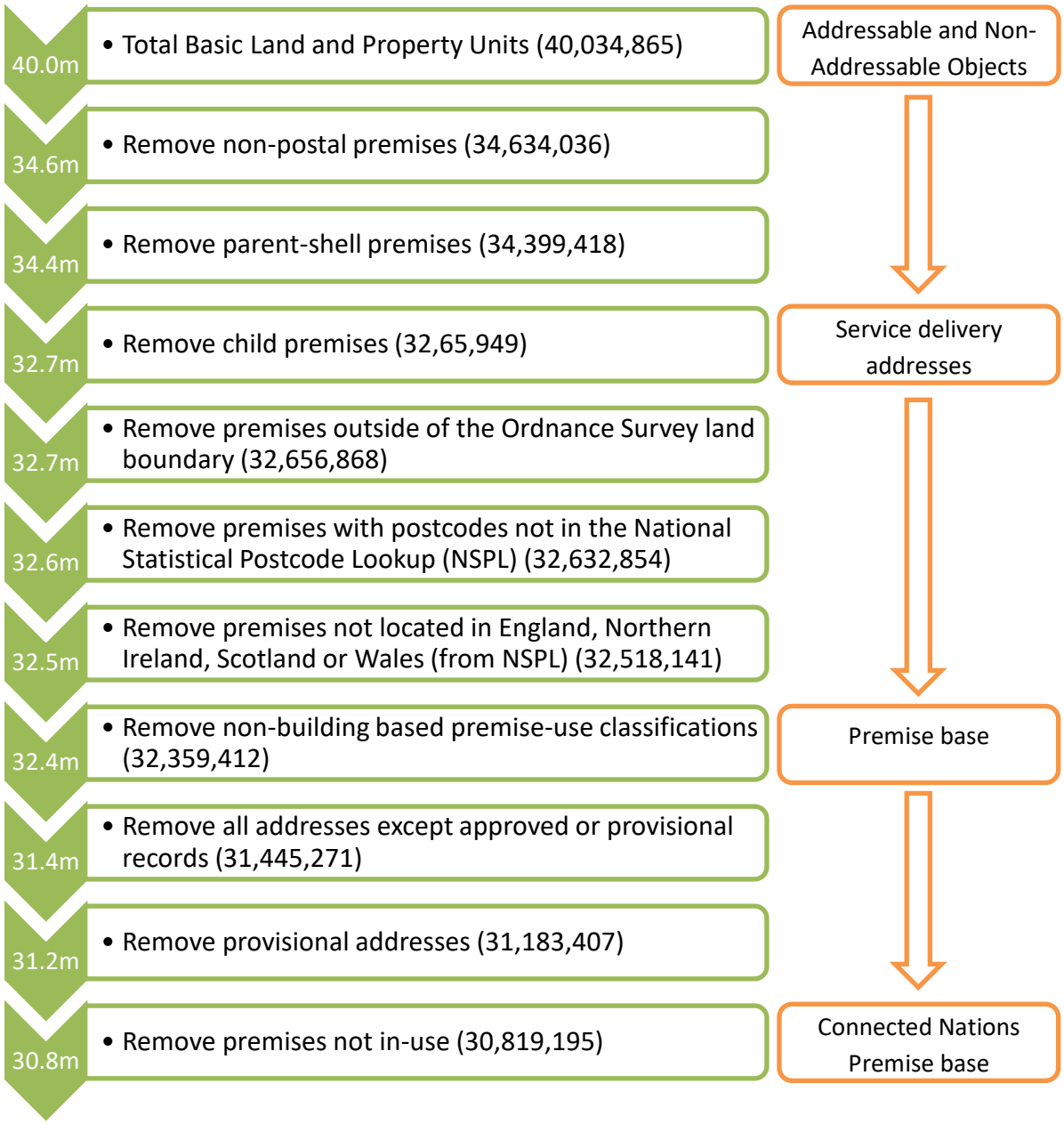
A1.13 The following SQL code is used to construct the premise base. A separate process is undertaken to link operator data to individual addresses.

```
SELECT
	count (*)
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
```

[3] https://geoportal.statistics.gov.uk/search?collection=Dataset&sort=name&tags=PRD_NSPL

```
	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,Sco,NI,Wal (excludes Channel Isl, IoM)
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 IN ( 1, 6) --approved or provisional addresses only
AND
	b.logical_status = 1 --approved addresses only
AND
	(
	b.blpu_state IS NULL
	OR
	b.blpu_state = 2
	) --in use premises
```

Figure 1: Premise base definition with AddressBase® Epoch 70 counts



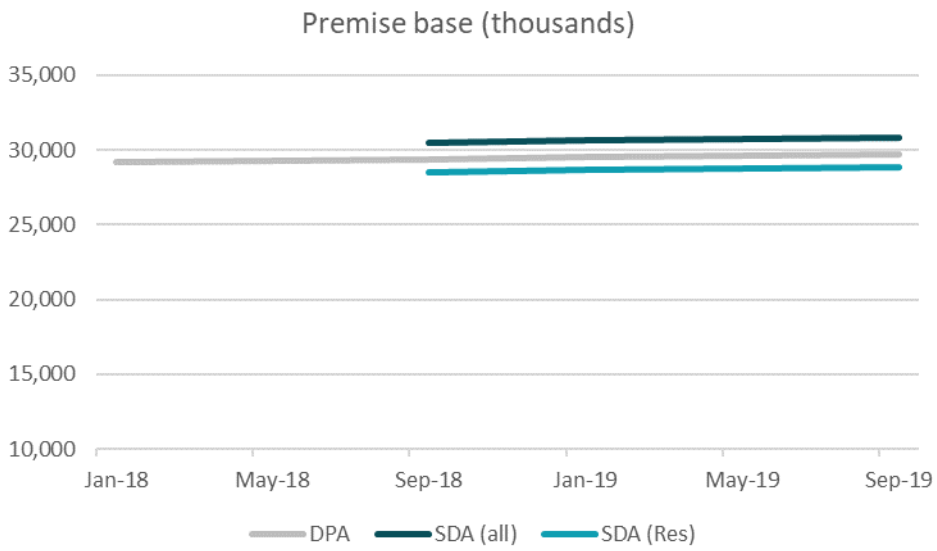
Comparison to previous approach

A1.14 Previously for this report Ofcom identified premises based on delivery point addresses and by excluding PO boxes and large organisations. The inclusion of records from Local Land and Property Gazetteers results in a more comprehensive list of addresses that enables improved data matching to operator data and provides a wider basis for the assessment of broadband deployment for both residential and commercial entities.

A1.15 The change to the 'premise base' for Epoch 70 leads to an increase in properties identified from 29.7m to 30.8m. Whilst more records are included in the 'premise base' these records continue to be matched to operator data.

A1.16 Figure 2 shows the change in volumes between the previous approach; the Delivery Point Address (DPA), and the current approach; the Service Delivery Address (SDA). This is also differentiated by All premises (all) and Residential (Res) only premises.

Figure 2: Change in premise base volume



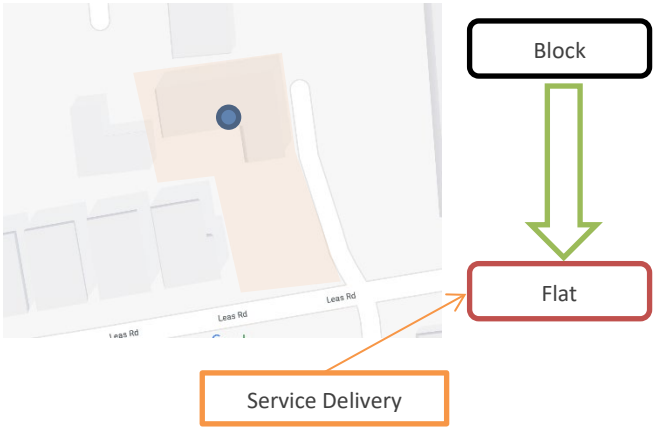
A1.17 There were three primary reasons to adopt this change:

- The use of address level data in a wide range of outputs requires a comprehensive address list. Reliance on only delivery point addresses resulted in some omissions where address information did not exist in the Royal Mail Postcode Address File, but Local Land and Property gazetteers did
- The use of the Royal Mail Postcode Address File also led to the suppression of individual units within larger complexes, as well as the duplication of sites. The new approach ensures that all locations where a broadband service may be delivered are represented
- The exclusion of large organisations using the postcode type removed businesses that are 'large volume mail users' but does not remove all large organisations. The increasing focus on industrial connectivity means that it is now appropriate to incorporate all locations where a broadband service may be delivered.

Examples

A1.18 The following present scenarios of how the Service Delivery Address method is applied to AddressBase®.

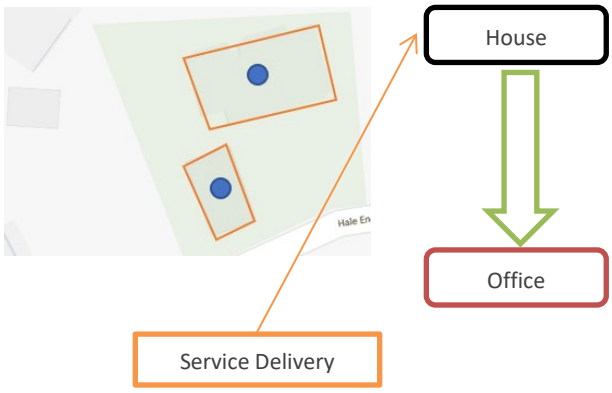
Flats where each flat receives mail via individual post-boxes (e.g. within a communal entrance)



A1.19 In this example the block is simply a "shell" for the flats within. It does not represent a household or business that a service would be provided to. Each of the flats would be classed as SDAs and be included in the premise count, but the parent-shell (block) would be excluded. It assumes the following characteristics in AddressBase®:

- The block will have a UPRN
- Each of the flats within the block will have a UPRN
- The UPRN for the block will not have a parent UPRN
- The UPRN for each flat will list the block's UPRN as its parent UPRN
- The block will be flagged as a 'parent-shell' indicating that it is acting solely as a container for the UPRNs within it
- The block will be flagged as a "non-addressable" object.

A house with an external office next to the property and without a letterbox or separate entrance

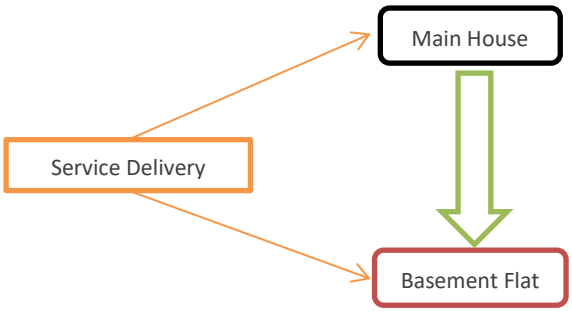


A1.20 In this example, the office has a parent that is addressable, and that parent is not a "parent-shell" so the office is excluded from the premise count, but the house is a Service

Delivery Address and should be included in the premise count. The office is treated as if it is a room within the house. It assumes the following characteristics in AddressBase®:

- The house will have a UPRN
- The office will have a UPRN
- The UPRN for the house will not have a parent UPRN
- The UPRN for the office will list the house's UPRN as its parent UPRN
- The office is an addressable child of the house, occupying a space within the curtilage of the property
- The office will receive mail via its parent (the house).

A basement flat with a separate letterbox and separate entrance



A1.21 In this example, the basement flat and the main house are both Service Delivery Addresses, counted as separate records in the premise base. It assumes the following characteristics in AddressBase®:

- The main house will have a UPRN
- The basement flat will have a UPRN
- The UPRN for the house will not have a parent UPRN
- The UPRN for the basement flat will not have a parent UPRN
- The basement flat and the main house may occupy space within the same curtilage, but they are each treated as separate entities
- The basement flat receives mail separately to its parent.

Data matching

A1.22 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 operators provided a unique property reference number (UPRN), a common identifier available for use in the UK. Other operators provided address information that would need to be processed and linked to our premise base. Over 88 million records were received from operators and 99.8% of our uniquely identified premise base was matched to at least one operator using the UPRN or building address reference.

A1.23 Our approach to address matching involves comparing records using:

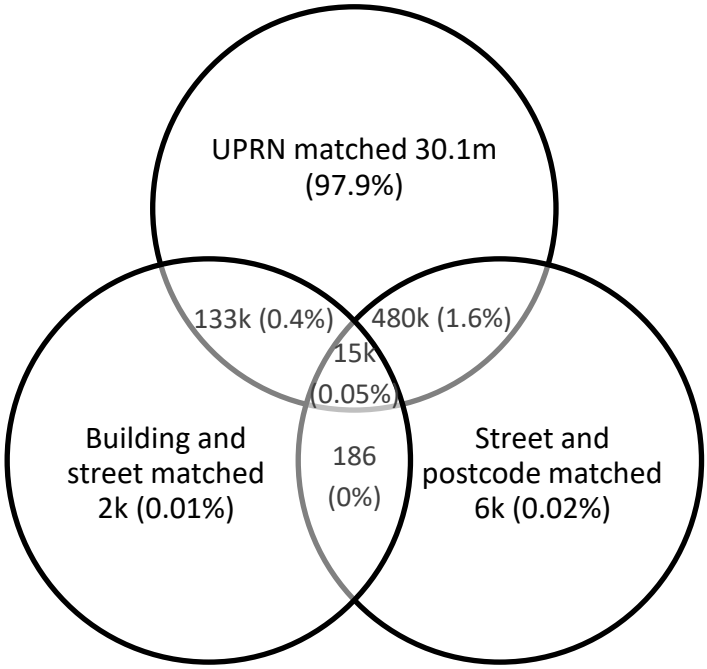
a) Direct matches based on the UPRN hierarchy

b) Confident matches using addresses that have an identified building number or name, a street address and postcode

c) Approximate matches using addresses that have a street address and postcode.

A1.24 Figure 3 shows that the 30.1m premises (97.9%) were matched to operators using the UPRN. Some premises were matched using different methods for each operator, but the UPRN was the basis for matching 30.25m premises overall. Only 8,300 premises (0.03%) were matched using address information only.

Figure 3: Address match results to the premise base from all operators



A1.25 Of the remaining 77,000 (0.2%) of premises not matched by UPRN or building address information 73,000 were in a postcode where other addresses had been matched.

Postcode estimates

A1.26 In previous reports Ofcom used a postcode estimate across operators to account for address matching and data set version and timing issues. Improvements in operator address information has removed many, but not all, mis-matches.

A1.27 Across the 88m records received from all operators, just over 45,000 (0.1%) could not be assigned to a geographic location and 140,000 records (0.2%) could only be matched to a postcode.

A1.28 As the number of non-used records is a small volume, and operator overlaps reduce the number of premises for which no information is available, for this report we have removed all postcode estimate results to ensure that we are reporting as accurately as possible at the address level.

Fixed broadband networks

Coverage

A1.29 Our data on coverage of fixed broadband services is collected from a number of operators (see A3 fixed network providers). In 2019 operators were asked to provide data for each address where a service was provided. This was provided with a reference date of 1 September 2019.

A1.30 For the overall coverage of fixed broadband we have identified the number of UK properties, our 'premise base'. For September 2019 we have used a premise base of 30.8 million.

A1.31 We use premises data from the Ordnance Survey (OS) AddressBase® Premium dataset[4] (August 2019, Epoch 70) and the OS AddressBase® Islands dataset[4] (August 2019, Epoch 70). This is combined with additional geographic classifications from the ONS National Statistics Postcode Lookup (NSPL)[5] (August 2019) and Urban and Rural categories derived from the Locale classification.[6]

Calculating availability

A1.32 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 detailed analysis to be undertaken. We apply thresholds in our analysis to investigate different patterns of provision. For coverage we have used the maximum predicted download speed available at a premise to determine in which broadband category a premise is represented.

A1.33 Since the first Connected Nations report in 2011, we have tracked the progress of superfast broadband roll-out. We use 30 Mbit/s download speeds as the threshold for defining superfast services. We use the term 'Ultrafast' for services offering download speeds of 300Mbit/s or higher.

A1.34 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 10Mbit/s and an upload speed of 1Mbit/s. In this report we include all unmatched and unclassified premises when assessing their access to a broadband service.

Historic changes

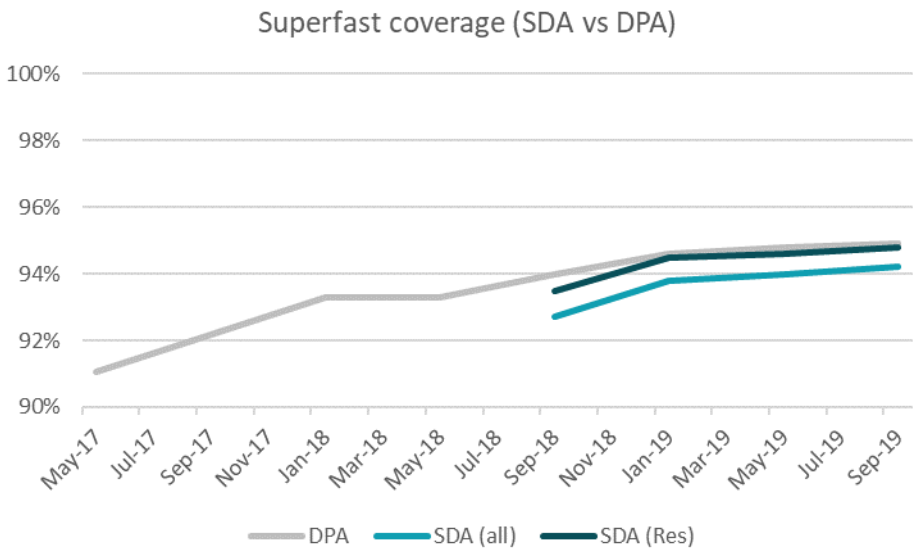
A1.35 The combination of changes to the premise base definition and not using postcode estimates leads to a restatement of broadband availability coverage results at the aggregated level.

[4] https://www.ordnancesurvey.co.uk/business-and-government/products/addressbase-products.html
[5] http://www.ons.gov.uk/ons/guide-method/geography/products/postcode-directories/-nspp-/index.html
[6] http://www.bluewavegeographics.com/images/LOCALE_Classification.pdf

A1.36 In September 2018, we reported that superfast coverage was 94% using the Delivery Point Address (DPA) method. Applying the new Service Delivery Approach (SDA) shows that superfast coverage would have been 93.5% for residential premises and 92.7% for residential and all commercial premises. Figure 4 shows how the trend for superfast coverage has continued and, together with improved address information, the difference between the DPA and the SDA approach for residential premises converges.

A1.37 The inclusion of all commercial properties in the premise base does suppress all availability metrics as we do not include leased line provision in our analysis.

Figure 4: Comparison of address matching methods over time for Superfast availability

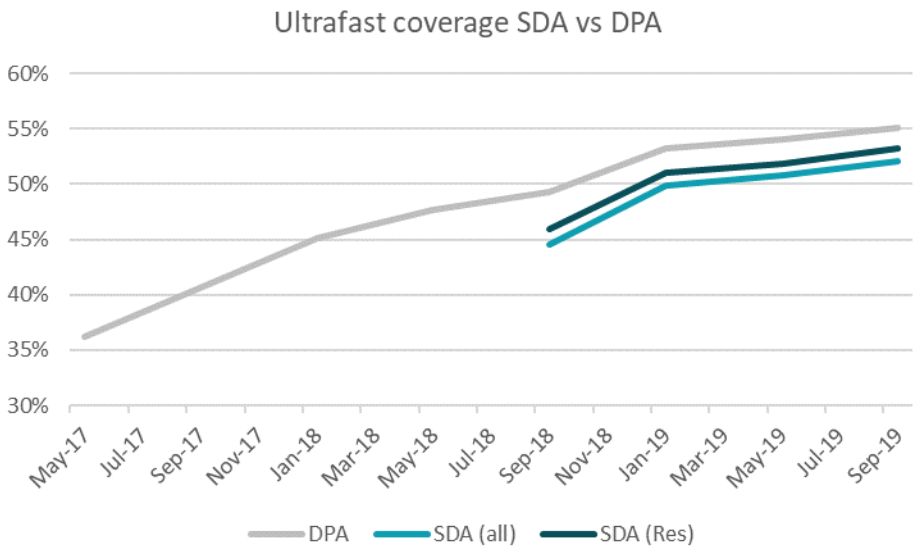


A1.38 In our Summer update[7] we identified that one communications provider's full fibre availability data was overstated for some premises, due to a mis-interpretation of the Ofcom definition of full fibre availability and how it applies for different installation practices.

A1.39 With the change to our premise base and the removal of postcode estimates our assessment of Ultrafast availability has been adjusted. Figure 5 shows how the trend of Ultrafast deployment has continued to increase to 53% at September 2019 for residential premises.

[7] https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-update-summer-2019

Figure 5: Comparison of address matching results over time for Ultrafast availability



Performance metrics, speeds and data use

A1.40 We gathered data from many of the fixed broadband internet service providers (see A3 fixed network providers) on both their retail services and the services they provide to other ISPs as a wholesale service. This was provided with a collection date of 1st to 30th May 2019. This is one month earlier than in previous reports to align the timing of performance and coverage data.

A1.41 Our analysis of broadband speeds is based on the information provided by these ISPs regarding the sync speed of each active line. This gives a measure of the maximum possible connection speed achievable between the ISP's access network and the consumer premises. Line speed measurements are typically a few Mbit/s lower than sync speed measurement, and they typically vary throughout the day depending on the level of congestion in the ISP's network.

A1.42 This data was collected at the address-level and by line identifier and involves a more complex matching process. In addition to matching records via the UPRN or address to our premise base, we also need to match wholesale providers including BT Group, Sky, TalkTalk and Vodafone) to the Openreach infrastructure using either a line identifier (where these are common) or via address matching. Of the 25.4 million records received, 90.1% (22.0m) could be allocated to geographic locations using a UPRN address or postcode matching process. Due to changes in data systems across providers a proportion of lines could not be matched accounting for 3.3m records (10% of all records).

A1.43 Moreover, a premise is considered in our analysis if any line associated with that premise has a measured speed greater than zero. A total of 24.5m records met this criterion and were used in line performance and data usage calculations. Of these records 22m could be assigned to a geographic location. Overall UK figures include all 24.5m records, whilst geographic analyses by rurality and region use the 22m records.

A1.44 Our estimate of take-up is based on the total number of lines reported, compared to all premises.

A1.45 Our analysis of data use is calculated from the amount of data downloaded and uploaded on each line as reported by operators. We also collected data on the total data use between the hours of 6pm and midnight, to assess data use at 'peak times'. Our analysis considers all lines where the amount of data downloaded was greater than zero.

Access capacity

A1.46 We asked fixed communications providers to state the percentage of access network equipment or infrastructure that were, at the time of submission, unable to meet customer orders for new service using the highest speed technology or to provide service at the maximum speed advertised. The network equipment included those in the exchange and cabinet (or equivalent).

A1.47 As operators use different technologies (e.g. full-fibre, telephone line xDSL, DOCSIS etc.), data cannot be directly compared, so data from all submission were aggregated to provide an overall figure.

PSTN migration

A1.48 We asked the providers of fixed broadband communications to provide a breakdown of the technology used to delivery voice services over the access network. Some broadband providers do not offer voice services, and many internet voice service providers do not deploy fixed broadband networks and were therefore not approached to provide data to us, so the results obtained are indicative only.

Mobile

Coverage

A1.49 Our data on the coverage of mobile networks were collected from the four mobile network operators, EE, O2, Three and Vodafone (see A3 mobile network operators) as 100m x 100m pixels referenced against the Ordnance Survey Great Britain (OSGB) grid system, for their coverage as at 1st September 2019 for 2G, 3G and 4G networks. Premises coverage is calculated from the base of 30.8 million premises derived from the OS AddressBase® Premium dataset[8] (August 2019 version, Epoch 70), OS AddressBase® Islands dataset[8] (August 2019, Epoch 70).

A1.50 In addition, geographic identifiers are added from the ONS NSPL[9] (August 2019 version) and Urban and Rural categories are added from the Locale classification[10]. Roads data is

[8] https://www.ordnancesurvey.co.uk/business-and-government/products/addressbase-products.html
[9] http://www.ons.gov.uk/ons/guide-method/geography/products/postcode-directories/-nspp-/index.html
[10] http://www.bluewavegeographics.com/images/LOCALE_Classification.pdf

taken from Ordnance Survey[11] and Northern Ireland Land & Property Services Open Data sources[12].

A1.51 We apply the 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.

A1.52 In 2018 measurement work to identify the minimum coverage level (the technology-specific threshold) required to deliver a good quality of experience to consumers on the 4G network has been undertaken. We have 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.

A1.53 For 2G, 3G and, now, 4G networks, we define coverage based on the minimum signal strength required to deliver a 98% probability of making a 90 second telephone call successfully. In the case of 4G specifically, our definition also delivers a 98% chance of getting a download speed of at least 2Mbit/s.

A1.54 We use the signal strength thresholds shown in Figure 6 when estimating coverage.

Figure 6: Mobile strength thresholds

Service		Metric	Outdoor	Indoor and in-car
2G		RxLev	-81dBm	-71dBm
3G		RSCP CPiCH	-100dBm	-90dBm
4G		RSRP	-105dBm	-95dBm
Voice:	**2G**	RxLev	-81dBm	-71dBm
	3G	RSCP CPiCH	-100dBm	-90dBm
	4G	RSRP	-105dBm	-95dBm
Data:	**3G**	RSCP CPiCH	-100dBm	-90dBm
	4G	RSRP	-115dBm	-105dBm

Mobile prediction models

A1.55 The mobile coverage figures provided in this report rely on the accuracy of coverage prediction data supplied by the mobile operators. We note that operators continue to update and improve their prediction models, which is welcome. The data used in this report includes predictions provided to us by EE using a newly developed coverage

[11] https://www.ordnancesurvey.co.uk/business-and-government/products/os-open-roads.html
[12] https://www.opendatani.gov.uk/dataset/osni-open-data-50k-transport-line1

prediction model, which has seen some changes in the coverage it predicts for landmass and premises. EE has provided us with information on the validation work it has undertaken to date.

A1.56 It was noted in our Spring update[13] that reductions in indoor coverage can be the result of re-use of 3G spectrum for 4G services and the in-building penetration losses that apply to signals at these frequencies. This can cause relatively marginal changes in overall service coverage, because 4G networks are particularly optimised for data rather than calls. These changes, coupled with our normal practice of rounding of figures to the nearest percentage point, can result in reductions of for certain categories of reported coverage.

A1.57 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.

Data use

A1.58 This data was collected in May 2019 and included information on the amount of data uploaded and downloaded on each mobile cell in these networks. The geography of data traffic is defined by the location of the associated mobile cell base station.

Fixed Wireless Access from Wireless Internet Service Providers

A1.59 Our analysis of Fixed Wireless Access by Wireless Internet Service Providers (WISPs) coverage includes data from 13 providers, eight of whom provided data relating to their network in May 2018 and five of whom provided data relating to their networks in September/October 2019. This data relates to the location and technical characteristics of their network infrastructure and details their service provision to customers.

A1.60 We apply a modelling method to this data to assess each provider's network coverage. The modelling method is based on ITU-R P.530 recommendations which are appropriate to the line-of-sight systems used by the WISPs

A1.61 We initially evaluate the probability of establishing line-of-sight links between a provider's mast sites, or access points, and potential customer premises. This considers the maximum range served by each access point based on the technical data submitted and then uses OS AddressBase Epoch 57 (March 2018) to determine the premises within reach of each access point. We then evaluate the viability of establishing a line-of-sight link by performing a geometrical analysis of the path between the access point and each premises; this uses information from a clutter database[14] to account for differences in the terrain and surface clutter along the link.

[13] https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-update-spring-2019
[14] https://www.getmapping.com/products/height-data/height-data-getmapping

A1.62 If a link can be established, we then evaluate its ability to support different broadband speeds based on its length, i.e. the distance between the provider's access point and the potential customer's premises. Longer links typically have lower probabilities of receiving faster broadband speeds due to the antenna's power fading across longer distances and impacted by the atmosphere along the link.

A1.63 The results of our analysis indicate whether premises have a high, medium or low chance of receiving decent or superfast broadband speeds. We do not provide granular detail about the broadband speeds consumers may be able to receive from WISPs because the quality of service delivered can be impacted by many external factors, for example environmental conditions or interference from nearby systems.

A1.64 We contacted over 100 WISPs in 2018. Figure 2 lists the WISPs who submitted network data and which has been analysed and included in our results. We invite any WISP which has not yet submitted data or are not listed in the table to contact us at connectednationsreport@ofcom.org.uk.

Figure 7: WISPs data included in our analysis this year

Air Broadband	Airband
Boundless Networks	Cromarty Firth Wireless Networks
Kencomp	Loop Scorpio
Lothian Broadband	Net1
Quickline Communications	ResQNet
Rural Comms	Secure Web Services
Wessex Internet	

Other fixed wireless services

A1.65 In this report we have considered information provided by mobile network operators on the performance and availability of fixed wireless services delivered using mobile technology. An explanation of these services is available in our statement on Delivering the Broadband Universal Service (https://www.ofcom.org.uk/consultations-and-statements/category-1/delivering-broadband-universal-service).

Urban and rural classifications

A1.66 We have used the Locale[15] classification to identify premises as being in an urban or rural area. Locale is a third-party data source based on the analysis of 2011 census output areas (OAs). Each OA is assigned to one of seven Locale Groups using a combination of Government conurbation definitions, population density at the OA- and postcode sector-levels, urban sprawl boundaries, OS roadmaps and additional visual inspection.

A1.67 We assign the Locale classifications to either Urban or Rural based on the following:

- Urban: Codes A to C relate to settlements with populations over 10,000 and codes D to E relate to settlements with populations over 2,000

[15] http://www.bluewavegeographics.com/images/LOCALE_Classification.pdf

- Rural: F to G relate to settlements with populations under 2,000

A1.68 For fixed broadband analysis each premise is assigned to a census output area via its postcode. For mobile analysis, each pixel is assigned to a census output area through a spatial comparison of the pixel OSGB coordinate to the corresponding census output area polygon. The Locale urban and rural classification is then matched to these records via the census output area.

Geographic boundary changes

A1.69 The table below identifies changes for local authorities across the United Kingdom, effective as at 1 April 2019.

Figure 8: Geographic changes in the United Kingdom

Authority in 2019	Previously	Type of change
Bournemouth, Christchurch and Poole Council (Unitary Authority)	Bournemouth Poole Christchurch	Merger of authorities
Dorset Council (Unitary Authority)	Dorset (County Council) comprising the Non-Metropolitan Districts of: Weymouth and Portland West Dorset North Dorset Purbeck East Dorset	Merger of authorities
West Suffolk (Non-Metropolitan District)	Forest Heath St Edmundsbury	Merger of authorities
East Suffolk (Non-Metropolitan District)	Suffolk Coastal Waveney	Merger of authorities
Somerset West and Taunton (Non-Metropolitan District)	Taunton Deane West Somerset	Merger of authorities
Glasgow City (Council area)	Glasgow City (Council area)	Boundary adjusted towards North Lanarkshire
North Lanarkshire (Council area)	North Lanarkshire (Council area)	Boundary adjusted from Glasgow City

A1.70 These changes result in the number of Lower Tier authorities decreasing from 326 to 317 in England.

A1.71 In Scotland the adjustment changed the boundary between Glasgow City and North Lanarkshire, but the number of Lower Tier authorities was unchanged at 32.

A1.72 The number of Lower Tier authorities in Northern Ireland (11) and Wales (22) is unchanged.

A1.73 In total there are 382 Lower Tier authorities in the United Kingdom.

A1.74 Comparisons to previously published reports should take note of these changes.

A2. Glossary

2G: Second generation of mobile telephony systems, 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

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'.

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.

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

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

Full Fibre coverage: Services that provide a fibre optic cable from the exchange to the end user's home or office. In 2018 we have modified this definition to: where the network has been rolled out to a “lead-in” that will serve the consumer end premise and where the consumer would expect to pay a standard installation charge for that connection.

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

ITU-R: International Telecommunications Union Radiocommunication Sector. One of the three sectors of the ITU, responsible for radio communication.

ITU-T: International Telecommunications Union Telecommunication Standardization Sector. One of the three sectors of the ITU, responsible standards in telecommunications.

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

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

Ultrafast broadband: A data service that can deliver download speeds of at least 300 Mbit/s.

Voice (Mobile): Mobile voice services where nearly all 90-second calls are completed without interruption from any of 2G, 3G or 4G mobile services.

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.

WISP: Wireless Internet Service Provider. 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. They commonly use license exempt or light licensed spectrum such as the 5GHz band

A3. Obtaining information from providers

A3.1 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.

A3.2 Under section 134A and 134B of the Act[16] Ofcom is required to prepare a report for "each relevant period", as defined in section 134A(4) of the Act, that deals with the electronic communications networks matters listed in section 134B(1), and the electronic communications services matters listed in section 134B(2), of the Act.

Fixed network providers

A3.3 The data for use in this report was obtained, or continued to be used, from the following fixed network providers:

- B4RN
- Bridge Fibre
- BT Group
- Cablecom Glide
- Call Flow
- CityFibre
- Community Fibre
- Gigaclear
- G.Network
- Hutchinson 3G UK Limited ("Three")
- Hyperoptic
- IFNL
- ITS
- KCOM
- Openreach
- Sky
- Spectrum Internet
- TalkTalk
- Truespeed
- Virgin Media
- Vodafone
- VX Fibre
- Wessex Internet
- Wight Fibre

[16] Sections 134A and 134B of the Act, as amended by Section 1 of the Digital Economy Act 2010, can be found here: https://www.legislation.gov.uk/ukpga/2010/24/section/1

Mobile network operators

A3.4 The following mobile network operators supplied data for use in this report:

- Everything Everywhere (“EE”)
- Hutchinson 3G UK (“Three”)
- Telefónica UK (“O2”)
- Vodafone.