

Mobile Matters

Using crowdsourced data to assess people's experience of using mobile networks

Published 17 July 2025

Welsh version available

Contents

Section

Overview 3

5G standalone performance 7

Share of network connections 9

Data connection success rate: 12

Video streaming 14

Response time (latency) 16

Connection speeds 18

Annex

A1 Technical methodology 27

A2 Statistical methodology 31

A3 Glossary of terms 34

Overview

Mobile phones have become indispensable, touching nearly every aspect of our lives. From checking real-time travel updates to navigating with GPS, they help us move through the world with ease. We rely on them to shop and bank online, to be entertained and socially connected, and to remain organised and productive even while working remotely.

More than just offering convenience, mobile phones provide instant access to people, services, and information wherever we are. We expect to have a good mobile service anytime, anywhere; it is only when we lose signal or experience poor connectivity that we realise just how dependent we are on fast, reliable mobile networks.

This research is part of Ofcom's programme of work to understand and improve the quality of experience of UK mobile users. We use real-world data to provide consumers, industry and stakeholders with detailed information about mobile network performance.

The findings are based on Ofcom's analysis of a huge dataset, provided by Opensignal, which was collected from thousands of mobile phone users across the UK. The subset of Opensignal's data that was used in the analysis for this report comprised over 120 million datapoints.

This report measures mobile performance in coverage areas

The data reported here is only collected when there is network availability. As such, this report looks at how well mobile networks perform in areas where there is coverage. Whether mobile network coverage is available or not is, of course, critical to customers' experience, and we report network coverage metrics in our Connected Nations reports.

We have also recently relaunched Ofcom's mobile coverage checker, Map Your Mobile, which provides postcode-level information on network availability, using an improved predictive model to better reflect the real-world mobile experience that people can expect to receive.[1] Map Your Mobile uses the same Opensignal crowdsourced dataset as this report, to provide a performance score for each mobile network in a consumer's postcode district.

Approach

In this report we look at a number of factors that affect network performance in coverage areas, including mobile network operator, UK nation and whether the user is in an urban or rural area. We seek to address the following questions:

- When I want to connect, what is the likelihood of connecting to a 5G, 4G, 3G or 2G network?
- How often will I fail to get a connection?
- How often will I be able to stream videos without interruption?
- How quickly does the network respond to my requests?
- How fast can I download and upload data?

Our analysis is based on crowdsourced data collected by Opensignal from actual mobile users across the UK, which we have analysed using our own statistical methodology. Only data recorded from

[1] Ofcom uses predictions of signal strength provided by the mobile network operators to determine whether coverage is likely to be available in any given area. Among other changes, Map Your Mobile includes a new, more stringent threshold to indicate where consumers are likely to get a connection for more data-hungry services such as streaming, which require a stronger signal strength.

customers of the UK MNOs has been included, and the most recent data in the report (referred to as '2025') was collected between October 2024 and March 2025.

For the first time, we have been able to include year-on-year comparisons in this report (using data collected between October 2023 and March 2024, which was the basis of the 2024 Mobile Matters report). However, we have found that year-on-year differences tend to be small, and may be due to factors other than network performance, such as changes in the mix of panellists' devices, content delivery network (CDN) configurations, or global changes to Opensignal's methodology.

The data we have looked at consists of measurements recorded on Android smartphones and excludes those recorded on Apple iOS devices. While Opensignal runs tests on iOS devices, in many cases the app executing the tests runs in the background. From version 15 onwards, iOS has some restrictions on this type of testing, so to remain consistent with past Mobile Matters reports, and minimise the impact of these restrictions on our analysis, we have excluded iOS test results from the analysis in this report.

The sample distribution broadly matches the population distribution of the UK, as do the relative operator shares, and we have ensured that the sample sizes are sufficient to ensure the robustness of the findings. For a more detailed description of the data collection and analysis, please see the Technical methodology and Statistical methodology annexes.

An interactive dataset accompanies this report.

5G and 5G standalone

One of the recent developments in mobile networks is the launch of 5G standalone (5G SA) services. Until mid-2023, when Vodafone launched the first 5G SA network, all 5G in the UK was 5G non-standalone (5G NSA). But 5G SA roll-out has gained momentum; O2 and EE began rolling out their 5G SA networks in 2024, while Three is yet to launch its 5G SA service, and EE recently reported that its 5G SA network covered more than 40% of the UK population. We plan to start reporting on 5G SA coverage in our Connected Nations 2025 report which is due to be published in Q4 2025.

Throughout most of this report, our analysis of 5G services combines the performance of 5G SA and 5G NSA connections; however, in the 5G standalone performance section we compare the two technologies, and 4G, using some key metrics.

2G and 3G switch-off

Mobile technology has evolved significantly over the decades, with each new generation bringing better performance. As a result, the UK has a mix of legacy technologies (2G and 3G) alongside more modern 4G and 5G networks. As 4G and 5G services are widely available across the UK, MNOs have committed to retiring their 2G and 3G services by 2033.

EE and Vodafone completed their 3G network switch-off in early 2024, before the start of our most recent measurement period. Three followed by closing most of its 3G network at the end of 2024, during our latest measurement period, while O2 began its switch-off after the analysis period, in April 2025. As a result, this report only includes the details of 3G performance results at the UK level, other than where we look at the average proportion of mobile network connection attempts.

While MNOs are responsible for the timing of the switch-off process, we want to ensure that consumers are treated fairly and can continue to access the mobile services they need.

What we have found – in brief

5G standalone vs 5G non-standalone performance

- **5G standalone accounted for 2% of all 5G connection attempts in the six months to March 2025.** There are two main types of 5G: 5G standalone (5G SA) and 5G non-standalone (5G NSA), 5G SA being the more recent technology. UK MNOs have started to offer 5G SA but its use is currently low.
- **Standalone 5G's average response time (latency) was about 15% lower (better) than for 5G NSA.** However, our analysis also indicated that 5G SA had a lower average connection success rate (95.9%) than 5G NSA (97.6%), although this was slightly higher than 4G's.
- **5G SA provided significantly higher download speeds than 5G NSA.** Seventy per cent of 5G SA download speeds measurements were at 100 Mbit/s or higher, compared to 46% for 5G NSA, and 2MB, 5MB and 10MB file download times, on average, were about 45% faster on 5G SA than over 5G NSA.
- **However, the picture was more mixed for uploads.** While 5G NSA had a higher proportion of low-speed connections (18% of 5G NSA upload speeds provided less than 2 Mbit/s compared to 10% on 5G SA) it also had a slightly higher share of higher-speed connections (30% of 5G NSA uploads were 20 Mbit/s or higher vs 28% on 5G SA).

Video streaming tests

- **Overall, 98.2% of 30-second video streams completed without interruption over 5G.** This was a slightly higher proportion than over 4G (96.6%) and much higher than the 88.3% 3G average. At an overall UK level, a higher proportion of 5G and 4G video streams completed without interruption in in urban areas than in rural areas.

Mobile network share and data connection success rate

- **Over a quarter (28.3%) of network connection attempts were to 5G networks in 2025.** This was a year-on-year increase of 8.8pp, largely at the expense of 4G, for which there was a 7.2pp decline in its share of connections.
- **There was a small increase in the proportion of connections to 2G networks.** This was very small (up by less than 0.1pp to 0.2%). The proportion of connections on 3G networks declined year on year, as these are being closed down.
- **Mobile users with a 5G compatible tariff and device were able to access 5G services 97.6% of the time when their provider had 5G coverage.** This was higher than the 95.7% average for 4G services and 76.6% for 3G.
- **Our report shows year-on-year declines across several performance metrics, including data connection success rates.** However, when performance dipped, the falls were generally not large enough to affect the user experience, and could be due to factors other than network performance. Data connection success rates fell for both 5G and 4G in 2025, down by 0.8pp and 1.5pp respectively.

MNO comparisons

- **EE had the highest proportion of network connections that were on 5G, at 31.9%.** Vodafone had the lowest proportion of connections on 5G (23.8%) and the highest share on 4G, at 75.7%. O2 customers had the lowest share of 4G connections (67.9%) and the highest proportion on 3G (3.3%), while Vodafone customers had the highest proportion on 2G (0.5%).

- **Three had the highest average connection success rate over 5G, while Vodafone's was the highest over 4G.** However, the differences between the MNOs' 5G and 4G data connection success rates were small - there was less than 1pp difference between the lowest and highest recorded MNO success rates for each technology.
- **Across both 5G and 4G, a slightly higher proportion of EE video streams completed successfully** than on the other MNOs' networks, although the differences between EE and the lowest-performing MNOs (O2 and Three jointly over 5G, and Three on 4G) were not large, averaging around two percentage points (pp) for each technology.
- **Three had the lowest (best) response time (latency) over 5G, while EE's was the lowest over 4G.** Average response times (latency) for the MNOs ranged from 15 to 21 milliseconds (ms) for 5G and from 18ms to 23ms for 4G. O2's average response times were slightly higher than the other MNOs' on both 5G and 4G, although they were still sufficient to give a good user experience for even the most demanding online activities.
- **Three's download speeds tended to be faster than the other MNOs' on 5G, while EE compared well over 4G.** Three had the shortest download times for 2MB, 5MB and 10MB files over 5G, followed by Vodafone, while EE was fastest across all file sizes over 4G, although these differences were quite small. O2 had the lowest proportion of connections with a 100 Mbit/s or higher download speed over both 5G (33%) and 4G (4%).
- **EE had the highest proportion of upload speed tests at 20 Mbit/s or higher over both 5G and 4G** (38% and 19% respectively). O2 had the lowest proportions of 5G and 4G upload speed tests at 20 Mbit/s or higher (21% and 8% respectively).

Comparisons by nation and rurality

- **The proportion of connections on 5G networks continued to be higher in urban areas of the UK** (29.5%) than in rural areas (18.8%). 5G's share of connections increased in urban and rural areas, but the year-on-year difference between the two was unchanged at 10.6pp).
- **Download speeds tended to be lower in rural areas than in urban areas of the UK**, as evidenced by the distribution of download speeds and the download times for 2MB, 5MB and 10MB files, which were consistently faster in urban areas (although the differences were relatively small).
- **There were only minor variations in file download times between the four nations of the UK**, although 5G and 4G downloads in Northern Ireland and Wales tended to take slightly longer than in England and Scotland.
- **At a UK level, urban connections had a higher proportion of faster connections than rural areas over 5G and 4G.** Northern Ireland had the lowest proportion of download speed measurements of 50 Mbit/s or higher on both 5G and 4G, and in general, had the slowest file download times.
- **Northern Ireland also had the lowest proportion of 5G upload speeds at 20 Mbit/s or higher** (25%) and the highest proportion of 5G upload tests under 2 Mbit/s (20%). Over 4G, Wales had the lowest share of upload speeds of 20 Mbit/s or higher (12%) and the joint-highest share under 2 Mbit/s with Northern Ireland (both 35%). The proportion of 5G and 4G upload speed tests measured at 20 Mbit/s or more was higher in urban areas of the UK than in rural ones, while rural areas had a higher share than urban areas of speeds measured at under 2 Mbit/s.

5G standalone performance

How does the latest technology compare to earlier versions?

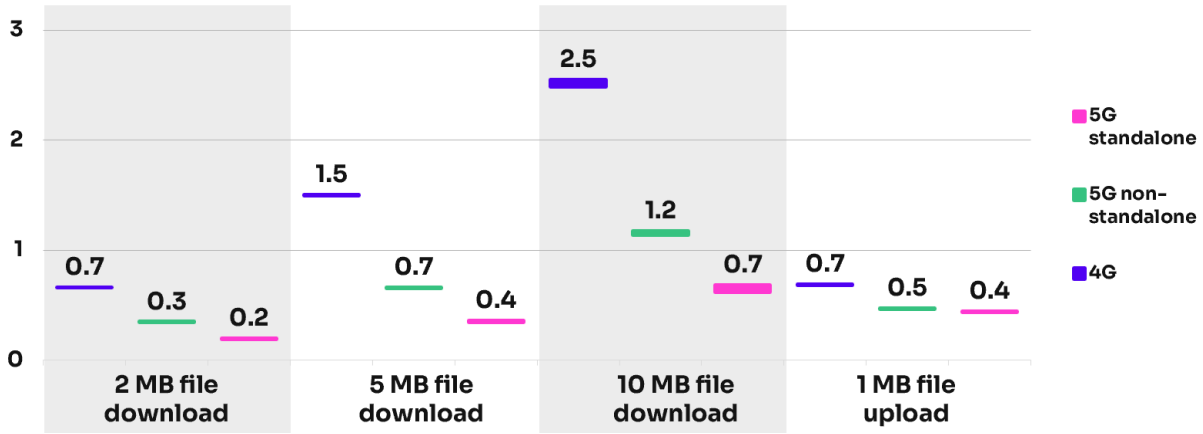
The first UK 5G standalone (5G SA) service launched in 2023; before this, all 5G in the UK was 5G NSA, which uses 5G and 4G technologies to provide mobile connectivity.[2] Over the past few years, UK MNOs have started to offer 5G SA: Vodafone calls its service '5G Ultra' whereas EE and O2 call theirs '5G Standalone'.

5G SA replaces the 4G technology used in 5G NSA with 5G, enabling lower response times, improved security, enhanced quality of service, greater energy efficiency and faster connection speeds. Only a small proportion of 5G use is currently on 5G SA – in the most recent Opensignal dataset used for this report, 5G SA connections accounted for 2% of all 5G connections.

Elsewhere in this report, our analysis of 5G performance combines 5G NSA and 5G SA. However, in this section, we compare the performance of the two technologies using some of the metrics that determine how well a mobile connection works.

Our analysis shows that a key benefit of 5G SA over 5G NSA is in the time taken to download files. File downloads of 2 MB, 5 MB and 10 MB were, on average, about 45% faster over 5G SA than 5G NSA, and the time to download a 10 MB file over 5G SA was the same as that taken to download a file of half that size over 5G NSA. It was also faster to upload a 1MB file over 5G SA, but the difference (about 6%) was much smaller than when downloading a file.

Figure 1: Average (median) time to download and upload different sized files, by mobile technology: 2025 (seconds, lower is better)

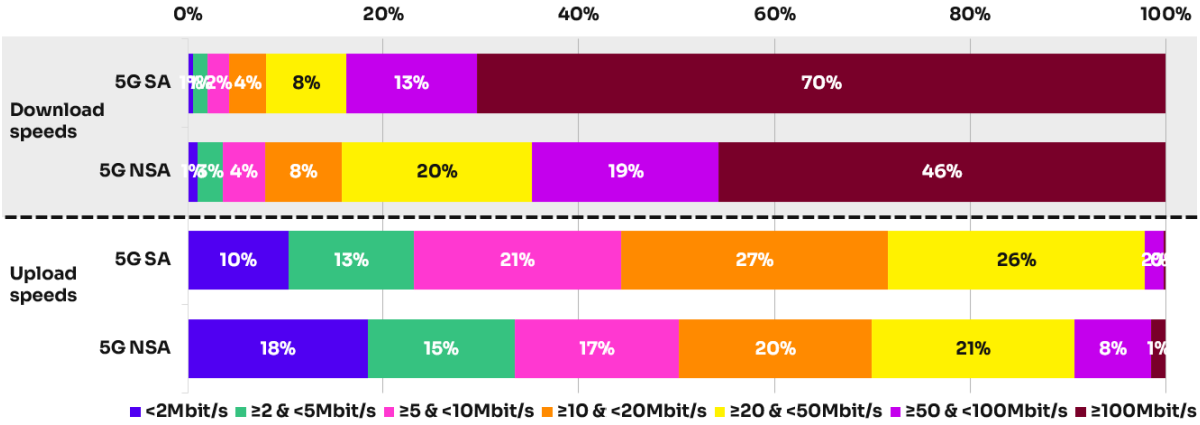


Source: Ofcom, using crowdsourced data provided by Opensignal; October 2024 to March 2025 data.
Notes: The chart bars/lines show that there is a 95% probability that the actual average performance for all consumers (i.e. not just the consumer panellists within our sample) falls within the ranges shown; data only relates to areas where there was mobile network coverage.

[2] 5G NSA uses a 5G radio access network and a 4G LTE core network, whereas 5G standalone (5G SA) replaces 5G NSA's 4G core network with 5G technology.

The differences in the download speed distributions of 5G SA and 5G NSA were consistent with their file download times. These showed a higher proportion of faster connections for 5G SA, with 70% of download speeds being over 100 Mbit/s, compared to 46% for 5G NSA. However, the picture was mixed for upload speeds, with 5G NSA having a higher proportion of low-speed connections (18% of 5G NSA upload speeds provided less than 2 Mbit/s, compared to 10% on 5G SA) and a slightly higher share of higher-speed connections (30% of 5G NSA uploads were 20 Mbit/s or higher, vs 28% on 5G SA).

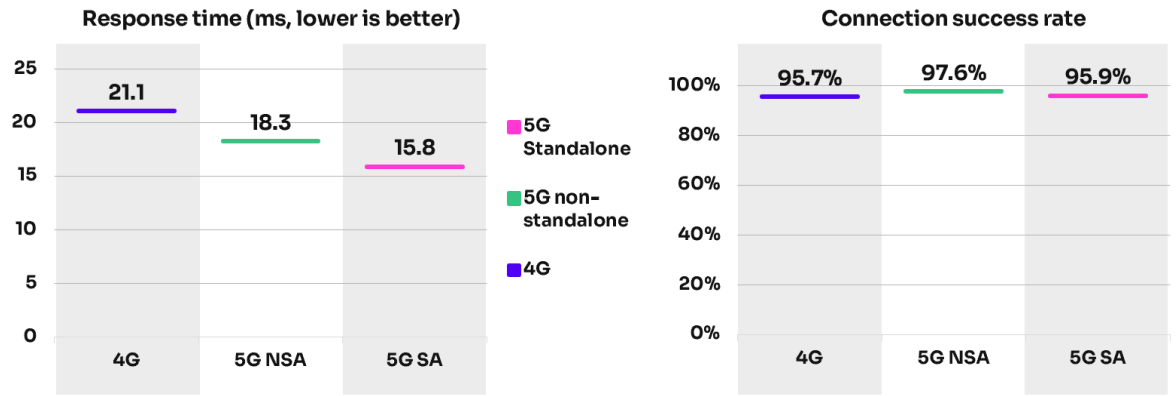
Figure 2: Distribution of download and upload speeds, by 5G technology: 2025



Source: Ofcom, using crowdsourced data provided by Opensignal; October 2024 to March 2025 data.
Notes: Data only relates to areas where there was mobile network coverage.

There was also a mixed picture when comparing 5G standalone's latency and data connection success rate results to those of 5G NSA. While the average response time for 5G SA was about 15% lower (better) than the average for 5G NSA, it had a slightly lower average data connection success rate (95.9% compared to 97.6% over 5G NSA), although this was slightly higher than the average over 4G.

Figure 3: Average (median) response time (latency) and data connection success rate, by mobile technology: 2025



Source: Ofcom, using crowdsourced data provided by Opensignal; October 2024 to March 2025 data.
Notes: The chart bars/lines show that there is a 95% probability that the actual average performance for all consumers (i.e. not just the consumer panellists within our sample) falls within the ranges shown; data only relates to areas where there was mobile network coverage.

Share of network connections

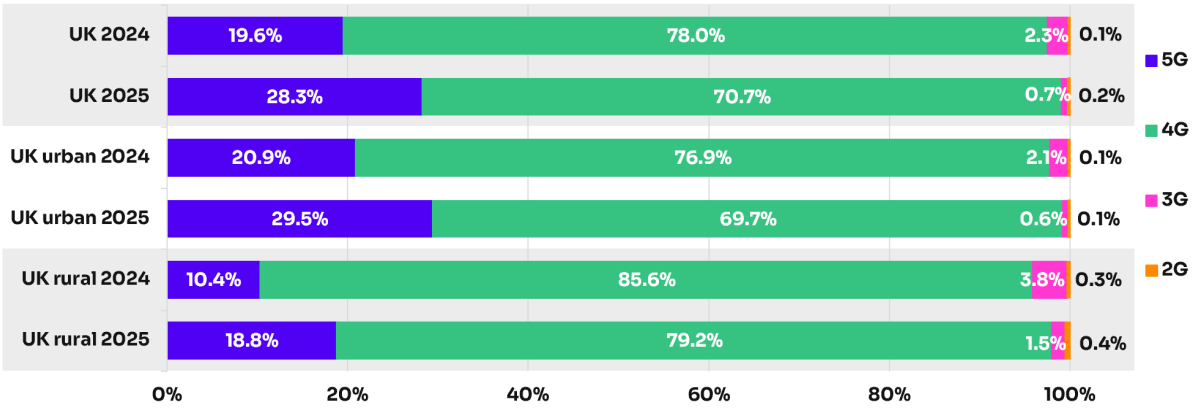
When I want to connect, what is the likelihood of connecting to a 5G, 4G, 3G or 2G network?

This section looks at the technology split of mobile data connection attempts when a user's device has already connected to a mobile network (when the user was in a coverage area with an active service plan and had the appropriate handset capability for the technology in question).

This analysis of information regarding the network technology that phones are attempting to use can be used as an indication of network availability, although it may slightly understate the use of newer mobile technologies (particularly 5G) where users have older handsets or tariffs which limit the networks they can access.[3] While the data in this section shows the share of network connection attempts, we refer to it as 'the proportion of network connections', for ease of reading.

Our analysis shows that 4G continued to be the main technology for mobile users in 2025, accounting for 70.7% of connections, more than double the proportion for 5G (28.3%). The proportion of 5G and 4G connections were markedly different in urban and rural areas, with 29.5% of connections in urban areas being 5G, compared to 18.8% in rural areas. The proportion of connections on 5G increased by 8.8pp year on year, reflecting growing 5G availability, users upgrading to 5G devices and mobile operators including 5G connectivity with more tariffs. Meanwhile, 4G's share of connections fell (by 7.2pp), as did 3G's, as 3G networks are being closed. There was a small increase in 2G use year on year, up by less than 0.1pp to 0.2%.

Figure 4: Proportion of mobile network connections, by mobile technology and rurality: 2024 and 2025

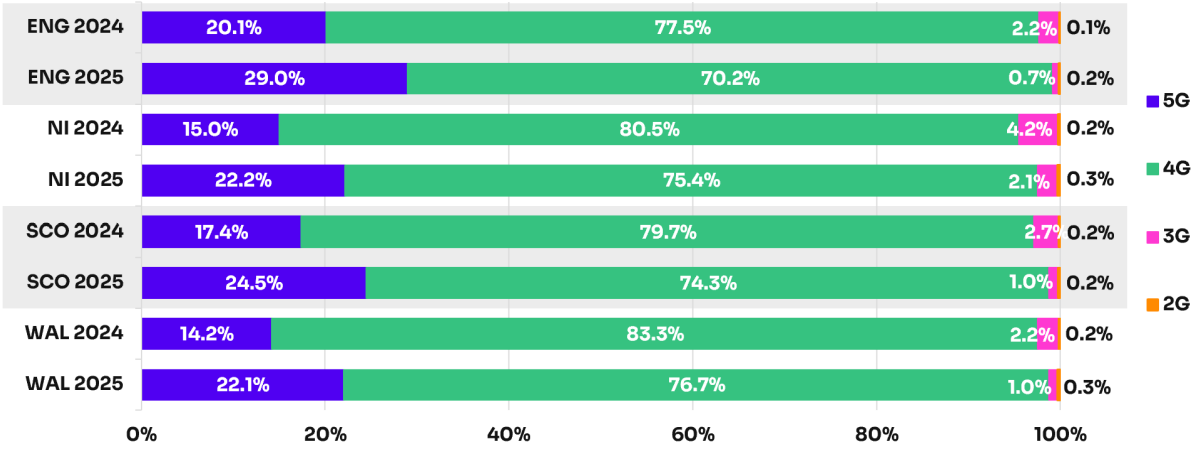


Source: Ofcom, using crowdsourced data provided by Opensignal.
Note: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage; EE and Vodafone switched off their 3G networks during our 2025 data collection period.

[3] The network generation a phone can use is determined by the handset specification, SIM, and data plan. Some older phones may only support 3G or 4G connections, and some users may have a data plan which is not 5G-enabled. Similarly, 2G and 3G may be under-represented as we do not get crowdsourced data from featurephone users, who are more likely to only use 2G and/or 3G services.

Comparing the four UK nations, England had the highest proportion of mobile network connections on 5G, while Wales and Northern Ireland had the lowest. Conversely, Wales had the highest share of 4G connection attempts and England the lowest. For 3G, the share of connections was highest in Northern Ireland and lowest in England. The proportion of connections on 2G networks was low across all four nations.

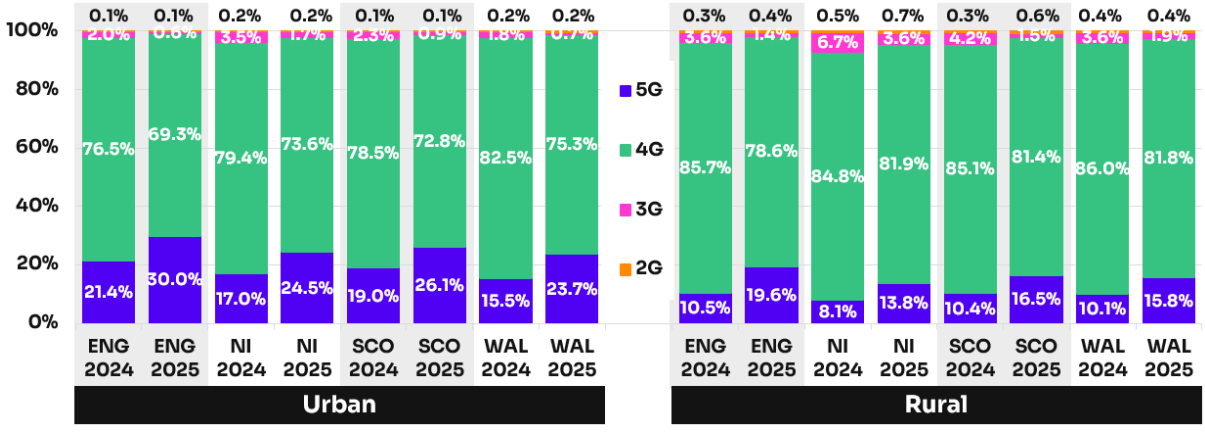
Figure 5: Proportion of mobile network connections by mobile technology and nation: 2024 and 2025



Source: Ofcom, using crowdsourced data provided by Opensignal.
Note: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage; EE and Vodafone switched off their 3G networks during our 2025 data collection period.

Within all the UK nations, urban areas had a higher proportion of connections to 5G (and lower shares for 4G, 3G and 2G) than rural areas.

Figure 6: Proportion of mobile network connections by mobile technology, rurality, and UK nation: 2024 and 2025

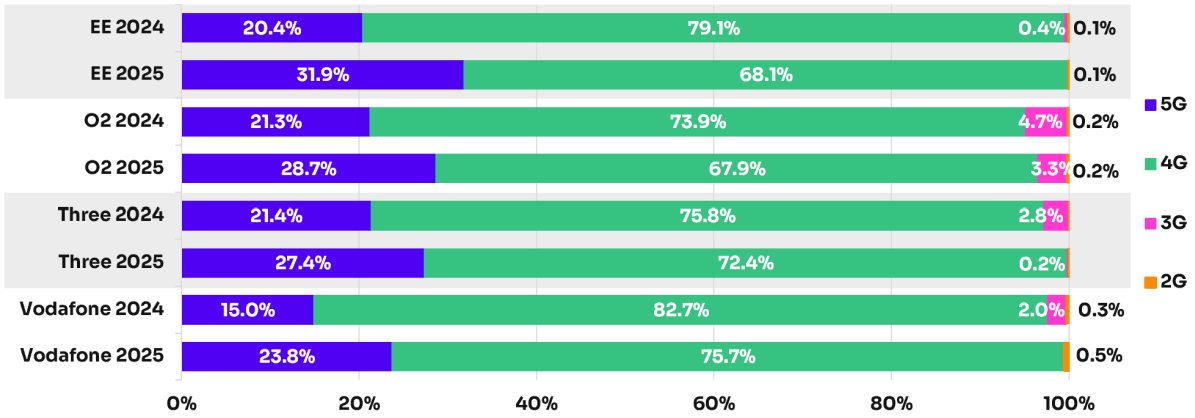


Source: Ofcom, using crowdsourced data provided by Opensignal.
Note: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage; EE and Vodafone switched off their 3G networks during our 2025 data collection period.

The merger between Vodafone UK and Three UK completed in May 2025, resulting in the creation of VodafoneThree. In this report we include Three and Vodafone connections separately as they continue to operate as separate brands, as they did during our most recent measurement period.

EE customers experienced the highest average proportion of mobile network connections on 5G networks in 2025, while Vodafone customers had the lowest 5G share. Over 4G, Vodafone customers had the highest average share of connections and O2 the lowest. The proportion of mobile connections to 3G was highest for O2 (as we would expect), as it was the only MNO which had not started (or completed) its 3G closure programme during our 2025 measurement period, while for 2G the proportion was highest for Vodafone.

Figure 7: Proportion of mobile network connections by mobile technology and MNO: 2024 and 2025



Source: Ofcom, using crowdsourced data provided by Opensignal.
Note: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage; EE and Vodafone switched off their 3G networks during our 2025 data collection period.

Data connection success rate:

How often will I fail to get a connection?

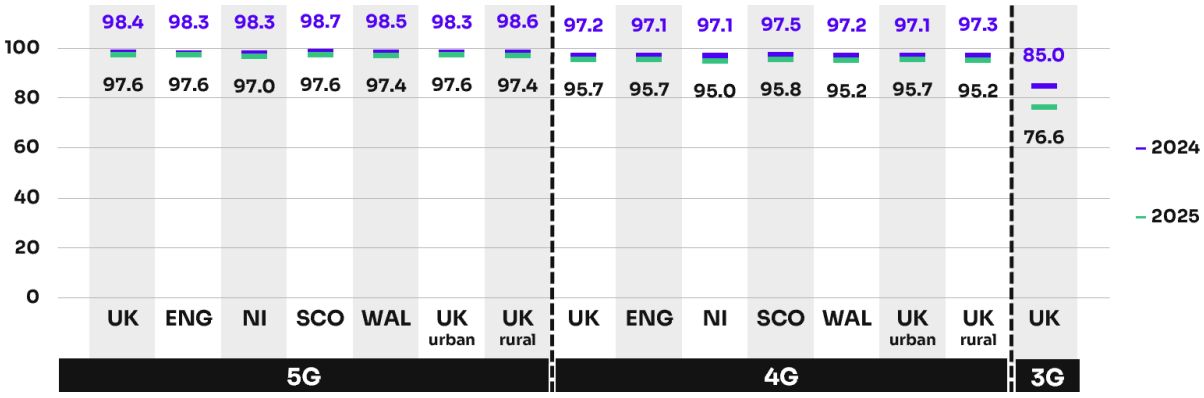
Although 'mobile network coverage' refers to the geographic area where mobile services are available, being within a coverage area does not guarantee a successful connection.[4] Issues such as weak signal strength, network congestion due to high traffic, and service outages can limit or prevent access. The data connection success rate indicates how often data services can be accessed when the user is in a coverage area.

Our analysis shows that in the UK overall in 2025, 97.6% of connection attempts to 5G data services in 5G network areas, and 95.7% of connection attempts to 4G data services in 4G network areas, were successful. The connection success rates across the four UK nations were similar, as were the overall rates in rural and urban areas of the UK, with differences of less than 1pp for the same technology (i.e. a difference of less than one failure in 100 connection attempts).

Year-on-year comparisons of connection success rates show that they were slightly, but consistently, lower in 2025 than 2024; the UK 5G connection rate was 0.8pp lower overall and 4G was 1.5pp lower. Northern Ireland had the largest changes out of the UK nations, with a drop of 1.3pp for 5G and 2.1pp for 4G. However, the size of these changes means they are unlikely to be noticeable to mobile users (with a 2pp drop representing only about one extra connection failure in 50 attempts) and, as outlined in the Overview section, could be due to factors other than changes in network performance.

While the connection success rates to 5G and 4G were slightly lower in 2025 than in 2024, the 3G rate was significantly lower, at 76.6%, a year-on-year fall of 8.4pp.

Figure 8: Average proportion of successful data connections while the screen was active, by mobile technology, UK nation and rurality: 2024 and 2025

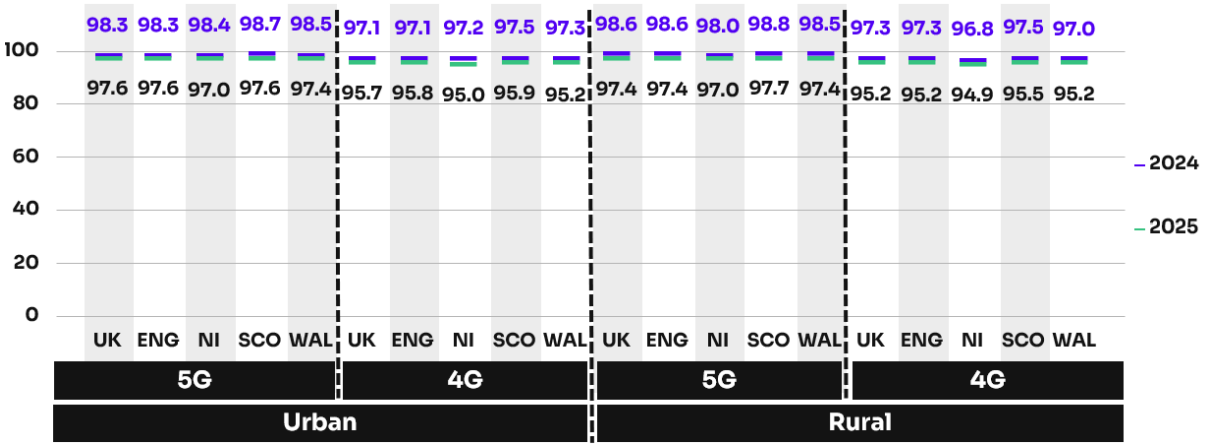


Source: Ofcom, using crowdsourced data provided by Opensignal
Note: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage.

[4] For information on the coverage provided by the UK's four mobile networks, please see Ofcom's Map Your Mobile tool and Connected Nations reports.

Connection success rates in urban and rural areas within each nation, over both 5G and 4G, were similar; the largest difference (0.5pp for 4G in England) equated to one additional failure per 200 connection attempts).

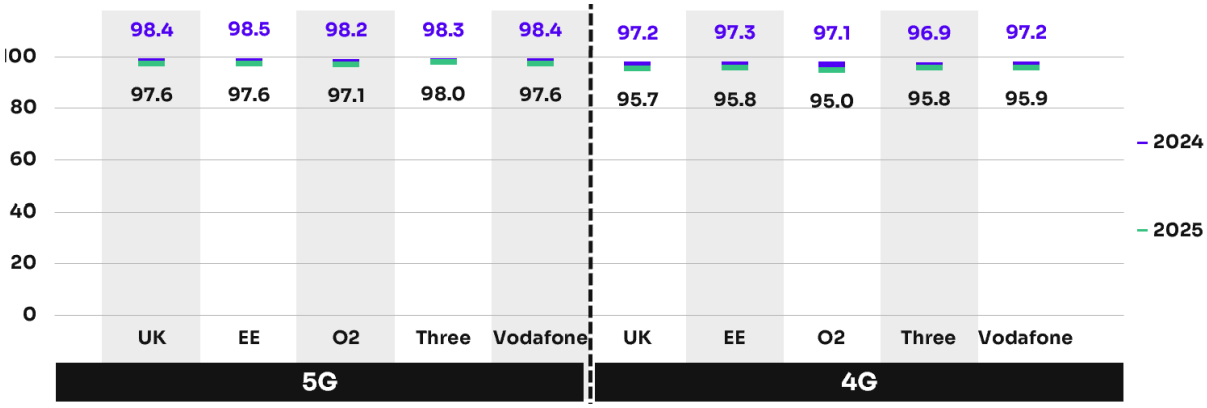
Figure 9: Average proportion of successful data connections while the screen was active, by mobile technology, rurality, and UK nation: 2024 and 2025



Source: Ofcom, using crowdsourced data provided by Opensignal.
Notes: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage.

Comparison of the connection success rates between MNOs shows that there was less than 1pp difference between them in 2025, over both 5G and 4G.

Figure 10: Average proportion of successful data connections while the screen was active, by mobile technology and MNO, and significant differences, to a 95% level of confidence: 2024 and 2025



	EE was better than…	O2 was better than…	Three was better than…	Vodafone was better than…
5G 2025	O2	-	EE, O2, Vodafone	O2
4G 2025	O2	-	O2	EE, O2, Three

Source: Ofcom, using crowdsourced data provided by Opensignal.
Notes: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage.

Video streaming

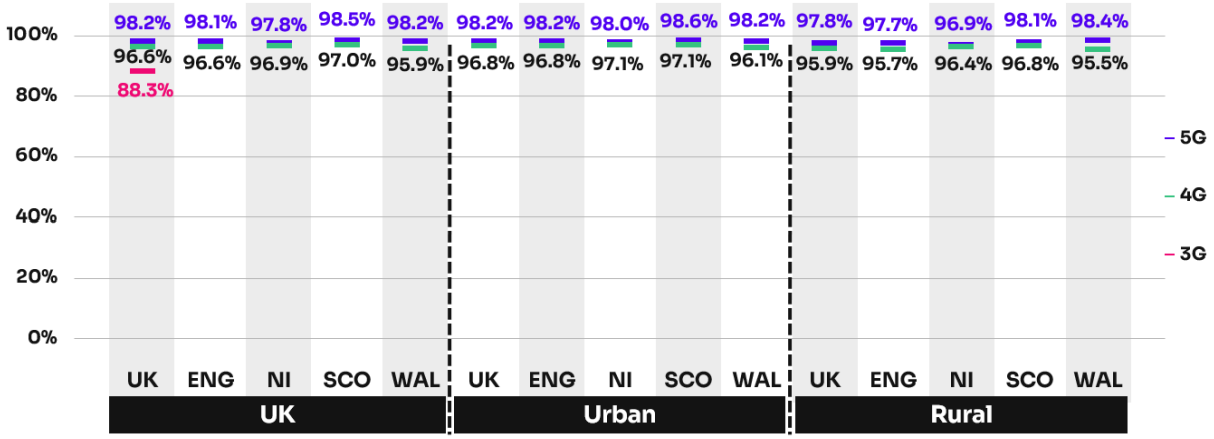
How often will I be able to stream videos without interruption?

Streaming video is one of the most bandwidth-heavy activities that people regularly use their mobile phones for. Opensignal's video streaming test streams a video from a typical CDN and measures buffering and playback activity. We have analysed the data from these tests to see the proportion of 30-second video streams that were successfully completed without playback stopping.

Overall, 98.2% of 5G streams completed without interruption, a slightly higher proportion than over 4G (96.6%) and much higher than the 88.3% average over 3G. At the overall UK level, 5G and 4G performed slightly better in urban areas than in rural areas; however, this was driven by the results in England: in the other nations there were no differences between urban and rural performance over 5G and 4G, partly due to their smaller sample sizes.

5G performed better than 4G in each of the UK nations, and within urban and rural areas of each nation, except in rural areas of Northen Ireland, where there was no difference. Scotland's 5G and 4G video streaming success rates compared well with those of the other nations in urban areas, and overall, although the differences were small.

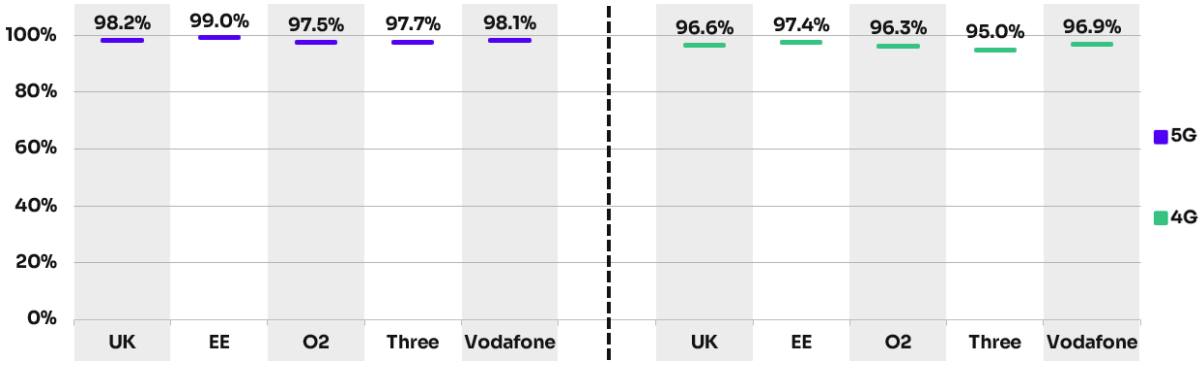
Figure 11: Proportion of 30-second video streams completed without interruption, by mobile technology, UK nation and rurality: 2025



Source: Ofcom, using crowdsourced data provided by Opensignal; October 2024 to March 2025 data.
Note: Data only relates to areas where there was mobile network coverage.

Across both 5G and 4G, a slightly higher proportion of EE's video streams completed successfully than those on the other MNOs' networks, although the differences between EE and the lowest-performing MNOs for each technology (O2 and Three for 5G, and Three over 4G) were not large, averaging about 2pp for each technology.

Figure 12: Proportion of 30-second video streams completed without interruption, by mobile technology and MNO, and significant differences, to a 95% level of confidence: 2025



	EE was better than…	O2 was better than…	Three was better than…	Vodafone was better than…
5G	O2, Three, Vodafone	-	-	O2, Three
4G	O2, Three, Vodafone	Three	-	O2, Three

Source: Ofcom, using crowdsourced data provided by Opensignal; October 2024 to March 2025 data.
Notes: The chart bars/lines show that there is a 95% probability that the actual average performance for all consumers (i.e. not just the consumer panellists within our sample) falls within the ranges shown; data only relates to areas where there was mobile network coverage.

Response time (latency)

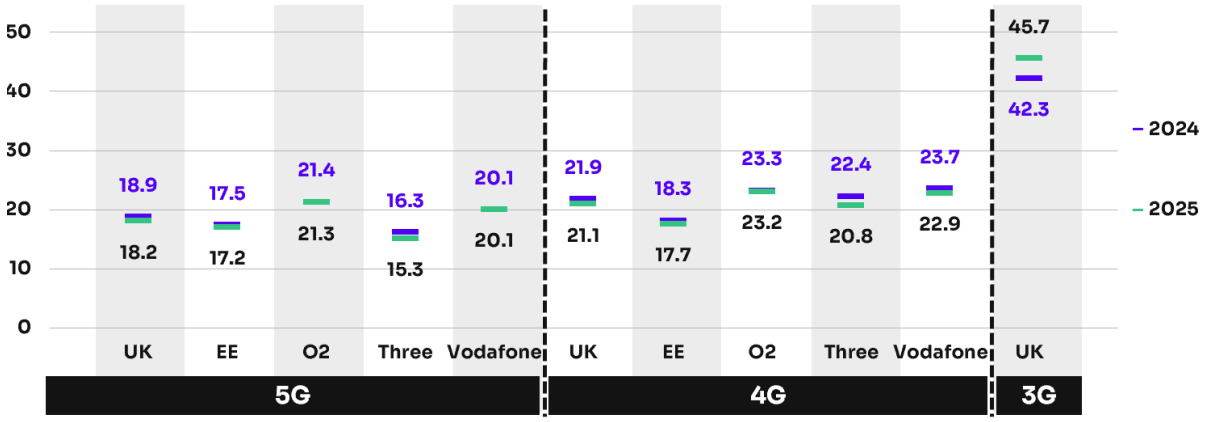
How quickly does the network respond to my requests?

Another factor determining a user's experience of mobile services is delay or 'lag', known as the response time or latency. Real-time activities such as video calling, voice chats (VoIP), and online gaming are sensitive to slow response times (high latency). When response times are slow, users may experience delayed or lost audio/video, leading to people talking over each other, dropped or reconnecting calls, and laggy screen-sharing. Slow response times are less disruptive while web browsing, although web pages may be slower to load and there could be delays when clicking buttons or submitting forms. In general, a response time under 50ms is sufficient for demanding activities such as video calling, while response times below 100ms are sufficient for most activities.

Our analysis shows that the average UK response times for both 5G and 4G networks in 2025 were under 25ms, sufficient for most activities; as expected, 5G had a faster response time than 4G. Three had the lowest (best) response time (latency) over 5G, while EE's was the lowest over 4G. However, there were only small differences in response times between the MNOs at the UK level, with 5G response times ranging between 15ms and 21ms and 4G ranging from 18ms to 23ms. While O2's response times were slightly higher than the other MNOs' on both 5G and 4G, they were still sufficient to give a good user experience for even the most demanding online activities.

Year-on-year comparison of the latency results shows that overall UK response times improved by 0.7ms for 5G, with Three improving by 1.0ms and EE by 0.3ms. Similarly, the overall UK response time for 4G improved by 0.8ms with Three improving by 1.6ms, Vodafone by 0.8ms and EE by 0.6ms. As set out in the Overview section, small year-on-year changes may be due to factors other than changes in network performance.

Figure 13: Average (median) response time by mobile technology and MNO, (ms, lower is better) and significant differences, to a 95% level of confidence: 2024 and 2025



	EE was better than…	O2 was better than…	Three was better than…	Vodafone was better than…
5G 2025	O2, Vodafone	-	EE, O2, Vodafone	O2
4G 2025	O2, Three, Vodafone	-	O2, Vodafone	O2

Source: Ofcom, using crowdsourced data provided by Opensignal.
Notes: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage.

Connection speeds

How fast can I download and upload data?

Time to download files

Downloading data is integral to most of the activities we do on smartphones, including web browsing, making voice and video calls over the internet using apps like WhatsApp, FaceTime, Zoom or Teams, streaming music and videos, and downloading e-books. The time taken to download a file varies depending on the size of file and the mobile technology the connection is provided over. As people use their smartphones for a variety of purposes, they access files of varying sizes over their mobile connection. Our analysis looks at the average time to download 2 MB, 5 MB and 10 MB files over 5G and 4G networks to represent these different scenarios.[5] For example:

- downloading a 2 MB file can be representative of downloading photos and short low-resolution video clips in messaging apps or social media;
- a 5 MB download can represent opening a photo in an email, opening a longer low-resolution video via instant messaging, or downloading a short audio file; and
- downloading a 10 MB file can be representative of activities such as downloading higher quality short-form video.

The connection speed tests later in the report simulate activities that require larger amounts of data such as downloading TV programmes, films, or music albums.

File downloads over 5G were consistently faster for each file size tested, with 4G taking about twice as long as 5G, and 3G more than 10 times as long as 5G. Year-on-year comparisons show that 5G file download times in 2025 were consistent with 2024, with changes of less than 0.1s across all file sizes. The year-on-year differences tended to be larger over 4G and 3G, and while 2 MB and 5 MB downloads over 4G were slightly faster in 2025 than in 2024, 10 MB file downloads on 4G, and 2 MB and 5 MB downloads on 3G took longer. As outlined in the Overview section, small year-on-year changes in the data may be due to factors other than changes in network performance.

Figure 14: Average (median) time to download a 2 MB, 5 MB and 10 MB file, by mobile technology (seconds, lower is better): 2024 and 2025



[5] As the test is a single file download, it is indicative of the performance of these types of services, rather than being an exact representation.

Source: Ofcom, using crowdsourced data provided by Opensignal
Note: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage.

Download times were broadly similar across the four UK nations. For the 10 MB file, the difference between the fastest and slowest nation on 5G was 0.1s, and 0.2s for 4G. However, file downloads in Northen Ireland and Wales tended to take longer than in England and Scotland over both 5G and 4G, although the differences were often small.

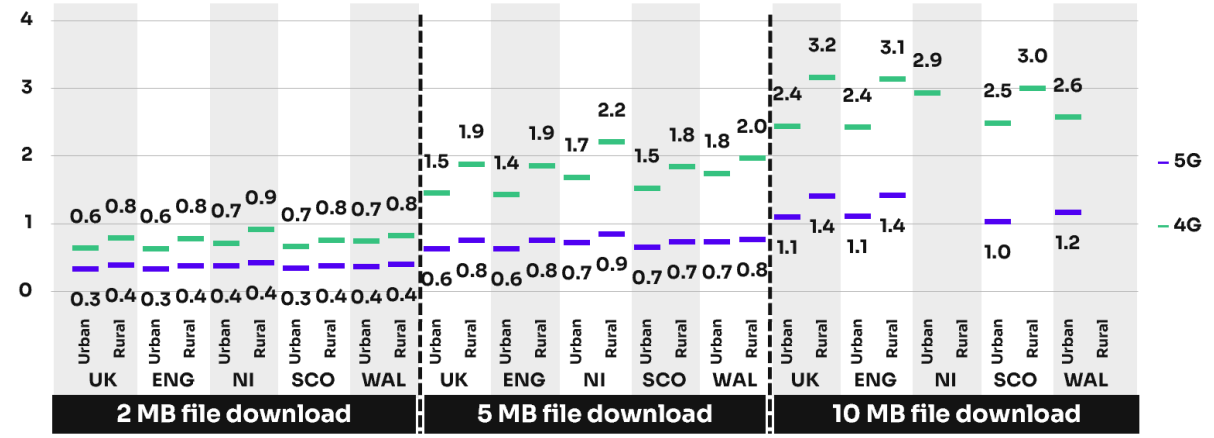
Figure 15: Average (median) time to download a 2MB, 5MB and 10MB file, by mobile technology and UK nation (seconds, lower is better): 2025



Source: Ofcom, using crowdsourced data provided by Opensignal; October 2024 to March 2025 data.
Notes: Data only relates to areas where there was mobile network coverage; missing datapoints indicate that there were insufficient measurements for robust analysis of the data (<500).

File downloads in urban areas of the UK were consistently faster than in rural areas for the same file size and network technology. However, the differences were relatively small, and in many cases would be imperceptible to users: for the 10 MB file download test, urban area downloads were 0.3s faster on 5G and 0.7s faster on 4G than those in rural areas.

Figure 16: Average (median) time to download a 2 MB, 5 MB and 10 MB file, by mobile technology, rurality, and UK nation (seconds, lower is better): 2025



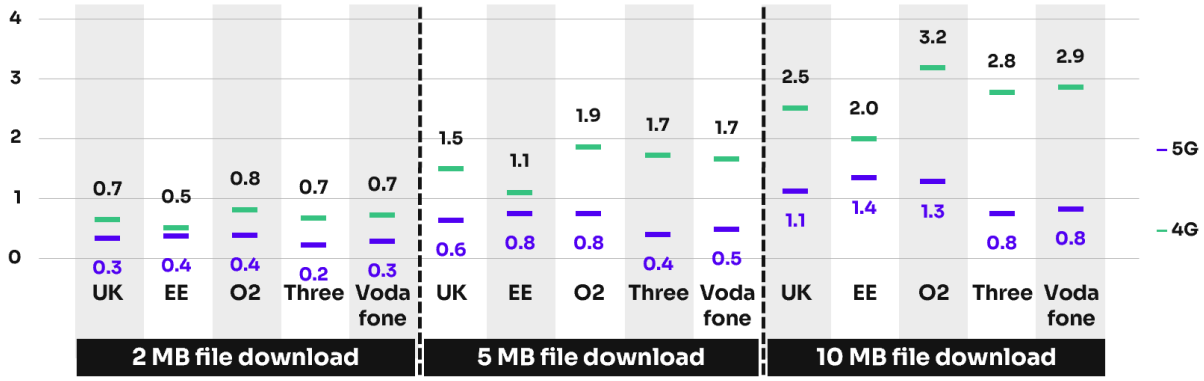
Source: Ofcom, using crowdsourced data provided by Opensignal; October 2024 to March 2025 data.
Notes: Data only relates to areas where there was mobile network coverage; missing datapoints indicate that there were insufficient measurements for robust analysis of the data (<500).

The differences between the quickest and slowest 10 MB file download times among the MNOs were 0.6s on 5G and 1.2s on 4G.

On 5G, 10MB file download times ranged from 0.8s (for Three) to 1.4s (EE) across the MNOs, while on 4G they ranged from 2.0s (EE) to 3.2s (for O2). Three was fastest on 5G across all file sizes, closely followed by Vodafone, while EE and O2 connections showed broadly similar 5G performance. Over 4G, EE consistently delivered the fastest download times across all file sizes, while O2's were slowest.

There was little change in 5G download times across all file sizes compared to 2024. However, EE file downloads took slightly longer across all file sizes in 2025, and O2's, Three's and Vodafone's were marginally faster. Again, there was little change in download times for 2MB and 5MB files over 4G in 2025; all MNOs' download times were slightly faster. Conversely, all MNOs except O2 (for which there was no change) were marginally slower for 10 MB downloads over 4G in 2025, with Three showing the largest increase, at 1.1s.

Figure 17: Average (median) time to download a 2 MB, 5 MB and 10 MB file, by mobile technology and MNO (seconds, lower is better) and significant differences, to a 95% level of confidence: 2025



		EE was better than…	O2 was better than…	Three was better than…	Vodafone was better than…
5G	2 MB	O2	-	EE, O2, Vodafone	EE, O2
	5 MB	-	-	EE, O2, Vodafone	EE, O2
	10 MB	-	-	EE, O2, Vodafone	EE, O2
4G	2 MB	O2, Three, Vodafone	-	O2, Vodafone	O2
	5 MB	O2, Three, Vodafone	-	O2	O2, Three
	10 MB	O2, Three, Vodafone	-	O2	O2

Source: Ofcom, using crowdsourced data provided by Opensignal; October 2024 to March 2025 data.
Notes: Data only relates to areas where there was mobile network coverage.

Distribution of download speeds

While the fixed-file size test data analysed above can be representative of online activities requiring small bursts of data, many common mobile activities such as video streaming or gaming involve data transfer well beyond 10 MB.

On faster connections, the 10 MB file download test (the largest tested) completed before the end-to-end connectivity had ramped up to full speed, so the result may understate the connection's capability. For example, a 10 MB file download test would complete in just 0.8 seconds on a 100 Mbit/s 5G connection.

Time-based tests measure how much data is transferred over a fixed period, which allows the connection to reach its optimal speed. Average download speeds are calculated from the results of these tests, and distributions of these speeds are shown below.

Figure 18: Indicative connection requirements for selected online activities

	Core activities	Moderate intensity activities	Ultra-high intensity activities
Download speed requirement	Less than 10 Mbit/s	20 Mbit/s to 50 Mbit/s	Over 50 Mbit/s
Example activities	Web browsing, online shopping, messaging, VoIP voice calls, streaming music, downloading smaller files.	High-resolution video streaming and video calls, quickly downloading larger files and apps.	Providing hotspot connectivity for several devices, each engaged in high-intensity tasks like 4K HDR video streaming, large file transfers.

Source: Ofcom

Our analysis shows that 8% of 5G connections, 28% of 4G connections and 88% of 3G connections had average download speeds below 10 Mbit/s in our 2025 measurement period.

One per cent of 5G connections and 5% of 4G connections in the UK had a speed below 2 Mbit/s, which would give users a good experience on only the most basic activities. A further 3% of 5G and 10% of 4G connections had an average download speed of 2 to 5 Mbit/s. 3G networks had a much higher proportion of lower-speed connections, with about a third (32%) of connections having an average speed of less than 2 Mbit/s.

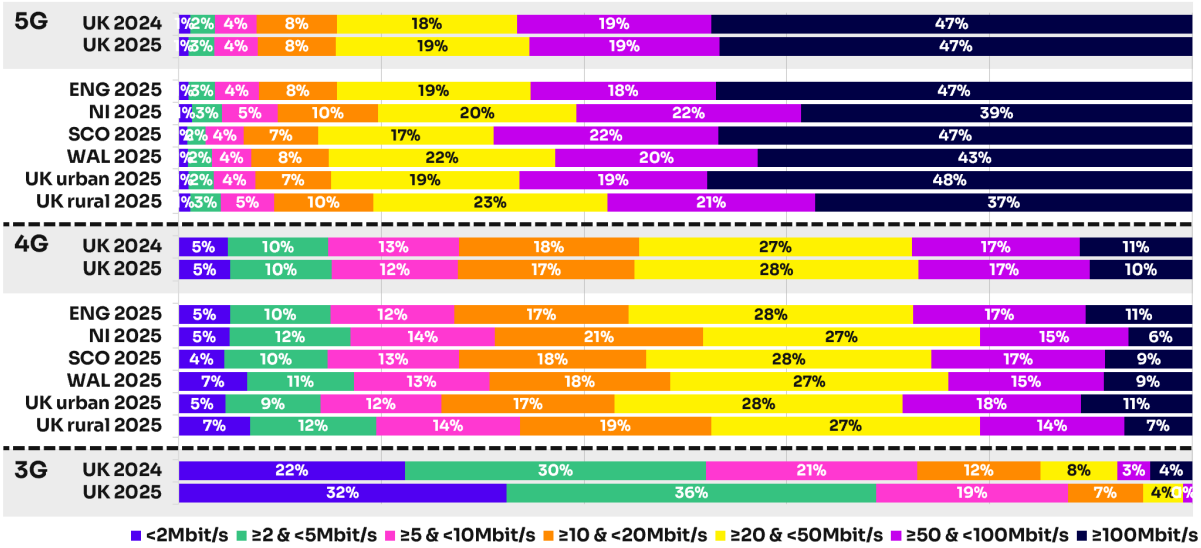
Overall, 96% of 5G and 85% of 4G connections were capable of supporting core online activities with speeds over 5 Mbit/s, compared to just 31% on 3G. Therefore, mobile users can expect a reliable experience for core activities when connected to 5G and a mostly dependable one on 4G, but should have lower expectations when using 3G.

Over 5G, 85% of connections had an average download speed of 20 Mbit/s or higher, sufficient for the moderate intensity activities listed above. This proportion was significantly higher than the 55% of 4G connections and 5% of 3G connections which achieved download speeds in this range.

Almost two-thirds of 5G connections (65%) delivered average download speeds of 50 Mbit/s or higher, again much higher than the proportions on 4G (27%) and 3G (1%). This means that in most cases, 5G should be able to support our ultra-high-intensity activities, whereas only a small

proportion of 4G connections, and hardly any on 3G, would be able to do so. Notably, 47% of 5G download speeds exceeded 100 Mbit/s, offering a significantly enhanced user experience with faster syncing and downloading, compared to 10% of 4G connections (no 3G downloads were recorded at this speed).

Figure 19: Distribution of download speeds, by mobile technology, UK nation and rurality: 2024 and 2025



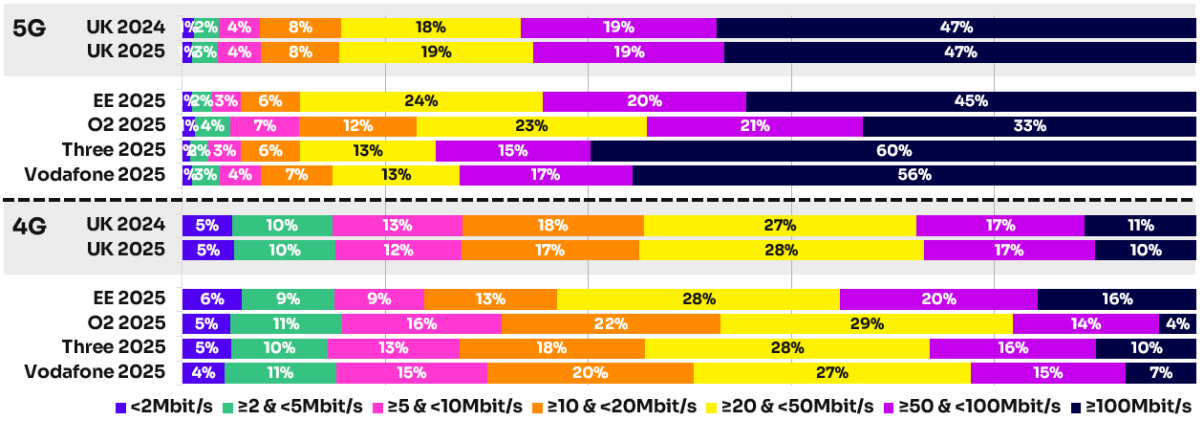
Source: Ofcom, using crowdsourced data provided by Opensignal
Notes: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage.

Among the MNOs, O2 customers had the highest proportions of download speeds recorded at less than 10 Mbit/s over both 5G and 4G (12% and 31% respectively). EE and Three had the joint-lowest share of 5G connections at under 10 Mbit/s (both 6%) while EE had the lowest share of 4G connections at these speeds (24%).

EE and Three also had the joint-highest proportions of 5G connections offering download speeds of 20 Mbit/s or higher (both 88%) while Three had the highest share of 5G connections at 50 Mbit/s or higher (75%). Over 4G, EE had the highest proportion of download speeds at 20 Mbit/s or higher and 50 Mbit/s or higher (63% and 35% respectively).

O2 had the lowest proportions of connections providing download speeds of 20 Mbit/s or higher and 50 Mbit/s or higher over both 5G and 4G.

Figure 20: Distribution of download speeds, by mobile technology and MNO: 2024 and 2025



Source: Ofcom, using crowdsourced data provided by Opensignal.
Notes: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage.

Time taken to upload a 1 MB file

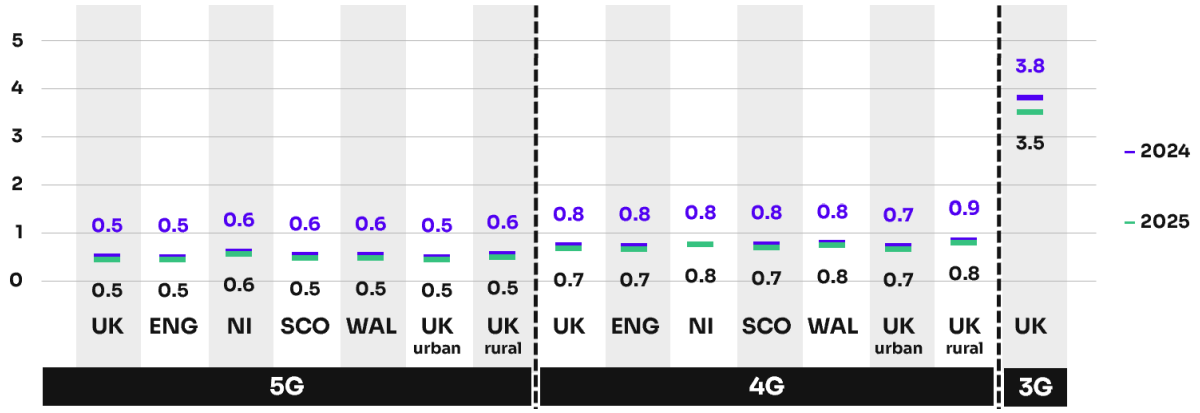
Uploading a 1 MB file can be representative of sharing photos or a short, low-resolution video via messaging apps or social media.[6]

The average time taken to upload a 1 MB file over 5G in the six months to March 2025 was about 30% shorter than the average over 4G. There were some differences in upload times between the UK nations within 5G and 4G, but these were small and unlikely to be noticeable. Similarly, while average urban 1 MB file upload times were lower than those in rural areas for both 4G and 5G services at a UK level, the size of the differences meant that they would be unlikely to impact the user experience.

In most cases the time taken to upload files over 5G and 4G decreased slightly year on year at a UK level and within each of the UK nations, apart from 4G in Northern Ireland, where there was no change. As mentioned in the Overview section, the small year-on-year changes observed in the data may be due to factors other than variations in network performance.

[6] As the test is a single file upload, it is only indicative of the performance of these services, rather than being an exact representation.

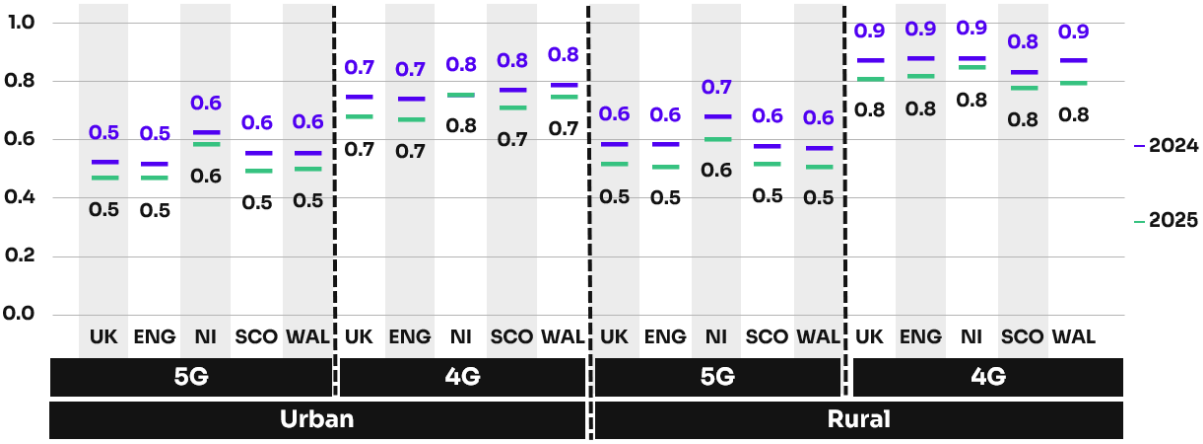
Figure 21: Average (median) time taken to upload a 1 MB file, by mobile technology, UK nation, and rurality (seconds, lower is better): 2024 and 2025



Source: Ofcom, using crowdsourced data provided by Opensignal.
Notes: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage; the analysis excludes measurements to Google's content delivery network for all four MNOs from mid-October 2024 to early February 2025: see the Statistical methodology for more detail.

Within each of the UK nations, it was slightly quicker to upload a 1 MB file in urban areas than in rural areas over both 5G and 4G. But again, the differences we found were small (the largest was 0.1s) and were unlikely to significantly affect the user experience.

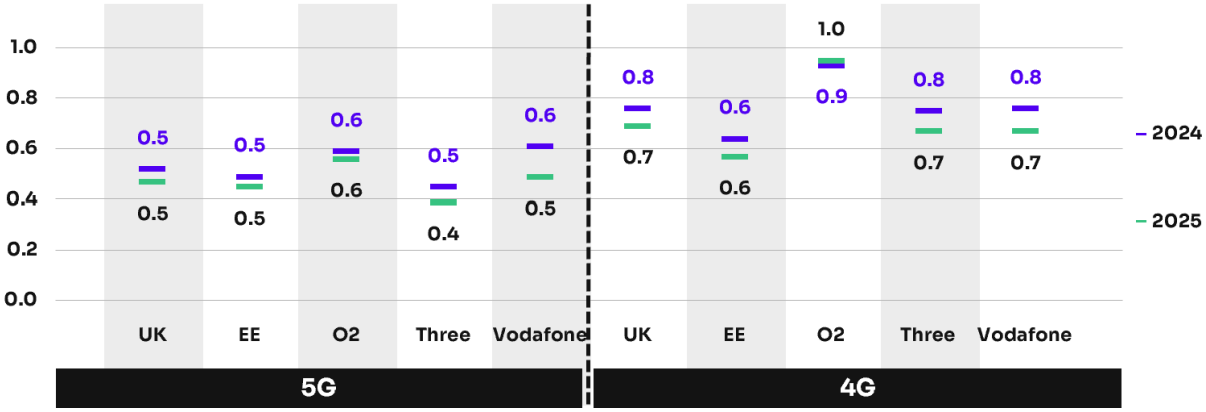
Figure 22: Average (median) time taken to upload a 1 MB file, by mobile technology, rurality and UK nation (seconds, lower is better): 2024 and 2025



Source: Ofcom, using crowdsourced data provided by Opensignal.
Notes: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage; the analysis excludes measurements to Google's content delivery network for all four MNOs from mid-October 2024 to early February 2025: see the Statistical methodology for more detail.

O2 had the longest times to upload 1 MB files over both 5G and 4G in 2025, while Three had the fastest times over 5G, and EE was fastest over 4G. There were small year-on-year falls in the time taken to upload a 1 MB file over 5G and 4G in the six months to March 2025 for all the MNOs except O2, which had a slightly longer upload time over 4G. However, these small year-on-year changes in the data could be due to factors other than network performance.

Figure 23: Average (median) time taken to upload a 1 MB file, by mobile technology and MNO (seconds, lower is better) and significant differences, to a 95% level of confidence: 2024 and 2025



	EE was better than…	O2 was better than…	Three was better than…	Vodafone was better than…
5G	O2, Vodafone	-	EE, O2, Vodafone	O2
4G	O2, Three, Vodafone	-	O2	O2

Source: Ofcom, using crowdsourced data provided by Opensignal.
Notes: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage; the analysis excludes measurements to Google's content delivery network for all four MNOs from mid-October 2024 to early February 2025: see the Statistical methodology for more detail.

Distribution of upload speeds

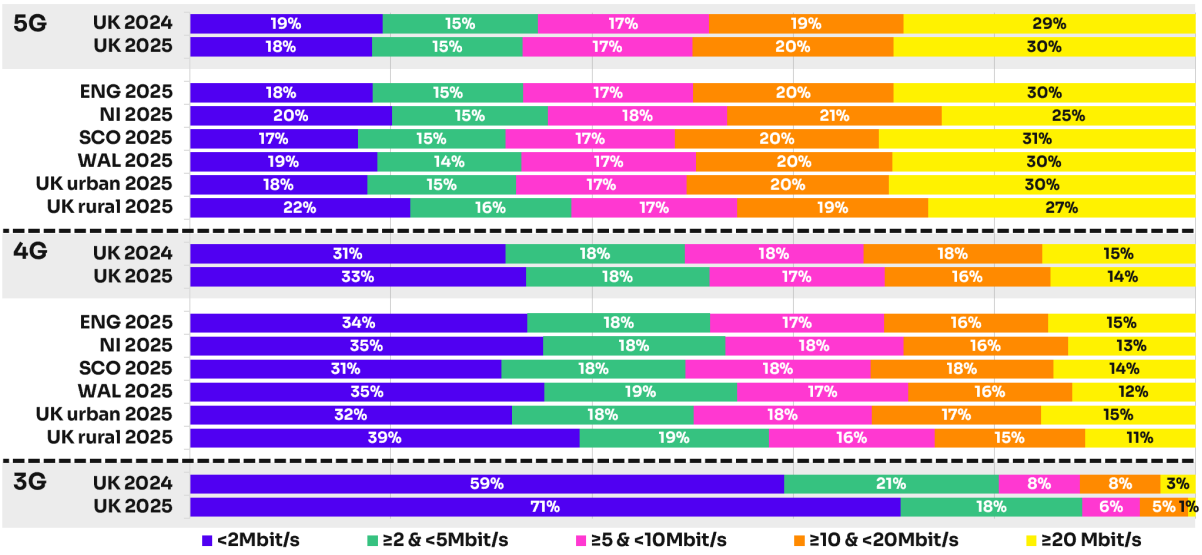
While our attention is often focused on download speeds, upload speeds are also important to receiving a seamless online experience, especially for real-time activities like video conferencing. Low upload speeds can lead to noticeable lags, delays, freezing, and buffering in both video and audio, disrupting the flow of conversations and making communication frustrating and less effective.

To provide a comprehensive view of network performance, Opensignal also uses time-based tests to measure connection upload speeds, similar to its approach for download speeds. Our analysis of the results of these tests indicates that 5G continued to provide faster upload speeds than 4G and 3G services in the six months to March 2025, with 5G having the highest proportion of uploads at 20 Mbit/s or higher (30% compared to 14% on 4G and 1% on 3G) and a lower proportion of tests with upload speed results of under 2 Mbit/s (18% vs 33% on 4G and 71% on 3G).

Northern Ireland had both the lowest proportion of 5G upload speeds at 20 Mbit/s or higher (25%) and the highest proportion of 5G upload tests that were under 2 Mbit/s (20%). Over 4G, Wales had the lowest proportion of upload speeds of 20 Mbit/s or higher (12%) and the joint-highest proportion of 4G upload speeds of under 2 Mbit/s, along with Northern Ireland (both 35%). The proportion of 5G and 4G upload speed tests measured at 20 Mbit/s or more was higher, and the proportion of those under 2 Mbit/s lower, in urban areas than in rural areas of the UK.

The proportion of 5G upload connections that were measured at 20 Mbit/s or higher increased year on year, and the proportion under 2 Mbit/s fell (although these changes were small), suggesting that any improvement in performance was only marginal (or could be due to factors other than variations in network performance, as mentioned in the Overview section). The opposite was true for both 4G and 3G uploads, suggesting a slight deterioration in performance during the year.

Figure 24: Distribution of upload speeds, by mobile technology, UK nation, and rurality: 2024 and 2025

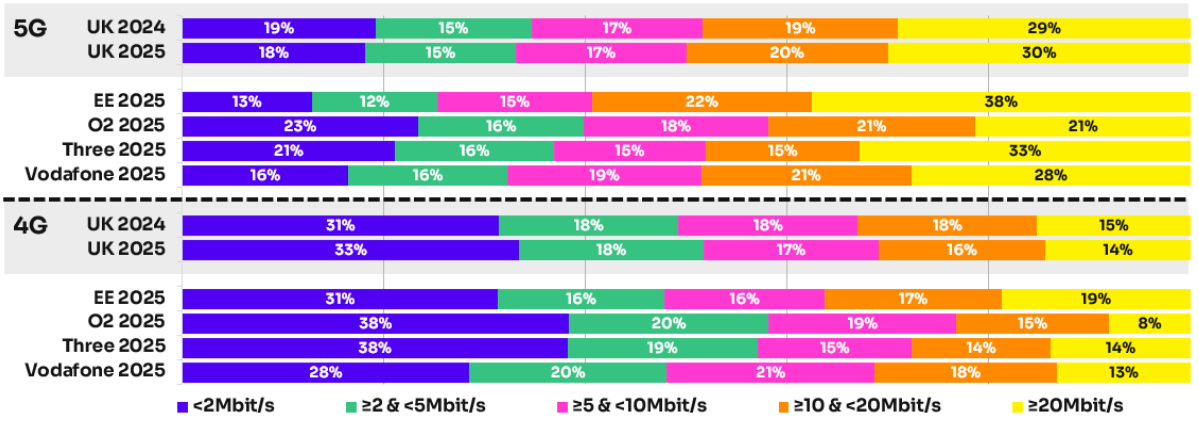


Source: Ofcom, using crowdsourced data provided by Opensignal.
Notes: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage.

Across the four MNOs, O2 had the lowest proportion of 5G and 4G speed test results recorded at 20 Mbit/s or more (21% and 8% respectively), 9pp lower than the UK average over 5G and 6pp below the UK 4G average. O2 also had the highest proportion of upload speeds under 2 Mbit/s among the MNOs over 5G, while O2 and Three had the joint-highest proportion under 2 Mbit/s over 4G.

EE had the highest proportion of 5G and 4G speed tests at 20 Mbit/s or higher, at 38% and 19% respectively (8pp higher than the UK average over 5G, and 4pp above the UK average over 4G). EE also had the lowest proportion of speeds under 2 Mbit/s over 5G (13%) while Vodafone had the lowest proportion over 4G (28%).

Figure 25: Distribution of upload speeds, by mobile technology and MNO: 2024 and 2025



Source: Ofcom, using crowdsourced data provided by Opensignal.
Notes: Datapoints labelled '2024' were recorded in the six months to March 2024, while those labelled '2025' were recorded in the six months to March 2025; data only relates to areas where there was mobile network coverage.

A1 Technical methodology

Ofcom uses measurements collected from mobile users to measure the mobile network performance and the consumer experience of using different mobile services. Opensignal's data collection methodology uses a sample of UK smartphone users who have installed apps that include the Opensignal software development kit (SDK) on their device. The data collection framework and sample methodology were developed and managed by Opensignal Limited ('Opensignal') and the resulting data was licensed to Ofcom. Opensignal also managed the collection and aggregation of the crowdsourced data.

Data collection

Individual measurements from smartphones are collected every day, under conditions of normal use. They include measurements in both indoor and outdoor locations.

Opensignal measures the end-to-end consumer network experience, and the full path from the user device all the way to the content delivery networks (CDNs) that host popular apps, services and websites.

The measurements of network speed are collected based on both user-initiated tests and automated tests. Most measurements are generated through automated tests (i.e. without user interaction), and are executed independently and at random intervals to capture what users are experiencing at a typical moment in time.

A rigorous post-processing system is used, which takes the raw measurements and calculates robust and representative metrics. This includes several steps to quality-assure the measurements.

For example, if a user failed to download any content, this measurement is eliminated and treated as a 'failed test' rather than being included in the average speed calculation.

Table A1: Data collection processes and actions

Process	Action taken
Initial filtering	Certain entries are automatically filtered out (e.g. when a phone is on a call), which are known to produce atypical results.
Operator name mapping	To ensure that the results only reflect the experience of customers who have bought the operator's own branded service, Opensignal removes results from mobile virtual network operator (MVNO) subscribers, and subscribers who are roaming, from the results for mobile network operators (MNOs). These subscribers may be subject to different quality of service (QoS) restrictions than an operator's own customers and so their experience may be different.
Selection of network type	Opensignal consolidates data into technology types. For example, when considering 3G connections, Opensignal includes the various 3GPP releases, including HSDPA, HSUPA and UMTS R99, into one group.

Source: Ofcom / Opensignal

The metrics analysed by Ofcom are:

- Share of mobile network connections
- Data connection success rate
- Response time (latency)
- Time to download a 2 MB/ 5 MB/ 10 MB file
- Time taken to upload a 1 MB file
- Distribution of download speeds
- Distribution of upload speeds

Metrics

Share of mobile network connections

Share of mobile network connections measures the frequency of individuals being connected to different mobile technologies. The share of mobile network connections metric is calculated across all mobile network generations.

Table A2: Identification of mobile network generations

Category	Description
2G	Records when the user was connected to 2G (network type is one of 'GPRS', 'EDGE', 'GSM').
3G	Records when the user was connected to 3G (network type is one of 'UMTS', 'WCDMA', 'HSDPA', 'HSUPA ', 'HSPA'.
4G	Records when the user was connected to LTE (network type is 'LTE') i.e. 4G.
5G	Records when an NR connection has been allocated to the device (NR State=3 in non-standalone access) or when there is a standalone access 5G connection.

Source: Ofcom / Opensignal

Data connection success rate

The data connection success rate metric provides a view on the success of an Opensignal server response test to connect to the internet, using 3G, 4G or 5G mobile data network connectivity when a mobile phone screen is on, to mirror consumer behaviour. The Opensignal server response test is also used to measure latency, and this methodology is recorded below.

Response time (latency)

Response time, often referred to as latency, is the delay between a consumer making a request to their mobile network for information and the network providing this information to the device.

Server response tests are performed against a number of leading content delivery networks (CDNs) that are typically used to host popular apps, websites, and mobile services.

A server response (SR) test is defined as a test which determines the latency, jitter and packet loss of the current connection using UDP. To accurately measure these key performance indicators (KPIs), a predetermined number of packets (usually 100) are sent to the test servers. Each of these packets contains a 32-byte payload which includes a number indicating the ordering of that packet in the sequence of packets sent out.

The SDK chooses the closest test server based on the geographical distance between the device and the server locations. Each packet is then sent to the test server via UDP, which is connectionless. This means that, unlike TCP connections, there is minimal handshaking involved; handshaking can produce measurement results that indicate slower than actual speeds.

The UDP protocol is also used to simulate latency-sensitive applications, such as video and VoIP calling. The precise time that each packet is sent out is recorded to nanosecond precision and stored for later calculations. The packet spacing is 20ms between packets.

The test server receives the packets sent from the SDK and then immediately echoes them back to the listening device. The precise time that each packet is received back on the device is also recorded, along with the specific payload of each packet, as this payload indicates the ordering of the packets returned to the device. The Metro Ethernet Forum (MEF) 10 specification is used to calculate the latency.

Latency is determined as half of the round-trip travel time of each packet, from the time the packet is sent from the SDK to when the same packet is received.

Time taken to download a 2 MB/5 MB/10 MB file and upload a 1 MB file

The Opensignal SDK performs a collection of active tests, in which phones are prompted to download a 2 MB, 5 MB or 10 MB file and upload a 1 MB file, and the throughput experienced when downloading / uploading these files is recorded.

The download throughput measures the time it takes to download a 2 MB file from a randomly selected CDN test server over a TCP connection – 2 MB is selected to simulate downloading photos or short low-resolution video clips in messaging apps or via social media. The measured download throughput is recorded against the current mobile connection (2G, 3G, 4G or 5G).

Download throughput tests are performed against CDNs commonly used to host popular website and other web applications over HTTPS. This allows test files to be downloaded with a low latency through one of the CDN edge servers located around the world. The payload is requested via URL. The end server that delivers the payload is determined by the CDN.

The fixed-size throughput tests do not measure the maximum throughput of the network. There is a technical limitation of the download throughput tests that limits the minimum throughput to 350Kbps. This is the result of the timeout implementation within the Opensignal SDK.

Each CDN service determines the closest edge test server to serve the download test file, based on the IP address of the device. The SDK opens a TCP connection (HTTPS GET) to the test server to start downloading the test file.

The current time is then recorded in nanoseconds, as well as a received (Rx) byte count. The received byte count is a numerical count of how many bytes have been delivered over the wireless radio at a given time. This is the final step performed before the actual bytes are streamed from the server, to ensure that the measurements have the highest level of accuracy. Data bytes are streamed-in as 1024-byte blocks, until either the file has completed downloading, or a timeout or a cancel test event is triggered. The connection is then closed, and the current time and the device's current received byte count are recorded.

Download and upload speed

Opensignal's download and upload speed metrics assess the mean speeds experienced on data connections to mobile networks.

Opensignal's speed tests involve downloading or uploading a file for a set period of time to test the data performance of a user's mobile network, directly from their handset.

The test is performed over HTTPS connections, and multiple threads are used to simulate a typical mobile app data connection. The download and upload servers are the same as those used by popular mobile apps, websites and mobile services which internet users connect to every day, provided by the major content delivery networks (CDNs).

Opensignal collects data primarily via automated tests that run in the background. These tests are run at various points in time to ensure that the metrics accurately reflect the speeds that users experience during normal use of their mobile network.

To calculate the metrics for download and upload throughput speed, Opensignal uses a dataset of individual test records which contains a series of fields including: test location, time, type (user-initiated or automated), network connection type (e.g. Wi-Fi, UMTS, LTE, 5G etc.), the servers that were used, the IP address, various RF parameters and a series of metrics associated with the speed and latency of the data connection that was measured during the test.

A2 Statistical methodology

The 2025 Mobile Matters report analyses findings collected from Opensignal's crowdsourced data sample between 1 October 2024 and 31 March 2025 and compares them with the 2024 Mobile Matters reported values collected between 1 October 2023 and 31 March 2024.

Crowdsourced sample records were included in the analysis if they met the following criteria:

a) the mobile network was either EE, O2, Three or Vodafone.
b) the location was in the UK and the UK nation was either England, Northern Ireland, Scotland, or Wales.
c) the mobile technology was known – either 2G, 3G, 4G, 5G, 5G SA, or 5G NSA.

Records which did not meet the above criteria were excluded from the analysis.

Ofcom has only analysed the performance recorded on Android smartphones (i.e. tests run on Apple iOS devices, and devices where the operating system was not identified, have been excluded from our analysis).

Both Ofcom and Opensignal have ensured that the sample sizes are sufficient to ensure the robustness of the findings shown in the report, and that the sample distribution broadly matches both the population distribution of the United Kingdom and the relative operator shares.

The urban / rural classifications used in the analysis are taken from Bluewave Geographic's Locale dataset.

Metrics and analysis methodology

For the 2025 Mobile Matters report the following metrics were analysed:

- Share of mobile network connections (%).
- Average proportion of successful data connections (%).
- Average (median) response time (milliseconds, ms).
- Average (median) time to download a 2MB/5MB/10MB file (seconds).
- Average (median) time taken to upload a 1MB file (seconds).
- Distribution of download speeds (%).
- Distribution of upload speeds (%).
- Proportion of videos completed without interruption (%).

Share of mobile network connections

This measure assesses how mobile network connections are distributed across each mobile technology (2G, 3G, 4G or 5G). Our analysis looked at how the proportion of these connections on each technology differed by nation, rurality, and mobile network operator (MNO). Two-tailed tests of proportion were performed to look for statistically significant differences; these are shown in the report. With such a large number of tests, very small differences between the proportions can be statistically significant, although there may be no noticeable difference for the consumer in their mobile phone experience.

Data connection success rate

To assess the data connection success rate, we looked at the total number of server response tests performed and calculated the percentage of these tests that were successful. The proportion of successful tests was then compared by nation, rurality, MNO, and mobile technology (3G, 4G or 5G). We used records where the mobile screen was on during this test, so that we could assess the percentage of cases when the user was able to connect to data services when the device was in active use.

With such a large number of readings, even very small differences between averages or proportions can be statistically significant. However, this may not equate to a noticeable or practical difference for the consumer in their experience of using their phone.

The proportion of successful tests with upper and lower 95% confidence intervals was calculated for each subgroup, and comparisons were made using two-tailed statistical tests. Analysis was conducted comparing 3G, 4G and 5G mobile technologies, nation, rurality, and MNO (only 4G and 5G performance was analysed at MNO level), and to look for any statistically significant differences in the performance of data services.

Response time (latency)

Response time, or latency, which is the delay in milliseconds between a consumer making a request to their mobile network for information and receiving a response, was compared by mobile technology and MNO. A two-tailed test of median response times was conducted on all sub-group comparisons.

Video streaming

Opensignal's video streaming test streams a video from typical content delivery networks (CDNs) and measures buffering and playback activity. We analyse this data to find the proportion of tests that were completed without the playback stopping. Upper and lower 95% confidence intervals were calculated for this proportion for each subgroup, and comparisons were made using two-tailed statistical tests.

Time taken to download files

The Opensignal dataset contains tests in which phones download differently-sized files (2 MB, 5 MB or 10 MB), and the throughput experienced when downloading this file is recorded. We applied a conversion to this measure by multiplying the file size by 8 (to convert from MB to Mbit) and then divided this figure by the recorded throughput to produce a measure showing the time taken for the user to download a 2 MB, 5 MB or 10 MB file respectively. The median time taken to download files of each size was calculated for each subgroup. Two-tailed tests of median download times were conducted on all sub-group comparisons. Performance was compared by mobile technology, nation, rurality and MNO.

Time taken to upload files

The Opensignal dataset also contains upload tests, where the throughput experienced when uploading a 1 MB file is recorded. We applied the same conversion as above to produce a measure assessing the time taken to upload a 1 MB file. The median time taken to upload a 1 MB file was calculated for each subgroup. Two-tailed tests of median download times were conducted on all

sub-group comparisons. Performance was compared by mobile technology, nation, rurality, and MNO.

Distribution of download and upload speeds

To assess the distribution of download and upload speeds, we used the Opensignal speed test which downloads or uploads data over a set period of time. The download/upload speed received is recorded every 30ms, and this collection of measurements is trimmed[7] and averaged to give a single value. The distribution of these speed tests is then calculated based on different speed bands[8] and compared by mobile technology, nation, rurality and MNO.

Exclusion of 'time taken to upload' test results for Google CDN

In mid-October 2024, Google updated the content delivery network (CDN) used for some of Opensignal's upload throughput tests. The impact of this change was not uniform across the UK operators.

Having worked with Google, in early February 2025 Opensignal introduced a new Google CDN upload throughput endpoint, which provided a better representation and utilisation of Google's infrastructure. This resulted in similar 'time taken to upload' test results to those returned previously, and provided a better representation of the end-user experience.

To ensure the validity of the data presented in this report, and consistency in the comparisons of MNO performance, our analysis excludes the 'time taken to upload' measurements to Google's CDNs for all four MNOs for the period mid-October 2024 to early February 2025.

[7] The top and bottom 10% of the tests were discarded.

[8] For download speed: <2 Mbit/s, ≥2 and <5 Mbit/s, ≥5 and <10 Mbit/s, ≥10 and <20 Mbit/s, ≥20 and <50 Mbit/s, ≥50 and <100 Mbit/s and >100 Mbit/s. For upload speed: <1 Mbit/s, ≥1 and <2 Mbit/s, ≥2 and <5 Mbit/s, ≥5 and <10 Mbit/s, ≥10 and <20 Mbit/s and ≥20 Mbit/s.

A3 Glossary of terms

Term	Description
2G / 3G / 4G / 5G	Generations of mobile technology, each offering better speed and performance than the previous one.
3G switch-off	The process by which MNOs shut down their 3G networks, reallocating resources to newer technologies like 4G and 5G.
5G non-standalone (NSA)	A transitional 5G version that still uses 4G infrastructure.
5G standalone (SA)	A full 5G system with no reliance on 4G, offering superior performance.
Bandwidth	The maximum rate of data transfer across a network. High-bandwidth activities (like streaming) require strong, consistent speeds.
Buffering	A temporary loading pause while a video gathers enough data to continue playing smoothly. High buffering indicates slower connection or latency.
Connection success rate	The percentage of data connection attempts that result in a successful connection to the mobile network.
Content delivery network (CDN)	A network of servers strategically placed to deliver digital content such as video streams quickly and reliably to users.
Coverage	The availability of mobile network signal in a particular geographic location.
Crowdsourced data	Data gathered from a large number of users.
Download / upload speeds	Rates at which data is received from (downloaded) or sent to (uploaded) the internet, measured in megabits per second (Mbit/s).
Download / upload time	The time it takes to retrieve a digital file from the internet to a device, measured in seconds. Lower values mean faster connections.
Featurephone	A basic mobile phone mainly for calls and texts, often with physical buttons and limited features like a simple camera or FM radio.
Latency (response time)	The time (in milliseconds) it takes for data to travel between a device and the network. Low latency is crucial for real-time activities like gaming or video calls.
Mbit/s (megabits per second)	A measure of data transfer speed. Higher Mbit/s means faster internet performance. For context, 100 Mbit/s = c12.5 megabytes per second.
Median average	The middle value in a dataset, used to reflect typical performance in download tests.

Term	Description
Milliseconds (ms)	A unit of time measurement used to report latency or response time. One second = 1,000 milliseconds.
Mobile data connection attempt	When a mobile device tries to establish a data connection to the network while within a coverage area.
Mobile Network Operator (MNO)	A company that runs a mobile network, such as EE, VodafoneThree and VMED O2.
Mobile performance	A measure of how well a mobile network functions, including connectivity, speed, and responsiveness.
Network availability	Indicates if a mobile signal is present and usable in a given location.
Network congestion	A condition where high network traffic causes delays, failed connections, or poor performance.
Network share	The portion of total mobile connections using a particular network type (e.g. 5G, 4G etc).
Rurality	A geographic classification dividing areas into urban and rural for performance comparison.
Smartphone	A mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, internet access, and an operating system capable of running downloaded applications.
Time-based tests	Tests that measure how much data is downloaded in a fixed amount of time, better reflecting real-world network capability on high-speed connections.
Two-tailed test	A statistical hypothesis test where the critical region of a distribution is split into two sides, testing for deviations in both directions (above or below a hypothesised value).
Video lag / delay	A symptom of high latency or slow speeds resulting in choppy or paused playback during streaming.
Video streaming success rate	The percentage of video streams that played without interruption during testing.
VoIP (Voice over Internet Protocol)	Technology that delivers voice communications and multimedia sessions over internet connections.