

The race to 5G

The contest to be the first operator in the world to launch a commercial 5G network has already been won – twice. 5G is the fifth generation of cellular network technology.

In May 2018, Ooredoo, a mobile operator based in Qatar, announced the commercial launch of the world's first 5G network. As no handsets were available at this time, the network was accessed via apps: the 5G network was being used, but apps replicated handsets.¹

A month later, Elisa, a Finnish based operator, launched its 5G network (claiming a world first) with subscriptions starting at €44.90 per month for unlimited data. The first use of this network was a video call using a 5G handset between Tampere, Finland and Tallinn, in Estonia.²

In August, Vodacom announced Africa's first commercial 5G network. Service has launched in Lesotho, with two business customers signed up at launch. 5G is being deployed in Lesotho as an alternative to fixed broadband connections.³

The UK is likely to have its first commercial 5G network within a year, with EE launching first, in August 2019.⁴ Vodafone and O2 plan to launch in 2020.⁵ Three is expecting to launch in 2020 or 2021.

Commercial launches will be preceded by trial networks launching throughout the remainder of 2018 and the first quarter of 2019.⁶ These trials will be one of hundreds: as of July 2018, 154 operators around the world had trialed or been licensed to field trial 5G-enabling and candidate technologies.⁷

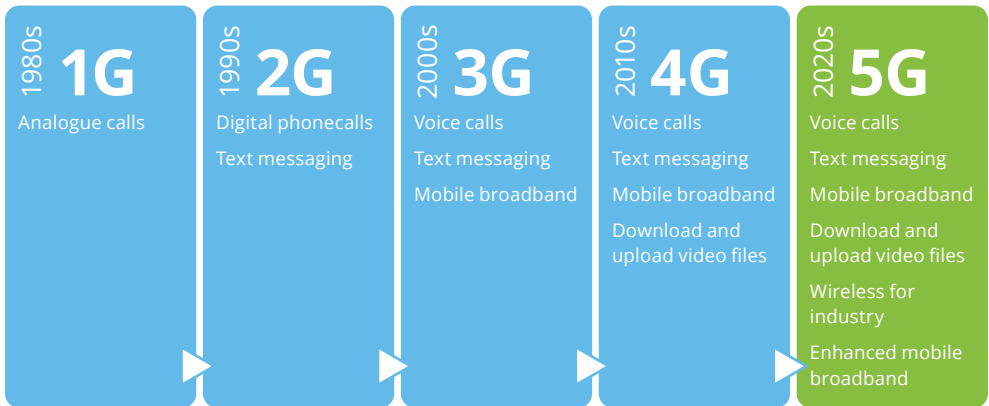
To some people, particularly those living in areas that only have 3G coverage, it may feel premature to be trialling 5G (and to many, the meaning of each generation of network may be too abstract, but see Figure 1 for a simplified view of the main changes in each generation of network technology).

Ofcom reported that as of 2017, 43 per cent of the country had 4G coverage from all operators in the UK. A third of A and B roads were covered by all operators, but 42 per cent of premises did not yet have 4G coverage from all operators.⁸

4G networks are still being rolled out, in the UK and in the rest of the world, and 4G networks will continue to be extended for years to come. Globally 4G connections are expected to continue growing through 2025, at which point they are forecast to represent half of all connections from a third in 2017.⁹

However the variability of demand for cellular network coverage, with peaks in demand in the most densely occupied parts of the UK, will mean that 5G is deployed in some locations at the same time that 4G is being implemented in other areas.

Figure 1. The five generations of cellular network technology



Source: Ofcom report 2018¹⁰

The rationale for 5G

The primary reason for deploying a new network technology is because the existing ones (currently 3G and 4G) may run out of capacity in the near term. In the most densely occupied parts of the UK, 3G and 4G networks are nearing saturation at peak times, primarily due to rising use of more data-intensive applications.

According to research from Ofcom, undertaken in the last quarter of 2017, about 7 per cent of attempted data connections over 3G failed, and 1.5 per cent of 4G connections failed. Failures were more likely in busy periods.¹¹

Deloitte's research found that about a third of respondents had encountered problems with mobile data quality when commuting.

5G should enable operators to meet the rising demand for mobile data over the coming years.

Deloitte's research found that the proportion of 18-24 year olds watching short-form video on their smartphones increased 11 percentage points to 45 per cent in the year to mid-2018. Between 2016 and 2017, average data usage per SIM increased by almost 50 per cent, from 1.3 gigabytes (GB) to 1.9 GB.¹² By 2025, Three expects its users (each person may have more than one SIM) to consume an average of 90 GB per month, compared to 7 GB presently.¹³

Network congestion is concentrated in cities, which is why 5G is likely to be rolled out in cities first. Most UK citizens (83 per cent) live in a city, of which almost half (43 per cent) live in a major conurbation.¹⁴ And a high proportion work in city centres. Under two per cent of the population of England and Wales live in a city centre, but about four million people work in one.¹⁵

Cities also attract those most likely to be connected. Almost two-thirds of those living in a major urban conurbation are under 45.¹⁶ Over half of those living in city centres are under 30.¹⁷

The 5G upgrade

A mobile network's performance is typically quantified by three main metrics: data rate, capacity and latency.

Data rates

5G is expected to offer peak data rates of to 20 Gbit/s once the technology has been fully developed. The first 5G modems support a peak of 5 Gbit/s delivered to a device, when tested in a lab.

Real world conditions would be slower, but still markedly faster than for 4G networks. According to simulations, based on the cell site locations and spectrum allocations of two current networks, median data speeds would surge with the upgrade to 5G. One simulation, based on a network in Frankfurt, estimated a nine-fold increase in median speed from 56 Mbit/s to 490 Mbit/s.¹⁸

This increment in speeds provides performance similar to that available from fixed networks, including fibre-to-the-premise (FTTP) connections. This means that 5G mobile networks could substitute for and compete with fibre-based fixed broadband connections.

Another test, based on a San Francisco network, calculated a 20-fold increase, from 71 Mbit/s for a median 4G user to 1.4 Gbit/s for a median 5G user in mmWave coverage.¹⁹

This degree of increase in speed – or even half of this – would enable a whole new slew of applications to be delivered over a mobile network.

Capacity

Capacity refers to the number of devices that can connect within a mobile network cell. There are currently more mobile data connections in the UK (84 million in 2017) than there are people. 5G offers 100 times the traffic capacity of 4G.²⁰

Latency

Latency is the delay that occurs in data communication; users experience latency when, for example, web pages take a while to load. With low latency these delays become imperceptible. With ultra-low latency, new applications become possible.

5G network technology would offer theoretical latency as low as one millisecond (0.001 of a second). Real life performance would likely be inferior to this, but still markedly faster than for 4G. As of 2017, latency on the UK's 4G mobile networks averaged between 42 and 47 milliseconds. For 3G networks it varied between 77 and 93 milliseconds.²¹

5G applications

The introduction of every new network technology offers revolution and evolution. Ahead of 5G's launch, multiple new applications have been postulated, ranging from self-driving cars to factory automation.²²

In the near-term, 5G is likely to be used in a more evolutionary manner. It will enable many existing applications, particularly those featuring video, but also those requiring a fast response, to perform better.

Users may be more likely to connect to a cellular network when downloading video. News sites, social networks and video-on-demand providers will likely upgrade the quality of video delivered, as defined by frame rate, resolution or colour range.

The introduction of 5G could be the stimulus for a new range of business applications to be introduced: mobile devices are used widely for consumer applications, but only a third of the workforce uses a mobile device for work tasks²³.

The faster data is collected and communicated, the more valuable it can become.

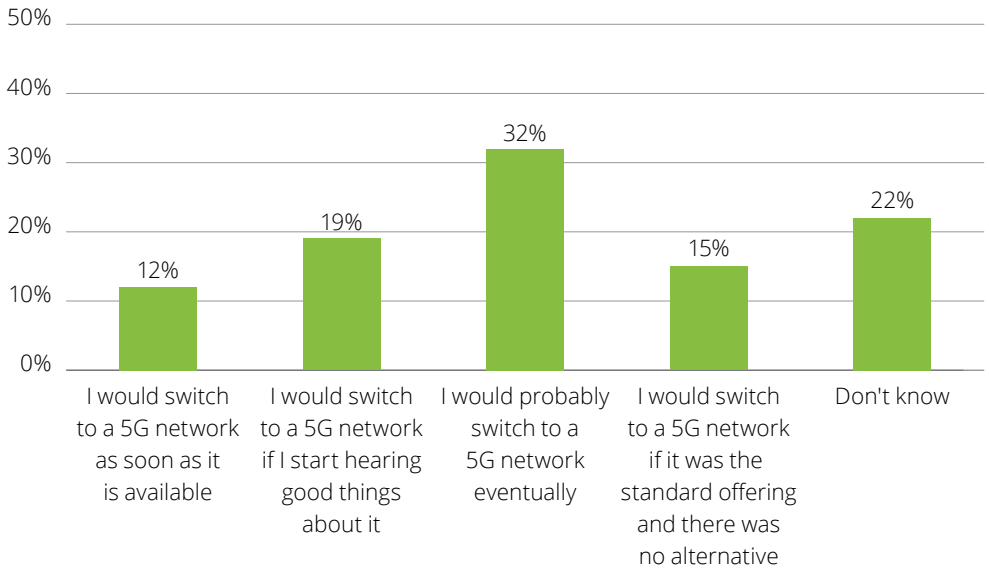
The likely pace of 5G adoption in the UK

The pace at which 5G is ultimately adopted will depend on a number of factors. One is network availability, with coverage starting in city centres and other areas with dense concentrations of people. This means demand will initially be from those living, working or commuting in cities.

As of mid-2018, interest in 5G was understandably modest, given the lack of mainstream understanding of the technology: 12 per cent of respondents said they would switch to 5G upon its launch. A further 19 per cent would switch if they heard good things about it. A third would switch eventually, and 15 per cent would only change if there was no alternative.

Figure 2. Attitudes towards 5G adoption

Question: A 5G network describes the next generation of mobile wireless communication which can provide consumers with mobile Internet speeds typically around 5 times faster than currently available on 4G/LTE. Which of the following best describes your attitude towards 5G networks?



Weighted base: All respondents who have a phone or smartphone aged 16-75 years (3,939)

Source: UK edition, Deloitte Global Mobile Consumer Survey, Jun 2018

A second factor will be handset availability. A few models are likely to be available in 2018, with more launched in 2019. A key trigger for adoption of 5G will be the launch of premium smartphones from the largest vendors; at this stage timings are speculative.

Bottom line

5G will be both revolutionary and evolutionary. Better connectivity makes existing applications more useful; it will improve every mainstream usage of smartphones.

5G's combination of higher speeds, lower latency and greater capacity will untether some applications from fixed networks.

A generation back people navigated around cities using atlases, or memorised knowledge. Twenty years back they printed out turn-by-turn instructions from websites.

A decade ago, the ability to navigate using a smartphone became possible, but network speeds and costs constrained usage.

Over the next decade, not only will smartphone-based navigation become more mainstream, the service will also become ever richer, with high definition photos of streets complementing traditional cartography.

Demand for connectivity is in the long term unquenchable; 5G should satiate the UK's thirst for a while, but most likely not indefinitely.

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