

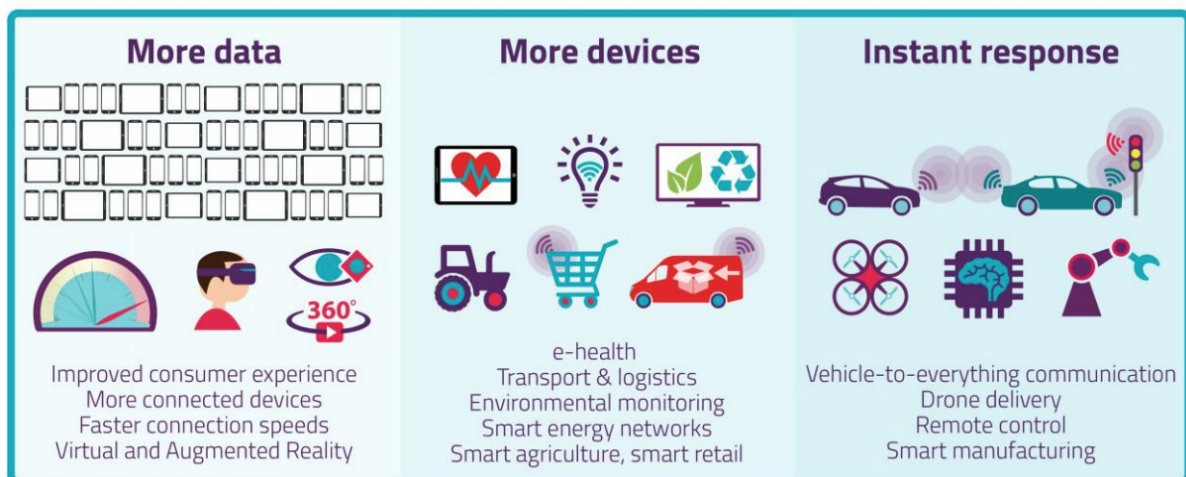
5G and Edge Networks: Fibre Outside Plant

Unless you have been on Mars for the past year or more, if you work in the network cabling industry you will be well aware of the impending boom in outside communications infrastructure. This of course relates to 5G roll out and the associated wireless applications it will usher in. The technology has the potential to impact everyone's lives in many ways, well beyond current 3G/4G due not only to greater bandwidth but also significantly improved latency. Beyond existing mobile networks, the first beneficiary is likely to be business and home broadband applications but the linking up with IoT technologies will mean other disparate sectors such as transport, agriculture and community care will be beneficiaries. All of these sectors will require widely distributed networks with high back-haul capacity. However, after cutting through all the big hopes for 5G, mobile device and broadband users will be the first mass beneficiaries. Intensive 5G fibre optic back-haul is necessary to seamlessly stream bandwidth-intensive applications such as 4K video.

A dense fibre infrastructure will be needed in the back-haul but also front-haul connections of small cells where high concentrations of data are required. In addition, whilst larger bandwidths provide higher data capacity, the higher frequency spectrum compared to 4G has a much shorter transmission range requiring more repeater masts, duct and pole installations and associated infrastructure. Much of this infrastructure will be installed and connected under the umbrella of the major providers such as Openreach, Virgin Media and companies who have sprung up to capture a slice of this market such as CityFibre.

Nevertheless, there will still be a large 'edge of the net' market to implement infrastructure on private land such as campus sites, estates and associated roads, farm land and industrial complexes. Many of the end clients that our industry serves will wish to install their own 'cell' whether via 5G or another wireless network.

Figure 1: Expected uses of 5G



Let's not get ahead of ourselves

There are a wide range of complementary technologies that have been coming thick and fast that will be able to utilise these new data connections rather than existing as siloes. From wearable tech and augmented reality, to smart agriculture and vehicle communication, the possibilities are boundless and only limited by the capacity and response speed of the network.

With the added capability to transmit ultra-low latency, almost real time data that would be essential for driverless vehicles & and drones, simple street lighting, street furniture and building roof tops will become radio beacon sites. The scope of infrastructure projects can start to be appreciated. However, for 5G to make a big impact into applications utilising IoT on a nationwide scale, the big carriers that currently deliver broadband services and mobile networks will probably need to re-architect their networks at the core to provide edge computing/micro data centres which have been much talked about.

We may be waiting some time for these advanced developments to become common place. Added to this the massive deployment of small cell radio access network (RAN) that will be necessary it will take many years to implement. In the meantime, additional fibre will be required to link up isolated cells.

5G and Edge Networks: Fibre Outside Plant

FTTX is where we're at

In our industry the main topic of conversation in this space is FTTX, fibre to the home or fibre to the kerb. One of the benefits of 5G is that it provides big savings by avoiding disruptive deep buried fibre from the kerb to the premise - typically from the kerb to the premise 5G will use the line of sight short range millimetre wave part of the spectrum.

In the UK we have a ready-made infrastructure of BT telegraph poles serving the last mile in rural and suburban areas. Self-supporting lightweight fibre cables known as ADSS (All Dielectric Self-Supporting) optical cables will be the most cost-effective delivery method. These can be significant fibre counts and 32 core seems to be one of the most popular. Termination of this size of cable can be comfortably made in a torpedo joint which can be mounted on the pole of underground. Alternatively, a pole box with sufficient break out glands for 'drop fibres' to the premise or radio device can be utilised. It can be seen that although 5G technology will be an important enabler for future smart 'everything' it will be a combination of both a radio access network (RAN) and wired infrastructure that will connect up the millions of users and future IoT cells. Whatever the application, there will be a requirement for fibre, and lots of it.

Enabling Smart Cities

So far, we have not even mentioned the potential acceleration of existing smart city projects that 5G could bring forth:

The phrase 'smart cities' has been banded around for many years now along with smart buildings and the UK, whilst having many initiatives and some good applications, has been generally slow to adopt compared to some countries like Singapore. Whilst cities stand to gain the most from the deployment of 5G technology, it is very costly to deploy the infrastructure in hard, congested cityscapes and schemes have completed for funding at a time of public spending austerity. Several public & privately funded organisations have been set up to drive forward initiatives for Smart Cities. Perhaps one of the best known in the UK is Catapult – Connected Places, previously known as Future Cities.

There are some 150 smart city projects listed globally on the www.nominet.uk site, with 27 of them UK specific. These projects cover a wide spectrum of technologies and applications. One project 'Bristol is Open' involved implementing a 30Gb/s broadband network that combines fibre, a wireless 'hetnet', experimental network technologies and a radio frequency mesh network deployed on 2,000 lampposts to create a giant laboratory. Utilising Bristol Universities' supercomputer it is being used to assist with traffic congestion, air pollution and assisted living for elderly as well as a self-driving car trial.

Within most of these projects there will be common elements of infrastructure to connect the multiple data nodes. Industrial grade switches at the edge of the network are required to connect to devices and aggregate cell data. As with future broadband deployment, there is likely to be a combination of wired and wireless infrastructure including copper cables delivering PoE. These switches are typically going to be housed in enclosures mounted above ground or street cabinets. Fibre uplinks will connect into the local carrier networks which will most likely be a radio device. The transmission of data will either be via a radio link (e.g. using 4G/5G/Wi-Fi or line-of-sight wireless & microwave) or it will be via underground and overhead fibre optic cables. The physical infrastructure of communication cables, joints, beam splitters and accessories to support these networks are the bread and butter of our industry. In a hard city scape, mounting cable joints on a pole e.g. street furniture, rather than underground has significant cost benefits over the construction of a jointing pit and is more accessible. However, road crossings mean going underground is unavoidable and with congested ducts, 5G radio and other wireless solutions should come into their own and help to accelerate projects that would otherwise never get off the ground.

What does it mean for installers?

Companies in the business of installing structured cabling and particularly Telecommunications are well placed to capitalise on this latest technology wave. There are many examples of outside infrastructure projects our customers have completed (also collectively known as Outside Plant or OSP) They include transport hubs, Industrial complexes, university & hospital campus sites, wind farms, residential & holiday parks and sports venues. All these types of facilities offer opportunities for 5G. For companies starting out who wish to get in on the act, there is a range of training courses and certifications available backed by City & Guilds and BICSI specific to Fibre and Outside Plant.

5G tech offers as yet unknown opportunities that will shape the world we live in tomorrow. We can all be a part of this evolution.

References: Figure 1: https://www.ofcom.org.uk/_data/assets/pdf_file/0022/111883/enabling-5g-uk.pdf