5G : The key to unlocking digital technology

KPMG Board Leadership Centre

It's been nearly a decade in the making, but 5G - the next generation of mobile broadband that will eventually replace, or at least augment, your 4G connection - is finally becoming a reality. Although 5G, in and of itself, will be the most disruptive technology globally over the next 3-5 years, it is its wider ecosystem that will be truly revolutionary, particularly for businesses and other enterprises. In this paper, Mike Stone, KPMG's Global Head of Technology Transformation for Infrastructure, Government and Healthcare, looks at why 5G is so revolutionary and its key characteristics?

5G Evolution or Revolution

It could be argued that 5G is just the next evolutionary step after 2, 3 and 4G, but there are 2 major differences that support the argument that 5G is revolutionary, they are:

— **The power of the exponent:** With 5G, you'll see exponentially faster download and upload speeds. Latency, or the time it takes devices to communicate with wireless networks, will also drastically decrease.

— **5G will be Enterprise-led:** Unlike its predecessors, which were consumer-led, 5G will be enterprise-led. Through its ability to allow thousands of devices in a small area to be connected at the same time, 5G facilitates a richer and nearer real time decision support fabric and common operating picture.

In short, the connectivity and capacity offered by 5G is opening up the potential for new, innovative services.

Although it will take a number of years for a universal rollout of 5G, the networking capability exists **today** to provide private 5G networks around such enterprises as government installations ports, airports, factories, warehouses, universities, hospitals, entertainment centres and even metropolitan areas.

The speed (the physics suggest up to 20Gbps is possible) and latency (less than a millisecond), as well as its ability to support up to a million active connections in every square kilometre mean that every aspect of an enterprise can be connected. This will enable sensors in equipment such as industrial robots to communicate amongst themselves and potentially make decisions independent of humans.

The Key Characteristics of 5G

Scale and Capacity – with 4G, if we are lucky, we experience 100Mbps, compared with 5G which delivers sustained speeds of over 10Gbps. The physics suggests that this can be stretched to 20Gbps

Latency – Latency and jitter together in 4G averages at over 100ms. In 5G, we are currently operating at 7ms and this is confidently expected to go down to 0.6ms

Massive Input, Massive Output (MIMO) – 4G is engineered to support 100k connections in every km^2, whilst 5G will support 1m active connection in every km^2. This is what allows every sensor to be connected to the internet

Network Slicing – unlike 4G, in 5G virtual slices of the bandwidth can be given to different enterprises, or different parts of an enterprise. These can be customised to support the client and even sub-sliced. Different authentication can be applied to each sub-slice. This feature also supports the implantation of different levels of classification within the same 'pipe'.

Mesh Network – Again unlike 4G, 5G is a meshed network, which means that it can self-heal (i.e. messages/calls will find a different way through, if the most direct route is blocked). It is therefore autonomic

Connectivity is king

5G is the lynchpin of an ecosystem that will connect everything and everyone, everywhere ….. even Tupperware[1] is going digital! This ecosystem has data at its heart and it will enable the veritable tsunami of data from myriad sources that 5G is likely to release, to be securely exploited in new ways.

[1] https://www.digitaltrends.com/home/smarterware-smart-tupperware/

Apart from 5G, this ecosystem consists of other technologies that are all maturing at just the right time. They are: Augmented Intelligence, the Internet of Things, Robotics and Augmented/Virtual Reality. The cloud is also an essential ingredient, as is cyber security and privacy. Together this ecosystem will power the fourth industrial revolution (or Industry 4.0).

Essentially there is a confluence of other technologies that are maturing at just the right time to exploit 5G - artificial intelligence, the internet of things, robotics and virtual reality. 5G will supercharge these technologies and together the sum of the parts will make the 5G story even more revolutionary.

How will it happen?

Data is at the heart of the ecosystem. Most organisations exploit less than 25% of the data that already exists within the organisation. 5G will unleash an entirely new tsunami of data, so how will organisations exploit it to deliver a common operating picture – a single centralised source of (visualised) real-time information?

There are two key foundational layers to the 5G ecosystem – cloud and mobility. Organisations need the capability to store and process data, and deliver it to mobile devices as increasingly all data will be mobile data at some point in its existence.

Artificial Intelligence is making great strides, but it needs significant bandwidth to be able to operate without degrading performance. 5G will both release new waves of data, but also has the bandwidth to support the AI needed to make sense of it. This offers the potential to augment decision making, both human and machine, by delivering very near real time information.

At the same time huge strides forward are being made in the Internet of Things arena. With embedded online sensors in equipment we can now (say) envisage full predictive maintenance of machinery such that maintenance is conducted only when a part needs it, leading to huge productivity gains and cost savings.

With the ultra low latency of 5G, it is also possible for sensors to detect unusual vibrations in machines and stop production before damage is done.

Robotics are also advancing apace, particularly in factories and in the healthcare arena where very fine remote robotic surgery is now entirely feasible. In addition, drone technology will rapidly advance in a 5G world. One can readily imagine its use in a public safety situation, such as a major urban fire where the existing 4G network would be overloaded. 5G could offer first responders a secure communications envelope from an incident control point, supported by drones, and the potential to then use drones to reduce the risk to responders.

Beyond this, augmented reality is coming of age. The speed and latency of 5G, offers the ability to overlay additional details onto a heads up display to enable hands free enhanced working in real time.

A secure environment

The whole 5G ecosystem needs to be set in a cyber security and privacy envelope to fulfil its game-changing potential. Sensors intercommunicating and making decisions independent of humans can only work properly if there is surety that no malicious code has been injected and that the output will be what was expected. This is no mean challenge, but one of the key characteristics of 5G is the ability to network slice and to enable different authentication on each slice, with negligible impact on the workload.

With good security, the 5G ecosystem will not just be the fundamental underpinning of Industry 4.0, but can also deliver on, what to date has been, the empty promise of 'edge computing', bringing data analysis and storage closer to the location where it is needed to improve response times and save bandwidth.

So whilst 5G is in itself is a game changer, it is the fact that it unlocks a wider ecosystem of capabilities that is truly revolutionary.

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