

5G: from smartphone to smart everything

by Dr Zhou Hong, President, Huawei European Research Institute (ERI)

Beyond the business aspects, 5G will revolutionise the ways in which we connect and interact, learn, share and communicate. This new level of smart connectivity has the potential to enhance quality of life on a number of levels, ranging from road safety to home systems and healthcare.



Dr Zhou Hong is the president of the Huawei European Research Institute (ERI). He is responsible for Huawei's European research, standardisation, development and technical cooperation activities. He was appointed as the president of Huawei Central Hardware and Engineering Institute in 2012.

Before that, he was responsible for the R&D of Huawei Wireless Product Line, including research, standardisation and development from 1997 to 2012.

He studied at the Department of Electronic Engineering of Fudan University, China, from 1987 to 1997, graduating with a Ph.D. in 1997.

When the world embarked on its transition from analogue to digital over 20 years ago, GSM achieved a remarkable progression from outsider to global norm. Two key factors were at play: a strategy of openness driving the GSM standard, and Europe taking the lead to drive its technological development and ensure smooth transition from collaboration to competition.

This proven track record in federating effort between the public and private sectors at a global scale puts Europe in a strong position to take the lead in developing the next-generation wireless standard, 5G. Like GSM, or 2G, and unlike the subsequent 3G and 4G upgrades, 5G will bring a major transformation.

As a key enabler of the future digital society and economy, 5G is not simply a next-generation mobile network infrastructure, but the platform for a connected world. It opens the door to new ways of innovation and collaboration, creating new opportunities and transforming industries and societies for the decades to come.

I network, therefore I am

We need 5G. Not only because it will achieve better mobile networks, but because it will bring virtually everything and everyone online. 5G goes beyond smartphones. It is the change engine that can revolutionise the way we work and live, becoming the fabric of our everyday lives.

In terms of capacity, 5G will bring a thousandfold increase compared to previous generations, enabling mobile broadband everywhere and for everything we do in daily work and life. It will also bring ultra-low latency – dramatically cutting the time it takes for communications to travel across the network – and an ultra-high degree of reliability for critical communications.

This is essential for connecting many critical vertical sectors and transforming vertical industries. Think of the automotive industry: how could we trust a connected car to get us safely across a busy junction if the network cannot guarantee ultra-reliability and immediate response? For car-to-car communication,

5G networks are expected to provide end-to-end delays of one millisecond, 99.999% transmission reliability and approximately 100% availability.

To get us there, a new type of network design is required. Its novel, agile architecture will be service-oriented and, to a large extent, software-defined. Leveraging emerging technologies such as Software Defined Networking (SDN), Network Functions Virtualisation (NFV) and Mobile Edge Computing (MEC) will ultimately enable us to achieve a fully integrated network that unifies connection, security, mobility and routing management.

Reaching full potential

Popular culture has it that we humans use only a small percentage of our brain power. While this is of course a myth, let me use this analogy to describe our vision of what a 5G-driven society will look like: making full use of the potential that is already there, delivering potent results by establishing the right connections.

Wireless network innovation will empower societies and drive economic growth in entirely new ways. The business impact of this technology goes well beyond the ICT industry: we will be entering an era in which every business is digital. This networked business environment is expected to generate a large number of new jobs and services. 5G functionalities will support a myriad of new network and service applications.

We are likely to witness new sustainable business models. Service-oriented, software-defined 5G architecture will open up new possibilities for small businesses, vertical industries, software-defined operators and physical infrastructure providers, as well as for their corresponding suppliers.

Beyond the business aspects, 5G will revolutionise the ways in which we connect and interact, learn, share and communicate. This new level of smart connectivity has the potential to enhance quality of life on a number of levels, ranging from road safety to home systems and healthcare.

All around us

One of the main applications of 5G will be the 3D full collaborative and immersive experience. It is expected to become available at home and in cinemas, theatres, public arenas, cars, vessels, trains and aircrafts and will use the next generation of devices without requiring polarised lenses or binaural receivers.

Most importantly, 5G is expected to fully support Internet of Things (IoT) platforms and offer new outsourced services – Anything or Everything as a Service. The advanced 5G infrastructure could deliver these without owning hardware, software or the cognitive objects themselves.

Covering human-to-human, human-to-machine and machine-to-machine communications, it will drive the trend towards all-encompassing smart connectivity. Smart cars, smart grids, smart cities, smart factories – the IoT promises to make business greener and cleaner while helping us save time and money.

Europe as a catalyst

It is clear that large-scale, multi-layered collaboration is required to achieve this transformation. The EU is leading the way to drive this process and has taken decisive steps to unleash the power of 5G.

By launching the 5G PPP, a €1.4 billion joint initiative between the European ICT industry and the European Commission, Europe is taking on a leading role in developing 5G technology. The partnership is leveraging industry investments vital to driving technological progress, but also exploring the huge technological expertise available locally and globally.

Timing is crucial: by fostering early consensus among a broad range of stakeholders at a global level, the 5G PPP can clear out obstacles that would hamper development and deployment later in the process. Key topics will include a common 5G vision, architecture, spectrum utilisation, regulatory issues and pre-standardisation and international collaboration.

On the private side, it is extremely important that all key industry stakeholders – ICT vendors, operators, content and service providers, vertical industries and corresponding suppliers – contribute to the 5G PPP initiative.

On the public side, 5G will be driven by fruitful collaboration between Europe and the relevant bodies in China, Japan and Korea. These include the IMT-2020 Promotion Association in China, the 5G Promotion Forum in Japan and the 5G Forum in Korea.

It is vital that public authorities develop effective policies with regard to spectrum, pre-standardisation and international collaboration. What Europe needs is an evolving regulatory framework that provides a true level playing field for current and new players coming into the picture, thanks to the novel sustainable business models that 5G will enable.

Funding for promising projects will speed up progress. I believe that the EU can play an important role in consolidating and building on the most important research and innovation results attained in previous research framework programmes, gathering resources for 5G tests, proof of concept and large-scale trials, and bringing the right stakeholders on board, notably vertical industries.

The METIS project (standing for ‘Mobile and wireless communications Enablers for Twenty-twenty (2020) Information Society’) is an example of a successful European initiative. This pan-European project, which received funding under the EU’s Seventh Framework Programme (FP7), aims to lay the foundation of the 5G mobile and wireless

communications system. It is developing and evaluating the key technology components of 5G systems, and will integrate the technical components that address the requirements of this system.

Clearing out obstacles

Let us not forget that 5G is still in its early research stages. A number of issues must be resolved before it can become a reality. These include technological challenges, such as how to engineer network architecture capable of handling the data volumes and transmission speeds necessary to accommodate more users on the network.

Spectrum availability is also a key issue. By 2020, it is estimated that 6.5 billion people worldwide will use mobile networks for data communications and 100 billion additional ‘things’, such as vehicles, meters, medical devices and home appliances, will be connected to the network over 5G.

New spectrum for international mobile telecommunications (IMT) is expected to be agreed upon for the World Radio Communication Conference (WRC) in 2015. ITU is currently at work on IMT spectrum requirements for 2020 and beyond. After WRC-15, ITU will be able to determine network system and technology requirements.

Spectrum is a scarce and valuable commodity for the ICT community. As a finite resource, the availability of spectrum for wireless broadband is key to accommodating data traffic growing at an exponential rate. The EU’s objective of allowing for additional spectrum to be made available for wireless applications and services is therefore good news for 5G. EU action is required to make additional spectrum available for wireless applications and services.

Let’s work together

From our perspective as a global ICT leader with a strong European presence, there is no alternative to involving stakeholders from around the globe with different fields of expertise. To bring this revolutionary technology to the market as early as 2020, let us combine our strengths.

We need to join forces – across countries, continents, industries and sectors. I believe that Europe has a key role to play in creating the right synergies, paving the way for a hyper-networked future and building a better connected world. ●