

WELCOME TO THE 5G FUTURE

Augmented and virtual reality, driverless cars, personal robots and a world with billions of wireless nodes connecting almost everyone and everything around us... the possibilities are endless with the arrival of 5G.

The impending arrival of the super-fast 5G Network will have a widespread and profound effect on our lives. How we relate to and use technology will see a pronounced shift. The potential is dizzying and we're only just scratching the surface of the impact and ramifications of 5G – how it will affect businesses, consumer experiences and society at large.

The G stands for generation of mobile networks and the mobile wireless standard of broadband technology. Every subsequent generation refers to a specific minimum speed, reliability and connectivity required to qualify the network as that particular generation. >





DATA TRAFFIC DRIVES 5G DEMAND

1G
1984

2G
1991

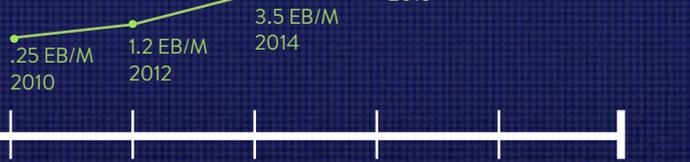
3G
2002

4G
2006

5G
2018

CISCO PREDICTS GLOBAL MOBILE DATA TRAFFIC WILL GROW 7X BETWEEN 2016 AND 2021. AND OVER 78% OF THE TRAFFIC BY 2021 WILL BE VIDEO

Estimated Global Mobile Data Traffic Exabytes/Month



Source: Cisco Visual Networking Index

The first generation enabled us to talk to each other, 2G allowed us to send messages, 3G provided data and internet access, and 4G ramped up the speed of it all. 5G will deliver connectivity at unprecedented speeds to devices that are encapsulated in the Internet of Things (IoT), such as smart phones, smart cars and all manner

of gadgets and appliances, from milk cartons and plant pots through to digital cameras and dishwashers.

In the early noughties scientists and experts observed that cellular networks were increasing tenfold in terms of speed every five years. In a decade that became 100 times faster. Now, as 2020 approaches, it's perfectly plausible that data speeds will be 1000 times faster than we have been accustomed to in recent years. And this will be accompanied by a super-low latency rate – which refers to the lag between sending and receiving messages.

So, when that little icon saying '4G' in the corner of your phone becomes '5G' – a whole world of change could be enabled. There will be no need to search for Wi-Fi because your cellular connection will easily outstrip it.

You may be travelling with driverless cars and working much less than before because automation will have soared, and the world of entertainment will be transformed with virtual reality and augmented reality reaching new and unprecedented levels.

The prospects, implications and challenges associated with 5G are so multifarious and deeply complex that the arrival of 5G is really something that we will witness play out over decades.

To monitor and contribute to the advent of 5G, The Institute of Electrical and Electronics Engineers – the world's largest technical professional organisation

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GERHARD FETTWEIS,
CHAIR PROFESSOR AT DRESDEN
UNIVERSITY OF TECHNOLOGY



for the advancement of technology – established the IEEE Future Directions 5G Initiative, dedicated to studying the emergence and effects of 5G. Its mission is to “inspire a global community to innovate for a better tomorrow through highly cited publications, conferences, technology standards, and professional and educational activities. IEEE is the trusted voice for engineering, computing, and technology information around the globe”.

Gerhard Fettweis, Chair Professor at Dresden University of Technology and Senior Research Scientist at the International Computer Science Institute, co-chairs the IEEE Future Directions 5G Initiative. He explains: “In voice telephony today, the reaction time that we need for us to feel we’re part of a natural conversation is 100 milliseconds, basically a tenth of a second. If we are to make Augmented Reality work – to create the sensation that you’re participating in an augmented, physical reality – we’ll need to cut that reaction time to one-thousandth of a second. 5G may enable us to do that. In addition to the IoT and Augmented Reality, think about the reaction time needed by driverless cars, industrial automation, and so on.”

Another application of 5G will be the IoT – people will be connected to the cloud and each other,

Above: Another application of 5G will be the IoT – people will be connected to the cloud and each other, and networks of devices via wireless nodes embedded in everything around us and delivering real-time information and insight into our environment

Left: When that little icon saying ‘4G’ in the corner of your phone becomes ‘5G’ – a whole world of change could be enabled





Above: General health monitoring will also be transformed with implantable monitors checking people for stress, nutrition and any form of symptom of disease

and networks of devices via wireless nodes embedded in everything around us and delivering real-time information and insight into our environment. An expanding mesh of global networks will become capable of managing billions of nodes. So how exactly could 5G change your life?

Well, for starters it could save your life. The health sector could be transformed, with the technology in place for doctors to perform surgeries via robotic devices on patients in remote locations – either on the other side of the planet or simply in another city. Time and distance suddenly become obstacles that can be overcome to save lives.

General health monitoring will also be transformed with implantable monitors checking people for stress, nutrition and any form of symptom of disease. The ability to track health will in turn have a significant impact on the insurance industry – someone who is a heavy smoker or who has a poor diet could find the price of their premium being affected by their lifestyle.

Driverless cars is another major sector that will advance with 5G. The average reaction speed of humans is 200 milliseconds, and this does not prevent countless accidents happening somewhere every few seconds or less. If self-driving cars were the norm, and they were all communicating with each other and the surrounding environment within a millisecond, accidents could become a thing of the past. And almost as good – no more traffic jams!

Personal robots could also finally make the leap from the pages of sci-fi novels and big screen movies into your connected home. With the IoT in full swing, your everyday domestic chores, everything from watering the plants to keeping the dietary basics in home, could all be monitored and taken care of.

If 5G evolves into a globally accepted technology, it could generate value for billions of people, but with half of the world's population unconnected to the Internet, is there a risk of a digital divide in this 5G revolution?

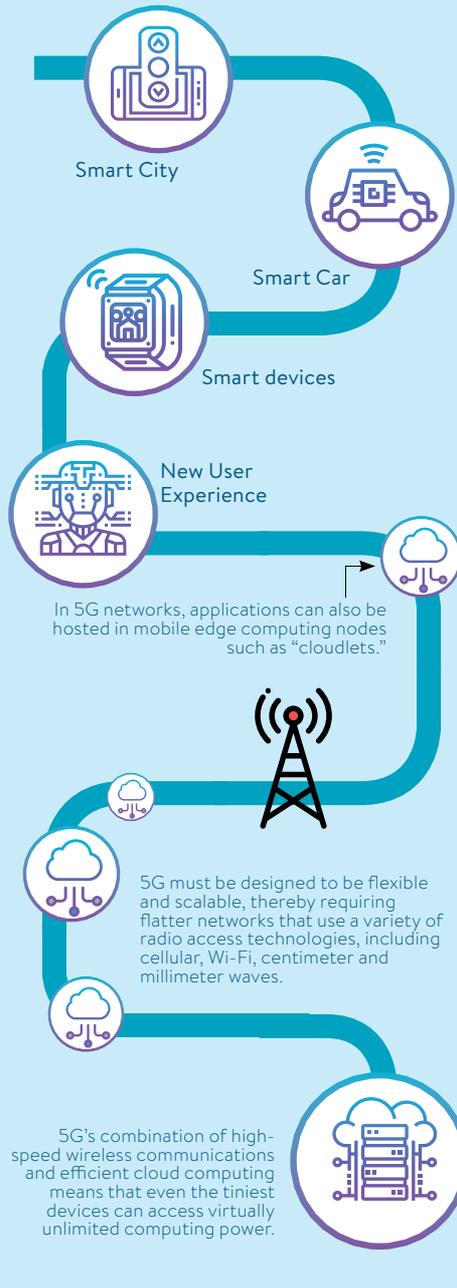
Dr Ashutosh Dutta, Senior Wireless Research Scientist at Johns Hopkins University Applied Physics



Left: Driverless cars is another major sector that will advance with 5G.

5G: FROM DEVICE TO DATA CENTRE

BY 2020, 50 BILLION SMART DEVICES ARE EXPECTED TO BE IN USE. 5G WILL HELP SUPPORT THE MASSIVE GROWTH IN THE INTERNET OF THINGS AND ENABLE DEVICES TO COMMUNICATE WITH EACH OTHER SEAMLESSLY.



Lab. and Co-Chair with Fettweis of the IEEE Future Directions 5G Initiative, says: “Gerhard and I feel very strongly that the IEEE mission to ‘improve technology for the benefit of humanity’ means all of humanity. We’re taking our 5G Summits to both developed and developing countries to gain a cultural understanding of how local needs and local innovations might spread 5G in various ways.

“We are consciously attracting and including startups and entrepreneurs to bring their fresh voices and ideas into the conversation,” he added. “And we are deliberately including academia, industry and policy-makers in our community to address the need to bring this ultra-broadband capability to everyone who can use it.”

In the UAE, Etisalat – the country’s largest telecom provider – will build 300 5G towers and have 600 sites ready in 2019 to provide the most advanced digital and telecom services to Dubai Expo2020 visitors.

Welcome to the future and an avalanche of innovation for the decades ahead. ↗