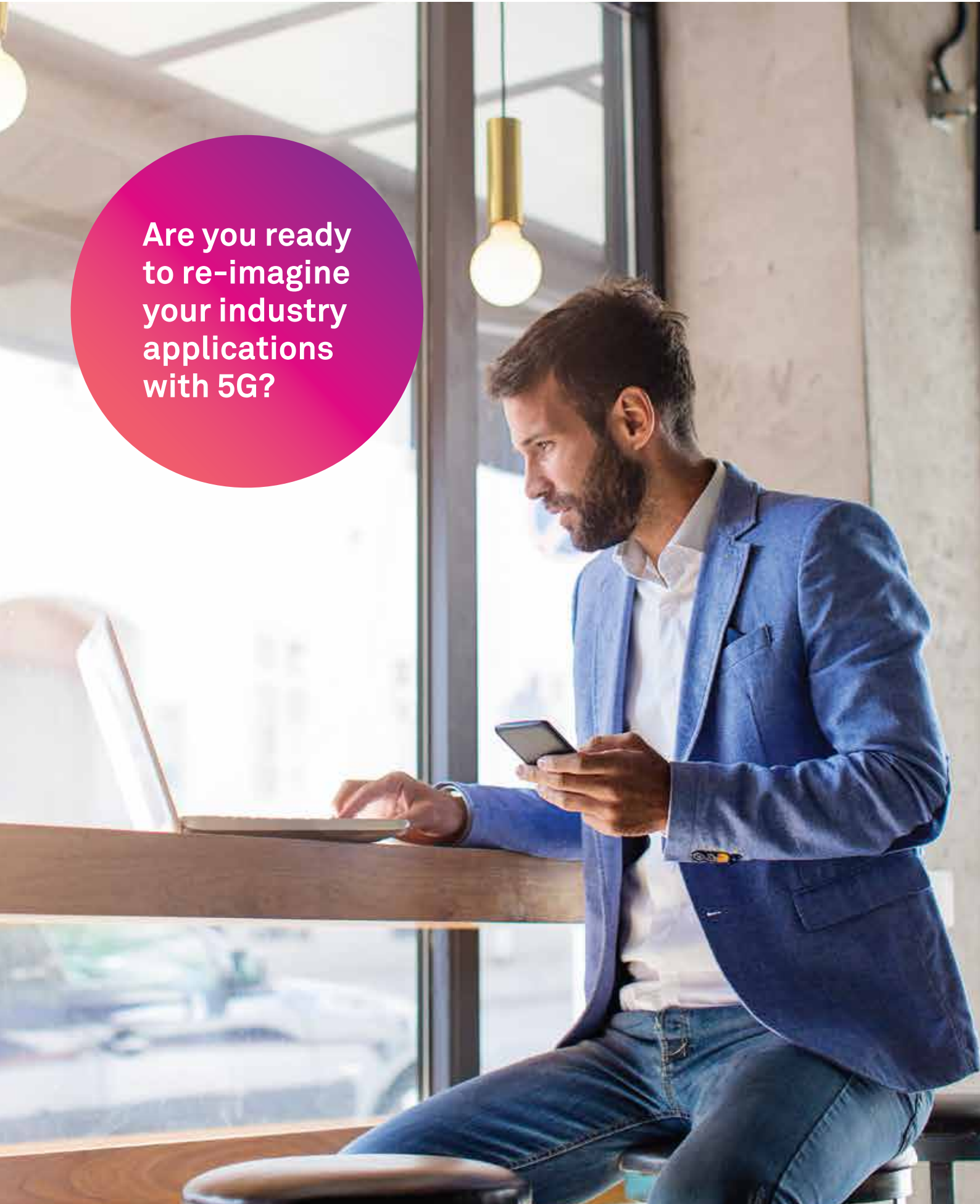


**Are you ready  
to re-imagine  
your industry  
applications  
with 5G?**



**T**he excitement around 5G is palpable. As of May 2019, 20 mobile carriers had rolled out 5G networks across 294 global locations<sup>1</sup>. The latest GSMA report says that mobile services generated 4.6% of global GDP in 2018 or they added \$3.9 trillion in economic value. With 5G, they will generate 4.8% of global GDP by 2023, which translates to \$4.8 trillion in economic value<sup>2</sup>. Of course, some of the expected growth can be attributed to the 5G-fueled increase in mobile subscribers (700 million new mobile subscribers are expected to be added by 2025)<sup>3</sup>. But the real reason for the excitement is because 5G is the first step towards building intelligent connectivity—a fact that spells new business opportunities around smart farms, factories and cities. How can your business prepare to raise new competitive barriers and build fresh revenue streams by re-imagining its applications at the hands of 5G?

### Revolutionary, not evolutionary

Mobile technology has been through steady evolution. It went from 2G that offered SMS to GPRS then Edge and 3G supporting a maximum rate of 2Mbps for stationary and 348Kbps for

mobile subscribers. More recently it evolved to 4G/LTE with true broadband. 4G was to support peak downlink data rate of 1Gbps and uplink data rate of 500Mbps. Now we have the ultra-reliable, low latency 5G networks turning up with mandated peak data rates of 20Gbps downlink and 10Gbps uplink with a user experience data rate guarantee of 100 Mbps. Note that until the arrival of 4G/LTE, the emphasis was on building fatter `pipes' and adding to capacity for a growing subscriber base and their hunger for data. These `pipes', once laid, could not be re-configured. 5G is different. It is built on programmable networks, making it revolutionary, and not only evolutionary. It is designed to deliver assured service quality along with the ability to scale itself based on the user requirements. In simple terms, the network became user centric.

The fact that 5G networks are programmable has several important implications for businesses. For example, when a 5G network is nearing its maximum capacity, it can reconfigure itself to mobilize resources to elastically scale as per the capacity requirements for the forecast demand based on the current network condition.





## Most CSPs will only achieve a complete end-to-end 5G infrastructure on their public networks during the 2025 to 2030 time frame

However, it may reach the physical limit of the configured resources. In that situation, the network orchestrator can intimate the human in the loop to equip additional servers with requisite compute, storage and network capacity to meet the need. The programmability feature enables realization of network functions based on commodity hardware and specialized software with support of micro services architecture. In summary, the network becomes intelligent to dynamically plan and reconfigure itself to meet the user requirements with minimal human intervention for its operations.

From the end user perspective, the programmability means that the user can now interact with the network using the open API (Application Programming Interface) that it exposes. This feature enables the enterprises to re-imagine the vertical applications to enhance the end user experience by demanding the right amount of bandwidth and latency from the network. This enables the applications to optimize the experience based on the spending potential of the user. The applications are no longer limited by the “best effort data rate and latency” that the network pipes traditionally provide. Applications with different characteristics ranging from low bitrate IoT devices to high bandwidth AR/VR applications to extremely reliable networks like remote driving and remote surgery can all be catered to by a 5G network with the concept of network slicing.

### Do the “new” with 5G

Among the early realizations that businesses will have is that 5G is not about doing more of what 4G allows, but about doing radically new and innovative things that were not attempted before. This could potentially enable remote surgery and put highly reliable driver-assist applications into cars, improving their autonomy. Interestingly, it could allow industrial robots to become programmable and entire factories to become a catalogue of microservices. Utilities and O&G organizations could use 5G to simulate a variety of scenarios for the repair and enhancement of mega construction projects using digital twins. Low latency capability of 5G will enable remote control and remote monitoring in real-time, and help realize use cases such as monitoring infrastructure of oil, gas, power Lines which would be expensive and hazardous for humans.

### The BYON trend

None of this will happen overnight. According to Gartner, “most CSPs will only achieve a complete end-to-end 5G infrastructure on their public networks during the 2025 to 2030 time frame — as they focus on 5G radio first, then core slicing and edge computing.”<sup>4</sup> This could mean that organizations like universities (with a large campus), military installations, shipping fleets, utilities, manufacturing plants and medical units that stand to benefit from the low-latency, high reliability and security of 5G could launch a serious Build Your Own Network (BYON) trend.

Networks could be acquired either from CSPs or from OEMs and infrastructure providers.

In 2018, Audi signed up Ericsson to experiment with 5G in its factories. It was using Wi-Fi and Ethernet to connect its manufacturing robots. The high latency and low reliability of Wi-Fi and Ethernet impedes the use of the robots. Audi hopes to ensure that with 5G its robot force can do more, delivering a more agile production environment. Early this year, Audi got a 5G network to its booth at the Hannover Messe and had a robot interact with visitors in real time to demonstrate the smooth interaction 5G could enable between man and machine<sup>5</sup>.

It will be interesting to see how the possibility of private 5G networks pans out. Costs for private 5G networks need to be low enough for businesses to consider them. Investments in private 5G networks will have to be recovered in the next five to ten years before public networks provide the same capabilities. The other scenario that can be imagined is that of an organization that finds a use case with an exceptionally high ROI or a use case that delivers a significant competitive advantage to make the early investment worthwhile.

### Are you ready to change the game?

5G has some characteristics that are game changers. One of them has to do with how 5G networks manage throughput and improve spectral efficiency. Statistically, the Quality of Service (QoS) for mobile networks has been tied to the distance of the user from the base station. The only way to improve QoS has been to increase the density of base stations. This is not always practical for reasons of cost and the availability of real estate for mobile towers.

5G uses an advanced signal processing technique to create dynamic beamforming and beam steering that allow the network node (base station) to provide a dedicated beam to the subscriber. This feature, bundled with MIMO (Massive Input Massive Output) enables the network to provide the amount of data rate the user requires dynamically. This means that

applications (subscribers) that want a temporary or momentary increase in throughput can be intelligently targeted by the Network anchoring point. Vodafone has already demonstrated how beamforming has improved network capacity by a factor of five in 50 rural communities in Germany<sup>6</sup>. The key is to stop carpet bombing a cell with coverage and direct signal to areas where it is required.

In addition to beamforming, 5G has the ability to slice a network and tailor it for the requirements of specific applications. Network slicing is when a number of virtual networks exist on the same physical infrastructure. This is a critical capability for businesses. For example, surveillance cameras in a power plant may consume higher bandwidth during certain periods and in areas that have moderate coverage. Network slicing can offer guaranteed QoS for the cameras without affecting other demands. For CSPs the opportunity represented by network slicing is forecasted to be \$300 billion by 2025<sup>7</sup>.

To exploit the capabilities of 5G, businesses must begin now. There are three leading questions that businesses must ask:

- How do I upskill to get an understanding of how to leverage 5G?
- Do I really know how to interact with 5G networks? Is my current architecture and infrastructure capable of drawing on the power of 5G?
- Do I know what to do with my applications once I re-imagine my business based on capabilities that 5G networks are exposing?

While 5G will become widely available in the coming years, there are several aspects of the technology that will be rolled out slowly, over the next five to ten years. This fact may lead to a sense of complacency in businesses. On another level, most businesses would look for the availability and uptake of 5G enabled phones as an indicator of traction for the technology. These

are misleading indicators. 5G is not focused around just the phones—it is central to the success of real-time systems, IoT, Fixed Wireless Access and new business models. Therefore, the right time to start thinking about 5G is now.

## References

<sup>1</sup>For the latest information on 5G rollouts, please refer to the interactive Ookla 5G Map at <https://www.speedtest.net/ookla-5g-map>

<sup>2</sup>The Mobile Economy 2019: <https://bit.ly/2FgCx8h>

<sup>3</sup>The Mobile Economy 2019: <https://bit.ly/2FgCx8h>

<sup>4</sup>Gartner Survey Reveals Two-Thirds of Organizations Intend to Deploy 5G by 2020: <https://gtnr.it/2U83P6G>

<sup>5</sup>5G: Ericsson, Audi and Sick present human-robot interaction in real time: <https://bit.ly/2D17fSM>

<sup>6</sup>Vodafone Germany Starts Deploying Beamforming - Intelligent Antenna Technology: <https://bit.ly/2kBZeOh>

<sup>7</sup>Network slicing use case requirements: <https://bit.ly/2kBZ7Cl>



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