



Myths and Reality of 5G Communications

5G Consumer Potential

On 7 May 2019, Ericsson [1] released a new ConsumerLab report, “5G Consumer Potential,” that busts industry myths surrounding the value of 5G for consumers and outlines the opportunities available for communications service providers. Backed by solid research from one of the biggest ever consumer expectation studies, the report looks at the potential of 5G to benefit consumers, uncovering certain realities that bust the following four common industry myths:

- *Myth 1:* There are no near-term consumer benefits of 5G.
- *Myth 2:* There are no real use cases for 5G, nor is there a price premium on 5G.
- *Myth 3:* Smartphones are the only solution for 5G.
- *Myth 4:* Current usage patterns can be used to accurately predict future 5G demand.

The study brings some sense of reality to the ongoing debate in the information and communication technology (ICT) industry about whether there is an opportunity for a premium consumer offering based on 5G’s extra capabilities. The key findings of the study include the fact that consumers expect 5G to provide relief from urban network congestion in the near term—especially in mega-

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cities, where six in 10 smartphone users report facing network issues in crowded areas. The respondents also anticipate more home broadband choices to be available with the launch of 5G.

Further, the report dispels the ICT industry myth that consumers are unwilling to pay a premium for 5G. In fact, smartphone users state that they are willing to pay 20% more for 5G services, and half of early adopters would pay as much as 32% more. However, four out of 10 of these high spenders expect new use cases and payment models as well as a secure 5G network and consistently high Internet speed.

Another key finding is that current 4G usage patterns are not indicative of future usage behaviors. Video consumption is set to rise with 5G. Consumers expect not only to stream video at higher resolutions but also to use immersive video formats such as augmented reality (AR) and virtual reality (VR), with users in the 5G future watching an additional three hours of video content weekly on mobile devices when they are out and about; this includes one hour wearing AR glasses or VR headsets. The study also reveals that data usage for

one in five smartphone users could reach more than 200 GB per month on a 5G device by 2025.

From these and other insights, Ericsson ConsumerLab has drawn up a consumer road map of use cases involving 31 different applications and services. The road map is divided into six use-case categories: entertainment and media, enhanced mobile broadband, gaming and AR/VR applications, smart home and fixed wireless access, automotive and transportation, and shopping and immersive communications.

This latest Ericsson ConsumerLab study is based on 35,000 interviews with smartphone users in the age range of 15–69, carried out in 22 different countries. The participants’ views are representative of almost 1 billion people. To gain perspective on industry sentiment regarding the consumer value of 5G, an additional 22 interviews were conducted with experts, including academics and senior executives working for telecom operators, handset and chip manufacturers, and start-ups and think tanks.

First 5G Smartphones

On 16 May 2019, Verizon announced that its consumers can purchase the

Samsung Galaxy S10 5G—Samsung's first 5G smartphone in the United States—in Verizon stores and online at verizonwireless.com. The launch comes on the heels of Verizon's announcement of 20 U.S. cities that will get 5G ultrawideband service in 2019: Atlanta, Georgia; Boston; Charlotte, North Carolina; Cincinnati, Ohio; Cleveland, Ohio; Columbus, Ohio; Dallas; Des Moines, Iowa; Denver, Colorado; Detroit; Houston; Indianapolis, Indiana; Kansas City, Missouri; Little Rock, Arkansas; Memphis, Tennessee; Phoenix, Arizona; Providence, Rhode Island; San Diego, California; Salt Lake City, Utah; and Washington, D.C.

5G ultrawideband uses New Radio technology and device hardware to deliver advanced capabilities to consumers and businesses. When customers move outside Verizon's 5G coverage area, the Galaxy S10 5G hands off the signal to Verizon's 4G long-term evolution (LTE) network.

Available for a limited time on Verizon, the Samsung Galaxy S10 5G smartphone makes the power, speed, and connectivity of Verizon's 5G ultrawideband network available to consumers and businesses. That network provides faster download speeds than 4G LTE, with increased bandwidth capacity, so that more users are able to use more data in the same location. Access to these faster speeds could change the way customers use their smartphones for work, play, and everything in between.

The Galaxy S10 5G features a 6.7-in cinematic, active-matrix organic LED display, so users can immerse themselves in a whole new way. It also features the Galaxy S series' most advanced, professional-grade camera system, with six lenses and a 3D depth-sensing camera that uses time-of-flight technology to let users capture videos with a striking blur effect.

A powerful 4,500-mAh all-day intelligent battery can optimize usage based on how customers live, to deliver peak performance throughout the day. The Galaxy S10 5G comes

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with two storage options: 256 or 512 GB. Now, users can download movies, TV, and photos at hyper-fast data rates and store them all on their handheld devices.

5G Mobile Platforms

The Mobile World Congress (MWC) Barcelona (Spain) is the world's largest exhibition for the mobile industry. This year, the event took place on 25–28 February.

At MWC19 Barcelona, Qualcomm Technologies announced a new Snapdragon mobile platform with 5G integrated into a system on chip. The company builds on Snapdragon X50 and X55 5G modems and radio-frequency front-end (RFFE) solutions by offering a newly integrated Snapdragon 5G mobile platform that reinforces the company's role in providing the global mobile ecosystem with the flexibility and scalability needed for broad and fast 5G adoption. Original equipment manufacturers will be able to use investments made in Snapdragon X50 and X55 modems to enable accelerated commercialization on the new integrated 5G platform.

This new platform is the first stage on a road map of software-compatible 5G mobile platforms and takes advantage of the company's newly announced second-generation 5G millimeter-wave (mm-wave) antenna module and sub-6-GHz RFFE components and modules. This 5G modem-to-antenna solution is designed to enable device makers to quickly and cost effectively develop 5G smartphones for virtually any 5G network or region in the world.

The integrated Snapdragon 5G mobile platform features Qualcomm 5G PowerSave technology to enable smartphones for the battery life users expect today. PowerSave builds on connected-mode, discontinuous

reception, a feature in 3rd Generation Partnership Project specifications, along with additional techniques from Qualcomm Technologies to enhance battery life in 5G mobile devices. PowerSave is also supported in the Snapdragon X50 and X55 5G modems, which are expected to power the first waves of 5G mobile devices introduced this year. Samples of the new integrated Snapdragon 5G mobile platform are scheduled to go to customers in the second quarter of 2019, with commercial devices expected in the first half of 2020.

5G Wireless Backhaul Trials

In a joint innovation project, Ericsson and Deutsche Telekom have achieved a landmark data transmission rate, consistently topping 100 Gb/s in a trial microwave link over 1.5 km. Conducted at the Deutsche Telekom Service Center in Athens, Greece, this trial represents a major technical breakthrough, achieving throughput speeds more than 10 times greater than current commercial solutions on the mm-wave spectrum (70/80 GHz and above).

The achieved milestone confirmed the feasibility of microwave technology over the mm-wave spectrum as a key technology capable of meeting the performance requirements for 5G. In addition, the trial showed the importance of applying spectral-efficient techniques, such as multiple-input, multiple-output (MIMO), on wireless backhaul technologies to address upcoming 5G radio-access demands.

The key technological advances of the trial included an 8 x 8 line-of-sight MIMO transmission link with a cross-polarization interference cancellation setup using Ericsson's commercial MINI-LINK 6352 radios and a 2.5-GHz channel bandwidth

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in the E band (70/80 GHz) capable of transmitting eight independent data streams over the radio path. This corresponds to a breakthrough spectrum efficiency of 55.2 b/s/Hz at peak. During the mid-April trial, measured transmission rates were consistently above 100 Gb/s, with a telecom-grade availability of more than 99.995% and peak data transmission rates reaching 140 Gb/s.

5G in Football Stadiums

Camp Nou is a legendary football stadium in Barcelona, Spain, home to some of the world's most passionate fans and one of the world's most dominant football clubs. Currently, the Camp Nou stadium has a dedicated 3G and 4G coverage system based on Ericsson Micro Radio Units and the Radio Dot System in its VIP areas. This solution makes Camp Nou one of the best stadiums in Europe in terms of mobile capacity and performance.

Now, Ericsson has evolved that solution in the stadium to 5G using massive MIMO active antennas operating in the 3.5-GHz frequency band. Telefónica, Ericsson, and FC Barcelona streamed live images from Camp Nou to MWC19 Barcelona, as well as exclusive footage of the team's first training session at the Ciutat Esportiva Joan Gamper stadium and a virtual tour of the stadium. The project is being developed in collaboration with the Global System for Mobile Communication Association and Mobile World Capital Barcelona within the framework of the 5G Barcelona initiative.

The 5G capability will transform not only the event experience but also sports on actual screens. At MWC19 Barcelona, Telefónica and Movistar Riders—a multigaming

e-sports organization in Spain—presented the event Movistar Riders on 5G, the first exhibition in Europe focused on 5G and e-sports. During the presentation, the Movistar Riders *Call of Duty* professional team used gaming consoles and a 5G router connected to the Internet through Ericsson's 5G mobile network. Four team members played *Call of Duty: Black Ops 4*, a shooter game in which low latency is fundamental to success.

5G in Shopping Malls

The 50th anniversary of World Telecommunication and Information Society Day was celebrated on 17 May 2019. The 17th of May marks the founding of the International Telecommunication Union in 1865, when the first International Telegraph Convention was signed in Paris.

On the eve of this event, the China Real Estate Association, China Mobile, and Huawei jointly launched the world's first 5G+ five-star shopping mall, Shanghai's Lujiazui L+, which uses the 5G digital indoor system (DIS). At the launch event, the China Real Estate Association also hosted a news conference releasing a report detailing evaluation criteria for shopping malls. The report noted that digital cellular telecommunications systems are an important part of the digital transformation of shopping malls. The L+ mall provides customers and registered stores with a high-quality, innovative shopping and service experience brought by 5G networks; it also serves as a key milestone in the integrated development of the communication and real estate industries.

The L+ mall is a huge, full-service shopping complex, spanning 12 floors (including one underground) and more than 140,000 m² in gross

floor area. It aims to serve middle- and upper-income households and elite groups who pursue excellent-quality products and services. The interior design, service, and other aspects all reflect the pursuit of quality and innovation. At this time, China Mobile and Huawei have deployed 5G DIS at life aesthetics zones on the first floor and fifth floor of the mall.

During the launch event, customers could experience Gb/s-level transmission rates and high-definition (HD) video calls on 5G networks with 5G mobile phones. Services such as shopping assistance, delivery, and destination guidance offered by 5G smart robots enhance the mall's efficiency. In addition, other services are available in 5G-covered shopping areas, such as 5G+ artificial intelligence (AI) face recognition, 5G+ 8,000-pixel HD video, indoor precise navigation, and people-flow analysis. In this way, the unique, high-quality 5G+ five-star mall provides customers with an outstanding and diversified shopping experience and lays a solid foundation for the digital transformation of registered stores.

5G for the Banking Sector

Ericsson announced that the company has partnered with Telstra, Australia's largest service provider, and Commonwealth Bank of Australia to explore 5G edge computing use cases and network capabilities for the financial sector by testing end-to-end banking solutions over 5G.

The collaboration marks an Australian first in terms of bringing technology providers and the financial services sector together to explore 5G edge computing, which is expected to simplify network operations and the complexity now faced at individual bank branches. The collaboration will explore optimal 5G coverage solutions to provide more flexibility for bank operations and locations. Trials are expected to showcase what the bank branch of the future might look like as well as how 5G edge computing could reduce the

network infrastructure currently required at branches.

5G Smart Harbors

Ericsson and China Unicom, the world's fourth-largest mobile service provider by subscriber numbers, are developing a 5G smart harbor at the Port of Qingdao in China. News of this followed a successful technical solution verification at the port and was jointly announced by the partners during a media event from Ericsson's booth at MWC19 Barcelona. One of the key findings of the field trial is that up to 70% of labor costs can be saved when a harbor upgrades to 5G automation, compared to traditional fully automated harbors.

The Port of Qingdao is among the top ten busiest ports in the world, processing approximately 19.3 million containers every year. It has been operating as Asia's first fully automated harbor since 2017, and using 5G will keep it at the forefront of port innovation.

The partners, in collaboration with leading global port machinery manufacturer Shanghai Zhenhua Heavy Industries Co., Ltd., achieved several ground-breaking accomplishments as part of their six-month 5G smart harbor verification in late 2018. These included an automated ship-to-shore crane that lifted a container over a 5G connection operated from the control center. The 5G connection included data traffic from more than 30 HD cameras as well as control data for a programmable logic controller. These operations required stable, remote, real-time control with millisecond-level latency in control signals, which only key 5G technologies can deliver. The field trial confirmed the feasibility and potential of 5G applications for the development of smart harbors.

5G Smart Manufacturing

With 5G a growing reality and Industry 4.0 underway, Ericsson is taking a significant step toward smarter wireless manufacturing and automation at its 5G factory in Tallinn, Estonia. In

partnership with ABB, Ericsson will deploy an intelligent automation system at the manufacturing facility throughout 2019, beginning with the Ericsson Radio System portfolio. The company will subsequently combine this system with its own connectivity layer, adding machine learning and AI to the site's production and enabling real-time data analytics and an end-to-end predictive automated manufacturing chain.

As part of the recently signed local agreement, ABB will provide a fully automated, flexible robot cell solution for the final assembly of 5G radios. Enabled by 5G and ultralow-latency connectivity, smart manufacturing is widely expected to be deployed exponentially over the coming years. New standards within cellular connectivity make it possible for businesses to connect almost every factory asset, automating the supply chain, ensuring operational efficiency and quality, and enabling flexible production through cloud robotics.

As highlighted in Ericsson's recent special edition of its "World Economic Forum Mobility Report" [2], the digital transformation to smart manufacturing will be enabled through a large network of sensors for predictive maintenance of machines and robots on the factory floor, cloud robotics, identification and tracking of goods in the end-to-end value chain, and remote diagnostics through high-resolution 3D video or haptic sensors. Ericsson's smart factory is expected to be fully operational by the end of 2019.

Next-Generation 5G Services

Ericsson and the United Nations Educational, Scientific and Cultural Organization (UNESCO) have formed a new partnership to educate and empower the next generation. The partnership's objective is to develop a new digital-skill learning program with specific emphasis on scaling up AI skill development for young people.

With the rapid deployment of advanced technologies, such as

mobile broadband, the cloud, the Internet of Things (IoT), automation, and AI, a new set of skills is required to enter the workforce. There is an unprecedented opportunity to harness technologies and use them not only to advance economies but also to combat some of the world's looming challenges. Next-generation 5G services are set to play a key role in accelerating digitalization and the impact of technologies such as AI.

The impact of AI is also felt across the education sector, where it has the potential to increase access, automate processes, curate learning, and improve outcomes. It will continue to bring opportunities for new and enhanced forms of learning and offer flexible lifelong learning pathways. With this background, Ericsson and UNESCO are combining their respective strengths in the AI-for-youth initiative to do the following:

- develop and manage a globally available repository of AI and other key digital-skill training courses
- build the capacities of master trainers from selected countries around the globe with advanced knowledge of AI skills development
- support master trainers to mobilize AI hub centers and hackathons to train young people in the development of AI applications.

The initiative was launched at Mobile Learning Week 2019, UNESCO's flagship education conference, held at UNESCO Headquarters, Paris, France, 4–6 March 2019. The event brought together education and technology experts from around the world with a focus on AI and sustainable development.

Broadband IoT Smart Vessels

At this year's MWC19 Barcelona, Ericsson revealed an award-winning industrial use case demonstrating early examples of how 4G and 5G connectivity can benefit our planet and improve society. The use case—a broadband IoT smart vessel—showed an unmanned vessel operating remotely over a 4G network. Showcased as

part of Ericsson's evolved cellular IoT solution, the smart vessel harnesses the increased capacity and lower latency of forthcoming networks to perform operations in almost real time. Following predefined GPS routes, the vessel operates autonomously, collecting water quality monitoring data, identifying the causes of pollutants with HD cameras, and taking measures necessary to address these pollutants. The smart vessel can be remotely steered to a desired location in a polluted area for close monitoring and taking action to mitigate the pollution.

Running on a commercial 4G network, this use case was jointly developed with China Mobile and OceanAlpha, the largest unmanned-surface-vessel company in the world. The remotely controlled machine is just one example of the billions of smart devices that are widely expected to be enabled by 5G over the coming years. In November 2018, at the United Nations' World Geospatial Information Congress in China, Ericsson and China Mobile jointly won the award for most popular 5G application with their demonstration of a 5G unmanned river-cleaning vessel.

Tactical LTE Solutions

The Public and Corporate Security International Exhibition, the leading Latin American defense and security exhibition, took place in Sao Paulo, Brazil, 2–5 April 2019. At the event, Motorola Solutions presented the concept of end-to-end integrated security and defense with the most advanced sensors, handheld devices, software, cameras, radios, and AI, designed to create safer cities and help public safety and defense officers in emergencies or as they handle their daily duties.

At the exhibition, the company introduced a tactical LTE solution that generates an on-site 4G LTE "bubble" to integrate different systems. This dedicated 4G service optionally supports interoperability (through added equipment and applications)

with radio communication systems based on the Terrestrial Trunked Radio and Project 25 standards. The system also enables encryption, which prevents unauthorized people from listening to messages or viewing data. It even enables the use of multimedia data, transmitting video, images, maps, and other information in real time between the control center and field officers.

In addition to the tactical LTE device, Motorola Solutions also showcased the LEX L11, a rugged device with advanced applications for mission-critical communications as well as HD cameras and dedicated buttons for emergency and alert communications. One such application is WAVE, which integrates digital radio devices, cellular networks, and even desktop computers with the ease of a push-to-talk application.

One of the main new features of the solution is its ability to integrate sensors within a police officer's gun holster. When the gun is drawn, the Si500 microphone's audio and video recording is automatically switched on, providing an unbiased account of an incident. Videos are stored under strict security standards and can be used in court for investigative purposes.

Mobile Solutions for Public Safety

Motorola's local partners, Aksel and Siltec, have been selected by the Polish Prison Service to fulfill a public contract to modernize the service's communications system. Under the contract, all penal institutions in Poland will be equipped with state-of-the-art MOTOTRBO Digital Mobile Radio (DMR) [3] technology from Motorola Solutions to replace an analogue radio infrastructure with a proven digital radio communication solution. The consortium will modernize the public safety radio communications systems in line with the country's Program for the Modernization of the Prison Service in 2017–2020, which was passed in 2016.

The next-generation technology will provide greatly improved qual-

ity, reliability, and coverage as well as secure encryption of voice communications in the Polish Prison Service's prison facilities and convoy vehicles. The system includes crucial GPS tracking functions, allowing increased levels of security by localizing the positions of vehicles and of officers in penal institutions. Moreover, this mission-critical communications system can be expanded for future interoperability with other public safety agencies and organizations in Poland. The modernization of the Polish Prison Service radio system to a fully functional, next-generation DMR system will be completed in 2020.

Wireless Solutions for Industry 4.0

Ericsson announced that the company has launched Ericsson Industry Connect [4], an easy-to-use cellular connectivity solution to accelerate Industry 4.0 digital transformation. This solution allows communication service providers to offer dedicated cellular networks at factories and warehouses starting with 4G LTE and with a clear path to 5G. The offering strengthens Ericsson's private networks and IoT portfolios by making 4G and 5G technologies accessible to new industrial markets. Built for industrial environments such as factories and warehouses, the system enables secure, reliable coverage with high-device density and predictable latency. With a network management process designed to be easy to use for professionals in information and operational technology, the solution aims to make cellular technology rapidly deployable among factory and warehouse staff.

With industrial-grade wireless connectivity, Ericsson Industry Connect can facilitate innovative Industry 4.0 use cases such as digital twin inspection (a real-time digital replica of a physical entity) with a massive number of sensors, mobility for human-machine interface instructions for workers, collision avoidance and remote control for autonomous guided vehicles, and collaborative robotics

for automated operations. Scania, a Swedish provider of transport solutions, has already implemented Ericsson Industry Connect in its smart production lab in Södertälje. Ericsson also demonstrated its solution at Hannover Messe, held in Hannover, Germany, 1–5 April 2019.

Wireless Solutions for Agriculture 4.0

Nokia announced that it has joined ConectarAGRO to bring 500,000 Brazilian farmers more access to Agriculture 4.0 and IoT technologies. ConectarAGRO is a consortium of eight partners from agribusiness (CNH, AGCO, Bayer, Jacto, Solinftec, and Trimble) and the telecom industry (Nokia and TIM Brazil), whose aim is to bring connectivity to some of the 93% of Brazilian farmers who currently have no wireless access to broadband services on their farms. Nokia will contribute the technology to enable TIM Brazil to provide 4G coverage and support IoT and other precision agricultural technologies that will boost yields and help to meet rising food demand.

There is currently next to no wireless broadband coverage of Brazil's agricultural areas (less than 7%). The companies supporting the ConectarAGRO initiative will contribute so that many farmers can, for the first time, connect farm fleets and employ robots, temperature and moisture sensors, drone aerial images, and the GPS to boost farm yields of soybeans, cotton, corn, sugar cane, and many other crops while reducing fuel consumption, insecticide use, and water for irrigation. This will give a significant boost to Brazil's agribusiness sector, which, in 2017, contributed 23.5% of Brazilian's gross domestic product (GDP) and accounted for nearly 80% of GDP growth.

As part of its contribution to the ConectarAGRO initiative, Nokia will develop 4G LTE and 5G wireless broadband solutions as well as satellite and microwave technology. These will provide a powerful connectivity platform for supporting advanced IoT solutions that improve the efficiency of resource

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use and boost productivity for farmers. Nokia is currently the only connectivity technology vendor contributing to ConectarAGRO, and it plans to expand its activities to other rural areas in Latin America and worldwide.

AI on Mobile Devices

On 18 April 2019, Qualcomm Technologies announced that the company is working with Vivo, Tencent *Honor of Kings*, and Tencent AI Lab to drive and explore new gaming experiences for on-device AI applications utilizing the fourth-generation Qualcomm AI Engine. Dubbed *Project Imagination*, this joint effort builds on the four parties' AI expertise and is designed to bring consumers smarter, more efficient, and more immersive experiences and spur on-device AI innovation across the mobile ecosystem.

The first implementation of Project Imagination takes full advantage of the powerful heterogeneous computing capabilities of the Qualcomm AI Engine and the integrated elite gaming features on the Qualcomm Snapdragon 855 mobile platform. The idea is to enable, for the first time, high-performance on-device AI inference in mobile gaming at scale without the cloud on Vivo's iQOO smartphones. Building on iQOO's strong computing power and exceptional system optimization allows the project to upgrade and optimize the user experiences in multiplayer online battle arena games such as *Honor of Kings*. Traditionally, neural network training and inference have been performed in the cloud. Now, with the increased performance and computing power of mobile platforms, AI has rapidly moved from the cloud to the device.

Wi-Fi 6 Products

The Huawei Global Analyst Summit 2019 was held in Shenzhen, China,

16–18 April 2019. During the event, Huawei and the Wi-Fi Alliance organized a media roundtable meeting with the theme "Wi-Fi 6, Unlocking Business Value." During the roundtable meeting, Huawei announced AirEngine as its new Wi-Fi brand, which will be applied to its full series of enterprise-class Wi-Fi 6 products. Additionally, with global media and analysts present on site, Huawei highlighted that its Wi-Fi 6 products have been deployed on a large scale in five major regions worldwide.

Emerging applications such as AR, VR, and 4,000-pixel (4K) video require more bandwidth, higher concurrency, and lower latency, which pose challenges to traditional Wi-Fi networks. These challenges must be resolved as quickly as possible to enable the digital transformation of enterprises. This is where Huawei's AirEngine comes in as proof of the company's commitment to high-quality Wi-Fi networks. It serves as a wireless connection engine that accelerates the digital transformation of enterprise services.

Three compelling benefits make AirEngine stand out: ultrahigh performance, optimal user experience, and enabling new business models. The product features the industry's best performance, as verified by Tolly, an international testing organization. It builds on technical strengths originating from Huawei 5G smart antenna technology and intelligent application acceleration technologies and achieves intelligent optimization for optimal user experience and service continuity. AirEngine can also accommodate new applications such as 4K video and VR and leverage in-depth cooperation with partners to achieve wireless transformation for teaching, research, manufacturing, and other mission-critical services,

enabling new business applications. AirEngine is specifically designed for building high-quality Wi-Fi networks that feature high-performance connections, optimal user experience, and new business concepts.

Wi-Fi 6 for Automotive Platforms

Qualcomm Technologies introduced the new Qualcomm Automotive Wi-Fi 6 chip, the QCA6696, bringing the next generation of Wi-Fi and Bluetooth connectivity to the automotive industry. Complementing the Qualcomm Snapdragon Automotive 4G and 5G platforms, the QCA6696 is the company's most advanced Wi-Fi solution and is designed to offer fast, secure, and efficient Wi-Fi connectivity to meet consumer demands for greater robustness and reduced latency when operating in congested and dense environments.

The QCA6696 features dual Wi-Fi 6 MIMO access points designed to support gigabit transmission in-car hotspots and deliver efficient Wi-Fi connectivity throughout the vehicle, supporting ultrahigh-definition video streaming on multiple displays and screen mirroring from compatible devices and wireless backup cameras, as well as offering Bluetooth 5.1 support and Qualcomm aptX Adaptive audio to deliver high-fidelity voice and streaming. The QCA6696 chip also features full MIMO client capability designed to extend the range at high data rates when connecting to external access points for automotive services, such as vehicle diagnostics, software updates, and automatic check-ins when pulling up to dealerships. The QCA6696 is now sampling and is expected to appear in commercial vehicles in 2021.

Mobile Health-Care Innovations

The third annual Massachusetts Institute of Technology (MIT) Hacking Medicine Grand Hack took place in Boston, Massachusetts, 3–5 May 2019. This is one of the largest health-care hackathons in the world

and aims to bring together hundreds of engineers, clinicians, designers, developers, and businesspeople to brainstorm about and build innovative health-care solutions.

At the event, Samsung Electronics America teamed up with MIT and the Veterans Health Administration (VHA). As a part of the VHA track, hackathon participants had an opportunity to use the Samsung Galaxy Note9 to develop new applications that address cancer, mental health, and active sports therapy and rehabilitation. The Note9 offers smartphone innovations on a large-format display, including a Bluetooth Low-Energy S pen; an intelligent camera with AI capabilities; the Samsung DeX, which transforms the smartphone into a personal-computer-like experience; and a removable solid-state drive to support all data needs. Bringing together the VHA's priorities, Samsung's technology, and the MIT Hacking Medicine innovation ecosystem offered tremendous potential to innovate and scale value-based services, such as telehealth, virtual care, and remote patient monitoring. All have the potential to make a profound impact on every aspect of the VHA's health-care delivery process.

Samsung has a deep and long-standing commitment to health care dating back to the early 1990s, when the company opened the Samsung Medical Center in Korea. Since that time, the company has been working with partners to develop and deploy multiple commercial solutions for the U.S. market designed to improve health-care outcomes. For more information about how Samsung is helping health care, government, and industries to change the way they address business challenges, visit Samsung's website [5].

Connected Aging

Sierra Wireless is a company that provides fully integrated device-to-cloud solutions for the IoT. On 24 April 2019, Sierra Wireless announced that its IoT connectivity solution is enabling

tracking and communications for the NurtureWatch [6], a wearable device that helps elderly people stay safe, healthy, and independent. The NurtureWatch is a great example of how IoT solutions are transforming lives. It empowers senior citizens to maintain their independence and improve the quality of life for themselves and their families.

The expense of continuous, at-home care is one of the primary reasons elderly people move into care facilities. For families and health-care companies, this device can offset the cost of supporting the elderly and help them live independently at home. In addition to 24/7 heart-rate monitoring and fall detection, the NurtureWatch provides pill reminders to ensure medication compliance, GPS-based location tracking, geo-fencing to help the aged stay in safe locations, and an SOS button with two-way calling to guarantee that they can quickly and easily call for help.

The NurtureWatch is paired with a smartphone to keep seniors connected and provide a safety net that allows constant monitoring and gives them greater independence, without the expense or intrusion of full-time caregivers. To develop this solution, the company teamed with Captjur, a services and technology company based in California.

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