

GETTING DOWN TO 5G BUSINESS

By Gary Arlen

From tracking professional basketball shooting techniques to managing 3D printers in factories to customizing farm field nutrients, 5G is finding its way into countless industrial applications.

S

ure, you've heard about the capabilities for fifth generation (5G) wireless technology in self-driving vehicles and for smart city management. And you have heard claims about faster/clearer 5G mobile phone service. But attention is now on Standalone Non-Public Networks (SNPNs), "network slicing," Internet of Things (IoT) ventures and countless business services throughout the digital economy.

Analysts contend that 5G innovation will be led by enterprise projects, not by consumer services.

Of course, the technology comes first. "5G can support three primary types of connected services," says Joe Glynn, vice president of business development at chip-maker Qualcomm. He explains, "enhanced mobile broadband" for faster smartphones will be capable of new immersive experiences like extended reality and adds "low latency" systems for "remote control of critical infrastructure, vehicles and industrial equipment." Glynn, who chairs CTA's Wireless Division Board, focuses his outlook for 5G innovation on massive IoT projects that seamlessly connect virtually everything from smart home devices to smart cities.

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Ami Silverman, Microsoft's corporate vice president of Consumer Channel Sales and Marketing, also sees 5G's major value in the enterprise "by effectively delivering more compute resources more quickly to the edge of the network and driving a new class of devices powered by 5G."

"5G will enable customers to set up networks in their commercial space — on a construction site, at a refinery or a hospital — that are virtualized network slices with their own performance parameters," Silverman says. "Think of automated high-precision asset localization, tracking and positioning in manufacturing. 5G opens new frontiers with enhanced mobile broadband up to 10 times faster, reliable low-latency communication, and very high device density up to one million devices per square kilometer," Silverman explains.

This bandwidth and reliability will help create smart buildings, factories and agriculture. "Whereas previous generations of wireless devices were primarily mobile devices like smartphones, watches and tablets, 5G is a true leap forward in terms of connectivity capabilities," Silverman cites 5G's support for a larger variety and volume of devices as a critical value. "This will provide a significant opportunity for edge devices in the digital feedback loop to take advantage of processing high volumes of data at much faster speeds."

Andrew Albrecht of the AT&T Business Development 5G Center of Excellence emphasizes the value of 5G



5G SECURITY AND GLOBAL STANDARDS

One notable value of 5G is that it is much more secure than 4G.

"5G adds new protections for enhanced authentications," explains Mike Bergman, CTA's vice president of technology and standards. It can stave off general security incursions such as resource theft, internet threats such as Distributed Denial of Service (DDOS) attacks and access from unauthenticated Wi-Fi devices. 5G can also provide security for traffic that moves along the network. The U.S. government wants to assure that "adversarial actors" cannot get into the 5G supply chain, that devices attached to the network are "authorized and authenticated" and that communications between the network and devices are secure, Bergman says.

One policy factor affecting the adoption of a global 5G standard is the confirmation of "Release 17" features from the 3GPP (3rd Generation Partnership Project), a consortium of global standards organizations that oversees protocols for mobile telecommunications.

Because of pandemic postponements, the final Release 17 version has been delayed. The protocols are expected to be "frozen" in March 2022, Bergman says. The new version will encompass 5G Wireless-Wireline convergence and enables support for new verticals, including industrial automation, "Ultra Reliable and Low Latency Communication (URLLC)" and Non-Public Networks (NPNs) as well as Cellular Internet of Things (CIoT).



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in "IoT-heavy industries" where it can implement or scale data intensive technologies in new ways. "Novel 5G features like network slicing will ultimately transform how industries think about and use 5G," Albrecht explains. "We'll continue to see increased use of 5G in the operation technology side of many businesses." He cites video as a sensor, AR/VR, mobile robotics, location-based services and even industrial control communications.

Sally Lange, founder of Slang Consulting in Chicago and a former CTA Executive Board member while at Sprint, categorizes the emerging 5G opportunity parade into four themes: efficiency, avoidance, connectivity and safety. Lange believes those features are interwoven, such as predictive intelligence (avoidance) and safety. Some of the 5G services may be geared to specific categories, and she's enthusiastic about "new things that can be connected" via 5G wireless technology such as the "retailization of health care" for remote diagnostics and monitoring.

CONNECTIVITY AT THE CORE

"5G will be the connectivity standard," says Steve Koenig vice president, CTA market research. Although he expects smartphone voice and data services for consumers will be at the vanguard for residential 5G broadband, Koenig envisions "in five years we'll have a robust landscape of industrial IoT applications across the economy powered by 5G in every conceivable economic sector."

Koenig foresees massive 5G private networks for hospitals, campuses, factories and other institutional users. By 2027, he predicts revenues from business and institutional 5G customers will outstrip the consumer side. He also anticipates 5G will alter the amount of churn, which has been an expensive thorn in the wireless business. Koenig foresees "a myriad of connected sensors, displays, computing platforms: all kinds of things that are probably not connected with a wire." Similarly, a factory "could have thousands of sensors on its production lines, monitoring processes in real time, which would also boost safety," Koenig adds. He also expects autonomous equipment in the field, sensors in the soil measuring moisture nutrients and spectrographic analysis.

Qualcomm's Glynn says, "Economic studies by Accenture commissioned by Qualcomm, predict 5G will generate up to \$1.5 trillion in additional U.S. GDP between 2021 and 2025, and will create or transform up to 16 million American jobs."

Microsoft's Silverman expects "5G will bring orders of magnitude more data to the network edge. We will see a new class of devices powered by 5G," she says. "The 'smart' prefix highlights that there is a compute-intensive workload, running machine learning or artificial intelligence-type logic," Silverman adds, putting the emphasis on "near real-time" operations. "In addition to cost efficiency, latency is the new currency, and to reduce latency we need to move the required computing resources closer to the sensors, data origin or users." She adds, "5G and cloud computing allow organizations to connect millions of endpoints, analyze data and deliver immersive experiences."

Other examples on the Microsoft horizon include online gaming and remote events. In both cases, real-time experiences such as social engagement, mobile digital experiences, live interaction, payment and processing will benefit from the ultra-low latency and responsive features that 5G can deliver.

'OUT-OF-THE-BOX' VENTURES

Seeing 5G opportunities, companies are refining their strategies. General Motors and AT&T have allied for automotive connectivity. Separately, AT&T and Microsoft are working on network enhancements for improved roadway-centric coverage, faster media downloads to moving vehicles and faster, more reliable, secure over-the-air software updates for navigation, mapping and voice services.

IBM and Verizon are collaborating on 5G use cases and 'management approaches' at the IBM Industry Solutions Lab (ISL) in Texas. The companies are offering industrial enterprises a test environment to experiment with 5G networking, cloud-and-edge compute and analytics-based AI software. The setup is focused on robotics, guided vehicles, manufacturing process automation, visual quality inspection and industrial analytics.

General Electric is looking at "additive manufacturing" (3D printing) and sees 5G as a way to monitor and control the customized



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– Ami Silverman Microsoft

ventures. GE sees it as a transformative approach to industrial production that enables the creation of lighter, stronger parts and systems.

5G played a role in the Phoenix Suns' drive toward the NBA title. Although the team was eliminated in the semi-finals, it credited a Verizon 5G system in its Footprint Center in Phoenix (part of a \$230 million renovation) with helping players improve shooting skills and identify when players were fatigued. With 100 sensors, high-resolution cameras and other tools, the system enabled team managers to track players' movements and offer (via 5G transmission) real-time analytics — rather than wait for video reviews.

For example, the "Noahlytics Data Service" (from an Alabama basketball tech company) uses sensors in the team's practice centers. It tracks arch consistency, depth and left/right trajectory of a ball and the 5G technology beams data in real-time to coaches and players, giving them instant data to modify players' actions for sinking a shot. "It gets down to centimeter accuracy," according to the team.

NEED FOR INDUSTRY STANDARDS

One challenge is integrating new wireless and computing technology, including cloud services. For example, network slicing, a type of virtual network technology, uses both network virtualization and software-defined networking. 5G network slicing will revolutionize remote collaboration to achieve things that are not possible today. It will create end-to-end networks that could fulfill specific requirements without affecting overall network performance. Among the options could be industrial automation, virtual and augmented reality, holograms and high-definition video, to support remote collaboration.

Microsoft's Silverman says industry standardization of service-based architecture exemplifies how 5G will be more "cloudified" than any previous mobile technology generation. "Beyond running 5G network functions in the cloud, there are significant opportunities when networks are integrated with hyper-scale cloud services such as artificial intelligence, machine learning, security, analytics and IoT processing. When combined with ubiquitous compute and opened to a large community of application developers, new capabilities for enterprises and end-customer experiences will emerge."



5G OPEN INNOVATION LAB
5goilab.com

Among the resources for 5G development is the "5G Open Innovation Lab" (5GOILab), a global innovation ecosystem for corporations, academia and government established in Seattle last year. With about a dozen corporate partners like Dell, Ericsson, Intel, Microsoft and T-Mobile, the group seeks to support startup and

early-stage ventures as they develop 5G projects. Its initial target industries are energy, healthcare, manufacturing, transportation/logistics, agriculture, media/entertainment, retail and space/satellite. In February, the Lab launched its first 5G application development field lab for the agricultural industry.

Silverman cites Microsoft's project with AT&T as an example of the integrated 5G future. AT&T will move its 5G mobile network to the Microsoft cloud in a strategic alliance intended to become "a path for all of AT&T's mobile network traffic to be managed using Microsoft Azure technologies."

The companies will start with AT&T's 5G core, the software at the heart of the 5G network that connects mobile users and IoT devices with internet services. Silverman says the process will enhance productivity and cost efficiency while focusing on the delivery of large-scale network services that meet its customers' evolving needs.

Microsoft is also working with Verizon to help enterprises accelerate the delivery of fast and secure 5G applications. Verizon's onsite 5G Edge network integrated with Azure Edge services can enable ultra-low latency, helping businesses tap into real-time data analysis and delivery. She envisions applications incorporating computer vision, augmented, mixed and virtual reality, digital twins or machine learning that can be enhanced with 5G and mobile edge compute on customer premises.

AT&T's Albrecht says, "Network security and privacy are key cornerstones for us. With 5G, we're working to embed security directly into the design, architecture and functionality of our network, eventually giving us enhanced security to enable us to better protect the network."

Glynn describes 5G as "dramatically improving everything from bandwidth, capacity and battery life to spectral efficiency and latency." He says 5G can provide a more uniform user experience so data rates stay consistently high—even when users are moving around. He envisions 5G-enabled drones, personal robots, and vehicles capable of "capturing and sharing video wirelessly at impressive resolutions — 4K and 8K to start — with frame rates, night vision, and color accuracy that were impossible with 4G."

Glynn adds, "We believe camera and sensor data from 5G IoT devices will have world-changing implications for safety, reducing the

number and impact of traffic accidents, and enabling the remote strategy and command of emergency services." He believes the "next big step forward" for IoT will be the commercialization of 5G NR-Light solutions, to enable low-power IoT devices to send and receive at higher data rates.

5G FOR INDUSTRIAL USERS

Glynn says, "Trials of 5G industrial IoT are ongoing with applications such as connected robots and automated guided vehicles (AGVs) with precise positioning, and we expect to see more employees with AR/VR headsets making use of 5G's high data rates and low latency reliability," he adds. "The factory of the future with Industry 4.0 is an opportunity for 5G to serve as an enabler of smarter manufacturing, as the factory presents a challenging radio environment with fast movement, large obstructions and demanding quality of service needs — scenarios that 5G was built for."

Similarly, Lange sees 5G generating many changes in digital categories, such as e-commerce — what she calls "in-store experiences at home." She adds, "We haven't been able to replicate" the in-store experience, but she believes 5G will enable opportunities like pop-up stores. It is part of a larger transformation, fueled during the pandemic, in which consumers want "the tech to transact everywhere." She contends this shift comes at a time when merchants are realizing they don't need a year-round physical presence if they want to establish a seasonal store.

"This drives efficiency," Lange adds. "5G lets people be more entrepreneurial." Lange believes that 5G suppliers should focus on health care and the aging population. 5G can be vital in creating "a smart home for aging populations." She says, "My hope is that this creates enterprise solutions for health, such as remote patient monitoring. She adds, insurance companies want to enable home health care, or as she puts it "the retailization of health care."

AGREEING ON THE UNKNOWN

Two things experts agree upon: 5G will be big, but they don't know exactly how or where.

Lange is focused on 5G's entrepreneurial opportunities. She says, "We are going to see a massive number of new companies and new industries," adding that a new "ecosystem around them" will also develop.

Qualcomm's Glynn summarizes, "Our engineers are working to double 5G's downlink performance to 20 Gbps over the next several years. Qualcomm sees 5G as the unified connectivity fabric to wirelessly connect virtually everything around us. We are driving a rich roadmap of system innovations for the IoT expansion" by integrating 5G, AI and mobile "to reimagine how IoT technologies are implemented."

Microsoft's Silverman envisions new devices, acknowledging 5G technology will create "significant opportunity for edge devices in the digital feedback loop to take advantage of processing high volumes of data at much faster speeds."

AT&T's Albrecht says, "How this will be manifested is anyone's guess but I'm excited about what the future brings. I doubt any of us could have anticipated the LTE applications that transformed how we'd live today, so it wouldn't surprise me to see even greater connectedness in how we live, work and play." ■

