

# Accelerating the Move to the Cloud With Always Connected Computing

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**Pete Bernard, Principal Group Product Manager, Microsoft**

The evolution of the modern workplace has connectivity at its core. It's the oxygen required for creativity and teamwork. Being untethered with wireless connectivity is freedom, expanding our ability to create and team wherever we are. At the same time we're seeing a transformative change of the modern workplace, with 84 percent of large organizations planning to move their local server workloads to the cloud in the next two years<sup>1</sup>. Businesses invest millions of dollars in fixed-line infrastructure — pallets of Wi-Fi access points and miles of cable and hours of maintenance — to desperately try to keep up with this need to be connected and be competitive.

But we're now on the cusp of a disruption driven by connectivity and the cloud — the use of cellular 4G LTE networks that we have been enjoying on our smartphones (and ultimately 5G) to make a secure cloud available to workers anywhere, virtually instantly — in licensed and unlicensed spectrum — to save companies those millions of dollars in CapEx and OpEx.

The disruption we're starting to see in cellular broadband is similar to the disruption we saw with the advent of Wi-Fi back in the late 90s, after the FCC opened under-utilized bands to the industry and partners came together to develop standards for wireless connectivity. The first PC laptop with Wi-Fi (via the PCI bus!) was introduced in 1999, and Microsoft included secure Wi-Fi support in Windows XP, originally released in 2001, driving Wi-Fi support around the world. These efforts across the industry drove down connectivity costs, drove up coverage and unlocked a digital transformation of its own.

What are the factors that make this new cellular disruption a reality? Cellular costs are dropping rapidly (13 percent in the U.S. alone last year<sup>2</sup>) across geographies as more efficient LTE-Advanced that aggregates licensed and unlicensed spectrum to increase throughput and capacity, as well as competitive data plans are rolling out; coverage of 4G is almost at 98 percent<sup>3</sup> in many developed markets with expanding capacity; and with Gigabit LTE, we're now reaching speeds above 500 Mbps.

Combine that with innovations like SD-WAN, a robust enterprise-grade cloud infrastructure, and innovative Always Connected PCs with beyond all-day battery life and easy activation using eSIM, and we're ready to leverage hundreds of billions of dollars invested in cellular networks we use every day to transform our modern workplaces and drive down our wired infrastructure costs. Let's examine these factors in more detail.

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<sup>1</sup> <https://betanews.com/2017/11/09/enterprise-workloads-cloud-3/>

<sup>2</sup> U.S. Labor Department data, March 2017

<sup>3</sup> Per GSMA, 2017

# Cellular Networks on the Rise

As smartphone users, on track to hit 6.1 billion by 2020<sup>4</sup>, we are all experiencing dramatic increases in network speeds — moving from single Mbps only recently to Gigabit LTE<sup>5</sup> this year, which is providing downlink speeds north of 500 Mbps in 41 mobile operator networks worldwide and growing. These speeds usher in a new level of performance that businesses require. Gigabit LTE provides higher capacities than previous generations (LTE-A<sup>6</sup> but not Gigabit), which means better coverage and less congestion and faster downloads<sup>7</sup>.

In 2019, networks with 5G capabilities will begin to appear — offering multiples in throughput and extraordinary reductions in latency due to technologies like MIMO (multiple input, multiple output), which dynamically transmits data as highly focused beams to simultaneously send and receive multiple data signals over the same radio channel, enabling multiple users to utilize the same time and frequency resources.

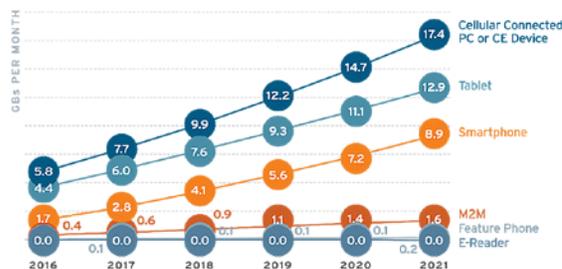
4G coverage has dramatically increased, with north of 80 percent population coverage across all developed economy markets<sup>8</sup>, hitting north of 98 percent in North America<sup>9</sup>. LTE and 5G technologies in higher spectrum frequencies help drive coverage in urban areas and throughout buildings. And, the advent of mmWave cells (essentially small repeaters that could also house edge computing capabilities) using 5G technology will dramatically expand coverage as needed, as well as provide indoor location capabilities nearing 1 cm of accuracy — an incredible improvement of accuracy, especially for factory floor autonomous vehicles, never mind for finding the nearest available conference room.

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## Growing Usage of Always Connected PCs<sup>10</sup>

### Average Monthly Cellular Data Usage Will Exceed 6.5GB per device by 2021

451 RESEARCH'S MARKET MONITOR AND FORECAST: GLOBAL MOBILE DATA TRAFFIC, Q1 2017



<sup>4</sup>Ericsson Mobility Report  
<sup>5</sup>Also referred to as Cat-16  
<sup>6</sup>Also referred to as Cat-12  
<sup>7</sup>SIGNALS Research Group

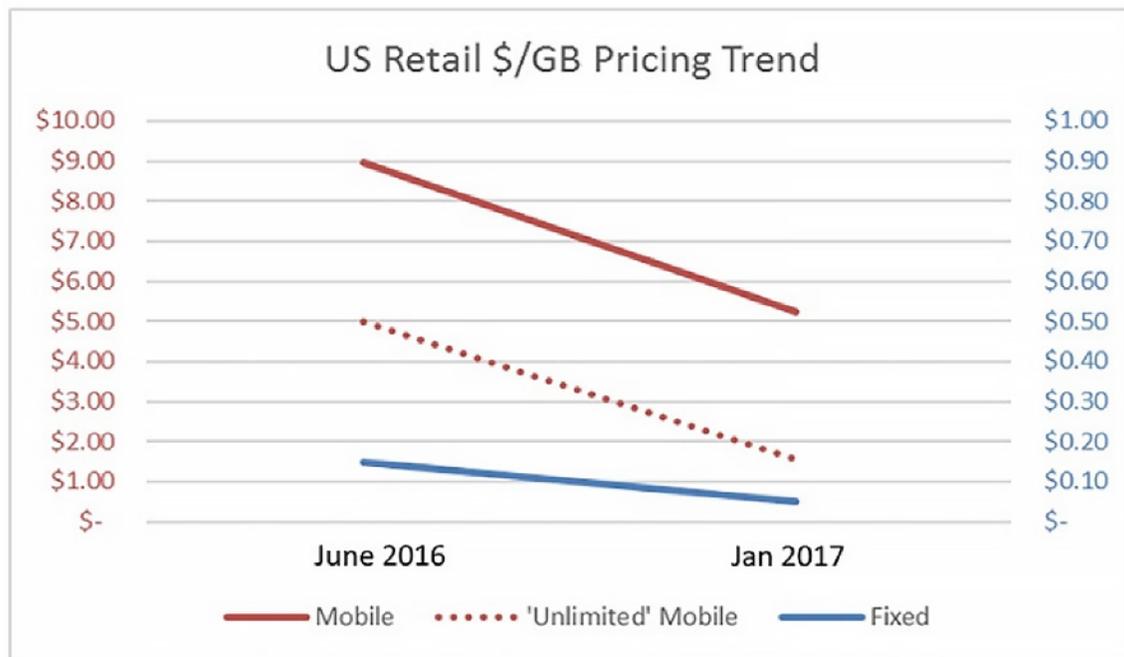
<sup>8</sup>GSMA data  
<sup>9</sup>GSMA data  
<sup>10</sup><https://451research.com/blog/1662-featured-data-1>

# Cellular Cost Are Plummeting

Fundamental to this shift to cellular is cost. Consumers and businesses are benefiting from a dramatic decrease in the cost per subscriber due to new rollouts of LTE-A and other network technologies and increasing competition across the globe. Overall, cellular data prices are down 13 percent from this time last year in North America<sup>11</sup>. Mobile operators are also clamoring to roll out new plans to support an ever-increasing cellular data appetite. Three in the U.K. recently introduced a 100GB plan for 25 pounds per month.

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## Costs per GB Dropping<sup>12</sup>



Notes: Mobile retail pricings based on 4-line family plans. Verizon's "plus 2GB per line" promotion included in data allowance calculation. Sprint's temporary "3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> line free" promotion excluded. T-Mobile's and Sprint's "unlimited" plans capped at 28GB/mo and 23GB/mo respectively per plan footnotes. Fixed retail pricing based on Internet standalone pricing with 1TB monthly cap allowance.

We expect to see even more innovative business models from these partners to address the opportunity of a cellular-first business network, potentially providing a lower cost structure for data that does not pass through the cellular network core, or stays within the corporate network.

<sup>11</sup> U.S. Labor Department data

<sup>12</sup> <http://www.fiercewireless.com/wireless/mun-it-looks-like-unlimited-data-here-to-stay>

# Wi-Fi Evolution

Wi-Fi was a major advance for business connectivity when it was first deployed at the turn of the century. Its proliferation was fueled by its clear mobility benefits over wired Ethernet — the flexibility to be connected virtually anywhere inside, eliminating the need for hard-wired ports in conference rooms with a race to grab the Ethernet cable. Enterprise access points proliferated, albeit at high prices, coupled with standardized support in Windows XP SP2<sup>13</sup>. This collaboration drove exponential growth, which drove prices down into the consumer realm. When data rates were low and the modulation and coding schemes were simple, Wi-Fi networks were quite tolerant to errors in deployment and issues in the environment.

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Wi-Fi isn't standing still and remains a cornerstone of connectivity for businesses and consumers globally. A feature called Wi-Fi Passpoint enables devices to seamlessly hand over wireless data between wireless network infrastructure, roam between networks – including those owned by different service providers. Agile Multiband improves resource management across available frequency bands to deliver an optimized spectrum environment, and the new 802.11ax HEW (High Efficiency Wireless) standard will deliver up to 10 Gbps speeds. Where Wi-Fi used to be about managing single access points, today's Wi-Fi supports complex mesh configurations with band steering, and seamless handoff across networks with state-of-the-art security. And, of course, advances in antenna technology like beamforming and MIMO apply to Wi-Fi, too.

We all want to get and stay connected as fast and as easily as possible. Yet, the fact remains that deploying and managing enterprise-quality networks is increasingly complex — especially when balancing coverage and capacity needs, which requires intelligence in spectrum reuse and increasingly dense networks.

While many enterprises currently prefer to own and operate their own corporate infrastructure, others turn to commercial telecommunications providers and major carriers and outsource their needs for enterprise-grade WiFi. An emerging path for these enterprises is to turn to commercial LTE providers and leverage the commercial LTE infrastructure in addition to or instead of WiFi, and some are choosing to install private LTE networks. Although Wi-Fi can provide great convenience at the local coffee shop and in hotels (albeit at painfully slow speeds), there is the concern of business PCs connected to public Wi-Fi, leaving them potentially vulnerable to intrusion and compromise. That concern can be mitigated by the use of VPN configurations by network admins, but there will still be businesses that simply have not set up the right protections for their employees in this scenario.

For example, banking and other organizations that need enhanced secure connectivity are installing LTE as the primary source of connectivity for their employees — and CSOs are looking at new ways to increase security and save additional money.

Whether the network is owned and self-managed or outsourced, meeting enterprise' needs for ubiquitous connectivity requires a number of wireless solutions and a new generation of LTE, and ultimately 5G, will be an important part of their strategy.

<sup>13</sup> Windows XP Service Pack 2 (SP2) was released on Aug. 25, 2004. SP2 added new functionality to Windows XP, such as WPA encryption compatibility and improved Wi-Fi support (with a wizard utility).

# The Industry Is Ready

Mobile operators are recognizing the enterprise opportunity. In 2016 the expected focus for 5G was predominantly consumers, but as of 2017 there has been a shift to an even distribution of focus on consumer as well as on enterprise and specialized industry segments like media and entertainment, automotive transport, healthcare, and energy<sup>14</sup>.

## Explosive Mobile Broadband Growth

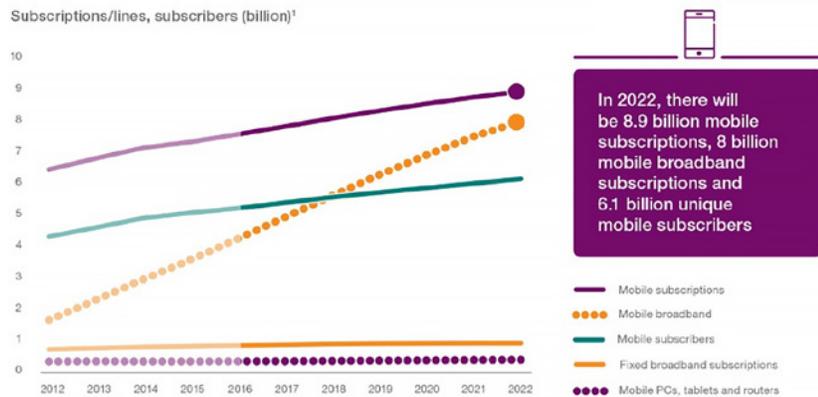


Figure 1 Ericsson Mobility Report, 2017

In addition to the ever-increasing capability (and screen size) of smartphones, we're seeing dramatic new interest in LTE-connected compute devices like the Always Connected PCs. They provide weeks of standby time and beyond all-day battery life in form factors that are sub 7 mm and extremely light for one-handed use, yet also provide the Windows 10 capabilities that users know and love. OEMs across the geographic, price and design ranges have a rich pipeline of devices that will begin to hit the shelves in early 2018, and we're grateful for the innovation of our OEM and silicon partners to help make this a reality.

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<sup>14</sup> Ericsson's 5G readiness survey published in September 2017

# Beyond Always Connected PCs to Cellular IOT

Business already requires high degrees of mobility and connectivity to be productive. Productivity solutions like Office, team solutions, CRM, LOB apps, and Azure-based real-time data analytics from IOT objects and big data all require constant cloud connections to stay current and be truly collaborative. Mission-critical data and factory floor automation require low latency and high security connectivity. Businesses are worldwide, real time, on the move and where the customers are. Ubiquitous connectivity and outstanding battery life for devices are key requirements to be competitive.

Cellular networks for businesses can extend all the way out to drones that are flying remote inspections with high-definition video feeds to autonomous vehicles that are speeding through distribution centers or across the tarmac at an airport. Cellular networks in business have the potential to unlock new transformations required to stay competitive.

Shifting the network strategy to cellular also enables low-cost and remote sensors to use NB-IoT<sup>15</sup> and other low-speed, super-high-efficiency protocols to stay connected 24/7 on a secure enterprise network — an NB-IoT<sup>15</sup> implementation in the field can stay operational with two AA batteries for nearly 10 years<sup>16</sup>. QoS capabilities on cellular networks can enable everything from high-speed transfer of jet engine diagnostics, which could be close to a TB of data, all the way to agricultural sensors that remain in the field for years, sending bytes of data daily.

In a 5G world, the sub-1ms latency and mmWave small cells could provide indoor location capabilities within 1 cm, ideal for those autonomous vehicles and robots moving at high speed. 5G mm Wave would also help avoid RF conflicts in industrial environments. All of these devices can be managed, and their data harvested, on a single secure network using cellular-first capabilities, in concert with more traditional PCs — further reducing costs and opening up new agile scenarios for businesses.

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<sup>15</sup> NarrowBand IoT (NB-IoT) is a Low Power Wide Area Network radio technology standard that has been developed to enable a wide range of devices and services to be connected using cellular telecommunications bands.

<sup>16</sup> Qualcomm

# Private Cellular Networks

An interesting new area of work is the advent of private cellular networks, where a large enterprise can deploy its own cell network using Citizens Broadband Radio Service (CBRS) or open access spectrum. This network is fully within the control of the enterprise and therefore is operated without any explicit cost per Gigabyte. The network is self-configuring and provides complete control over QoS and other capabilities, while keeping all the connecting devices on an existing enterprise deployment model — no SIMs. This type of network could be ideal for airports, transportation ports, hospitals, oil and gas refineries, major manufacturers, and any business with significant geographic coverage and requirements for a completely agile and high-performance network.

## Private Cellular Network

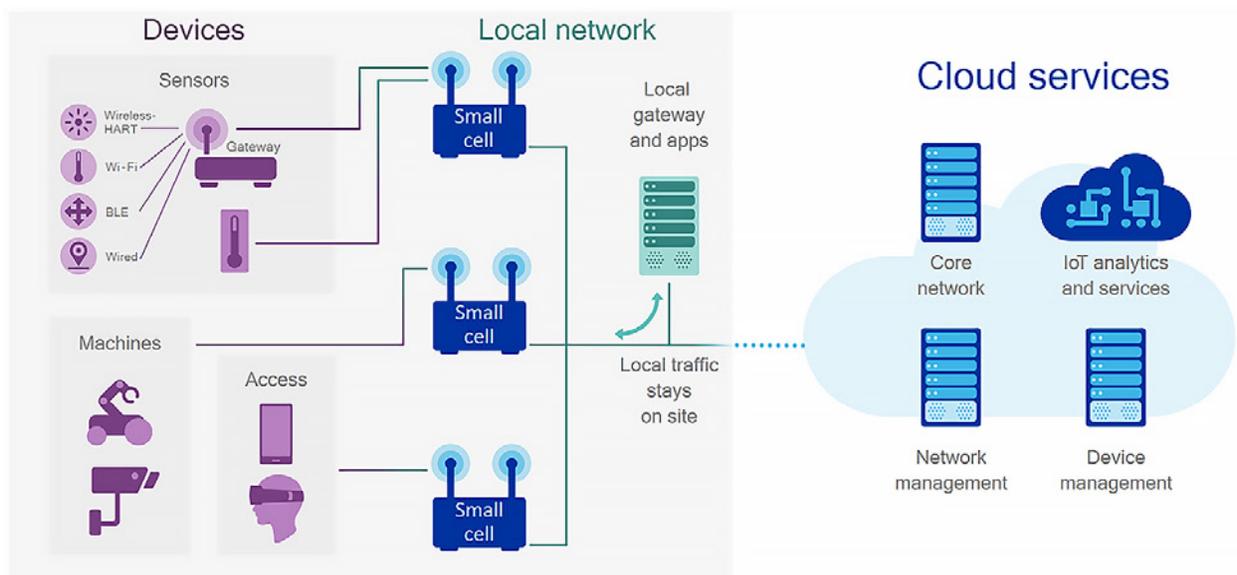


Figure 2 source: Qualcomm

# Moving the Modern Workplace Forward

As we see transformative investments in network technologies happening now and over the next five years, we also now see a disruptive opportunity for modern workplaces to have all their productivity devices include LTE as their primary connectivity network, along with WiFi and new 5G capabilities.

Like the Wi-Fi revolution at the turn of the century that Microsoft helped foster, with support for Wi-Fi in Windows and a portfolio of PCs from partners with Wi-Fi built-in, we expect this transformation of the modern workplace with cellular capabilities to take time, but to rapidly expand as the value proposition lands at businesses around the world.

All the technology and economic trends we're seeing from our partners point to one conclusion — we are on the road to an always connected modern workplace that can reap material cost savings while transforming its capabilities. Our numerous partners are critical in this journey — in the silicon ecosystem, PC OEMs, mobile operators, network technology providers and ISVs — to establish a new “always connected” approach to business.

We'll transform business, learn new things, and bring energy and creativity to the opportunity. I look forward to you joining us.

