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Wireless networks have changed the way we interact with the world around us. They have brought us high-resolution video, rapid communications, and the advent of the app economy. That app economy is currently valued at $950.6 billion and employs 4.7 million Americans. We have become accustomed to having instant access to the world's collected information from anywhere at any time. In fewer than 10 years, we have remote control over items in distant locations and more efficient delivery of physical objects and services.

The innovation brought about by apps started with smartphones, but the idea and implementation of cloud-plus-mobile is changing the entire networked economy. Today, you have likely already taken advantage of this interconnectivity – you may have checked work emails, ordered your coffee, tracked your bus, requested time off for a doctor's appointment, and Slacked your co-workers to let them know to avoid a road or subway closure – all before getting to your desk. In fact, some of you may not even have a desk and work completely remotely. The next phase of applications-as-software using virtualization and software integration into businesses and industry platforms via mobile is near. The combination of network infrastructure changes and new applications is the key to success for the fifth-generation new mobile infrastructure known as "5G."

Connecting a New Network

One key aspect that differentiates 5G from our current environment is the concept of 5G as a "network of networks." It employs sophisticated network management to more efficiently transmit a high volume of data using different bands of spectrum utilizing new software and devices. 5G is leveraging network virtualization, software defined networking, network slicing, and cloud-based radio networks to update and innovate faster than traditional networks.
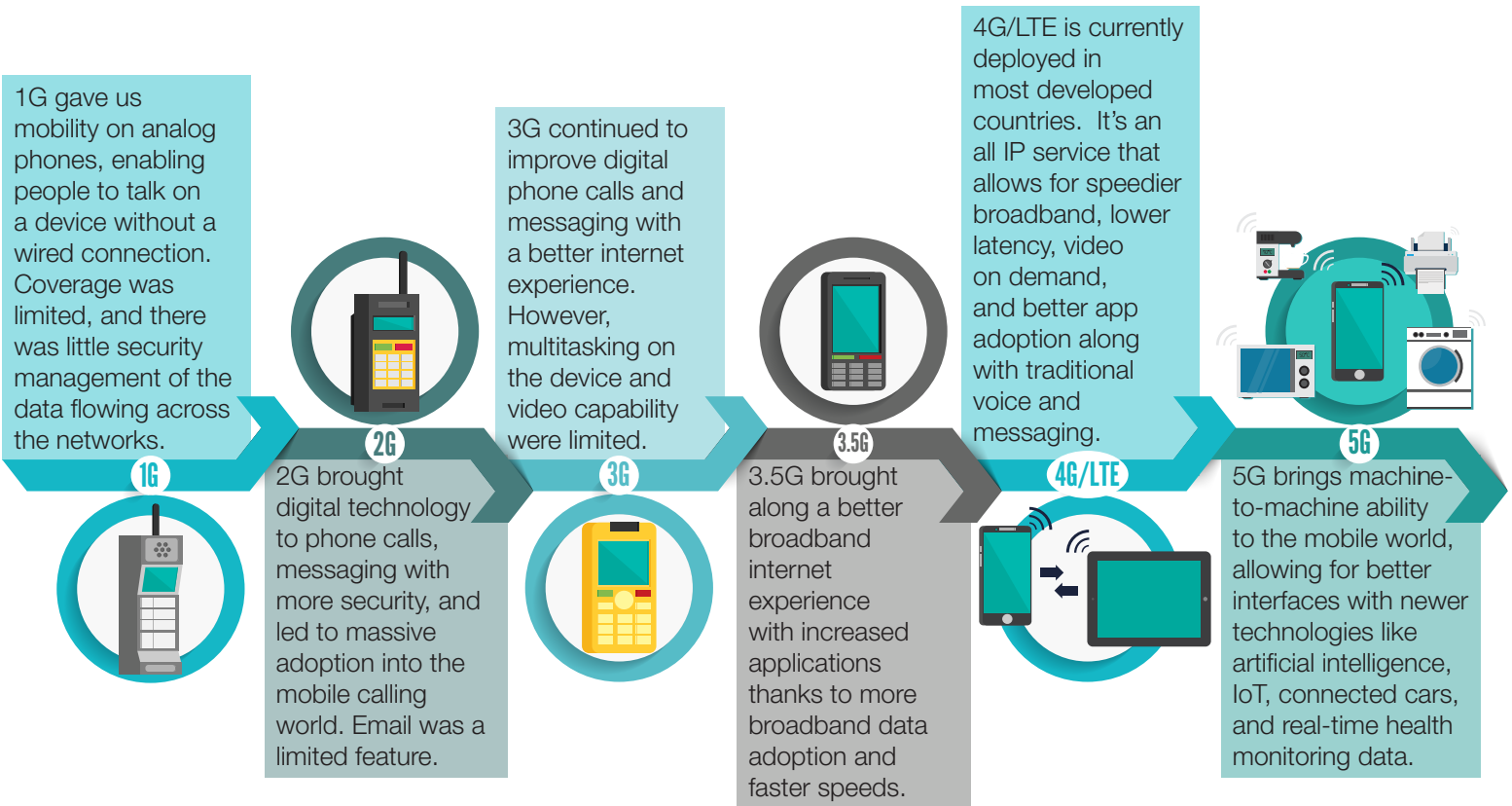
One of the hardware changes in 5G is reliance on "small cell" technology, or low powered radio access networks. Small cells have a shorter range, but they can increase quality and strength of connections within a short distance and can effectively utilize cellular network capacity more efficiently while extending service coverage and allowing more data to be sent through the network. These small cells are used in concert with macro-cells and large cell towers to take advantage of spectrum frequencies that older technologies cannot.

But small cells, without sophisticated network management practices, cannot solve the burgeoning need for high speed and low latency. At a high level, internet service providers or wireless carriers use network slicing to partition a single physical network into multiple virtual networks. This capability ensures that service providers can decrease interference from current and new internet of things (IoT) services. This function is essential to transmit the extraordinarily high volume of data that would ordinarily inundate a single network.

While 4G/LTE helped make the internet more accessible on mobile devices, 5G will offer ultra-low latency to its users that will give mobile infrastructure the reliability needed for the applications that depend on the integrity of the network. These enhancements can provide a highly tailored service to meet specific customer need. Automating workflows with data-rich applications delivered on a high-quality connection allows for faster data transfer and information sharing between workers who may be at a virtual desk, at a medical clinic, in an IoT-enabled warehouse, or with a customer in the store.

5G will enable professional and industrial applications to customize network services with a better cost structure due to virtualization of network applications, faster data transfer, and low-latency connectivity. Massive machine communications will take advantage of these network enhancements and allow for better asset tracking, smart agriculture applications, smart cities with better infrastructure monitoring, and IoT deployment.

The Generations of Wireless Mobile Technology

1G gave us mobility on analog phones, enabling people to talk on a device without a wired connection. Coverage was limited, and there was little security management of the data flowing across the networks.

1G

2G

2G brought digital technology to phone calls, messaging with more security, and led to massive adoption into the mobile calling world. Email was a limited feature.

3G continued to improve digital phone calls and messaging with a better internet experience. However, multitasking on the device and video capability were limited.

3G

3.5G

3.5G brought along a better broadband internet experience with increased applications thanks to more broadband data adoption and faster speeds.

4G/LTE is currently deployed in most developed countries. It's an all IP service that allows for speedier broadband, lower latency, video on demand, and better app adoption along with traditional voice and messaging.

4G/LTE

5G

5G brings machine-to-machine ability to the mobile world, allowing for better interfaces with newer technologies like artificial intelligence, IoT, connected cars, and real-time health monitoring data.

Manufacturing in the Cloud

To date, most of the conversations around 5G focus on consumer use, but small businesses will be the direct beneficiaries of many of these enhanced scalable network improvements. With the marriage of low latency, high bandwidth internet, plus the ubiquity of information available in the cloud, small businesses are perfectly positioned to take full advantage of 5G deployment. 5G will help with data and device density by creating more efficient ways to manage the information flow brought on by IoT connections.

Even simple tasks like inventory control, transaction records, and client information can be more efficiently managed with cloud-plus-mobile technology. For example, software-based companies, like SwissLog, have already started enhancing their processes to be mobile enabled. Swisslog's SmartLIFT technology creates an indoor, localized GPS network to aggregate data from sensors on forklifts and directional barcodes placed around the warehouse. Managers can access analytics through their tablets or mobile phones to optimize productivity and receive real-time inventory reports.

Your Office in the Cloud

Virtual workspaces enabled by 5G allow for small businesses to have a new level of scalability. Business owners can recruit talent from anywhere, work with clients in multiple time zones, and across national borders. Today many small businesses are forgoing traditional office spaces to lower costs and invest capital in other areas. Thanks to cloud-plus-mobile, small businesses have full access to all the tools needed to carry out business functions. For example, a small business in Los Angeles takes multiple sets of real estate data to create 3D visualizations to give residential and commercial developers a more accurate picture of local markets. To do this well requires enormous power in the cloud and fast, low latency connectivity to the 3D device.

5G also lays the groundwork for the potential use of mid-band spectrum to lower the cost of broadband for businesses with physical offices. With the use of small cells and the 3.5 GHz band, small businesses that operate in areas with limited access to fiber optic-enabled broadband can elect for more optimal internet speeds using new wireless services. With this cost-effective wireless solution available companies do not have to expend a large amount of capital to bring fiber all the way to their building. Businesses could leverage this spectrum band for fast and wireless broadband so that they can conduct their day-to-day tasks at a much lower cost just by purchasing and managing a router tuned to that frequency.

For example, Birmingham-based MotionMobs is in an office building equipped with just DSL broadband. For a vibrant mobile applications development shop actively managing both local and remote employees, DSL simply doesn't get it done. The company had to contact its local ISP to pull a new underground line to its office at the enormous cost of almost $200,000. 5G will allow MotionMobs to grow and support the company's basic operations (e.g., data storage, multiple coders working on projects on the network, etc.). MotionMobs' staff of 18 work on far more than simple consumer-focused applications; a primary driver is now intra-company and B2B mobile applications. MotionMobs, and other similarly-situated companies, need high-speed internet everywhere their customers are if they want to grow.

Healthcare in the Cloud

Using connected care in clinics and hospitals gives caregivers and their patients the ability to share data from remote monitors and wearable technology. Lower latency will enable remote patient monitoring and numerous telehealth applications that depend on precise timing and telemetry. Last week, Apple announced a new watch with ECG technology built directly into the back and bezel and the ability to alert an emergency contact to a dangerous fall. Yet without a reliable network, great software won't be able to provide that information to the right place at the right time.

Beyond instantaneous communication, the ability to collect and analyze large datasets could enable early detection of a life-threatening health condition through real time monitoring coupled with data analytics. If that data contains significant HD imagery or video, high-bandwidth can make the difference between delivery of the information over wireless communication or via a USB thumb-drive. Finally, 60 percent of American adults have at least one chronic condition and 42 percent have more than one, which accounts for 71 percent of the total healthcare spending in the United States according to the Centers for Disease Control. The use of telemedicine to manage chronic disease symptoms with wearable devices will be entirely dependent on a mobile network that can support the technology.

Other life-saving applications, like RapidSOS, allow mobile phones to share location data sent from an emergency situation to first responders. Once the responders are present, they can send real-time medical information to an emergency room. The ability to have immediate and consistent information during an emergency, including an uplink connection to video and data feeds, can mean the difference between life and death in an emergency situation.

5G Provides a Competitive Advantage for Business

5G promises to bring innovation and job creation right to Main Street. Many local governments understand they must change rules governing broadband deployment to eliminate regulations that slow the adoption of new technology in their community.

Unfortunately, local governments have outdated laws or regulations on the books that put 5G small cell antennas in the same class as multi-story macro-cell towers. For example, Lincoln, Nebraska, continues to hold back on siting small cell towers, causing businesses to reassess Lincoln as a headquarters town. Meanwhile, cities like Indianapolis, Charlotte, Oklahoma City, Raleigh, and Waco are investing in the foundation for 5G networks to be available to both large and small businesses. We know that network connectivity is a game-changer for keeping businesses local. In today's app marketplace, 83 percent of the top 500 apps are made by companies outside Silicon Valley. 5G's technical improvements are likely to continue the trend of businesses developing software locally and deploying globally. Moreover, 5G can provide local communities the economy of scale that will allow a small business to use the same underlying network infrastructure used by many larger institutions, without the expense of a significant network investment.

Regulatory changes do not mean subsidizing the build-out of infrastructure by the local governments; instead, this will ensure the cost associated with reviewing small cell deployment plans are proportionate to the cost local governments incur for their time spent towards the review. If a local government slows down 5G deployment with excessive regulatory fees, it will be at the cost of the local businesses and the citizens who will miss the opportunities for growth due to insistence on regulatory red tape.

5G technology can attract investments that improve the local economy and potentially make the local government more efficient at delivering its own services to the community. Once it's deployed in local regions, 5G broadband can bring communities new business prospects, enhance their educational opportunities, and create better communications with faster speeds, lower latency, and higher capacity. The average download speed in the United States is 6.5 megabytes per second. 5G is expected to deliver up to 500 megabytes per second, giving it exceptionally enhanced transfer and download capabilities. An estimated $275 billion in infrastructure investment by mobile providers will bring these speeds to new areas, provided the local government shows an interest in bringing new technology to their community.

Conclusion

Mobile networks continue to transform our society. 5G will enable advanced network applications to be available to citizens and businesses with new mobile performance speeds and capabilities that should encourage local government officials to welcome 5G to their communities as quickly as it can be deployed. To make faster, more responsive, more pervasive network capabilities a reality we need to have a collaborative effort that engages all government officials. Local, state, and federal governments should allow the innovation possible by 5G infrastructure to become a reality for both businesses and consumers in the very near future.

To help state and local governments understand how to realize the benefits of 5G, ACT | The App Association has undertaken an economic study for release in 2019 that shows the impact of 5G beyond merely consumer benefits. More specifically, the study will look at job creation numbers from increased bandwidth and lower latency that would occur under 5G. For example, the App Association will explore the types of business or job-creating services, including business-to-business and machine-to-machine communication, that would be possible with increased bandwidth and low latency capabilities, as well as key economic development metrics at the state and local levels.