Next-Gen Infrastructure: Becoming 5G-Ready

By: Andy Penley

5G, the fifth generation of mobile network standards, will deliver multi-gigabit speeds, increased availability, greater reliability and massive network capacity. Once achieved, this will make everything from critical communications between first responders to video streaming and gaming better, faster and more accessible. With such transformative opportunities on the horizon, the race to ensure the widespread rollout of 5G is on.

Still, there is a lot of progress that needs to be made in the way of underlying infrastructure to support 5G technology. The new era of networking requires a fundamentally different type of network infrastructure, and revolutionizing yesterday's architectures demands a lot of cooperative work. As these foundations develop to support the 5G future, it's important that all parties—infrastructure providers, communities, citizens, policymakers and more—understand what it will take to make the next generation a reality.

Particularly when it comes to increasing the number of existing network antenna locations for 5G access, commonly referred to as mobile densification, ensuring that all parties understand the infrastructure rollout process and its implications for communities is crucial for streamlining deployments. The 5G buildout and the innovative future it supports will improve the lives of individuals, communities and economies everywhere, enabling access to life-changing capabilities, so education on the hurdles and how we evolve cooperatively is key.

The 5G basics

5G is a new global wireless standard, the latest in the line of succession that began with 1G and, until now, ended at 4G. At its core, 5G is meant to connect everything everywhere in a way that

empowers innovation and improves nearly all facets of day-to-day life. It is also a critical step for ensuring we can keep up with the expanding data demands that are being driven by rapid digitization. In fact, statistics currently predict that the total amount of data created, captured, copied and consumed globally will reach 149 zettabytes in 2024. To put this amount into a non-networking perspective, one Cisco analyst noted that if each terabyte in a zettabyte were a kilometer, one zettabyte would be equivalent to 1,300 trips to the moon and back again.

Now that we're firmly in the Zettabyte Era, we need infrastructure that can keep pace—this is why Gartner forecasted that worldwide 5G network infrastructure market revenue would almost double in 2020, reaching $8.1 billion. With this new generation, devices and locations can be thoroughly connected so that the massive amounts of data that run through and between them can move faster and at higher volumes. This is the data transport and processing foundation that will enable driverless cars, smart cities and beyond—but more than that, it will enable applications that make individual lives easier, safer and perhaps even more enjoyable.

The promise of the new standard

Emergency response, healthcare, education, farming and many other crucial industries will benefit from 5G's capabilities. For example, first responders will benefit from faster speeds and greater capacity that enable firefighters to save more lives through the use of smart building floor plans that offer insights such as real-time room temperature readings. Rescue workers will be able to access real-time video footage from aerial and remote locations during a natural disaster to help them target their response. With faster information access comes the ability to complete life-saving tasks more efficiently.

Meanwhile, teachers and students across the world will be able to more effectively continue education beyond the classroom, leveraging more interactive platforms and greater access to global online resources, including other top worldwide educators. Similarly, healthcare workers will be able to better support patients with the ability to easily communicate with the world's best surgeons and specialists without having to travel. Furthermore, smart health wearables will monitor crucial patient vitals and provide ongoing updates to primary care providers, helping telehealth achieve an unprecedented level of effectiveness and accessibility. The same high-capacity fiber networks that enable these assorted capabilities will also be leveraged to provide better broadband services to more enterprise businesses and homes, allowing service to better align with work-from-home demands and even entertainment needs.

In short, 5G lowers the cost of access and barrier to entry for essential, or even just life-enhancing, services that may only currently be available to those who have the means to meet them where they currently exist. 5G removes roadblocks that keep many individuals and communities from achieving the quality of life and operations that today only some can take advantage of—and the opportunities are limitless.

Still, 5G's benefits go beyond individual industries to create a comprehensive and beneficial impact on worldwide economics. Qualcomm, a global leader in wireless technology, predicts that 5G will create a global sales enablement growth trajectory of around $13.1 trillion by 2035. It

also predicts that 5G-enabled job growth will reach 22.8 million over the next 15 years and drive global GDP growth by 10.8 percent—$265 billion annually over the same 15-year period.

Realizing the potential

To achieve these results, the underlying infrastructure and the networks that have supported data and applications for years are now undergoing a fundamental shift. Networks of the past were built to solve a sparse networking problem, and now they must solve the challenge of supplying mobile capabilities with equal parts robust capacity and high accessibility. This means completing massive build-outs of wireless nodes and antennas.

In the past, a limited number of macro base stations was suitable. However, as data now needs to be able to reach more destinations and coverage needs to become more comprehensive, C-RAN architecture—defined by a centralized or cloud-computing-based radio access network (RAN) architecture—is paramount. This requires dividing large macro sites into a highly dense fabric of small cells, antennas and edge colocation points. These nodes will be needed everywhere: there will likely be one on every street corner, every manhole, every piece of street furniture and every utility pole available. This densification ensures access to additional spectrum through the deployment of small, low-powered cell sites connected to local network hubs with fiber-optic cables.

Of course, it's natural to wonder how this future of networking will impact local communities. However, with the many opportunities 5G brings, it's important to note that this process of densification should be celebrated for what it will deliver while creating relatively minimal interference for citizens and municipalities.

What local communities should know

Small cells are not a novel development. In fact, hundreds of thousands of them had already been deployed by 2017. Nevertheless, as the number of these wireless sites grows, it's understandable that the ideas of aesthetics, construction processes and other impacts will come into question.

It's important to note that these sites are compact, safe and very low-energy. Independent field studies have measured the electromagnetic emissions from a 20-watt small cell transmitting from 9.5 feet above the ground at 2.5 GHz; this is what T-Mobile has announced it is using for its 5G service. The measured power level was well below the Federal Communications Commission's limit for public exposure, clocking in at just 00.017 percent of that limit. It's true that the additional spectrum used for 5G will be at a higher frequency than what was previously utilized, but since it is transmitted at low power levels, the spectrum will not travel as far nor be able to penetrate as strongly as the traditional lower bands. This is why it must be deployed so densely, and it's also why it should be of no additional concern for communities or individuals.

Radio-frequency utilization is tightly regulated by the FCC, and the limits the agency sets are based on thousands of peer-reviewed studies conducted over the past century by numerous

independent scientific organizations. The limits in place today have been studied since their implementation in 1996 and were reaffirmed on a unanimous, bipartisan basis in 2019. 5G's goal is to ultimately make the world safer and more easily navigable for all, and deployment (despite its necessary density) will continue to remain in line with that commitment.

Facilitating cooperative progress

While infrastructure providers, mobile network operators and others continue to work with municipalities and prioritize their understanding of 5G and its development, there are some ways that municipalities can help reach true rollout more efficiently on behalf of their constituents. By seeking out information about 5G and becoming more knowledgeable about why it's crucial, public utilities, policymakers, government entities and citizens better understand how to pave the way for progress. This understanding leads the way for new approval procedures, eases the acquisition of municipal rights-of-way for new deployments and even helps homogenize these procedures across different areas—all of which are currently challenges that are slowing densification. With knowledge comes comfort, and with comfort comes progress.

We've made great collective strides toward the 5G future, but there is still a lot of work to be done before we can achieve 5G's full potential and unlock its benefits. Much of the U.S. is still a "Wild West" for wireless, and complications still pervade the infrastructure sphere. Information-sharing remains key for generating a mutual understanding that all can build from and ultimately thrive on.

If wireless densification is the foundation of next-generation healthcare, business, education and more, then collective trust and knowledge is the foundation for that densification, and it must be prioritized. Change at scale may not be easy, but in the case of 5G and the bright future it brings for everyone in all walks of life, it's more than worth it.