

The Future of Public Safety with 5G

Understanding the impact of the new generation of cellular technology in public safety



5G

Executive Summary

How will 5th generation cellular networks impact tablet use in public safety?

Today, mobility is a cornerstone technology throughout public safety organizations. Connected mobile devices such as rugged tablets help frontline workers undertake mobile working safely and securely, as they can execute tasks out in the field faster and with greater accuracy. Police officers complete reports more efficiently. Paramedics can provide patients with tailored care. Firefighters can coordinate with increased safety. 5G promises to be the enabling technology for first responders to help them better protect and serve their communities.

At the heart of every one of those mobility solutions is a cellular network, the key enabler that carries the steady flow of information to and from the mobile devices that drive public safety processes. But cellular networks are evolving, and the pace of evolution is increasing: 4G is evolving into 5G.

As a public safety organization, you have likely started discussions about how the next generation of cellular networks can impact your current mobility solutions, your near-term mobility plans, and your overall mobility strategy. Do you need to start replacing infrastructure and devices now?

How will your organization benefit from 5th generation cellular technology? And when is the right time to build migration into your mobility plans? The following overview of 5G and our initial recommendations can help you determine where and how this technology fits best in your organization—and when you should begin deployment.

5G is here. It's everywhere you look—whether you're on the internet, watching TV, reading newspapers or driving past a billboard. The promise of 5G speeds is driving consumers to buy 5G phones by the droves, making 5G the fastest growing mobile technology in history. In just one year (Q3 2019 to Q3 2020), there were 225 million new 5G subscribers. By comparison, it took four years for 4G LTE to build that size of a subscriber base¹. The meteoric rise continues—there were 660 million 5G subscribers by the end of 2021. And in 2027, the number of worldwide 5G subscribers is predicted to hit 4.4 billion, representing an impressive 37% annual growth rate over 6 years, at which point it will be the dominant mobile access technology by subscriptions².

So, what's driving the 5G frenzy?

5G benefits everyone—service providers and end users. Carriers and service providers benefit from increased device sales, more efficient infrastructure, and new business models, driving incremental revenues and reducing costs. Service providers continue to switch on 5G and more than 180 have launched commercial 5G services globally. Both organizations and consumers benefit from new use cases, higher speeds and more reliable lower latency performance. Consumers are embracing it as 5G smartphones are less expensive than expected, which drives the conversion from 4G to 5G, in much the same way as they drove the return on investment of prior generations of cellular network technologies. However, wider organization adoption of 5G will help speed up the development and availability of 5G-enabled devices—and the maturity of 5G enterprise solutions.

The many benefits of 5G in public safety

While consumers will benefit from 5G's additional speed, the many benefits of 5G in the public safety space will help improve existing applications and drive the deployment of new applications.

Wired speeds—up to 10 Gbps

With up to 10 Gbps, 5G will deliver speeds equivalent to wired internet—10 to 100 times faster than 4G LTE.

Low latency

Discussions of 5G benefits almost always include its speed and low latency. What exactly is latency? Latency is the time it takes for information to travel from the mobile device to the server and back. To understand the impact of low latency, let's look at an example. If you're driving a car at 60 mph (95 kmh), it will take a human 250 milliseconds (ms) to react to a situation that requires braking. In that timeframe, the car will travel about 100 feet. If you were able to react in 1 ms, the car would only have moved forward a little more than an inch.

When it comes to latency, just how low can 5G go? The 5G specification calls for a maximum of 4 ms latency, and 1 ms for ultra-reliable low latency applications. While the evolution to those speeds will take some time, once they arrive, they will help pave the way for real-time applications, such as autonomous emergency response vehicles.

90% reduction in total energy requirements³

From an energy requirements perspective, 5G is a green technology that is actually good for the planet. While it will connect more higher speed devices, it will not require more energy to do so. Studies show that under certain conditions, the complete 5G ecosystem—including infrastructure, base stations and mobile devices—has the potential to reduce

overall energy consumption per unit of traffic by up to 90%.³ And low power 5G IoT modes enable the batteries in IoT devices to last up to 10 years,⁴ paving the way for sensor applications that weren't feasible before due to the time and cost for frequent and regular battery changes. As an example, automated electric response vehicle proposals have relied on a combustion generator positioned in the roof or rear of the vehicle that is turned on at the scene to meet additional energy needs. The vehicle's core electric chassis can support the to and from journey, but not the additional burden of on-site operation. 5G has the potential to alleviate the cost of extra generators, because it supports more, with much less power consumption.

1000x bandwidth per unit area⁵

5G's major increase in bandwidth provides support for 100 times the number of devices that 4G LTE could support. 5G supports one million devices for every square kilometer (.386 square miles) vs. 100,000 for 4G LTE, paving the way to a world where everything is always connected, all the time.

Improves signal quality and strength

Massive MIMO (Multiple Input-Multiple Output) in the Sub-6GHz range enables more simultaneous connections, which is ideal in densely populated areas. Using massive MIMO, multiple users can communicate simultaneously at the same time and using the same frequency, reducing latency and increasing system capacity. This would help first responders operating in a densely populated city stay connected to critical information, people and other public safety officials without interruption or signal loss.

5G enterprise applications

5G's increased uptime, lower latency and greater bandwidth will help to improve all the mobility applications in use today by improving application performance. But those same attributes also pave the way for a new family of applications in public safety, including:

Situational Awareness

5G can enable first responders to tap into a wealth of information in the systems in a smart home. Police, firefighters and paramedics could use a 5G-enabled tablet to access the real-time feed from security cameras to obtain a new level of situational intelligence. This information could help firefighters identify hotspots before they enter a burning home. In addition, a caller could send live video to a dispatcher or even first responder enabling a faster and better response. And 5G's network slicing can enable the dynamic creation of a virtual network to prioritize crucial data during a response, such as tracking the vitals and location of first responders and instantly seeing building plans.

Incident Response

Since 5G coverage will be consistent throughout a coverage area, police, fire and EMS personnel can depend on the availability of apps like augmented reality, virtual reality, and cross reality to ensure incident responses are performed properly with support from remotely based experts. In addition, connecting people, assets and services can help enable intelligence that adds safety and efficiency. Infrastructure and building sensors may be connected to physiological sensors—if a tracked firefighter moves through a burning building, their exact location and vital signs can be monitored so if they need rescue or assistance, the response time can be much faster helping to improve outcomes. Police officers responding to a crime may have the ability to know the identity of a suspect from facial recognition data through local surveillance cameras and some life-threatening activities could be conducted with tablet operated robots and augmented reality to help keep first responders safe during the cleanup of hazardous materials or disarming and removing of explosive devices.

Asset Management

With ubiquitous, reliable, 5G coverage, Emergency Medical Services, for example can more effectively deploy mobile solutions that streamline and help error-proof processes. For example, Law Enforcement and Fire can track the exact locations of expensive equipment more efficiently, and

in real-time. RFID sensors or tags on medical equipment can help ensure devices are on the right ambulance, and a rugged tablet can sense the location of high value items like defibrillators to help eradicate the costs of losing items. Tablet operated drones may be utilized for delivery of medical supplies to medical personnel at an accident scene, or biological samples sent for analysis ahead of the patient.

Emergency Medical Response

5G speeds and low latency can improve the delivery of Emergency Medical Response. For example, first responders can stream real-time patient diagnostic data from the field and ambulance to the emergency room, so hospital teams are best prepared to care for incoming patients the moment they arrive. Paramedics may link the patient to their medical record and apply emergency care tailored to their individual needs. Doctors may be streamed via live video feeds recorded on tablet and advise on treatment or speak directly to the patient from a remote location.

Data Driven Decision Making

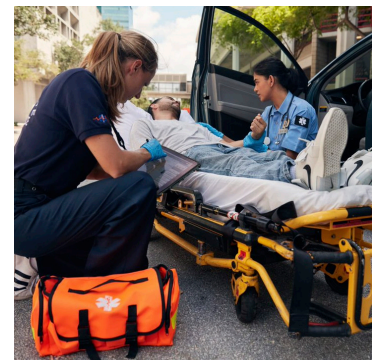
First responders can access the same data as they would in the office, but out on the field on a connected 5G tablet. Law enforcement officers could link fingerprint data to the vehicle registration in real-time. Officers may have the ability to pull criminal history and other important data on a suspect or person in need of help, enabling them to understand who they are dealing with and adapt an appropriate response. Voice recognition may be used to convert conversation to text eradicating the need to transcribe conversations. Drones can be used to scan a crime scene to assist with developing much more detailed reports that can be shared with multiple team members for immediate review.

Conclusion

5G technology has the ability to help empower first responders in ways that enable better, faster and safer responses. The benefits mentioned above are just a small fraction of the significant operational improvements that 5G could deliver. While 5G is here, it is far from ubiquitous, which heavily impacts its ability to deliver value in all public safety applications. Today, coverage is primarily centered in highly populated areas, with coverage in rural areas expected to lag significantly. In areas where 5G is not available, connectivity will fall back to 4G, reducing the ROI for 5G devices. And, if public safety applications are designed to leverage the high bandwidth and low latency of 5G where the required 5G speeds aren't yet available, application performance could suffer, impacting productivity and safety.

In short, just as it took many years for the build-out of the 4G network, it will take years for the full buildout of the 5G network as well. So, when it comes to the need for 5G devices in public safety, you have time to migrate. There is no risk of carriers abandoning their 4G networks anytime soon. In fact, some carriers are continuing to improve their 4G networks, in turn improving the quality of the service your first responders. And even as 5G becomes available to all, there will be no impact or degradation of their 4G voice or data communications.

As a result, your workforce can continue to use their 4G devices for now. When your 4G devices are ready to be replaced, this may be an opportune time to begin implementing 5G devices to avoid a heavy financial and resource burden down the road and help ensure your agency is ready for the 5G future coming soon.



Zebra can help you analyze the current state of your applications and your application strategy to help you create a migration plan for one or all these technologies to ensure you have a solution tailored for your agency.

Contact your Zebra representative or visit zebra.com to find a partner.

1. Ericsson Mobility report 2021 2. Ericsson Mobility report 2021 3. Nokia confirms 5G as 90% more energy efficient; Nokia; December 2, 2020

4. What 5G means for the Future of the Internet of Things; Neil Sequeira; January 11, 2019; 5G Technology World

5. Introducing 5G technology and networks (speed, use cases and rollout); Thales Group; March 16, 2021 6. 5G vs. Wi-Fi 6: a Powerful Combination for Wireless; Intel



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