ZEBRA CAPTURE YOUR EDGE

5G, Wi-Fi 6/6E and CBRS

Understanding the impact of the new
generation of wireless technologies
on your enterprise mobility strategy

Executive Summary

5G

Wi-Fi 6/6E

CBRS

How will next generation wireless technologies impact your business?

Today, mobility is a cornerstone technology in almost every business. Mobile devices help workers get more done in a day, as they are able to execute tasks faster and with greater accuracy. Retail associates can better assist shoppers. Nurses can provide patients with faster care. Manufacturers can take production volumes and product quality to the next level. Warehouse operators can make sure every customer receives the right items in the right order on time. And public safety officers and first responders can better protect and serve their communities.

At the heart of every one of those mobility solutions is a wireless network, the key enabler that carries the steady flow of information to and from the mobile devices that drive your business processes — and your success. But wireless networks are evolving, and the pace of evolution is increasing: 4G is evolving into 5G, Wi-Fi 6 and Wi-Fi 6E have arrived, and the notion of a shared spectrum wireless network is gaining momentum — an example is Citizens Band Radio Service (CBRS) in North America.

As an enterprise, you have probably started discussions about how this next generation of wireless 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 the new generation of wireless technologies? And when is the right time to build migration into your mobility plans? The following overview of these new wireless technologies and our initial recommendations can help you determine where and how these technologies fit best in your organization — and when you should begin deployment.

5G The fastest growing mobile technology in history

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 base. The meteoric rise continues — there was a 66% increase in global 5G subscribers in just one quarter (between Q3 2020 and Q4 2020).[1] And in 2026, the number of worldwide 5G subscribers is predicted to hit 3.5 billion, representing an unbelievable 57% annual growth rate over 6 years.[2]

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. Both enterprises and consumers will benefit from new use cases, higher speeds and more reliable lower latency performance. Consumers have embraced 5G as "the next big thing and are driving 5G adoption right now, just as they have driven the return on investment of the prior generations of cellular network technologies.

However, enterprise adoption of 5G will help speed up the development and availability of 5G-enabled devices — and the maturity of 5G enterprise solutions.

5G is here. It's everywhere you look. But is it time to migrate to 5G devices for your enterprise applications?

The many benefits of 5G in the enterprise

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

90% reduction in total energy requirements[3]

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.

1000x bandwidth per unit area[5]

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 of 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.

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 across industries, including:

Healthcare

5G speeds and low latency can improve the delivery of healthcare. For example, first responders can stream real-time patient diagnostic data from the field and ambulance

to the emergency room so hospital care teams are best prepared to care for incoming patients the moment they arrive. The quality of telehealth appointments should also greatly improve, providing patients with a more natural experience akin to an in-person meeting.

With 5G, very large 1 GB files generated by scans can be sent to a patient's physician in minutes instead of hours — without impacting network performance or availability. Rather than waiting until the evening when there is less network traffic, facilities can send scans as soon as they are available, eliminating delays in the transfer of crucial information, the patient diagnosis, delivery of the results to the patient, treatment, and the scheduling of second opinions —and ultimately improving the quality and speed of care. And 5G speeds and low latency can make the tactile internet and haptic communication a reality, providing surgeons on one side of the world with the sense of touch required to successfully complete a robotic surgery on the other side of the world via a 5G network. The result? World class healthcare, even in remote areas — patients can utilize any surgeon, regardless of location, without traveling.

Manufacturing

Real-time data collection and analysis from sensors on the production line can help manufacturers improve efficiency, impacting production speed and workforce productivity. Augmented, virtual and cross reality technologies can help technicians reduce production line downtime by ensuring repairs are executed perfectly. They can also help technicians uncover and address emerging issues during routine maintenance, before they impact machine performance. Sensors on tools can enable automatic tracking of tool usage to ensure that any required maintenance is

always performed on time — such as calibration. And 5G can provide the constant connection robots require, without the limitations of wires, enabling the creation of the factory of the future. Plus, sensors on doors, gates and areas where sensitive information or goods are stored can help improve safety without adding manpower.

Mining

5G can enable mining operations to deploy autonomous vehicles that help improve efficiency and worker safety — workers no longer need to be in the vehicles.

Transportation and Logistics

With ubiquitous, reliable, 5G coverage, expansive facilities such as airports, seaports and rail yards, can more effectively deploy mobile solutions that streamline and error-proof processes. For example, sensors on baggage can help ensure luggage reaches the right plane on time, and a rugged mobile device can verify the identity of incoming shipping containers to ensure they are processed promptly and properly. Autonomous cars, trucks and drones could be utilized for delivery operations. Sensors can be placed on refrigeration units in delivery trucks to ensure correct temperatures are maintained throughout shipping for sensitive pharmaceuticals, frozen foods and more.

Utilities/Field Service

Since 5G coverage will be consistent throughout a coverage area, utility companies' field service personnel can depend on the availability of apps like augmented reality, virtual reality and cross reality to ensure maintenance and repairs are performed properly. And any dangerous activities could be conducted with robots and augmented reality to help keep workers safe — for example, during the cleanup of hazardous materials or removal of explosive devices.

Retail

Operating with very high capacity and small cells, 5G mmWave can enable futuristic retail use cases which will revolutionize the in-store personal experience. For example, it can be used to deliver personalized digital signage to customers through an interactive "magic mirror" in a dressing room.

Hospitality

Guests could utilize their cell phones to open the door to their rooms, adjust lights and more, all with the press of a button or two on the 5G device that is always on hand. If all merchandise in a quick service restaurant has an RFID sensor, store managers can enable "smart shelves" that alert workers when a shelf needs replenishing, allowing associates to spend more time helping guests instead of checking inventory.

Public Safety

5G can enable first responders to tap into a wealth of information in the systems in a smart home. Police and firefighters could use a 5G-enabled handheld mobile computer or tablet to access the real-time feed from security cameras in a home to obtain a new level of situational intelligence. This could help firefighters identify hotspots before they enter a burning home. A 911 caller could send live video to a first responder or 911 operator enabling a faster and better response to the situation. 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 location of first responders and first responder equipment.

Summary

While 5G is here, it is far from ubiquitous, which heavily impacts its ability to deliver value in enterprise applications. Today, coverage is primarily centered in highly populated areas, with coverage in rural areas expected to lag significantly. In addition, there are three 5G bands — low, mid and high (known as mmWave). mmWave is the band that offers the gigabit speeds. In order to justify the higher cost of 5G mobile devices, the 5G mmWave should be available in nearly all of the geographic areas where your workers spend their time. In areas where 5G is not available, connectivity will fall back to 4G, reducing the ROI for 5G devices. And, if enterprise 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 workforce productivity, at the least, and possibly worker safety.

In short, just as it took many years for the buildout 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 the enterprise, you have plenty of time to migrate. There is no risk of carriers abandoning their 4G networks anytime in the near future — the 5G networks are built on top of 4G networks. In fact, some carriers are continuing to improve their 4G networks, in turn improving the quality of the service your workers experience. And even as 5G becomes available to your workers, 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 until your enterprise has a use case that requires the speeds of 5G — and 5G higher speeds are actually available throughout your coverage area. When your 4G devices are ready to be replaced, you can assess whether your applications have a need for 5G speed, and if so, begin migration at that time.

Wi-Fi 6/6E

The importance of Wi-Fi 6 and Wi-Fi 6E in the enterprise

Wi-Fi 6 and Wi-Fi 6E are here. Should you migrate your Wi-Fi network infrastructure and devices to Wi-Fi 6? Or wait for Wi-Fi 6E?

At the start of the mobile revolution, enterprises provided workers with mobile devices that could access information in key business applications. But, as mobility has matured, enterprises want more. With the convergence of voice and data, enterprises want to give workers one device that does it all, simplifying life for the workforce and eliminating the need to purchase and manage separate devices. To enable the most collaborative workforce possible, enterprises want to put a mobile device in the hands of every worker. IoT devices are now common, improving operations by providing instant visibility into new levels of information — from the temperature in a cold storage warehouse to visibility into areas in a retail store that are overloaded with shoppers. And next-generation technologies such as augmented reality are finding their way into the enterprise, where they can help streamline and error-proof everyday processes.

As enterprises deploy more mobile solutions to more workers, the Wi-Fi network becomes more congested. The Wi-Fi network needs to be able to accommodate more devices, more connections and more traffic. And with next-generation Wi-Fi 6, it will.

Also known as 802.11ax, Wi-Fi 6 is the first generation to adopt the new numeric naming convention. Wi-Fi 6 addresses everything from the need for speed to the need to accommodate more devices and improved security. Compared to Wi-Fi 5, Wi-Fi 6 quadruples bandwidth and capacity, reducing congestion and interference. And with substantially reduced latency (75% lower, according to Intel), a substantial increase in devices and traffic won't impact application performance.[6]

Wi-Fi 6 paves the way for enterprises to put a mobile device with voice and data capabilities in the hands of every worker, blanket the enterprise with IoT devices to provide a new level of business intelligence, and deploy emerging technologies such as augmented reality to enable workers to get more done, more perfectly.

And if you need more speed, more bandwidth and more capacity, Wi-Fi 6E delivers. Wi-Fi 6E utilizes an additional Wi-Fi frequency band — 6 GHz. The 6 GHz band offers an additional 1200 MHz of Wi-Fi spectrum, compared to the maximum 560 MHz for prior Wi-Fi generations, boosting the total available spectrum to 1600 MHz — quadrupling the available space. With this added spectrum, customers can allocate additional wideband 160 MHz channels. The result is a Wi-Fi network that offers the highest possible reliability and capacity, plus the lowest possible latency, capable of supporting sensitive applications such as autonomous vehicles, and offering enterprises maximum relief for Wi-Fi network congestion.

Wi-Fi 6/6E: key features and benefits

Wi-Fi 6 delivers what everyone wants — enterprises and users alike — more of everything. More speed. More capacity. More responsive applications. More battery cycle time. And more security.

It's triple the speed
Wi-Fi 6 offers much faster data rates. Where Wi-Fi 5 (802.11ac) maxes out at 3.5 Gbps, Wi-Fi 6 offers a maximum possible data rate of 9.6 Gbps, potentially tripling the speed of its predecessor, Wi-Fi 5,[6] and providing support for more bandwidth-intensive applications.

It can handle up to four times the devices
Wi-Fi 6 adds a third band (6 GHz) to the Wi-Fi 5 dual band (2.4 GHz and 5 GHz) solution. MU-MIMO, short for Multi-User Multi-Input/Multi-

Output, enables multiple devices to communicate simultaneously with the access point. The result? Up to four times the network capacity[6] — so you can give more workers more devices, without risking congestion.

Lightning-fast application performance
Less latency means more responsive applications, which helps to improve the workforce experience and productivity.

Longer battery cycle times
A new feature, Target Wake Time (TWT), enables access points to determine when devices can access the network, substantially reducing the time that antennas are powered on to transmit and search for signals. Battery power consumption is reduced, extending battery cycle times. While all devices can benefit from TWT, this feature is particularly beneficial to smaller, lower-power IoT devices, such as sensors. Sensor batteries last longer, and since IoT devices don't need to be "always connected," network traffic is reduced.

Better security
Wi-Fi 6 gets a security upgrade, thanks to WPA3. Compared to WPA2, WPA3 uses the latest security protocols, enabling stronger authentication and increased cryptographic strength — ideal for markets with sensitive data, such as healthcare and retail. Improvements include requiring a username and password to access the Wi-Fi network instead of just a password. Encryption keys are longer, increasing from 128-bit to 192-bit, which are harder to break. Another new feature called Simultaneous Authentication of Equals (SAE) adds a new layer of security during ongoing communications. And Opportunistic Wireless Encryption (OWE) improves security by preventing eavesdropping when connected to public Wi-Fi hotspots.

Use cases: do you need Wi-Fi 6 or Wi-Fi 6E right now?

Just a few examples of applications that Wi-Fi 6 can enable includes:

Complete workforce collaboration
Give your entire workforce the simplicity of a single device that provides data access as well as all the functionality of a 2-way radio for push-to-talk instant communications, plus a mobile PBX handset. By enabling workers to take and place calls through the PBX, enterprises only need to give workers one device — instead of three.

On-demand Training
Enable any number of users to watch real-time, on-demand training videos and enable video calls within your facility to provide live assistance — for example to support new technicians repairing equipment on the manufacturing production line.

Telehealth visits
Enable remote healthcare consultations and appointments, allowing physicians in a clinic or hospital to conduct visits with patients in their homes.

A new generation of IoT devices
Throughout the supply chain, manufacturers, distribution centers and warehouses can deploy any number of IoT devices to track critical metrics without compromising the quality of service in other applications, including temperature sensors to monitor cold storage.

Improve the retail customer experience
Provide shoppers with virtual or augmented reality applications to guide shoppers through the store — no more searching for items. Deploy self-service kiosks to enable customers to place orders, check stock and more. And empower shoppers to start interacting with your store applications out in the parking lot.

The new world of warehousing
Give all workers on the warehouse floor augmented and virtual reality applications to visually direct them via the fastest path to the right location to pick items for an order or put away incoming inventory — and verify that the correct items were picked or placed on the shelf for storage. Wi-Fi 6/6E will also make it easier to track and trace all inventory — from incoming raw materials to outgoing finished goods.

Wi-Fi 6E supports applications that require the fastest throughput and highest capacity, including:

Maximum users
Wi-Fi 6E can support the densest user environments, for example, a stadium full of fans or trade show with over 100,000 attendees.

Cloud computing solutions
With nearly non-existent latency, any enterprise can enable superior performance for mobile solutions that depend on cloud applications.

Manufacturing, mining and warehousing: autonomous vehicles and robots
Wi-Fi 6E enables a new generation of industrial automation solutions, from autonomous vehicles in mining operations and shipyards that help improve worker safety and throughput to robots picking products in a warehouse.

Summary

Ultimately, you will need to upgrade your Wi-Fi network to either Wi-Fi 6 or Wi-Fi 6E. But when and how should you migrate? And should you upgrade to Wi-Fi 6 or Wi-Fi 6E?

To answer these questions, you need to take a good look at current application needs as well as anticipated new application needs. You'll also need to consider whether Wi-Fi 6E is available in your geography. If Wi-Fi 6E is not currently available in your area, you'll need to consider when certification is expected, how much of the spectrum will be available, and whether there are any usage restrictions.

The answers will help guide your planning. You may need Wi-Fi 6 now and Wi-Fi 6E to meet future plans. You might need to layer Wi-Fi 6 or Wi-Fi 6E network and a CBRS network together to achieve the coverage you need. Or you may never need Wi-Fi 6E. Understanding your application roadmap and availability in your geography will help you determine if, how and when to start down the upgrade path.

CBRS What is it, and who needs it?

Today, enterprises have two choices when it comes to providing workers with wireless connectivity: Wi-Fi or cellular. But when enterprises need the attributes of both Wi-Fi and cellular, there's a new wireless option available: private LTE networks. In the U.S., the most popular private network option is Citizens Band Radio Service (CBRS). This short brief provides an overview of CBRS technology and the specific customer use cases where it is ideal in the enterprise.

What is CBRS? CBRS represents both a frequency band and a new cellular deployment model called "shared spectrum." As a band, CBRS (known as Band 48) makes available 150 MHz of spectrum in the 3.5 GHz band. The 3.5 GHz represents an attractive frequency range relative to coverage and capacity. Unlike past cellular bands, CBRS is part of a "shared spectrum" model which enables utilization in both licensed and unlicensed deployments. Unlicensed deployment enables enterprise customers to deploy CBRS without procuring licensed spectrum auction or leasing spectrum. Furthermore, a single CBRS base station can provide the same coverage as 10 Wi-Fi access points.

The premise behind shared spectrum is to allow spectrum sharing between three tiers of priority users. In the case of CBRS, the highest priority is given to existing spectrum users, including government users, such as those with the Department of Defense (DoD). Sharing with lower priority users is made possible because these highest priority users operate in small geographical pockets and generally do not use the complete frequency band. In this model, lower-tier users are able to operate in regions and bands so as not to interfere with high-priority users. The next lowest priority group of CBRS users operate in the licensed spectrum (under a Priority Access License, or PAL) which is auctioned similar to other cellular bands. Finally, the lowest priority users operate unlicensed in what is called General Authorized Access (GAA). GAA essentially enables enterprise customers to own and operate a cellular-based network without procuring or leasing spectrum. This has never before been available to enterprise customers and represents significant opportunities.

> CBRS marries the best of Wi-Fi and cellular technology. Do you have applications that could benefit from this new wireless network option?

Under GAA, enterprise customers can create sizeable networks to serve as either stand-alone networks or to supplement existing Wi-Fi or cellular networks. These can be short lived or permanent. For example, CBRS networks can be used at sporting events, festivals, rallies, satellite vaccination centers, or as support centers after a hurricane, wildfire or other natural disasters.

While Wi-Fi could be utilized to serve these use cases, CBRS would require significantly fewer base stations and provide the reliability and predictability found in cellular protocols such as 4G or 5G. And since CBRS authentication leverages the same SIM authentication used by cellular networks, these networks are very secure.

Many customers are looking at CBRS as a means to supplement their Wi-Fi coverage in large open areas. This can be either indoors or outdoors. Using CBRS, a retailer can readily extend coverage to a large parking lot. Shipyards, airports, mining facilities, corporate and college campuses are all potential users to sites that could benefit from CBRS.

Quite often, CBRS networks may be deployed as a "private network." As its name implies, a private network is essentially isolated or has gated access to a public network. Isolation provides an enhanced degree of data privacy. Private networks may either be administered by the enterprise customer or by a service provider.

The CBRS advantage: the enterprise benefits of CBRS vs. Wi-Fi and cellular

CBRS was architected to extend wireless services in expansive environments. It delivers a set of unique advantages:

It's more secure

With CBRS configured as a private network, only your organization and authorized users can get access. Unlike the public LTE network, your data never leaves a private LTE network, which is especially important in healthcare and finance, which operate under tight government-mandated regulations for data security. Since an activated SIM card (physical or digital) must be in each CBRS-enabled device, network administrators have full control over what devices are allowed on the network. And CBRS-configurable network topologies enable best practices in IT security design, further strengthening security.

Better indoor and outdoor coverage

A private LTE network can provide great coverage anywhere — inside the four walls and in large outdoor areas. Configured as a private LTE/5G network, customers can add capacity as needed. And every inch of your outdoor area is covered, unlike the cellular network's service quality, which can fluctuate depending on topography, proximity to a cell tower and network congestion.

The flexibility to dedicate and segment your bandwidth

A CBRS network can be used to segment users and traffic to ensure ample bandwidth for crucial business communications. For example, a large campus-style hospital could provide wireless services to patients and visitors on a Wi-Fi network, while a CBRS-based private LTE network could be deployed for private access to connect mobile equipment and medical staff, such as physicians, nurses and other crucial workers. And with integrated Quality of Service (QoS), you can dedicate bandwidth however it will best serve your organization — for example, a specific group of users or a specific type of traffic.

It's designed for extended coverage

CBRS is designed to extend coverage that otherwise would require a significant degree of Wi-Fi infrastructure.

Increased resiliency

Unlike the cellular network, enterprises can add additional cells to ensure service in the event of equipment failure or unusually large volumes of traffic.

Lower cost for larger areas

While the cost of a private LTE base station is higher than an access point, one CBRS base station can cover an area equal to 10 Wi-Fi access points outdoors and three to four access points indoors, made possible due to increased power levels and improved link reliability. As a result, it's easier to scale and support a CBRS-based wireless solution for large environments — there is less infrastructure to purchase, deploy and manage, fewer cables to run, and less power required.

Enterprise use cases — where does CBRS deliver the most value?

CBRS can bring value to specific use cases in practically every vertical market.

Retail

There are a lot of applications in the typical retail store. Kiosks enable customers to look up product information. There are a wide variety of systems that are crucial to day-to-day operations, including manned point of sale, self-checkout, payment processing, task management and inventory. There are internal communications between workers. And wired and wireless networks support it all. CBRS can complement an existing Wi-Fi network to ensure availability of high-performance wireless connections to support the most critical functions, such as inventory tracking, payment processing and internal communications — effectively eliminating any impact from bandwidth issues on overloaded Wi-Fi or cellular networks in use in the store.

Events and Entertainment Venues

The ability to cost-effectively extend reliable wireless services to very large crowds in large outdoor areas and in buildings makes CBRS a natural choice to power applications in permanent venues, such as stadiums, concert halls and theme parks, as well as temporary venues with hundreds of thousands of attendees, such as the Olympics grounds or a golf course hosting a championship tournament. With CBRS, there's more than enough bandwidth to support it all — attendee external communications, workforce internal communications, applications that improve the attendee experience, point-of-sale mobile devices, ticket kiosks, surveillance cameras and any number of IoT devices, from air filtration systems to refrigeration systems.

Transportation and Logistics

The expansive outdoor/indoor environments in seaports, rail yards and airport grounds can easily span a thousand acres or more. Very large indoor on-premises warehouses can have a high volume of users and IoT devices. Creating a Wi-Fi network with ample range and capacity to enable real-time tracking of heavy equipment, shipping containers and baggage would be very expensive to deploy and manage. The public cellular networks may not offer strong coverage in every square foot of the outdoor space, and indoor areas will be an additional challenge. But CBRS is just right, able to meet all the needs with a single LTE private network.

Healthcare

CBRS-based LTE private networks are ideal for large campus-style hospitals that need to extend coverage outdoors throughout the campus, as well as inside its many buildings — including new outdoor pop-up temporary facilities. Another great use of CBRS is traffic segmentation. A CBRS network can segment internal hospital network traffic from patient traffic to improve network stability, availability, bandwidth and security for crucial hospital applications.

For example, you can protect critical communications that take place all throughout the campus — text messaging and voice calls between physicians, nurses, lab technicians and other crucial staff. And you can ensure a constant flow of information from the wireless sensors that track patients as well as life-saving medical equipment such as IV pumps, gurneys and patient monitoring equipment that send alerts and alarms directly to nurses when patients are in distress.

Hospitality

Large resorts with many buildings and outdoor areas, such as pools and beaches, can leverage CBRS private LTE networks to ensure coverage everywhere — throughout the grounds and in buildings. Instead of relying on spotty cellular communications for outdoor areas and a Wi-Fi network to provide reliable wireless connectivity to workers, hotel guests and conference attendees inside buildings, you can now set up a CBRS network to do it all, with less equipment to purchase and manage.
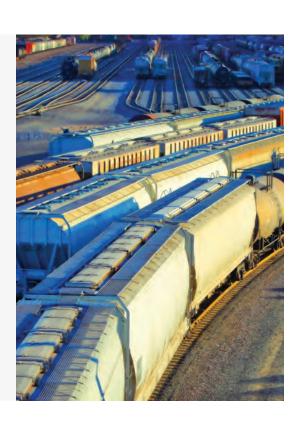
Manufacturing

CBRS is ideal for large manufacturing plants common in automotive, aerospace and petrochemical plants. These facilities often have millions of square feet of indoor areas that include production lines and warehouses that store raw materials and finished goods, plus thousands of acres that are home to expansive yards. Large volumes of IoT devices can be deployed to track assets such as forklifts, clamp trucks and the fleet of delivery trucks and automobiles that are ready for shipping to customers or dealers. The network can also be used to send a real-time stream of crucial data, such as temperatures in freezers in pharmaceutical manufacturing or environmental conditions in clean rooms. And CBRS can provide robots and autonomous vehicles with the guaranteed two-way, real-time communications required for safe operation.

Primary business drivers for CBRS

CBRS allow enterprises to address a series of specific wireless challenges, including the need to:

- Provide highly reliable coverage:
  - deeper inside buildings
  - in expansive campus environments, indoors and outdoors
  - to link Wi-Fi-enabled buildings
  - to support temporary venues for short periods of time
  - to enable environments with a large volume of IoT devices, requiring high bandwidth
  - to ensure mission-critical wireless connectivity for solutions such as autonomous vehicles
  - to ensure specific workers always have service

- Segment traffic to ensure security, quality of service and/or available bandwidth

Education

CBRS networks can help school districts and higher education facilities navigate the challenges of remote and synchronous learning. CBRS can become an equalizer, ensuring high-speed wireless connectivity on campus. When in-person classes resume, CBRS can provide wireless connectivity to enable lessons on school-owned laptops and tablets in outdoor classrooms. And with great in-building coverage, CBRS can also provide wireless connectivity in dormitories and classrooms, virtually eliminating the need for a Wi-Fi network.

Warehousing

CBRS can empower cutting-edge warehouses that are deploying robotic equipment to streamline, speed and error-proof processes, such as pick and pack. Since CBRS provides superior in-building coverage, the dead zones common with Wi-Fi networks that would wreak havoc on robotic warehouse processes are simply eliminated.

Summary

CBRS is nicknamed the "Innovation Band" for good reason. Simply put, its architecture and capabilities enable enterprise customers to leverage cellular technologies such as 4G and 5G, using licensed and/or unlicensed spectrum. CBRS elegantly combines the best of Wi-Fi and cellular technologies, marrying Wi-Fi's great in-building coverage with cellular's great outdoor coverage, speeds, capacity and range. It also offers greater security than either network provides today. The result is a single wireless network capable of accommodating an extremely high volume of connections in every inch of the most expansive environments.

CBRS can be layered into an existing wireless environment to meet additional needs or deployed as a single standalone wireless network — the choice is yours, based on your goals and objectives. For example, at a championship golf tournament, an event host could deploy CBRS for communications with staff and attendees, while attendee personal phone calls and text messages could utilize the public cellular network. Or a hospital could leave a Wi-Fi network intact to provide patients and families with Wi-Fi connectivity but layer in CBRS to separate all hospital-related wireless communications, ensuring quality of service and privacy.

Whether you want to deploy a standalone CBRS-only private LTE wireless network or want to layer CBRS with your existing wireless services, you can choose to either purchase, install, operate and manage the CBRS equipment yourself or contract with a provider that will take care of the back end — installation, deployment and everyday management — for a dependable monthly fee that makes budgeting easy.

While, CBRS private LTE networks are only available in the U.S. today, similar networks are under consideration in other areas, including the United Kingdom and parts of Europe.

Conclusion

There is no single best-practices roadmap to help enterprises determine how and when to transition to the next generation of wireless technologies.

Start with a thorough examination of all of the applications you use today and the applications you have planned over the next three to five years. Then you can assess each application's requirements individually and determine which of the three wireless protocols is best suited for each application. It comes down to speed, bandwidth, reliability and latency needs. Rather than a one-size-fits-all approach, chances are you'll need to layer two (or all three) of these new wireless technologies to meet all of your needs.

While the emergence of three next generation wireless technologies makes the creation of your wireless network roadmaps more complex, it also gives you freedom of choice — the flexibility to define the best wireless network strategy to support your application requirements.

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 of these technologies to ensure you have a solution tailored for your business. Contact your Zebra representative or visit www.zebra.com to find a partner.

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