

Understanding
where 5G
makes sense
for retailers.



This white paper provides an overview of 5G network technology in a business context for retailers. It covers what the technology can do and explores its commonalities and differences with other network communications options. This paper also examines which use cases benefit from 5G (and which do not). It also discusses how 5G and legacy network technology can and should coexist.

Introduction

You're hearing a lot about 5G these days, and you're likely hearing that your business needs it because "it's fast." While that's true – 5G does in fact dramatically speed up data transfer and greatly reduces latency – there's more to consider as your business continues its digital transformation. Speed matters, but 5G isn't always necessary for every business process and connected device. And – by design – not all 5G is the same.

This white paper is written to help you and other decision-makers, influencers and stakeholders better understand how 5G fits into your overall network strategy, and to show how certain 5G bandwidth options best enable certain use cases.



Getting started: Think strategically first

Developing and executing a network strategy for the future – one that optimizes operations, controls costs and enables agility and flexibility -- means more than just “getting 5G.” The decisions your company arrives at, and the network investments it makes, require a clear understanding of what 5G “really is,” what the 5G spectrum makes possible, and knowing “what 5G isn’t.” That’s why Verizon -- in addition to heavily investing in its multi-bandwidth 5G network -- continues to support a broad range of network technologies and offerings, from 4G LTE and fiber to managed and virtual network services. And that’s why we’ve fostered an ecosystem of innovative solution providers to help companies create new business value through the strategic design and deployment of information technology.

5G is an enterprise technology that is helping companies connect their supply chains and get better visibility into their assets, wherever the assets may be. It is an operations technology powering advanced robots and automated guided vehicles in distribution centers, and also powers smart cameras for continuous, real-time planogram adherence. It is also a consumer technology that is bringing the metaverse and other next-generation experiences to life. It is a customer engagement technology that is helping brands engage with consumers. It is a retail technology that is enabling frictionless commerce.

It can be confusing to know where to start with 5G, especially with so many other initiatives and ideas in development. Some brands are already operating in the metaverse, and virtual and augmented reality for CX is expected to grow 85% per year through 2025¹. One reason is that 84% of consumers say the experience a company provides is as important as its products or services, and 71% want companies to communicate with them in real time. As to whether it is worth the investment, 66% percent of customers are willing to pay more for a great experience.

Your business should buy the connectivity that you need to enable the use case outcomes you want to see. However, it isn’t just about getting what you need for now. It is about future-proofing your investment so it can scale to enable the use cases of the future, and you should do it in a way that you can easily scale to the use cases of tomorrow without needing to replace your entire investment.

5G removes barriers to innovation

Consider the following. If you’re a retailer and want to run your stores like you always have, 5G will let you do it faster, but you won’t see incremental benefits. If you want to offer free Wi-Fi to patrons in the store, stream promotional and educational content to them while they’re there, and have the option of adding kiosks or temporary POS stations, then 5G becomes interesting. If you want to install intelligent shelves to prevent out-of-stocks and automate replenishment, use smart cameras and real-time analytics to monitor store traffic and reallocate staff in real time, and provide immersive experiences like having virtual reality headsets that enable customers to try on clothing or test merchandise virtually, then 5G may be essential.

For fully autonomous stores – where everything is self service, cashless and with no cashiers – 5G is the foundation. In these examples, investing in the optimal bandwidth for one of the featured use cases would result in overpaying or getting underperformance for others. The good news: You can create a platform today that lets you add bandwidth and scale use cases when you need to, without ripping up and replacing the network infrastructure.

The value in 5G is the barriers it removes. It makes next-generation processes possible at a time when retailers need to deliver next-generation experiences. Getting the most value from 5G and other communications infrastructure depends on using the right bandwidth (5G or other) for each use case.



What 5G is, and what it isn't.

“5G” is a commonly used term, but it can also be a misunderstood one. That is because 5G is not a single technology or band of wireless spectrum, it describes a range. The various spectrum bands within the 5G umbrella are each best suited for different use cases. The best option for achieving millisecond responsiveness in an advanced distribution center or warehouse management system is not the best for supporting contactless checkout. For these and other reasons, 5G should not be considered a commodity. Important performance differences exist among 5G spectrum bands, and in 5G connectivity and services from different providers.

Any enterprise that decides to use 5G must choose and optimize a 5G band for its use cases. Most likely, it will need multiple bands, and would be best served by keeping some of its networks and connected devices on legacy or other non-5G networks.

When the right band is selected, the 5G connectivity itself will not always be enough to provide the full benefits that businesses envision. It is part of an overall solution that provides additional benefits. Other components and network technology, such as Verizon's Network-as-a-Service (NaaS) solution delivery, multi-access edge computing (MEC) architecture and software applications that take advantage of the new processes 5G enables all help to unlock the full value.



Spectrum overview

Not all 5G is created equal, and that is by design. There are three primary types of 5G – high-band, mid-band and low-band – plus differences within these categories that arise from the usage environment and network provider. Each of the three bands has strengths and weaknesses related to its coverage area, interference resistance, endpoints supported, latency, speed and more.

In many operations today, Wi-Fi is used in place of 4G LTE. 5G is faster and safer than public Wi-Fi,² and has the important enterprise advantage of providing persistent connectivity. Unlike with wireless LAN technology, 5G users and connected devices don't experience hiccups and potential service interruptions as they are handed off from one Wi-Fi hotspot to another. Additionally, 5G is inherently more secure than Wi-Fi.

One of the most important differences between 5G and 4G LTE is latency, which describes the time it takes for signals to be sent and received and accounts for the lag that may be experienced when viewing streaming video or gaming. It is an important variable in the performance of real-time systems, especially in situations that must support hundreds or thousands of connected users and for AR/VR use cases. Latency on 4G LTE networks is typically around 20 – 30 milliseconds (ms); 5G latency depends on the band, but typically is 10 ms or less.

Choosing a 5G bandwidth for a use case or facility doesn't mean you can only use that bandwidth. Multiple 5G bands, and non-5G spectrum, can interoperate in an enterprise network. For example, Verizon 5G Nationwide uses the Verizon 4G LTE network infrastructure and its massive fiber-optic backhaul resources.

Low-band (< 1GHz)

Low-band's strengths seem counterintuitive – it is good for dense, indoor environments, but also for covering wide areas, making it advantageous for providing 5G connectivity to rural areas. Lowband also excels at simultaneously supporting a high volume of connected devices, providing high service reliability for high-mobility work environments. It is extremely well suited for equipment monitoring within a factory. The peak speed for low-band is approximately 200 Mbps, which is relatively slower than other 5G options.

Mid-band, including C-band (1 – 7 GHz)

Mid-band is often called “the Goldilocks band” because its balance of coverage area and speed is just right for many leading enterprise use cases. Mid-band spectrum has a wider channel size than low, which can be used to provide subscriber services through hotspot-based mobile broadband. Mid-band is an excellent option for many types of connected machines because it provides low-latency performance in urban and suburban environments. Its ability to provide fast, reliable city-wide coverage makes mid-band a popular choice for smart city applications, and for users in manufacturing, education, public services and other sectors. Mid-band is forecast to provide nearly 65 percent of 5G's total socioeconomic value according to research by GSMA, the leading global wireless industry association.³

C-band

If mid-band is the Goldilocks band, C-band is the sweet spot within it because it provides an outstanding balance of coverage range, interference resistance, speed and latency for many enterprise applications. In C-band Verizon has achieved 1.4 Gbps peak download speeds near active cell sites and 500 Mbps further away.⁴ C-band is between 3.7 and 3.98 GHz, placing it in the middle of the overall 5G band. It was initially mostly used in Europe and Asia but the infrastructure is developing quickly in the U.S. Many of the next-generation business processes and benefits that 5G enables are expected to be run in the C-band bandwidth. For example, C-band is helping close the digital divide by bringing broadband access to rural areas. With 5G and virtual reality, shoppers in rural communities can have the same experiences as shoppers in the heart of the city.

High-band (also called mmWave, or Ultra Wideband/UWB)

Much of the original attention and hype around 5G centered on the high-band variety, which has the fastest speeds, the highest throughput and the lowest latency. The bandwidth can potentially support 1 million devices per square kilometer. It is viewed as the enabling technology for high-speed automated IoT applications, robotics, next-generation virtual workspaces to connect a remote workforce, high resolution video streaming and as a fundamental component of AR/VR applications.

High-band technology can do a lot, but it can't break the laws of physics. Its great speed requires a tradeoff for range, which may be limited to 2,500 meters in dense urban environments (although range can be boosted with private network configurations). That illustrates why the total network configuration is key to 5G performance and value, not just the bandwidth. Virtual networks, fixed-wireless access (FWA) infrastructure and other components can offset range/speed limitations for high-band and other bandwidths to give each enterprise the performance it requires for its specific needs.

Besides their fundamental differences, 5G bands, even with the same category, can be further differentiated because the enterprise may use a public or private network, which may be licensed or unlicensed.

Private 5G networks are enterprise-specific 5G ultrawideband wireless implementations that can be created for indoor or outdoor environments. Because they are enterprise-specific, they are segregated from public networks – cellular communication stays on premises – and can be configured to the organization's specific security and performance requirements. Controlled authorized user access and device management and the inherent privacy of on-premises networking help keep the network secure.



5G fixed wireless access bring the performance and reliability of wired broadband to business operations far from the confines of the corporate headquarters and enables companies to grow and expand with fewer constraints on deployment timelines and costly infrastructure upgrades.”

Jason Leigh, Research Manager, 5G and Mobile Services IDC

Private 5G networks are considered a relatively easy to integrate for organizations that already have 4G LTE connectivity. They enhance organizational capabilities by providing high-bandwidth, low latency coverage that can support scaled implementations of artificial intelligence and machine learning, virtual and augmented devices, remote monitoring, IoT devices and other networked devices.

Private networks can operate on licensed or unlicensed bandwidth. **Licensed spectrum** is dedicated for the use of the entity that holds the license, for example a telecom provider or the military. By purchasing separate spectrum licenses, Verizon and other wireless providers avoid interfering with each other's networks.

Unlicensed spectrum comes without some of the regulatory protections that apply to standard, licensed bandwidth. Although unlicensed spectrum can enable some higher performances, the lack of regulatory protections increases the risk of interference and can reduce the overall value proposition of the deployment.

In fixed wireless access (FWA) implementations clients get dedicated 5G connectivity, including a dedicated receiver. It is often used to provide high-speed connectivity where fiber or cable are impossible or impractical. FWA also reduces interference and enables enterprises to support higher user/device densities.

This 5G spectrum overview is helpful for understanding the 5G options that are available, but not what type of connectivity you need. That is largely because there is no single right answer for most enterprises. A company is likely to need a mix of 5G, Wi-Fi and fiber technologies to optimize operations across various facilities such as offices, distribution centers and stores; legacy wired and wireless networks will still serve some needs effectively. When it comes to 5G, what enterprises need most is flexibility, today and for the future.



Verizon services and their customer benefits

5G is an integral part of an interdependent ecosystem, but there are other aspects that are significant variables to the performance and value an enterprise receives. 5G performance can be held back or get a boost from the network availability, network configuration, security and supporting infrastructure, which increasingly includes IoT and other edge devices. These and other infrastructure components and partners that the network provider brings to the table matter.

Today, 48 percent of businesses believe they are losing at least \$5 million in potential revenue because they lack network transformation; 17 percent believe they are losing more than \$10 million.⁵ At Verizon, we cover all areas of connectivity so you can not only buy the right size for now, but you can do it in a way to easily expand it in the future. We believe the business need should drive the network choice – not the network services provider.

Private 5G

Verizon released the first U.S. private network offering. Verizon's Private 5G is a non-standalone private network that combines 5G Ultra Wideband small cells with Private LTE's packet core and radios. Private 5G leverages the best of 5G Ultra Wideband and 4G LTE capabilities as different operational environments require, and also maintains interconnection to the organization's legacy local and wide area networks and enterprise applications. While all cellular traffic stays on-premises, Private 5G allows authorized remote user access to enterprise applications.

MEC/Verizon 5G Edge

Multi-access edge computing puts computing, storage and network resources close to where data is produced and used. MEC implementations can be public or private. A complementary technology for 5G, public MEC provides both an IT service environment and cloud-computing capabilities at the edge of the public mobile network, within the radio access network (RAN) and in close proximity to mobile subscribers, devices, enterprises and other organizations—all with a range of networking and computing needs. Private MEC brings similar compute and storage resources together but co-locates them on the customer premises with a private, onsite 5G RAN. Combining the RAN, compute, storage and devices on premises enables support for the most critical and latency-sensitive applications – data does not need to be transmitted to the data center for real-time processing. That results in extremely low latency for use cases like customer traffic flow analysis from customer flow monitors, real-time inventory tracking with smart shelves, planogram monitoring with intelligent cameras, to name a few. The on-premises setup also improves security and provides for data sovereignty. Our partnerships with AWS, Microsoft Azure and Google Cloud enable specific 5G edge performance improvements and capabilities for their respective cloud environments.

Security

Verizon's 5G security efforts build upon our long-held position as an industry leader. When designing our 5G network Verizon used the proven "security by design" approach, which builds in security at various levels. We are a leading contributor to industrywide 5G and IoT security initiatives because security must extend beyond the network to the endpoint level, including IoT devices, patient monitors and other emerging endpoints. Verizon understands how to apply network scanning, anomaly detection, segregation and other security techniques across OT and IT networks to optimize protection and performance. By managing network security and hosting devices, we get valuable insights into the digital landscape. Our NaaS offering helps organizations keep their network security up-to-date and take advantage of innovation from a recognized leader in network and cyber security.

5G use cases and real-world examples

Here are some of the ways 5G can improve your retail operations and increase revenues:

- Improve supply chain visibility with IoT/RFID real-time inventory
- Enhance the customer experience with cashierless checkout or scan and go apps.
- Leverage robots to transport goods in the backroom or distribution centers
- Utilize computer vision to provide real-time customer traffic information or monitor inventory on shelves
- Offer customers augmented and virtual reality tools to personalize shopping for apparel, accessories or furniture
- Assist customers in finding products in the store with wayfinding apps



Burberry drove visits to its physical stores from a program that featured holograms and online fashion shows in the metaverse and other experiences where customers could earn non-fungible tokens (NFTs) to use on virtual merchandise. "For us, it's all about engagement – getting more people to watch and invest in the game," says Dan Costello, the organization's chief revenue officer and senior VP of business innovation. "[Without Verizon] we'd be piecing together technologies using APIs and things of that nature, but there would be a bit higher latency than we could work with. I don't think there's a way to accomplish our vision of understanding movements as they happen without the power of MEC computing, and, more importantly, without the people that are behind it at Verizon."



Why Verizon?

Verizon provides all the flexibility organizations need and all the functionality that 5G has to offer. We are the ideal partner for network and business transformation because we support low, mid and UWB 5G bandwidth, 4G LTE and physical fiber, and have the partner ecosystem and NaaS services to blend and scale it all seamlessly. Our 5G customers include companies in diverse industries and public sector organizations that are improving their innovation, responsiveness and reliability with our next-generation services and solutions.

With Verizon, organizations have a strategic partner. Our networks—including America's most reliable 5G network and one of the world's largest and highest performing global IP networks—are among our greatest assets. By the end of 2022 we had more than 175 million points of presence (POPs) covered by 5G services worldwide plus more than 1 million miles of fiber. Our customers benefit from the billions that we have invested in developing the platforms, technologies and solutions that organizations need. But our greatest strengths are our vision, our people and our proven ability to deliver.

The network can be a multiplier, increasing the value of your investments and expanding your capabilities. The combination of our advanced networks, cutting-edge solutions plus professional and managed services can connect systems across your enterprise to empower you to overcome the business challenges that you face. We can connect all of your ecosystems, bringing users and applications together, to achieve all that you can imagine.

We call the result Enterprise Intelligence. It can make you more efficient, more agile, better prepared for unexpected challenges, and ready to seize new opportunities. Agility – both in business practices and their underlying infrastructure – are needed to thrive today and to be ready for tomorrow. Verizon is the partner you need.

1. Frost & Sullivan “Revolutionizing the Customer—and Retailer— Experience with Rich and Connected Digital Displays” <https://www.verizon.com/business/resources/casestudies/2021/improving-the-customer-value-chain-using-interactive-technology.pdf>
2. Public Wi-Fi speeds from March 2021 based on Opensignal independent analysis of measurements recorded during the period December 19, 2020 – March 19, 2021 © Opensignal Limited.
3. GSMA “5G Spectrum Guide – Everything You Need to Know” <https://www.gsma.com/spectrum/5g-spectrum-guide/>
4. Verizon “Verizon adds spectrum for faster speeds, better performance & greater availability of 5G UW” July 18, 2022 <https://www.verizon.com/about/news/verizon-adds-spectrum-faster-speeds-better-performance-greater-availability-5g-uw>
5. IDC Enterprise Network Transformation Maturity Index Summary <https://www.naasenterprisesurvey.com/#cover>

