

Understanding where 5G makes sense for distribution organizations



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 can offer low latency, fast data transfer and high speeds – 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 provides an overview of 5G network technology in a business context for distribution organizations. It covers what the technology can do and explores its commonalities and differences with other network communications options. This paper also examines some of the use cases that can benefit from 5G. It also discusses how 5G and legacy network technology can and should coexist.



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 can make possible and 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, automated guided vehicles and Internet of Things (IoT) inventory tracking sensors to transport and track inventory in the distribution center. It is also enabling camera vision for safety, mobile devices for employee productivity and condition-based monitoring of equipment status and temperature controls for operational efficiency.

It can be confusing to know where to start with 5G, especially with so many other initiatives and ideas in development. According to a recent distribution study conducted by Incisiv, 81% of distribution organizations have or plan to deploy mobile devices for their workforce by 2026. Radio-frequency identification (RFID)/IoT inventory tracking is already deployed by 35% of distribution organizations, with another 13% planning to deploy it by 2026. Robotics for picking and packing products are also an area of growth, with 19% of distribution companies currently using robotics and another 25% planning to deploy by 2026.¹

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-readying your investment so it can scale to enable the use cases of the future, without needing to replace your entire investment.



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 deploy 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 may not, standing alone, provide the full benefits that businesses envision. It often is part of an overall solution that provides additional benefits. Other components and network technology, such as Verizon's Network as a Service (NaaS) Solutions 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 distribution operations today, Wi-Fi is used in place of 4G LTE. 5G is typically faster and safer than public Wi-Fi and has the important enterprise advantage of providing consistent 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 public 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 processing bandwidth-intensive data such as video content. It is an important variable in the performance of real-time systems, especially in situations requiring support for hundreds or thousands of connected users or for augmented reality (AR)/virtual reality (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 uses the Verizon 4G LTE network infrastructure and its massive fiber-optic backhaul resources.

Low-band (< 1 GHz)

Low-band's strengths seem counterintuitive; it is good for dense, indoor environments, but it's also good for covering wide areas, making it advantageous for providing 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 options.

Mid-band, including C-band (1–6 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 coverage makes mid-band a popular choice for smart city applications and for users in manufacturing, education, public services and other sectors.

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. 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.

High-band (also called mmWave)

Much of the original attention and hype around 5G centered on the high-band spectrum, which has the fastest speeds, the highest throughput and the lowest latency. 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 use either licensed or unlicensed spectrum.

Private 5G networks are enterprise-specific 5G UWB 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.

Private 5G networks are considered 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.



5G fixed wireless access brings 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.”²

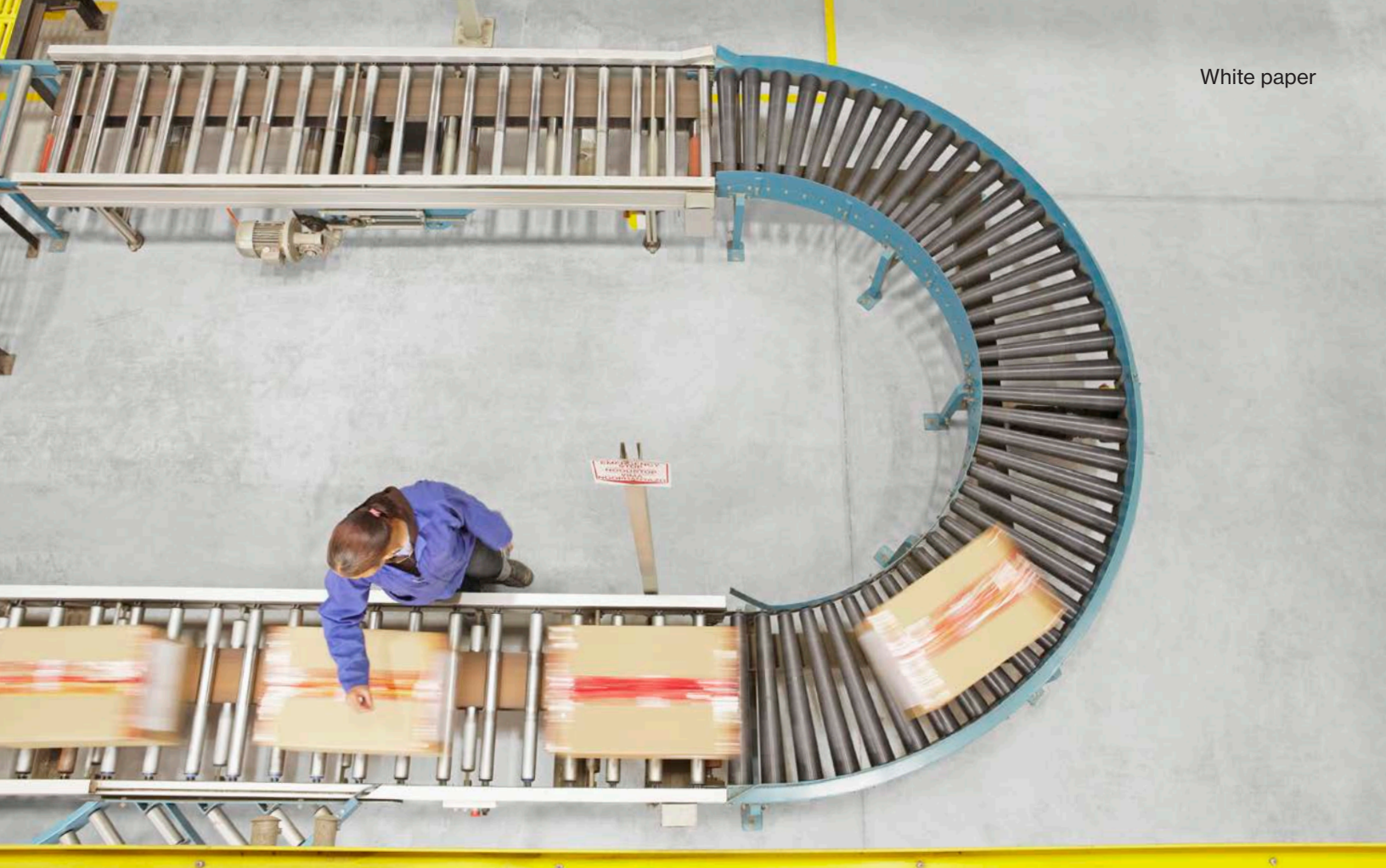
Jason Leigh,
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5G Private Networks can operate on licensed or unlicensed spectrum. Licensed spectrum is dedicated for the use of the entity that holds the license (for example, a telecom provider or the military). By purchasing separate spectrum licenses, 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 FWA implementations, clients get dedicated 5G connectivity, including a dedicated receiver. It is often used to provide high-speed connectivity where fiber or cable may be 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 impacted by 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.

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 – not the network services provider – should drive the network choice.

Private 5G

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/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, on-site 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 low latency for use cases like automated mobile robotics (AMRs), real-time inventory tracking or intelligent cameras. The on-premises setup also improves security and provides for data sovereignty. Our partnerships with AWS 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, we used the "security by design" approach, which builds in security features at various levels. By managing network security and hosting devices, we get valuable insights into the digital landscape. Our NaaS offering helps organizations take advantage of network innovations from a leader in network and cybersecurity.

5G use cases and real-world examples

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



Improve supply chain visibility with IoT/RFID real-time inventory.



Monitor freezer and refrigerator temperatures with critical asset sensors.



Leverage robots to transport goods in distribution centers.



Utilize computer vision to monitor inventory on shelves.



Provide staff AR tools for training and task management.



Assist employees in finding products in the distribution center with wayfinding apps.



Why Verizon

Verizon provides the flexibility organizations need and the functionality that 5G has to offer. We are the ideal partner for network and business transformation because we support low-band, mid-band and high-band 5G bandwidth, as well as 4G LTE and physical fiber, and we 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 network³ and one of the world's largest and highest-performing global IP networks—are among our greatest assets. 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. "2024 State of Smart Distribution Study: The Age of Efficiency and Resilience," Incisiv, in partnership with Verizon, July 2024.
<https://www.incisiv.com/report-2024-state-of-smart-distribution-study-the-age-of-efficiency-and-resilience>
2. "IDC PlanScape: 5G Fixed Wireless Access Connectivity for Business Agility and Operational Resilience," IDC, July 2022.
<https://www.idc.com/getdoc.jsp?containerId=US49377922>
3. **Based on RootMetrics® State of 5G Report, United States, 1H 2024. Tested with best commercially available smartphones on three national mobile networks across all available network types. Your experiences may vary. RootMetrics rankings are not an endorsement of Verizon.**

