

What 5G networking brings to edge computing



Edge computing and 5G are two intertwined technologies that can be leveraged to underpin the next generation of smart devices and applications. 5G offers greatly increased performance and density for connected devices, and the number of edge computing devices may reach up to three times the earth's population by 2023.¹ 5G will enhance edge computing applications, from retail marketing to connected stadiums to augmented vehicle components, by improving application response times, reducing performance latencies and enabling companies to better collect, process and analyze data.

This paper explores the evolution of 5G, with a focus on the benefits 5G is expected to bring to edge computing. It also looks at how the technology advances could affect industries from manufacturing to healthcare, potentially empowering enterprises around the world.

The edge revolution

The impetus toward moving processing power and data closer to end users or end devices is accelerating. Whether driven by Internet of Things (IoT) devices or edge computing in general, the cycle of centralized/decentralized IT has moved from mainframe to client-server to cloud, and now to a hybrid cloud architecture with processing both at the network edge and at the core.

Even though the hype cycle might make it seem otherwise, edge computing is not new; enterprises have been taking advantage of intelligent devices for decades. However, new use cases bring the possible benefits up a notch. For example, manufacturers are using sensors to ensure that equipment is operating properly, raising alarms when necessary, and hospitals are using edge computing equipment to provide real-time patient data. Even the world of logistics and transportation is using sensors to ensure that refrigerated loads stay cold, vehicles are operated safely and cargo is where it is supposed to be.

The increasing number of new devices with new capabilities—up to 75 billion new edge devices by 2025²—is part of a data deluge that feeds demand for actionable information that helps businesses understand trends, plan new products and stay ahead of the competition. The results are staggering: Humans now generate more than 2.5 exabytes of new unique data every day—about 1.7 MB per second for every person on earth.³ Sending all that data to a central processing location can put a tremendous strain on existing network resources—even over broadband connections—which degrades performance for time-critical functions, due to limitations, latency, inefficient use of available bandwidth and roundtrip delays.

The combination of so much data, the difficulties of moving it and the unacceptable latencies resulting from remote data processing has contributed to the growth of edge computing, which can significantly reduce transactional and transmission delays and help ensure that computing happens in the right location for every application. Edge computing is even more important in today's new reality, where workforce usage patterns have changed radically due to the COVID-19 pandemic. If edge devices can replace the need for a human to make a repair call or check the status of a piece of equipment on a factory floor, employee safety improves while productivity increases, since workers no longer need to travel to—and climb into or over—failed equipment to diagnose problems.

Edge computing and IoT devices have become increasingly sophisticated, collecting ever more types of data, ever more frequently. A newer generation of sensors and other devices increasingly run on battery power, allowing new use cases where power sources had previously not been available or cost effective.

The need for speed – and beyond

The enhanced capabilities of edge computing have the potential to lead to new use cases that can improve the user experience. Applications can become more immersive, increasingly tactile and more graphics-intensive. However, with the increased amount of data required to support such rich environments, a shorter control loop is needed to meet the demands of near real-time responsiveness. To take full advantage of these applications, organizations require a network infrastructure that supports emerging technologies like artificial intelligence and machine learning to achieve or maintain a competitive edge.⁴

As processing performance and the subsequent amount of data that is generated increase, the network infrastructure that supports these new applications must also scale to handle more devices, users and information. Some of the elements required of a network designed for the edge include:



Bandwidth

To successfully transmit an ever-growing amount of data, edge networks demand bandwidth that can scale on demand, blurring the line between wired and wireless connections. Increasingly, customers want a network that will meet their needs without having to worry about the intricacies of the underlying network technologies.



Reliability

As more processing moves to the edge, applications will become increasingly mission-critical. A sustained loss of availability could have a disastrous impact on the continuity of business operations.



Security

End-to-end encryption of data and control planes are table stakes. Tools to thwart malware and raise alerts to possible network attacks become important to help ensure that customer data and proprietary information remain safe today, tomorrow and next week.



Latency

Edge computing is all about low latency and reducing the time it takes from data capture to actionable insights.



Density

In today's world, not only are there more edge devices than humans, but there are also more employees and customers accessing corporate resources. What's more, they often rely on multiple mobile devices – sometimes to complete a single action. The ability to increase network capacity to support more devices in a given area is crucial for future networks.



Flexibility

Networks must be agile enough to support rapid changes, whether a new service rollout or a spike in demand. Networks need the flexibility to slice up bandwidth and resources to accommodate critical applications that ensure quality of service and help meet service-level promises.

All of these capabilities are designed into 5G architecture.

The 5G difference

The positive impact 5G will have on enterprise edge computing is substantial. For example, one large U.S.-based manufacturer of fiber-optic cable recently embraced 5G for its edge network infrastructure. Now the company is building on that investment and developing new edge applications to take advantage of its enhanced network capabilities.⁵ Its 5G plans include:

- Machine learning to increase automation and improve employee productivity
- Enhanced manufacturing processes with tools such as augmented and virtual reality, to take advantage of 5G's low latency, fast speed and high bandwidth
- Near real-time machine-to-machine communication, to dramatically increase data collection speed
- The ability to inspect and track inventory with 5G-connected cameras
- Improved functionality and efficiency of the factory floor, with the use of autonomous guided vehicles

The problem with technology inertia

To be successful, enterprises must keep moving forward. History shows that as competitive pressures mount and technology advances, companies that opt for the status quo may suffer dearly in the marketplace. Failure to meet these challenges by adopting a 5G strategy could lead to lost cost efficiencies for edge computing, as slower LTE networks are not likely to be able to support the increasing number of applications written with 5G in mind.

Enterprises should include a 5G strategy in their infrastructure to keep competitive in terms of network agility and flexibility. 5G offers the ability to create a network that evolves with a company's needs, sliced for each application. This unique feature of 5G networks effectively creates made-to-measure network configurations for a range of unique needs, ensuring that each is met without starving other applications of needed bandwidth. As network demands continue to grow, organizations that embrace high-performance edge computing applications will likely stand on more solid footing.

5G edge success factors

As enterprises develop a winning edge network strategy, the following factors should be taken into consideration:



Tools

A rich set of implementation tools designed for the edge, to speed the development, deployment and management of 5G edge applications



Network slicing

The ability to carve out bandwidth and performance slices, using the frequencies that meet all of an enterprise's business needs



Security

Security that is inherent to the network infrastructure and tools, integrated with the applications and edge devices to meet end-to-end security and governance mandates



Network basics

Basic network characteristics of bandwidth, low latency and support for device density, whether in the office, in a factory or at a stadium

Data collected and processed at the edge is aggregated and summarized, greatly reducing the bandwidth required to send and receive information between the network's edge and its core. All of these enhancements will help lower the costs to process, move and store data, because it will be handled where it makes the most sense in the network.

Solid preparations for 5G

Verizon recommends that enterprises prepare for their digital transformation—at the edge and enterprise-wide—by adopting five states of readiness. They can help business leaders through a digital communications transformation, from how to begin to which actions are needed to elevate, innovate and disrupt. They are:

1. **Ready to Start:** For enterprise, this could mean upgrading the WAN, while for smaller businesses, it may begin with migrating to a VoIP communication solution to prepare to streamline mobility, video conferencing and online meetings.
2. **Ready to Adapt:** These behind-the-scenes efforts help make IT more agile and efficient, such as adopting a software-defined WAN to better meet changing service demands via policies that help a network adapt on the fly.
3. **Ready to Elevate:** Elevating technology is critical to digital transformation. For example, a logistics company could update its supply chain software with next-generation fleet telematics that reduces blind spots and improve on-time delivery rates with new smart IoT sensors. 5G-powered computer vision will make these processes even more valuable.
4. **Ready to Innovate:** Innovation goes beyond operation, addressing value-added solutions that drive the business forward. These innovations help businesses get noticed in a crowded market—especially those that can anticipate the needs of their customers ahead of time. Verizon collaborates closely with customers to help them prepare to innovate, offering its Contact Center Managed Services (CCMS) around the globe, for example, and Verizon Knowledge Assist, a powerful AI tool.
5. **Ready to Disrupt:** The fifth and final state of transformation is being ready to disrupt. These organizations begin to adopt tools like augmented and virtual reality and other new technologies to design revolutionary experiences, changing the way the business approaches everything from forecasting to inventory management.

Verizon offers a partner network and ecosystem to help organizations create 5G edge and enterprise-wide applications. It also offers a broad range of professional services to help enterprises design and deploy their 5G edge network.

Verizon's goal for 5G is simple: to help every organization realize the full potential of 5G at the edge.

For more information, please contact your Verizon Business Account Manager.



1 Cisco Annual Internet Report (2018–2023), Cisco, Mar 9, 2020.

2 "The Future of IoT Miniguide: The Burgeoning IoT Market Continues," Cisco, Jul 19, 2019.

3 "How Much Data Is Created Every Day in 2020?" TechJury, Sep 10, 2020.

4 "How 5G Will Unleash AI," Forbes, May 8, 2020.

5 "Verizon and Corning Co-innovating with 5G to Create Factory of the Future," Verizon, Oct 23, 2019.

Network details & coverage maps at vzw.com. © 2020 Verizon. WP11141020