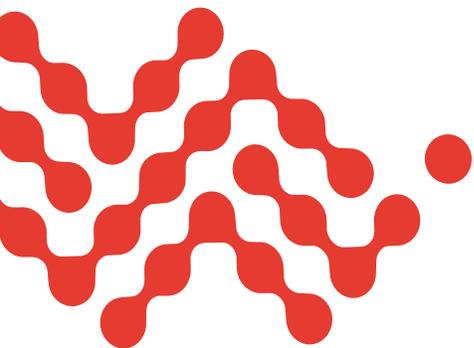




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5G Private Networks: Driving Digital Transformation and Business Growth

As consumers, we see the benefits of 5G with faster connectivity and the promise of real-time video on our mobile devices. On the home front, cellular service providers are rolling out 5G speeds on par with broadband/cable connectivity. These speeds enable providers to connect new homes and upgrade services without adding or upgrading cables or fiber optics.



For businesses and organizations, 5G delivers the potential to accelerate digital transformation through faster connectivity speeds, lower latency, increased capacity and increased security. When 5G is implemented in conjunction with a private cellular network, organizations can achieve additional business gains in the areas of automation, security and safety.

According to a study by Polaris Market Research, the global market for 5G-based private networks is projected to reach \$13.92B by 2028, representing an eight-year CAGR of 40.9%.¹ According to the study, key growth factors for 5G private networks include the need for ultra-reliable low latency connectivity in industrial applications, growth in time-sensitive and real-time networking, and new emerging trends in digitalization. In addition, network security is a strong driver as companies seek more control of their data content and data flows.



Benefits of Private Cellular Networks

A private cellular network is exclusively dedicated to a particular business or organization. It includes cell sites and core network servers that support an organization's cellular connectivity requirements, eliminating reliance on public cellular networks.

A private network helps ensure that you have consistent, reliable coverage across your entire organization's footprint, which is especially important for remote locations where there is no public cellular coverage. It's also critical for complex environments where physical structures (e.g., shelves in warehouses and ships/containers in a port) block Wi-Fi signals.

Private networks also offer increased security by restricting access to the network and adding new and redundant layers of security not typically offered to the public.

The Impact of 5G on Private Networks

While private networking is achievable using 4G LTE, 5G delivers significant improvements in speed, latency and connection density.

- **Speed**

5G delivers higher throughput than 4G LTE networks which is essential for data-intensive applications such as high definition video. Actual throughput depends on the technology and spectrum used, but enhanced 5G offers peak theoretical download speeds of at least 20Gbps and reliable 100Mbps usage in dense urban areas.²

- **Latency**

4G LTE networks offer a theoretical latency of 10ms while delivering approximately 30-50ms in practice. 5G is currently providing latency down to single digits, with lower latencies coming as hardware and infrastructure evolve.³ Low latency is essential in applications such as robotics, manufacturing, remotely operated systems and vehicle-to-vehicle communications.



- **Network Slicing**

4G LTE network cores were difficult to segment for varying traffic types, leaving customers unable to shape their data flows for different network and bandwidth requirements. The 5G network core introduces network slicing, enabling network operators to virtualize network traffic, typically in a cloud-based flexible environment. In addition, its software-defined network technology introduces control plane functions that allow administrators to create mini-services supporting network connections with different performance profiles.

Private network operators can prioritize specific applications for quality-of-service purposes. For example, real-time robotic applications could be given network priority, where low bandwidth IoT sensors might only need a narrow part of the spectrum.

- **Increased Connection Density**

5G is designed to seamlessly connect a group of IoT devices in a given area. 5G will eventually handle as much as 100 times more connected devices per square kilometer, up to one million devices.⁴

- **MEC**

5G Multi-Access Edge Computing (MEC) brings compute power closer to the network edge, eliminating the time it takes to run data to a centralized data center. This reduces communication latency, increases system performance and leads to new business opportunities.

- **Wi-Fi 6**

While 5G offers significant advantages over Wi-Fi, the new release of Wi-Fi 6 delivers higher capacity, lower latency, and higher speeds than its predecessor, Wi-Fi 5. Organizations can roll out their 5G private network for critical applications and use Wi-Fi 6 for less critical functionality.



Making A Case for 5G Private Networks

While there is significant growth projected for 5G private network usage, spend will be small, less than 10% of what will be spent on public LTE and 5G networks in the next 5 years.⁵ Factors inhibiting growth include long capital equipment replacement cycles in target markets such as manufacturing, along with the high up-front cost and complexity of implementing a 5G private network. As a result, larger enterprises that can show a high return on investment (ROI) will be the earlier adopters of 5G private networks.

5G private network growth is being driven by an increase in the available spectrum. For example, in the US, the CBRS (Citizens Band Radio Service) spectrum within the 3.5 GHz band previously controlled by the US government was first made available by public auction in 2020. In addition, the unlicensed 900 MHz band is used for real-time monitoring of industrial, utility and railroad operations. In Germany, the 3.7-3.8 GHz 5G band is available directly from the government for industrial application use.

5G Private Networking Use Cases

Below are three use case examples of successful 5G private network implementations:

MANUFACTURING

Manufacturing companies can use 5G private networks to support autonomous robots on the factory floor with ultra low-latency communications. These networks enable manufacturers to reliably communicate despite electronically “noisy” environments, large metallic production equipment and thick facility walls and floors. In addition, 5G private networks can support the high-speed relay of production data to local edge computing operations for real-time in-factory processing.

According to the ARC Advisory Group, 5G has the potential to fulfil the holy grail of industrial connectivity: freedom from the high cost and functional limitations of wired infrastructure.⁶ 5G private networking has been implemented in General Motors Factory ZERO, the first automotive plant in the US to install dedicated 5G fixed mobile network technology. Bosch has also embraced 5G technology and is planning to roll out 5G to their roughly 250 plants around the world.⁷ Bosch views 5G as a competitive advantage that will enable secure, improved and more flexible production. In addition, the 5G private network enables factory operators to have all relevant security aspects under their complete control.⁸

TRANSPORTATION HUBS INCLUDING SHIPPING PORTS AND AIRPORTS

Transportation hubs are currently at the center of supply chain backlog discussions. Most hubs are looking at ways to improve efficiency, lower costs and increase monitoring and safety. According to Ericsson’s Connected Ports report, shipping



ports are looking to improve operations through remote-controlled ship-to-shore cranes, automated gantry cranes, automated guided vehicles, equipment condition monitoring and drones for surveillance and delivery.⁹ These initiatives require using a 5G private network for implementation.

According to Senza Fili, one international seaport recently studied ways to improve voice and data coverage throughout the port.¹⁰ The study determined it would require 11,000 Wi-Fi access points or 15 private LTE base stations. With the private LTE stations, they can track everything within the port, increasing operational efficiency and reducing shipping errors.

SMART CITIES

Cities are beginning to deploy private networks to enable their community's digital transformation. Private networks run by a municipality can help bridge the digital divide bringing internet connectivity to disadvantaged people in the community. Private networks also allow municipalities to control traffic congestion better, communicate with first responders and monitor utilities. According to Enterprise IoT Insights, by 2025, almost one quarter (23 percent) of all private LTE and 5G networks will be deployed by smart cities, either at local or national government levels.¹¹

The City of Las Vegas has recently deployed what is claimed to be the largest LTE, 5G-ready private, municipal network in the US.¹² A primary goal of the network was to help bridge the digital divide during COVID-19 school shutdowns by connecting with over 30,000 children lacking internet access. The Las Vegas Advanced Connectivity for Community and Economic Development (ACCED) network uses CBRS spectrum and, as of July 2021, covers around 65 square miles surrounding the downtown area. It is available for internal city departments and students of the Clark County School District. The city plans to expand the wireless network throughout Las Vegas and potentially neighboring cities.

Making It All Happen

While the thought of designing your own 5G private network may be daunting, there is help available. Numerous private companies can help develop and implement a 5G private network that meets your individual needs. In addition, several telecom service providers are beginning to offer private networking implementations along with their public cellular offerings. And grants are available to help municipalities implement a community-wide private network.





Sierra Wireless AirLink Routers for Private Cellular Networking

Sierra Wireless AirLink® routers deliver best-in-class connectivity, combined with intelligent management and real-time monitoring for public and private networks. Our routers are purpose-built and military/industry-certified to survive in extreme environments while delivering ultimate VPN security.

The [AirLink XR80](#) and [AirLink XR90](#) are Sierra Wireless' newest generation of 5G routers designed for mission-critical and business-critical applications. The AirLink XR90 is best suited to mobile applications, and the AirLink XR80 is designed for fixed-use applications. The [AirLink RV55](#) supports 4G LTE and LTE-M/NB-IoT functionality for Industrial IoT and SCADA applications.

All AirLink routers are supported by AirLink Complete or AirLink Premium services, providing router management tools, reporting and technical support. AirLink Professional Services can further assist you with your 5G private network development and deployment.

The Sierra Wireless difference

With a rich 25-year history of innovation in the wireless space, Sierra Wireless has been the first to market with many technology solutions for global customers.

Our innovative products and solutions connect thousands of businesses to critical data and millions of people to information. Our customers trust us to develop products and services that get them to market faster and can, in turn, help save lives, reduce carbon emissions and make neighbourhoods safer.

Not only do we build solutions for our customers, but we maintain relationships with carriers around the world to untangle the complexity of cellular connectivity and contracts. This partnership enables us to present a single, easy plan for customers that combines hardware sales, operations and services under one relationship. It's a one-stop-shop solution designed to get your operations off the ground quickly.

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About Sierra Wireless

Sierra Wireless (NASDAQ: SWIR) (TSX: SW) is a world leading IoT solutions provider that combines devices, network services, and software to unlock value in the connected economy. Companies globally are adopting 4G, 5G, and LPWA solutions to improve operational efficiency, create better customer experiences, improve their business models, and create new revenue streams. Sierra Wireless works with its customers to develop the right industry-specific solution for their IoT deployments, whether this is an integrated solution to help connect edge devices to the cloud, a software/API service to manage processes with billions of connected assets, or a platform to extract real-time data to improve business decisions. With more than 25 years of cellular IoT experience, Sierra Wireless is the global partner customers trust to deliver them their next IoT solution.

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