

This IDC Spotlight discusses the leading trends, potential benefits, and challenges that organizations face as they look to take advantage of private 5G solutions.

Unified Wireless: Simplifying Private 5G and Wi-Fi Deployments to Enable Next-Generation Connectivity

October 2025

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Introduction

The private 5G (P5G) market is maturing rapidly with commercial activity accelerating worldwide as enterprises address their next-generation wireless connectivity needs. Private 5G is particularly compelling in use cases that require wide area coverage, high-speed mobility, and dedicated spectrum for mission-critical applications. As private 5G gains momentum beyond early deployments, it is also redefining how organizations can use this technology to complement Wi-Fi and drive pervasive wireless coverage across the operational footprint. While Wi-Fi has a well-established role today, private 5G adds a new dimension to enterprise planning.

Survey data reinforces the market momentum for private 5G: IDC's 2025 *Enterprise Connectivity and Infrastructure Survey* (n = 758) asked a global respondent class how their organization's use and investment in various connectivity-related products and services will change over the next 12 months. Some 62% of respondents reported they would increase their investments in private mobile network infrastructure (4G/LTE/5G), with 29% reporting they would increase their investments more than 10%.

Indeed, early commercial deployments have shown that private 5G can help organizations reliably connect mobile endpoints in situations where applications and devices may require reliable and deterministic performance or wide area coverage over outdoor campuses and grids.

Even so, organizations are learning that there are many factors to evaluate when adding private 5G to existing Wi-Fi and wired networks. When considering private 5G, it is important to analyze where 5G and Wi-Fi can work together to solve customer problems.

For example, recent innovations in Wi-Fi 6E and Wi-Fi 7 have enhanced Wi-Fi's ability to optimally address a higher density of connections, particularly indoors. Private 5G can help by covering devices outdoors and over longer distances, or where endpoints are moving at high speeds. It is also advantageous in very crowded or complex radio frequency (RF) environments to ensure connectivity for mission-critical applications.

AT A GLANCE

WHAT'S IMPORTANT

- » Private 5G augments Wi-Fi to help organizations support a range of applications by improving network wide area coverage, dedicated capacity for mission-critical applications, and high-speed mobility.
- » Enterprise-grade simplicity, flexibility in deployment options, and integration with existing management solutions can help IT and network admins overcome barriers to implementing private 5G.

As such, private 5G and Wi-Fi can augment each other in many scenarios. However, private 5G remains a relatively new technology, unfamiliar to many enterprise IT and operational technology (OT) staff. Historically, 5G (and 4G/LTE) was designed and deployed at scale to support millions of subscribers connected to a service provider (SP) network, but that is changing. Private 5G solutions can differ in several ways, including a smaller form factor radio for ease of integration and power savings, the use of lightly licensed or shared spectrum, and an emphasis on hybrid cloud delivery where portions of the private 5G stack can be hosted both on premises and in the cloud.

Applying Private 5G to Industry Use Cases

While private 5G adoption can be segmented by verticals and use cases (see Figure 1), the foundational driver for private 5G across all adopters starts with improved coverage. Whether it's a utility connecting geographically distributed substations or a manufacturer unifying the value chain across assembly and distribution centers, reliable coverage is the starting point. While adopters may start with coverage in mind, they are quickly finding ways to repurpose private 5G for more advanced use cases.

Table 1 highlights some of the leading vertical adopters of private 5G and shows where and how the technology can add value to an organization's connectivity footprint. Considering today's adoption rate and number of contracts, IDC expects the worldwide private LTE/5G network infrastructure market (both RAN and core) to reach \$5.9 billion by 2029.

TABLE 1: *Private 5G Use Cases by Industry Vertical*

Industry Vertical	Featured Use Cases
Manufacturing and warehousing	Real-time automation/process automation, monitoring, automated guided vehicles (AGVs), industrial controls, and smart factory
Public sector and defense	Tactical network, facility modernization, and rapid deployment kits for field divisions
Transportation and logistics	Monitoring and tracking, hazard sensing, barcode scanner, surveillance, and worker safety
Energy and natural resources (e.g., mining)	Remote monitoring and control, digitized operations, data curation/management, AGVs, automated extraction
Stadiums and public venues	Back-of-house applications, including point of sale (POS), ticketing, and video surveillance
Higher education	R&D and innovation lab enablement, data privacy, campus connectivity, event and ticket management, and video surveillance
Retail	Video applications, tracking and monitoring, POS, and smart signage

Source: IDC, 2025

Defining Private 5G

While most enterprise IT teams are familiar with Wi-Fi solutions, many will have to learn new terminology and value propositions when evaluating private 5G. Doing so can help potential adopters understand how to deploy and manage private 5G within an existing IT framework.

Private Wireless Network (Private LTE or P5G)

- » **A private wireless network** is defined as any 3GPP-based cellular network deployed for a specific enterprise/industry vertical customer that provides dedicated access to private resources. Such a network could include dedicated spectrum, hardware, and software infrastructure, and it comprises a solution that can support a range of use cases spanning fixed wireless access, traditional and enhanced mobile broadband, IoT endpoints/sensor connectivity, and ultra-reliable low-latency applications. Private LTE/5G infrastructure carries traffic native to a specific organization, with no shared resources in use by any third-party entities.

Private 5G Components

- » **Small cell radios:** Small cells are smaller, less energy-intensive radios that are well suited for enterprise deployments. In the instance of private 5G, small cells provide the radio access coverage that devices connect to.
- » **Mobile core:** The mobile core, or 4G/5G core, is the control center of a private cellular network that manages all the data traffic as well as the protocols, interfaces, and services that provide functionality. Today's core adopts a service-based architecture (SBA) in which the discrete core network functions can be in a variety of settings — including on premises and in public, private, and hybrid clouds — hosted and managed as a set of microservices.
- » **Spectrum and shared spectrum for private 5G:** Like Wi-Fi, private 5G is reliant on spectrum to provide connectivity. Unlike Wi-Fi, private 5G spectrum is either acquired from operators or uses a lightly licensed regulatory model. The United States uses Citizens Broadband Radio Service (CBRS) for access to shared spectrum, while many key markets in Europe, South America, and Asia are standardizing and adopting a lightly licensed model for spectrum in the 3.5–4.2GHz range.

Private 5G Deployment Considerations

As noted previously, private 5G is emerging as another tool to help enterprises deploy new applications and use cases. While the technology's value is slowly becoming apparent, private 5G best practices remain a work in progress. For example, deploying private 5G often requires up-front planning to ensure that deployments align with the organizational strategy and efficient deployment and management. However, some early deployments have faced challenges with the project scope, TCO, and efficient management of a new class of 5G infrastructure and devices by IT teams. For private 5G adopters to see the most benefits, some key considerations are as follows:

- » **Focus on simplicity and flexibility:** Organizations often have a critical decision point when it comes to private 5G: Deploy a turnkey solution with all necessary components included, or take a modular approach, which enables customers to bring their own equipment tailored to their specific use case. In some instances, a modular approach is warranted, for example, where a specialized small cell radio is required (e.g., in an underground mine). In other cases, a unified or end-to-end approach offers compelling advantages, including simplified procurement, integration, and deployment timeline. Private 5G networks require a full stack of hardware and software spanning

small cells (radios), radio management, core software and hardware platforms, plus dashboards for management. The range of components is often cited as a key inhibitor for many enterprises. Offering organizations flexibility in deployment models, including offering turnkey solutions, will ensure private 5G can be used for a wider range of use cases. More broadly, solutions that simplify day 0 planning, day 1 deployment, and day N ongoing management are key.

- » **Ease of integration:** With enterprises inundated with many options for connectivity, most deploy a wide range of technologies to support their applications and use cases. For example, it is relatively common for an enterprise to deploy or consume a range of fixed and wireless networks that are often integrated underneath a broader SD-WAN/SASE platform. For private 5G to become relevant across many industries, it will need to align with an enterprise architecture, not the other way around. In detail:
 - **Integration in the secure AI-native management layer:** One area where integration can be most impactful is in the network management layer. IT teams are already experts at managing Wi-Fi by using a single-pane dashboard approach. Any private 5G solution should readily integrate with existing dashboards to provide ubiquitous visibility to subscribers, applications, and performance metrics while ensuring that service-level agreements are consistently met. Unified wireless management of both Wi-Fi and private 5G enables organizations to take advantage of AI-powered engineering and operations capabilities that can be managed centrally and deployed across both technologies. The goal is to empower IT teams without adding more time, effort, and resources to learn a new management interface.
 - **Alignment with Wi-Fi offerings:** Private 5G and Wi-Fi can work together to deliver pervasive wireless coverage in scenarios ranging from RF-sensitive indoor environments to large grid-based coverage needs outdoors. Indeed, both solutions provide suitable coverage when deployed, but integrating them via unified management can provide even more control, simplicity, and security for enterprise IT teams. The latest innovations in Wi-Fi 6/6E and Wi-Fi 7, and the ability to deploy Wi-Fi on the 6GHz band, will only increase its ability to support a broader range of use cases on the wireless network.

Trends: Broader Spectrum Availability Helps Private 5G Gain Traction Globally

The general availability of private 5G spectrum will continue to improve. Within the United States, the CBRS spectrum-sharing paradigm is maturing, while many developed countries are seeing regulatory agencies move to unlock spectrum for private 5G use.

In 2019, the U.S. market formally adopted a shared spectrum strategy whereby an overarching spectrum management system enables CBRS tenants to utilize 150MHz of spectrum (3.55–3.7GHz) for many uses. CBRS users include large service providers, enterprises, and even neutral host providers that are targeting multitenant opportunities.

Outside the United States, the spectrum allocated for private 5G usage differs greatly. In certain industrial nations such as Germany, France, and Japan, regulators have allocated licensed spectrum for enterprise or industrial use, which is available for licensing on more enterprise-friendly terms.

Overall, the rise in private 5G interest and early commercial adoption is expected to push many more countries to either develop a shared spectrum model like the United States or allocate dedicated spectrum for enterprise use. By the end of

2025, IDC expects over 25 countries spanning the Americas, Europe, and APAC to have either dedicated or shared spectrum policies in place for private 5G adoption.

In addition, the current geopolitical climate is prompting governments and industries to harden critical infrastructure. In light of global conflicts and geopolitical tensions, countries are exploring private 5G as an application for government, utilities, energy, manufacturing, and Smart Cities as a means to protect critical infrastructure from cyberattacks and data intrusion. This expansion of broad spectrum availability will lower the barrier to entry for private 5G and allow for standardized offerings and faster time to value.

Considering HPE's Solutions for Private 5G

HPE is a leading provider of enterprise network solutions. The company has a range of advanced wireless LAN (WLAN) infrastructure, including Wi-Fi 7 and Wi-Fi 6E access points (APs) with Wi-Fi location certifications, extensive IoT support, and cloud-based management. Further, HPE has elevated its portfolio to address key enterprise industry trends, including SD-WAN/SASE and cloud-managed Wi-Fi. As part of this innovation, the company has been developing a private 5G solution that is deeply integrated with its existing solution.

HPE Aruba Networking Private 5G

HPE offers a full-stack private 5G solution, HPE Aruba Networking Private 5G, which is designed to make it easier for IT teams to deploy and manage private cellular networks. For customer flexibility, the solution can be deployed in two ways:

- » "Turnkey," in which all hardware and software components, including 4G/5G mobile core software, hardware appliance, small cell radios, SIMs/eSIMs, and cloud management dashboard, are supplied and supported by HPE (currently available in the United States, with international markets on the product road map)
- » "Modular," in which a customer deploys the HPE 4G/5G mobile core but uses third-party small cell radios (and potentially other components) to support regional requirements and/or specialized use cases (this option is available globally) (For customers that don't have a preferred radio vendor, HPE has a formal agreement with Nokia whereby HPE can resell Nokia radios in most geographies.)

HPE Aruba Networking Private 5G includes:

- » The 4G/5G core software has been on the market for over 15 years and has over 600 enterprise deployments. The core software includes all 4G and 5G services, so enterprises can begin with 4G (often to support existing device types) and then migrate to 5G without needing to upgrade the software.
- » A cloud-native dashboard is available for deployment and management of the private 5G network. The dashboard can be paired with HPE's other management platforms (e.g., HPE Aruba Networking Central) for dual dashboard control of Wi-Fi, private 5G, and other LANs. Integration at the network management layer represents innovation in the private 5G marketplace and will help enterprise IT teams simplify the management of multiple LANs, regardless of access type:
 - HPE is taking a stepwise approach by first offering dashboard-integrated management of private 5G radios via the existing dashboard.

- HPE plans to support single dashboard management of wired, wireless (private 5G and Wi-Fi), and SD-WAN solutions. This will enable customers to leverage HPE Networking's "AI for networking" (i.e., AIOps) and self-driving network capabilities.
 - Unification will also extend to policy, whereby devices that can dually connect to a Wi-Fi or private 5G network will be able to share policy parameters, even if they transition from one network to another. HPE utilizes proven technology that supports device identity handoff to a Wi-Fi or cellular network by sharing device credentials in real time. This innovative capability can enable a device to seamlessly traverse wireless LANs while ensuring identity and security.
- » HPE indoor/outdoor small cells are designed for multiple deployment scenarios as well as ease of procurement during a private 4G/5G project. Current versions support the B48/n48 spectrum bands (e.g., CBRS or 3.5GHz), but versions that support n77 (3.7GHz) and n78 (3.5GHz) are planned for the near future.
- » In addition to the foundational private 5G hardware and software (e.g., core, small cells), HPE supports a hybrid deployment model with HPE servers on premises, SIMs for device connectivity, and integration with spectrum access systems for CBRS implementations. Considering the complexity commonly associated with early private 5G implementations, HPE's fully integrated and preconfigured approach (i.e., "turnkey" as aforementioned) has the potential to accelerate deployments and lower the learning curve for enterprises.
- » HPE will support neutral host networks through partnerships with MNOs and other third-party service providers. Leveraging operator relationships established through HPE Aruba Networking Air Pass, HPE's hybrid solutions will support both private network services and shared public/subscriber access.

HPE Aruba Networking Central

This cloud-based network management platform is for HPE Aruba Networking wired, wireless, and WAN solutions. It leverages an AIOps framework to resolve issues and make recommendations; streamlines operations across wired, wireless, and WAN architecture; and leverages intent-based policy, automation, and orchestration for improved network security.

HPE Aruba Networking Wi-Fi access points and CX switches are managed by Central. The Wi-Fi 6E and Wi-Fi 7 APs support the 6GHz band for faster, more reliable performance and extend the standard with enhanced IoT connectivity and visibility, AI-powered sustainability, and location services capabilities.

HPE GreenLake

HPE GreenLake remains a foundational aspect of HPE's go-to-market capabilities. Indeed, many early private 5G implementations have adopted either a hybrid cloud or a fully private cloud model, where network management and core network functions are hosted in the cloud to reduce up-front costs, ease management, and support software upgrades.

Challenges

- » **Limited spectrum availability on a country-by-country basis:** Spectrum availability for private 5G is swiftly improving on a global basis but has not achieved parity with other WLAN solutions, such as Wi-Fi, which benefits from a federated spectrum model adopted globally.

- » **Lack of enterprise technical knowledge:** 5G is a technology initially designed and deployed for telecom service providers, thus creating a solution and knowledge gap within enterprises that may want to deploy a private 5G network for their own consumption. However, that is changing as solutions are re-architected and pre-integrated with existing enterprise offerings.
- » **Relative lack of 5G-compliant devices:** In IoT use cases, a key challenge for P5G is the lack of 5G-compliant devices, particularly among legacy equipment. 5G support in new devices is ramping, however, and there are solutions related to using eSIM or iSIM or leveraging management platforms that can support management of both Wi-Fi and 5G-compliant devices.
- » **Limited resources:** Enterprises constantly struggle with where to dedicate time, money, and internal learning to produce the best outcomes. As private 5G is a newer solution for enterprise teams, it is prudent for private 5G to be seamlessly managed alongside Wi-Fi/wired networks on a single pane of glass, which can lower the burden on enterprises to master the technical aspects of a private 5G solution from day 1.
- » **Enterprise awareness:** Many organizations are simply unaware that private 5G is an option in the enterprise IT marketplace. While the private 5G ecosystem continues to grow, it will fall to a mix of stakeholders spanning telecom service providers, systems integrators, and vendors such as HPE to drive private 5G awareness.

Conclusion

The private 5G market continues to flourish, offering wider coverage, higher-speed mobility, and additional spectrum for mission-critical applications to augment Wi-Fi's ubiquitous reach. Private 5G helps connect mobile endpoints reliably, especially where dedicated performance, data privacy, or wide area coverage is needed. Emerging innovations in both Wi-Fi and private 5G provide a compelling "1 + 1 > 2" value proposition for many enterprises. With private 5G deployments continuing to gain momentum, it is clear that many organizations see value in this technology for its ability to support pervasive wireless coverage and a range of use cases and applications, from wider area coverage to higher-speed mobility to traffic segmentation to challenging RF environments.

Organizations worldwide continuously evaluate how to connect devices and endpoints in the most efficient and beneficial way possible, and private 5G is a compelling way to augment existing Wi-Fi deployments.

About the Analyst



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To learn more about HPE Networking solutions for private 5G, visit hpe.com/us/en/aruba-networking-private-5g.html. For real-time news updates, follow us on X and Facebook, and for the latest technical discussions on mobility and HPE Networking products, visit the Airheads Community on airheads.hpe.com/home.



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