The State of Play in the Private 5G Market

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Contents

Summary

Summary and key takeaways

Where are we with private 5G?
Spectrum liberalization in countries such as Japan, the US, South Korea, and Germany along with the needs of enterprises for security and control of a reliable networking solution are two of the key trends that are underpinning the growing relevance of private 5G networks.

Private 5G is a global phenomenon
Every corner of the world and every vertical has seen private 5G networks deployments, and industrial verticals are leading the way to private 5G adoption. From a regional perspective, the highly industrialized regions and countries that have made spectrum available for the enterprise are at the forefront of private 5G development.

There are still obstacles on the way to wide-scale adoption
The market needs to overcome some significant challenges to really mature. For instance, enterprises do not have an in-depth knowledge and understanding of 5G. This means they may be hesitant to trust the technology for their mission- and business-critical needs. Providers need to learn how to sell private 5G in a complex and fragmented market.

You cannot talk about private 5G without edge and applications
Alongside connectivity, edge computing—a distributed computing model that places workloads in multiple locations (e.g., on the device, on site, or at the network edge) closer to the data source—becomes an obvious complementary asset. Connectivity, edge computing, and applications need to be considered together to drive an enterprise's transformation. Any enterprise will need a mix of connectivity, multiple computing locations, hybrid architecture, and applications to meet its varied needs. Within this scenario, a unified platform that enables connectivity, computing, and applications becomes a game changer because it eases enterprise adoption thanks to a single experience and set of tools.

No one can do it all alone
Every category of company that is active in the technology market is interested in private 5G, but given the wide set of skills that it requires, no one wins alone. Private 5G has a complex competitive environment that highlights the need to create successful partnerships and ecosystems to serve the varied needs of a rapidly evolving multi-vertical market.

The state of the market

Private 5G gains momentum

Private 5G networks have gained immense attention and are becoming a prominent opportunity because of their key role in supporting enterprises' transformation. The race to monetize private 5G networks involves various stakeholders including service providers, cloud service providers, technology vendors, system integrators, and enterprises themselves. The global private 5G networks market is projected to reach $7.5bn by 2027.

Private 5G adoption is set to become a cornerstone of an enterprise transformation, and this is because of various trends underpinning this market:

- **Spectrum availability drives market growth.** The availability of dedicated spectrum is a fundamental factor driving the adoption of private 5G networks. Dedicated spectrum resources enable optimal coverage, capacity, and performance. Governments and regulatory bodies are recognizing the importance of allocating suitable spectrum bands for private network use, fostering innovation, and supporting specific industrial use cases. The availability of appropriate frequency bands can vary by region and country; there is also a growing trend of service providers providing their own spectrum to support private 5G deployment. As of September 2023, more than 30 countries have provided spectrum to the enterprise or are planning to do so, among them the US, Japan, Germany, Norway, and South Korea.

- **Enterprises want enhanced control, security, and customization.** Private 5G networks offer enterprises control over their connectivity infrastructure. With their selected partners, organizations can design, configure, and manage their networks according to their specific needs, ensuring data privacy, security, and compliance with industry- or country-specific regulations. This level of control is crucial for industries dealing with sensitive data or mission-critical operations. Private 5G networks enable enterprises to tailor their network architecture to suit their unique requirements. This flexibility extends to coverage areas, application support, and quality of service. As industries become more specialized and diverse in their needs, the ability to customize network parameters becomes a key driver for adoption.

- **Private 5G can replace and consolidate legacy technologies.** Private 5G networks are becoming a preferred technology because of the capabilities of cellular technology to serve multiple use cases. For instance, the technology can be used to replace Wi-Fi in outdoor environments because of its better coverage and mobility, or it can replace land mobile radio (LMR) technologies such as Tetra to support higher-bandwidth critical communications. It is also better suited than any other technology to connecting both fixed and mobile assets, for instance, in a factory environment. Thus it is ideal to drive industrial automation.

From an enterprise perspective one driver stands out: security, data management, and privacy was ranked number one by 19% of respondents, according to Omdia's *Private LTE and 5G Networks Enterprise Survey Insight 2022 – Drivers, Technologies, and Applications*. Enterprises want to have control of their network, and providers should emphasize these messages. Enterprises can implement tailored security measures and configurations that align precisely with their security policies and regulatory requirements. But the market is not the same everywhere: for instance, 21% of manufacturing enterprises ranked enabling process automation as the number one driver, making it the main driver for that sector. This can be explained by the strong need for efficiency and productivity on the assembly line, which automation can bring. Sixteen percent of energy and utilities enterprises ranked consolidating various network technologies as the number one driver.

Figure 1: Top five drivers for enterprise adoption of private 5G (proportion of enterprises ranking an option 1 or 2)

Note: n=450

■ Rank 1 ■ Rank 2
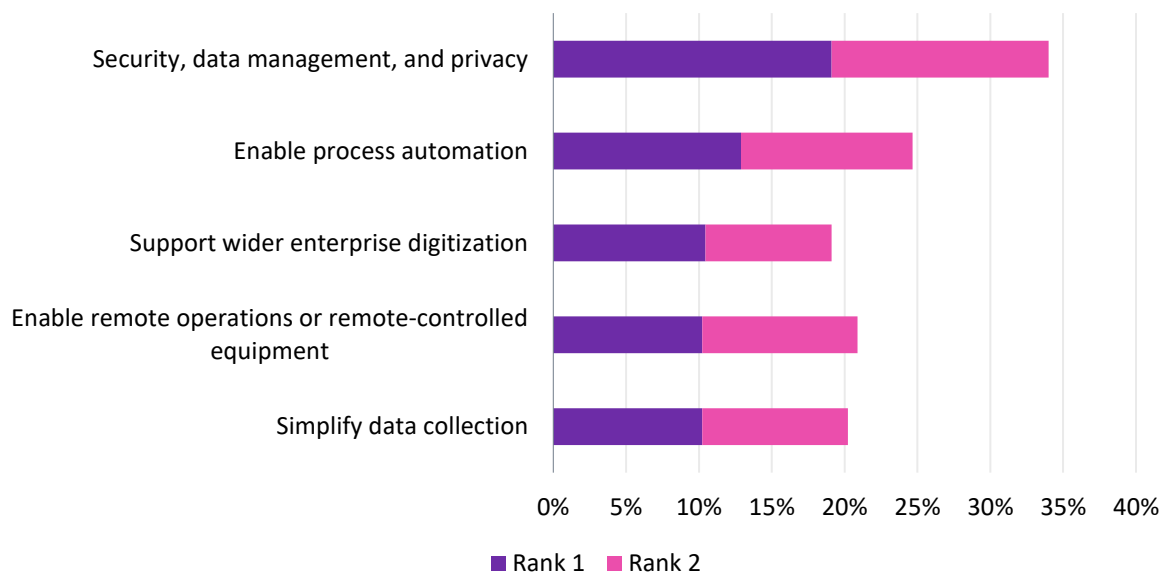
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Source: Omdia Private LTE and 5G Enterprise Survey Insights 2022 – Drivers, Technologies, and Applications

A market built on multiple geographies

Highly industrialized regions are first movers

Private 5G is a global phenomenon, but some regions are moving faster: North America, Western Europe, and Asia & Oceania have concentrated 80% of all the private LTE and 5G network announcements since 2018, according to Omdia's *LTE and 5G Private Networks – 2Q23 Database*. North America is the main region: 595 private LTE/5G announcements have been made since 2018, accounting for 37% of all announcements. The reason North America has made more announcements than other regions is, in part, the extensive trialing and testing of the citizens broadband radio service (CBRS) in the market. Europe has had fewer announcements than North America, partly because of its fragmentation of regulation and spectrum, but it is the leading region in terms of network rollouts.

Figure 2: Private 5G announcements by region
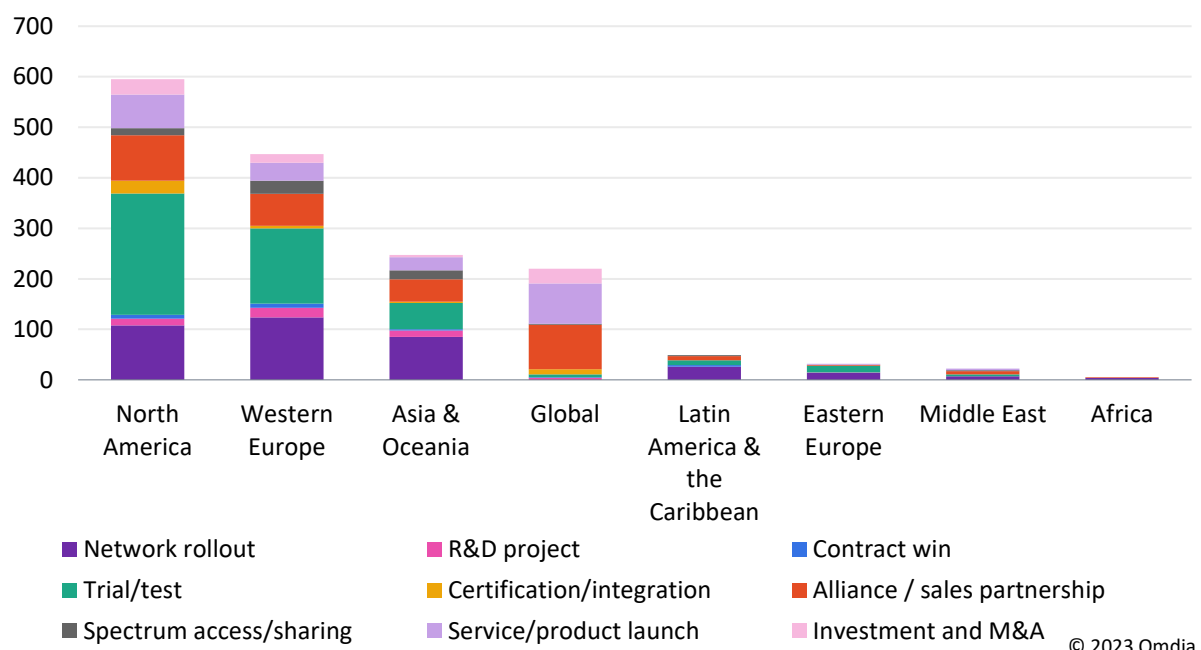
Source: Omdia LTE and 5G Private Networks Tracker – 2Q23 Database

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Asia & Oceania are developing at a slower pace than North America and Western Europe. In certain markets, such as Japan, there is a more cautious approach to adopting private 5G networks. Enterprises and providers acknowledge the benefits of the technology but are careful about widespread implementation. China has a unique approach to private networks. Chinese enterprises' 5G activities focus on private solutions that use public networks as a foundation, and this results in more hybrid network-based solutions. Globally, industrial verticals contribute to more than 60% of all announcements.

Spectrum allocation has significant importance in the private 5G networks landscape and differs according to country. The CBRS in the US is a good illustration. Through dynamic sharing of the 3.5GHz band, CBRS enables efficient spectrum utilization, balancing spectrum availability among three distinct priority user categories. This strategy not only fosters innovation but also enhances the economic feasibility of private 5G networks for enterprises that may face challenges in obtaining dedicated spectrum.

The achievements of CBRS in the US underscore the significance of proactive regulatory measures that strike a balance between existing users and emerging participants for spectrum access. This framework serves as a potential model for other regions seeking to encourage the adoption of private 5G networks.

Opportunities and challenges in a private 5G market

The market is just beginning

Private 5G brings opportunities for providers because enterprises need to optimize their processes and costs, increase collection and use of data, and improve security in highly competitive and challenging global markets. However, many challenges still exist, including integration, lack of devices, lack of experience, and a complex ecosystem.

Opportunities

Entering new vertical markets and winning new contracts: The obvious opportunity with private 5G lies in the fact that private 5G networks enable the cellular ecosystem to enter new verticals and enterprise contracts that before were off limits. Connecting a factory floor and first-responder safety communications are examples of this.

Additional services and technologies: The next opportunity coming from private 5G is in upselling and cross-selling services and technologies to complement the private 5G network. Services can include integration and network management, and additional technologies can include the likes of software-defined wide area networking (SD-WAN) or edge computing.

Supporting new use cases and applications at scale: Private 5G can support traditional use cases such as connected workers, but it can also support new applications at scale. These include machine vision, augmented reality / virtual reality (AR/VR), and autonomous guided vehicles (AGVs). Unlike other technologies it can scale without suffering a deterioration in performance or requiring a significant increase in capex.

Becoming a central piece in an enterprise digitization: These three opportunities combine effectively, meaning that the cellular ecosystem of vendors and providers can become the central actor in an enterprise digital transformation.

Challenges for the enterprise

Lack of cellular expertise and trust: A lot of enterprises do not have expertise in or knowledge of 4G LTE or 5G. There is also the confusion of associating public cellular network performance and challenges to those of a private 5G setting. Some verticals are quite conservative in their purchasing decisions, so the fact that they do not know cellular also means they do not yet trust cellular technology for mission-critical needs.

Integration and finding the right use cases: Integration is one of the key challenges faced by the enterprise, and this is because virtually every one is a brownfield of existing connectivity options, technologies, and solutions. This means that the private 5G network needs to be fully integrated in the IT and operational technology (OT) environments. This is a complex task that often the enterprise cannot solve on its own.

Cost: Cost is a key challenge because private 5G networks can be expensive but also because many enterprises do not know the technology well. For instance, private 5G is a very different technology from Wi-Fi and one whose total cost of ownership becomes much more appealing when the deployment becomes wider, more complex, or has a large number of connected devices and stringent performance requirements.

Challenges for providers

Delivery of solutions not products: Enterprises have problems (e.g., reduce machinery downtime) and are seeking solutions to address those problems. They are not looking for simple products. This is a challenge for certain providers and service providers: creating and selling solutions requires certain skills and training of the workforce, encompassing product developers as well as the sales force.

High competition and fragmentation: The huge opportunity presented by private 5G creates an extremely competitive environment. This means that different players are active, possibly leading to price competition but also to enterprises being overwhelmed about what private 5G is and what it can deliver. Multiple competing players also means difficulties in striking strong partnerships and creating a strong ecosystem: many players will be trying to create their own ecosystem to take center stage in this market.

The early stage of the device ecosystem: Though the market is growing, the lack of a wide device ecosystem to support private 5G is often highlighted as a key market roadblock. This is particularly true for industrial and cellular-native devices. For smartphones, the market is a bit more developed. For instance, Apple recently announced support for private 5G in the latest iteration of its iOS 17 software.

The role and relationship of private 5G, edge, and applications

Private 5G, edge, and applications cannot be separated

Connectivity is not an end in itself but an enabler of edge computing and the application ecosystem built on top of it. Alongside private 5G, edge computing—a distributed computing model that places workloads in multiple locations (e.g., on the device, on site, or at the network edge) closer to the data source—becomes an obvious complementary asset. While each edge computing location is suited to specific requirements, common benefits include the reduction of the data trip and of the connectivity demand for backhaul, and better data security (this can improve latency but also reduce cost).

Figure 3: Top three additional technologies that enterprises purchase along with their private 5G networks

Note: n=193

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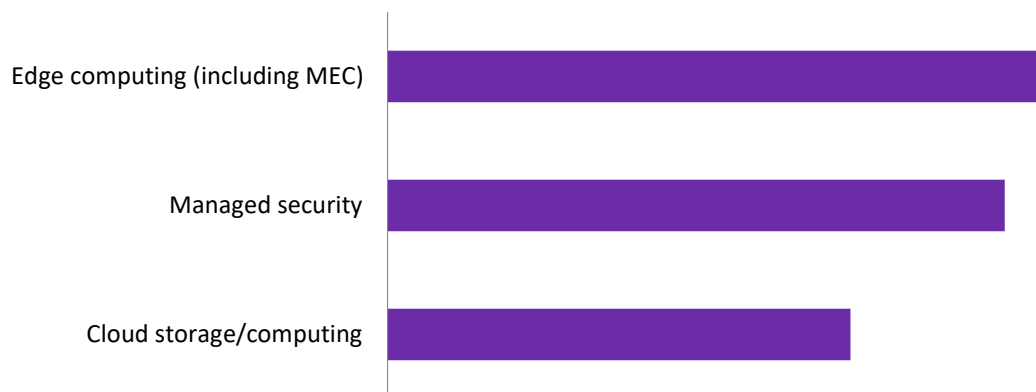
Enterprises see the critical importance of edge computing as part of their private 5G journey; in fact, according to Omdia's *Private LTE and 5G Network Enterprise Survey Insight 2022 – Providers, Solutions, and Business Models*, 34% of enterprises currently using a private 5G network are requesting edge computing alongside their private 5G project.

Private 5G needs to work in tandem with the edge because there are multiple applications with different requirements and because enterprises have several distributed cloud architecture footprints. Applications need both the cloud and the edge depending on the task to be performed, with workload distributed accordingly. The same application may need certain data to stay on site for security or latency reasons, while other data computing, such as training the artificial intelligence (AI) model, can be done in a central cloud or server. In the case of a factory, a private 5G network can connect devices including cameras and AGVs. Each device may have an edge application with an embedded artificial intelligence / machine learning (AI/ML) model that delivers on inferencing for faster decisions, and AI training may be done at a central location.

This intersection of private 5G, edge computing, and applications creates a clear opportunity for a platform play. A unified hybrid platform becomes critical to prevent increased operational complexity from multiple cloud environments, edge locations, and applications.

One of the main benefits of a unified hybrid platform is that the needs of an enterprise for private 5G connectivity, edge workloads, and applications will now all be met in the same environment. With a unified platform, service providers can build solutions based on standardized components, so they will be able to support an enterprise's current needs (e.g., more reliable connectivity) and use the same components and tools to support future needs (e.g., machine vision).

A unified platform able to support hybrid clouds and different architecture options makes it easier for an enterprise to execute its digital transformation strategy. From a service provider point of view, it can provide support for a wider pool of enterprises across verticals that all have different priorities and architectural preferences. Different enterprises can adjust their platform configuration depending on their vertical and their data and site requirements, which might include, for example, requiring data to stay local within a single site or needing a hybrid architecture across multiple sites.

With many enterprises leaning toward multiple clouds for their transformation and workloads, a unified platform that can deliver a consistent experience and tools across those disparate environments becomes essential. A platform play and common tools make it easier for partners and developers to create an ecosystem built on standards and consistency.

A market that will be defined by multiple players, partnerships, and ecosystems

The opportunity to create new contracts in vertical markets, to upsell services, to take a piece of the pie of the edge and applications market, and to target Wi-Fi and Tetra replacement with associated managed services results in a large set of players all competing in private 5G. This creates a complex scenario in which each category of companies has strengths, weaknesses, and most importantly, a specific strategy to use to lead the market.

Overall, two main categories can be identified in the private 5G world. On one side are the technology providers, which are those companies providing the main technologies underpinning the solution; network vendors are the classic example of this category. On the other side are those companies whose main activity and expertise in this market revolves around services and delivery; a service provider exemplifies the category. These categories are not mutually exclusive, but they can be used to drive analysis and simplify the representation of a complex market.

Figure 4: Schematic representation of the main categories of players in the private 5G market
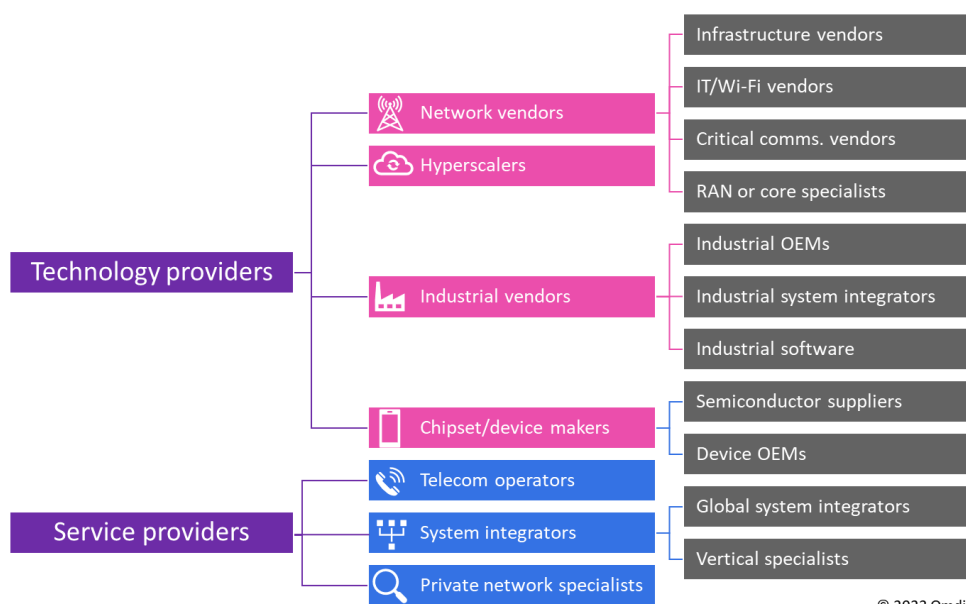
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Source: Omdia

Network vendors

Strengths
Network vendors have a first-mover advantage, provide the key technology needed for private 5G, and are learning lessons in different vertical markets.

Weakness
They need to change their go-to-market strategy from that of their traditional business to have a broader and more complex set of partners and ecosystems of providers and resellers.

Strategy
Network vendors are often increasingly focused on the industrial and OT side of the market while at the same time looking to build through the stack, whether on devices or applications.

Hyperscalers

Strengths
They know and understand that private 5G is an enabler of the edge, cloud computing, and applications. They have scale, skills, and deep pockets for research and development.

Weakness
In a hands-on, custom-made market such as private 5G, hyperscalers need partners to take on those responsibilities so they can focus solely on the highly scalable side of the computing market.

Strategy
Hyperscalers look at private 5G as a means to drive cloud and edge consumption and to strengthen their relevance (and that of their ecosystem) within the enterprise.

Industrial vendors

Strengths
They know and have the trust of the industrial enterprise and can leverage their existing customer base. They create OT technologies and understand trends in their industries.

Weakness
Industrial vendors do not know cellular and are taking a very cautious approach to it, likely because they know that they could be heavily disrupted by cellular and open ecosystems.

Strategy
When it comes to private 5G most industrial vendors are still testing the waters, but the expectation is that they will channel private 5G to maintain the relevance of their wider product offerings.

📱 Chipset/device makers

Strengths
Chipset/device manufacturers produce the key elements of the market that are essential to scale and to meet the performance and power requirements in the reduced available footprint of edge solutions.

Weakness
These original equipment manufacturers (OEMs) are pivotal for market growth, but they want guaranteed high demand to invest in this area. The lack of devices for industrial environments is a barrier to adoption.

Strategy
A few companies are pushing up the value stack, for example, into the radio access network (RAN) side of private 5G network. They are trying to support the creation of demand for private 5G.

📞 Telecom operators

Strengths
They understand 5G and have experience in network deployment and management. They are local players and can count on assets including spectrum and large sales forces.

Weakness
Many telecom operators struggle to sell solutions or to understand vertical markets. As a whole, the category has been slow to look at the private 5G opportunity.

Strategy
They want to leverage public networks and shape the market toward hybrid networks and later network slicing.

⊟ System integrators

Strengths
They have the trust of the enterprise, they are experts in guiding the enterprise via consulting, and they provide integration services (which is a key challenge in the market).

Weakness
Not all have in-depth knowledge of 5G. With large consulting units, they may struggle with some enterprises demanding simple and fast solutions rather than complex projects.

Strategy
System integrators have developed strong partnerships with network vendors to accelerate the market and are often targeting the edge computing opportunity.

🔍 Private network specialists

Strengths
They are champions of deploying and managing private 5G networks because that is a core business for them. They are agile and fully dedicated to the market.

Weakness
They are relatively young or small companies that need to scale against larger rivals while supporting the increasing complexity of the market.

Strategy
Private network specialists focus on selecting target markets, and to scale they leverage the early lessons they learned before service providers and system integrators joined the market.

No one wins alone in a private 5G world

With private 5G delivering benefits for a wide range of markets, such as an oil and gas platform in the middle of the sea or a stadium within a megalopolis, no single player will have all the answers to serve such diverse scenarios. Any serious private 5G player must count on strong partnerships and a well-developed ecosystem to succeed.

No single company has the full skill set needed for private 5G: these solutions require expertise in many areas including cellular infrastructure, cloud, edge, applications, integration and consulting; understanding of vertical markets, knowledge of legacy technologies and of IT and OT environments; security expertise; 5G service and management; and deployment and operation of complex networks. It is therefore essential to create an ecosystem of partners all pursuing the same goal and all excelling on specific sections of this complex private 5G value chain.

Enterprises want end-to-end solutions that can address their needs, for example, increasing yield or reducing accidents, so having partnerships with integrated products and services is paramount to win customers.

However, developing a solid ecosystem of partners is not an easy endeavor. It requires significant time, resources, and investments. Partners need to develop solutions together, and they need in-depth understanding of each other's technologies, assets, capabilities, and products. Joint tests in labs are necessary, but joint deployments in a live production environment (and the lessons drawn from them) are very different from the carefully controlled lab environment. This means that it takes time to create a successful ecosystem of partners. There needs to be consistency of building blocks, products, and tools, ensuring that anyone from a provider to a developer can integrate and develop solutions over common elements.

Where Red Hat can help

Private 5G can be deployed in various cloud environments including private, public, hybrid or multicloud setups. Fundamental to these deployments is a unified cloud-native platform that achieves new levels of efficiency and agility and offers a reliable, low-latency network with applications close to the end user.

Red Hat addresses this platform requirement with a number of solutions, including Red Hat Enterprise Linux and Red Hat OpenShift Container Platform. These platforms can be used to deploy and operate a hybrid mix of containerized applications including private 5G and edge workloads. They are consistent, flexible, and modular with the ability to scale from a single node suitable for edge locations to multiple servers within a data center. They are capable of supporting 5G and other technologies within an enterprise customer's IT/OT environment and have the automation tools and frameworks that are needed to easily onboard and fully manage vertical- and enterprise-specific applications across the whole lifecycle.

Automation is essential for consistent deployment and operation of private 5G networks. Red Hat platforms give service providers the tools and capabilities they need to achieve security and compliance with relevant network policies and governance procedures. They can efficiently manage large-scale deployments, which results in reduced opex.

The Red Hat partner ecosystem unlocks the transformative capabilities of its cloud-native platforms and allows organizations to meet their unique challenges. Working with partners, Red Hat creates innovative solutions that are continuously validated to ensure reliability and are fully integrated to ensure the efficient deployment and operation of private 5G networks. This collaboration enables service providers to go further in the market by providing more complete and better tailored offerings.

Conclusion

The private 5G market is ready to expand as an increasing number of countries providing spectrum to enterprises, enabling them to deploy private 5G networks. Significantly, private 5G is delivering on the security, control, and flexibility needs of enterprises across a broad set of industries and across a wide range of regions.

As private 5G goes mainstream and becomes a key cog in supporting complex enterprise transformation, the opportunities for the ecosystem are abundant. Private 5G enables the creation of new contracts in vertical markets that have not previously used cellular technology, and it drives the upselling and cross-selling of services as part of a wider digitization processes. There are, however, still some challenges for the market to overcome before it becomes really mature, including the lack of in-depth knowledge of cellular technology in many enterprises, market fragmentation, and the need for integration with existing systems and solutions.

Private 5G is creating a complex competitive environment in which virtually every technology market player wants to compete. Every category of player will bring specific advantages: service providers will bring 5G expertise, and industrial players will bring an understanding of the end-customer's problems and needs. Such a complex market will require the creation of solid partnerships and ecosystems.

Red Hat solutions utilize the power of open source to support private 5G connectivity, edge workloads, and application needs, all within a unified platform across private and hybrid multicloud. A unified platform allows service providers to build solutions based on standardized components, while the Red Hat partner ecosystem helps with the creation of innovative solutions that are continuously validated to ensure reliability and that are fully integrated to ensure the efficient deployment and operation of private 5G networks.

Appendix

Methodology

This white paper was created using Omdia expertise and datasets.

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Omdia consulting

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