

WHITE PAPER

Business Value and Functionality Are Driving Private 5G Network Adoption

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Abstract

Private 5G and edge computing solutions are gaining traction in enterprises globally. Driven by a desire to improve processes and leverage data for actionable insights, various industries are adapting these solutions to fit their specific needs. Organizations recognize the value private 5G and Multi-access Edge Computing (MEC) deliver. With spectrum becoming widely available and technology ecosystems developing, enterprises recognize that now is the time to implement and reap the benefits of private 5G and edge computing.

Current Environment

Digital transformation continues to drive business strategies, with companies optimizing and deploying new digital systems to gain operational efficiency, deliver enhanced user experiences, and support new business processes leveraging data capable of delivering business insights.¹ Innovative technologies will accelerate the transformation. One of the most promising technologies is fifth-generation (5G) wireless networks.

Increased productivity, efficiency, and security:

5G technology can help companies become more flexible and efficient in their production and operations, while improving security.

-Manufacturing Company, Australia

Prior to 5G, cellular wireless services had a primarily consumer focus with limited enterprise use cases. For example, 4G made it possible to incorporate video easily into apps and supported transferring larger amounts of data. Enterprises leveraged the technology for tertiary WAN backup links or in very specific industrial uses. However, 5G is positioned to deliver a wide range of new commercial services and applications for enterprises spanning numerous industries. Many technology factors support this change. The substantial increase in

performance available from mid- and high-band 5G, coupled with the corresponding reduction in latency, makes it possible to run time-sensitive, data-intensive applications. Security has also been enhanced to meet the demands of business use cases. Further, 5G supports connecting a huge number of devices, up to 1 million per square kilometer, to support both high-density IT- and operational technology (OT)-centric use cases. And to support these new and innovative transformation initiatives, edge computing infrastructure provides the necessary resources to tie the elements of the solution together and extract additional business value.

As a result, enterprises are embracing 5G and the edge computing infrastructure that enables it. To validate this statement, Dell Technologies commissioned TechTarget's Enterprise Strategy Group (ESG) to survey 662 global IT and line-of-business (LOB) decision-makers to detail and document the adoption and use of 5G and its complementary technologies. The top-level findings from this survey, conducted to assess respondents' embrace of 5G, are telling and are corroborated by existing ESG research (see Figure 1).²

¹ Source: Enterprise Strategy Group Research Report, [2023 Technology Spending Intentions Survey](#), November 2022.

² Source: Enterprise Strategy Group Custom Research commissioned by Dell, [Dell Private Mobility and Edge Computing Survey](#), February 2023. All Enterprise Strategy Group research references and charts in this white paper have been taken from this custom research, unless otherwise noted.

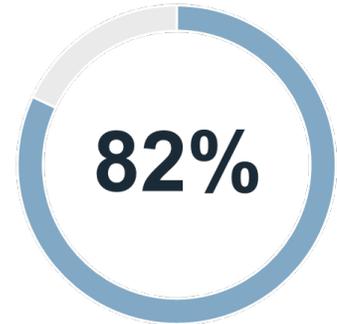
Figure 1. Enterprises Are Embracing Private 5G and Edge Computing



Of respondents know or believe they know of a current need for private 5G connectivity.



Of respondents believe 5G initiatives will drive net-new edge computing environments.



Of respondents believe that 5G is a top 5 priority for digital transformation.

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

The compelling business benefits that 5G technology delivers make it attractive. The most frequently cited examples of those benefits in the survey included:

- The ability to deliver enhanced (53%) or new (51%) end-user experiences that are more compelling, engaging, and differentiated.
- Improved safety for staff (52%).
- Improved operational efficiency (47%) enabled by better access to data or the support of more effective business processes.
- Better security (45%) to protect against a range of cyberthreats.
- The ability to capture larger amounts of more diverse data to support real-time insights to business (43%).

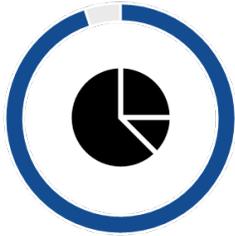
Enhancing worker productivity:

Having 5G connectivity instead of 4G connectivity will increase speed and efficiency by up to 20%, depending on the use case.

-Technology Company, Canada

The Opportunities for 5G Private Networks Are Real

Many modern technologies are attractive to commercial customers. However, the real measure for the importance of these solutions is customer commitment to them. It is clear from the survey data that customers of all types are committed to private 5G network deployments. The data shows that 95% of enterprises have formally quantified or are in the process of quantifying the value of private 5G networks. What's more, 89% of the firms in the survey have allocated and approved budgets. Given the focus on the enterprise, technology providers and carriers are working together to ensure enterprises can rapidly deploy private 5G solutions. Today, there are more documented solutions, proven reference designs, and trained professionals to support these implementations.

Figure 2. Formal Quantification of Value Is or Will Be Complete, and Budgets Are Approved**95%**

Have formally quantified or are in the process of quantifying the value of private 5G networks.

**89%**

Have allocated and approved budget.

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

As a result, the survey shows that 78% of enterprises expected to install private 5G within the next 12 months. And some industry verticals are moving even faster. The data shows that manufacturing, retail/wholesale, and technology companies will be more aggressive in their deployments, stating that they plan on deploying within the next six months. And manufacturing, financial services, energy, and technology verticals reported that 5G networks were their highest priority for network-centric projects.

The data highlights that now is the time to deploy a private 5G network infrastructure that can support new and innovative digital business processes that aren't possible with prior architectures.

Identifying General and Industry-specific Use Cases

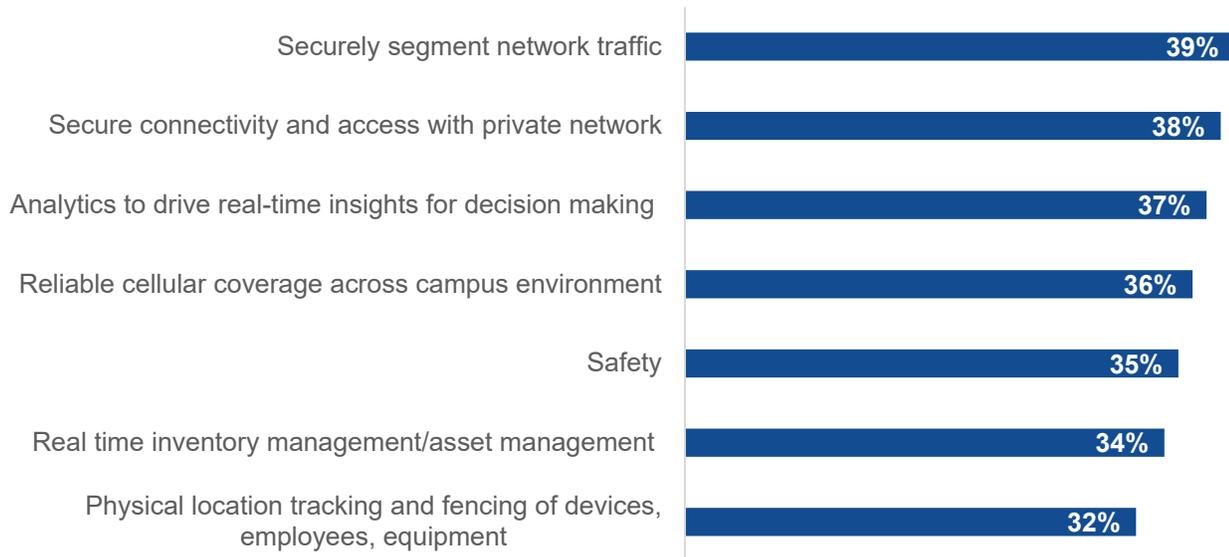
The data on adoption and deployment timeframes makes it clear that the use of private 5G networks in enterprises is a given. The next set of data focuses on the most common use cases, looking at both general use cases that appeal to most types of businesses and industrial-specific use cases. This breadth reflects the highly adaptable nature of private 5G networks.

General Use Cases

Choosing from a list of 16 potential general use cases, respondents selected all those that their organization planned to support with a private 5G network (see Figure 3). The respondents clearly understood the security benefits of 5G: The most commonly cited use case was to securely segment network traffic, followed closely by securing connectivity and access with a private network.

Figure 3. Top 7 General Use Cases for Private 5G Networks

For which of the following general use cases is your organization going to deploy a private 5G environment to support? (Percent of respondents, multiple responses accepted)



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Enhanced endpoint device security and management:

A private network will make managing the devices and the network easier, increase security, and enhance end-user functionality.

-Transportation and Logistics Company, United States

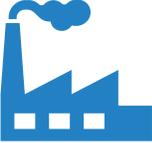
The third most frequently cited use case was to support analytics to drive real-time insights for decision-making. Private 5G enables scalable data collection, with consistent high-speed connections and the ability to move large amounts of data—all essential to both real- and near-real-time apps.

Organizations also cited reliable cellular coverage across a campus, which is an expected use case falling in the sweet spot for private 5G networks, especially for larger or more dispersed campuses.

The fifth- and seventh-ranked choices demonstrate that safety-focused use cases will be common, including tracking the physical location of devices, employees, and equipment.

The sixth most popular selection highlighted the need to have real-time inventory and asset management. Additional use cases reported include smart buildings, grids or cities, timestamping of goods shipped and received, monitoring environmental factors, mission-critical push to talk/video, enabling augmented reality and mixed reality experiences, gamification, video analytics, loss prevention, and point-of-sale (POS) use cases.

Upon closer inspection, the survey data indicated that the most popular general use cases vary depending on vertical industry. For example, the following verticals had these top choices:

Industry	Most Commonly Selected 5G General Use Cases
 Transportation/Logistics	<ul style="list-style-type: none"> Physical location tracking and fencing of devices, employees, and equipment (48%). This may include asset tagging, proximity detection, and location sensors. Secure connectivity and access using a private network (48%). Real-time inventory/asset management (46%). Secure segmentation of network traffic (46%).
 Manufacturing	<ul style="list-style-type: none"> Secure connectivity and access with private network (40%). Securely segmenting network traffic (39%) Delivering reliable cellular coverage across a campus environment (39%). Mission-critical push to talk/video (32%) Enabling smart buildings (37%).
 Healthcare	<ul style="list-style-type: none"> Securely segmenting network traffic (43%). Reliable cellular coverage across campus environment (40%). Physical location tracking and fencing of devices, employees, and equipment, like crash carts and other mobile devices (38%). Automatic time stamping of goods delivered/received (33%), including medications and food to ensure positive patient experiences and outcomes.
 Energy/Natural Resources	<ul style="list-style-type: none"> Safety (38%). An increased emphasis on employee and plant safety are driving this. Analytics to drive real-time insights (38%). Secure connectivity and access with private network (34%). Mission-critical push to talk/video (31%).
 Retail	<ul style="list-style-type: none"> Securely segmenting network traffic (40%). This will help ensure PCI compliance and privacy of personal information. Safety (38%). Secure connectivity and access with private network (38%). Automatic time stamping of goods delivered/received (33%). Point of Sale (POS) (19%).

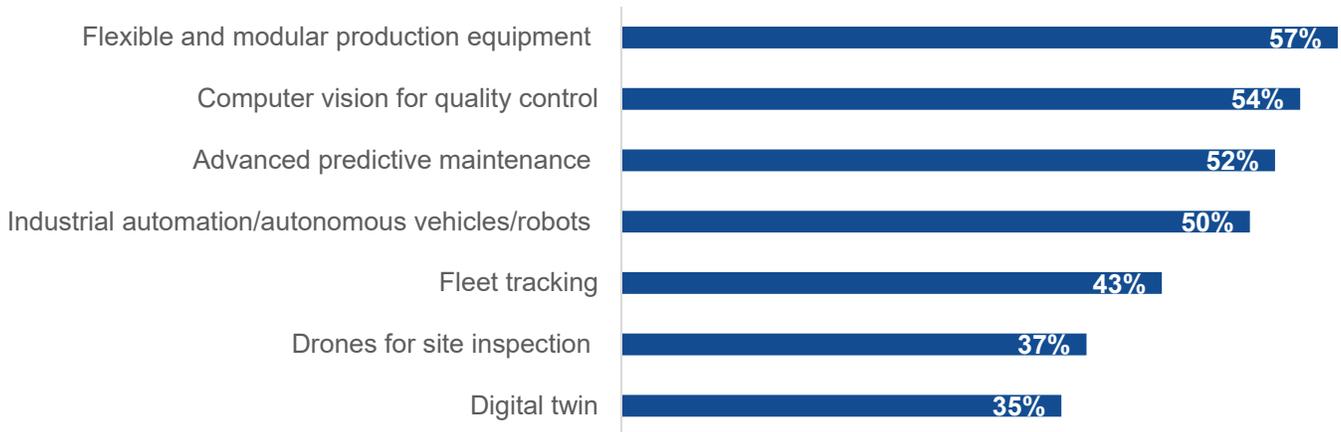
Industrial Use Cases

There are many use cases in the industrial sectors, with individual cases specific to given vertical industries or even types of companies. The data in this section reviews the most frequently cited industrial use cases for all respondents, many of them supportive of industrial mega-trends, such as Industry 4.0 or intelligent manufacturing.

Production-centric applications, unsurprisingly, lead the list of seven industrial use cases listed in Figure 4. Agility and speed are essential to manufacturers, so the ability to support flexible or modular equipment (the most selected) versus machines tethered to ethernet cables is important to achieving them both. The second choice, computer vision for quality control, is a valuable tool for improved efficiency, both reducing reject rates and automating a traditionally human-centric function. Advanced predictive maintenance enables organizations to improve availability and productivity and reduce costs by limiting unplanned downtime. Also selected by half of the respondents was the need to support industrial automation, autonomous vehicles, or robots. That was followed by fleet tracking, drones for site inspection (especially popular for utilities), and digital twin technologies.

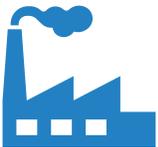
Figure 4. Industrial Use Cases for Private 5G Networks

**For which of the following industry-specific use cases is your organization going to deploy a private 5G environment to support?
(Percent of respondents, multiple responses accepted)**



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Again, putting an industry-specific lens on the data reveals that certain verticals have priorities different from the aggregate results. This includes:

Industry	Most Commonly Selected 5G General Use Cases
 Transportation/Logistics	<ul style="list-style-type: none"> Advanced predictive maintenance (65%), which is likely to ensure that transportation equipment and services are highly available. Industrial automation/autonomous vehicles/robots (60%). Computer vision for quality control (58%). Fleet tracking (53%).
 Manufacturing	<ul style="list-style-type: none"> Flexible and modular production equipment (58%). This is no surprise, as 5G enables entirely new, modern production environments. Computer vision for quality control (55%). Industrial automation/autonomous vehicles/robots (51%). Fleet tracking (44%).

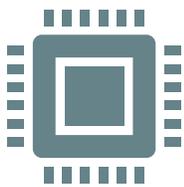
Industry

Most Commonly Selected 5G General Use Cases



Energy/Natural Resources

- Flexible and modular production equipment (59%). Both major segments benefit from it.
- Advanced predictive maintenance (52%).
- Computer vision for quality control (48%).
- Drones for site inspection (43%), which are becoming much more common for inspecting power transmission lines, windmill farms, and more.



Technology

- Computer vision for quality control (59%).
- Flexible and modular production equipment (54%).
- Industrial automation/autonomous vehicles/robots (54%).
- Digital twins (43%). Digital twins is an emerging technology in networking used to expedite the ability to see how making a change could impact a design or environment.

Business Benefits of a Private 5G Network

As organizations of all types focus on driving business success on numerous axes, private 5G networks offer the opportunity to improve many individual elements of business operations. It should be noted that respondents could select multiple responses and that the spread is very close across all responses, indicating that organizations across all verticals see significant benefits from private 5G environments (see Figure 5). The most commonly cited benefit expected from private 5G networks is the ability to deliver an enhanced end-user experience, at 53%. Not far behind was the ability to create new end-user experiences, which came in with 51%. Both responses were more popular with the retail vertical. Virtual stores, augmented reality shopping, and virtual dressing rooms are all options that private 5G networks will support. Splitting the difference between those two responses was the ability to increase safety, at 52%; this response was well represented across all industries.

Real-time analysis of unstructured data (construction use of video):

5G helps organizations deploy technology at low cost to quickly capture, organize, and analyze massive amounts of video information. This reduces the need for some teams to even visit the construction site.

-Construction Company, Australia

Safety can cover a lot of ground and may include location-based warnings or the ability to turn off devices or machines if humans get too close. The ability to become more operationally efficient was also important, especially to those respondents from the travel/logistics vertical. Improved security ranked highly, especially in the financial vertical. The ability to capture real-time insights, improve productivity, and generate new revenue streams were also reported.

Figure 5. Benefits of a Private 5G Network

**Thinking generally about the potential business benefits of a private 5G deployment, which are most top of mind for your organization?
(Percent of respondents, N=662, multiple responses accepted)**



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

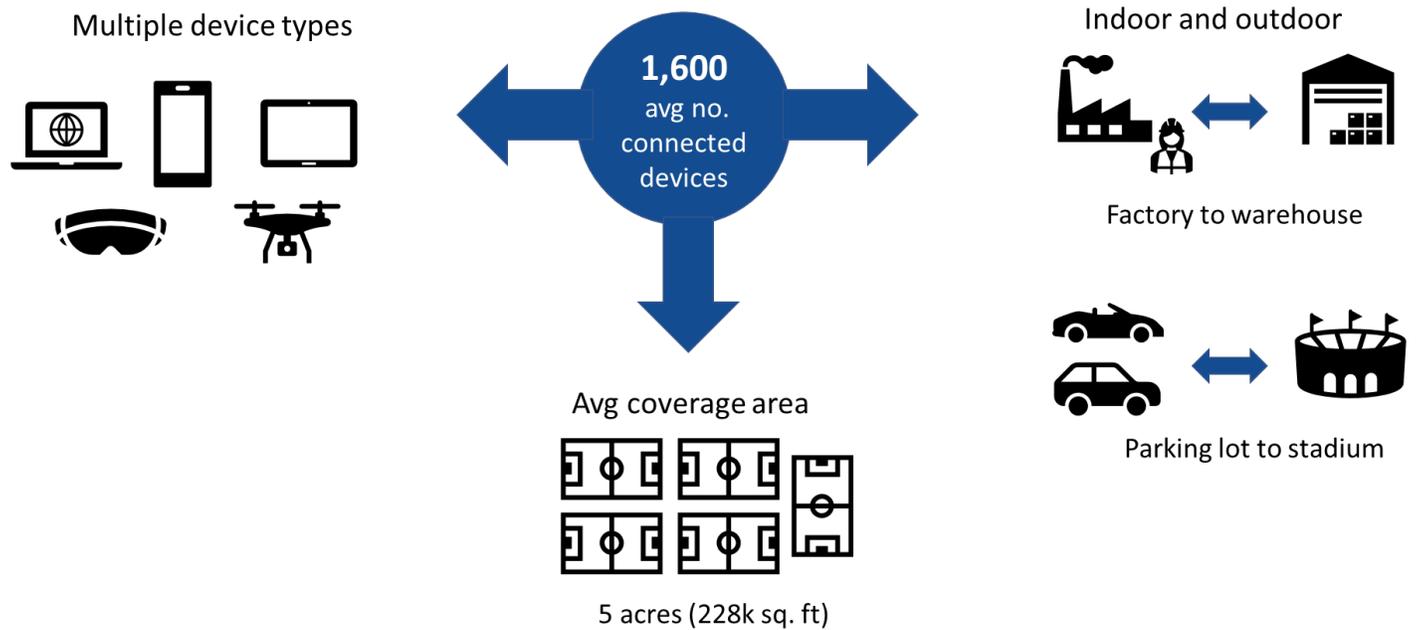
Private 5G Complements Traditional Wi-Fi Networks

Organizations are working out how 5G and Wi-Fi will work in concert. The survey data shows that 53% of respondents believe private 5G will be complementary to or a partial replacement of Wi-Fi. What is clear, though, is that just over nine out of ten (91%) respondents stated that mixed environments should provide cohesive and consistent network visibility and management across both the 5G and the Wi-Fi networks, as users move around campus locations, visit factories, or go to remote stations within an organization's facility.

Those expecting 5G to replace Wi-Fi believe that scalability, particularly for IoT solutions, will be a key advantage for 5G. In addition, the support for rapid growth in the amount of data being transmitted is an important part of scalability. Security advantages, starting with a private network and extending to network slicing, dedicated spectrum, and SIM card-based security, will all tilt customers toward 5G. Performance is an important consideration for moving to 5G. With committed quality of service, lower latency, no interference, and the ability to license dedicated spectrum to support performance, there is enough headroom to meet current and future demands. Finally, the ability to connect more devices in a specific geographic area is attractive, particularly as OT and nontraditional devices are included.

Data from the survey respondents gives an indication of the breadth and usage for 5G deployments. The estimated average number of devices connected to current 5G networks is 1,600. When asked what types of devices organizations planned to connect to their 5G networks, 56% said laptops, 54% said smartphones, and 47% said IoT sensors. More than three-quarters of respondents expected their deployments to span both indoors and outdoors, while others expected deployment in either one environment or the other. With the average coverage area expected to be just over five acres, a 5G network is the logical choice because it can provide broad geographic coverage without the need to deploy and manage hundreds of access points. (Figure 6)

Figure 6. Devices and Environments Connected to 5G



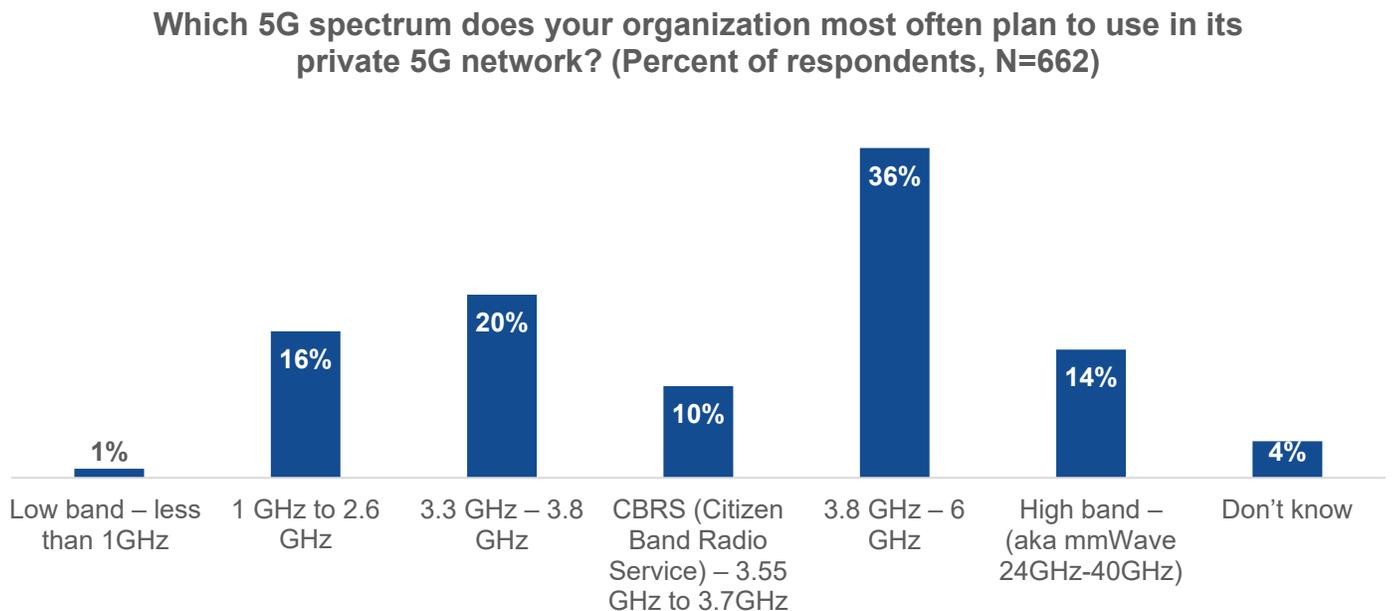
Source: Enterprise Strategy Group, a division of TechTarget, Inc.

The Role of Service Providers in Enabling Private 5G Networks

While some organizations have experience deploying private 4G/LTE solutions, the expected wave of private 5G deployments has the potential to overwhelm in-house resources. Part of the difficulty is that 5G deployments will require workers to learn and become comfortable with a new technology, which could negatively impact deployment timelines and operational efficiency. As a result, external partners are needed that can provide the experience, the expertise, and, most importantly, the spectrum to deploy private 5G solutions. With this in mind, the survey asked organizations what entities they are turning toward to facilitate a private 5G solution and how they prefer services to be structured. The data clearly shows that service providers will play a significant role.

Acquiring spectrum will be the necessary starting point for many projects because the spectrum will ensure that connectivity will be available as the project moves forward. Two-thirds (66%) of respondents plan to acquire mid-band spectrum (3.3 GHz to 6.0 GHz). Recently released Citizen Broadband Radio Service (CBRS) at the low to mid-range of the mid-band spectrum (3.55 GHz to 3.7 GHz) is a popular choice for private 5G deployments. These spectrum ranges offer a good combination of coverage area and performance. High-band mmWave will be deployed by 14% of respondents for applications that demand ultra-low latency and the highest levels of performance.

Figure 7. Spectrum Selected



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Service providers have made significant investments in high-band and mid-band licensed spectrum, including valuable blocks of CBRS, and 34% of those surveyed cited service providers as the most likely provider of spectrum they will purchase from. As these providers continue to invest in spectrum, the payoff will grow. Global system integrators (24%) and IT vendors (20%) follow closely behind as providers of spectrum for private 5G deployments.

Spectrum is often procured in parallel with the design of private 5G networks before deployment, as there is critical on-site radio frequency (RF) environmental planning required prior to deployment. The design phase requires partners with experience and expertise to optimize this planning to ensure long-term design goals are achieved. Selecting the right partner for private 5G deployments is critical to the project's successful completion. The survey showed that service providers are the preferred choice for a partner, as they have the expertise and resources in designing and deploying private 5G network projects. Almost half of respondents surveyed preferred private 5G as a service, which aligns well with service provider models.

In addition to their preference for spectrum procurement, service providers also ranked highest (29%) for design and deployment of private 5G networks, followed closely by global system integrators at 22%, IT vendors at 14%, and cloud service providers at 13%. Only 2% of the respondents believed they have the internal experience and expertise needed to deploy private 5G on their own. Coupling the design and deployment complexities of private 5G with MEC makes telecom service providers a good choice.

Edge Computing Solutions Complement Private 5G Network Adoption

To support business applications and workloads, private 5G networks will be combined with other essential infrastructure components. The ability of private 5G networks to support huge numbers of devices, deliver low latency connections, and accommodate larger data streams makes edge infrastructure an important component of the overall solution. And ensuring seamless integration between edge and the network is a requirement for

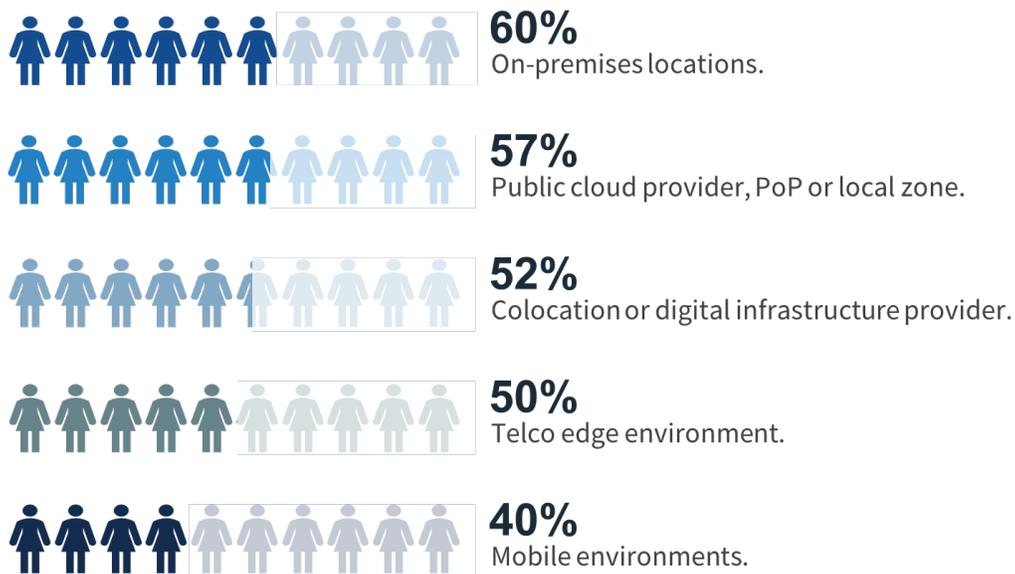
success. The survey shows the strength of the relationship between 5G and the edge, with 68% of respondents believing that most edge locations (60% to 100%) will be candidates for private 5G networks.

The edge certainly must be part of the strategic plan. Almost nine out of ten respondents (88%) expected to deploy four or more workloads at the edge. These workloads will often process sensitive or private information. As a result, security and compliance are critical issues. In fact, 95% of respondents cited compliance as a driver, and this is especially important for those in financial services, healthcare, and energy firms. Cost of the edge solution is another driver, with 97% of respondents expressing a need to focus on the cost of the solutions.

The need to address security and compliance needs, as well as the need for operational simplicity, makes it important to have a consistent platform or stack at the edge. And such consistency will make it easier to have unified management for all edge locations. The survey makes clear that respondents are focused on consistency: 93% believed consistent edge infrastructure is critical or important, and 92% put the same level of importance on having a unified management platform.

However, there is no single method of deploying edge infrastructure. Flexibility is essential since different use cases, business structure, and IT environments will result in different approaches. The survey found that there is no single right answer for respondents. Consider the survey data reported in Figure 8

Figure 8. Edge Computing Deployment Options



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Conclusion

For many enterprises, 2023 will be the year of private 5G. More than three-quarters of organizations reported that they want to deploy their first private 5G network within the year. In addition, organizations state that they will continue to invest in private 5G networks, with almost three-quarters (73%) saying they will significantly or moderately increase their investments over the next 12 to 24 months. And a vast majority (70%) of these organizations also said they will significantly or moderately increase investments in edge computing over the same timeframe. This highlights the complementary nature of private 5G and edge computing.

The teams driving 5G have done their homework on the anticipated benefits and have requested and secured budgets. They have identified and documented well-defined general and industrial use cases. Compatibility of 5G with existing Wi-Fi investments is a consideration that companies are still navigating, but the need for unified network visibility is clear. Other considerations found in our survey include an organization's need to evaluate the number and types of devices to be connected, the spectrum applicable for their use case, and the coverage area for their specific environment (indoor/outdoor) for their 5G deployments. Edge computing will likely play a role in these deployments and be driven by cost and compliance considerations. The extent of the edge computing deployments will be dictated by the number of workloads required to process data and deliver valuable business insights, analytics, and storage capabilities of the edge.

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