

“The manufacturing sector is the largest addressable market for private 5G networks in terms of the number of addressable sites; awareness of the benefits of 5G is also high.”

-Analysys Mason

Analyst Research

Accelerating Smart Manufacturing with Private 5G Networks

Executive Summary

Digital transformation is driving manufacturer's adoption of new and flexible networking solutions. The most important 5G criteria are reliability and security. The largest manufacturers are more likely to acquire their own spectrum and deploy dedicated private networks where they can control security and architecture. However, nearly 50% of manufacturers say they are open to a hybrid deployment that includes a virtual instance or network slice of a service provider's 5G network. Enterprises indicate that they may use different models for different use cases.

Cost

Cost is a common barrier across all deployment models, including the hybrid model. Other concerns are management complexity (37%) and data privacy (33%) in the case of network slicing. Interviews with enterprises suggest that trials of private 5G networks based on a single use case do not justify investment. Service providers need to aggregate use cases, gain executive sponsorship and involve the person responsible for network/IT infrastructure renewal early in the process. The high investment barrier requires cross-department coordination to speed the approval process.

Managed services

The good news for mobile operators and mobile equipment vendors – is that they are perceived to be the go-to companies for the provision of private 5G networks and network slicing. Once enterprises start implementing, they quickly find they need the help of specialist companies (e.g. systems integrators) that deeply understand vertical requirements.

68% of manufacturers are interested in working with managed service providers with the expertise to deploy private 5G networks.

KPIs

Service providers should emphasize the ability to monitor the private cellular networking KPIs that matter to enterprises, particularly around security. Enterprises do not yet fully appreciate the operational challenges they will face since it is early in the market. There is an opportunity to integrate performance and security solutions and monetize SLA tiers to assure premium performance for 5G applications.

Private networks but which deployment models?

Analyst research co-sponsored by Accedian from Analysys Mason, looks at how enterprises plan to adopt and manage private 5G networks. More than 200 respondents from enterprises in the U.S.A, Germany, UK and Japan were surveyed across six verticals: manufacturing, financial services, retail, transport, healthcare, and the public sector. This paper focuses on the interviews with 51 enterprise respondents from the manufacturing sector.

Private 5G networks that are dedicated to a particular organization can be delivered in a number of ways:

- As an organization-implemented and owned private 5G network that runs on its premises (in-building, campus).
- As virtual private instances (a network slice) of a service provider's wide-area 5G network over which the organization has a high degree of autonomy and control.
- As a mix of dedicated, on-premise and service provider-owned wide-area 5G network assets (hybrid private 5G network).

“ 75% of manufacturers say 5G is a key enabler of their digital transformation strategy.

- Cap Gemini's global enterprise 5G survey.

”

Learn how manufacturers plan to cut the wires and deploy 5G:

1. What are the key drivers and barriers behind adoption of the various models of private 5G network deployment?
2. Which type of suppliers are most preferred for implementing private 5G networks?
3. What are the areas of use cases to focus on in the short term?

“ WiFi accounts for at least 50% of connectivity in our factories and is fine for supporting mission critical processes because redundancy is built in through the meshed network. We will evolve to WiFi 6 because our main issue is latency in transporting pulses of data from machinery to the Manufacturing Execution System, not bandwidth. We believe it will be 5-8 years before the boundary between WLAN and telco 5G disappears and they can be used together. In any case, it will take this long for manufacturing to transform – I have IT colleagues investigating this as part of our PLM/MES transformation.

- European manufacturer

”

Key findings on adoption of private 5G networks in manufacturing

Technology

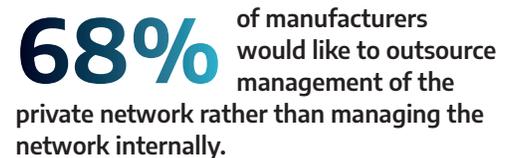
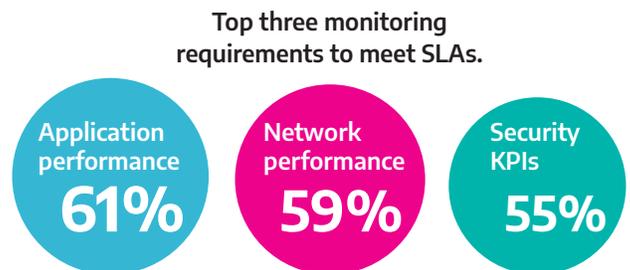
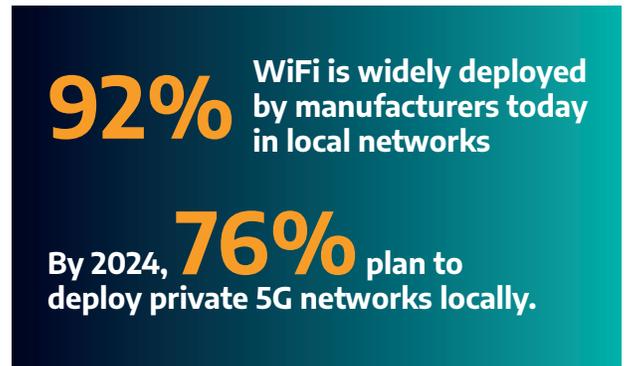
- WiFi is widely deployed by manufacturers today in local networks (92%). By 2024, 76% plan to deploy private 5G networks locally.
- The most important attributes of 5G private networks for manufacturers are reliability (82%) and security (78%), this is consistent across all six verticals.
- The preferred model for 5G private network implementation for manufacturing, and across all sectors, is the hybrid model (45%), followed by the network slice model (35%).
- When deciding between deployment models, network security (63%), network (49%) and application performance (45%) and speed/simplicity of deployment (49%) are the main criteria. Data privacy (43%) is another vital factor influencing how to implement the network.

KPIs

- Application performance (61%), network performance (59%) and security KPIs (55%) are the top three monitoring requirements to meet SLAs.
- For time-critical use cases, performance KPIs need to be reported in real-time. 78% of manufacturers will introduce time-critical use cases using private 5G networks within a year, an earlier time frame than other verticals.

Cost

- Cost is a common barrier across all deployment models, including the hybrid model, other concerns are management complexity (37%) and data privacy (33%) in the case of network slicing.
- 68% of manufacturers would like to outsource management of the private network rather than managing the network internally. Their preference (41%) is to use their network provider or another third party managed service provider (27%).



“ Network slicing is one of the options the group is exploring but the 3GPP slicing standards are not yet mature enough to implement and telecom operators can't use them to provide services to customers yet. In any case, enterprises are going to want end-to-end (E2E) slicing, not just of the mobile network. We expect MNOs to offer slicing when features become available and stable. ”

- Government industrial body

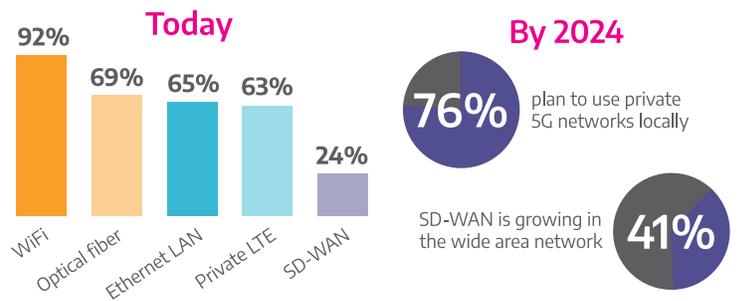
Enterprise demand drivers for 5G private networks

- Operational efficiency**
 Digital transformation and efforts to digitize processes.
- IT and OT convergence**
 Need low-latency high-bandwidth networks to automate and process data.
- Data privacy**
 Require more control and visibility of their data.
- Replacing legacy networks**
 Support new applications/processes as flexible, cost-effective alternative to fixed networks.
- WiFi limitations**
 WiFi is limited in terms of reliability and support for critical mobility use cases.
- Industrial spectrum**
 Some industries prefer their own licensed spectrum to have more control over the private network deployments.

Connectivity in manufacturing

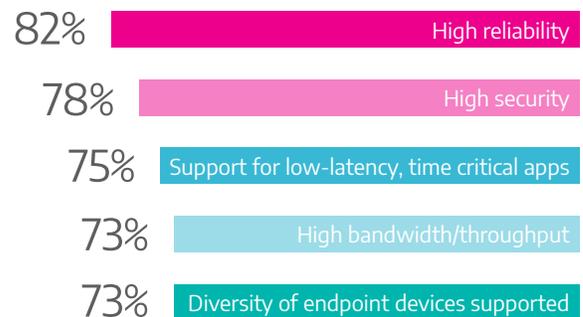
WiFi is the most widely-used connectivity technology for local area networks. Interest in deploying 5G private networks is high among manufacturers, over 75% plan to deploy 5G locally in specific locations.

Use of wide-area connectivity technologies varies with growth in SD-WAN expected over the next five years.



Most important 5G attributes

Reliability and security are the most important 5G requirements for the manufacturing sector, this is consistent across all verticals. Support for low-latency time-critical applications is also important to manufacturers. In addition, high network bandwidth, throughput, and support for a wide range of endpoint devices are important attributes that manufacturers require.

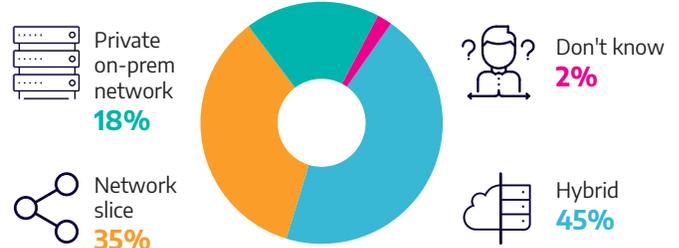


Private 5G preferred deployment model

The preferred model for private network implementation for manufacturing, and across all sectors, is the hybrid model, followed by the network slice model.

Deployment types:

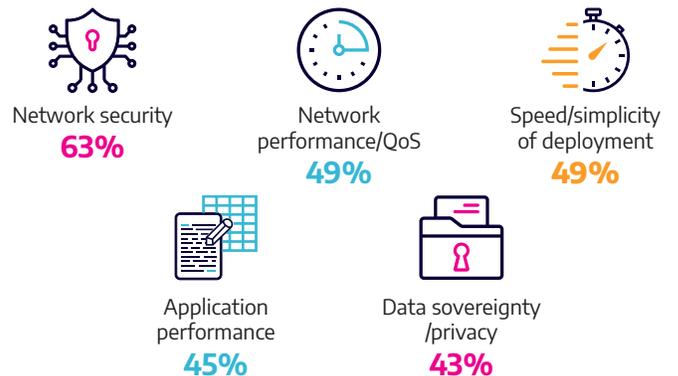
- A fully private organization-owned on-premises 5G network.
- A virtual private network or network slice.
- A hybrid mix of dedicated, on-prem and service provider 5G.



Important factors influencing deployment model

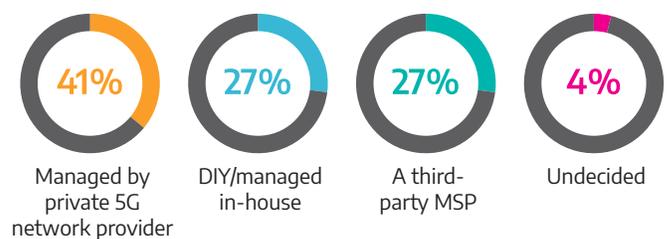
Network security, network and application performance and speed/simplicity of deployment are the main criteria in deciding on how to implement private 5G networks.

Data privacy is another vital factor influencing the choice of private 5G deployment.



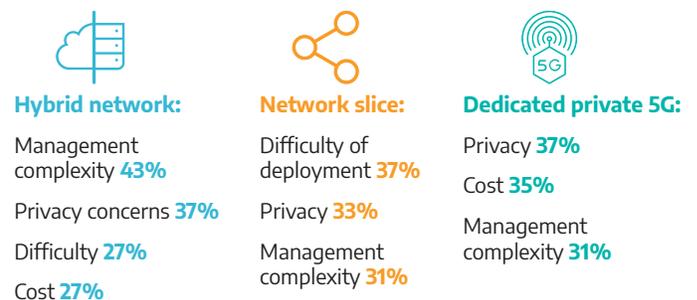
Preferred suppliers

The good news for mobile operators and mobile equipment vendors – is that they are perceived to be the go-to companies for the provision of private 5G networks and network slicing.



What's holding them back?

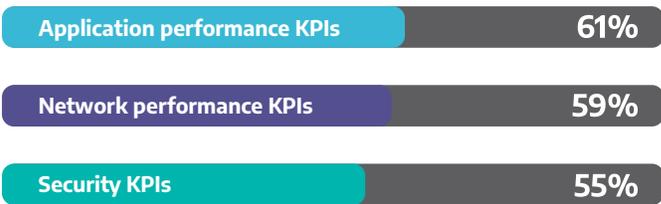
Cost and privacy are common barriers across all deployment models. Manufacturers are worried about the difficulty of deploying a network slice. Data privacy concerns are also top of mind. Service providers will need to educate enterprises on the benefits of hybrid and network slice models.



Top performance metrics to be monitored

Performance monitoring of both private 5G networks and applications is important to manufacturers. Monitoring is required to minimize downtime and delays that would impact productivity and end user experience. Application (61%) and network performance KPIs (59%) are both critical, but so is also security insight (55%). Performance monitoring is a consistent requirement across all network deployment models.

For time-critical use cases, performance KPIs need to be reported in real-time. 78% of manufacturers will introduce time-critical use cases using private 5G network within a year, an earlier timeframe than other verticals. Manufacturers also identified a need for edge computing platforms to support a large proportion of their use cases. Deploying private networks to automate factory processes and install automated guided vehicles, for example, to deliver parts to different areas of the factory are the most common use case.



% of 5G manufacturing use cases for private 5G that require edge computing platform	
% of use cases that rely on edge	% of respondents
1-25%	41%
25-80%	51%
80%+	7%

Manufacturing 5G use cases

5G offers high capacity, wireless ubiquity and flexibility combined with low-latency performance. It is the natural choice to “cut the cables”, which makes it easier to adapt the physical locations of operations, avoid unreliable WiFi and get rid of the many different IoT connectivity standards used today, such as LoRa.

Industrial Internet of Things, also known as IIoT, is a major pillar of Industry 4.0, the fourth industrial revolution, where factories are increasingly automated, benefiting from flexible connectivity and the ability to connect anything from anywhere easily.

In Western Europe, original equipment manufacturers (OEMs) in the automotive sector have been at the forefront of private network adoption. “Companies such as BMW, Ford and Mercedes Benz have deployed private networks for their factories, often based on 5G. By 2026, Analysys Mason expects emerging Asia-Pacific (primarily China) to account for the largest share of private LTE/5G networks in the manufacturing sector”¹.

“ Most manufacturers are putting sensors/ cameras in their production lines to identify faulty components in their production processes. The sensors/ cameras are connected over 5G to edge computing nodes which use AI algorithms to identify faults. This technology is replacing the human eye and has been found to increase efficiency by 80-90%.

- AsiaPac manufacturer ”

¹Private LTE/5G networks: worldwide trends and forecasts 2021-2026 (analysismason.com)

5G's value addition to industrial operations use cases

Shop-floor operations

Real-time analytics leveraging edge computing	<p>5G's faster wireless communication, improved reliability and ability to connect 10-100x more devices can provide real-time information from a large set of devices, which can be converted into real-time insights leveraging edge computing</p> <p>5G will enable flexible management of edge and cloud resources, such as on-demand deployment of applications or data transfer</p>
Video surveillance of remote production lines	<p>5G's faster wireless communication can provide high quality, real-time video feed for surveillance</p>
Remote control of distributed production line	<p>5G's guaranteed quality of service and ultra-reliable and low-latency network can support the time-critical operations in remote plants from a central command center</p>
AI enabled and remote-controlled motion e.g., collaborative robots, self-driven cars, drones	<p>5G's fast and reliable data transmission capabilities can deliver the sensing or remote-control abilities of these innovations with the right level of security</p>
Real-time service and breakdown alerts	<p>Low latency of 5G network will also enable the real-time emergency shutdown of remote systems</p> <p>5G will increase the effectiveness of monitoring and alert systems, leveraging its ability to connect more devices over more reliable and secure network</p>
Remote operations/maintenance/training solutions through AR/VR	<p>5G's ultra-low latency and high bandwidth will support the development of cloud-based, high resolution AR/VR services, driving adoption</p>
Predictive/preventive maintenance	<p>5G will enhance predictive/preventive maintenance capabilities as it will increase real-time data collection from many more devices supported by AI/analytics.</p> <p>5G will also enable remote maintenance thanks to its low latency and high reliability</p>

Source: Capgemini Research Institute, Industrial companies' survey on 5G, March–April 2019, N=806 industrial companies

Conclusion

Private 5G market adoption is at an early stage. Despite all the hype, private 5G is still not clearly understood. Service providers need to educate enterprises on the benefits of hybrid and network slice models, as well as adjacent areas such as edge computing.

Service providers should explore how to monetize different offers based on the Quality of Service (QoS) required by each type of 5G service or application. For Industrial IoT which is business-critical, this will be of extreme importance. The ultra-low latency and high availability required by an industrial robot will require a more stringent service level agreement (SLA) than a set of sensors that only need basic connectivity.

In order to capture their rightful share, mobile operators will need to design 'mobility' use cases with security and performance guarantees, and work with partners and systems integrators with deep vertical knowledge.

“

Our trial to replace wired connections between the mixed reality (MR) system and head-mounted displays with wireless connections through the private 5G network at production plants started last year. Private 5G is capable of eliminating the time lag to realize real-time task support via MR. What ultimately drives our trial is the estimation that a massive number of skilled workers will be reaching retirement age soon, and we expect the MR system to support workers who engage in such skilled work.

- AsiaPac manufacturing company

”

About Accedian

Accedian is the leader in performance analytics, cybersecurity threat detection and end user experience solutions, dedicated to providing our customers with the ability to assure and secure their digital infrastructure, while helping them to unlock the full productivity of their users.

Learn more at accedian.com

Accedian | 2351 Blvd. Alfred Nobel, N-410 | Saint-Laurent, QC H4S 2A9 | 1 866-685-8181 | accedian.com

© 2021 Accedian Networks Inc. All rights reserved. Accedian, Skylight, per-packet intel, and the Accedian logo are trademarks or registered trademarks of Accedian Networks Inc. To view a list of Accedian trademarks visit: accedian.com/legal/trademarks