

# Unlocking Mission Critical Use Cases with Private 5G Network



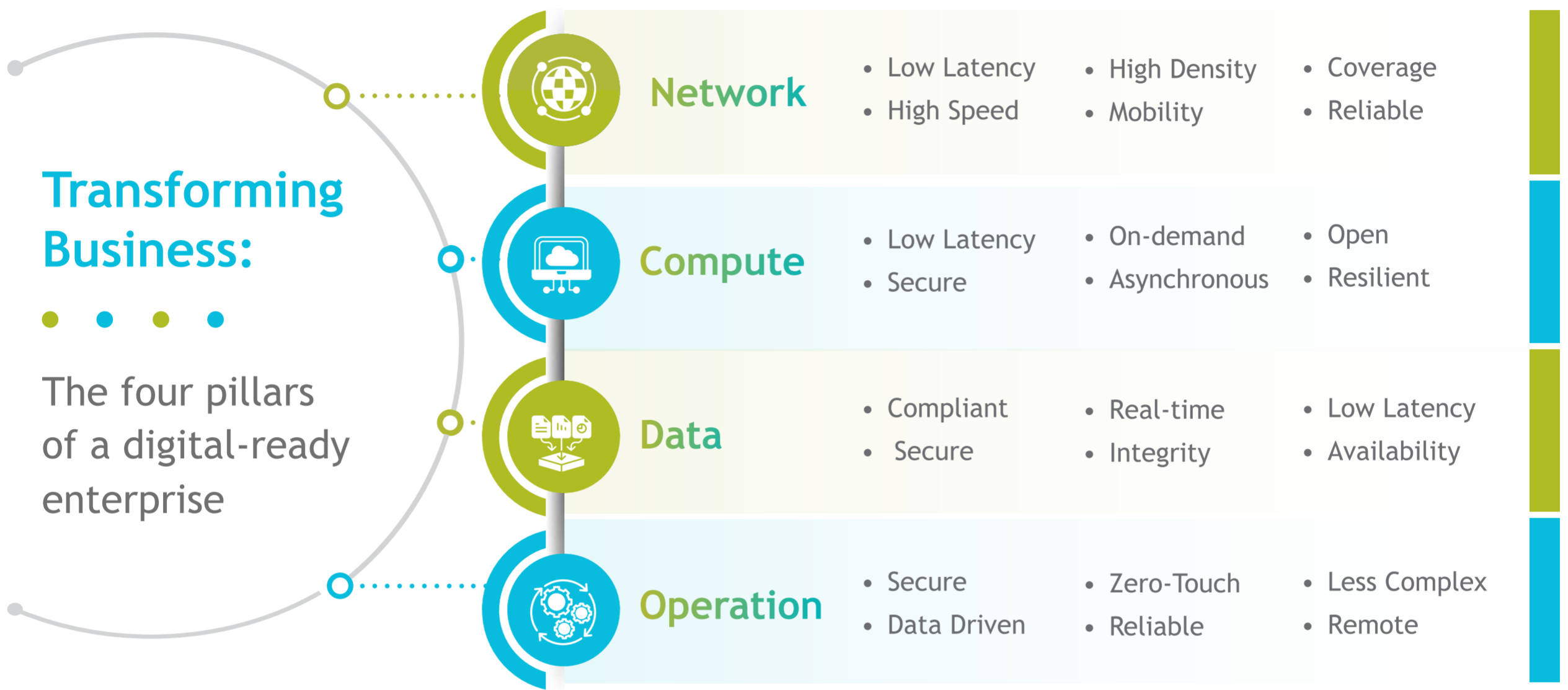
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# INTRODUCTION

The world is undergoing a significant digital transformation, enterprises are rapidly advancing their business and technology capabilities to stay competitive, efficient and aligned with evolving safety, security and sustainability demands.

As businesses look to enhance operational safety, minimise security risks and promote sustainability, the need for robust digital infrastructure and its enablement becomes more critical. We need a combination of a network, computing infrastructure and a data platform, run using an agile operations methodology, to host any application that enables digitalisation towards Industry 4.0 and supports mission critical use cases.

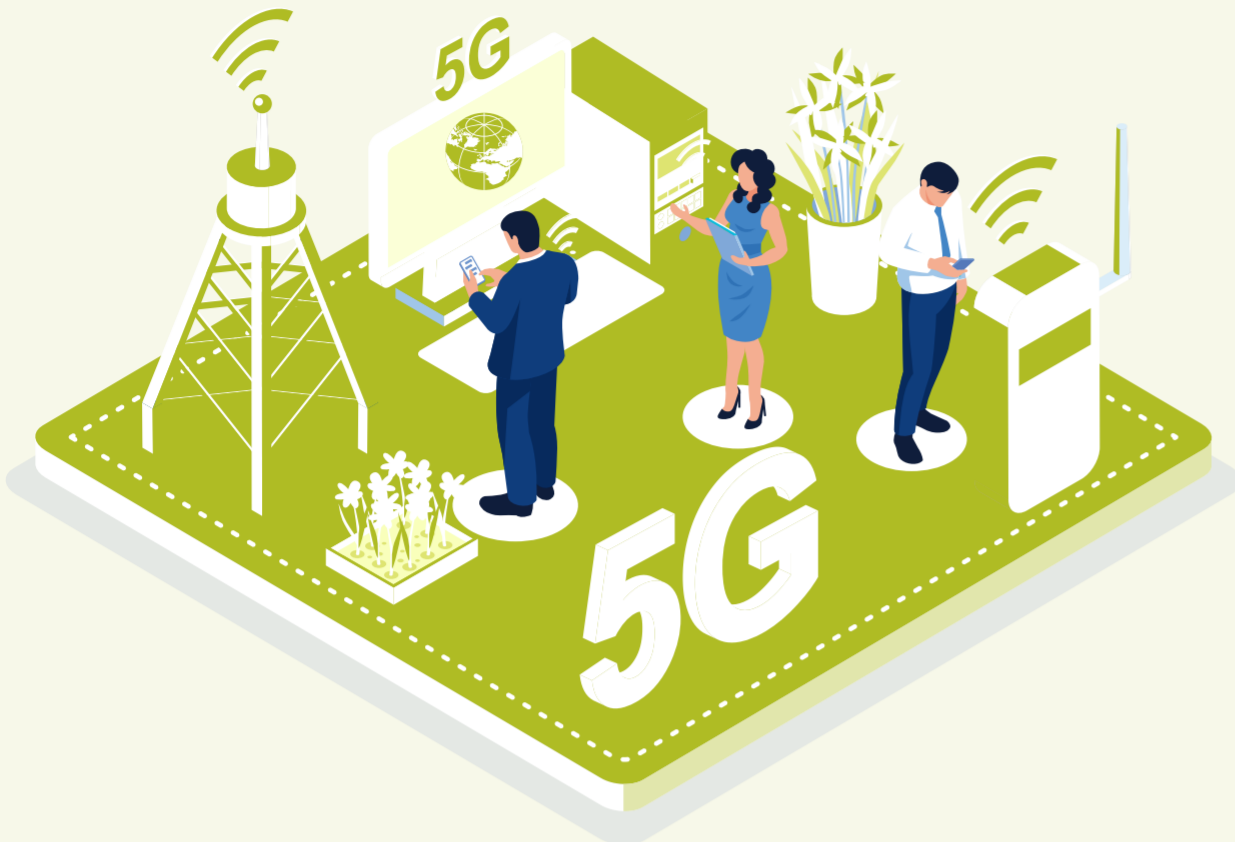


According to a **Transforma Insights** report<sup>1</sup> by 2030, 29.4 billion devices are expected to be interconnected, emphasising the growing need for robust digital enablement, particularly through the convergence of Operational Technology (OT) across enterprise ecosystems. This surge in connected devices demands ultra reliable, high bandwidth network. Deploying Industry 4.0 solutions powered by private networks can generate an operational cost savings ROI of 10X over 5 years, as highlighted by ABI Research<sup>2</sup>.

With the emergence of industrial IoT and cloud computing and the advent of 5G and edge clouds, there are ambitious expectations on safety, security and sustainability by enterprises. AI is further fueling Industry 4.0 by driving intelligent automation, predictive analytics and real-time decision-making. When powered by Private 5G, AI unlocks its full potential, enabling seamless, low-latency operations in robotics, IoT and digital twins for next-gen industrial transformation. As enterprises rapidly embrace Industry 4.0 and digital transformation across their value chains, industrial automation and data-driven intelligence have become key focal points. This shift is driving the growing demand for mission critical use case applications such as robotics/AGVs, drones, digital twins, Push-to-Talk, video analytics and AR/VR. In response, Private 5G networks have emerged as a crucial enabler, offering the reliable and secure infrastructure needed to support these mission-critical applications. In the rapidly evolving landscape of connected world and need of reliable communication, Private 5G tactical wireless networks are emerging as a transformative force, particularly in the realm of mission-critical communications. These networks are designed with robustness and reliability to withstand challenging environments, are poised to revolutionise how critical information is exchanged in high-stakes situations.

<sup>1</sup> <https://transformainsights.com/news/global-iot-connections-294>

<sup>2</sup> Smart manufacturing and how to get started the implementation and ROI of industry 4.0 use cases by Dominique Bonte, Jake Saunders, Dimitris Mavrikis, Ryan Martin



Enterprises that fail to adopt Private 5G risk falling behind in an increasingly digital and interconnected world. Without the ultra-reliable, low-latency communication that 5G provides, businesses may struggle with inefficient operations, delays in real-time decision-making and limited automation capabilities. The absence of a robust private network can lead to security vulnerabilities, increased downtime and an inability to scale IoT deployments effectively. Additionally, enterprises may face rising operational costs due to outdated infrastructure, skill gaps in emerging technologies and a loss of competitive advantage against more agile, digitally advanced competitors embracing Industry 4.0. Private 5G Networks offer a transformative advantage, overcoming bottlenecks of traditional network solutions constrained by limitations in throughput, latency, Quality of Service (QoS), device density, interference and scalability.

## PRIVATE 5G: CONTEXT AND SIGNIFICANCE FOR ENTERPRISES

Enterprises are turning to Private 5G Networks to meet their need of safety, security and sustainability in today's fast-paced, connected world. Legacy IT/OT networks and Public networks often fall short in meeting these requirements, which can result in performance bottlenecks, security risks and less control over operations.

Private 5G Networks offers a customised, high-performance solution that directly addresses these challenges, these networks enable enterprises to maintain full control, scalability and security, enabling their businesses to function smoothly without disruptions from public devices or external threats.

Private 5G networks address key challenges like data security, network reliability and system performance through dedicated infrastructure, offering businesses the flexibility to define specific parameters for critical performance metrics such as bandwidth, latency, reliability and availability. This ensures that time-sensitive operations, such as real-time video streaming, automated manufacturing and IoT device communication, receive the necessary resources without interference from less critical traffic. With secure authentication methods, enterprises no longer need to worry about delays from public networks or unauthorised access. Additionally, self-service, self-configuration and self-management features provide businesses with increased flexibility and independence.

By adopting Private 5G networks, organisations gain substantial benefits, including higher throughput, reduced latency, extended coverage and improved mobility. These advantages lead to a more efficient workforce, enhanced service quality and lower power consumption. Industries such as manufacturing, process industries (steel, oil, gas) and logistics (ports, warehouses) can leverage Private 5G to overcome specific operational challenges, ensuring they maintain a competitive edge in a rapidly evolving market.

## PRIVATE 5G NETWORK USE-CASES

Enterprises require various use cases to address different business needs. Private 5G networks offering high bandwidth, ultra-low latency and enhanced reliability are designed to support a variety of mission-critical applications, such as video surveillance, autonomous vehicles, remote operations, industrial automation and real-time data analytics. These use cases are vital for enterprises to achieve key objectives, including driving revenue growth, improving<sup>1</sup> EBITDA through cost savings from enhanced operational efficiency and reduced business disruption, expanding market share and accelerating the development of new products and markets by boosting product innovation and shortening time-to-market.



## VIDEO SURVEILLANCE AND ANALYTICS



**Video surveillance and analytics** use cases are critical for enterprises to ensure security, compliance and operational efficiency across factories, warehouses and campuses. It enables real-time threat detection, perimeter monitoring and worker safety enforcement, reducing risks and enhancing incident response. Advanced AI-driven analytics further optimise operations by detecting anomalies, tracking assets and automating security workflows.

In **manufacturing**, AI-driven surveillance ensures worker safety by detecting PPE compliance violations, monitoring hazardous areas and identifying potential equipment failures before they cause downtime. High-resolution cameras with AI analytics can also oversee production lines, detecting defects and ensuring quality control without manual intervention.

<sup>1</sup> <https://www.snstelecom.com/private5g>

In **logistics and warehouses**, AI-powered video analytics optimise inventory tracking by monitoring the movement of goods, detecting anomalies and preventing theft or misplacement. Private 5G ensures seamless connectivity for real-time alerts and automated workflows, helping improve supply chain efficiency and reducing operational losses.

While in **ports**, AI-enhanced video surveillance plays a crucial role in securing vast terminal areas, monitoring cargo movement and ensuring efficient container handling. AI-powered cameras can detect unauthorised access, track vessel activity and prevent smuggling or theft. With Private 5G, high-definition video feeds are transmitted in real time to control centers, enabling quick response to security threats, optimising crane and truck operations and improving overall port logistics.

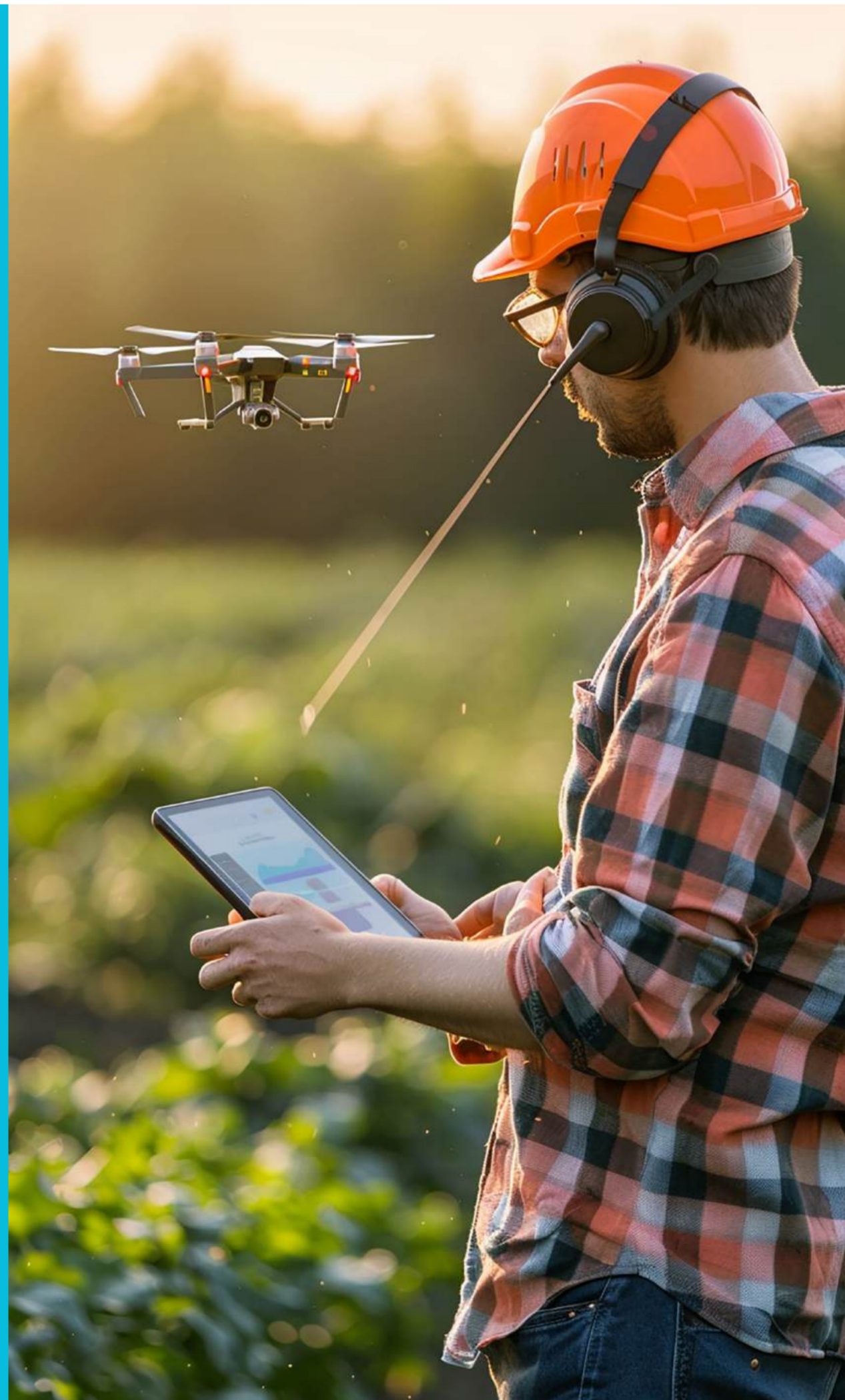
Private 5G networks, with enhanced bandwidth (eMBB) and Ultra-Reliable Low Latency (uRLLC) combined with Multi-Access Edge Computing (MEC), enable cameras to transmit real-time data to central monitoring station where AI/ML algorithms process the information and trigger automated actions. This combination significantly reduces latency, improving surveillance and enabling **50%<sup>1</sup> reduction in manual inspections, 90% defect detection accuracy, \$7M annual savings in one of the leading steel manufacturing.** Additionally, 5G's ability to support 4K/8K HD video streaming enhances image quality, enabling more detailed inspections.

## INSPECTION THROUGH DRONES

Drone-based use cases are becoming increasingly critical for surveillance and monitoring of key business functions in enterprise environments such as production plants, warehouses, yards and hard-to-reach areas (e.g., roofs, chimneys, boilers and furnaces), where human inspection is often challenging or unsafe. By enabling drones to inspect areas that are not yet deemed safe for workers, companies can reduce process downtime by as much as 7%. Industries such as manufacturing, agriculture and infrastructure stand to gain significantly from leveraging drones supported by Private 5G networks. Specially in agriculture one particular company through 5G UAVs, mobile robots, smart glasses, AI image recognition achieved **30%<sup>1</sup> reduction in pest-related losses, 15%<sup>1</sup> revenue increase.**

To ensure precise drone navigation during flight, Private 5G networks provide the necessary low-latency and high-reliability connectivity to support streaming high-quality 4K video. The enhanced Mobile Broadband (eMBB) capabilities of 5G provide the high bandwidth required for seamless data transmission, enabling drones to send real-time video and sensor data to ground stations. This ensures that relevant authorities stay informed, triggers alarms in case of anomalies and ultimately enhances operational safety and efficiency. This makes drones a transformative tool for proactive monitoring and intelligent decision-making, driving enhanced operational performance and safety in business-critical operations.

<sup>1</sup> <https://www.snstelecom.com/private5g>





## AUTONOMOUS GUIDED VEHICLES

Autonomous vehicles are revolutionising efficiency by enabling faster and more optimised movement of materials and sub-assemblies on the shop floor or within warehouses and yards, while also ensuring worker safety. Modern autonomous haulage systems, equipped with on-board sensors and local computational devices for edge computing, allow for high levels of automation, with core functions being autonomously controlled.

Private 5G network is a crucial enabler for AGV use cases, as it provides the high resiliency, high availability and low latency required to support seamless communication and real time access to operational data. This leads to more efficient route planning, fewer delays and less human intervention, One of the transport company operating in supply and chain achieved **70%**<sup>1</sup> reduction in connection timeouts, near-zero packet loss. With 5G-ready private cellular networks, AGVs will be able to operate in unstructured environments and adapt routes according to their surroundings using data from multiple sensors interacting with intelligent systems. By deploying a Private 5G network across industrial locations, organisations can ensure that all autonomous vehicles remain reliably connected throughout their operations, enhancing overall productivity, safety and operational efficiency. This connectivity empowers the adoption of next-generation technologies and reinforces the transformative potential of Industry 4.0.

<sup>1</sup> <https://www.snstelecom.com/private5g>

# PUSH-TO-TALK

Push-to-Talk (PTT) systems are revolutionising communication by providing instant, secure and dependable voice connections across teams, especially in mission-critical industries like manufacturing, mining, logistics, public safety and construction, where fast decision-making and coordination are essential. In these areas, public networks often suffer from limited coverage, rendering them unreliable for continuous communication.

By utilising dedicated PTT solutions, workers can stay connected without the limitations of traditional two-way radios, ensuring enhanced safety and operational efficiency. By isolating communication traffic within the private network, PTT systems benefit from enhanced security, reduced interference and guaranteed quality of service (QoS), ensuring priority for critical messages. Private networks also allow for full control over network performance, ensuring that voice transmissions are clear and reliable, even in remote or dense environments. Additionally, enterprises can customise network coverage to fit specific operational areas, enhancing reliability in regions with challenging connectivity conditions. There is an internal estimate that result is more efficient, uninterrupted communication with up to 30%<sup>1</sup> reduction in emergency response times and 20% increase in safety protocol compliance.



<sup>1</sup> Internal Estimate

# FLEET MANAGEMENT



Accurate tracking and monitoring of fleet assets is essential for industries such as mining, automotive and metals, which rely on a wide range of equipment including drills, longwall shearers, draglines, shovels, dozers, graders and wheel dozers in mining operations; trucks, locomotives and internal trolleys in steel plants; and trucks and trolleys in automotive facilities. To optimise operations and eliminate inefficiencies, these fleets must be transformed into "smart" assets by embedding sensors.

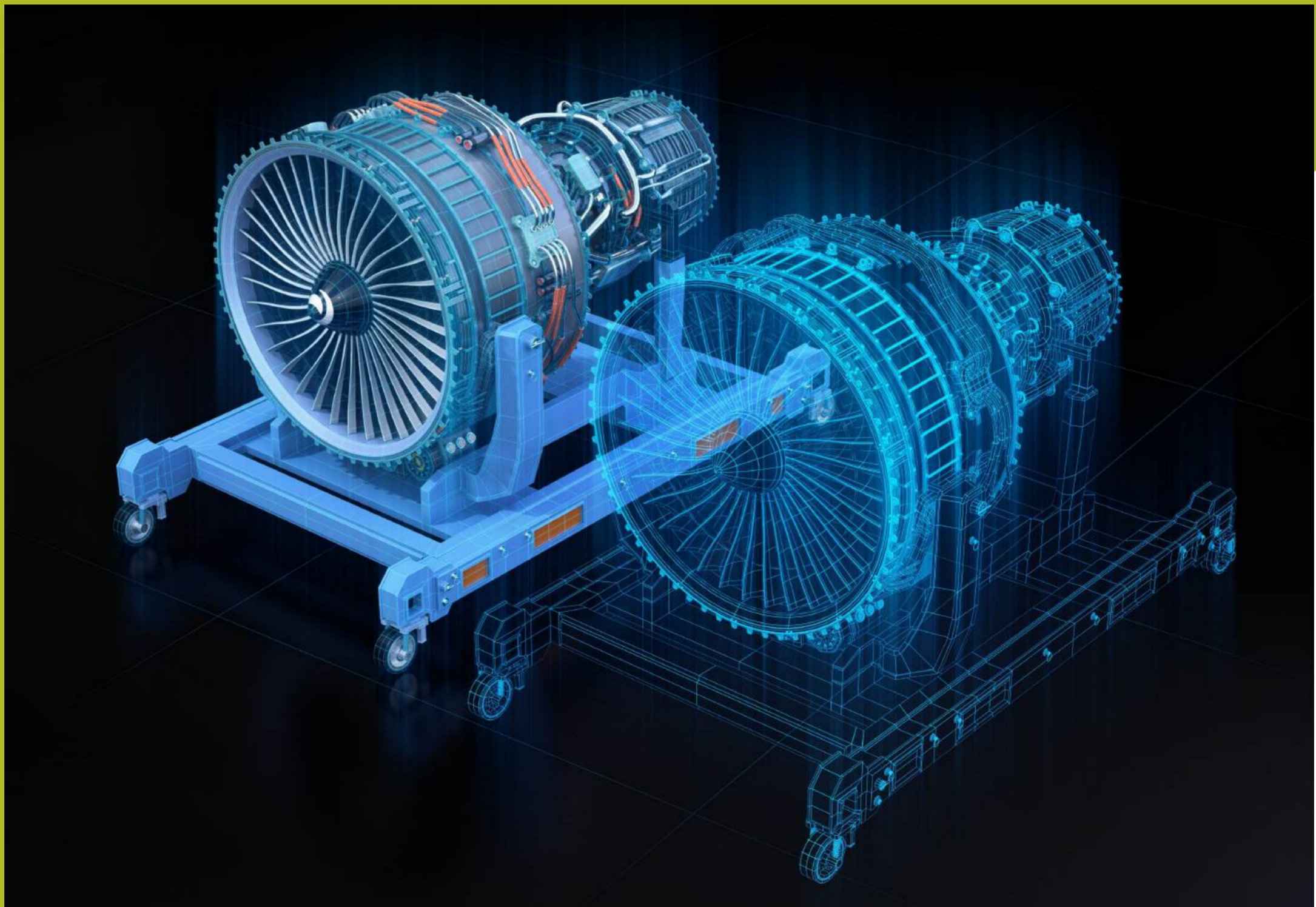
Private networks are transforming fleet management by providing the high-performance connectivity required to monitor and optimise assets in real time. With capabilities like Massive Machine-Type Communications (mMTC) and Ultra-Reliable Low-Latency Communications (uRLLC), Private 5G network enables the seamless connection of multiple sensors to a single core network, facilitating real-time data transmission with minimal latency. Additionally with customised QoS feature fleet-related traffic can be guaranteed high priority and bandwidth, ensuring real-time performance without delays, which is critical in time-sensitive situations. However, when moving into a public network area, public-private handover mechanisms can help manage QoS to ensure that, even on a public network, critical data (such as vehicle status or communication) continues to be prioritised. Integrating Industrial Internet of Things (IIoT) sensors with Private 5G networks enables enterprises to achieve significant operational improvements, One of the leading manufacturers reduced overtime hours by 50%<sup>1</sup>.

<sup>1</sup> [The Rise of Private 5G: Exploring Use Cases, Challenges, and Future Outlook - theCUBE Research](#)

# DIGITAL TWIN

Digital Twin technology is critical across industries like manufacturing, energy and infrastructures businesses strive to optimise operations, improve efficiency and enhance decision-making. A Digital Twin is a virtual replica of physical assets, processes, or environments that allows organisations to gain real-time insights, monitor performance and simulate scenarios without disrupting operations. By creating these real-time replicas, businesses can monitor asset health and performance, from machinery and vehicles to entire production lines and infrastructure. 5G is an important enabler of this use case given that ultra-low latency is required, for example adapting the actions of a machine tool in real-time cannot tolerate latency above 10 milliseconds.

Creating an accurate digital twin of the process and product requires data from sensors to be collected continuously and reliably. This avoids the possibility of missing the relevant data point that identifies the anomaly or feeding incomplete data into the analytics system that would risk misdiagnosing the situation. Connected through a Private 5G network, the Digital Twin can receive real-time data from its physical counterpart, enabling simulations, predictions and improved decision-making in the virtual environment.



## AR/VR

Augmented Reality (AR) and Virtual Reality (VR) technologies are rapidly transforming industries by offering immersive experiences for a range of use cases, from training and maintenance to design and remote assistance. Key areas that benefit from this transformation include remote field operations and technical support, which are vital for industries managing complex machinery and production processes. Often, these systems require specialist expertise for design, operation and troubleshooting and some equipment is difficult to access due to its location or the presence of hazardous materials. These challenges can lead to production delays, increased operational costs and extended downtime.



The solution to these issues lies in enabling robust remote capabilities that support activities such as product modifications, prototype testing, production line training and real-time adjustments to reduce errors. By integrating Augmented Reality (AR) and Virtual Reality (VR) technologies with advanced analytics, businesses can overlay critical information directly onto the physical environment, facilitating improved decision-making and faster responses. For these technologies to function seamlessly, low latency and high bandwidth are imperative to ensure that the virtual and physical worlds are fully synchronised. A Private 5G network offers reliable, fast and responsive connectivity that optimises remote operations, improves troubleshooting, enabling enterprises to create a dynamic, real-time environment that reduces downtime by up to **20%<sup>1</sup>** and delivers **30%<sup>1</sup>** cost savings through improved operational efficiency and minimised business disruption.

## CONCLUSION

To unlock the full potential of Private 5G Networks and deploy mission-critical use cases, enterprises must collaborate closely with network providers to overcome several key challenges. Ensuring enterprise readiness is essential—aligning strategic objectives, infrastructure and skill sets to support a seamless transition while prioritising robust security measures. By addressing technical parameters like coverage, latency and throughput, enterprises can turn these capabilities into tangible business outcomes such as cost efficiency and real-time performance. Tailored solutions for industries like manufacturing, mining, and logistics can address specific deployment challenges, while governance and regulatory concerns must be navigated together with network providers. Ultimately, successful integration of Private 5G networks requires effective collaboration with network providers, device partners and internal teams, enabling businesses to drive innovation, improve operational efficiency and secure a competitive advantage in a rapidly evolving digital landscape.

<sup>1</sup> Internal Estimate

## About Tata Communications

Tata Communications is a leading Commtch player that powers its customers hyperconnected ecosystems through its digital fabric. We bring together tools, platforms, skills and expertise to help customers build agile infrastructure, enable compelling employee and customer experiences, deploy connected solutions and build cyber resilience. With our solutions-oriented approach, proven managed service capabilities and cutting-edge infrastructure, we enable a hyperconnected ecosystem powered by network, cloud, mobility, Internet of Things (IoT), collaboration and security services. Over one-third of the world's internet routes are connected to our network. We connect businesses to 80% of the world's top cloud providers and 4 out of 5 mobile subscribers. Our customers consistently rely on us for our expertise and our industry-leading NPS is a testimony to that.

To learn more about Tata Communications' Digital Fabric and explore how we can transform mission critical Private 5G use cases for you, please write to [internetofthings@tatacommunications.com](mailto:internetofthings@tatacommunications.com)

For more information, visit us at [www.tatacommunications.com](http://www.tatacommunications.com)

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